



ABSTRACT

## Abstracts of the oral communications and posters presented during the congress Anatomia Clinica

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**INTERNATIONAL CONGRESS OF  
ANATOMIA CLINICA**

A JOINT MEETING OF

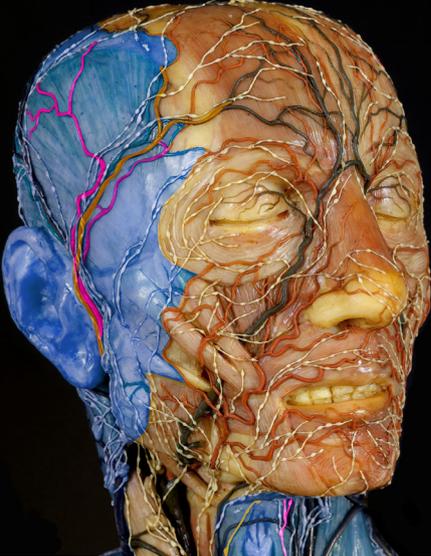
 **15<sup>TH</sup> EUROPEAN ASSOCIATION OF  
CLINICAL ANATOMY (EACA)**

 **11<sup>TH</sup> INTERNATIONAL SYMPOSIUM OF  
CLINICAL AND APPLIED ANATOMY (ISCAA)**

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**ABSTRACTS BOOK**

The international congress of Anatomia Clinica, held in Madrid 24th to 26th June 2019, has been a joint meeting of the European Association of Clinical Anatomy (EACA) and the International Symposium of Clinical and Applied Anatomy (ISCAA). The invited societies were the Japanese Research Society of Clinical Anatomy (JRSCA), the Mexican Anatomical Society (SMA) and the Spanish Anatomical Society (SAE).

It has been an important international meeting in the fields of clinical and applied anatomy, and translational research in anatomical sciences.

On behalf of the President of the Congress, PR J. Sanudo, and Vice-President, PR T. Vasquez, we are happy to group and publish here the selected abstracts of the presented communications (grouped by sessions) and posters.

F. Duparc (France) and M. Korschake (Austria), for the Scientific Committee, and B. Grignon, EACA General Secretary.

### Oral Session 1—Techniques in anatomy: from donation service to students evaluation

#### O-002

##### Comparison between dodge and traditional embalming techniques

*Iain Campbell, Sameer Dhumale, Thomas Gillingwater, Abdulmenem Alashkham*

*University of Edinburgh, Edinburgh, United Kingdom*

**Introduction:** Given the increasing use of cadavers for surgical training, soft embalming methods such as the Dodge technique have been employed in an attempt to generate more “lifelike” specimens. This study aimed to directly compare Traditional Formaldehyde Embalming (TFE) and Dodge Techniques (DT) based on: (1) practical considerations including cost effectiveness, practicality of embalming, equipment requirements, durability, longevity, and resistance to bacteria, and; (2) educational value in terms of suitability for teaching undergraduate and postgraduate students, suitability for clinical courses, tissue colour, consistency, accuracy, odour and joint flexibility.

**Materials and methods:** The cadavers were obtained from Anatomy, University of Edinburgh, in accordance with the Human Tissue (Scotland) Act 2006. The TFE and DT were assessed by technical and academic staff through questionnaire and semi-structured interview. **Results:** DT generated more “lifelike” tissue consistency and colour, improving their suitability for surgical training and anatomy teaching. Dodge cadavers presented with a less intense odour, and were more cost effective. However, TFE techniques conferred much better durability and resistance to bacterial and fungal development, making them more suitable for specimens that are to be exposed to the rigours of high-volume undergraduate anatomy teaching.

**Conclusion:** When taking the practical considerations and educational value into account, the DT is a viable compliment to the TFE technique. It has proven to be very suitable for surgical training courses due to flexibility of the tissues. Further research to assess the longevity, durability and resistance to bacteria and fungus of the DT in a larger cohort is recommended.

#### O-003

##### Study preferences in anatomy education: perspective of Turkish medical students

*Barut Cagatay, Karaer Ekremcan, Yavuz Melike*

*Bahcesehir University, Istanbul, Turkey*

**Introduction:** Anatomy has been taught for centuries and many variations occurred in anatomy education all around the world. Researches mostly focused on what is the best teaching method for students, instead of what is the best studying method for them. Thus, this study aims to identify the study preferences of Turkish medical students in terms of study methods and sources.

**Materials and methods:** 1998 medical students participated in the study. Participants were asked questions related with their way of studying anatomy; including time spent for studying, preference for a group or individual study, study materials, study methods. Descriptive statistics for categorical variables are given with frequency and percent and categorical independent data were analyzed with Chi-square tests.

**Results:** Students from 35 medical schools of Turkey answered the survey. Majority of the respondents preferred studying anatomy alone (72.9%). The preference for a group or individual study of males and females were similar ( $p = 0.569$ ), both genders preferred studying anatomy alone. Slide layouts of the theoretical class presentations were the leading preference for anatomy study sources (45.7%). The preference for study materials of males and females were similar ( $p = 0.235$ ). Although most frequent choice for study methods was regular repetitions there was a statistically significant differences between genders in terms of study methods ( $p = 0.002$ ). Study methods include correlation of structures with relations (18.0%), with functions (14.6%), with clinical situations (13.8%), memorizing with mnemonics (17.5%), and regular repetitions (20.8%).

**Conclusion:** Detailed interpretation of study preferences may lead changes in anatomy curricula in the future.

#### O-004

##### Unclaimed cadavers vs body donation: a comparative study of cadavers' transportation in the Departments of Anatomy in Greece

*Konstantinos Natsis<sup>1</sup>, Giannoulis Piagkos<sup>2</sup>, George P. Skandalakis<sup>2</sup>, Nikolaos Lazaridis<sup>1</sup>, Nikolaos Anastasopoulos<sup>1</sup>, Maria Piagkou<sup>2</sup>*

*<sup>1</sup>Department of Anatomy and Surgical Anatomy, Medical School, Aristotle University of Thessaloniki, Thessaloniki, Greece;*

*<sup>2</sup>Department of Anatomy and Surgical Anatomy, Medical School, National and Kapodistrian University of Athens, Athens, Greece*

**Introduction:** Cadaveric dissection plays a fundamental role in teaching anatomy. Although body donation (BD) provides a certain number of cadavers, it still remains low. The current study highlights the lack of cadavers and investigates the causative agents of this shortage over time.

**Materials and methods:** Our Databases were investigated for the distribution of corpses throughout the time period 1934–2019. The

number of collected unclaimed cadavers and these after BD were recorded in relation to the subjects' gender, age, place of origin and cause of death.

Results: In total 3.907 cadavers were dissected during the last 85 years, 3340 (2225 male and 1115 female) cadavers in Athens and 567 (433 male and 137 female) cadavers in Thessaloniki. Two hundred and fifty corpses derived from Athens, 2070 from the province, 600 from abroad and 420 were of unknown origin. Among them, 270 cadavers were younger than 20 years, 1220 (21–40 years), 756 (41–60 years), 880 over 61 years and 214 corpses were unclaimed. 3160 cadavers derived from hospitals, 401 from charitably institutions, 130 from their residence, 122 from psychiatric hospitals and 31 cadavers from prisons. During the period 1981–2019, 247 (129 male and 118 female) corpses were donated. Among them, 542 corpses were unclaimed and 21 cadavers derived through the BD program. During the period 1934–1959, tuberculosis was the first cause of death, contrariwise to the last decades, where cancer and cardiovascular disease took the first place.

Conclusion: The need for cadavers remains timeless because human body is an irreplaceable educational tool.

## O-005

### Improvement in the learning process of radiological anatomy competences after the implementation of E-learning modules

Jaime Jimeno Fraile, Marina Lleal Curtey, Alexandre Meri, Juan Sanchez, Marcos Busto, Alejandro Bravo, Jose Antonio Pereira

Universitat Pompeu Fabra, Barcelona, Spain

Introduction: One of the learning objectives in clinical anatomy is to acquire competences in the recognition of radiological and cross-sectional anatomical structures. We have analyzed our students' results in these skills and it require improvements. Thus, the study objective is to assess the effect of the e-learning modules on the learning of radiological anatomy competences in preclinical students in Medicine and Human Biology degree.

Materials and methods: The e-learning modules included contents on radiological anatomy of the digestive (EAD) and the genitourinary (EAGU) systems. These contents were developed on the Moodle platform. The time required by the students to complete the questionnaires, the self-assessment score, and the final exam score were assessed. A satisfaction survey of the tools was also completed by the students.

Results: A sample of 143 students was included in the study. In global exam, the students who performed the EAD recognized more frequently the radiological anatomy structures (91% vs 65%,  $p = 0.001$ ). In addition, students with better self-assessment scores were associated with higher scores in both the responses of the specific radiological examination (RR 0.34,  $p = 0.019$ ) and the final grade of the exam (RR 0.32,  $p = 0.026$ ). The overall satisfaction rating was very good (9.26/10) and regarded it as very useful (100/100).

Conclusions: The e-learning modules have been well valued with high satisfaction and great utility. In addition, self-administered e-learning modules implementation have improved the results in the learning of radiological anatomy competences. Therefore, we believe that its implementation in a systematic manner is highly recommended.

## O-006

### Body donation in Poland. Problems, perspectives and futures

Marcelina Lopińska<sup>1</sup>, Jerzy Gielecki<sup>1</sup>, Anna Żurada<sup>2</sup>

<sup>1</sup>Department of Anatomy Collegium Medicum, Medical Faculty, University of Warmia and Mazury in Olsztyn, Olsztyn, Poland;

<sup>2</sup>Department of Radiology Collegium Medicum, Medical Faculty, University of Warmia and Mazury in Olsztyn, Olsztyn, Poland

Introduction: The human body is the best atlas of anatomy. No plastic phantom can replace a human being. Doctors cannot be trained without contact with human cadavers. In 2003, the first program of conscious donation of human body was created. This program allows the voluntary transfer of the body for scientific purposes. Earlier, the Polish government allowed only the transfer of corpses of persons whose bodies were not taken away by the family and deceased prisoners. Today, to become donor, you must complete the act of donation. The form must be confirmed by a notary public.

Materials and methods: The aim of the study was to examine the attitudes of Poles towards the transfer of the body for scientific purposes carried out on a random, representative sample of 1000 inhabitants of Poland aged 15 and more, face-to-face interview technique.

Results: More than every fourth Pole would be willing to consent to the use of their bodies after death for science, but most would not agree. Those who would agree to pass the body to science would do it primarily because they want to help other people to be more effectively treated. Respondents who refused to hand over their bodies for learning are divided as to the reasons for their reluctance. The respondents are discouraged that their normal funeral would not take place, they do not want someone to interfere in their body after death and that their body would be maimed.

Conclusion: Body donation is the major source of cadavers.

## O-007

### Survey from students of military physician about different methods used to teach practical anatomy

Jesús García Martín<sup>1</sup>, Lorenzo Mauricio Hernández Fernández<sup>1</sup>, María Asunción Sánchez Gil<sup>2</sup>, Natalio García Hondurilla<sup>3</sup>

<sup>1</sup>Departamento de Cirugía y Ciencias Médicas y Sociales. Unidad Docente de Anatomía y Embriología Humana. Facultad de Medicina y Ciencias de La Salud, Alcalá de Henares, Spain; <sup>2</sup>Centro Universitario de la Defensa, Madrid, Spain; <sup>3</sup>Departamento de Ciencias Biomédicas, Facultad de Medicina y Ciencias de la Salud, Alcalá de Henares, Spain

Introduction: Classically there are different methods to teach practical human anatomy. They vary from the more used by the students, as the Atlas; till the sophisticated and exclusive to use by the Institutions as the ANATOMAGE. All of us have studied Anatomy using Bones and the Skeleton, and the useful Anatomical Models to get an spatial knowledge. And to reach the inner parts of the body the practise of Prosections and Dissections. These five methods were considered to assess the interest and utility experienced by 84 students of second degree preparing as military physicians in the Defense University Center (Centro Universitario de la Defensa) located in Madrid.

**Materials and methods:** We used a survey that includes these five methods to teach practical anatomy. This is an adapted items scale with five numeric form which extents from: Non useful, less useful, indifferent, useful and very useful.

And every one of these five methods were also evaluated using another five items scale that includes a punctuation from 1 to 5 to assess the level of utility and interest experienced by the students. We adapted a scale used by K–K. Leung et al. (2006) Medical Teacher, that evaluates the next items: 1- Facilitate learning of anatomy; 2- facilitate spatial visualization; 3- facilitate the retention of anatomical knowledge; 4- connect anatomy with real situations; 5- facilitate the application of anatomy in practice medicine.

**Results and Conclusions** are pending to obtain the final statistical analysis of all the surveys collected from the students.

## O-008

### Novel contrast agent with gadolinium reveals detailed human vascular anatomy from donor cadavers using MRI

Brion Benninger, Ciaran Smyth, Madeline Hay, Scott Echols

Medical Anatomy Center, Western University of Health Sciences, Lebanon, Oregon, United States

**Introduction:** MRI imaging of humans to reveal vasculature is classically conducted using contrast agents including gadolinium and iodine. These contrast agents exit vessels within seconds of being injected resulting in successfully imaging medium sized vessels and less so of smaller vessels. Post embalmed donor cadavers do not reveal vessels well as they are collapsed. The objective of this study was to investigate if a mixed contrast agent including gadolinium could be perfused into a donor cadaver to reveal medium, small and very small vessels using hospital MRI 1.5 T (T) scanner.

**Methods:** A literature search was conducted on hospital MRI imaging with vascular contrast agents on donor cadavers to reveal detailed human vasculature with MRI. Barium sulfate derivative and gadolinium was perfused into donor cadavers. MRI scan was conducted post perfusion. **Results:** Literature search revealed no known published manuscripts using a mixed contrast agent including gadolinium to reveal medium sized (2–5 mm), small (1–2 mm) and very small vessels (less than 1 mm). A novel contrast perfusion technique was successful in revealing detailed donor cadaver vascular anatomy with a conventional hospital MRI scanner.

**Conclusion:** A mixed contrast agent including gadolinium was successfully administered to donor cadavers using a novel perfusion technique which revealed detailed vasculature not previously appreciated using conventional MRI 1.5 T scanning.

## Oral Session 2—Head and neck/miscellaneous

## O-009

### Corona mortis: anatomical variation and its clinical significance

Waseem Al Talalwah<sup>1</sup>, Roger Soames<sup>2</sup>

<sup>1</sup>King Saud bin Abdulaziz University for Health Sciences, College of Medicine, Riyadh, Saudi Arabia; <sup>2</sup>University of Dundee, College of Life Science, United Kingdom

**Introduction:** Anatomical variation is unusual morphology of standard anatomical appearance. The neurovascular bundle is a common anatomical variation in human body. The anatomical variation of neurovascular bundle can be classified in origin, course and branches. A replacement of congenital absence of neurovascular bundle instead of standard morphological anatomy is considered as anatomical variation. Corona mortis one of the most common anatomical variation.

**Materials and methods:** after routine dissection of human cadavers for undergraduate students in anatomy laboratory, the current study conducted to identify the corona mortis and its incidence rate based cadaveric dissection. The current study investigates the anatomical variation and their incidences in different population as well as the clinical issues and optional treatment in medicine. **Result:** Corona mortis is one of common anatomical variation ranges between 1 and 60% in different researches. It is two forms arterial and venous anastomosis between the obturator and its accessory arteries. Current research, it found to be in 4.2% in different forms.

**Conclusion:** The obturator artery crosses the superior pubic ramus and is susceptible to injuries. Therefore, it becomes a clinical issue for different operations such as fracture of pubic rami, herniography and gun shots. Knowing variability of obturator artery origin in corona mortis may modify the surgical procedures to minimize the postsurgical complication. It is a mandatory to clarify the corona mortis prior to any surgical procedures. Therefore, the radiologists have to be aware of corona mortis to alert surgeons, orthopedics, urologists, obstetricians and gynecologists prior to operations and procedures.

## O-010

### Evidence-based anatomy

Kaissar Yammine

Lebanese American University, Beirut, Lebanon

**Introduction:** Evidence-Based Anatomy (EBA) is the concept of applying the principles of evidence-based medicine in the field of anatomy. The conduct of systematic reviews and meta-analyses (MA) to anatomical structures could help in assessing their variations and the corresponding clinical impacts with more accuracy.

**Methods:** Based on 20 anatomical meta-analyses published in the literature, an assessment of their results was conducted.

**Results:** Weighted results of the number of slips of each long extensor tendons of the hand showed where to better locate sources of tendon graft from the dorsum of the hand. Plantaris tendon demonstrated a better surgical consistency than palmaris longus. When compared to clinical MA, interventional cadaveric MA were found to be a better model in assessing potential complications in mini invasive surgery. Peroneus quartus and peroneus digit quinti muscles are unlikely to be variants of a same structure. Sternal lengths are not reliable to estimate stature from corpses. The fibularis tertius muscle could had played an essential role during the phylogenetic development of the erect bipedal posture and probably still during gait. The frequency and distribution of the sesamoids of the hand and the foot are likely to be linked to the degree of independence of the digits.

**Conclusions:** EBA offers the possibility of generating more accurate values in relation to anatomical variants. Values such as mean frequency and mean size of anatomical structures reported in the textbooks or in previous articles will change in the future.

**O-011****A comparison between the lumbopelvic biomechanics of several breastfeeding positions**

Gemma Biviá-Roig<sup>1</sup>, Juan Francisco Lisón<sup>2</sup>,  
Daniel Sánchez-Zuriaga<sup>3</sup>

<sup>1</sup>Department of Physiotherapy, Universidad Cardenal Herrera-CEU, Alfara del Patriarca, Spain; <sup>2</sup>Department of Medicine, Universidad Cardenal Herrera-CEU, Alfara del Patriarca, Spain; <sup>3</sup>Department of Anatomy and Human Embryology, University of València, València, Spain

**Introduction:** Postural recommendations about breastfeeding have been focused on the comfort of the mother and the proper hold of the child to the breast, ignoring the effects of each position on lumbopelvic region injuries. Given the high prevalence of postpartum low back pain, the aim of this study is to analyze the position of the lumbopelvic region and erector spinae muscle activity in the most common breastfeeding positions.

**Materials and methods:** We recorded the curvatures of the lumbar spine and pelvis in the sagittal plane, and the EMG activity of the right and left erector spinae muscles, in 34 women in erect standing and breastfeeding their own children in several positions recommended by the American Academy of Paediatrics: lateral decubitus, the cradle hold and the clutch hold, these last two with and without a step for one foot.

**Results:** Lateral decubitus and clutch hold (with and without step) showed the greatest values of lumbar spine flexion. Erect standing showed the highest anterior pelvic rotation, followed by lateral decubitus, whereas in all seated positions the pelvis was in posterior rotation. The support side in the lateral decubitus position showed the lowest muscle activation values.

**Conclusions:** Lumbopelvic position and muscle activation parameters did not show differences in any of the seated positions between keeping both feet flat on the floor, or support one of them on a step. The lowest activation levels were obtained in the lateral decubitus position, which could mean that this position may be more advisable than the rest.

**O-012****Anatomical repair of craniofacial defects by custom cranioplasties performed by low-cost 3D printing**

Sofiane Imekraz, Mourad Bouaziz

Faculty of Medicine, Annaba, Algeria, Algeria

**Introduction:** The authors applied the technology of modeling and 3D printing to make custom-designed implants for craniofacial defects without the use of expensive materials or exorbitant 3D printers. The realization and placement of cranioplasties were performed in a single surgical time.

**Materials and methods:** The implants are made with bone cement reformed on printed molds. These are designed on the basis of patients' radiological data (CTscan), printed and sterilized before the surgical procedure. The completion of the mold is done with the use of freeware and a low-cost printer. The correction of the deformation due to the lesion is done numerically by symmetry of the healthy side of the skull.

**Results:** The bone implant fits perfectly to defect, the complex anatomical reliefs are correctly reproduced and the risk of

deformation is reduced. Examples of anatomical repairs were exposed. Causal lesions were tumorous and traumatic.

**Conclusion:** 3D printing has revolutionized the prosthetic industry. Through this work, we expose a field of neurosurgery in which 3D printing can be used for the realization of custom cranioplasties. The result is satisfactory on:

- The surgical level (only one operating time),
- Aesthetic level (correct reproduction of the cranioplasty) and
- Economical level (lower cost).

**O-013****Anatomical variations of the levator palpebrae superioris muscle**

Robert Hatadaj, Mirosław Topol

Department of Normal and Clinical Anatomy, Medical University of Lodz, Lodz, Poland

**Introduction:** The levator palpebrae superioris muscle belongs to the extrinsic muscles of the eyeball, however it may be classified as well as the eyeball muscle or the mimic muscle. It is innervated by the oculomotor nerve. The levator palpebrae superioris originates on the lesser wing of the sphenoid bone. On its further course it broadens and decreases in thickness, and becomes the levator aponeurosis. Its contraction causes the eyelid to move upwards. Paralysis of the muscle is manifested by ptosis.

**Materials and methods:** 40 orbits were dissected. After removal the orbital roof, the shape of the levator palpebrae superioris and its anatomical variations (i.e. the presence accessory muscular bands or atypical formation of the muscle) were assessed.

**Results:** In 21 cases (52.5%) the levator palpebrae superioris showed typical morphology. In 7 cases (17.5%) the additional muscular slips were attached to the lacrimal gland. In another 7 cases (17.5%), additional muscular slips were attached to the trochlea of the superior oblique muscle; In 3 of those cases the additional fibers were well developed and formed accessory medial slips of the levator. In 5 cases (12.5%), the additional slips were attached both to the lacrimal gland and the trochlea of the superior oblique muscle. In one case the double origin of the levator palpebrae superioris was observed.

**Conclusions:** Plastic surgeons should be aware of anatomic variations of the levator palpebrae superioris muscle both in planning and in conducting surgeries of the upper eyelid.

**O-014****Prevention of migration of iliosacral screws after osteosynthesis of unstable pelvic injuries**

Vaclav Baca<sup>1</sup>, Daniel Hlavacek<sup>2</sup>; Krystof Sidlo<sup>2</sup>, Jan Skubal<sup>2</sup>, Zdenek Horak<sup>3</sup>, Valer Dzupa<sup>4</sup>

<sup>1</sup>College of Polytechnics Jihlava and Centre for Integrated Study of Pelvis, Prague, Jihlava, Czech Republic; <sup>2</sup>Centre for Integrated Study of Pelvis, Third Faculty of Medicine, Charles University, Prague, Czech Republic; <sup>3</sup>College of Polytechnics Jihlava and Centre for Integrated Study of Pelvis, Third Faculty of Medicine, Charles University, Prague, Jihlava, Czech Republic; <sup>4</sup>Centre for Integrated Study of Pelvis and Department of Orthopaedics and Traumatology, Third Faculty of Medicine, Charles University and FNKV, Prague, Czech Republic

**Introduction:** The condition of satisfactory healing of partly (type B) and completely (type C) unstable pelvic fractures is an adequate reduction and stable fixation of the anterior and both posterior pelvic segments. The mini-invasive method of osteosynthesis is currently generally preferred, but particularly suitable in some type of patients (higher age, polytrauma). We were interested in the stability of the posterior pelvic segment treated with iliosacral screws introduced by the “standard” method (two parallel screws) and the “new” technique (convergent screw threads locked together).

**Materials and methods:** patients treated with two iliosacral screws osteosynthesis of one or both posterior pelvic segments between 2009 and 2012, in the X-ray documentation there was retrospectively measured the migration of these screws in 6 weeks, 3 months, 6 months and a year after surgery. The results obtained were evaluated by the Chi square test at the 5% significance level.

**Results:** The study included 41 patients aged, 18 of whom were treated by the “classical” method and 23 patients by the “new” technique. Migration accompanied by clinical complaints (5 mm or more) within 6 weeks of surgery was found in 8 patients from 18 treated “classically” and in three patients from 23 after fixation with “new” technique, this difference was statistically significant ( $p = 0.0392$ ).

**Conclusions:** The new technique of iliosacral fixation means less risk of screw migration and therefore extends possibilities of minimally invasive treatment of unstable pelvic fractures as well as treatment of groups of patients in higher risk (e.g. higher age, polytrauma).

## O-015

### **Spatial relationship of the facial muscles in the nasolabial fold by anatomical dissection and three-dimensional microcomputed tomography**

Jehoon O<sup>1</sup>, Hyun-Jin Kwon<sup>1</sup>, Hun-Mu Yang<sup>1</sup>, Mi-Sun Hur<sup>2</sup>

<sup>1</sup>Department of Anatomy, Yonsei University College of Medicine, Seoul, Republic of South Korea; <sup>2</sup>Department of Anatomy, Catholic Kwandong University College of Medicine, Gangneung, Republic of South Korea

**Introduction:** The aim of this study was to clarify the spatial relationship of the facial muscles in the nasolabial fold by anatomical dissection and three-dimensional microcomputed tomography (3D Micro-CT) for aesthetic treatment.

**Materials and methods:** Facial muscles were dissected in 40 specimens of embalmed Korean adult cadavers. Facial muscles with the skin of the nasolabial fold were scanned in twenty-two specimens and their serial Micro-CT images were reconstructed into 3D models. A reference line for the nasolabial fold was delineated from the superior point of the alar facial crease to the lateral point of the orbicularis oris muscle at the level of the corner of the mouth.

**Results:** The levator labii superioris alaeque nasi passed through the upper third of the reference line in all dissected specimens (100%). The levator labii superioris passed through the alare to the midpoint and upper third point of the reference line in 55% and 45%, respectively. The zygomaticus minor passed through the upper half of the middle third and the total of the middle third of the reference line in 52.5% and 47.5%, respectively. The zygomaticus major passed through the lower third and the upper part of the lower half of the reference line in 60% and 40%, respectively. All of the above were also observed by 3D Micro-CT.

**Conclusions:** These findings will be useful for understanding which muscles affect a specific part of the nasolabial fold that has various contours and useful for reducing the nasolabial fold for aesthetics.

## O-016

### **The lacrimal system—pictorial review of the anatomy and pathology using dacryocystography**

Manuel Alberto Correia, Francisco Raposo, Filipa Proença, Carla Guerreiro, Luísa Biscoito, Graça Sá, Lia Neto

Centro Hospitalar e Universitário Lisboa Norte, Lisboa, Portugal

**Introduction/objectives:** The lacrimal system is a complex structure made of osseous and membranous passages that may suffer pathologic processes leading to stenosis/obstructions. Dacryocystography is a fluoroscopic examination of the nasolacrimal apparatus with the instillation of iodinated contrast. It's used to evaluate the anatomy, functional aspects and pathology of the lacrimal system. The objective of this work is to review the anatomy of the nasolacrimal system and correlate it with the findings of the digital subtraction dacryocystography (DSD) examinations made in our department. Anatomical details and their relationship with pathology are depicted. **Materials and methods:** Literature review of the normal anatomy/variants and retrospective analysis of the DSD performed in our centre in a six-year period (2013–2018). Identification and classification of pathology according to the different anatomical segments.

**Results:** There were 163 patients submitted to DSD (326 lacrimal systems in total). The majority (45%) had epiphora, the mean age was  $61 \pm 17$  years, 75% were female. Obstruction was the most frequent finding, 50% being in the transition lacrimal sac-lacrimal duct. One-third of the systems were normal. Diverticula/occlusion of the lacrimal puncta were rare findings.

**Conclusion:** The clinical complaints of the patients with nasolacrimal pathology are frequent. Understanding the pathologic processes and their correlation with the normal anatomy and the findings of the dacryocystography may contribute to improve the knowledge in this still poorly understood field.

## Oral Session 3—Thorax and heart

## O-017

### **The effect of hyperkyphosis on rib cage morphology**

Smadar Peleg<sup>1</sup>, Ruth Pelleg Kallevag<sup>1</sup>, Gali Dar<sup>2</sup>, Nili Steinberg<sup>3</sup>, Youssef Masharawi<sup>4</sup>, Hila May<sup>4</sup>

<sup>1</sup>Zefat Academic College, Zefat, Israel; <sup>2</sup>University of Haifa, Haifa, Israel; <sup>3</sup>Wingate Institute, Netanya, Israel; <sup>4</sup>Tel Aviv University, Tel Aviv, Israel

**Introduction:** Scheuermann's disease is characterized by an increased anterior vertebral wedging causing hyperkyphosis of the spine. While it was already known that the sacrum's orientation changes in kyphotic individuals, there is little information regarding morpho-

logical adaptations of the rib cage. The aim of this study was to reveal morphological changes in the rib cage in hyperkyphotic individuals. Materials and methods: A control group (n = 176) and a study group (hyperkyphotic, n = 194), all from the Hamann-Todd Osteologic Collection (Cleveland, Ohio, USA), were included in the study. Information regarding sex, age and ethnicity was recorded. Linear and angular measurements of the sternum (length and width), ribs 5–9 (length and depth), and thoracic vertebrae (transverse process angle of T5 to T9) were carried out. Indices were calculated from these measurements.

Results: Significant modifications in the morphology of ribs and sternum were found. In the kyphotic group, the sternum was significantly wider and the ribs were significantly longer compared to the control group. The attachment region of the longissimus muscle, however, was significantly smaller in the study group compared with the control group. Nevertheless, the orientation of the rib cage did not differ significantly between the groups.

Conclusions: Rib cage morphology undergoes considerable modifications in individuals with thoracic hyperkyphosis. The modifications mostly affect the anterior part of the rib cage and its proportions. Moreover, the relative attachment area of the longissimus muscle is smaller. All this might affect the functionality of the rib cage in breathing, posture and locomotion.

## O-018

### Pediatric central venous catheterization: the role of the aortic valve in defining the svc/ra junction

Lucy Hinton<sup>1</sup>, Nicholas Fischer<sup>1</sup>, Kiarash Taghavi<sup>2</sup>, Lomani O'hagan<sup>3</sup>, Ali Mirjalili<sup>3</sup>

<sup>1</sup>Department of General Surgery, Gisborne Hospital, Gisborne, New Zealand; <sup>2</sup>Department of Paediatric Surgery, The Royal Children's Hospital, Melbourne, Australia; <sup>3</sup>Department of Anatomy and Medical Imaging, University of Auckland, Auckland, New Zealand

Introduction: The aortic valve (AV) has been used as a surrogate marker for the superior vena cava/right atrial (SVC/RA) junction during the placement of central venous catheters. There is a paucity of evidence to determine whether this is a consistent finding in children. Materials and methods: Eighty-seven Computed Tomography (CT) scans of the thorax acquired at local children's hospitals from April 2010 to September 2011 were retrospectively collected. The distance between the SVC/RA junction and the AV was measured by dual consensus. The cranio-caudal level of the SVC/RA junction and the AV were referenced to the costal cartilages (CCs) and anterior intercostal spaces (ICSs).

Results: The results confirmed that the SVC/RA junction has a variable relationship to the AV. The SVC/RA junction was on average 3.1 mm superior the AV. This distance increased with age. In the < 1 year-old age group the SVC/RA junction was on average 1.3 mm superior to the AV (range: – 6 mm to 11 mm). In the 1–2 years-old age group: 3.5 mm (range: – 8 mm to 15 mm). In the 3–6 years-old: 3.8 mm (range: – 9 mm to 13 mm). In the > 7 years-old age group: 4 mm (range: – 11 mm to 16 mm). The surface anatomy of the SVC/RA junction was variable, ranging from the 2nd ICS to 6th CC.

Conclusion: The SVC/RA junction has a predictable relationship to the AV, and this can be used as an adjunct marker for accurate placement of central venous catheters except in the smallest neonates.

## O-019

### Structural organization of the conduction system of heart of human fetuses

Galina Spirina, Galina Spirina

Ural State Medical University, Yekaterinburg, Russian Federation

Introduction: Knowledge of individual differences in the structure of the cardiac conduction system in the prenatal period of development is necessary to interpret possible sources of pathological abnormalities in fetuses.

Materials and methods: The topography and parameters of the atrioventricular node, the bundle, its right and left bundle branches in relation to the structure of the interventricular septum were studied on 149 preparations of the human fetus hearts on the 12–32 weeks of development using standard morphological methods.

Results: In fetuses, the variability of the linear dimensions and the shape of the sinus part of the interventricular septum determines the different length of the atrioventricular bundle and the angle of its position. In the square form of the sinus part node is located at the junction of the interatrial and interventricular septums of the heart, anterior to the opening of the coronary sinus. The atrioventricular bundle is located on the top of the muscular crest of the sinus part. The angle of separation of the right and left bundle branches from the beam is 90°. In the pentagonal form of the sinus part, node is located at the opening of the coronary sinus, the bundle position angle increases to 45°, the angles of discharge of the bundle-branches—up to 160°–180°.

Conclusions: The topography and parameters of the atrioventricular node, bundle and bundle-branches are closely related to the structure of the parts of the interventricular septum, which is evident already in fetuses.

## O-020

### Features of the fetal heart anatomy in the prenatal period of the ontogenesis

Diana Liashchenko, Vlada Liashchenko

Orenburg State Medical University, Orenburg, Russian Federation

Introduction: Development of the fetal surgery demands detailed data on fetal internal organs anatomy of the person in the last decade.

Methods: Studying of the fetal heart anatomy features on material of 100 person fetuses of both sexes of 16–22 weeks of development without congenital malformations became the purpose of this work. For studying of this material the macromicroscopic preparation, a method of horizontal and sagittal sections, staining of cuts according to Van Gieson were used.

Results of a research allowed to establish that in 16–22 weeks of development the anatomy of heart is similar to the child anatomy. Clearly the basis and apex of the heart, both ventricles and atriums, both auricles, its coronal vessels and main grooves are defined. Careful measurements of all heart chambers allowed to determine that growth of heart by 22nd week goes mainly to length at insignificant increasing of width. Heart chambers for 16–22 weeks of development grow unevenly and in different directions. The sizes of both atriums in all age groups were comparable among themselves and did not differ.

In 16–22 weeks of development length, width and wall thickness of both heart ventricles of fetuses intensively change. The prevalence of length of the left ventricle of heart ( $16.76 \pm 1.1$  mm) over length of right ( $13.15 \pm 0.9$  mm) at fetuses in 22 week of development attracted attention at an identical thickness of their wall on this term of development. Results of work allowed to formulate the main features of fetal anatomy of the heart in the prenatal period of development.

## O-021

### The lymphovenous junction, a true anatomical valve?

Lomani O'hagan<sup>1</sup>, John Windsor<sup>2</sup>, Ali Mirjalili<sup>1</sup>

<sup>1</sup>Department of Anatomy and Medical Imaging, University of Auckland, Auckland, New Zealand; <sup>2</sup>Department of Surgery, University of Auckland, Auckland, New Zealand

**Introduction:** There is increasing interest in thoracic duct (TD) lymph due to its putative role in the promotion of multiple organ failure. This has highlighted the lymphovenous junction (LVJ) as an area for potential clinical intervention. However, the precise anatomy and physiology of the LVJ and its specialised valve remains obscure. The aim of this study was to determine the morphology of the LVJ and its valvular apparatus in humans.

**Materials and methods:** The LVJs from 20 formalin embalmed cadavers were harvested and examined under a surgical microscope. Two specimens were paraffin imbedded, sliced, and stained with Masson's trichrome. Histological slides were digitised, and a three-dimensional computer model produced.

**Results:** Surgical dissection of 5 specimens revealed no leafed-valve at the LVJ. The LVJ opened into a complex chamber that received the terminal TD and other lymphatic trunks. Delicate bicuspid valves were found guarding the openings of these trunks into the chamber. Histology of one specimen demonstrated the terminal TD draining into an outpouching of venous wall. A slit shaped bicuspid valve guarded the TD ostium. Four surgical dissections and histology demonstrated notable clot formation on the valve leaflets.

**Conclusion:** Preliminary results from surgical dissections and histology suggest the LVJ has a complex and variable morphology. A true anatomical valve guarding the LVJ may not always be present in humans. Clots seen on valve leaflets may be suggestive of a human physiological lymphovenous haemostatic mechanism, akin to that recently demonstrated in the mouse.

## O-022

### Aortic arch variants, which may cause compression of the trachea

Konstantinos Natsis<sup>1</sup>, Christos Lyrtzis<sup>1</sup>, Maria Piagkou<sup>2</sup>

<sup>1</sup>Department of Anatomy and Surgical Anatomy, School of Medicine, Aristotle University of Thessaloniki, Thessaloniki, Greece;

<sup>2</sup>Department of Anatomy and Surgical Anatomy, Medical School, National and Kapodistrian University of Athens, Athens, Greece

**Introduction:** Typically, the aortic arch (AA) gives origin to the brachiocephalic trunk (BCT), the left common carotid artery (LCCA)

and left subclavian artery (LSCA). The current study highlights characteristic cases of AA variants found in cadavers' dissection and underlines their relation with trachea. A systematic literature review on AA variants and coexisted neurovascular aberrations is performed.

**Materials and methods:** The AA variants causing tracheal compression are described in 8 Greek cadavers (mean age, 76 years). **Results:** The aberrant right subclavian artery (ARSCA) is the commonest AA variation (incidence 0.16–4.4%, 2.3% in Greeks). A course between trachea and esophagus was found in 1 case, which coexisted with a bicarotid trunk (BiCT). No pretracheal course was found. Another case of BiCT was detected in coexistence with a Kommerell diverticulum and an ARSCA. An atypical common origin of the LCCA with the BCT from the AA (1 case), a common trunk of the LCCA and BCT from the AA (1 case) and an atypical origin of the LCCA from the BCT (1 case) were also detected. An ectopic (leftward) origin of the BCT with trachea compression and displacement at the right side was recorded in 3 cases.

**Conclusion:** The knowledge of AA variants that may compress on trachea is of paramount importance for diagnostic and clinical purposes. Particularly, during tracheotomy, thyroideomy, and surgical neck dissection of 6th level, the lack of knowledge of these variants may cause massive hemorrhage. Thus, preoperative diagnosis, based on imaging, is essential.

## O-023

### Anatomical study of the origin of azygos vein in greek cadavers

Konstantinos Koutsouflianiotis<sup>1</sup>, George Paraskevas<sup>1</sup>, Maria Piagkou<sup>2</sup>, Konstantinos Natsis<sup>1</sup>

<sup>1</sup>Department of Anatomy and Surgical Anatomy, School of Medicine, Aristotle University of Thessaloniki, Thessaloniki, Greece;

<sup>2</sup>Department of Anatomy and Surgical Anatomy, Medical School, National and Kapodistrian University of Athens, Athens, Greece

**Introduction:** The azygos vein (AV) originates from the union of the right ascending lumbar vein (ALV) with the right subcostal vein (SCV) according to the classical anatomical textbooks. The current study aims to investigate the AV variable origin in Greeks.

**Materials and methods:** Thirty-five (20 male and 15 female, mean age 76 years) cadavers were dissected in our Departments during the time period 2016–2019.

**Results:** In 17 out of 35 cadavers (48.6%), the AV was formed by the union of the right SCV with a trunk originating from the inferior vena cava (IVC). In 6 cadavers (17.1%), the AV was formed by the union of the right SCV with a trunk originating from the 1st left lumbar vein (LV), while in 5 cadavers (14.3%) by the union of the right SCV with a trunk originating from the 1st right LV. In 2 cases (5.7%), the AV originated from the union of the right SCV with the right ALV, while in 4 cases (2.85%), the AV originated from the 2nd left LV, the right SCV, the 11th intercostal vein and the right renal vein. Steadily, in all cases the right SCV participated in the AV formation (100%).

**Conclusions:** In the current study, the most prevalent pattern of AV formation is the union of the right SCV with an IVC trunk. The in depth knowledge of possible AV variations is essential for the modern physician, surgeon and radiologist when interpreting cases of major pathways venous return obstruction and collateral veins enlargement.

**O-024****An unusual right coronary artery emerging from distal circumflex artery: a case report**

Sevda Lafci Fahrioglu<sup>1</sup>, Musa Muhtaroglu<sup>1</sup>, Refika Okcum<sup>2</sup>, Nedim Sezgin Ilg<sup>1</sup>

<sup>1</sup>Faculty of Medicine, Anatomy Department, Near East University, Nicosia, Cyprus; <sup>2</sup>Cardiology Department, Dr Burhan Nalbantoglu State Hospital, Nicosia, Cyprus

**Introduction:** The coronary arteries arise from the aortic sinuses, converging towards the apex of the heart. Normally, there are three main coronary arteries, the right coronary artery (RCA), left circumflex (LCX) artery and left anterior descending (LAD), with the LCX and LAD arteries arising from a common stem, the left main coronary artery (LMCA). Coronary arteries anomalies (CAAs) affect around 1% of the general population, ranging from 0.3 to 5.6% in studies on patients undergoing coronary angiography, and in approximately 1% of routine autopsy. One of the rarest coronary artery anomaly is a single coronary artery (SCA). In this case we represent a 53 years old male with SCA in whom the RCA originates from the distal LCX artery.

**Case report:** A 53 year old male was admitted to the hospital due to chest pain. He underwent coronary angiography. The angiography showed a very short left main coronary artery diving into LAD and LCX arteries in several millimetres. It was found that the patient had an anatomically different RCA which originates from the distal circumflex artery.

**Discussion:** Single coronary artery is a relatively rare congenital anomaly and incidentally detected during routine coronary or CT angiography. Most of the patients with SCA are asymptomatic. In some cases, the disease may appear with life threatening symptoms, including angina, myocardial infarction, syncope, arrhythmias, congestive heart failure or sudden death.

**Conclusion:** SCA is a rarely seen disease. Recognition of this rare anomaly will be helpful in the differential diagnosis of coronary artery abnormalities.

**O-025****What is the anatomical definition and function of a valve?**

Brion Benninger<sup>1</sup>; Ali Mirjalili<sup>2</sup>

<sup>1</sup>Medical Anatomy Center, Western University of Health Sciences, Lebanon, Oregon, United States; <sup>2</sup>Clinical Anatomy, Auckland University, Auckland, New Zealand

**Introduction:** Commonly used English written medical anatomy textbooks will not have a general definition of valve and its concepts. It will be mentioned in accounts of other structures. It can be an individual membranous structure working alone or in unison with others to successfully augment flow of fluid or air in a common direction and/or temporarily close off a lumen. Objective of this project was to elucidate valve definition, scope and common thread. **Methods:** Search contemporary English written anatomy texts for definition, scope and thread, and broader search.

**Results:** No contemporary English written anatomy texts provided definition, scope or common thread. Generic limited definition is provided in medical dictionaries with an overwhelming emphasis on cardiac valves. Further inspection reveals valves have different properties, strengths, be overtly obvious or subtle and function in orchestration with other structures and movements. Some may have a specific role during fetal life and a separate role after birth. Valves may develop from venous endothelium or chambers from the arterial system within the heart. Overwhelmingly they appear associated with low pressure systems, e.g. venous, lymphatic, gastrointestinal (gall-bladder, iliocaecal, rectum). When faulty, valves represent significant number of symptoms, pathologies and treatments. The authors believe valves are gate keepers to homeostasis and support anatomy texts in providing definitions and detailed accounts of their functions so up-and-coming medical minds can improve treatments etcetera.

**Conclusion:** Valves are poorly discussed yet exist dynamically throughout our bodies taking on chameleon shapes and roles deserving definition, concepts and a common thread throughout anatomy teaching.

**Oral Session 4—Applied anatomy in surgical techniques****O-026****Anatomical study of the perforator flap based on the acromial branch of the thoraco-acromial artery (ABTAA flap): a cadaveric study**

Portenard Anne-Carole<sup>1</sup>, Auquit-Auckbur Isabelle<sup>1</sup>, Gardeil Ludivine<sup>1</sup>, Elbaz Bénédicte<sup>1</sup>, Carricaburu Alice<sup>1</sup>, Duparc Fabrice<sup>2</sup>

<sup>1</sup>Department of Plastic, Reconstructive and Hand Surgery, Rouen University Hospital, France; <sup>2</sup>Laboratory of Anatomy, Faculty of Medicine, Rouen, France

**Introduction:** The aim of this anatomical study was to describe a local perforator flap, for covering shoulder defects, by determining the features of the acromial branch of the thoraco-acromial artery (abTAA), and the supplied cutaneous area.

**Methods:** Thirteen fresh cadaveric thoraxes were dissected bilaterally. A precise and reproducible protocol was performed. For each abTAA flap cadaveric dissection, the following parameters were measured after arterial injection: distances between the origin of the perforator artery on the abTAA and the sternum, the acromion, the clavicle, diameter of the perforator artery of the abTAA, length of the perforator pedicle course through major pectoralis muscle, and rotation arc. We also calculated the surface of injected skin paddle. These measurements were related to morphometric parameters evaluated through the distance between sternum and acromion.

**Results:** The mean distances measured from the origin of the perforator artery on the abTAA were 14.25 cm to the sternum, 3.45 cm to the acromion, 5.65 cm to the clavicle. The mean diameter of the abTAA was 1.20 mm ± 0.2. The arc of rotation was 180°, and the length of the perforator pedicle could be extended to 7.46 cm ± 1.15. We observed a colored elliptical cutaneous paddle with a longer radius 18 cm and a small radius 15 cm.

**Conclusions:** Our results suggest that this type of flap could be useful in clinical practice for reconstruction and covering of the acromial area with a thin cutaneous flap with low sequelae on the donor site.

**O-028****Selecting a recipient nerve for deep inferior epigastric perforator (DIEP) flap neurotization in breast reconstruction—an anatomical study**

Alice Varanda Pereira<sup>1</sup>, Márcio Ramos<sup>1</sup>, Maria Cristina Fialho<sup>1</sup>, Sofia Esteves<sup>1</sup>, Luis Vieira<sup>2</sup>, Ivo Álvares Furtado<sup>1</sup>

<sup>1</sup>Institute of Anatomy, Lisbon Faculty of Medicine, Lisbon, Portugal;

<sup>2</sup>Plastic Reconstructive Surgery Department, Lisbon Central Hospital Center, Lisbon, Portugal

**Introduction:** Breast reconstruction constitutes an essential step in breast cancer treatment. The DIEP flap is gold standard for autologous reconstruction in most centers. Literature findings suggest inconsistent and unpredictable recovery of breast sensitivity after reconstruction with a DIEP flap without nerve coaptation. Some studies accent the emphasis of flap neurotization for recovery of breast sensitivity post reconstruction however, current anatomical descriptions of the innervation of the post-mastectomy mammary region are lacking. The present study aims to describe the nerves that remain in the mammary region after a mastectomy.

**Materials and methods:** An observational cross-sectional study was performed on 12 breasts from 6 formalin-preserved adult cadavers at the Institute of Anatomy, Lisbon Faculty of Medicine, Portugal. A total mastectomy was carried out, and the remaining nerves were described. Firstly, the supraclavicular branches from the cervical plexus were identified and traced above the clavicle. After that, the nerve stumps of the anterior and lateral cutaneous branches of the intercostal nerves were identified, carefully dissected, and traced retrogradely to its origin.

**Results:** The branches and stumps of the supraclavicular, anterior and lateral cutaneous branches of the intercostal nerves remaining in the post mastectomy area were fully described, including its course, caliber, length and relationship to the internal mammary vessels and its branches.

**Conclusions:** Detailed understanding of the neuroanatomy of the mammary region after mastectomy allows adequate selection of a receptor nerve without increasing significantly surgery's complexity. May also provide patients with faster and better sensitivity recovery after a neurotized DIEP flap breast reconstruction.

**O-029****Anatomical basis of distally based anterolateral thigh flap**

María Jesús Rivera Vegas<sup>1</sup>, Andrea Puebla Parral<sup>2</sup>, Alex Didirka Diaz<sup>2</sup>, Eva Maranillo Alcaide<sup>3</sup>, María Teresa Vazquez Osorio<sup>4</sup>

<sup>1</sup>Hospital Universitario de Burgos, Burgos, Spain; <sup>2</sup>Facultad de Medicina, Universidad Complutense, Madrid, Spain; <sup>3</sup>Centro de Donación de Cuerpos y Sala de Disección Facultad de Medicina Universidad Complutense, Madrid, Spain

**Introduction:** The reverse anterolateral thigh flap represents an interesting alternative reconstructive approach to knee defects. The goals of this study are to define the different patterns of the descending branch of the lateral circumflex femoral artery (DBLCFA), which is used to perform this flap, and to consider their usefulness in reconstructive surgery.

**Materials and methods:** Twenty-two lower limbs (11 right, 11 left) from 11 embalmed cadavers were dissected. A digital caliper was used to take the following measures:

- Length of cutaneous perforator artery of DBLCFA.
- Length of DBLCFA from the exit of cutaneous perforant artery until its end.

The total length of the flap was calculated by adding the two previous measurements.

To establish the different patterns of DBLCFA, its anastomoses with different arteries have been taken into account. The pivot point was marked when the anastomosis existed.

**Results:** We have found 4 different patterns of DBLCFA; Pattern 1: no existence of anastomosis, (10 cases), Pattern 2: Anastomosis with Superior Lateral Geniculate Artery (5 cases), Pattern 3: Anastomosis with Deep Femoral Artery (3 cases), Pattern 4: Anastomosis with both arteries (4 cases). The pivot point was found at 11 cm (average) above upper outer edge of the patella. The length of flap was of 15 cm (average).

**Conclusions:** These preliminary data support that the outcomes to the reconstructive techniques with the reverse anterolateral thigh flap could be different attending to the pattern of DBLCFA. This is a useful flap for the reconstruction of the knee.

**O-030****Arterial supply of the breast and nipple-areola complex: MRI and cadaveric study**

Harshita Bhardwaj, Ritu Sehgal, T.S. Roy, Anurag Srivastava, Smriti Hari

All India Institute of Medical Sciences, New Delhi, India

**Introduction:** Preservation of the nipple-areola complex (NAC) along with the breast skin envelope is currently being attempted for a better aesthetic and functional outcome, necessitating a precise knowledge of their vascular supply to minimize post-operative necrosis. A comprehensive literature survey revealed minimal data on the arterial pedicles of the NAC and breast skin. The present study correlates radiographic and cadaveric data in an attempt to plug these lacunae. **Materials and methods:** Fifty female patients of carcinoma breast underwent breast MRI as part of their pre-operative assessment. Cadaveric dissection was performed on 11 breasts (5 left, 6 right) obtained from 10 female cadavers with no breast pathology. Radiographic and cadaveric data pertaining to the source, branches and pattern of arterial supply to breast parenchyma and the NAC was collected, tabulated and statistically analyzed.

**Results:** The MRI scans reveal that most vessels bilaterally supplying the medial half of breast originate from the internal mammary artery (IMA), while those supplying the lateral half arise from the lateral thoracic artery (LTA). IMA is the principal artery supplying the NAC in 78% cases, while LTA is the principal supply in less than 16% cases. Cadaveric dissection confirms in all cases barring one, that the principal parenchymal and NAC supply on either side arises from IMA.

**Conclusions:** IMA perforators supply the NAC most consistently and major part of the breast parenchyma as well. MRI breast is the most precise modality currently available for pre-operative evaluation of breast vascularity during skin/nipple-sparing mastectomies.

**O-031****Augmented reality guidance for free flap reconstructive surgery—a pilot study**

Laura Pérez-Pachón<sup>1</sup>, Matthieu Poyade<sup>2</sup>, Terry Lowe<sup>3</sup>, Flora Gröning<sup>1</sup>

<sup>1</sup>School of Medicine, Medical Sciences and Nutrition, University of Aberdeen, Aberdeen, United Kingdom; <sup>2</sup>School of Simulation and Visualisation, Glasgow School of Art, Glasgow, United Kingdom; <sup>3</sup>Aberdeen Royal Infirmary and School of Medicine, Medical Sciences and Nutrition, University of Aberdeen, Aberdeen, United Kingdom

**Introduction:** In free flap reconstructive surgery, awareness of the correct position, dimensions and volume of flaps is key to achieving optimal outcomes for patients. However, there is no practical tool to make this information available to surgeons during surgery. To overcome this shortcoming, we present: (1) an Augmented Reality (AR) application which overlays patient-specific 3D models onto the patient's body surface using the Microsoft HoloLens<sup>®</sup> headset and; (2) the preliminary results of a functional assessment of this application using a human cadaveric model.

**Materials and methods:** We obtained computed tomography (CT) angiograms of a human cadaveric leg after injecting a contrast agent to maximise the visualisation of the arteries. Based on these CT data, a 3D model of a flap was created and included in an AR application that renders the model on the headset's transparent lenses. To visualise the 3D model in the correct position on the cadaver's body surface, we used a fiducial marker (i.e. a radio-opaque object attached to the cadaver before scanning) fixed to an image marker which was detected by the headset's camera.

**Results:** Our application provides an optimal visualisation of the flap sectioning margins. However, we identified the need for adjusting the image marker size to allow a stable rendering of the 3D model and its correct alignment onto the cadaver's body surface.

**Conclusions:** AR guidance in flap surgery can assist surgeons to accurately locate and section flaps. Further research by manufacturers and researchers is required to implement this technology in clinical practice.

**O-032****The anatomical basis of the sensate deep inferior epigastric perforator (DIEP) flap in breast reconstruction**

Alice Varanda Pereira<sup>1</sup>, Antónia Braga Martins<sup>1</sup>, Francisco Baptista<sup>1</sup>, Tiago Miguel Peixoto<sup>1</sup>, Luis Vieira<sup>2</sup>, Ivo Álvares Furtado<sup>1</sup>

<sup>1</sup>Institute of Anatomy, Lisbon Faculty of Medicine, Lisbon, Portugal; <sup>2</sup>Plastic Reconstructive Surgery Department, Lisbon Central Hospital Center, Lisbon, Portugal

**Introduction:** The deep inferior epigastric perforator (DIEP) flap is gold standard, at several institutions, for autologous breast reconstruction after mastectomy. Sensation of the reconstructed breast is an important factor to improve patient satisfaction and to prevent injuries. Although flap neurotization is known to improve postoperative sensation recovery, most DIEP flaps are still performed without nerve repair.

The present study aims to describe the nerves supplying the DIEP flap and identify the ideal nerves for the design of a neurotised DIEP flap. **Materials and methods:** An observational cross-sectional study was performed on 12 hemicauders at the Institute of Anatomy, Lisbon Faculty of Medicine, Portugal. Dissections began by tracing the nerves exiting the DIEP flap through the preaponeurotic planes. Next, nerves T10-12 were followed through the neurovascular plane of the abdominal wall, as they penetrated the rectus abdominis (RA) muscle and terminated as cutaneous branches. A detailed mapping of the branching patterns and interconnections was carried out. The relationship between nerves and DIEP vessels was described.

**Results:** Small sensory nerves were identified leaving the periphery of the flap in the pre-aponeurotic plane. The deep nerves reach the flap after perforating the RA. Although of a larger caliber, these are often accompanied by vessels, may exhibit motor fibers, and their dissection is more complex.

**Conclusions:** Detailed understanding of the DIEP flap neuroanatomy may allow neurotization of the flap, during breast reconstruction, without significantly increasing the complexity and risks of surgery.

**O-033****The effect of maternal position on fetoplacental blood flow and oxygenation using MRI**

Sophie Couper<sup>1</sup>, Peter Stone<sup>1</sup>, Alys Clark<sup>2</sup>, Andrew Melbourne<sup>3</sup>, Ali Mirjalili<sup>4</sup>

<sup>1</sup>Department of Obstetrics and Gynaecology, University of Auckland, Auckland, New Zealand; <sup>2</sup>Auckland Bioengineering Institute, University of Auckland, Auckland, New Zealand; <sup>3</sup>Department of Medical Physics and Biomedical Engineering, University College London, London, United Kingdom; <sup>4</sup>Anatomy and Medical Imaging Department, University of Auckland, Auckland, New Zealand

**Introduction:** Maternal supine sleep position is associated with increased risk of late stillbirth. Our previous studies showed 16.4% reduction in maternal cardiac output, and 32% reduction in abdominal aortic blood flow in healthy pregnancy when the woman lay supine, compared to left lateral. However, there's a paucity of data on the effects of maternal position on placental blood flow and oxygenation. This study aims to investigate the effect of maternal position on placental blood flow and oxygenation in late gestation pregnancy.

**Materials and methods:** Twelve women with uncomplicated pregnancies at 34–38 weeks gestation were recruited. Magnetic resonance imaging (MRI) phase contrast, T2 and diffusion weighted sequences were used to study placental blood flow, internal iliac artery and umbilical venous flow when the mother lay in left lateral decubitus and supine positions. This MRI technique enabled segmentation of the placental oxygen signal into fetal, maternal and myometrial regions. The ethical approval was obtained from the University of Auckland Human Participants Ethics Committee.

**Results:** When supine, flow dropped 14% in right and 21% in left maternal internal iliac arteries, and 16% in the umbilical vein, compared with left lateral. Diffusivity was also seen to reduce in the placenta, but fetal oxygenation remained unchanged.

**Conclusions:** This is the first MRI study to describe the effect of maternal position in late pregnancy on maternal and fetoplacental blood flow and oxygenation. Our study explains why fetal oxygenation remains relatively consistent between the two positions despite

significant reduction in maternal and placental blood flow when supine.

### O-034

#### Anatomical study of the chondrocostal graft vascularization

Sacha Chroschiany<sup>1</sup>, Jean-Philippe Bernard<sup>1</sup>, Jeremy Hardy<sup>1</sup>, Pierre-Alain Mathieu<sup>2</sup>, Christian Mabit<sup>2</sup>, Pierre-Sylvain Marcheix<sup>1</sup>

<sup>1</sup>Centre Hospitalier Universitaire Dupuytren, Limoges, France;

<sup>2</sup>Laboratoire d'Anatomie, Faculté de Médecine de Limoges, France

**Introduction:** The loss of cartilaginous substance is a real therapeutic challenge. Some surgical techniques involve articular resurfacing by chondrocostal grafts. The purpose of this study is to analyze the vascularization pattern of a chondrocostal graft in order to use it as a free vascularized flap.

**Materials and methods:** We analyzed 6 chondrocostal grafts harvested from 4 fresh anatomical subjects, on the fifth chondrocostal junction, pedicled on the internal thoracic artery. The grafts were prepared by a radio-opaque solution injection. Finally a macroscopic, radiographic and tomodensitometric analysis with reconstructions was carried out. **Results:** Five out of six grafts provided information about the vascularization pattern. This study confirms (i) a constant vascularization of the costal perichondrium which is distributed directly through the superior and inferior intercostal arteries, (ii) a rich intercostal anastomotic network at the anterior and posterior faces of the graft (visualization of communicating arteries). In one injection out of five, posterior perichondral vascularization comes directly from the internal thoracic artery; a vascularization of the anterior perichondrium was systematically found, while the vascularization of the posterior perichondrium was observed in four out of five injections.

**Conclusions:** The chondro-costal flap is therefore a richly vascularized flap. The use of this graft as a pedicled free flap could be interesting for the resurfacing of cartilaginous substance loss; an anatomical modularity based on vascular anastomoses seems to be interesting for adaptation to different types of articular surfaces.

### O-035

#### 3D printing: from comprehensive anatomy to surgical planning

Pierre-Alain Mathieu<sup>1</sup>, Thibaud Cunique<sup>2</sup>, Justin Texier, Pierre-Sylvain Marcheix<sup>2</sup>, Christian Mabit<sup>1</sup>

<sup>1</sup>Laboratoire d'Anatomie, Faculté de Médecine de Limoges, France;

<sup>2</sup>Centre Hospitalier Universitaire Dupuytren, Limoges, France

**Introduction:** Three-dimensional (3D) printing was introduced for more than 3 decades as a promising new technology for rapid prototyping of products. Recent advances in 3D printing have provided orthopedic surgeons with this technology that has the potential to optimize preoperative planning, surgical instrument development and custom implant manufacturing. The aim of this work is to demonstrate the contribution of 3D printing in the understanding of complex clinical situations and the planning of a surgical procedures.

**Material and methods:** After reminding the fundamentals of image acquisition-processing and 3D printing technologies, the authors report clinical cases dealing with complex acetabular reconstruction in total hip revision; severe ankle and foot deformities.

**Results:** 3D printing allows for anatomic model creation so surgeons can study patient anatomy in a more concrete way compared with 2D imaging. The comparison of normal anatomic models with custom printed models of complex deformities can be used to deepen patients' insight into their condition as well as the surgical repair process. These data are the basis of the preoperative planning; additionally, intraoperative guidance is possible with models printed with thermoplastics and custom-made 3Dprinted implants can be created (ex: titanium shape matches acetabular implants) in particular for large bone defects.

**Conclusions:** As 3D printing technology advances and the cost of printing drops, the use of 3D printed models of patients bone may become standard in preoperative planning, surgical simulation, intraoperative guidance and implant development.

### O-036

#### Ultrasound-guided decompression surgery of the distal tarsal tunnel: a novel technique for the distal tarsal tunnel syndrome—part III

Simone Moroni

Clínica Vitruvio Madrid, Madrid, Spain

**Introduction:** It has been seen that tibial nerve branches could be entrapped at the distal tarsal tunnel. The aim of this study was to provide a safe ultrasound-guided minimally invasive surgical approach for a distal tarsal tunnel release concerning nerve entrapments.

**Materials and methods:** The study was carried out on ten fresh-frozen feet. All of them have been examined by high-resolution ultrasound at the distal tarsal tunnel. The surgical approach has been marked throughout the course of the medial intermuscular septum (MIS, the lateral fascia of the abductor hallucis muscle).

**Results:** After the previous steps, nerve decompression was carried out through a MIS release through a 2.5 mm ( $\pm$  0.5 mm) surgical portal. As a result, an effective release of the MIS has been obtained in all fresh-frozen feet.

**Conclusion:** The results of our anatomic study indicate that this novel ultrasound-guided minimally invasive surgical approach for the release of the MIS might be an effective, safe and quick decompression technique treating selected patients with a distal tarsal tunnel syndrome.

### O-037

#### 3D multimodal fusion of images as the new value in 3D stereoscopic visualizations

Jerzy Gielecki<sup>1</sup>, Andrzej Rutkowski<sup>2</sup>, Michał Chlebiej<sup>2</sup>, Tomasz Grzona<sup>2</sup>, Jakub Kluczewski<sup>2</sup>, Michał Ciucias<sup>1</sup>, Anna Żurada<sup>3</sup>

<sup>1</sup>University of Warmia and Mazury in Olsztyn, Olsztyn, Poland;

<sup>2</sup>Faculty of Mathematics and Computer Science, Nicolaus Copernicus University, Torun, Poland; <sup>3</sup>Department of Radiology, Collegium Medicum, Medical Faculty, University of Warmia and Mazury, Olsztyn, Poland

**Introduction:** A new concept of 3D multimodal fusion (3DMF) of anatomical models based on photogrammetry (PG), Laser Scanning (LS) and volumetric medical data (CT, MR) has been proposed. The

proposed method brings new values to 3DMF stereoscopic visualization purposes.

**Materials and methods:** The fusion processes were illustrated by both MR and CT datasets. To restore spatial relations 500 heads of healthy patients were scanned by 3 Tesla MRI and 80 Rows CT machines to use fusion images algorithms. The aggregation of various imaging data obtained in different modalities by the fusion images algorithms is coming to be very important in a new era in morphological studies and a new tool of 3D stereoscopic visualization such as virtual reality (VR) or augmented reality (AR).

**Results:** The first stage of 3DMF is a multisensory fusion of anatomical preparation(s). The second stage is interpatient data fusion from diagnostic imaging procedures by means of warping volumetric models. 3DMF is the hybrid combination of multiple images from different modalities (CT, MR, PG, LS). Multi-modular restorative image combination is a novel strategy utilized to perceive the anatomical variations or anatomical structures description in 3D space. The fusion of various modalities images is noticeable in morphological investigations, especially in the cerebral vasculature. **Conclusion:** The fusion of CT and MR datasets have greatly contributed to improving anatomical studies, but the examination of both modalities carries its own unique information. Combined techniques make a synthesis of anatomical structures and it is a way to the understanding of heterogeneous data.

#### Oral Session 5—Nervous system (central and peripheral)

#### O-038

##### Transmission electron microscopic examination of spinal cord injury and healing process in a series of animal studies

Mustafa F. Sargon

Department of Anatomy, Faculty of Medicine, Atilim University, Ankara, Turkey

**Introduction:** In this study; experimental spinal cord injury and the effects of various agents to healing process were discussed in the light of 23 ultrastructural studies performed from 1998 to 2018.

**Materials and methods:** Routine transmission electron microscopic tissue preparation technique was performed. All of the samples were examined under transmission electron microscope and scored.

**Results:** Most severe ultrastructural pathological changes were observed in large sized myelinated axons and the least one was present in small sized myelinated axons. Separations and interruptions in myelin configuration were very common in large sized myelinated axons. Only a very few of the medium sized myelinated axons had interruptions in myelin configuration. However; separation in myelin configuration was a common finding in this group. The only ultrastructural pathology observed in small sized myelinated axons was separation in myelin configuration. In the examination of grey matter; interneuronal oedema and intracellular vacuoles were prominent. The other intracellular organelles, cell membranes and nuclei were ultrastructurally normal in the studies. The unmyelinated axons were found to be normal in every study. In rat models; the effects of therapeutic agents on healing process began to appear in the fourteenth day and the maximal effect was observed at the end of 1 month.

**Conclusions:** Scorings of all the studies pointed out that the ultrastructural pathology increased parallel to the increase of the size of

myelinated axons and neurons were also affected in these injuries. Additionally; the most efficient therapeutic agents in healing process used in these studies were also discussed.

#### O-039

##### Anatomical bases of psychosurgery

Branislav Filipovic<sup>1</sup>, Branka Filipovic<sup>2</sup>

<sup>1</sup>University of Belgrade, Faculty of Medicine, Institute of Anatomy “Niko Miljanic”, Beograd, Serbia; <sup>2</sup>University of Belgrade, Faculty of Medicine, Clinical and Hospital Center “Dragisa Misovic-Dedinje”, Belgrade, Serbia

**Introduction:** Pharmacotherapy and cognitive behavioral intervention have improved the management of mental disorders, as many as 10–30% of patients with major affective, anxiety, or obsessive compulsive disorders (OCDs) remain refractory to all conventional forms of treatment. Some interventions on the specific anatomical structures are available in the treatment of different psychiatric diseases.

**Materials and methods:** We have reviewed PubMed, Embase, Index Copernicus, and Google Scholar for the period 2000–2019, for key words “psychosurgery”, “anatomy”, “fMRI” and “brain”. We have got 343 hits, out of which 10 were reviews and meta-analysis, while other were original investigations.

**Results:** Targeting the cingulum bundle (*cingulotomy*) was efficient in anxious or depressed patients. A more anterior part of the cingulum bundle, was performed for treating various affective and anxiety disorders, including OCD. *Mesoloviotomy* (ablation of the fibers of genu corporis callosi—mesolovion—greek term for corpus callosum Clinical results were best in patients with schizophrenia. Limbic leucotomy essentially represents a combination of bilateral anterior cingulotomy and subcaudate tractotomy, thus targeting both limbic circuits (cingulotomy) and frontolimbic projections (*subcaudate tractotomy*). More favorable outcomes in patients with OCD have been achieved with anterior capsulotomy. The treatment of opiate psychological dependence by bilateral stereotactic radiofrequency ablation of the nucleus accumbens was reported as successful. **Conclusion:** The importance of brain anatomy knowledge rises with the technical improvement (fMRI, gamma knife) for the treatment of drug resistant psychiatric diseases and disorders. Key words: Neurosurgery, psychiatry, brain anatomy.

#### O-041

##### Quantification of intraepidermal nerve fiber density through tissue clearing and labeling technique

Dai Hyun Kim, Se Jeong Lee, Eunsoo Lee, Ji Hyuck Hong, Soo Hong Seo, Hyo Hyun Ahn, Byung-Jo Kim, Woong Sun, Im Joo Rhyu

Korea University College of Medicine, Seoul, Republic of South Korea

**Introduction:** Cutaneous nerve biopsy, based on two-dimensional analysis, has been regarded as a creditable assessment tool for diagnosing peripheral neuropathies. However, advancement of

methodological imaging is required for the analysis of whole, intact structures of peripheral nerve fibers. The tissue clearing and labeling technique facilitates three-dimensional imaging of internal structures in unsectioned, whole biological tissues, without excessive time and labor costs. We sought to establish whether the tissue clearing and labeling technique could be used for the diagnostic evaluation of peripheral neuropathies.

**Materials and methods:** Five healthy individuals and four patients with small fiber neuropathy (SFN) and post-herpetic neuralgia (PHN) were prospectively enrolled. Conventional methods, including indirect immunofluorescence (IF) and bright-field immunohistochemistry (IHC), were adopted in addition to the tissue clearing and labeling method, ACT-PRESTO (active clarity technique–pressure-related efficient and stable transfer of macromolecules into organs), to quantify intraepidermal nerve fiber densities (IENFDs).

**Results:** Average values of IENFDs in the healthy control group were 6.54, 6.44 fibers/mm, and 90.19 fibers/mm<sup>2</sup> obtained by IF, bright-field IHC, and ACT-PRESTO, respectively. Average values in the patient group with SFN or PHN were 2.79, 2.73 fibers/mm, and 47.44 fibers/mm<sup>2</sup>, respectively.

**Conclusions:** Our study showed that the skin clearing method provided not only rapid and highly reproducible three-dimensional images of cutaneous nerve fibers but also yielded reliable quantitative data of IENFDs, comparable to the results obtained using conventional methods. Quantification of IENFDs using the tissue clearing and labeling technique is a promising way to improve conventional skin nerve biopsy assessment tools.

## O-042

### The relevance of anatomical variations for the regional anaesthesia of the shoulder

*Emilio González-Arnay, Lorena Jiménez-Sánchez, Mario Fajardo-Pérez*

*Universidad Autónoma de Madrid, Madrid, Spain*

**Introduction:** The axillary (AN) and suprascapular nerves provide around 90% of the shoulder capsule innervation. Lateral pectoral nerve (LPN) and musculocutaneous nerve also contribute. Although full blockade of the joint nerves (JNs) is achievable through interscalene blockades (ISB), this technique is not suitable for some patients. However, combined peripheral blockades have consistently failed to achieve the same results as the ISB. We hypothesized that this high failure rate is due to the interindividual variations in the emergence of the joint nerves. In this study, we aimed to assess the pattern of the joint nerves (JNs) emergence in order to discuss which approach is the most suitable.

**Materials and methods:** 42 formalin-fixed cadavers were subjected to bilateral dissection to assess the emergence of JNs from the LPN and the AN.

**Results:** In our population, most of JNs emerged from the posterior division of the AN, while in one-third of the shoulders some articular branches were already reaching the anteroinferior aspect of the capsule after emerging in the first portion of the AN. Less than 10% of JNs rooted in the LPN were easily identifiable in the anterolateral aspect of the shoulder.

**Discussion:** Our results show the extreme difficulty in reaching all the articular branches with either the anterior or posterior approaches to the AN and LPN. This is in accordance with previous studies of our group and other cadaveric studies. We discuss the possibility of performing full shoulder blockades by performing additional injections in the interpectoral space or under the subscapularis tendon.

## O-043

### Morphometric differences of the insular volume: MRI analysis with IBASPM

*Fatma Duman<sup>1</sup>, Niyazi Acer<sup>2</sup>, Güneş Aytaç<sup>3</sup>, Hatice Susar<sup>3</sup>, Kamil Karaali<sup>4</sup>, Muzaffer Sindel<sup>3</sup>*

<sup>1</sup>*Mustafa Kemal University, Department of Anatomy, Hatay, Turkey;*

<sup>2</sup>*Erciyes University, Department of Anatomy, Kayseri, Turkey;*

<sup>3</sup>*Akdeniz University, Department of Anatomy, Antalya, Turkey;*

<sup>4</sup>*Akdeniz University, Department of Radiology, Antalya, Turkey*

**Introduction:** The insula is important in the processing of visceral sensory/motor, emotion, vestibular, pain, temperature and language inputs, in addition to as visual, auditory, tactile, olfactory and gustatory information. In particular, the human insula has significant roles in self-recognition, time perception, empathy, awareness of emotions, decision-making and the processing of music and language. The aim of this study is to investigate the insular volume differences between genders and sides.

**Methods:** This retrospective study included 30 healthy (15 male, 15 female), age range was 18–21 years (M: 19.67 ± 0.90, F: 19.53 ± 0.83), MR images was taken from Akdeniz University radiology archive. Images was performed with the 3T Siemens Spectra MRI scanner. The insular volume was measured by the IBASPM.

**Results and discussion:** Insular volume average in male was 8.06 ± 0.76 cm<sup>3</sup> in left and 8.53 ± 0.58 cm<sup>3</sup> in right sides; in female was 6.81 ± 0.71 cm<sup>3</sup> in left and 7.38 ± 0.58 cm<sup>3</sup> in right sides. This measurement differences was statistically significant and right side was greater than left insula for both gender (p < 0.001). Insular volume in male was significantly greater than females' (p < 0.001) in both side.

**Conclusion:** It is obtained that right insula was greater than left. The reason of this outcome may be explain with, the insular anatomic relation of behavioral functions and emotional reactions and also the right side of the brain is best at expressive and creative tasks. The male insula volume found greater but the real gender differences should be analyzed with proportion of insula with whole brain in future researches.

## O-044

### 3D stereoscopic view in surgical neuroanatomy

*Javier Abarca Olivas<sup>1</sup>, Diego Echeverria Aza<sup>2</sup>, Pablo González López<sup>1</sup>, Victor Fernández Cornejo<sup>1</sup>, Francisco Sanchez Del Campo<sup>3</sup>, Eduardo Fernández Jover<sup>3</sup>, Pedro Moreno López<sup>1</sup>, Salvador Martínez Pérez<sup>2</sup>*

<sup>1</sup>*Hospital General Universitario, Alicante, Spain;* <sup>2</sup>*Instituto Neurociencias, Alicante, Spain;* <sup>3</sup>*Universidad Miguel Hernández, Alicante, Spain*

**Introduction:** The application of stereoscopy as a teaching method has been widely used in different basic, academic and clinical sciences. The compilation of the different stereoscopic methods in surgical neuroanatomy would make possible to reproduce this teaching mode in other centers.

**Materials and methods:** During the last 6 years the dissection with surgical perspective of anatomical specimens treated with formaldehyde, Thiel and Klingner methods has been performed in the

anatomical laboratory of the Faculty of Medicine (University Miguel Hernández). Photographic captures have been made with the use of a 2D camera and a conventional microscope. Special camera fixation systems that allow horizontal slides for stereoscopic capture as well as different lighting methods have been used. The technique to take stereoscopic pictures/videos and its projection are described in different fields of surgical neuroanatomy.

**Results:** Examples of photographs and videos of different anatomical regions and surgical approaches of neurosurgical interest are exposed. We have analysed the neuroanatomy lectures (both in 2D and 3D format) given in the last 5 years in different courses. Considering the participant's evaluation the 3D lectures has been significantly better accepted.

**Conclusions:** The learning of basic, academic and clinical neuroanatomy through the projection of stereoscopic photographs and videos can be useful as a teaching method. This tool gains value used as a complement to other methods already consolidated. The methods of image capture and stereoscopic projection in neuroanatomy can be reproduced in other centers of neuroanatomy teaching.

## O-045

### Anatomical study of the distribution of sensory nerves supplying the knee joint capsule and implications for genicular nerve blockade

Fonkoue Loïc, Behets Catherine, Kouassi Jean-Eric, Detrembleur Christine, Cornu Olivier

Université Catholique de Louvain, Brussels, Belgium

**Introduction:** Despite their emerging therapeutic relevance, there are many discrepancies in anatomical description and terminology of the articular nerves supplying the human knee capsule. This cadaveric study aimed to determine their origin, trajectory, relationship and landmarks for therapeutic purpose.

**Materials and methods:** We dissected 21 lower limbs from 21 cadavers, to investigate the anatomical distribution of all the articular nerves supplying the knee joint capsule. We identified constant genicular nerves according to their anatomical landmarks at their entering point to knee capsule and inserted Kirshner wires through the nerves in underlying bone at those target points. Measurements were taken, and both antero-posterior and lateral radiographs were obtained.

**Results:** The nerve to vastus medialis, saphenous nerve, anterior branch of obturator nerve and a branch from sciatic nerve provide substantial innervation to the medial knee capsule and retinaculum. The sciatic nerve and the nerve to the vastus lateralis supply sensory innervation to the supero-lateral aspect of the knee joint while the fibular nerve supplies its infero-lateral quadrant. Tibial nerve and posterior branch of obturator nerve supply posterior aspect of knee capsule. According to our findings, five constant genicular nerve with accurate landmarks could be targeted for therapeutic purpose.

**Conclusion:** The pattern of distribution of sensitive nerves supplying the knee joint capsule allows accurate and safe targeting of five constant genicular nerves for therapeutic purpose. This study provides robust anatomical foundations for genicular nerve blockade and radiofrequency ablation.

## O-046

### Cutaneous mechanoreceptors are differently involved in painful and non-painful diabetic neuropathy

Yolanda García Mesa<sup>1</sup>, Mario González Gay<sup>2</sup>, Irene García Martínez<sup>2</sup>, Jorge Feito<sup>3</sup>, Jorge García Piqueras<sup>1</sup>, Giuseppina Salvo<sup>4</sup>, Eliseo Viña<sup>5</sup>, Ramón Cobo<sup>1</sup>, Jose Antonio Vega Álvarez<sup>1</sup>, Olivia García Suárez<sup>1</sup>

<sup>1</sup>Universidad de Oviedo, Oviedo, Spain; <sup>2</sup>Fundación Hospital de Jove, Gijón, Spain; <sup>3</sup>Universidad de Oviedo, Salamanca, Spain; <sup>4</sup>Università di Messina, Messina, Italy; <sup>5</sup>Hospital de Cabueñes, Gijón, Spain

**Introduction:** Peripheral diabetic neuropathy (DN) is a complication of diabetes mellitus, that affects all modalities of sensation and especially affects the distal parts of the lower limbs. 15–25% of subjects undergoing diabetes mellitus suffer neuropathic pain characterized by sensations of numbness, burning pain and prickling or stinging around the hands and feet. This suggest that cutaneous small sensory fibers are involved in DN. However, whether or not the cutaneous mechanoreceptors (i.e., Meissner's and Pacinian corpuscles and Merkel cells) are also altered in DN remains to be clarified.

**Materials and methods:** Simple immunohistochemistry and double immunofluorescence associated to antibodies against Piezo2, S100 (Schwann-related cells), neurofilaments (axons), CK20 (Merkel's cells) were performed in skin samples taken from the foot glabrous skin of subjects diagnosed of DN and age matched control subjects. A quantitative analysis was carried out.

**Results:** The density of cutaneous mechanoreceptors as well as the expression of Piezo2 within them was significantly reduced in subjects suffering DN in comparison with the control ones. This reduction was evident in comparing samples from non-painful DN and painful DN (almost absence of mechanoreceptors, absence of Piezo2 in mchanoreceptors and reduction of about 75% of the Piezo2-positive Merkel's cells).

**Conclusions:** Present results demonstrate that DN, in addition to the well know decrease of small nerve fibers, courses with a marked reduction in the density of cutaneous mechanoreceptors as well as of the mechanotransducer protein Piezo2. Since these changes were stronger in painful DN a relation between mechanoreceptors and pain in diabetes seems to exist.

## O-047

### 3D printing applications in neurosciences

Mickael Bartikian<sup>1</sup>, Alexandre Rainha-Campos<sup>2</sup>, Angélica Ferreira<sup>1</sup>, António Gonçalves-Ferreira<sup>2</sup>, Lia Lucas-Neto<sup>2</sup>

<sup>1</sup>Anatomy Department-Lisbon Medical School, Lisbon, Portugal; <sup>2</sup>Anatomy Department-Lisbon Medical School and Neurosurgery Department North Lisbon Medical Center, Lisbon, Portugal

**Introduction:** Magnetic Resonance Imaging (MRI) and Computed Tomography (CT) are crucial techniques in the diagnosis/treatment of Central Nervous System (CNS) diseases. Despite the possibility of acquiring three-dimensional (3D) data, the two-dimensional monitors

limit the understanding of complex anatomical relationships and don't allow the interaction, training and pre-surgical planning directly on a 3D-model of the brain/skull.

**Objectives:** To create models of human brain/skull from clinical cases of CNS diseases through 3D-printing. To apply the models in pre-surgical planning, training and teaching in neuroanatomy/neurosurgery.

**Materials and methods:** MRI and CT scans of patients from our hospital Neurosurgery-Department were selected. The images were processed with segmentation software to reconstruct the skull-brain-tumours and other structures such as arteries and meninges. The digital volumes were converted to 3D-printer compatible files. Fused Deposition Modelling Technology printers were used.

**Results:** 3D-models of two neurosurgical clinical cases were created with high quality anatomical detail: a plagiocephaly with macrocrania and a petroclival meningioma. In the first case, the model was used by surgical teams to plan the cranial remodelling which was then performed on the patient. The second case constitutes a representation of the spatial relations between tumour and various CNS structures, allowing the training and improvement of surgical techniques.

**Conclusion:** Through 3D-models, physical training and practical pre-surgical planning become possible. The models may be useful for teaching of clinical anatomy. Time and costs of the complete process for a given clinical case are compatible with the use of models obtained by 3D-printing, integrated in a personalised medicine approach.

## O-048

### Novel bioengineered wraps for nerve injury without substance loss: a pre-clinical study

Andrea Porzionato<sup>1</sup>, Elena Stocco<sup>1</sup>, Silvia Barbon<sup>1</sup>, Cesare Tiengo<sup>2</sup>, Lucia Petrelli<sup>1</sup>, Paolo Parnigotto Pier<sup>3</sup>, Veronica Macchi<sup>1</sup>, Claudio Grandi<sup>3</sup>, Raffaele De Caro<sup>1</sup>

<sup>1</sup>Section of Human Anatomy, Department Neurosciences, University of Padua, Padua, Italy; <sup>2</sup>Clinic of Plastic Surgery, Department Neurosciences, University of Padua, Padua, Italy; <sup>3</sup>Foundation for Biology and Regenerative Medicine, Tissue Engineering and Signaling (TES) Onlus, Padua, Italy

**Introduction:** In case of peripheral nerve injuries (PNIs) without substance loss, end-to-end nerve repair adjuvated by implantation of an absorbable nerve wrap improves the repair outcomes. The aim of the study was to assess the preclinical efficacy of two novel biodegradable wraps based on synthetic oxidized polyvinyl alcohol (OxPVA) and a natural leukocyte-fibrin-platelet membrane (LFPm) we developed, versus the commercial product NeuraWrapTM.

**Materials and methods:** After sciatic nerve transection and neurorrhaphy, thirty Sprague–Dawley rats were randomly implanted with a) NeuraWrapTM; b) OxPVA; c) LFPm wraps. Twelve weeks later, functional recovery was assessed and explanted nerves underwent to morphological and morphometric study by histology (hematoxylin and eosin staining—H&E; Toluidine-Blue staining) and immunohistochemistry (anti-CD3, -F4/80, -S100 - $\beta$ -tubulin staining); ultrastructural analysis was performed by Transmission Electron Microscopy (TEM).

**Results:** All wraps assured nerve function recovery; no scar tissue/neuromas were visible at dissection. LFPm-wraps were completely resorbed, while residues were observed for OxPVA and NeuraWrapTM. In all groups, biocompatibility was confirmed by absence of significant inflammatory infiltrate as showed by histology and immunohistochemistry (CD3 and F4/80) which also proved the

nervous origin of the repaired tissue (S-100 and  $\beta$ -tubulin), later assessed also by TEM. According to morphometry, OxPVA and LFPm wraps were effective in promoting nerve regeneration especially in the distal portion.

**Conclusions:** Bioengineered OxPVA and LFPm wraps promoted lesion recovery and may be considered an interesting alternative to the commercial NeuraWrapTM.

## O-049

### Role of fasciae around the median nerve in pathogenesis of carpal tunnel syndrome: microscopic and ultrasound study

Carla Stecco, Federico Giordani, Chenglei Fan, Veronica Macchi, Carlo Biz, Raffaele De Caro

Department of Neuroscience, Institute of Human Anatomy, University of Padova, Padova, Italy

**Introduction:** This study investigated from a macroscopic and microscopic point of view the connection between median nerve (MN) paraneural sheath and myofascial structures around.

**Materials and methods:** 4 samples of MN and surrounding tissue were excised from 9 unembalmed upper limbs for microscopic analysis. Ultrasound images were analyzed in 21 healthy subjects and 16 CTS patients to evaluate the MN transversal displacement during fingers motion at CT and forearm levels.

**Results:** In all samples was found an anatomical continuity between epimysium and paraneural sheath and a reduction of paraneural fat tissue from proximal to distal. MN displacement in both levels were significantly reduced in CTS subjects ( $p < 0.001$ ).

**Conclusion:** Median nerve isn't an isolated structure, but is connected all around to myofascial structures. Therefore, an unbalance tension of epimysial fasciae can affect the paraneural sheath, limiting the nerve displacement and consequently has to be considered in CTS pathogenesis.

## Oral Session 6—Pelvis abdomen

## O-050

### The concealed “natural orifice” of the umbilicus revisited

Christina Glisic<sup>1</sup>, René Fortélyny<sup>2</sup>, Thomas Schmid<sup>3</sup>, Marko Korschake<sup>1</sup>

<sup>1</sup>Division of Clinical and Functional Anatomy, Medical University Innsbruck (MUI), Innsbruck, Austria; <sup>2</sup>Department of General-, Visceral- and Oncological Surgery, Wilhelminenspital, Vienna, Austria; <sup>3</sup>Department of Surgery, University Hospital for Visceral, Transplant and Thoracic Surgery, Medical University Innsbruck (MUI), Innsbruck, Austria

**Introduction:** The knowledge about “natural orifice” (a facial defect beyond the umbilicus) is indispensable to for example reduce pain and to minimize number of scars during the period after an operation. Therefore aim of the study was to investigate if a concealed “natural orifice” can be found beyond the umbilicus regularly with regard to use it as an access for various minimally invasive surgeries.

**Materials and methods:** Nineteen specimens were examined by macroscopic dissection. The diameter of the obtained fascial defects was measured with a digital calliper. To ensure the accuracy of the measured data the diameter was checked by the four-eye principle.

**Results:** In 100% of the specimens, a small fascial “defect” with a diameter between 2.5 and 14.2 mm could be found directly beyond the umbilicus.

**Conclusions:** The natural orifice was detected and dissected in 100 percent of the examined specimens that fulfilled the inclusion criteria. This is a promising finding and could lead to an alteration of the current operation techniques of minimally invasive surgeries.

## O-051

### Origin variability of superior gluteal artery and its clinical significances

Waseem Al Talalwah

King Saud Bin Abdulaziz University for Health Sciences, Riyadh, Saudi Arabia

**Introduction:** Superior gluteal artery is a prominent branch of posterior division of the internal iliac artery. It runs between the lumbosacral and first sacral root of sciatic nerve escaping from the pelvis via the greater sciatic foramen above the piriformis.

**Materials and methods:** The present study investigates the origin of the superior gluteal artery and clarify the clinical significance.

**Result:** In present study, the superior gluteal artery arises from the posterior division of the internal iliac artery directly in different five types according to Adachi’s classification of branching pattern of internal iliac artery. Type I superior gluteal artery was the most common in almost two-third of total cases whereas the type II in almost fifth of total cases. Further, type III, IV and V in almost ten percent of total cases.

**Conclusion:** With a variability of the superior gluteal artery origin, there is a variability of surgical procedures. Further, the superior gluteal artery arising from different forms of origin carries a high risk of intra-pelvic bleeding in case of posterior pelvic fracture. This study points out the variability of patterns of the superior gluteal artery observed during angiograph. Radiology measures are therefore important to be conducted prior to surgical operations to get an accurate decision in order to avoid unnecessary ligation, which may lead to monoparesis and other complications. Therefore, surgeons have to be aware of the superior gluteal artery variation in origin, course and branches to reduce the iatrogenic faults.

## O-052

### The middle rectal artery—a conflicting vessel in the depth of the pelvis

David Duller, Md Ulrike Pilsl, Md Georg Feigl, Md Norbert Tesch

Gottfried Schatz Research Center, Macroscopic and Clinical Anatomy, Graz, Austria

**Introduction:** We evaluated the frequency of developed middle rectal arteries for rectal surgical purposes because of inconsistent knowledge according to literature.

**Materials and methods:** The middle rectal artery was dissected bilaterally in 42 pelvises, all preserved with Thiel’s method. Dis-

section started at the origin of the internal iliac artery and followed all branches distally with a main focus on the ventral trunk including all visceral branches to the intrapelvic organs. The middle rectal artery was detected and identified by digital rectal palpation and traceable into the rectal wall. Adjacent structures such as the pelvic nervous plexus were saved as far as possible.

**Results:** In 39 out of 42 pelvises at least one middle rectal artery was found on both sides of the pelvis. Origin of this artery was located at different levels. In most of the cases, the middle rectal artery arose from the internal pudendal, the inferior gluteal artery or from the common trunk of these two vessels. In case of originating from a visceral pelvic branch, the middle rectal artery came from the inferior vesical artery. One preparation showed the blood vessel only on one side; in two of them the artery per se could not be displayed. In two cases the origin was found in a well-formed corona mortis.

**Conclusion:** The middle rectal artery is a well-developed vessel and constantly found bilaterally. Assumable, it has a role in the blood supply of the rectum cranial to the pelvic floor and should therefore be saved.

## O-053

### Coexistence of dense and sparse areas in longitudinal smooth muscle of the anal canal inspired by MRI

Satoru Muro<sup>1</sup>, Maika Habu<sup>1</sup>, Hiromasa Ka<sup>1</sup>, Ryuzaburo Kagawa<sup>2</sup>, Masayo Harada<sup>1</sup>, Keiichi Akita<sup>1</sup>

<sup>1</sup>Department of Clinical Anatomy, Tokyo Medical and Dental University, Tokyo, Japan; <sup>2</sup>Department of Proctology, Rakuwakai Otowa Hospital, Kyoto, Japan

**Introduction:** The wall of the anal canal is consisted of the internal anal sphincter, longitudinal muscle, and external anal sphincter. The longitudinal muscle is generally described as uniform structure. However, MRI of the anal canal shows low intensity areas like pillars and high intensity areas surrounding them in the longitudinal muscle layer. We hypothesized that smooth muscle fibers with different properties and state coexist in the longitudinal muscle of the anal canal.

**Materials and methods:** Thirteen cadavers (5 males and 8 females, mean age 78.4 years) were used for macroscopic anatomy and histological analysis with Masson trichrome stain and immuno-stain for smooth and skeletal muscles.

**Results:** In the inter-sphincteric space between the internal and external sphincters, columnar longitudinal muscle bundles were observed. These longitudinal muscle bundles were superiorly continuous with the longitudinal muscle of the rectum, and internally and externally covered by longitudinal smooth muscle fibers. In the axial sections of histological analysis, the columnar longitudinal muscle bundles were observed as a series of small circles formed by densely gathered smooth muscle fibers. These small circles were surrounded by sparsely scattered smooth muscle fibers. The distinction between the dense and sparse areas was gradually obscured in the inferior part of the anal canal.

**Conclusions:** The present study revealed that the longitudinal muscle of the anal canal has the dense and sparse areas of smooth muscle fibers. The coexistence of the dense and sparse areas probably reflected in the non-uniform MR image of the longitudinal muscle.

**O-054****Muscular arrangement of prostatic urethral wall in relation to the ejaculatory ducts in the seminal colliculus**

Mi-Sun Hur<sup>1</sup>, Hyun-Jin Kwon<sup>2</sup>, Hun-Mu Yang<sup>2</sup>, Jehoon O<sup>2</sup>, Seunggyu Lee<sup>3</sup>, Chang-Seok Oh<sup>4</sup>

<sup>1</sup>Catholic Kwandong University College of Medicine, Gangneung, Republic of South Korea; <sup>2</sup>Yonsei University College of Medicine, Seoul, Republic of South Korea; <sup>3</sup>National Institute for Mathematical Sciences, Daejeon, Republic of South Korea; <sup>4</sup>Sungkyunkwan University School of Medicine, Suwon, Republic of South Korea

**Introduction:** This study was conducted to investigate the muscular arrangement of prostatic urethral wall in relation to the ejaculatory ducts in the seminal colliculus.

**Materials and methods:** The prostates and urinary bladders of 12 formalin-fixed Korean adult cadavers were dissected. Five specimens were histologically analyzed by using Masson's trichrome stain, H&E stain, and Verhoeff-Van Gieson's stain.

**Results:** The inner longitudinal fibers of the detrusor muscle descended distally from the bladder neck and blended with the muscular tissue surrounding the prostatic urethra. At the proximal level of the prostate, the ejaculatory ducts and prostatic utricle were surrounded together by the circular fibers. At the seminal colliculus where the ejaculatory ducts and prostatic utricle opened, however, they were mainly surrounded by the longitudinal fibers which were most abundant in their amount. The longitudinal fibers posterior to the ejaculatory ducts and prostatic utricle formed a distinct muscular column in the seminal colliculus, and some circular fibers were observed internal to the longitudinal fibers. The longitudinal fibers surrounding the prostatic urethra branched out toward the anterior glandular tissue. The circular fibers of the smooth muscle at the membranous urethra were prominent and much thicker than those at the prostatic urethra.

**Conclusions:** The results of this study suggest a possible mechanism that the muscular column in the seminal colliculus may function to help the semen release into the prostatic urethra during ejaculation.

**O-055****Intramural distribution of the arteries in the stomach demonstrated by X-ray examination with barium contrast medium injected**

Haruka Eishi<sup>1</sup>, Kumiko Yamaguchi<sup>1</sup>, Yoshihiro Hiramatsu<sup>2</sup>, Keiichi Akita<sup>1</sup>

<sup>1</sup>Tokyo Medical and Dental University, TMDU, Tokyo, Japan; <sup>2</sup>Department of Radiology, Tachikawa Kitaguchi Kenshinkan, Tokyo, Japan

**Introduction:** There have been many studies about arteries of the stomach. Most of the reports are concerning to the outside of the stomach, however distribution of the arteries inside the stomach wall is still unclear. The purpose of this study is to delineate the distribution of arteries inside the stomach wall.

**Materials and Methods:** Ten samples including stomach and surrounding structures from formalin-fixed cadavers (4 male and 6 female) were used for this study. Barium contrast medium was injected into the arteries surrounding the stomach. X-ray photography (Softex, Softex, JAPAN) was performed before and after removal of vessels outside of the stomach. Distribution of intramural arteries was analyzed.

**Results:** Distribution of intramural arteries entering from the lesser curvature side was distributed in a wide range to the greater curvature side. Courses of the arteries were mainly vertical to the curvature just after entering the stomach wall. These arteries had many small branches to various directions. Each branch was distributed to the fundus and body of stomach near the greater curvature. Distribution of intramural arteries entering from the greater curvature side was in the limited area along the greater curvature of the gastric body and pyloric part of stomach. Many vascular anastomoses were found frequently between intramural arteries.

**Conclusions:** In the stomach wall, distribution of intramural arteries was dominated by arteries entering from the lesser curvature. Intramural arteries mainly running in the courses between the lesser curvature to the greater curvature.

**O-056****Development of neural structures and interstitial cells of cajal in the human fetal appendix**

Goran Radenkovic<sup>1</sup>, Aleksandra Velickov<sup>1</sup>, Vladimir Petrovic<sup>1</sup>, Dina Radenkovic<sup>2</sup>

<sup>1</sup>Institute of Histology and Embryology, School of Medicine, University in Nis, Nis, Serbia; <sup>2</sup>UCL Medical School, University College London (UCL), London, United Kingdom

**Introduction:** Interrelatedness and coordinated functions of interstitial cells of Cajal (ICC), enteric nervous system (ENS) and smooth muscle cells constitute the basis of peristaltic contractions of the gastrointestinal tract (GIT). ENS in the human appendix has a distinct pattern of organization. ICC subtype distribution is also different in the appendix compared to other parts of the gut.

**Materials and methods:** The study material consisted of 14 human fetal appendixes at 15–32 weeks of gestational age. The differentiation of enteric neurons and smooth muscle cells was immunohistochemically examined by using anti-NSE and anti-desmin antibodies, respectively. The specimens were exposed to anti-c-kit antibodies in order to investigate ICC differentiation.

**Results:** An important finding of this paper was the presence of numerous groups of neurons within the muscle layers of the appendix wall. In particular, in addition to myenteric plexus (MP) and submucosal plexus, there were groups of neurons within the circular and longitudinal muscle layers in human fetal appendix wall. At 15 weeks of development, c-kit immunoreactive ICC were present within the circular muscle layer, but were missing around the MP ganglia and within the longitudinal muscle layer. Such a distribution pattern persisted up to 32 weeks of development, differing significantly from ICC distribution in other parts of the human fetal gut.

**Conclusion:** A specific organization of ENS elements and ICC subtypes in the human appendix could possibly have an impact on motility and the etiology of appendicitis occurring later in life.

**O-057****Smooth muscle of the male pelvic floor: a study based on human fetuses**

Nyangoh Timoh Krystal<sup>1</sup>, Bessedé Thomas<sup>2</sup>

<sup>1</sup>Hospital Rennes, Rennes, France; <sup>2</sup>INSERM, Le Kremlin Bicêtre, France

**Introduction:** Genito-urinary dysfunctions are common clinical side effects of radical prostatectomy. **Objective:** We set out to explore the structure and innervation of the smooth muscle using male fetuses and specific muscular and neuronal antibody markers with 3D reconstruction.

**Methods:** We removed en-bloc the entire pelvis of three fetuses. The specimens were serially sectioned before being stained with Masson's trichrome and Eosin Haematoxylin, and immunostained for striated muscle, and somatic, adrenergic, sensory and nitrergic nerve fibers. Slides were digitized for 3D reconstruction.

**Results:** We individualized a middle compartment that contains smooth muscle (SM) cells. This compartment is in close relation with the levator ani muscle (LAM), rectum, and urethra. We describe a posterior contingent of the middle compartment from the sacrum to the rectum posterior to the rectal wall and an anterior contingent anterior to the rectal wall. The anterior contingent is split into 1) a centro-levator area or "core" of SM cells localized between the right and left LAM in the transversal plane, and between the rectum and urethra in the sagittal plane, 2) an endo-levator area that upholsters the internal aspect of the LAM, and 3) an infra-levator area below the LAM and infero-posterior to the endo-levator area. All these areas are innervated by autonomic nerves coming from the inferior hypogastric plexus. The core and the infra-levator area receive the cavernous nerve and nerves supplying the urethra.

**Conclusion:** We demonstrate existence of a smooth muscle of the middle compartment in the pelvis under autonomic influence.

**O-058****Anatomical evidence for an autonomic innervation of the male urethral sphincter: a study of human fetuses**

Nyangoh Timoh Krystal<sup>1</sup>, Bessedé Thomas<sup>2</sup>

<sup>1</sup>Hospital Rennes, Rennes, France; <sup>2</sup>INSERM UMR 1195, Rennes, France

**Introduction:** To describe autonomic urethral sphincter (US) innervation using specific muscular and neuronal antibody markers and 3D reconstruction.

**Materials and methods:** We performed en-bloc removal of the entire pelvis of three male human fetuses between 18 and 40 weeks. Serial whole mount sections (5 µm intervals) were stained and investigated. The sections were stained with Masson's trichrome and Eosin Haematoxylin, and immunostained with: anti-SMA antibody for smooth muscle; anti-S100 antibody for all nerves; and anti-PMP22 antibody, anti-TH antibody, anti-CGRP antibody, anti-NOS antibody for somatic, adrenergic, sensory and nitrergic nerve fibers, respectively. The slides were digitized for 3D reconstruction to improve topographical understanding. An animated reconstruction of the autonomic innervation of the US was generated.

**Results:** The external and internal US are innervated by autonomic nerves of the inferior hypogastric plexus (IHP). These nerves are sympathetic (positive anti-TH antibody), sensory (positive anti-CGRP

antibody), and nitrergic (positive anti-NOS antibody). Some autonomic fibers run within the neurovascular bundles, posterolaterally. Others run from the IHP to the posteromedial aspect of the prostate apex, above an through the rectourethral muscle. The external US is also innervated by somatic nerves (positive anti-PMP22 antibody) arising from the pudendal nerve, joining the median line but remaining below the rectourethral.

**Conclusions:** This study provides anatomical evidence of an autonomic component in the innervation of the external US that travels in the neurovascular bundle. During radical prostatectomy, the rectourethral muscle and the neurovascular bundles are to be preserved, particularly during apical dissection.

**Oral Session 7—Education evaluation****O-059****Simlife surgical simulator: or how to associate body donation centers and surgical simulation?**

Danion Jerome, Oriot Denis, Breque Cyril, Richer Jean Pierre, Faure Jean Pierre

ABS LAB; University Medical School of Poitiers Bâtiment D1, Rue de la Milétrie TSA 51115 86073 POITIERS Cedex 9 France, Poitiers, France

**Introduction:** The evolution of surgical techniques requires an intense pace of training and certification of teams. Simulation training in surgery requires realism very close to the operating room: based on a fresh body (frozen/thawed) given to science, made dynamic with pulsatile vascularization with simulated blood heated to 37 °C and ventilation by a patented technical module, thus allowing the surgical learner to be immersed in an operating room like environment with a simulated anesthetized patient (coloration and warming of the viscera with venous blood return, pulsatile circulation and movements of the chest cavity).

**Materials and methods:** The realism of the simulation teaching model is the basis of the pedagogical contract for simulation teaching: we have therefore set up an evaluation of the anatomical and global realism of the model, the overall satisfaction of the learners, and the ability of the system to correspond to a simulation teaching model. To do this, we used a self-questionnaire in which the items studied were evaluated using a Likert scale from 1 to 10.

**Results:** Satisfaction evaluation of Simlife surgery learners.

	N = 32
Ability of the model to be used as a teaching model	8.75 (0.84)
Anatomic realism	8.67 (0.96)
Global realism	8.56 (0.95)
Global satisfaction	8.45 (0.90)

**Conclusions:** Using Simlife technology permit to organize surgical simulations courses in almost all specialties of surgery using open or video assisted and robotic access. Since 3 years we organized more than 20 courses of surgical training, more than 200 learners benefit from training sessions using Simlife technology.

**O-060****Formative assessment in anatomy as a way to enhance learning process and knowledge retention. Why, what and when?**

*Bezdicikova, Marcela; Webster, Samuel V*

*Swansea University Medical School, Swansea, United Kingdom*

**Introduction:** Assessment in education is generally perceived to be a tool for testing knowledge and grading students. The concept of using formative assessment for learning brings learner and teacher feedback to different steps of the learning process. Anatomy is perceived as a huge learning load for medical students, especially in the first year. The aim of this contribution is to introduce different forms of formative assessment that we recently piloted in teaching and learning anatomy.

**Materials and methods:** The Virtual Learning Environment (VLE) is one option for formative assessments but is dependent upon University software decisions. On-line options, such as Kahoot, Mentimeter, Slido, and Turning Point are widely used. Another effective approach, highly rated by students, is peer teaching/learning followed by informal assessment and moderation. One value of interactive forms used through a session is that it offers immediate feedback. The formative practical spotter test remains one of the most used methods. **Results:** Current learners are adapted to collaboration in teams and formative assessment feedback via group interaction and competition appears to enhance learner motivation. Students concentrate more by using various learning activities and frequent feedback through interactive social discourse. Higher scores in summative assessment were proved when using written and practical formative assessments throughout the module.

**Conclusions:** Formative assessment is a powerful active tool to support learning and teaching. Followed by constructive feedback it triggers discovery and reflection of personal strengths and weaknesses. It allows learners to identify areas where improvement would benefit overall success in summative assessments.

**O-061****Gamification and audience response system (ARS) in the learning of the locomotor system anatomy in the 1st year of medicine**

*Ofelia González Sequeros<sup>1</sup>, Laura López González<sup>1</sup>, José Luis Fernández Alemán<sup>2</sup>, Juan José López Jiménez<sup>2</sup>*

*<sup>1</sup>Universidad de Murcia, Espinardo, Facultad de Medicina, Murcia, Spain; <sup>2</sup>Universidad de Murcia, Espinardo, Facultad de Informática, Murcia, Spain*

**Introduction:** The increase in the use of electronic devices such as smartphones in teaching, make easy the application of new learning methodologies such as ARS in which students answer multiple-choice questions and see their results immediately on a screen, what make easy for the teacher to solve doubts and increasing students attention and participation. The objective of this work is compared the effectiveness between the ARS platform known as SIDRA and this platform equipped with gamification elements (G-SIDRA), both developed in the University of Murcia, to obtain better results, increasing the competitiveness between the students, when participating individually or as a team.

**Materials and methods:** The experience will consist of 4 tests, with 10 multiple-choice questions, corresponding to various blocks of the subject “General and descriptive anatomy of locomotor system”, 1st

year of medicine. The academic performance of the G-SIDRA group (49 students) will be compared (Student *T* test), respect to SIDRA group (39 students).

**Results:** There are no statistically significant differences in the performance of the students, neither in the success rate (94%) nor the performance rate (86%) that were the same score in G-SIDRA and SIDRA groups. However, grades were higher in G-SIDRA and greater attendance for the classes has been observed, in a continuous and uninterrupted way (66.7%) compared with SIDRA (46.9%).

**Conclusions:** Students showed greater motivation in attendanced classes and taking tests in G-SIDRA. In fact, the satisfaction among users of G-SIDRA is significantly high (4.6/5), and 100% of students recommend the use of G-SIDRA in all subjects.

**O-062****Utilization and effect of learning materials in human anatomy course**

*Kumiko Yamaguchi, Nobutoshi Nawa, Keiichi Akita*

*Tokyo Medical and Dental University, TMDU, Tokyo, Japan*

**Introduction:** Developing effective study skills in early years of medical school is crucial for students’ success. Human anatomy is one of the first courses in medicine in our university. The aim of this study was to examine effects of tests and e-learning tools on term-end examination (term-end) scores in anatomy course, and to create our original learning support system.

**Materials and methods:** The data included 104 medical students who took human anatomy course in 2018. Following six were analyzed with relation to score of “term-end”. (1) average score of 12 mini-tests on anatomical terminology (terminology), (2) number of questions answered in eReview (Elsevier Japan), (3) number of lectures observed in streaming, (4) amount of time spent on dissection class, (5) score of sketch in dissection class, (6) score of review after dissection class. A linear regression was fit to examine the association between score of “terminology” and “term-end”.

**Results:** Significant association was detected between score of “terminology” and “term-end”. Increase in score of “terminology” by 10 points was associated with 9.3 points increase in “term-end” score (95% CI 7.2, 11.4;  $P < 0.01$ ), although some students failed in “term-end” even if their score of “terminology” were high. eReview and streaming were more frequently used among high-scoring students. Better performance during dissection class was related to better score, also not reaching statistical significance.

**Conclusions:** According to these results, scoring high on “terminology” might be a marker for high scores on the “term-end”. Optional e-learning tools would help students to study effectively.

**O-063****An advanced surgical anatomy course that emphasises unique parts of the “hidden curriculum”**

*Quentin Fogg*

*The University of Melbourne, Melbourne, Australia*

**Introduction:** The educational strengths of anatomy courses in medical, allied health and science curricula have been thoroughly documented. Amongst these, the “hidden curriculum” of skills

directly or indirectly developed through anatomy courses has also been considered. These include empathy, team work, communication and others. In Australasia, medical graduates work for approximately 5–7 years before gaining access to specialist training, including in surgery. During this period many aspiring surgeons seek to advance their anatomical knowledge through further study. Such courses therefore afford excellent opportunity to increase a variety of skills beyond anatomy.

**Methods:** This study will describe the structure of the Graduate Diploma in Surgical Anatomy (GDSA) and use staff and student feedback to analyse its effectiveness. The GDSA is a 20-week, dissection-based course. During the course, oral communication and standardised dissection technique are assessed through each student giving five oral presentations of their dissection. Feedback and skill development are built into both assessments and routine classes.

**Results:** Student evaluations highly rated the opportunity to gain feedback from successive presentations and the emphasis on technique. Staff feedback suggested a sharp increase in dissection quality, student confidence and their ability to communicate orally.

**Conclusions:** Emphasising key components of the hidden curriculum is of value to students and staff. Further studies will explore whether this approach increases the success rate for admission to specialist training and improves performance in this training.

## O-064

### Yin and Yang. Pin and flipped pin tests

Marcelina Łopińska<sup>1</sup>, Jerzy Gielecki<sup>1</sup>, Anna Żurada<sup>2</sup>

<sup>1</sup>Department of Anatomy Collegium Medicum, Medical Faculty, University of Warmia and Mazury in Olsztyn, Olsztyn, Poland;

<sup>2</sup>Department of Radiology Collegium Medicum, Medical Faculty, University of Warmia and Mazury in Olsztyn, Olsztyn, Poland

**Introduction:** Recent reports indicate that methods based on the Flipped Classes (FC) model could be a very effective tool in anatomy education. The purpose of the study was to describe a Flipped Pin Classes model based on the innovative application which runs on the multiplatform tablets in Department of Anatomy UWM in Olsztyn, Poland.

**Materials and methods:** At the beginning of each class, a tablet is handed to the leader of the students' group. The students are requested to pin a given structure on the specimen and take a picture with the indicated structure. Students' answers and photos are sent over the secured Wi-Fi network to the server-side application. The feedback can be given to the students via individual email addresses. After the classes, each group receives their photos and six random photos from another group to check and evaluate the placement of the pins. The answers are scored. The highest scoring group is exempted from the practical exam.

**Results:** The FPC model was evaluated by a standard survey. The new education model was compared to the traditional model (open labs) by midterm pin test scores. In classical practical pin test, all structures (pins) are matched by the teacher. In flipped pin classes position of the student is changed. Like a teacher, students are matching specimen according to given name list of anatomical structures.

**Conclusions:** The FPC enable students to be better prepared for the practical exams. Students can understand the strategy of preparing the pins for the practical examination.

## O-065

### Pin test in mini-OSCE format. Unexpected benefits from the use of tablets

Katarzyna Polak<sup>1</sup>, Jerzy Gielecki<sup>1</sup>, Anna Żurada<sup>2</sup>

<sup>1</sup>Department of Anatomy Collegium Medicum, Medical Faculty, University of Warmia and Mazury in Olsztyn, Olsztyn, Poland;

<sup>2</sup>Department of Radiology Collegium Medicum, Medical Faculty, University of Warmia and Mazury in Olsztyn, Olsztyn, Poland

**Introduction:** Mini-OSCE (mini Objective Structural Clinical Exam) is an integral part of the anatomy course. An innovative method of using mini-OSCE in which the students leave the pencil and paper format was designed. Modern multimedia devices are used during practical pin test examination.

**Materials and methods:** The method incorporates the latest technologies such as multiplatform tablets equipped with genuine application. Its features allow to send examined students' actions to a server-side application, where they are reviewed and assessed. Mini-OSCE consists of series of stations with specimen. Within each station student recognizes two anatomical structures, each marked with a pin. The student is required to type the official name of the pinned structure on tablet. After a specified time, student taking the test advances to the next station.

**Results:** The system is easy to set up and maintain, since it only requires tablets with the mini-OSCE app installed and a single Wi-Fi network to operate. As a backup, the student's actions (such as test responses) are also recorded directly to the tablet memory storage in an encrypted files. The security features prevent students from cheating.

**Conclusions:** The method aims to provide an unbiased practical part of assessment in anatomy. Mini-OSCE tablet system ensures objectivity, repeatability and task standardization. It allows to evaluate a wide range of students' anatomical knowledge in a short time with provided feedback.

## O-066

### Near-peer teaching strategy for a human anatomy course: perceptions of undergraduate medical students

Maria Alessandra Sotgiu<sup>1</sup>, Pasquale Bandiera<sup>1</sup>, Vittorio Mazzarello<sup>1</sup>, Andrea Montella<sup>1</sup>, Bernard Moxham<sup>2</sup>

<sup>1</sup>Department of Biomedical Sciences, University of Sassari, Sassari, Italy.; <sup>2</sup>Cardiff School of Biosciences, Cardiff University, Cardiff, United Kingdom

**Introduction:** The reduction of hours devoted to the anatomical sciences has led to a decline in anatomical knowledge among medical students. Several educational strategies have consequently been introduced for anatomy courses to improve students' skills and knowledge. The use of near-peer teaching (NPT) in medical education has been well documented. The strength of this educational approach relies on a "cognitive and social congruence" between teacher and student. Our aim was to evaluate students' perceptions of the benefits of a NPT programme.

**Materials and methods:** A pilot NPT programme was offered to students attending the second and third year human anatomy classes at

the University of Sassari, Italy. A total of 60 h of NPT was offered during hands-on activities within microscopic anatomy. Students completed anonymously a satisfaction survey, including items on a five-point Likert scale. The survey results were recorded in a database for statistical analyses.

**Results:** A total of 113 students participated, of whom sixty-eight (60%) and forty-five (40%) were second and third year students respectively. Fifty-six percent were female and the age of participants ranged from 20 to 30 years. Most students (79, 70%) valued the support of the NPT instructors and claimed NPT helped resolve uncertainties. Most students (94, 83%) agreed that NPT programmes should be included within medical curricula, particularly for anatomical topics.

**Conclusions:** The NPT educational approach could be a key method of supporting learning and we recommend that it should be formally introduced in medical curricula.

## O-067

### The fast and the furious learning of anatomical terms. ANKI flashcards method

Lukasz Klepacki<sup>1</sup>, Jerzy Gielecki<sup>1</sup>, Anna Żurada<sup>2</sup>

<sup>1</sup>Department of Anatomy Collegium Medicum, Medical Faculty, University of Warmia and Mazury in Olsztyn, Olsztyn, Poland;

<sup>2</sup>Department of Radiology Collegium Medicum, Medical Faculty, University of Warmia and Mazury in Olsztyn, Olsztyn, Poland

**Introduction:** The student's satisfaction and willingness to expand their anatomical knowledge using interactive ways of learning anatomical structures were analyzed.

ANKI software is free and open source program which allows to memorize difficult terms by the repetition method. Repetition is still the mother of medical studies. "Anki" is a Japanese word which stands for "memorization". ANKI's algorithm could be modified to allow to show cards, text, images, sounds and video.

**Materials and methods:** ANKI flashcards were prepared by the academic staff of the Anatomy Department. Flashcards have been prepared in the form of a package of appropriately described pictures that can be displayed in color on any digital device. One picture contains one labeled anatomical structure. In the updated version of packages with structures the correct pronunciation will be provided. **Results:** Using the questionnaires with the five-point Likert's scale, the students positively evaluated the level of benefits resulting from the interactive form of learning anatomical terminology.

**Conclusion:** This study confirms that interactive techniques improve the practical exam results. Students' satisfaction and motivation to expand knowledge of anatomy was statistically confirmed.

## O-068

### Using virtual and augmented-mixed reality-3D models from ct scans of real patient for anatomy education

Deniz Demiryurek

Hacettepe University Faculty of Medicine, Ankara, Turkey

**Introduction:** Anatomy education for centuries has been cadaveric and textbook-based training, which are limited to the anatomy labs hours or two-dimensional illustrations of the human body. The use of

virtual augmented reality technology is gradually being incorporated in medical school classroom environment for learning of anatomical structures, discussing the structures on real-time clinical models, and most importantly increasing the desire for learning anatomy. The aim of this presentation is creating 3D virtual holograms from CT images of a real patient case and visualizing these models to improve anatomy education in medical school.

**Materials and methods:** High resolution computerized tomography (HR-CT) slices of an 84-year-old patient has been used to create virtual 3D models and visualized with the virtual reality headset Microsoft HoloLens which stimulates holograms for a realistic experience.

**Results:** Patient's thoracic wall including the vertebrae, ribs and sternum and the lungs have been successfully modelled and visualized with Microsoft HoloLens.

**Discussion and conclusion:** We have found that the combined use of OsiriX viewer software of real patient images through the virtual headset Microsoft HoloLens allowed for individualized learning of clinical anatomy, as each hologram's anatomy is specifically unique to each and every patient. This use of real-time virtual imaging of a patient allows to learn the variations of anatomical structures as well. Ultimately, these future doctors will be equipped with the knowledge to efficiently adjust to a new age of virtual technology that stimulates models from radiologic images of real patients in order to make clinical and surgical decisions.

## O-069

### Hands-on courses of bronchoscopy for anesthesiologists and intensivists

Vaclav Baca<sup>1</sup>, Hana Bartakova<sup>2</sup>, Michal Otahal<sup>3</sup>, Jan Skubal<sup>4</sup>, Jiri Votruba<sup>2</sup>

<sup>1</sup>College of Polytechnics Jihlava and Educational Center for Anatomy and Endoscopy, Third Faculty of Medicine, Charles University, Prague, Jihlava, Czech Republic; <sup>2</sup>Department of Pulmonology, First Medical Faculty, Charles University and VFN, Prague, Prague, Czech Republic; <sup>3</sup>Department of Anesthesiology and Critical Care, First Medical Faculty, Charles University and VFN, Prague, Prague, Czech Republic; <sup>4</sup>Educational Center for Anatomy and Endoscopy, Third Faculty of Medicine, Charles University, Prague, Czech Republic

**Introduction:** Anatomy of respiratory system and elementary skills in flexible bronchoscopy belong to the basic knowledge for anesthesiologists and intensivists not only for the EDIC exam but for the clinical practice too. Demonstrations on cadavers performed by pulmonologists and clinical anatomists is very reasonable approach of teaching.

**Methods:** Hands-on courses were organized, donor bodies embalmed according to Thiel's method were used, and then the questionnaires were e-mailed to alumni focused on impact of the workshop on their clinical practice and a need of their follow-up education.

**Results:** 12 FBSC workshops for 141 participants were organized between 2012 and 2015. Overall, 98 questionnaires were returned and 77% of participants declared application of practical skills obtained in the workshop in their clinical practice, 74% declared usage of the theoretical know-how, more than 90% expressed their wish to take a part in advanced training.

**Conclusions:** Practical courses and demonstrations of FBSC for specialists is one of the possibility how to increase amount of physicians performing FBSC in critical care and increase the quality in clinical education in this medical branch.

**O-070****Mixed simulation center or clinical anatomy lab: paradigm shift in teaching and learning anatomy for training healthcare professionals**

Brion Benninger

Medical Anatomy Center, Western University of Health Sciences, Lebanon, Oregon, United States

**Introduction:** Teaching anatomy to healthcare trainees relies on pedagogical lecture-dissection practical. These conventional methods are reproducible and relatively effective. Pinned lab exams are biased poor measuring parameters consistent with critical thinking and clinical skills. Students grow bored of didactic and lab experiences. Objective of this study is to reveal innovative philosophies and practices to teach today's expected anatomy knowledge base and skill sets for a changing paradigm in healthcare education.

**Methods:** Literature search was conducted on student learning psyche, cognition, and behavior. Alternatives to conventional lecture and lab delivery was developed. Anatomy lab was redefined as a Simulation (SN) lab, subdivided into Dry, Wet and Mixed SN (DSN, WSN, MSN), and further stratified into 1st, 2nd, and 3rd order SNs based on the nature of the SN and how its integration with today's healthcare approach.

**Results:** Search revealed multimodal SN improves learning favoring anatomy teaching integrating SN. Lectures converted to 3 × 15-minute didactic sessions with 5-minute breaks equaling 1-hour. Lab delivery of DSN, WSN and MSN with anatomy deconstruction/reconstruction (D/R) philosophies was applied. DSN included surface anatomy, 3D models, Sectra 2D/3D imaging, Opus mini robotics, live and SN ultrasound, and wearable SN. WSN included dissection/prosection cadavers with surgical equipment integrating cadavers, imaging and clinical skills. MSN combined DSN and WSN to integrate both D/R learning. Paradigm shift must occur to maximize anatomy teaching/learning experiences, dissection is augmented by SN technologies including mixed realities with D/R learning philosophy.

**Conclusion:** Sensorial rich mediums providing visualization and kinetic sense combined with D/R philosophy creates better learning.

**O-071****Innovative video laryngoscope and bronchoscopy system with disposable user pieces can be utilized to teach and maintain intubation airway anatomy and skill sets**

William Maloney, Brion Benninger

Medical Anatomy Center, Western University of Health Sciences, Lebanon, Oregon, United States

**Introduction:** Obtaining an airway accurately and in a timely manner saves lives and morbidity. We depend on pre-hospital care providers to be experts. Medical schools teach basic life and cardiac support which includes airway, but few students practice such skills, and fewer were taught anatomy of clinical intubation. Medical school anatomy lab exposes some to cricothyrotomy. Video laryngoscope (VL) is challenging known intubation techniques, anatomy, and protocols. Bronchoscope is used for intubation, tracheostomy, lavage, and biopsies. Knowing where best to conduct tracheostomy and

understand intubation anatomy may alter with spinal curvature, degree of extension-flexion, anteroposterior diameter of chest and whether child or adult. Length of trachea in relation to surface landmarks needs understood. Objective was to evaluate if a simulator and donor cadavers could reveal functional airway anatomy using a VL and bronchoscope (BS) unit (VLBS) to teach airway anatomy and skill sets.

**Methods:** VLBS unit by Glidescope was used on 7-Sigma burn simulator and donor cadavers on separate days to evaluate reproducibility. VL and BS was placed into oral/nasal cavity singularly and together for single and two user training viewing nasal and oral cavity, pharynx, trachea and bronchial anatomy.

**Results:** No known studies using a combined VLBS unit to teach or maintain anatomy and airway skills for medical students was identified. Consistent extensive anatomy was revealed from both simulator and cadavers at different times and days.

**Conclusion:** VLBS unit could be used as an anatomy-airway skill system to teach and/or maintain airway anatomy and skillsets in cadaver or simulation labs.

**Oral Session 8—Locomotor system****O-073****Anatomic study regarding the deltoid and spring ligament based on the joint capsule**

Amaha Kentaro<sup>1</sup>, Nimura Akimoto<sup>2</sup>, Akita Keiichi<sup>3</sup>

<sup>1</sup>Department of Orthopedic Surgery, St Luke's International Hospital, Tokyo, Japan; <sup>2</sup>Department of Functional Joint Anatomy, Graduate School of Medical and Dental Science, Tokyo Medical and Dental University, Tokyo, Japan; <sup>3</sup>Department of Clinical Anatomy, Graduate School of Medical and Dental Science, Tokyo Medical and Dental University, Tokyo, Japan

**Introduction:** Adult acquired flatfoot deformity (AAFD) is caused by impaired medial ligamentous structures in addition to posterior tibialis tendon dysfunctions. Anatomical studies of the medial ankle have predominantly focused on specific ligaments such as the deltoid and spring ligaments. However, anatomic features of them remain controversial. Furthermore, there have been no reports regarding the relationship between these ligaments and the adjacent structures, such as joint capsule. The aim of the current study is anatomically investigate the medial ankle in terms of the joint capsule.

**Materials and methods:** We used embalmed 22 cadaveric ankles (mean 82.7 years). We detached the joint capsule in 16 ankles, analyzed the capsule and its attachments of the ankle and adjacent joints. We conducted the histological analysis in 6 ankles.

**Results:** The capsule could be separated as a continuous sheet, including 3 different features. The anterior capsule consisted of a fat tissue. Between the medial malleolus and talus, the capsule strongly connected them as a fibrous tissue, normally referred to as the deep deltoid ligament. On the subtalar and talonavicular joints, the capsule covered them as a cartilaginous tissue, normally referred to as the superomedial ligament of the spring ligament.

**Conclusions:** The deltoid and spring ligaments could be interpreted as a part of the joint capsule including different histological features. The joint capsule seemed to act as joint stabilizer and form the gliding floor of the posterior tibialis tendon. The anatomic knowledge of the current study could lead to appropriate managements of the AAFD.

**O-074****Anatomical relationship between the morphology of the styloid process of the ulna and radioulnar ligament attachment**

Akimoto Nimura, Masahiro Tsutsumi, Satoru Muro, Keiichi Akita

Tokyo Medical and Dental University, Tokyo, Japan

**Introduction:** To clearly understand the attachment of the radioulnar ligament to the styloid process, we investigated the anatomical characteristics of the distal ulna, particularly the styloid process.

**Methods:** We included the distal ulna of 12 cadaveric wrists using micro-CT to visualize and measure the distribution of the cortical bone thickness. We histologically analyzed three specimens in the axial plane. In addition, to examine the radioulnar ligament attachment to the styloid process, we macroscopically analyzed seven specimens.

**Results:** The distal ulna has a prominent area that continues from the dorsal base to the tip of the styloid process and a depression on the palmar side of the fovea. Micro-CT images after data processing revealed that the prominence corresponded to cortical bone thickening. Histologic analyses showed that connecting fibers from the disc proper (i.e., radioulnar ligament) were attached to the dorsal side of the base, middle, and tip of the styloid process via the fibrous cartilage, with gradual changes in direction from the dorsal side to the palmar side. Macroscopic observation showed that the bony prominence of the styloid process correlated with the radioulnar ligament attachment.

**Conclusion:** We revealed that the radioulnar ligament was attached to the dorsal base, middle, and tip of the styloid process of the ulna, which was confirmed by the bony morphology and cortical bone thickening of the distal ulna and the existence of the fibrocartilage at the attachment sites. Our findings may provide the anatomical basis for the accurate diagnosis of triangular fibrocartilage complex injuries.

**O-075****Ultrasound-guided surgery for the proximal tarsal tunnel syndrome: a novel ultra-minimally invasive approach**Alejandro Fernández Gibello<sup>1</sup>, Simone Moroni<sup>1</sup>, Gabriel Camuñas Nieves<sup>1</sup>, Rubén Montes Salas<sup>1</sup>, Marit Zwierzina<sup>2</sup>, Christoph Tasch<sup>2</sup>, Vasco Starke<sup>2</sup>, José Sañudo<sup>3</sup>, Teresa Vázquez<sup>3</sup>, Marko Korschake<sup>2</sup><sup>1</sup>Clínica Vitruvio, Madrid, Spain; <sup>2</sup>University of Innsbruck, Innsbruck, Austria; <sup>3</sup>Universidad Complutense de Madrid, Madrid, Spain

**Introduction:** The tarsal tunnel syndrome (TTS) was first described by Keck et al. and Lam et al. in 1962 and until now the real prevalence of this pathology is unknown. The plantar heel pain itself has a prevalence of 11–15% of the adults with foot problems and up to 88% of the patients with this chronic pain have some degree of entrapment. Therefore the aim of this study was to provide a new and safe ultrasound-guided ankle and foot decompression technique (UGAFDS) for a proximal tarsal tunnel release.

**Materials and methods:** We performed the technique on 10 fresh-frozen feet (6 male, 4 female), which belong to the Body Donation Centre of the Complutense University of Madrid.

**Results:** The UGAFDS-technique was possible. The liberation of the tarsal tunnel could be done without damaging of any nobel structure.

**Conclusions:** The UGAFDS approach might be a promising technique treating the tarsal tunnel syndrome with minimizing possible side-effects and complications.

**O-076****Does the reverse shoulder arthroplasty provoke arm lengthening and subsequently of the brachial plexus?**Laura Serrano Mateo<sup>1</sup>, José Ramón Sañudo Tejero<sup>2</sup>, Fernando Marco<sup>1</sup><sup>1</sup>Trauma and Orthopaedic Surgery Department, Hospital Clínico San Carlos, Madrid, Spain; <sup>2</sup>Anatomy and Embriology Department, Medicine Faculty, Complutense University, Madrid, Spain

**Introduction:** The use of reverse shoulder arthroplasty (RSA) is becoming more extended and its clinical results are good or excellent according the literature. It is being found that there are more neurophysiological changes in the brachial plexus with RSA than with the total shoulder prosthesis with anatomical design; it can be related to the arm lengthening associated to the RSA. Therefore, the main goal of this study is to quantify the lengthening of the terminal branches of the brachial plexus after using RSA.

**Materials and methods:** A total of 20 embalmed shoulders belonging to the Donors Center of the Complutense University of Madrid were dissected (sex and side). The brachial plexus and its terminal branches were dissected and marked. Measurements were made to determinate the change of position of the nerves, the arm lengthening and the lengthening of each nerve were measured with a digital calibre before and after the implantation of an RSA. Two models of RSA were used: SMR<sup>®</sup> (Lima) and Delta-Xtend<sup>®</sup> (DePuy-Synthes).

**Results:** The mean arm elongation was 10.5 mm. The subacromial space suffers an elongation of 17–29%. All the nerves suffer elongation in the area studied: radial (17%), axillary (14.9%), ulnar (19%), musculocutaneous (22.05%), median (23.1%). There were no significant differences between the type of prosthesis used.

**Conclusions:** The RSA causes an arm lengthening that it is being shown in the elongation of the neurological structures of the arm. Therefore, its design it can be considered as one of the possible etiological factors that contributes to neurological lesions in RSA.

**O-077****Venous system of the digits and the hand: an anatomical study and surgical applications**Martin Lhuair<sup>1</sup>, Guillaume Wavreille<sup>2</sup>, Mikael Hivelin<sup>1</sup>, Aurélien Aumar<sup>2</sup>, Vincent Hunsinger<sup>1</sup>, Mohamed Derder<sup>1</sup>, Peter Abrahams<sup>3</sup>, Laurent Lantieri<sup>1</sup>, Christian Fontaine<sup>4</sup><sup>1</sup>Department of Plastic, Reconstructive and Aesthetic Surgery, Hôpital Européen Georges Pompidou, Assistance Publique des Hôpitaux de Paris, Université Paris Descartes, Paris, France; <sup>2</sup>SOS Hands and Fingers, Clinique Lille Sud, Lesquin, France; <sup>3</sup>Institute of Clinical Education, Warwick Medical School, University of Warwick, Coventry, United Kingdom; <sup>4</sup>Institute of Anatomy and Organogenesis,

*Faculté de Médecine Henri Warembourg, Université de Lille, Lille, France*

**Introduction:** While the importance of venous return restoration on the prognosis of digital replantation's is fundamental, venous anatomy of the hand and digits is poorly known compared to arterial anatomy. Data available in the literature on the subject are scarce. The purpose of this descriptive anatomical work was to study the venous anatomy of the hand and fingers.

**Materials and methods:** Our series reports descriptive results from 7 hand dissections, from different fresh cadavers. Hands were previously injected with a colored 30% (n = 5) agar solution or latex (n = 2) before being dissected under optical magnification ( $\times 4$ ). Each anatomical piece was photographed before being analyzed.

**Results:** Injections showed the venous system dorsal but also palmar. The venous dorsal system was more developed than the palmar venous system. There was a constant latero-nail vein on all long fingers and thumb. Finally, the presence of anti-reflux valves at the level of the middle phalange of the long fingers was observed.

**Conclusion:** The knowledge, a priori, of the arrangement of the venous system of the hand and the fingers should help the surgeon when confronted with digital replantations, in particular distal (zones II and III of Ishikawa).

## O-078

### Morphological analysis of the hip capsular attachment on the anterosuperior acetabular margin

*Masahiro Tsutsumi<sup>1</sup>, Akimoto Nimura<sup>2</sup>, Eisaburo Honda<sup>3</sup>, Hajime Utsunomiya<sup>3</sup>, Soshi Uchida<sup>3</sup>, Keiichi Akita<sup>1</sup>*

<sup>1</sup>Department of Clinical Anatomy, Tokyo Medical and Dental University, Tokyo, Japan; <sup>2</sup>Department of Functional Joint Anatomy, Tokyo Medical and Dental University, Tokyo, Japan; <sup>3</sup>Department of Orthopaedic Surgery and Sports Medicine, Wakamatsu Hospital of University of Occupational and Environmental Health, Kitakyushu, Japan

**Introduction:** Although hip surgeons partially detached the joint capsule from the anterosuperior acetabular margin to correct bony abnormalities and repair any associated soft tissue damage, few studies have focused on the anatomical structure of the hip capsular attachment. This study aimed to investigate the capsular attachment on the anterosuperior acetabular margin based on the bony morphology, attachment width and histological features.

**Materials and methods:** We investigated 15 hips from 9 Japanese cadavers. Eleven and 4 hips were assigned to macroscopic and histological analyses, respectively. In all specimens, the three-dimensional morphology of the anterosuperior acetabular margin was examined using microcomputed tomography (micro-CT).

**Results:** Width of the capsular attachment varied according to the location, and the attachment width on the inferior region of the anterior inferior iliac spine (iAIIS) was significantly wider than that on the anterosuperior acetabular margin. In addition, the attachment on the iAIIS corresponded with the bony impression, which was identified by micro-CT. Histological analysis revealed that the inner attachment of the fibrous joint capsule on the iAIIS was adjacent to the proximal margin of the labrum and the attachment on the iAIIS was fibrocartilaginous.

**Conclusions:** The capsular attachment on the iAIIS, which is the same as the origin of the iliofemoral ligament, was characterized by the bony impression, attachment width, and distributed fibrocartilage. Anatomical knowledge of the capsular attachment on the iAIIS

facilitate an understanding of the pathological condition of the hip joint instability.

## O-079

### Quantitative 3D anatomy of medial column septae in the plantar foot

*Georga K. Bruechert<sup>1</sup>, Casper G. Thorpe Lowis<sup>1</sup>, William H.B. Edwards<sup>2</sup>, Quentin A. Fogg<sup>1</sup>*

<sup>1</sup>The University of Melbourne, Melbourne, Australia; <sup>2</sup>Epworth Hospital, Melbourne, Australia

**Introduction:** There is limited understanding of the fascia and septae that separate the tendons of the tibialis posterior (TP), flexor digitorum longus (FDL) and flexor hallucis longus (FHL) muscles through the tarsal tunnel (TT) and their organisation in the plantar aspect of the foot. Compartment syndromes, particularly postoperatively, may be reduced with better understanding of this anatomy. This is particularly important in the medial column of the plantar foot due to the convergence of the major toe flexors. This study aims to describe and quantify the medial plantar septae of the foot.

**Materials and methods:** Embalmed feet (n = 10) were subject to CT and MR imaging, followed by dissection and reconstruction in a 3D virtual environment using a digital microscribe.

**Results:** At the level of the TT, the three tendons had distinctly individual sheaths. The TP tendon maintained its individual sheath until its distal attachment. The sheaths of the FDL and FHL tendons converged at the plantar aspect of the foot. The lateral wall of this medial column sheath is supported by a thick fibrous septae, physically separating the medial and central columns.

**Conclusions:** The medial column of the foot sees convergence of the two major tendons into common sheath, which is reinforced by thick septae laterally. This separation may influence communication of this space with the rest of the foot and may create a barrier for fluid dispersal leading to compartment syndromes. A more detailed understanding of plantar foot anatomy will drive innovation in the management of foot disorders.

## O-080

### Spatial anatomy of the proximal attachments of the thenar musculature

*Quentin Fogg<sup>1</sup>, Neil Ashwood<sup>2</sup>*

<sup>1</sup>The University of Melbourne, Melbourne, Australia; <sup>2</sup>Burton Hospitals NHS Foundation Trust, Burton-Upon-Trent, United Kingdom

**Introduction:** Reconstructive surgery of the thumb intrinsic musculature is complex and requires consideration of static anatomy and its dynamic application. Postoperative results, indicated by hand function scoring, may be improved through a more detailed understanding of how the thenar muscles are interrelated, along with their supporting neurovasculature. This study aims to quantify these relations.

**Materials and methods:** Unembalmed hands (n = 10) were imaged (CT) then dissected using a fascicular approach to define the precise anatomy at a tissue level. The footprints of each attachment were recreated in a virtual environment using a digital microscribe, facilitating quantification.

**Results:** The superficial thenar muscles attached proximally in a near-continuous band. This band coursed along the radial margin of the flexor retinaculum before diving deep along the disto-radial margin of the carpal tunnel. The recurrent branch of the median nerve and muscular branches of the radial artery were varied in their organisation amongst the muscle bellies.

**Conclusions:** The superficial thenar muscles attach proximally in continuous band, adding strength to prior suggestions that they should be considered more like the rotator cuff of the shoulder. These data suggest that the full extent of the proximal attachment should be considered when reconstructing the thumb, and that the highly varied neurovasculature should be given particular attention in partial reconstructions or tissue salvage.

## O-081

### Defining an effective zone of injections in piriformis with reference to standard and reliable anatomical landmarks

Sibel Kibar<sup>1</sup>, Simel Kendir<sup>2</sup>, Nihal Apaydin<sup>3</sup>, Ferdi Yavuz<sup>4</sup>, S. Tuna Karahan<sup>2</sup>

<sup>1</sup>FizyoCare Medical Center, Department of Physical Therapy and Rehabilitation, Ankara University Faculty of Medicine, Department of Anatomy, Ankara, Turkey; <sup>2</sup>Ankara University Faculty of Medicine, Department of Anatomy, Ankara, Turkey; <sup>3</sup>Ankara University Faculty of Medicine, Department of Anatomy, Ankara University Brain Research Center, Ankara, Turkey; <sup>4</sup>FizyoCare Medical Center, Department of Physical Therapy and Rehabilitation, European University of Lefke, Faculty of Health Sciences, Department of Physical Therapy and Rehabilitation, Gemikonagi, Turkish Republic of Northern Cyprus, Ankara, Turkey

**Introduction:** The cause, diagnosis, and treatment of piriformis syndrome remain elusive and enigmatic. Many studies have been conducted to investigate various treatment options including injections of local anesthetics, corticosteroids, and botulinum neurotoxin. The present ultrasound-guided injections rely on visualizing the piriformis while performing internal and external rotation to hip when the hip and the knee is flexed. However, ideal positioning of the patient and performing these maneuvers in a patient with pain or obesity may not always be possible. This study was therefore performed to define an effective zone of injection in piriformis with reference to standard and reliable anatomical landmarks regardless of the position of the lower limb.

**Materials and methods:** For this purpose, 10 cadaveric lower limbs were dissected to define the relation of piriformis to superior posterior iliac spine (SIPS) and tip of ischial tuberosity (IT). The motor nerve entry points of piriformis were also defined. Then, measurements were performed on 21 pelvic bones for to define the relative position of the piriformis relying on bony landmarks.

**Results:** The mean distance between the SIPS and IT was 12.8 cm. The distance between the SIPS to upper edge of the piriformis was 4.6 cm, and to the lower edge was 7.4 cm. It was determined that the nerve innervating the piriformis was found at the upper edge of the piriformis being a branch of superior gluteal nerve.

**Conclusions:** The ideal site of injections in piriformis was suggested to be the upper 1/3 of the line connecting the SIPS-IT.

## O-082

### Deltpectotal acromio-coronal technique (DPAC): designing an anatomically accurate, reproducible humeral intraosseous cannulation replacing difficult IV access

Brion Benninger, Jonathon Mang, Wilson Chang

Medical Anatomy Center, Western University of Health Sciences, Lebanon, Oregon, United States

**Introduction:** Increasing world-wide obesity, rampant IV drug abuse and military warfare has compromised intravenous access regarding resuscitation. Since 1980's, intraosseous access was developed for secondary sites when anatomy was compromised. Current humeral intraosseous access (HIOa) technique has not yet been established or investigated. This study objective was to design and develop a reproducible safe HIOa technique based on anatomy.

**Methods:** Literature search was conducted on IO techniques and website videos. HIOa techniques were analyzed and performed on cadavers using palpation, ultrasound and full dissection. Cadavers: N = 14: M-11, F-3, with no shoulder arthroplasty), Freedom art embalmed; average age 76. Dissectors (D), N = 87, had not performed HIOa procedure previously were taught the Deltpectoral-Acromio-Coronal technique (DPACt), identifying deltopectoral groove (DPG), acromial coronal plane (ACP), and greater tuberosity (GT) of the humerus from static and dynamic palpation in neutral and internal rotation positions of the glenohumeral joint for HIOa on cadavers. Visual, auditory, palpation, imaging, learning (VAPIL) ratio method demonstrated static and dynamic surface and deep anatomy and execution of DPACt. Palpation and ultrasound was conducted pre-and post HIOa prior to dissection.

**Results:** Search revealed no known HIOa techniques and a Website video revealed HIOa technique with no name and minimal anatomy. DPACt was successful identifying DPG, ACP and GT during static and dynamic palpation by 87/87D, first attempt HIO needle insertion success 86/87D, 87/87D on second attempt and 87/87D repeated on same day.

**Conclusion:** This study successfully designed an anatomically based HIOa using DPACt conducted by novices integrating cadavers, ultrasound and physical exam skills.

## O-083

### Morphological analysis of the suprapatellar fat pad

Edgardo Enrico Edoardo Picardi<sup>1</sup>, Veronica Macchi<sup>1</sup>, Giulia Fontanella Chiara<sup>2</sup>, Anna Rambaldo<sup>1</sup>, Edi Simoni<sup>1</sup>, Cinzia Tortorella<sup>1</sup>, Rafael Boscolo Berto<sup>1</sup>, Marta Favero<sup>3</sup>, Arturo Natali<sup>4</sup>, Andrea Porzionato<sup>1</sup>, Raffaele De Caro<sup>1</sup>

<sup>1</sup>Institute of Human Anatomy, Department of Neuroscience, University of Padova, Padova, Italy; <sup>2</sup>Department of Biomedical Sciences, University of Padova, Padova, Italy; <sup>3</sup>Rheumatology Unit, Department of Medicine-DIMED, University Hospital of Padova, Padova, Italy; <sup>4</sup>Department of Industrial Engineering, University of Padova, Padova, Italy

**Introduction:** The suprapatellar fat pad (SFP) is located above the patella and behind the suprapatellar joint recess with the function of

increasing the congruency of the extensor mechanism. Osteoarthritis SFP has been demonstrated to produce high amount of inflammatory molecules and to be more fibrous than subcutaneous adipose tissue in osteoarthritis (OA) patients. The aim of this study was to analyze the morphological characteristics of the SFP compared to that of the infrapatellar fat pad (IFP) in normal subjects.

**Materials and methods:** Ten specimens of SFP and ten of IFP were sampled from bodies of the donation program of the University of Padova without history of OA. The sections obtained from the paraffin-embedded samples were stained with hematoxylin–eosin and van Gieson for elastic fibres.

**Results:** The histotopographic study demonstrated that, SFP consisted of white adipose tissue, of lobular type, with smaller lobules, compared to IFP, (mean area  $0.64 \pm 0.09$  mm Vs  $1.15 \pm 0.11$  mm) and delimited by thicker septa (mean thickness  $0.26 \pm 0.05$  mm Vs  $0.22 \pm 0.034$  mm). Moreover, numerous vessels and abundant elastic fibres (5–10%) were recognisable. The mean area of the adipocytes was  $2.99 \pm 1.47$ mm<sup>2</sup>.

**Conclusions:** Since in previous study, where no differences were observed in SFP MRI characteristics between OA patients and control group, this study demonstrated that peculiar morphological characteristics can be highlighted in SFP: small lobules and thick interlobular septa. These features and its specific localization make it different from IFP: these could be considered the morphological reasons why this fat pad is not clearly involved in OA.

## Poster session

### P-001

#### Arteriovenous communication between left testicular vein with accessory renal artery: a case report

*Sarah Sko Sangma, Neerja Rani, Jessy J P, Ritu Sehgal, Saroj Kaler*

*All India Institute of Medical Sciences, New Delhi, India*

**Introduction:** Renal artery variations including their source and number are very common and occur in 30% population. Arteriovenous malformations (AVM) are congenital disorders of the circulatory system that arise during embryonic period or soon after birth. Renal and gonadal arteriovenous malformations is an aberrant vascular connection between arteries and veins. But, the arteriovenous communication between testicular vein and accessory renal artery is the rarest of all variations pertaining to the vascular anomalies affecting the gonadal and renal vasculature. Therefore, we report one such exceptional case having arteriovenous communication between left testicular vein with accessory renal artery.

**Materials and methods:** During routine dissection for undergraduates we came across anomalous vascular pattern between left testicular vein with accessory renal artery of 65 years old adult male cadaver at All India Institute of Medical Sciences, New Delhi, India.

**Results:** We observed one accessory renal artery on lower pole of left kidney and arteriovenous communication (diameter 0.2 cm) between accessory left renal artery and left testicular vein. We also observed two accessory renal arteries on the right kidney. Accessory renal vein was draining the lower pole of right kidney. Right gonadal artery was absent and right gonadal vein drained into accessory right renal vein. Left gonadal vessels were normal.

**Conclusion:** Arteriovenous malformation between left testicular vein with accessory renal artery can result in significant haematuria which may require arterial embolization or nephrectomy. Also such abnormal communication may obstruct the flow of blood in vein with high risk of varicocele.

### P-002

#### Ectopic pelvic kidney and its renal artery from the common iliac artery: a case report

*Lafcı Fahrioğlu Sevda, Muhtaroglu Musa, Önderoğlu Selda, İlğ Sezgin*

*Near East University, Nicosia, Cyprus*

**Introduction:** The initially form of the kidneys are near the tail of the embryo in the early stages of embryogenesis. Growth of the embryo in length causes the kidneys to “ascend” to their final position in the lumbar region at the 9th week of gestation. The most common type of renal ectopia is pelvic kidney. The pelvic kidneys which reside in the pelvis minor are clinically asymptomatic in general but are more prone to urinary infections and stone formation.

**Case report:** The 37-year-old man was admitted to the emergency room with complaints of left flank pain, nausea and vomiting. The patient was thin and tall. A kidney stone was suspected, and a renal ultrasound demonstrating several shadowing echogenic areas consistent with nephrolithiasis in the both kidneys. In addition, while the right kidney was in the normal size and location, the left kidney was located on the ectopic site, just above the bladder. The CT scan which is performed after ultrasound demonstrated multiple renal stones but no double collecting systems in both kidneys. Doppler examination revealed a double renal artery separated from the aorta on the right side. The left renal artery was separated from the common iliac artery immediately after aortic bifurcation. There was no renal artery stenosis in both kidneys.

**Discussion:** The patient with abnormal located kidney should be monitored with ultrasound for the secondary infection and hydronephrosis. Our case indicates the importance of the ectopic kidney location when planning surgical procedures in patients with renal and pelvic pathology.

### P-003

#### Variant origin of inferior phrenic arteries and their clinical significance

*Jessy J P, Sarah Sangma, Seema Singh, Neelam Verma, Neerja Rani*

*All India Institute of Medical Sciences, Delhi, India*

**Introduction:** Inferior phrenic arteries are the chief arterial supply to diaphragm. They originates from aorta or celiac trunk, variably from common trunks and possibly from renal artery, accessory renal arteries, left gastric, hepatic, gonadal arteries. Variations in their mode of origin are not uncommon, but very less information is available regarding functional anatomy of inferior phrenic artery. Also the statistical information regarding the origin of either right phrenic or left phrenic artery is not provided. Due to lack of information regarding inferior phrenic arteries, a more definitive study is necessary to find its applications and to provide additional data to existing anatomical literature.

**Materials and methods:** The present variation was observed during routine dissection of 65 year adult male cadaver at All India Institute Of Medical Sciences, Delhi, India.

**Results:** Inferior phrenic artery was seen to arise from a proximal common trunk of celiac artery, followed by its division into right and left phrenic branches, supplying the diaphragm. The distal common trunk gave rise to splenic and common hepatic artery.

**Conclusion:** Knowledge of variations in origin of inferior phrenic artery will be useful for management of liver transplants and biliary tract surgery, enhancing the understanding of both specific anatomy of inferior phrenic arteries as well as their potential significance in supplying hepatocellular carcinomas and other liver tumours, primary or metastatic such as cholangiocarcinoma, hepatoblastoma and subcapsular adenoma.

## P-004

### New method of microsurgical anti-reflux choledochojejunostomosis in experiment

Anatoly Tretiakov, Ilya Kagan, Sergei Liashchenko, Igor Kuznetsov

Orenburg State Medical University, Orenburg, Russian Federation

Strictures, bile ducts disruptions are common pathology. The aim is to develop and prove new microsurgical anti-reflux choledochojejunostomosis. In the jejunum of 15 dogs two parallel incisions at a 10–12 mm distance perpendicular to the intestine axis were performed. At the same time, the serous-muscular layer is dissected down to the submucous membrane. Then, between the incisions, a tunnel was formed between the muscular and submucous layers of the jejunum. A common bile duct was pulled through the formed tunnel to the distal incision. At the second incision level an excessive space of common bile duct was formed to immerse into the jejunum lumen and to suture the common bile duct wall and the jejunum submucous membrane. At the same time, the mucous layer of the duct and jejunum was not sutured. The serous and muscular layers in the first and second incisions was stitched. The 6/0–8/0 microsurgical thread was used, the surgical microscope was used with magnification by 10–15. After the surgery X-ray examination was performed, the strength and tightness of the anastomosis was checked. 21 days later the histotopographic sections indicated a fully recovered mucous layer, connected submucosal lamina of the bile duct and intestine. The muscular membrane above the duct is increased by 1.3–1.5 times.

A new model of microsurgical anti-reflux choledochojejunostomosis showed high functionality, durability and no reflux. This surgery allowed to form the structure like sphincter and similar to major duodenal papilla.

## P-006

### Left inferior vena cava: case report and review of the literature

Jordi Elvira, Eneko Barbería, Ana Soler, Pablo Rodríguez, Montserrat Jové, Fran J. Valderrama-Canales

Faculty of Medicine and Health Sciences, Rovira i Virgili University, Tarragona, Spain

**Introduction:** The inferior vena cava (IVC) is typically a right sided vessel formed from four pairs of veins in the embryo. Variations of the IVC are well known and, broadly, are classified as transpositions, duplications, and absence/interruptions. Circumaortic and retroaortic

left renal vein are often included in such variations because they are closely related to embryology of the IVC.

**Materials and methods:** During routine dissection of an embalmed 71 years old male cadaver, one left inferior vena cava (LIVC) was identified.

**Results:** The LIVC crosses to the right, ventrally to the aorta, when receiving the left renal artery, which, previously, has received the left testicular artery. As the LIVC locates on the right side, receives the right testicular artery and, slightly cranial, the right renal artery empties on the LIVC.

**Conclusions:** Left-sided IVC is a rare but clinically significant anatomical variant within inferior vena cava variations. The clinical significance of this variation mainly relates to the potential for misdiagnosis when analysing abdominal images, the aetiology and management of venous thromboembolism, and the possibility of operative complications during retroperitoneal surgery.

## P-009

### Anatomical characteristics in posterior cerebral artery and posterior communicating artery

Dijon Musliu<sup>1</sup>, Selim Cerkez<sup>2</sup>, Sadi Bexheti<sup>3</sup>, Jeton Shatri<sup>4</sup>

<sup>1</sup>Institute of Anatomy, Faculty of Medicine, University of Prishtina, Institute of Anatomy, Prishtina, Kosovo; <sup>2</sup>Institute of Anatomy, Faculty of Medicine, University of Tetovo, Institute of Anatomy, Faculty of Medicine, University of Tetovo, Macedonia; <sup>3</sup>Institute of Anatomy, Faculty of Medicine, University of Tetovo, Institute of Anatomy, Faculty of Medicine, University of Tetovo, Kosovo; <sup>4</sup>Institute of Anatomy, Faculty of Medicine, University of Prishtina, Institute of Anatomy, Faculty of Medicine, University of Prishtina, Kosovo

**Introduction:** Circulus arteriosus cerebri (CAC) as an anastomotic polygon at the base of the brain forms an important collateral network to maintain cerebral blood perfusion. Most of the variations have been reported on posterior cerebral and posterior communicating arteries. The aim of this study was to investigate different anatomic variations and dimensions of posterior part of the CAC and their prevalence.

**Materials and methods:** This is an observational descriptive study performed at the University Clinical Center, Clinic of Radiology. A randomized sample of 155 angiographic examinations in adult patients of both sexes without clinical manifestations for cerebrovascular disease who were instructed to exploration is included.

**Results:** Mean length and diameter of the posterior cerebral artery was  $6.87 \pm 1.482$  mm and  $1.99 \pm 0.7$  mm respectively. The diameters and lengths measured in our study were comparable with other brain-cadaver studies especially those performed by MRA. All dimensions of the arteries are larger in male than female, except the diameter of PCoA that is larger in female ( $p < 0.05$ ). Significant differences were found in diameters of arteries between the younger and the older age groups.

**Conclusions:** Similar to other studies, most variations are related to the posterior part of the circulus arteriosus cerebri. Thus, knowledge of the variations, diameter and the length of the arteries of CAC has a great importance in interventional radiology for various endovascular interventions as well as during anatomy lessons.

**P-010****Aneurysm of external iliac artery in female patient with hip joint pain**

Jitka Riedlová<sup>1</sup>, Veronika Krbcová Moudrá<sup>1</sup>, Martin Šeremeta<sup>2</sup>, Vladimír Musil<sup>3</sup>, Jana Mrzálková<sup>1</sup>, Jan Lami<sup>4</sup>

<sup>1</sup>Department of Anatomy, Third Faculty of Medicine, Charles University, Prague, Czech Republic; <sup>2</sup>Department of Anatomy, Third Faculty of Medicine, Charles University and Centre of Nuclear Medicine Ltd., Prague, Czech Republic; <sup>3</sup>Centre of Scientific Information, Third Faculty of Medicine, Charles University, Prague, Czech Republic; <sup>4</sup>Centre of Nuclear Medicine Ltd., Prague, Czech Republic

Isolated aneurysm of external iliac artery is serious but not very common disease. Due to anatomical localization it is hard to make correct diagnosis. The disease usually manifests by not much pronounced clinical symptoms so that its catchment is mostly random. In the submitted contribution is documented case study of 64-years old female with marked hip joint pain. Aneurysm of external iliac artery was diagnosed during three-phase skeletal examination at the Nuclear Medicine Department. Study was supported by projects of Charles University Q16 and Q41.

**P-012****Situs inversus totalis and its clinical significance**

Gregory Tsoucalas<sup>1</sup>, Ioannis Kaffes<sup>2</sup>, Despoina Kakagia<sup>1</sup>, Vasilios Thomaidis<sup>1</sup>, Aliko Fiska<sup>1</sup>

<sup>1</sup>Democritus University of Thrace, Alexandroupolis, Greece; <sup>2</sup>IASO Thessalias, Larissa, Greece

**Introduction:** Situs Inversus Totalis (SIT, situs inversus viscerum or dextroversion), a complete transposition (right to left reversal, mirror imaging) of thoracoabdominal organs, with respect to the sagittal plane, is a rare congenital condition with an incidence of approximately 1/10.000 live births. The male to female incidence is 1:1 with no racial predilection.

**Materials and methods:** We present a case of a female patient 68 years of age, hospitalized for acute appendicitis, presenting SIT, primary breast (in situ) cancer and ovarian stromal cancer in early stage (all, apart appendicitis, incidental findings). Surgery included breast-conserving operation, appendicectomy (postileal position, 45 min to be unearthed, gastroenterologist was unaware of SIT), hysterectomy and bilateral salpingo-oophorectomy.

**Results:** Such cases may complicate any interventional or surgical procedure. The exact cause of its appearance is still blurred. However, it is linked with several factors including autosomal recessive inheritance with incomplete penetrance, immobility of nodal cilia which inhibits the flow of extraembryonic fluid during embryogenesis, maternal diabetes, cocaine use, and conjoined twinning, while it exists as a part of Kartagener's and rarely alongside with Vacterl syndrome. Patients with SIT present a series of congenital anomalies (60%) of the gastrointestinal tract, including rotational anomalies, biliary

atresia, splenic agenesis, small bowel atresia, duplication, and colon aganglionosis, as well as a series of intra-abdominal malignancies. **Conclusions:** Radiologists and surgeons must anticipate anatomic complexity, while advanced surgical skill is required for someone to intraoperatively visualize branching pattern variants, lymph clusters and reversed/alterd anatomic position of visceral organs. Imaging techniques improve significantly the outcome.

**P-013****Replaced right hepatic artery arising from abdominal aorta. A case report**

Eleni Panagouli<sup>1</sup>, Gregory Tsoucalas<sup>2</sup>, Vasilios Thomaidis<sup>2</sup>, Anastasios Karayannakis<sup>2</sup>, Vasilios Souftas<sup>2</sup>, Aliko Fiska<sup>2</sup>

<sup>1</sup>National and Kapodistrian University of Athens, Alexandroupolis, Greece; <sup>2</sup>Democritus University of Thrace, Alexandroupolis, Greece

**Introduction:** Deviations of the normal arterial branching pattern of the common hepatic artery (CHA) are not rare, with an incidence of 41%. Two types exist: the accessory, an additional vessel supplying a hepatic lobe, and the replacing, which provides the sole supply to a lobe, presenting an unexpected point of origin. Additionally, the CHA may be absent, with an incidence approximately 1.4–6.5%. We describe a rare case of absence of CHA, combined with replaced right hepatic artery (RRHA) arising directly from the abdominal aorta (AA).

**Materials and methods:** The described variation was a random finding in a female individual aged 62 during a diagnostic abdominal CTA. **Results:** Just above the celiac trunk (CT) the aorta gave rise to an unexpected artery, which coursed to the liver and entered the right hepatic lobe. The artery in question functioned as a RRHA. The celiac trunk had a trifurcated branching pattern; however, the left hepatic artery originated from the CT along with the left gastric and splenic artery.

**Conclusions:** Origin of the RRHA directly from the AA is rather rare, with an incidence ranging between 0.33 and 1.7%. This abnormal pattern, combined with the absence of CHA, has not been classified as an anatomic variation. Such arterial aberrations should be kept in mind during cholecystectomies, liver transplantations and pancreatetectomies in order to avoid complications.

**P-014****Branches of the basilar artery examined with ct angiography**

Ace Dodevski<sup>1</sup>, Marija Papazova<sup>1</sup>, Julija Zhivadnikovik<sup>1</sup>, Biljana Zafirova<sup>1</sup>, Elizabeta Chadikovska<sup>1</sup>, Biljana Trpkovska<sup>1</sup>, Biljana Bojadzieva<sup>1</sup>, Menka Lazareska<sup>2</sup>, Vjolca Aliji<sup>2</sup>, Milenko Kostov<sup>3</sup>

<sup>1</sup>Institute of Anatomy, Medical Faculty, Univ. Ss" Cyril and Methodius", Skopje, Macedonia; <sup>2</sup>University Clinic of Radiology, Skopje, Macedonia; <sup>3</sup>University Clinic for Neurosurgery, Skopje, Macedonia

**Introduction:** The basilar artery is formed by the union of the vertebral arteries; it runs over the ventral surface of the pons and terminates at

the upper border of the pons by dividing into the posterior cerebral arteries. It gives of many vital branches supplying various parts of the brain. The aim of this study was to determine origin and variations of branches of the basilar artery with CT angiography.

**Materials and methods:** We examined radiographs of 103 patients who had CT angiography undertaken for a variety of clinical reasons, performed as a part of their medical treatment at the University Clinic for Radiology in Skopje, R. Macedonia. The study population included 103 patients, 58 male and 45 females, age range from 25 to 82, mean age 58.4 years.

**Results:** The AICA originated from the proximal part of the basilar artery in 83.49% of the specimens. Most of the SCA arise from the basilar artery as a single vessel (96.11% on right and 97.08% on left). The most common variations of the SCA were duplication (frequency 1.94% on right and 0.97% on left) and origin from PCA (frequency 1.94% bilateral). Adult configuration of PCA was present in 69.81%; fetal configuration of PCA was present in 22.64% and transitional configuration of PCA was present in 7.54% patients.

**Conclusion:** A precise understanding of the basilar artery anatomy is fundamental for planning and performing endovascular procedures and neuro-interventions, as well as for the accurate interpretation of ischemic areas.

## P-015

### Detailed quantitative analysis of the diameter of the deep femoral artery—anatomical study

*Łabętowicz Piotr<sup>1</sup>, Olewnik Łukasz<sup>2</sup>, Podgórski Michał<sup>3</sup>, Danowska-Klonowska Dominika<sup>4</sup>, Kiciński Przemysław<sup>1</sup>, Topol Mirosław<sup>2</sup>, Polgaj Michał<sup>1</sup>*

<sup>1</sup>Medical University of Lodz, Department of Angiology, Interfaculty Chair of Anatomy and Histology, Poland; <sup>2</sup>Medical University of Lodz, Department of Normal and Clinical Anatomy, Interfaculty Chair of Anatomy and Histology, Poland; <sup>3</sup>Polish Mother's Memorial Hospital Research Institute, Department of Diagnostic Imaging, Poland; <sup>4</sup>Medical University of Lodz, Department of Histology and Embryology, Interfaculty Chair of Anatomy and Histology, Poland

**Introduction:** The deep femoral artery (DFA) is the largest branch of the femoral artery (FA). Both, the place of the arising and morphology of its branches are variable. Novelty of the work is the Introduction: of index  $\delta$ ; which is to determine the ratio of the diameter of the DFA in place of origin to the diameter of the femoral artery at the place of origin the DFA.

**Materials and methods:** 80 formalin fixed lower limbs were dissected. The DFA and its branches: medial circumflex femoral artery (MCFA) and lateral circumflex femoral artery (LCFA) were visualized, their branching pattern was noted and their diameters were measured. The index  $\delta$  was defined and calculated.

**Results:** Considering the sex, the mean values of the  $\delta$  index in the anatomical study were statistically significant— $p = 0.0031$ . In this study, the mean value of this indicator for the male sex was 0.88 ( $\pm 0.18$ ), while for the female sex it was 1.04 ( $\pm 0.26$ ). This index calculated for body sides and a given type was not statistically significant.

**Conclusion:** The  $\delta$  index, elaborated and calculated in anatomical studies, showed no statistically significant differences depending at

the body side. This index was statistically significant in the case of sex and indicates a greater distribution of blood through the deep femoral artery in women than in men.

## P-016

### Cinematic rendering—development and application of an innovative image visualization technology for the use of volumetric data in anatomical education

*Scholz Michael*

*FAU Erlangen-Nürnberg, Erlangen, Germany*

The Cinematic Rendering (CR) technology was originally invented by Siemens Healthineers a few years ago as a medical image visualization technology that enables 3D photorealistic images to be produced of the human body. The main attraction of this software application is that existing imaging procedures such as computer tomography (CT) or magnetic resonance imaging (MRI) can be used to provide the raw data for CR. Based on this technology it will be possible to create photorealistic images and three-dimensional visualizations of the human anatomy, which can further be used for teaching and learning in anatomical education.

## P-017

### Prevalence of the type of fusion in horseshoe kidney: a retrospective study on computed tomography scanning in Greeks

*Konstantinos Natsis<sup>1</sup>, Maria Piagkou<sup>2</sup>, Melpomeni Kosmidou<sup>3</sup>, Despina Panagiotidou<sup>3</sup>, Ioannis Tsitouridis<sup>3</sup>*

<sup>1</sup>Department of Anatomy and Surgical Anatomy, School of Medicine, Aristotle University of Thessaloniki, Thessaloniki, Greece;

<sup>2</sup>Department of Anatomy and Surgical Anatomy, Medical School, National and Kapodistrian University of Athens, Athens, Greece;

<sup>3</sup>Department of Radiology, General Hospital of Papageorgiou, Thessaloniki, Thessaloniki, Greece

**Introduction:** Horseshoe kidney (HSK) is the commonest fusion anomaly, with prevalence 0.25% and male predominance. HSKs are generally linked at the lower poles by an isthmus of parenchyma or a fibrous tissue. HSK prevalence in Greeks, the form (midline or L-shaped kidney) and type of fusion (functional or non-functional parenchyma or fibrous tissue) were determined in a large computed tomography (CT) database scans of patients. The current study depicts the classification types of fusion based on imaging and cases of asymmetry are highlighted. Associated pathology is also discussed.

**Materials and methods:** 15,540 CT scans (in 7900 male and 7640 female patients) were retrospectively investigated during the last 37 years (1981–2018).

**Results:** Seventy-seven (76 U-shaped and 1L-shaped) HSKs (0.5%) were detected in 47 males and 30 females. A male predominance (0.6%) was recorded. In the majority of cases (58 HSKs in 32 males and 26 females) a functional renal parenchyma (width from 1 to

5 cm) was found. In 31 cases, asymmetry was recorded (right side dominance in 17 cases and left side in 14 cases). Symmetrical fusion was recorded in 27 cases. A fibrous isthmus (width from 1 mm to 1 cm) was detected in 16 (13 male and 3 female) cases. Symmetrical and asymmetrical cases had the equal incidence (8 cases); in cases of asymmetry right side dominance was found (5 cases).  
 Conclusions: Knowledge of the type of renal fusion is of paramount importance for surgeons who dealing with renal isthmus division, due to the increased risk of severe complications.

## P-018

### Incidence of persistent left superior vena cava in normal population detected using computed tomography angiography

Konstantinos Natsis<sup>1</sup>, Melpomeni Kosmidou<sup>2</sup>, Maria Piagkou<sup>3</sup>, Konstantinos Koutsouflianotis<sup>1</sup>, Nikolaos Otountzidis<sup>1</sup>, Ioannis Tsitouridis<sup>2</sup>

<sup>1</sup>Department of Anatomy and Surgical Anatomy, School of Medicine, Aristotle University of Thessaloniki, Thessaloniki, Greece;

<sup>2</sup>Department of Radiology, General Hospital of Papageorgiou, Thessaloniki, Thessaloniki, Greece; <sup>3</sup>Department of Anatomy and Surgical Anatomy, School of Medicine, National and Kapodistrian University of Athens, Athens, Greece

**Purpose:** The current study investigates the incidence of persistent left superior vena cava (PLSVC) in the normal Greek population, using computed tomography angiography (CTA) scans of the thoracic area. It also highlights the associated abnormalities (superior vena cava-SVC agenesis and duplication) declaring their importance in pathology and surgery.

**Materials and methods:** Data were retrospectively collected from 1890 (1030 male and 860 female patients, mean age 68.5 years) CTA scans during the last 27 months (January 2016–March 2019), after the radiologic investigation of pulmonary embolism, aortic aneurysmal disease and lung cancer staging.

**Results:** Six (2 males and 4 females) out of 1890 cases (0.32%) were detected with a PLSVC and SVC absence. In 5 cases, the PLSCV drained into the right atrium. In a case, the inferior vena cava was absent and was replaced by the azygos vein continuation. A double SVC was found in 2 cases (1 male and 1 female) (0.11%) and in one of them, the left SVC drained into the left pneumonic vein.

**Conclusion:** The PLSVC and double SVC are rare congenital malformations in normal population. The current study underlines 6 and 2 cases, respectively; supporting further the need of considering the PLSVC drainage. In cases of drainage into the coronary sinus, the value of diagnosis patients with coronary sinus dilation is underlined. CTA is a very useful preoperative imaging tool to diagnose venous system anomalies.

## P-019

### Nephron endowment assessment in pre-transplantation kidneys using a digital histomorphometric approach

Elena Canciani<sup>1</sup>, Antenore Giussani<sup>2</sup>, Gaia Pellegrini<sup>1</sup>, Camilla Catelli<sup>3</sup>, Claudia Dellavia<sup>1</sup>, Nicola Fusco<sup>4</sup>, Stefano Ferrero<sup>4</sup>, Francesco Pallotti<sup>5</sup>, Silvano Bosari<sup>5</sup>, Gianluigi Ardissino<sup>6</sup>

<sup>1</sup>Università Degli Studi di Milano-Department of Biomedical, Surgical and Dental Sciences, Milano, Italy; <sup>2</sup>Fondazione IRCSS Ca'

Granda, Ospedale Maggiore Policlinico-Kidney Transplant Unit, Milano, Italy; <sup>3</sup>Fondazione IRCSS Ca' Granda, Ospedale Maggiore Policlinico-Division of Clinical Engineering, Milano, Italy; <sup>4</sup>Università Degli Studi di Milano-Department of Biomedical, Surgical and Dental Sciences, Fondazione IRCSS Ca' Granda, Ospedale Maggiore Policlinico-Division of Pathology, Milano, Italy; <sup>5</sup>Fondazione IRCSS Ca' Granda, Ospedale Maggiore Policlinico-Division of Pathology, Milano, Italy; <sup>6</sup>Fondazione IRCSS Ca' Granda, Ospedale Maggiore Policlinico-Pediatric Nephrology, Dialysis and Transplantation Unit, Milano, Italy

**Introduction:** Kidney function largely depends on nephron number. However, the role of (donor's) nephron endowment (NE) has been poorly investigated in kidney transplantation (KTx) probably because technically difficult and no reliable surrogate markers exists. The aim of this study was developing an easy and reliable algorithm for computation of NE in kidneys addressed to KTx.

**Materials and methods:** Forty-one kidneys removed from 26 brain-dead donors (12 female, mean age of 62.6 years) were analyzed. Computed tomography was performed on kidneys to stereologically compute the cortical volume. Tissue sections from 6 standardized areas of each kidney were harvested and processed for histomorphometry. On each section stereological method was employed to evaluate glomerular density (GD), size and volume. NE was computed for each kidney by multiplying the cortical volume for GD and dividing by the average glomerular volume. Number of functional (FG) and atrophic (AG) glomeruli was also assessed.

**Results:** Mean volume of the cortical portion was  $48.2 \text{ cm}^3 \pm 17.7$ . Glomeruli represented  $9.53\% \pm 2.19$  of cortex. Mean glomerular volume was  $5.75\text{E}-6 \pm 2.04\text{E}-06 \text{ cm}^3$ . Glomerular number was:  $858,550 \pm 373,245$  (NE),  $650,606 \pm 310,400$  (FG) and  $207,944 \pm 99,837$  (AG). GD was higher at the upper pole compared to medium and inferior areas but no significantly.

**Conclusions:** Nephron count is feasible with relatively limited resources by measuring GD in a single spot and applying the algorithm we have developed. The integration of traditional pathology with cutting-edge digital technologies and bioinformatics is a reproducible promising tool for diagnostics also in the area of KTx towards a better understanding of the mechanisms influencing the outcome.

## P-021

### Novel contrast agent reveals detailed human vascular anatomy with hospital CT scanner

Brion Benninger, Madeline Hay, Ciaran Smyth, Scott Echols

Medical Anatomy Center, Western University of Health Sciences, Lebanon, Oregon, United States

**Introduction:** Imaging technology equipment and contrast agents regarding the quality of cross-sectional human anatomy has reached a plateau, but perhaps not a ceiling. Typical hospital CT and MRI scan widths enable clinicians to identify the majority of pathologies sensitive to cross-sectional slices with and without contrast and/or when rendered into 3-D imaging. The objective of this study was to investigate if an alternative contrast agent can improve human vascular anatomy with a donor cadaver using current hospital CT (80 slice) imaging.

**Methods:** A literature search was conducted on alternative imaging with vascular contrast agents to reveal detailed human anatomy from donor cadavers. A barium sulfate derivative was perfused into donor cadavers. Hospital CT scan was conducted post perfusion and viewed with Sectra visualization table for 3D rendering.

Results: Literature search revealed no known published manuscripts using a new contrast agent to reveal medium sized (2–5 mm), small (1–2 mm) and very small (less than 1 mm) vessels. A novel contrast perfusion technique was successful in revealing detailed human vascular anatomy from a conventional hospital CT scan. DICOM files were successfully rendered into 3D images using Sectra revealing medium, small and very small vessels.

Conclusion: A new contrast agent was successfully administered to donor cadavers using a novel perfusion technique which revealed vasculature to a detail not previously appreciated using conventional hospital CT scanning.

## P-023

### Gender aspects of the anatomical and surgical mapping of the parathyroids and implications for thyroid surgery

Florian Burger, Marko Konschake

Medical University Innsbruck, Innsbruck, Austria

Introduction: Hypoparathyroidism remains one of the most common complications in thyroid and parathyroid surgery. This study aims for an improved understanding of potential gender differences of the blood supply as well as of the localization of the parathyroids compared to the two most important intraoperative landmarks: the inferior laryngeal nerve (ILN) and Zuckerkindl's tubercle (ZT).

Materials and methods: We examined 103 laryngeal compounds to classify the blood supply (Type a, b and x) and the localization of the parathyroids compared to the ILN and ZT. For intraoperative localization we defined in a Cartesian coordinate system the ZT plane as x-axis and the course of the ILN as y-axis.

Results: Type a was present in 70% in female and 61.1% in male, type b in 14.4% and 16.7% and type x in 15.6% and 22.2%. We discovered that 71.4% of the left parathyroids in female and 79.4% in male compounds as well as 77.5% and 65.7% of the right parathyroids lie within 1 cm of the ILN and 1 cm cranial and 2.5 cm caudal to the ZT plane.

Conclusions: This perimeter marks the most crucial area during surgery for a possible better preservation of the parathyroids intraoperatively and provides the surgeon with an anatomic mapping showing areas of special carefulness needed. Since the inferior thyroid artery provides the blood in the most cases, all branches should be handled with care. Significant anatomical differences between male and female compounds did not occur.

## P-024

### Bone bridges in the course of middle meningeal artery: potential for clinical application

Jorge Eduardo Duque Parra<sup>1</sup>, Eduardo Londoño Garzón<sup>2</sup>, Jhony Alejandro Díaz Vallejo<sup>1</sup>

<sup>1</sup>Universidad de Caldas, Universidad de Manizales, Depto de Ciencias Basicas, Manizales, Colombia; <sup>2</sup>Universidad de Caldas,

Universidad de Caldas, Depto de Ciencias Basicas, Manizales, Colombia

Introduction: The middle meningeal artery is distributed intracranially between the greater wing of the sphenoid and the homologous groove, there are few references on the formation of bony bridges in its trajectory that may be relevant in the clinical and surgical application. Materials and method: We analyzed 100 skulls-dried and whole heads-of adults, removing the calvaria, and identifying the spinous foramen, through which the middle meningeal artery courses, to determine the existence or not of bone bridges-unilateral, bilateral or absence-.

Results: Of 100 adult skulls analyzed, it was found at the level of the medial aspect of the greater wing of the sphenoid bone and in its internal table, 73% had bone bridge and in 27% there was absence. Of the specimens with bone bridge, 39% was bilateral and of the latter, 34% was unilateral; 16% was on the right and 18% on the left.

Conclusion: The bony bridge for the middle meningeal artery is an anatomical constant that should be valued in clinical and surgical considerations, because it can compress meningeal branch of the nervus spinosus and the middle meningeal artery and its sympathetic innervation by narrowing it in that sector and can generate headache.

## P-026

### Anatomical location of the vertebro-basilar junction: MRI morphometrics for planning neuroendoscopic transsphenoidal transclival approaches to the prepontine cistern

Vivek Yedavalli, Alexander Khalaf, Mika Jain, Tarik Massoud

Stanford University School of Medicine, Stanford, United States

Introduction: The expanded endonasal transsphenoidal approach to the retroclival space may be used to endoscopically treat surgically challenging intradural lesions anterior to the brainstem. The precise location of the vertebro-basilar junction (VBJ) relative to the rhinopharyngeal and sphenoidal parts of the clivus has not been established previously to guide neuroendoscopic procedures.

Materials and methods: We cross-referenced axial VBJ and sagittal head MRIs of 100 normal adults, and recorded the midsagittal VBJ position. We then chose three planes perpendicular to the posterior clival margin, from the lowest point of the sphenoid sinus (sphenoclival plane, [A]); the VBJ [B]; and the pontomedullary junction (PMJ) [C]. To classify the VBJ location, we obtained the range and mean distances of [B] from [A] and [C], and statistically correlated these with patient age. We measured the mean length of the clivus above and below [B].

Results: VBJs were midsagittal in 64%, and left or right parasagittal in 27% and 9%. [A] was always above [B] by a mean 8.3 mm. [B] was 24% at the same level as [C], 34% above, and 43% below, with a combined mean 2.1 mm below [C]. These distances did not correlate with age. Posterior clinoids were a mean 22 mm above, and foramen magnum was 13 mm below [B].

Conclusions: The endoscopic endonasal approach to the clivus provides an important corridor for minimally invasive skull base and anterior midline posterior fossa surgery. Careful scrutiny of MR images and the described VBJ morphometrics can help in accurate procedure planning to avoid basilar artery injury.

**P-027****The anterolateral ligament of Korean knee: anatomical study**

Yong-Seok Nam, Dai-Soon Kwak, Ho-Jung Cho, Yi-Suk Kim, In-Beom Kim

The Catholic University of Korea, Seoul, Republic of South Korea

**Introduction:** Many researchers have studied the structures of the anterolateral part of the knee, since publication of a study on the anterolateral ligament (ALL) as a new ligament of the knee. Several researchers have investigated the existence of the ALL, and its frequency has been inconsistently reported. Therefore, we assessed whether the ALL is the anatomical true ligament and studied the morphological variations of this structure.

**Materials and methods:** Sixty-four Korean adult cadavers (120 knees, mean age: 79.1 years) were used for this study. The lateral part of the knee joint was carefully dissected with internal rotation of the tibia. We checked the existence and morphological features and measured the dimensions (length, width, and thickness) of the ALL.

**Results:** The ALL was clearly distinguished from the capsulo-osseous layer of the iliotibial tract and runs obliquely from the lateral femoral epicondyle to the tibial plateau. The ALL was found in 42.5% of the samples, and 15 cadavers had ALLs in both knees. There was no prevalence difference between females and males. Most of the anterior border of the ALL was blended with the knee capsule.

**Conclusions:** We concluded that this structure is a local thickening of the capsule in the anterolateral region of the knee, where it possibly developed against some external physical stress. Therefore, the ALLs in this present study can be defined as a capsular ligament of the knee and, as per the nomenclature of the capsular ligament, can be also called the ‘anterolateral (capsular) ligament.’

**P-028****Standardization of human cadaveric sternum for biomechanical studies of sternum closure in cardiac surgery**

Robert Selthofer<sup>1</sup>, Igor Lekšan<sup>1</sup>, Antun Šumanovac<sup>1</sup>, Grgur Dulčić<sup>1</sup>, Anđela Grgić<sup>2</sup>, Kristina Selthofer-Relatić<sup>1</sup>, Kristina Milanović<sup>1</sup>, Antonio Kokot<sup>1</sup>, Vasilije Nikolić<sup>1</sup>

<sup>1</sup>Faculty of Medicine, University in Osijek, Osijek, Croatia; <sup>2</sup>Faculty of Dental Medicine and Health, University in Osijek, Osijek, Croatia

**Introduction:** Sternal dehiscence is a serious complication in cardiac surgery which carries high mortality rate. Numerous studies show that successful sternum cerclage technique is significant for postoperative healing of the sternum. Marked biological heterogeneity of the sternum presents a problem in investigations of different sternum cerclage techniques. The aim of this study was to standardise human cadaveric sternums in order to find optimal model for biomechanical testing of sternal suture types.

**Materials and methods:** The study was carried out on 91 sternal preparations obtained from osteological collection of the Institute for Anatomy at Faculty of Medicine, University of Osijek. Morphometric analysis and cortical bone thickness were performed. Mineral density of the sternum was determined for all samples using different methods and the obtained results were compared.

**Results:** Morphometric analysis, cortical bone thickness and sternum mineral density resulted with measures of „standard female and male sternum“.

**Conclusions:** Standardization of the sternum according to various biomechanical features can provide optimal sternum samples for biomechanical testing of sternal suture types.

**P-029****Vascular variations responsible for insufficient le fort I operation**

Simon Bruneder<sup>1</sup>, Wolfgang Zemann<sup>2</sup>, Andreas Weiglein<sup>1</sup>

<sup>1</sup>Macroscopic and Clinical Anatomy, Medical University of Graz, Graz, Austria; <sup>2</sup>Department of Oral and Maxillofacial Surgery, Medical University of Graz, Graz, Austria

**Introduction:** Le Fort I osteotomy is a routine operation in orthognathic surgery with a low rate of complications. With an occurrence rate of 1%, ischemic complications are rare, but can have severe consequences. Ischemic complications range from gingival retraction or loss of tooth vitality to avascular bone necrosis of the Le Fort I segment. The blood supply of the Le Fort I segment is based on the ascending palatine, ascending pharyngeal, descending palatine, and smaller buccal branches. The objective of this study was to identify arterial variations responsible for arterial hypoperfusion and avascular bone necrosis of the Le Fort I segment.

**Materials and methods:** A total of 30 halved human head specimens, preserved according to Thiel’s embalming method and subjected to arterial latex injection, were examined. The ascending palatine and ascending pharyngeal arteries were analyzed. Dissection was performed using macroscopic methods and a dissecting microscope.

**Results:** The typical palatine vascularization pattern was apparent in 90% of specimens, in which the ascending palatine and ascending pharyngeal arteries were both supplying the Le Fort I segment. In 10% of specimens, the Le Fort I segment was dependent on the ascending pharyngeal artery alone. The missing ascending palatine artery was replaced with the anterior branch of the ascending pharyngeal artery.

**Conclusion:** Individuals with the variable blood supply found in 10% of specimens may be at higher risk for hypoperfusion and avascular necrosis due to intrinsic operational procedures. An individualized operation plan that considers the arterial anatomy may prevent avascular complications in at-risk patients.

**P-030****A rare case of an aberrant right subclavian artery, atypical thyroid gland vasculature and a right non-recurrent laryngeal nerve**

Guy Sovak<sup>1</sup>, Nir Ben Simon<sup>2</sup>

<sup>1</sup>Canadian Memorial Chiropractic College, Toronto, Canada; <sup>2</sup>Private Clinic, Holland Landing, Canada

**Introduction:** Anatomical variations in either the branching of the aortic arch, the vasculature of the thyroid gland or the path of the recurrent laryngeal nerve are usually asymptomatic. Sometimes, however, they do lead to clinical symptoms and can complicate neck surgeries such as thyroidectomy.

**Methods:** Dissection of a cadaver of an 83-year-old Caucasian female. **Results:** Herein we report the concurrent finding of an aberrant right subclavian artery, atypical thyroid vasculature and a non-recurrent laryngeal nerve in a female cadaver. These anatomical variants might

cause a variety of clinical problems including dysphagia, respiratory problems and the potential for injury to the right laryngeal nerve during neck surgery.

Conclusions: These anatomical findings draw attention to the value of comprehensive imaging of the neck prior to surgery.

### P-031

#### The internal orifice of the eustachian tube as reference of the parapharyngeal carotid artery in endoscopic skull base surgery: a anatomic study

Jaime Santos Pérez<sup>1</sup>, Marta Alonso Mesonero<sup>2</sup>, Agustín Mayo Iscar<sup>3</sup>, Ana Sánchez Martínez<sup>2</sup>, Juan Francisco Pastor Vázquez<sup>4</sup>

<sup>1</sup>Departamento de Anatomía y Radiología, Universidad de Valladolid, Servicio de Otorrinolaringología y Cirugía de Cabeza y Cuello, Hospital Clínico Universitario de Valladolid, Valladolid, Spain; <sup>2</sup>Servicio de Otorrinolaringología y Cirugía de Cabeza y Cuello, Hospital Clínico Universitario de Valladolid, Valladolid, Spain; <sup>3</sup>Departamento de Estadística, Universidad de Valladolid, Valladolid, Spain; <sup>4</sup>Departamento de Anatomía y Radiología, Universidad de Valladolid, Valladolid, Spain

Introduction: The orientation in endoscopic skull base surgery, is mandatory to avoid important complications as internal carotid artery injury. The internal osseous orifice of the Eustachian tube (CT), due to its proximity to the external opening of the carotid canal (CC), is considered a useful reference. The knowledge of the anatomical relationships between these two bony structures, would allow to acquire safe reference points for the location of the internal carotid artery.

Materials and methods: An observational, retrospective study is designed to measure distance, angle and position between CT and CC. We studied 55 dry skulls, 29 men and 26 women, aged between 34 and 101 years, available in the collection of human osteology of the Anatomical Museum of the University of Valladolid. The distances were measured with a digital caliper, and the angles, using the PixelStick 1.1.2 program for mac on a photograph taken with a Nikon D3000 SLR camera.

Results: The carotid canal is located  $4.95 \pm 1.16$  mm and  $1.19 \pm 2.71^\circ$  to the internal orifice of the Eustachian tube. The internal orifice of the Eustachian tube is located at  $0^\circ$  of the carotid canal, that is, anterior, in 66.36%, anteromedial in 30.94% and anterolateral in 2.7%.

Conclusions: The internal orifice of the Eustachian tube is a key reference for the localization of the parapharyngeal internal carotid artery. It is preferably located anterior or anterolateral to it. This situation should be taken into account for the section of the cartilaginous tube, which should be in the lateral direction.

### P-032

#### Anatomical study of deep temporal fascia with regard to reduction of zygomatic arch fracture

Tae-Jun Ha<sup>1</sup>, Jung-Ah Park<sup>1</sup>, Soon-Heum Kim<sup>2</sup>, Wu-Chul Song<sup>1</sup>

<sup>1</sup>Department of Anatomy, Konkuk University School of Medicine, Seoul, Republic of South Korea; <sup>2</sup>Department of Plastic and Reconstructive Surgery, Konkuk University School of Medicine, Seoul, Republic of South Korea

Introduction: It has been widely accepted that there was a split of the deep temporal fascia into superficial and deep layers, and the deep layer was covering the lateral surface of the temporalis muscle. We measured the distance from the superior border of the zygomatic arch to the split line of the deep temporal fascia.

Materials and methods: Seven hemifaces of Korean adult cadavers were investigated after the removal of skin, subcutaneous tissue, superficial temporal fascia and superficial fat pad. The superficial layer of deep temporal fascia was exposed and we cut the superficial layer along the line that it adhered to the deep layer inseparably. The distances between the superior border of the zygomatic arch and the split line of the deep temporal fascia were measured at three points; the jugale, zygion and a distance of 3 cm from tragus.

Results: In all cases, there were thick identifiable deep layers of deep temporal fascia between the intermediate temporal fat pad and temporalis muscle. The splitting point of deep temporal fascia was located 45.5 mm (42.5–47.1 mm), 40.5 mm (38.4–44.3 mm) and 36.9 mm (26.2–41.9 mm) above the superior border of zygomatic arch on average at the point of jugale, zygion and at a distance of 3 cm from tragus.

Conclusions: This study measured the distances from the superior border of zygomatic arch to the split line of the deep temporal fascia and this results could be applied clinically to temporal approach for the surgical treatment of an isolated zygomatic arch fracture.

### P-033

#### Comparative vascular anatomy of the canine prostate: angiographic analysis

Carmen Lopez-Sanchez, Virginio Garcia-Lopez, Francisco Miguel Sanchez-Margallo, Virginio Garcia-Martinez, Fei Sun

University of Extremadura, Faculty of Medicine, Minimally Invasive Surgical Center Jesus Uson, Cáceres, Badajoz, Spain

Introduction: Dogs are the only experimental animals with spontaneous benign prostatic hyperplasia and prostate cancer. These characteristics make them an ideal model for preclinical evaluation of minimally invasive surgical techniques and devices. This study aims to evaluate anatomic features of prostatic arteries in comparison with the human anatomy.

Materials and methods: Twenty adult beagles, including 10 with hormone induced benign prostatic hyperplasia (BPH) and 9 with spontaneous BPH, underwent selective angiography. From all the above dogs, angiograms were obtained to evaluate anatomic features of the internal iliac artery (IIA), anterior division of IIA and prostatic artery (PA) and its branches. Internal diameters of IIA and PA were available in 6 dogs.

Results: Unlike in humans, the caudal end of the abdominal aorta gives off a trifurcation with 2 external iliac arteries and a common trunk of IIA, which further divides into three arteries: left and right IIA and sacral median artery. The main trunk of PA arises from the anterior branch of IIA, giving off a final branch of the inferior vesical artery and a terminal branch of the middle rectal artery. The inner diameter (mm, mean  $\pm$  SD) of the left and right anterior division of IIA and PA was  $1.90 \pm 0.15$ ,  $1.98 \pm 0.11$ ,  $0.95 \pm 0.07$ , and  $0.90 \pm 0.03$ , respectively.

Conclusions: The prostatic artery in dogs is relatively regular with less anatomic variations seen in humans. Adult beagles may serve as an ideal animal model in preclinical investigation.

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**P-035****Anatomical surgical skills of the middle cranial fossa: neuroanatomy laboratory**

Carlos Andrés Mondragón-Tirado, Juan Pablo Sosa-Cabezas, Virginio García-López, Carmen López-Sánchez, Luis Fernando Porras-Estrada, Virginio Garcia-Martinez

Faculty of Medicine, University Hospital, Neuroanatomy Lab, University of Extremadura, Badajoz, Spain

**Introduction:** The anatomy of the middle fossa floor and its correlation with radiological findings require a specific training. We describe a series of tumors and their location in different areas in a dissected cadaveric specimen in our Neuroanatomy laboratory.

**Materials and methods:** We have made microscopic dissections in a cadaveric specimen identifying structures of the middle fossa floor, as well as the most frequently affected regions and their correlation with radiological findings in a series of tumors.

**Results:** The affected regions were the internal auditory canal, Meckel cavum, geniculate body, arcuate eminence and epitimpanic portion. Several of the above areas were frequently affected at the same time. The most frequent pathologies are benign tumors affecting the middle fossa floor. Despite the fact that they are not usually malign lesions, they can injure some structures causing serious deficits.

**Conclusions:** Familiarization with anatomy of the middle fossa floor allows to carry out surgical approaches safely. Neuroanatomy laboratory training is necessary to learn anatomical and surgical skills in order to address pathological processes of the middle fossa floor.

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**P-037****Anatomical variations of the superficial ulnar artery**

Grzegorz Wysocki<sup>1</sup>, Agata Olszewska<sup>1</sup>, Edward Clarke<sup>1</sup>, Robert Hatadaj<sup>1</sup>, Michał Polguj<sup>2</sup>, Mirosław Topol<sup>1</sup>

<sup>1</sup>Medical University of Lodz, Department of Normal and Clinical Anatomy, Poland; <sup>2</sup>Medical University of Lodz, Department of Angiology, Lodz, Poland

**Introduction:** The ulnar artery may occasionally run superficially to the forearm muscles. In that case it is named the superficial ulnar artery (SUA). The aim of the study was to assess its anatomical variations.

**Materials and methods:** One hundred and twenty randomly-selected, isolated upper limbs fixed in 10% formalin solution were dissected.

**Results:** The superficial ulnar artery was found in three out of 120 limbs (2.5%), and three anatomical variations of the SUA were found. In the first case, the SUA took origin within the cubital fossa from the superficial brachial artery (superficial brachial artery was defined by us as a single artery in the arm, running superficially to the median nerve within the medial bicipital sulcus. In this case, the SUA ran superficial to the bicipital aponeurosis. In the second case, the SUA also took origin within the cubital fossa, however it arose from the superficial brachioradial artery. Two arteries were present in this case on the arm. The first artery ran superficially to the median nerve. The second artery ran deep to the median nerve and continued as the common interosseous artery in the forearm. In the third case, the SUA arose on the arm from the brachial artery. In this case, the SUA ran deep to the bicipital aponeurosis.

**Conclusions:** Orthopedic, hand and plastic surgeons should be aware of the anatomic variations of the radial artery both in planning and conducting surgeries of the upper limb.

**P-038****OS acromiale misinterpreted as a fracture following arthroscopic acromioplasty. A case report**

Trifon Totlis<sup>1</sup>, Grigorios Grigoriadis<sup>1</sup>, Stavros Papadopoulos<sup>1</sup>, Maria Piagkou<sup>2</sup>, Konstantinos Natsis<sup>1</sup>

<sup>1</sup>Department of Anatomy and Surgical Anatomy, School of Medicine, Faculty of Health Sciences, Aristotle University of Thessaloniki, Thessaloniki, Greece; <sup>2</sup>Department of Anatomy and Surgical Anatomy, School of Medicine, Faculty of Health Sciences, National and Kapodistrian University of Athens, Athens, Greece

**Introduction:** Iatrogenic acromion fracture is a potential risk during arthroscopic acromioplasty. Purpose of the current study is to present a case in which a radiolucent line in the post-operative radiograph due to the existence of an os-acromiale was mimicking a fracture.

**Case report:** A 65 years old woman suffering from subacromial impingement syndrome underwent arthroscopic anterior acromioplasty. In the preoperative radiologic evaluation, the os acromiale was overlooked. Intraoperatively, the subacromial bursa was resected and the curved undersurface of the anterior acromion was smoothed using a burr in the subacromial space. Intraoperatively, no obvious fracture or acromion non-union was detected. Postoperative shoulder X-ray depicted a radiolucent line in the anterior acromion and an iatrogenic fracture was suspected. Clinical examination excluded the diagnosis of a fracture. After meticulous evaluation of the preoperative radiographs and magnetic resonance imaging, the failure of complete fusion between the apophyses of meso- and meta-acromion was revealed. As no tenderness, on the site of partial non-union of the os acromiale with the acromion, was detected, the finding was considered incidental.

**Conclusions:** The current case is didactic for orthopaedic surgeons and radiologists. Knowledge of the existence and radiologic appearance of the os acromiale is important for its recognition and differential diagnosis from a fracture. The os acromiale, when unstable, may cause shoulder pain, ROM limitation and lead to degenerative changes. An unstable os acromiale may complicate a typical anterior acromioplasty and internal fixation should be considered.

**P-039****Anatomical study of the importance of the right superior colic vein in the right laparoscopic hemicolectomy**

Arantxa Blasco-Serra<sup>1</sup>, García-Granero, Álvaro<sup>2</sup>; González-Soler, Eva M.<sup>1</sup>; Higuera-Villar, Cynthia<sup>1</sup>; Alfósea-Cuadrado, Gloria M.<sup>1</sup>; Sancho-Muriel, Jorge<sup>2</sup>; Álvarez-Sarrado, Eduardo<sup>2</sup>; Frasson, Matteo<sup>2</sup>; Flor-Lorente, Blas<sup>2</sup>; Fletcher-Sanfeliu, Delfina<sup>3</sup>; Pamies, Jose<sup>4</sup>; García-Granero, Eduardo<sup>2</sup>; Martínez-Soriano, Francisco<sup>1</sup>; Valverde-Navarro, Alfonso A.<sup>1</sup>

<sup>1</sup>Department of Human Anatomy and Embryology, University of Valencia, Valencia, Spain; <sup>2</sup>Department of General and Digestive Surgery, University and Polytechnic Hospital La Fe, Valencia, Spain; <sup>3</sup>Department of Cardiovascular Surgery, University Hospital Son Espases, Palma de Mallorca, Spain; <sup>4</sup>Department of Radiology, University Hospital Son Espases, Valencia, Spain

**Introduction:** The superior right colic vein (SRCV) can be a risk of superior mesenteric vein bleeding by avulsion during laparoscopic right hemicolectomy. The aim of this study is to assess the extent of

residual transverse colon (RTC) lengthening achieved after sectioning right superior colic vein (RSCV) for free-tension anastomosis after laparoscopic right colectomy.

**Materials and methods:** A right colectomy with complete mesocolic excision, and central ligation of ileocolic and right colic vessels was performed in 13 human cadavers (8 formaline-fixed and 5 fresh), obtained through the Body Donation Program for Teaching and Research Purposes of the University of Valencia. The distance between costal margin and antimesenteric margin of RTC before and after section of the RSCV at the level of Henle Gastrocolic Trunk (HGT) was measured.

**Results:** RSCV was constant in 100% of the subjects and it drained to HGT in every of them. The main distance of RTC length in fresh cadavers before and after RSCV ligation was 12.4 and 15.1 cm respectively, meanwhile the distance in formaline-fixed cadavers was 7.8 cm and 11.5 cm respectively. The increased length obtained in RTC externalization in reference to right costal margin was 2.7 cm for fresh cadavers (28% of initial length) and 3.6 for formaline-fixed cadavers (46% of initial length).

**Conclusion:** RSCV ligation at the level of HGT increases the length of RTC externalized and may help for a free-tension extracorporeal anastomosis after laparoscopic right colectomy.

## P-040

### Anatomosurgical study of supralevator abscesses: simulation in cadavers

Valverde-Navarro, Alfonso A.<sup>1</sup>; García-Granero, Álvaro<sup>2</sup>; Blasco-Serra, Arantxa<sup>1</sup>; González-Soler, Eva M.<sup>1</sup>; Higuera-Villar, Cynthia<sup>1</sup>; Alfosea-Cuadrado, Gloria<sup>1</sup>; Sancho-Muriel, Jorge<sup>2</sup>; Sánchez-Guillén, Luis<sup>2</sup>; Álvarez-Sarrado, Eduardo<sup>2</sup>; Pellino, Gianluca<sup>2</sup>; Frasson, Matteo<sup>2</sup>; Fletcher-Sanfeliú, Delfina<sup>3</sup>; García-Granero, Eduardo<sup>2</sup>; Martínez-Soriano, Francisco<sup>1</sup>

<sup>1</sup>Department of Human Anatomy and Embryology, University of Valencia, Valencia, Spain; <sup>2</sup>Department of General and Digestive Surgery, University and Polytechnic Hospital La Fe, Valencia, Spain; <sup>3</sup>Department of Cardiovascular Surgery, University Hospital Son Espases, Palma de Mallorca, Spain

**Introduction:** Supralevator abscesses are the most uncommon location among ano-rectal abscesses. Nevertheless, such pathology results in a high mortality due to its difficult diagnosis and treatment. This study aimed to deepen the knowledge of the pathogenesis and management of supralevator abscesses, as well as the complications derived from its incorrect treatment.

**Materials and methods:** This is a descriptive anatomic study of 3 cadaveric pelvises (2 male and 1 female) prepared in formalin and sagittally sectioned and 1 perineal dissection of a fresh male pelvis in the lithotomy position. We performed an anatomosurgical description of the pelvic and perianal zones simulating different types of SLA and their possible drainage pathways and secondary fistula formation after adequate/inadequate drainage. The cadavers were obtained through the Body Donation Program for Teaching and Research Purposes of the University of Valencia.

**Results:** We have accomplished to realistically reproduce the origin of the different types of supralevator abscesses, as well as their locations and possible drainage pathways, and we determined the definitive treatment of secondary fistulas and their morbidity due to their incorrect drainage.

**Conclusions:** A proper anatomical knowledge of the supralevator abscesses and surgical training by using cadaveric simulations could improve the diagnostic criteria, facilitate the correct decision on

surgical drainage pathways, and, thus, decrease postoperative morbidity in patients with this disease.

## P-041

### Using intra- and extra-oral landmarks d2 to determine lip's width

Rehab Eltarhoni<sup>1</sup>, Clare Lamb<sup>2</sup>, Christopher Rynn<sup>2</sup>

<sup>1</sup>Center of Anatomy and Human Identification, University of Dundee, Dundee, United Kingdom; <sup>2</sup>University of Dundee, Dundee, United Kingdom

Dentists use anthropometric measurements of the face when replacing anterior teeth. Forensic scientists use the teeth and bones of the skull to reconstruct/approximate facial soft tissue. However, the accurate reconstruction of the lips has not yet been achieved. This study aims to reconstruct/approximate lips by identifying the relationship between lip width and extra- and intra-oral landmarks using photographs. In total, 108 images were taken from 31 male and 77 female participants. Two front-facing images were taken, one with the participant showing a relaxed expression and a second with smiling widely. The study was approved by the research ethics committee of the University of Dundee and written consent was obtained from all participants. A digital camera, paper photomicrographic scales, and Adobe Photoshop were used to collect five horizontal measurements: Inter iris, the distance between the medial borders of the iris (ir-ir); inter canthal, the distance between the medial canthal of the eye (en-en); inter alar, the distance between the ala of the nose (al-al); inter canines, the distance between the distal end of the maxillary canines (ICW); and lip width, the distance between the corners of the lips (Ch-Ch). The result showed that the intra-oral landmark (ICW) has a strong positive correlation with the lip's width ( $P < 0.000$ ,  $R = 0.556^{**}$ ), while the extra-oral landmarks—the (al-al)—have the strongest correlation with the lip's width ( $P < 0.00$ ,  $R = 0.552^{***}$ ), followed by the (ir-ir) ( $P < 0.00$ ,  $R = 0.413^{**}$ ) and (en-en) ( $P = 0.033$ ,  $R = 0.205^*$ ). Reconstruction of the lip's width from D2 data is achievable by using intra- and extra-oral landmarks.

## P-042

### Anatomical study of the vascular arcades of the splenic flexure of the colon: possible surgical implications during laparoscopic medial approach

Francisco José Pérez-Moltó<sup>1</sup>, Álvaro García-Granero<sup>2</sup>, Arantxa Blasco-Serra<sup>1</sup>, Eva M. González-Soler<sup>1</sup>, Cynthia Higuera-Villar<sup>1</sup>, Gloria Alfosea-Cuadrado<sup>1</sup>, Luis Sánchez-Guillén<sup>2</sup>, Omar Carreño<sup>2</sup>, Jorge Sancho-Muriel<sup>2</sup>, Eduardo Álvarez-Sarrado<sup>2</sup>, Blas Flor-Lorente<sup>2</sup>, Matteo Frasson<sup>2</sup>, Delfina Fletcher-Sanfeliú<sup>3</sup>, Eduardo García-Granero<sup>2</sup>, Francisco Martínez-Soriano<sup>1</sup>, Alfonso A. Valverde-Navarro<sup>1</sup>

<sup>1</sup>Department of Human Anatomy and Embryology, University of Valencia, Valencia, Spain; <sup>2</sup>Department of General and Digestive Surgery, University and Polytechnic Hospital La Fe, Valencia, Spain; <sup>3</sup>Department of Cardiovascular Surgery, University Hospital Son Espases, Palma de Mallorca, Spain

**Introduction:** During laparoscopic splenic flexure mobilization, the medial approach is based on the entrance to the lesser sac by opening the visceral peritoneum of the mesocolon, just above the ventral edge

of the pancreas (VEOP), which is an avascular zone, the splenic flexure avascular space (SFAS), in most cases. Occasionally, however, in addition to the marginal artery of Drummond, we can find additional vascular arches, either in the center of the mesocolon, the Riolan's arch, or more infrequently at the base of the mesocolon, the artery of Moskowitz. The aim of this study was to assess the incidence of the artery of Moskowitz, its distance from the VEOP, and its possible surgical implications.

**Materials and methods:** We performed a cadaveric study on 27 human cadavers. The vascular arcades of the splenic flexure were dissected, the number of vascular arches, and the origin and localization of its terminal anastomosis were recorded, and the distance between the VEOP and the most proximal vascular arch was quantified.

**Results:** Artery of Drummond was identified in 100% of the specimens. In 18% Riolan's arch was present, and in 11% Moskowitz artery was found. The SFAS was greater in cadavers that only presented the artery of Drummond than in those who presented Riolan's arch. The SFAS was considered non-existent in the three specimens with Moskowitz artery.

**Conclusions:** When the artery of Moskowitz is present this surgical approach would be contraindicated due to risk of iatrogenic bleeding. A radiological preoperative study could be essential.

## P-043

### The renal artery structure. Variations along its length

Blanca Mompeó<sup>1</sup>, Natalia Mederos<sup>2</sup>, Irene Castaño<sup>1</sup>, Pablo Hernández-Morera<sup>1</sup>, Eva Marañillo<sup>3</sup>, José Ramón Sañudo<sup>3</sup>

<sup>1</sup>Universidad de Las Palmas de Gran Canaria, Las Palmas, Spain;

<sup>2</sup>Instituto de Medicina Legal de Las Palmas, Las Palmas, Spain;

<sup>3</sup>Universidad Complutense de Madrid, Madrid, Spain

**Introduction:** The Knowledge of the renal artery structure has grown in importance with the increasing of the kidney transplantation surgery and the techniques for treatment of refractory hypertension as "Renal Artery Adventitia Stripping" and "Catheter Based Renal Denervation". The purpose of this study was characterize the arterial wall structure along its length.

**Materials and methods:** 96 fresh human renal artery segments were collected from 16 cadavers (14 men and 2 women) aged ranged 14–75 years. The renal arteries were sectioned in three-thirds (inner, media, outer) and processed for histological studies. The samples were stained with Hematoxylin–Eosin and Masson Trichromic. Microscopic observations and quantitative analysis by digital image technique were performed in the wall sections. Organization of the tunica in the arterial wall and the connective and muscular composition in the tunica media were estimated.

**Results:** Light microscopy revealed that the renal artery is an elastic artery in its proximal third and it becomes a muscular artery in the two distal thirds and in its branches. The muscular component in the tunica media increases towards the distal part of the artery. In addition, it appears several layers of smcs of longitudinal disposition in the outer adventitia of the two distal thirds. Differences in the muscular and connective components between the right and the left renal artery were also observed.

**Conclusions:** These preliminary data support that the pathophysiological processes and the outcomes to the treatments techniques in the renal artery could be different attending to the involved sector of the artery.

## P-044

### Anatomic dissection of the superficial planes of the hand on a human cadaver—review of the bifurcation point of the common digital arteries and nerves

Miguel Matias, Luis Ribeiro, Luis Vieira, Juliana Sousa, Diana Grangeia

Centro Hospitalar Lisboa Central-Hospital de São José, Lisboa, Portugal

**Introduction:** Hand trauma is one of the leading causes of plastic emergency department admission. The knowledge of the precise course of vessels and nerves is of major clinical importance in order to evaluate the integrity of neurovascular structures in face of common injuries.

**Objectives:** To perform a detailed anatomical study of the superficial palmar arch and the neurovascular pedicles of the hand.

**Methods:** In order to better understand the anatomy of the palmar superficial arch and the digital nerves we performed cadaver dissection with skeletisation of the referred structures in order to better comprehend their relations, especially the point where the common digital palmar artery and nerve bifurcate and their relative positions in space.

**Results:** In our analysis, the common digital artery was anterior to the nerve, until it bifurcated gaining a more posterior position thereafter. Also of clinical relevance is the fact that the nerve bifurcates more proximally (distal diaphysis of the metacarpal bone) than the artery (near the interdigital space).

**Conclusions:** A sound knowledge of the vascular and nerve structures of the hand, specially at finger level is clinically important to make accurate diagnosis and treatment regarding hand trauma.

## P-045

### Bilateral giant ophthalmic carotid artery aneurysms presenting as unilateral diplopia: a case report

Ferda Selçuk<sup>1</sup>, Sevda Lafcı Fahrioğlu<sup>2</sup>

<sup>1</sup>Dr. Burhan Nalbantoğlu State Hospital, Nicosia, Cyprus; <sup>2</sup>Near East University, Nicosia, Cyprus

**Introduction:** The etiology of giant aneurysms is multifactorial. It becomes symptomatic in 9/100.000, most frequently in the fifth and sixth decades of the life. Intracavernous carotid artery aneurysms (ICAAs) represent less than 1% of intracranial aneurysms and show a slight female predominance.

**Materials and methods:** We report an interesting case of bilateral ICAA in 42-year-old female presented as acute diplopia and emphasize the need of a thorough systemic evaluation in young patients with diplopia and treated with endovascular coil embolization. A 42-year-old woman was admitted to the neurology department suffering from the unilateral diplopia. Neurological examination showed the left sixth cranial nerve palsy and had no further general motor or sensory symptoms. In view of the clinical findings, magnetic resonance imaging of the brain was undertaken. Coronal, axial T1 and T2 weighted images demonstrated bilateral heterogeneously enhanced masses indicating in the bilateral ICCA. Digital Subtraction Angiogram (DSA) showed bilateral ophthalmic artery aneurysm. Premedication with double antiplatelet and steroid treatment was started before the endovascular procedure. The patient was endovascularly treated with a month break. Endovascular loose

packing coil embolization and Derivo 3.5 × 30 mm flow diverter stent was placed to the segment of the damaged ICA. Contrast stagnation was observed at the aneurysm sac soon after the flow diverter placement.

Results: The patient was treated with endovascular loose packing coil embolization and Derivo 3.5 × 30 mm flow diverter stent.

Conclusion: It should be kept in mind that intracavernous carotid artery aneurysms may be bilateral in patients with unilateral cranial nerve symptoms.

## P-046

### Three pull trigger technique using innovative thoracostomy chest tube introducer may surpass conventional techniques

Brion Benninger, Marcus Pearson, William Maloney

Medical Anatomy Center, Western University of Health Sciences, Lebanon, Oregon, United States

Introduction: Commonest intervention in thoracic trauma is conducting a thoracostomy placing a chest tube into pleural space for draining fluid/air. It is widely successful, diagnostic, therapeutic and often definitive treatment for presenting symptoms. It can be used to introduce agents for pleurodesis or deliver drugs for chest infections or chemotherapy. Despite its common use, technique has remained rather crude and unchanged over 50 years and with experience, be completed in 5–10 min. Objective of this study was to design an innovative technique for thoracostomy chest tube (TCT) initially on pig ribs and subsequently cadavers.

Methods: We developed a visual, auditory, palpation, imaging, learning (VAPIL) ratio in anatomy lab using Sectra (2D/3D cross-sectional imaging) ultrasound and prosected cadavers prior to using 3-pull trigger technique with Reactor (minimally-invasive surgical TCT placement technology). Adult pig ribs with skin for kinesthetic sense and structure orientation was used before cadaver attempts.

Results: Clinically a high rate of failure has been observed with the classic technique of needle decompression for tension pneumothorax. With time difference between basic science learning and skills acquisition, it seems logical to integrate anatomy with such skills during year 1. TCT was repeatedly conducted in less than 2 min (minus adhesive tape or suturing).

Conclusion: Employing VAPIL method in anatomy lab using a 3-pull trigger technique with Reactor suggests novices could perform accurate surface anatomy and TCT placement in under 2 min. Further TCT-Reactor studies are warranted.

## P-047

### A retroaortic and descending left renal vein: an anatomical variation that reflects the complexity of venous system development

Francisco Reina<sup>1</sup>, Laura Cárdenas<sup>2</sup>, Clara Martínez<sup>2</sup>, Ana Carrera<sup>1</sup>

<sup>1</sup>Universidad Girona, Girona, Spain; <sup>2</sup>Hospital U. Josep Trueta, Girona, Spain

Introduction: Anatomical variations of the renal vessels are relatively frequent. This type of variation can affect both the arterial system and the venous system. Some may have a greater clinical significance than would be expected, especially in the transplant surgery or in the

Doppler ultrasound diagnosis of renal pathology of vascular origin. These types of variations help us to understand embryonic development.

Materials and methods: During the dissection of a retroperitoneal region in a fixed corpse corresponding to a 39-years-old woman, from the body donation program, the presence of an anatomical variation of the venous system of the left kidney was observed. The morphology and topographic relationships of this variation were described with precision.

Results: Left renal vein (11.5 mm in diameter and 98 mm in length) showed a descending path from the renal hilum, crossing behind the abdominal aorta artery and joining the inferior vena cava at 17.5 mm from the union of the two common iliac veins. The right renal vein was double (superior and inferior), with an horizontal trajectory and diameters of 22 and 29 mm, respectively. The patient showed anomalous bilateral dilation of the urinary tract, with symmetrical and normal aspect of the two kidneys.

Conclusions: Nowadays, renal Doppler ultrasound allows the evaluation of different renal pathologies of vascular origin. For nephrologists and radiologists, it is important to know that anatomical variations of the renal arterial and venous tree are relatively frequent, in order to make a correct assessment of the vascular status of a kidney and analyse what can be the possible causes of some pathologies.

## P-048

### Case report: intestinal obstruction due to incarcerated meckel's diverticulum (litré's hernia)

Lorenzo Mauricio Hernandez Fernandez, Raul Díaz Pedrero, Ana María Slocker De Arce, Soledad Aguado Henche

Universidad de Alcalá, Alcalá de Henares, Spain

The anomalies in the development of the digestive tract can give rise to congenital alterations that appear in advanced adulthood. In this communication we present a case of hernia incarcerated in senescence, providing iconography of the procedure, making a review of embryology. Clinical case: A 90-year-old woman with a history of Alzheimer's disease, without previous abdominal surgeries. Physical examination revealed a tumor in the left inguinofemoral region, with clinical signs of intestinal obstruction. The diagnostic judgment was intestinal obstruction secondary to an incarcerated femoral hernia (Litré Hernia). Urgent intervention was decided. A midline laparotomy was performed, in which an incarcerated hernia was found in the left femoral orifice, containing a large Meckel's diverticulum with part of the mesentery. Due to the proximity of the ileocecal valve, it was decided to perform an extended resection to a right hemicolectomy, with anastomosis. The hernia was repaired using a preperitoneal prosthesis following the Nyhus technique. The evolution of the patient was satisfactory, being discharged in a week with restoration of the transit and good healing of the wound.

Conclusions: Meckel's diverticulum is the most frequent congenital malformation of the gastrointestinal tract. The knowledge of the embryology of the digestive tract is fundamental for the understanding of this alteration of the development, which could potentially result to pathologies and complications, that although usually they appear in the early ages of the life, we must not ignore their possible appearance in people who are aged, as is reflected in this case.

**P-049****Repair of incisional hernia (eventration) with prosthesis. Comparison of results in relation to the location of the mesh in different anatomical compartments**

Ana María Slocker De Arce, Raul Díaz Pedrero, Lorenzo Mauricio Hernandez Fernandez, Josefa Carrascosa Sanchez

Universidad de Alcalá, Alcalá de Henares, Spain

**Introduction:** Incisional hernia is one of the most frequent surgical problems. Its repair and the rate of complications is a source of constant study. In the present communication it is analyzed the preferential anatomical compartment more advisable to place the mesh, in order to avoid or minimize the appearance of complications.

**Objective:** To evaluate the presentation of the most frequent complications after surgical repair of incisional hernias, using prostheses according to their anatomical location, in a sample of patients operated on at the Prince of Asturias University Hospital in Alcalá de Henares.

**Methodology:** Retrospective study of patients undergoing incisional hernia repair between January 2015 and December 2016. They were divided into 2 groups: supraaponeurotic (onlay) and infraaponeurotic (sublay) placement. The number of recurrences, seromas and chronic pain was recorded.

**Results:** A total of 166 cases were collected, 118 supraaponeurotic (onlay) and 48 infraaponeurotic (sublay). The average age of the patients was 60 years. The supraaponeurotic placement produced more seromas (11.8%) and more recurrence (7.6%), compared to the placement of the mesh in the infraaponeurotic position (8.3%) and (4.16%), respectively. Chronic pain, however, was greater in the infraaponeurotic group (4.1% versus 1.7%).

**Conclusions:** The infraaponeurotic placement presented fewer recurrences and seroma, although a higher percentage of chronic pain. Anatomical factors could explain these results.

**P-050****Variability of verucae hippocampi in the human gyrus parahippocampalis**

Sadi Bexheti<sup>1</sup>, Dorentina Bexheti<sup>2</sup>, Selim Cerkezi<sup>1</sup>, Jeton Shatri<sup>3</sup>

<sup>1</sup>Department of Anatomy, Faculty of Medicine, Tetovo, Macedonia;

<sup>2</sup>Cancer Research UK Cambridge Institute, Li Ka Shing Centre, London, United Kingdom; <sup>3</sup>Department of Anatomy, Faculty of Medicine, Prishtina, Kosovo

**Introduction:** In the surface of gyrus parahippocampalis is described an anatomical structure named verucae hippocampi (hippocampal Warts). The aim of this paper is to define the size, shape, distribution and their ranking in the surface of gyrus parahippocampalis.

**Materials and methods:** In the study, are included 60 brains, namely 120 hemispheres without pathological changes. We are talking about a very small anatomical structure, so we utilized a method for taking casts that is used in dentistry-orthodontics (Optosil/Delicron) with which we take signs to 0.5 mm. All these structures are analyzed under stereomicroscope and all the information about these verucae hippocampalis are defined.

**Results:** Based on the distribution of these structures, is made the parceling of the surface of gyrus parahippocampalis where we used these verucae as a criterion. Verrucae have different shapes: oval, spherical and many irregular shapes where it comes to the

hybridization of some shapes that we can compare to the latin letters or numbers. Which is more characteristic, their rostro-caudal axis has similarity with the rotation axis of uncus gyri parahippocampalis, the curvature of whom moves for 180 degrees and the same is followed by the longitudinal axis of verrucae hippocampi.

**Conclusions:** By the efferent roads they go to the cortex of formatio hippocampi that plays an important role in the process of memory and learning and pathological changes of neurons which form the cortex of this part and are presented at the Alzheimer's disease and other diseases, the beginning of which is in these two structures.

**P-053****Branches of the anterior communicating artery**

Marija Papazova, Julija Zhivadinovik, Ace Dodevski, Niki Matveeva, Biljana Zafirova, Elizabeta Chadikovska, Biljana Trpkovska, Biljana Bojadzieva

Institute of Anatomy, Medical Faculty, Univ. SS "Cyril and Methodius", Skopje, Macedonia

**Introduction:** Cerebral circulation, especially arterial, in recent decades has attracted the interest of anatomists and clinicians. The anterior communicating artery acts as an anastomosis between the left and right anterior cerebral arteries. The branches of the anterior communicating artery are divided into two groups small and large. The aim of this study was to examine the morphological and topographic characteristics of the branches of the anterior communicating artery.

**Materials and methods:** The investigations of anatomical characteristics of the branches of the anterior communicating artery were made on 133 human brains without cerebrovascular pathology, from both sexes at age from 23 to 68. Brains were fixed in a 10% solution of formaldehyde, and the obtained material was analyzed using a stereoscopic light microscope.

**Results:** Small branches were from 1 to 4 in number (mean 2). The diameter of the small branches was in range from 80 to 260 µm; with a mean value of 151 ± 49 µm. Large branches were identified as the subcallosal artery and median artery of the corpus callosum. The subcallosal artery was present in 92% of the cases with the diameter from 340 to 610 µm; with a mean value of 410 µm. The median artery of corpus callosum was present in 8% of the cases with the diameter from 650 µm to 1.2 mm.

**Conclusion:** Detailed anatomical knowledge of the branches of the anterior communicating artery is important when considering vascular surgery in the area of the anterior portion of the circle of Willis.

**P-054****Evaluation of brain changes produced by a program of education in pain and physical exercise in patients with chronic pain. Research project**

Miguel A. Galán<sup>1</sup>, Federico Montero<sup>1</sup>, Rodrigo De Luis<sup>2</sup>, María Pérez<sup>3</sup>, Félix J. De Paz<sup>4</sup>

<sup>1</sup>"Unidad de Estrategias de Afrontamiento Activo para el Dolor en Atención Primaria", Primary Care Management, Valladolid, Spain;

<sup>2</sup>E.T.S. de Ingenieros de Telecomunicación. University of Valladolid, Valladolid, Spain; <sup>3</sup>Anesthesiology and Resuscitation, Hospital

*Clínico Universitario, Valladolid, Spain; <sup>4</sup>Department of Anatomy and Radiology, University of Valladolid, Valladolid, Spain*

**Introduction:** The latest advances in Neurosciences have shown that in chronic musculoskeletal pain there are a series of functional and structural changes in the central nervous system (CNS) that contribute to the perpetuation of pain. In a randomized clinical trial (n = 170) conducted by this research group, it was shown that in patients with chronic musculoskeletal pain, a Pain Neuroscience Education program (PNE) and a physical exercise program aimed at promoting Neurogenesis and cerebral neuroplasticity, obtained statistically significant and relevant differences in quality of life, functionality, central sensitization and intensity of pain. These changes were assessed through questionnaires and functional tests validated for that purpose, but were not assessed by brain imaging techniques.

**Materials and methods:** Our purpose is to conduct an observational study with 40 patients with chronic musculoskeletal pain belonging to the Area of Health Valladolid East. The Intervention Group will receive 10 h of PNE and 18 sessions of physical exercise program aimed at improving functional capacity, neurogenesis and cerebral plasticity. The result variables will be measured by means of questionnaires and validated functional tests in addition to neuroimaging tests. An assessment will be made at the beginning, another at the end of the intervention and a third at 6 months.

**Results and conclusions:** If the intervention produces functional and cerebral changes at the CNS level It opens the door to new treatment strategies.

## P-055

### Unilateral and bilateral aplasia of the anterior cerebral artery

*Milena Trandafilović, Ljiljana Vasović, Slobodan Vljaković*

*Department of Anatomy, Faculty of Medicine, University of Niš, Niš, Serbia*

**Introduction:** There were the descriptions of many morphologic variations of the anterior cerebral artery (ACA). The aim of this work was to investigate the cases of possible aplasia of ACA in the presence of its vascular source.

**Materials and methods:** It was applied macro- and microdissection of brain arteries under magnifying glass on the brain base of 388 adult cadavers. Each case was photographed and diagrammatically represented in the workbook. Length and outer diameter of corresponding arteries on photos were measured using computer software program. **Results:** It was discovered 2/388 cases of ACA aplasia—unilaterally in one case (0.26%), and bilaterally in the second case (0.26%). These cases belong to adults of male and female gender, autopsied because of homicide and myocardial infarction, aging 68 and 80, respectively. Except of some additional vascular variations (fenestration of the right ACA, hypoplastic posterior communicating arteries, variable origin and number of the right superior cerebellar artery and basilar ectasia in the second case), cerebral pathology was not evidenced in these two cases. We compared these and similar literature cases obtained during retrospective studies and/or single reports.

**Conclusions:** Although summarized available literature cases pointed out more frequent appearance of an aneurysm of the right ACA and in male gender associated with the left ACA aplasia, presented case did not prove this state. Recent case of total bilateral ACA aplasia, as the second case discovered till this time, represents a true rarity.

## P-057

### Magnum vertebrae by sacral vertebrae: best terminological basis for the teaching of gross anatomy

*Jorge Eduardo Duque Parra<sup>1</sup>, John Barco Ríos<sup>2</sup>, Genaro Morales Parra<sup>3</sup>*

*<sup>1</sup>Universidad de Caldas, Universidad de Manizales, Manizales, Colombia; <sup>2</sup>Univeridad de Caldas, Manizales, Colombia; <sup>3</sup>Universidad de Manizales, Manizales, Colombia*

**Introduction:** *Sacrum* is the largest of the vertebrae, its name comes from the roman term *sacer*, assimilated from the greek *ἱερόν ὀστέον*, from Galen's writings. The sacred attribute included the erroneous interpretation of these greek words in sacrificial rites, role in the protection of the genitals and considered a kind of nest for the resurrection according to Christians. The ancient Egyptians linked him with Osiris, resurrection god of the Sakkara texts (iii a.n.e) noted by Plutarch. Others used to attribute the adjective *ἱερόν* to the belief that it would be indestructible. The greek adjective *ἱερός* also means strong. It has been suggested that *os sacrum* is a bad translation of the term meaning strong bone, supported by the alternative greek name *μέγας σπόνδυλος*, translated as large vertebra, in latin vertebra magna. In classical greek, sacrum was known as *κλόνις-clonis-*, a term related to the latin *clunis* that means buttock; correspondingly the alternative latin name of the sacral ossa clunium, as if it were the bone of the buttocks.

**Discussion:** The use of the sacred term adopted from latin, was incorporated into the *Terminologia Anatomica* using terms that don't provide descriptive/functional information, this amounts of nonsense in the logic of morphological thought, as the sacred term, linked to religious tradition. The Anatomical terminology has principles, but they do not apply to the sacrum because it doesn't imply structure or function.

**Conclusion:** The term sacral is inappropriate, it's neither structural nor functional, so must be changed. The one *vertebra magna* is proposed.

## P-058

### Collaborative mentoring for effective Undergraduate Medical Research Groups (GIA: anatomy research group)

*Quiroga Garza, Alejandro; Zarate Garza, Pablo Patricio; Jacobo Baca, Guillermo; Fernández Rodarte, Bernardo Alfonso; Martínez Garza, Javier Humberto; De La Fuente Villarreal, David; Elizondo Omaña, Rodrigo Enrique; Gúzman López, Santos*

*Universidad Autonoma de Nuevo Leon, Facultad de Medicina, Human Anatomy Department, Monterrey, Nuevo León, Mexico*

**Introduction:** Research benefits professors and students, mentor and mentees, however, many Universities lack formal programs, especially in basic sciences such as anatomy. Faculty, many times, lack the time, resources, and a well-structured program. Mentoring and collaborative work, have played an important role in creating an effective environment that inspires its members into scientific production, enhances research skills, while gaining experience. Our objective was to evaluate the student research program.

**Materials and methods:** A student anatomy research group (*Grupo de Investigación en Anatomía* [GIA]) model was integrated as an extracurricular activity in the medical school of UANL, in Monterrey, Mexico, integrating basic and clinical fields through a collaborative mentoring and tightly organized structure. A retrospective analysis of longitudinal scientific production is evaluated to determine the efficacy of the model.

**Results:** The transformation stages of the group showed the progress, demonstrating fundamental elements such as student initiative, persistence, and collaborative mentoring as part of the integration of the model. Structure and training were key. In 15 years, student involvement increased from 13 to 76, professors from 5 to 18, publishing from 1 paper/year to 14, up to 90 cites/year, and multiple presentations in national and international meetings.

**Conclusions:** A steady increase in student/professor involvement, publishing, presentations in meetings, and cites was evidenced in a 15-year period of the GIA model.

## P-062

### Gross anatomy of endocranium and encephalon: the base of skull and cranial nerves

*Melania González Rodríguez, Sandra Villar Conde, Verónica Astillero López, María Santoro García, Gema Velasco Muñoz, Isabel Úbeda Bañón, Alicia Flores Cuadrado, Alino Martínez Marcos, Daniel Saiz Sánchez*

*Universidad Castilla-La Mancha, Facultad de Medicina, Ciudad Real, Spain*

**Introduction:** The Ciudad Real Medical School is characterized by an innovative educational methodology. Practical phases encourage self-learning and consolidation of knowledge acquired in theoretical phases. The objectives of the module “Generalities of Human Nervous System” include the study of main parts of the brainstem and the cranial nerves in the encephalon as well as in the base of skull.

**Materials and methods:** A total of nine corpses with the base of skull exposed and the corresponding encephalons were available for students in order they can correlate both visions. After practical sessions, a 4-point anonymous online Likert scale survey was filled out to know if the objectives established in the module have been reached through the practical activity.

**Results:** Students were very satisfied with the study of the base of the skull and the cranial nerves at dissection room. A total of 76 students filled out the online survey. 75% of them think the study of the main parts of the brainstem at dissection room make easier their identification, 64.5% in the study of cranial nerves in the encephalon and 77.6% in the base of skull. 78.9% think that study at dissection room improves three-dimensional vision in Anatomy.

**Conclusions:** The study of main parts of the brainstem and the cranial nerves in the encephalon as well as in the base of skull in the dissection room improve knowledge of the nervous system in Medical Grade.

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## P-063

### Gross anatomy of endocranium and encephalon: main sulci and gyri, vasculature and ventricular system

*Sandra Villar Conde, Verónica Astillero López, Melania González Rodríguez, María Santoro García, Gema Velasco Muñoz, Daniel Saiz Sánchez, Isabel Úbeda Bañón, Alino Martínez Marcos, Alicia Flores Cuadrado*

*Universidad de Castilla-La Mancha, Facultad de Medicina, Ciudad Real, Spain*

**Introduction:** The educational model of the Ciudad Real Medical School is based on small groups, self-learning and the practical reinforcement. Each topic is addressed in a module that includes two theoretical and two practical sessions finalizing with an evaluation. During Module 3 of the subject Anatomy II “Generalities of the human Nervous System”, students face gross anatomy of the human brain. The aims are the identification of the divisions of the brain, the cerebral lobes, the main gyri and sulci, the cerebral ventricles and the subarachnoid cisterns.

**Materials and methods:** Three groups of 25–30 students are divided into six subgroups each. Complete or sagittally hemisected brains and atlases were available for students. Afterwards, a 4-point Likert anonymous online survey was filled out by students.

**Results:** The survey about the practice of the study of human brains was filled out by 76 students. The 90.8% of them consider that this activity make easier the identification of the cerebral lobes. The 75% affirm that it allows 3D location of cerebral ventricles and subarachnoid cisterns as well as arterial irrigation and venous drainage. Also, 75% of students feel more motivated with the subject after this activity.

**Conclusions:** The study of the human encephalon at the dissection room is essential to achieve the objectives proposed in Module 3 “Generalities of the human Nervous System” of Human Anatomy II and improves students motivation.

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## P-064

### Gross anatomy of endocranium and encephalon: removal of the skull cap and brain extraction

*Verónica Astillero López, Melania González Rodríguez, Sandra Villar Conde, Gema Velasco Muñoz, María Santoro García, Alicia Flores Cuadrado, Daniel Saiz Sánchez, Alino Martínez Marcos, Isabel Úbeda Bañón*

*Universidad de Castilla-La Mancha, Facultad de Medicina, Ciudad Real, Spain*

**Introduction:** Medical Grade at the Ciudad Real Medical School takes 6 years. Gross anatomy is taught during the two first courses. Anatomy II deals on head structure including skull and encephalon. Teaching model is focused on small groups of students with active

participation and teacher mentoring. Each topic is organized into modules of five phases of work along 3 weeks: theoretical (I, III), practical (II, IV), and evaluation (V). In phase II of module 3, corresponding to “Generalities of the Nervous System”, students extract the brain. The main objective of this practice is facing students to the elements of skull cap, meninges, brain and their topographical relationship.

**Materials and methods:** Each group of 25–30 students dissects 3 corpses using the Grant’s Dissector manual. They are accompanied by an anatomy professor, an assistant scholarship and two technicians. To evaluate the effectiveness of the teaching method, an anonymous online survey was carried out with a 4-point Likert scale.

**Results:** Survey was answered by a total of 77 students. Brain extraction made easier understanding of brain meninges at 76.6% of students. 77.9% considered that it helped identification of skull cap elements as well as the dura relationships with the encephalon. Finally, 99.8% of the students recommended this practice in the rest of Spanish Medical Schools.

**Conclusions:** The methodology used in the brain extraction practice is effective for the correct acquisition of the proposed objectives.

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## P-066

### Anxiety of the students of occupational therapy and medicine in front of the dissection room

Carmen Romo Barrientos<sup>1</sup>, Juan José Criado-Álvarez<sup>2</sup>, Alino Martínez-Marcos<sup>3</sup>, Isabel Ubeda-Bañón<sup>3</sup>, Alicia Flores-Cuadrado<sup>3</sup>, Daniel Saiz-Sánchez<sup>3</sup>, Alicia Mohedano Moriano<sup>4</sup>

<sup>1</sup>Integrated Care Management, Castilla-La Mancha Health Services, Talavera de la Reina, Spain; <sup>2</sup>Integrated Care Management, Castilla-La Mancha Health Services, Department of Medical Sciences, School of Health Sciences, University of Castilla-La Mancha, Talavera de la Reina, Spain; <sup>3</sup>Department of Medical Sciences, Ciudad Real Medical School, Regional Centre for Biomedical Research, University of Castilla-La Mancha, Ciudad Real, Spain; <sup>4</sup>Department of Medical Sciences, School of Health Sciences, University of Castilla-La Mancha, Talavera de la Reina, Spain

**Introduction:** The practices with human corpses suppose a fundamental part in human anatomy teaching. However, this dissection experience can be stressful for the students, generating a high level of anxiety. The objective of this study is to know the attitudes, reactions, fears and state of anxiety of the students of the first year of medicine (MED, CR, UCLM) and occupational therapy (TO, UCLM), facing their first practice of dissection/prosection.

**Materials and methods:** A cross-sectional study of pre-post-practice type was conducted, administering to the students an “ad hoc” questionnaire and the State-Trait Anxiety questionnaire (STAI) to know the level of anxiety in its two measures, Anxiety Trait (AR, how the person feels basally) and State Anxiety (AE, increases as a response to different types of tension).

**Results:** Significant differences were found between the pre-post practice scores, with a significant decrease in the AE for both degrees. Comparing the two samples, we found higher levels of AR and previous AE in the students of MED, both types of anxiety descended in the students of MED, and in the TO students it is only decreased in AE (Fig. 1).

**Conclusion:** Medical students show higher scores in AR and AE, both before and after practice; they seem to be more aware of the

experience they are going to face. Despite a higher level (AR and AE), MED students feel equally prepared than TO to face dissection.

## P-067

### Maternal care brings in no different between anthropometric measurements in newborn in rural–urban—Albania 2010–2013

Klodiana Poshi

Hospital University of Tirana, University Medicine, Albania

**Objective:** The objective of the present study was to explore that the good education during pregnancy, bring healthy newborn in rural–urban zone. This study is based in cross-sections retrospective study. Our study realized during January 2010–February 2013. 368 maternal and their newborn... We used one-way ANOVA method and two-level linear regression models to examine the associations between birthplace rural–urban and anthropometric measurement in newborn. **Results:** It was noted that the change in the average birth weight in urban/rural is not statistically significant, even after the control (confounding effect control) of a number of independent factors in Model 3: the average weight at birth was 3186 grams in the urban and 3234 grams in rural ( $p = 0.371$ ). It can be noticed that the change of the average perimeter of the head in urban/rural is not statistically significant, even after checking (confounding effect control) for a number of independent factors in Model 3: the average perimeter of the head at birth was 34.5 cm. Only chest perimeter is statistically significant, even after control (control of the confounding effect) for a number of independent factors in Model 3: the average thoracic perimeter was 33.1 cm in the urban and 33.5 cm in the rural ( $p = 0.045$ ). We did find any statistically significant, for abdominal perimeter.

**Conclusion** As can be seen from the above results, no significant correlation was found between the mother’s place of residence and the anthropometric parameters of infants.

## P-068

### ANATOM-UVA: a virtual environment for the learning of anatomy

Félix J. De Paz<sup>1</sup>, Juan F. Pastor<sup>1</sup>, Josep M. Potau<sup>2</sup>, Juan L. Calabia<sup>3</sup>, Carlos Alberola<sup>4</sup>, Rodrigo De Luis<sup>4</sup>, Mario Martínez<sup>4</sup>, Natividad Gacía Atarés<sup>1</sup>

<sup>1</sup>Department of Anatomy and Radiology, University of Valladolid, Valladolid, Spain; <sup>2</sup>Unit of Human Anatomy and Embriology, University of Barcelona, Barcelona, Spain; <sup>3</sup>Hospital Clínico Universitario, Valladolid, Spain; <sup>4</sup>E.T.S. de Ingenieros de Telecomunicación. University of Valladolid, Valladolid, Spain

**Introduction:** Currently, the expansion of ICT conditions the way in which content, games, publicity or personal relationships are accessed. The Transformation of learning and training contexts is one of the five areas considered priority by UNESCO to influence the process and Education for Sustainable Development. We wanted to equip students with another learning tool for the study of anatomy through a virtual reality environment.

**Materials and methods:** We Organize two groups (of 15 members each) among the students of the subject “Structure of the Visual System” (Degree of Optics and Optometry, University of Valladolid).

One was the control group and the other learned the use of a public domain computer application on the Internet (ITK-snap), a tool for segmentation and analysis from medical image (*Dicom*), with capacity to generate labels and possibility of converting them to viewable files in 3D environment, and they proceeded to identify the different structures of the different cuts that were provided by the radiologists, also collaborators of the project.

Results: When examining all the students, those who made the labelling of the cuts, had better results than those of the control group. Then, the generated teaching materials were used to facilitate the learning of the control group, so the beneficiaries multiplied.

Conclusions: The use of ICT, namely using a tool for segmentation and analysis of medical images, benefits the learning of anatomy. By applying new stimuli, by breaking down routines and demotivating Inertias, we found better results and more motivation in the student.

## P-069

### Double staining whole mount transparent specimens of the human larynx for the clinical anatomy and medical education

*Tsuyoshi Saga<sup>1</sup>, Koichi Watanabe<sup>1</sup>, Joe Iwanaga<sup>2</sup>, Kunimitsu Nooma<sup>1</sup>, Sadaharu Kitashima<sup>3</sup>, Yoko Tabira<sup>1</sup>, Koh-Ichi Yamaki<sup>1</sup>*

<sup>1</sup>Department of Anatomy, Kurume University School of Medicine, Kurume, Japan; <sup>2</sup>Seattle Science Foundation, Seattle, United States; <sup>3</sup>Kitashima Dental Clinic, Kurume, Japan

Introduction: The three dimensional structure of the larynx is difficult to understand for medical students. We created the transparent specimens of the larynx with cartilage and bone staining for medical education. Although recent radiological examination including X-ray and computed tomography revealed the morphology of the larynx in living body, the ossification of the larynx with aging including the extent and degree hasn't been described well. Then, we applied for the larynx the tissue transparent method which is usually performed in the small vertebral animals.

Materials and methods: Several larynxes were removed from the formalin-preserved cadavers which were donated to our medical school for the purpose of medical education and research. First, the specimens were dehydrated by the soaking with the graded alcohol. Second, the cartilage in the specimens were stained with alcian blue in acetic acid alcohol for 48 h. Third, the excess alcian blue was removed by soaking the tissues in the 0.5% trypsin solution within 2 weeks. Fourth, the ossified region was stained with the alixarin red in 0.5% KOH solution. Fifth, specimens were bleached and dehydrated through the graded KOH glycerin mixtures. Lastly, the specimens were put into the glycerin with small amount of thymol for the preservation.

Results and conclusions: We successfully obtained transparency and stainability of cartilage and bone in all cases. These stained transparent specimens make the medical students and clinicians easy to observe the three dimensional structure of the larynx and the difference between the areas of the cartilage and the ossification macroscopically.

## P-070

### The anatomy in the TFG (end-of-degree project) of nutrition

*Isabel San José Crespo<sup>1</sup>, Marina López Paniagua<sup>1</sup>, Félix De Paz Fernández<sup>1</sup>, Roberto Cabo Pérez<sup>2</sup>*

<sup>1</sup>University of Valladolid, Faculty of Medicine, Valladolid, Spain; <sup>2</sup>Faculty of Medicine, University of Oviedo, Oviedo Spain

Introduction: The value of the knowledge of Anatomy for Health Sciences, other than Medicine, has been questioned. When the Department of Anatomy was included in the distribution of TFGs (end-of-degree Project of the Degree in Nutrition), we considered that these works should have the anatomical dissection of part of the digestive system as a basis. After the anatomical study, a bibliographic review of the alterations of the chosen area and its impact on the patient's nutrition status would be made. Today, years later, the number of students who demand this type of TFG has substantially grown. Therefore, we have decided to explore the factors that may have influenced this increase.

Materials and methods: There are seven TFS that involve different parts of the digestive system. The seven students who chose to develop their projects in the Department of Anatomy knew that an anatomical study based on dissection was mandatory. Students' feedback about the experience regarding the learning of Anatomy and the acquisition of transversal competences for the exercise of their profession, as well as the degree of satisfaction of the tutoring process was collected. The tutor evaluated the fulfillment of objectives. The qualifications of all of them were gathered.

Results: The evaluations of the works are between remarkable and outstanding. The degree of student satisfaction goes from high to very high.

Conclusion: The Nutrition TFGs with an anatomical approach are widely accepted and have demonstrated to be useful for future graduates in Human Nutrition and Dietetics.

## P-075

### Real anatomical models for improving surgical skills in trauma life support

*Ana Carrera<sup>1</sup>, Laia Falgueras<sup>2</sup>, Maite Albiol<sup>2</sup>, Francisco Reina<sup>1</sup>*

<sup>1</sup>Universidad Girona, Girona, Spain; <sup>2</sup>Hospital U. Josep Trueta, Girona, Spain

Introduction: The acquisition of clinical skills is essential both in the training of doctors during their residence period and in the recertification of physicians. In most of these formations plastic models and sometimes experimental animals are used, although not always they reflect the real anatomy.

Materials and methods: We have developed a series of learning models based on the use of anatomical prosections. These models were designed to develop practical skills in some of the stations of the Advanced Trauma Life Support courses of the American College of Surgeons: airway, shock, peritoneal washing, thoracic drainage, cricothyroidotomy and pericardiocentesis. Models allowed the students to perform the technique in a total or in a partial way and the

verification of the final result. The experience was assessed by a questionnaire of satisfaction.

**Results:** The degree of acceptance and satisfaction regarding the use of simulation models from anatomical prosections was high. Students considered that the use of anatomical prosections brings advantages with respect to the use of other models. The best understanding of the anatomical references and the greater correlation of the technique with the real situation are those aspects best valued.

**Conclusions:** Clinically oriented prosections used as anatomical real models for the development of clinical skills have a special significance in the continuing education of different clinical disciplines. The need for a precise knowledge of the anatomy to be able to successfully perform these techniques in an emergency situation, make this type of anatomical models a very useful tool for medical training.

## P-076

### Usefulness of additional virtual dissection to teach anatomy in a university setting. A pilot study

Rafael Boscolo-Berto, Cinzia Tortorella, Andrea Porzionato, Carla Stecco, Anna Rambaldo, Veronica Macchi

*Institute of Human Anatomy, Department of Neurosciences, University of Padova, Padova, Italy*

**Introduction:** The rising prevalence of informatics play an increasingly important role in medical education, potentially representing an integrative system to be combined with the traditional dissection.

**Materials and methods:** We investigated a group of voluntary medical students attending the second year (n 30). We randomized 30 medical students to a first group, which applied to virtual dissection, and a second one which applied to textbooks of topographical anatomy. The topic of interest was stated as being the forearm (bones, muscles, vessels and nerves). Following this preliminary step, they all applied to the gross dissection of a human forearm, subsequently surveyed by a test aimed to evaluate their retained information with regard to 2D and 3D anatomical structures other than basic anatomical knowledge. **Results:** We found a comparable performance in terms of basic anatomical knowledge regarding bones, vessels, nerves but not muscles for which virtual dissection was of benefit. Similarly, virtual dissection seemed to be useful for 2D and 3D reporting of anatomical structures, especially for muscles location, showing an independent role by logistic regression.

**Conclusions:** The overall evidence was in support of the use of virtual dissection to integrate the learning of human anatomy, with particularly reference to the understanding of 3D spatial relationships between anatomical structures. Nevertheless, these upcoming anatomy applications serve as useful integrative learning tools, when used in conjunction with traditional practical dissection.

## P-077

### Disruptive innovation: converting a simple inexpensive home security system into a useful distance learning tool between continents

Brion Benninger, Luis Rivas-Vasquez, Ruben Estrada

*Medical Anatomy Center, Western University of Health Sciences, Lebanon, Oregon, United States*

**Introduction:** Distance-learning can be viewed from three levels; 1. Through rose colored glasses where delivery from a world expert and or innovative minds stimulating others from less accessible corners of the world; 2. Creating a cost-effective delivery of curricula from one campus site to another often referred to as streaming etcetera; 3. Inexpensive delivery with live quality audio ± live video ± video recordings. The objective of this project was to identify technology less than \$200 which transmits live audio lecture ± live visual recording ± recordings of skills.

**Methods:** Search was conducted identifying technology under \$200 with cloud service. Assess live lecture delivery and visual recordings. **Results:** Ring was the home security system identified with speaker system, 180° panoramic visual and recording capabilities. Free Ring app download to iPhone linked with handheld Ring unit. Lecture was successfully delivered from coffee house in New Zealand with iPhone to Ring unit in Oregon while seven people listened. Lecturer heard comments and viewed recorded activity for 10–20 s which populated immediately on iPhone app. Live visual movement was not good, but recorded visual activity was good.

**Conclusion:** This project exercised disruptive innovation using an inexpensive cloud-based home security system by Ring delivering anatomy lectures between countries for distance learning. This suggests students from distant sites (countries) don't all have to own computers and be connected to WIFI to receive tutorials or lectures from another country.

## P-078

### Positional relations of the hypoglossal and superior laryngeal nerves with the superior thyroid, lingual, facial and occipital arteries

Yujiro Sakamoto

*Tokyo Medical and Dental University, Bunkyo-ku, Japan*

**Introduction:** The hypoglossal and superior laryngeal nerves supply the tongue and the larynx, respectively, and their troubles affect daily life such as articulations. Because the nerves pass superficial and deep to the external carotid artery, respectively, their relationships with the branches of the artery are helpful to detect them and their affected position. However, the branches show variations.

**Materials and methods:** The hypoglossal and superior laryngeal nerves and the origins of the superior thyroid, lingual, facial and occipital arteries were gross anatomically examined in 15 Japanese cadavers.

**Results:** The thyrolingual, linguofacial or thyrolinguofacial trunk was found in 9 sides. The occipital artery arose at the level of the lingual or facial artery or between or above them. The facial type included the linguofacial trunk, the between the thyrolingual and the above the linguofacial and thyrolinguofacial. The hypoglossal nerve mainly passed superior to the between type occipital artery or inferior to the above type and then ran at the level of the facial artery, including the linguofacial trunk, or between the facial and lingual arteries. The internal branch of the superior laryngeal nerve mainly passed at the level of the lingual artery, including the linguofacial trunk. However, it passed above the thyrolingual and thyrolinguofacial trunks. The external branch passed below the superior thyroid artery.

**Conclusions:** The positional relations of the nerves with the branches of the external carotid artery vary according to their branching pattern. The features of their relationships have to be taken into consideration to identify the nerves.

**P-079****The morphometric study of the ciliary ganglion and its related clinical application**

Lita Tesapirat<sup>1</sup>, Supharat Jariyakosol<sup>2</sup>, Vilai Chentanez<sup>1</sup>

<sup>1</sup>Department of Anatomy, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand; <sup>2</sup>Department of Ophthalmology, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand

**Introduction:** Ciliary ganglion can be easily injured without notice in many intraorbital procedures. It lays posterolateral in the orbit; the surgical procedures approaching lateral side of the orbit are always associated with the ciliary ganglion injury which results in transient mydriasis.

**Materials and methods:** Forty embalmed cadaveric globes were dissected under surgical loupe to observe characteristics of roots reaching the ciliary ganglion, number of short ciliary nerve, location of the ciliary ganglion in the orbit. Distances between the ciliary ganglion and important landmarks were measured.

**Results:** The ciliary ganglion located near orbital apex, lateral to optic nerve and medial to lateral rectus muscle. Mean width of the ciliary ganglion was 2.24 mm and mean diameter from anterior edge to posterior edge was 3.50 mm. Mean distances from the ciliary ganglion to posterior end of globe, lateral rectus muscle, optic nerve and the scleral insertion of the lateral rectus muscle were 16.04 mm, 2.88 mm, 1.47 mm and 31.53 mm, respectively. Moderate inverse correlation was found between the distance from the ciliary ganglion to posterior end of globe and the distance between the ciliary ganglion and the lateral rectus muscle. The number of motor root could be 1, 2 and 3 roots. Sensory root was found only 1 root in every specimen. Sympathetic root could be observed 1 root in most of the specimens. The number of short ciliary nerves was six to fourteen nerves.

**Conclusion:** This anatomical knowledge should be concerned in intraorbital procedures to reduce complication of the ciliary ganglion injury.

**P-080****Characteristics of aesthetically most important parts of the female face: what do we find attractive?**

Nikola Vučinić<sup>1</sup>, Mirela Erić<sup>1</sup>, Snežana Tomašević Todorović<sup>2</sup>, Dušica Marić<sup>1</sup>, Bojana Krstonošić<sup>1</sup>, Dragana Radošević<sup>1</sup>, Boris Vuković<sup>3</sup>

<sup>1</sup>University of Novi Sad, Faculty of Medicine, Department of Anatomy, Novi Sad, Serbia; <sup>2</sup>University of Novi Sad, Faculty of Medicine, Department of Physical Medicine and Rehabilitation, Clinic for Medical Rehabilitation, Clinical Center of Vojvodina, Novi Sad, Serbia; <sup>3</sup>University of Novi Sad, Faculty of Medicine, Novi Sad, Serbia

**Introduction:** Facial appearance is one of the most important factors that influences the assessment in what degree is some person attractive. The lips, the nose and the eyes are aesthetically the most prominent facial parts in both sexes. The aim of this study was to calculate the dimensions and determine the shapes of the lips, noses, faces in a whole, and to establish the colors of eye and hair in attractive females. The aim was also to show female faces that have the best set of examined facial features.

**Materials and methods:** In the first phase of the study, attractive faces of 30 females were photographed. In the next stage, photographs were

shown to another group of 60 males, who had the task to evaluate the examined facial features using Visual Analogue Scales. The facial parts rated by the highest marks were measured in the ImageJ program.

**Results:** The most attractive in females were lips ratio 2:1, medium nose, nasal profile III and nasal profile V, black eyes, blond hair and narrow shape of face.

**Conclusions:** Results obtained in our study show a higher degree of representativeness compared to other studies due to a different methodological approach, they can be used as aesthetic guide and can help in the planning of lip corrections and rhinoplasty.

**P-081****Anatomical variations of the human mental foramen using digital panoramic radiography**

Svetlana Jovevska

University “Goce Delcev” Stip Republic of North Macedonia, Stip, University “Goce Delcev” Stip, FMN, Macedonia

**Introduction:** Mental foramen (MF) is usually the anterior limit of inferior dental canal, which is located in the body of mandible between the inferior and alveolar margins. The great diffusion of the surgical techniques in jaws surgery and the progress of the radiological imaging procedures expressed many interest in clinical anatomy of MF. The aim of this study was to determine and compare the position and symmetry of mental foramen in horizontal as well as in vertical plane.

**Methods and material:** One hundred digital panoramic radiographs were selected and studied regarding the location and symmetry of MF. The size of MF was recorded using digital caliper and its appearance was determined by visual examination. The collected data were subjected to statistical analysis using paired Student's t-test.

**Results:** The commonest position of MF in horizontal plane was in line with the longitudinal axis of the second premolar (31.0%) while in vertical plane it was found to be located inferior to the apex of second premolar (42.2%). The difference in dimensions on the left and right sides were not statistically significant.

**Conclusion:** MF exists in different locations and possesses many variations. Hence, individual, gender, age, race and assessing technique largely influence these variations. It suggests that the clinicians should carefully identify these anatomical landmarks, by analyzing all influencing factors, prior to their diagnostic or the other dental, surgical and implant operation.

**P-082****Anatomical substract of the masseter muscle myofascial trigger points in fresh cadaver**

Flávia Emi Akamatsu, Roberto Procópio Pinheiro, Ana Maria Itezerote, Samir Omar Saleh, Flávio Hojaij, Mauro Andrade, Alfredo Luiz Jacomo

University of São Paulo, São Paulo, Brazil

**Introduction:** Myofascial pain syndrome (MPS) is a common cause of chronic musculoskeletal pain and is characterized by myofascial trigger points (MTP), limited range of motion in joints, referred pain and local twitch response during mechanical stimulation of MTP.

MTP are clinically identified by palpation of a taut band of muscle or fascia. Physiopathology of MPS remains unclear and it has been suggested that MTP occur when a nociceptor and a muscular motor endplate coincide. Seven different MTP are clinically described for the masseter muscle, but anatomical correlation is still lacking.

**Methods:** Masseter muscles from five fresh cadavers were carefully dissected from their origins in order to observe the exact point where nerve fibers penetrated the muscle belly. As muscle size varies among individuals, we calculated the relative entry point of the nerve into the muscle by defining six different areas in the muscle belly: three superior (I, II and III) and three inferior (IV, V and VI), beginning at the posterior margin of the muscle and statistical analysis using anatomical data with Poisson distribution and logarithm link function followed by Bonferroni multiple comparisons. ( $p < 0.005$ ).

**Results:** Areas I, II, V and VI concentrated the masseteric nerve entry points. These locations correspond to the clinically described MTP.

**Conclusion:** Anatomical correlation of the MTP may be useful for a better understanding of the physiopathology of these disorders and provide basis for their treatment.

## P-083

### Neuroimaging anatomy and abnormalities of the cranial emissary veins: a pictorial and educational review

Vivek Yedavalli, Sean Creeden, Alexander Khalaf, Tarik Massoud

Stanford University School of Medicine, Stanford, United States

**Introduction:** Cranial emissary veins (EVs) are valveless, transmit bidirectional blood flow usually from extracranial veins to intracranial venous sinuses, and often communicate with skull diploic veins. They serve to equalize intracranial pressure and to cool the brain. EVs are often seen on MRI, CT, and angiography, but there are limited neuroimaging descriptions of their anatomy and abnormalities.

**Materials and methods:** We comprehensively review the neuroimaging anatomy of EVs and categorize their abnormalities according to etiology.

**Results:** We first describe EV anatomy, including those relevant clinically, e.g. the (retro)mastoid EVs (MEV), posterior condylar veins (PCV), petrosquamosal sinus, occipital EVs, ophthalmic veins (OVs), and sphenoidal ovale or Vesalian veins. We then review the imaging of EV abnormalities. These include: (1) post-craniotomy hemorrhage or epistaxis; (2) sinus thrombosis by spread of infection, or when bone wax is applied to bleeding EV foramina; (3) pulsatile tinnitus due to enlarged MEVs and PCVs; and (4) their relevance to endovascular procedures, e.g. (a) EVs may be used to gain access to the intracranial venous sinuses, e.g. via the MEVs or OVs, (b) in some skull base tumors, enlarged collateral EVs may require preoperative occlusion, (c) EVs can serve as primary drainage pathways in cases of venous sinus occlusion or arteriovenous malformations and fistulas (AVFs); and (d) EVs have been implicated in the mechanism of formation of certain AVFs.

**Conclusions:** EVs are often overlooked venous structures. Knowledge of their anatomy, abnormalities, and relevance to endovascular procedures is important for neuroanatomists and neuroradiologists.

## P-084

### Flow limiting anatomical variants of the internal jugular veins: an imaging review including intraluminal and extrinsic obstructive abnormalities

Vivek Yedavalli, Alexander Khalaf, Tarik Massoud

Stanford University School of Medicine, Stanford, United States

**Introduction:** Modest restriction of extracranial venous drainage may be a risk factor in several neurological diseases, especially when the dominant internal jugular vein (IJV) is affected, or in bilateral compromise.

**Materials and methods:** We review the variant imaging anatomy of the IJV and causes of luminal or extrinsic obstruction, classified according to etiology.

**Results:** IJV obstruction may be intraluminally thrombotic or extrinsically compressive. Contributions of normal anatomic and physiologic variants causing IJV extrinsic compression in the upper neck are underappreciated. Positions that can induce IJV torsion and compression include neck rotation, flexion or extension. Styloidogenic jugular compression syndrome is caused by bony impingement of the IJV between the lateral mass of C1 and a prominent styloid process or posterior belly of digastric. Enlarged collateral condylar veins and their recipient deep cervical veins may be present. Neck veins are less susceptible to thrombosis than the extremities. IJV thrombosis is therefore uncommon and challenging to diagnose. We also present a pictorial review of local or systemic causes of IJV thrombosis, e.g. central venous catheterization, IV drug abuse, post neck dissection, deep neck infections, Lemierre syndrome, head and neck malignancy, coagulation disorders, distant malignancies, trauma, post tonsillectomy, acute mastoiditis, acute otitis externa, and thyroid goiter.

**Conclusions:** Common causes of IJV obstruction seldom present difficulties in differential diagnosis. However, anatomical variants as causes of IJV compression, and the more uncommon lesions described above can be both unexpected and challenging on neuroimaging. This presentation will aid in understanding the many imaging manifestations of IJV obstruction.

## P-086

### Anatomical considerations of the mental nerve hole for oral surgery in peruvian adults

Juana Rosa Delgadillo Avila<sup>1</sup>, Carlos Humberto Campodonico Reategui<sup>1</sup>, Ada Delgado Yauyo<sup>2</sup>, Vladimir Huayta Alarcon<sup>3</sup>

<sup>1</sup>Universidad Nacional Mayor de San Marcos, UNMSM, Peru;

<sup>2</sup>Universidad San Martín de Porres, USMP, Peru; <sup>3</sup>Universidad Científica del Sur, UCS, Peru

**Summary**

**Introduction:** The mental foramen (AM) is the opening through which the inferior dentary goes out of the jaw giving its mental branch. The mental nerve (NM) constitutes one of the anatomical structures important to identify to preserve and avoid injuring it.

**Objective:** To determine the relationships between the mental nerve and the anatomical repairs for the use of oral surgery.

**Materials and methods:** A prospective and cross-sectional study was designed that included 31 human cadavers that were dissected at the level of the hemimandible. We analyzed the emergency variables of the NM and its relationships with dental pieces attached.

**Results:** It was found that the most frequent distance between the NM emergence with respect to the alveolar ridge and the mandibular ridge was from 11 to 15.5 mm in 57.6% of cases and from 11 to 15.5 mm in 72.7% of cases respectively. The relationship of the NM with respect to the attached teeth was mainly at the level of the second lower premolar in 63.6% of cases. 18.2% presented an accessory NM and the most frequent location was higher than the NM in 66.7% of specimens.

**Conclusions:** The NM emergence in a sample of Peruvians is mostly below the second lower premolar. Few cases presented an accessory MN. These data should be taken into account in surgeries in the mental region to avoid clinical complications.

## P-087

### Study of the occasional neck venous drainage variations

Antonio Caravaca García<sup>1</sup>, Antonio Sanmartin Caballero<sup>1</sup>, Wasim Elhendi Halawa<sup>2</sup>, David Almorza Gomar<sup>3</sup>, Gonzalo Pérez Arana<sup>4</sup>, Jose Arturo Prada Oliveira<sup>3</sup>

<sup>1</sup>Hospital Punta de Europa, SAS, Algeciras, Spain; <sup>2</sup>Hospital del S.A.S. Punta de Europa, Algeciras, Spain; <sup>3</sup>University of Cadiz, Cádiz, Spain; <sup>4</sup>Inibica, Universidad de Cadiz, Cádiz, Spain

The venous system is usually characterised for a broad variability, which introduces a clinical attention. This is a common aspect, but it is especially interesting in the neck region. This region keeps common aspects to other corporal portions: as the double drainage system—deep and superficial—; and the common variations in middle calibre venous, which connect to the great venous vessels. But the neck region possesses different and critical clinical approaches.

**Material:** We analysed the clinical variations in those patients under ORL surgical and explorative procedures in our Hospital.

**Method:** We analysed the occasional variations appeared during the clinical practice of ORL procedures and surgical approach.

**Results:** We observed usual variations described in literature. Though we reported some unusual variants. We described uncommon anastomoses between External and Internal Jugular Veins, extremely gross External Jugular Veins, or alternative origin of External Jugular Veins after gross postero auricular veins.

**Discussion:** Many ORL procedures, urgent or usual, are underwent under a precise and correct anatomical basis. Then many unwished consequences can appeared due to the surgical aggression of superficial venous networks. A precise information and formation of anatomical variants and malformations need to be correlated to the study of anatomy. The approach to medical practice based in anatomical knowledge offers many opportunities and disadvantages. Medical routines based in the precise location of structures is the only way to success. But thus, a narrow inflexible approach can be the opportunity to serious problems related to the damaged venous system.

## P-088

### The anatomical considerations of the compensatory hypertrophy of the upper half of the masseter after bont-a injection

Kyu-Lim Lee<sup>1</sup>, Hyun Jin Cho<sup>2</sup>, Hyun-Jin Park<sup>1</sup>, Tansatit Tanvaa<sup>3</sup>, Hee-Jin Kim<sup>1</sup>

<sup>1</sup>Division in Anatomy and Developmental Biology, Department of Oral Biology, Human Identification Research Institute, BK21 PLUS Project, Yonsei University College of Dentistry, Seoul, Republic of South Korea; <sup>2</sup>Labella Clinic, 455 Gangnam-daero, Seocho-gu, Seoul, Republic of South Korea; <sup>3</sup>The Chula Soft Cadaver Surgical Training Center and Department of Anatomy, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand

**Introduction:** Previous studies related to BoNT-A injection procedures of the masseter were confined to the clinical anatomy of the lower half of the masseter. Nevertheless, some alternative BoNT-A injection procedures are performing on the upper half of the masseter for the midface shaping and there have not been any studies focused on the upper masseter. Therefore, the aim of this study is to determine the detailed anatomical structure of the upper half of the masseter to provide a safer and more effective injection guideline.

**Materials and methods:** Twelve hemifaces from Korean and Thai cadavers were used in this study. The masseter was dissected from the origin layer by layer, and the tendon and belly of the masseter was observed.

**Results:** The tendinous pattern (Type A) surrounding the tendon on the surface of or deep in the masseter was in 33% of the cases (4/12). The capsule pattern, in which the tendon formed more than one capsule surrounding the muscle completely, was in 67% of the cases (8/12). In the capsule pattern, 1 or 2 capsule were observed in 42% (5/12) and in 25% (3/1), respectively.

**Conclusions:** A typical short of long-term sequela related to masseteric hypertrophy injection procedure is the compensatory hypertrophy and the paradoxical masseteric bulging after injecting BoNT-A, respectively. This symptom is manifested by an uneven injection of the entire area and multiple layers of muscle. Based on the result of this study, more effective procedure can be performed by identifying the pattern of the tendon and belly.

## P-089

### Prevalence and feature of bifid mandibular canals in a european population: a cbct study

Sara Bernardi<sup>1</sup>, Serena Bianchi<sup>1</sup>, Giuseppe Varvara<sup>2</sup>, Emanuele Candido<sup>2</sup>, Beatrice Feragalli<sup>2</sup>, Maria Adelaide Continenza<sup>1</sup>, Maurizio Piattelli<sup>2</sup>, Guido Macchiarelli<sup>1</sup>

<sup>1</sup>Department of Life, Health and Environmental Sciences, University of L'Aquila, L'Aquila, Italy; <sup>2</sup>University of G. d'Annunzio Chieti and Pescara, Chieti, Italy

**Introduction:** Mandibular canal is a skeletal structure hosting neurovascular shaft composed by Alveolar Inferior Artery, Alveolar Inferior Vein and Alveolar Inferior Nerve. Mandibular canal morphology present variations described and known in literature as bifurcation. These variations can be involved during several proce-

dures in oral surgery, in local anesthesia and can represent a cause of discomfort in case of mobile dentures. According to the Naitoh classification, there are 4 types of bifid mandibular canal basing on the position of the origin of the accessory canal: retromolar (1); dental (2); forward (3); buccolingual (4). The study aimed to detect and analyze the prevalence and the features of prevalence of bifid mandibular canals in a European adult population sample.

**Materials and methods:** 300 cone beam computed tomographies performed between 2012 and 2019 were examined. The parameters considered were the frequency, the type according the Naitoh classification, the length and the angle. These data were statistically analyzed by means of SPSS software.

**Results:** the 50% of the examined sample population presented the variation. The type 3 and the type 1 were the most prevalent. The mean length of the canals was  $11.38 \pm 3.62$  mm on right and  $11.79 \pm 5.62$  mm on the left side. No statistically significant difference between left and right side was found.

**Conclusion:** The presence of the bifid mandibular canal variation represent an anatomical variations detectable by means of CBCT that should be always considered in the initial planning of dental procedures involving the posterior area of the mandible.

## P-090

### Evaluation of dynamic facial parameters during smiling: a pilot study

Umut Ozsoy, Sezen Karasin, Yilmaz Yildirim, Rahime Sekerci

Akdeniz University, Faculty of Medicine, Department of Anatomy, Antalya, Turkey

**Introduction:** Face is a dynamic structure during facial expressions. Therefore, the determination of dynamic parameters in healthy individuals as well as static parameters is important for the understanding of facial biomechanics. The aim of our study is to determine and compare the range of motion, velocity and acceleration parameters of the specific landmark on both sides of the face during smiling.

**Materials and methods:** During smiling, facial motion of 6 volunteers (3 male and 3 female) aged between 19 and 40 years (mean  $26.8 \pm 8.7$  years old) were obtained by opto-electronic motion analysis system. For data collection, four landmarks (mx = maxillary point, chk = cheek point, ch = chelion, nsl = nasolabial point) were used on each side of the mouth and cheek area. Each volunteer repeated the movement five times and the mean value was obtained. **Results:** Individual differences were observed in the dynamic parameters of each landmark. However, we found that these differences had a significant high correlation (correlation coefficient range between 0.8 and 0.9,  $p < 0.001$ ). Mean values were determined for range of motion in the right and left side as 9.2 and 9.3 mm, for velocity as 33.8 and 26.9 mm/s and for acceleration as 235 and 277  $\text{mm/s}^2$  respectively. No significant difference was observed when the both sides of the face were compared ( $p < 0.05$ ).

**Conclusions:** The dynamic parameters to be obtained from the studies on a large cohort of healthy subjects may contribute to a better understanding of facial biomechanics and follow-up of recovery after treatment.

## P-091

### Clinical implications of the topographic dimension of the parotid gland

Hyun Jin Park<sup>1</sup>, Wook Oh<sup>2</sup>, Kyu-Lim Lee<sup>1</sup>, Hyosang Ahn<sup>1</sup>, You-Jin Choi<sup>1</sup>, Hee-Jin Kim<sup>1</sup>

<sup>1</sup>Division in Anatomy and Developmental Biology, Department of Oral Biology, Human Identification Research Institute, BK21 PLUS Project, Yonsei University College of Dentistry, Seoul, Republic of South Korea; <sup>2</sup>Samsung Feel Clinic, Seoul, Republic of South Korea

**Introduction:** Various surgical and non-surgical procedures such as thread lifting, SMASectomy, botulinum toxin injection, and filler augmentation are performed under the zygomatic arch. Many anatomical and clinical studies of the area under the zygomatic arch have been studied, however the anatomy of the parotid gland has not been well-known. Therefore, the aim of this study was to observe the topographic anatomy of the parotid gland via cadaveric dissections. **Materials and methods:** Thirteen hemifaces of Korean cadavers were used in this study. The reference line (the line connecting the mandible angle to upper margin of zygomatic arch along with the posterior margin of ramus) was divided into four sections (P1-P4). The distance from the reference lines to anterior and posterior border of parotid gland was measured on each section.

**Results:** The distance of the parotid glands from top to bottom is shown in the table below. The parotid gland tail was located 13.3 mm below the mandible angle point.

	P1	P2	P3	P4
Anterior border	$16.33 \pm 8.85$	$24.40 \pm 10.94$	$8.76 \pm 8.66$	$-3.80 \pm 3.96$
Posterior border	$1.96 \pm 5.26$	$18.09 \pm 6.38$	$27.48 \pm 6.31$	$23.25 \pm 9.13$

**Conclusions:** A general esthetic procedures is performed at the supine position, where the position of the parotid gland changes depending on the patient's position. Topographic anatomy of the parotid gland serves as a reliable reference for esthetic procedures on lower face and neck region.

## P-092

### Anatomical continuation between the subsmas fat (innominate fascia) and roof: the true nature of the roof (retro-orbicularis oculi fat)

Hyosang Ahn<sup>1</sup>, Hyoung-Moon Kim<sup>2</sup>, Hyung-Jin Lee<sup>1</sup>, Ji-Hyun Lee<sup>1</sup>, Hee-Jin Kim<sup>1</sup>

<sup>1</sup>Division in Anatomy and Developmental Biology, Department of Oral Biology, Human Identification Research Institute, BK21 PLUS Project, Yonsei University College of Dentistry, Seoul, Republic of South Korea; <sup>2</sup>Miaero Clinic, Gwanak-ro, Gwanak-gu, Seoul, Republic of South Korea

**Introduction:** In previous studies, the subSMAS fat (named as 'innominate fascia') and the retro-orbicularis oculi fat (ROOF) have

been regarded as the different structures without any clear definition. Therefore, this study aims to analyze the anatomical location and continuation between the subSMAS fat and the ROOF by comparing the layered structure between these two deep fat compartments, and thereby to suggest a safe injection guideline for the forehead and temporal augmentation procedures.

**Materials and methods:** The ultrasonography scanning was performed from the upper medial eyebrow to the lateral region of superior temporal line from 10 healthy young volunteers to investigate the anatomical location and continuation pattern between the subSMAS fat and ROOF. Four Thai embalmed cadavers were dissected the orbicularis oculi, frontalis muscle, superficial temporal fascia, and SMAS to confirm the location and continuation pattern between the innominate fascia and ROOF.

**Results:** On ultrasound, the frontalis muscle and the superficial temporal fascia were connected each other. And there was hyperechoic connected fat layer underlying those structures from the frontal (submuscular layer) to temporal region (subSMAS fat). When dissecting, the ROOF which located deep to the orbicularis oculi and frontalis muscle continued to the subSMAS fat (innominate fascia) passing through the superior temporal line in the upper temporal region.

**Conclusions:** Based on our results, we confirmed that the subSMAS fat (innominate fascia) is an anatomical fat structure continued from the ROOF. This study may be helpful to suggest the safe injection layer in non-invasive treatment for forehead and temple augmentation procedures.

## P-093

### Comparison between conventional blind injection and ultrasound-guided injection technique of botulinum toxin on masseter: clinical trial

Hyungkyu Bae<sup>1</sup>, Jisoo Kim<sup>2</sup>, Hyosang Ahn<sup>1</sup>, Hyun-Jin Park<sup>1</sup>, Kyulim Lee<sup>1</sup>, Kyung-Seok Hu<sup>1</sup>, Hee-Jin Kim<sup>1</sup>

<sup>1</sup>Division in Anatomy and Developmental Biology, Department of Oral Biology, Human Identification Research Institute, BK21 PLUS Project, Yonsei University College of Dentistry, Seoul, Republic of South Korea; <sup>2</sup>YSBio Co. Ltd., Dr. Youth Clinic, Seoul, Republic of South Korea

**Introduction:** The aim of the study was to propose a more efficient and safer BoNT-A injection method on the masseter by comparing the conventional blind injection and the novel ultrasound (US)-guided injection technique through clinical trial.

**Materials and methods:** Forty sides of the masseter from 20 volunteers (10 males, 10 females; mean age: 25.6) were examined in the prospective study. The same doses (25U) of BoNT-A were injected into the masseter of each volunteer using conventional blind and US-guided injection techniques on left and right side, respectively. Each volunteer's masseter was then analyzed by three-dimensional facial scanning and US imaging before and after the injection. And it was analyzed in a same manner one month after the injection.

**Results:** US-guided injection showed higher facial contour reduction than the conventional blind injection procedure ( $p < 0.01$ ). The average amount of the facial contour reduction one month after the injection was 2.01 mm and 2.24 mm in conventional blind and US-guided injection, respectively. One case of paradoxical masseteric bulging (PMB) was observed on the side where conventional blind injection was performed.

**Conclusion:** US image visualizes the anatomical structures that may interfere the spreading of BoNT-A such as the deep inferior tendon,

so allowing it to be avoided during and after the injection. As a result, the incidence of PMB would be reduced by preventing the localization of BoNT-A within the masseter, and an even distribution would lead to better efficiency in facial contour and muscle volume reduction.

## P-095

### Anthropometric changes after thyroidectomy in patients with neck organs compression syndrome according to MRI in early postoperative period

Sergei Liashchenko, Arina Zhirnova, Oleg Abramzon

Orenburg State Medical University, Orenburg, Russian Federation

Thyroidectomy in patients with thyroid hyperplasia, that causes neck organs compression, leads to significant topographic-anatomical changes in neck organs. The MRI analysis on seven patients who have undergone the surgeries on multinodular colloid goiter and Graves' disease is performed. That all was accompanied by neck organs compression syndrome before thyroidectomy and 30 days after surgery. The transverse, anteroposterior trachea, esophagus, carotid artery, and jugular vein sizes were analyzed. The dislocation of the neck organs relative to each other and bone anatomical structures were assessed. The compared topographic and anatomical parameters, recorded before and after thyroidectomy, indicate that in the postoperative period the dislocation of the neck structure caused by thyroid hyperplasia is not eliminated. Tracheal disposition remains. The difference between pre- and postoperative transverse size values was on average 0–3 mm. Moreover, its angular displacement decreased by on average 6.6 degrees. The anterior–posterior size of the esophagus after surgery increased by on average  $1.03 \pm 0.42$  cm, which results in acquiring a spherical shape. In two patients, the esophagus was displaced from the membranous part of the trachea to its left-side wall, parallel to the latter up to the level of the thoracic vertebra. A significant increase in the transverse size of the jugular vein and its displacement anterior to the carotid artery were observed. In this case, the vagus nerve moved posteriorly. Evaluation of pre- and postoperative changes is necessary to improve the surgical technique under complex primary and redo surgeries on thyroid gland.

## P-096

### Comparison of postnatal development of different parts of the occipital bone

Nikola Štoković, Matea Vukić, Martin Čemerin

Department of Anatomy, School of Medicine, University of Zagreb, Zagreb, Croatia

**Introduction:** The occipital bone consists of the basilar part, two paired lateral parts and the squamous part. The aim of our work was to investigate dynamics of postnatal development of different parts of the occipital bone.

**Materials and methods:** In the study, we measured 79 occipital bones (age range 0–30 years) from the collection of separated skull bones at the Institute of Anatomy “Drago Perović”. 10 parameters which indicated the development of different parts of the occipital bone were measured for each bone. For all observed parameters, we calculated

the overall relative increase (%) at adult age in relation to the average values at birth.

Results: Total postnatal increase in observed dimensions of squamous part was between 15.1 and 46 mm, of lateral part between 6.3 and 12.7 mm and of basilar part 14.2 mm. Overall postnatal relative increase of squamous part dimensions ranged from 57 to 78%, while the increase of dimensions of the basilar and lateral parts ranged from 95 to 119%. The highest growth rate of all parts of the occipital bone was observed during the first year of life.

Conclusions: The squamous part of the occipital bone increased more in absolute values than basilar and lateral parts. However, basilar and lateral parts of the occipital bone which are part of the cranial base increased relatively more than the squamous part which in part forms the calvaria. The growth dynamics of different parts of the occipital bone may be of importance in clinical and forensic medicine.

## P-097

### Postnatal development of the parietal bone

Matea Vukić, Martin Čemerin, Nikola Štoković

Department of Anatomy, School of Medicine, University of Zagreb, Zagreb, Croatia

Introduction: The parietal bone is a paired bone which forms the central part of the calvaria. The aim of our research was to elucidate dynamics and relative changes in the dimensions of the parietal bone during postnatal development.

Materials and methods: We used 128 parietal bones (age range 0–30 years) from the collection of separated skull bones at the Institute of Anatomy “Drago Perović”. We measured 5 dimensions on each parietal bone (length of anterior margin, superior margin, posterior margin, inferior margin and bone thickness). Growth index (average value at adult age/average value at birth) was calculated for each observed dimension.

Results: Growth of the parietal bone was highest in the first year of life. Total increase in length of parietal bone margins during postnatal development ranged between 28.3 and 43.2 mm, while the growth indexes of the parietal bone margins length ranged between 1.5 and 1.72. Thickness of the parietal bone increased for 6.4 mm but due the thickness at birth, the growth index of thickness was 9.5.

Conclusions: The highest relative growth showed parietal bone thickness, while the other parts of the parietal bone showed similar growth rates as other bones of the calvaria. The presented dynamics of the growth of the parietal bone is important in paediatric neurosurgery and forensic medicine.

## P-098

### Postnatal development of the frontal bone

Martin Čemerin, Matea Vukić, Nikola Štoković

Department of Anatomy, School of Medicine, University of Zagreb, Zagreb, Croatia

Introduction: The frontal bone consists of the squamous part, two paired orbital parts and the nasal part. The aim of our research was to investigate the dynamics of frontal bone development and compare absolute and relative changes in the frontal bone dimensions during postnatal development.

Materials and methods: In our investigation, we used 94 frontal bones (age range 0–30 years). On each bone, we measured nine dimensions which were indicators of the growth of squamous, orbital and nasal part as well as bone thickness which was measured in the squamous part. In order to compare relative growth of different parts of the bone, growth index (average value at adult age/average value at birth) was calculated for each observed dimension.

Results: Total postnatal increase in observed dimensions of squamous part ranged between 25.6 and 49.6 mm, of orbital part between 12.6 and 15.6 mm and of the nasal part between 4.5 and 5.9 mm. However, all parts of frontal bone had similar growth indexes (squamous part 1.52–1.8; orbital part 1.58–1.62; nasal part 1.49–1.61). Largest relative increase in the size was observed in frontal bone thickness (8.15). The growth rate of the frontal bone was highest during the 1st year of life.

Conclusions: The squamous part of the frontal bone showed the highest increase in observed dimensions but all parts of the bone showed similar relative changes during postnatal growth. Understanding the frontal bone development is important both in clinical and forensic medicine.

## P-099

### Variability of sutural and fontanellar bones in Greek adult skulls

Konstantinos Natsis<sup>1</sup>, Trifon Totlis<sup>1</sup>, Maksim Tishukov<sup>1</sup>, Maria Piagkou<sup>2</sup>

<sup>1</sup>Department of Anatomy and Surgical Anatomy, School of Medicine, Aristotle University of Thessaloniki, Thessaloniki, Greece;

<sup>2</sup>Department of Anatomy and Surgical Anatomy, Medical School, National and Kapodistrian University of Athens, Athens, Greece

Introduction: Sutural (SBs) and fontanellar bones (FBs) are formed from independent ossification centers along cranial sutures and fontanelles. The current study, in Greek adult dry skulls, investigates the incidence of SBs and FBs, number and topography, exocranially and intracranially. Side symmetry, gender and age impact were also recorded.

Materials and methods: One hundred and twenty-four intact and 47 craniotomized skulls were examined.

Results: SBs appeared in the majority of skulls (74.3%). No gender dimorphism and age influence was detected concerning their incidence. Intracranially, 21 skulls (44.7%) had SBs and 3 skulls (6.4%) had FBs. In neurocranium, SBs and FBs showed a higher incidence, contrariwise to the orbit, in which SBs had a low incidence (2.9%). SBs most commonly located in lambdoid suture (LS) (43.3%), coronal suture (CS) (36.8%), parietomastoid suture (23.4%) and asterion (22.2%). SBs were also detected in occipitomastoid, sagittal, squamosal, zygomaticosphenoid, metopic, frontonasal and frontozygomatic suture. FBs were found at pterion (5.3%), anterior (1.8%) and posterior (1.2%) fontanelles. In LS, SBs (1–18 in number) were larger than 1 cm, while in CS (1-multiple) they were smaller than 0.5 cm. A statistical significant difference existed only in asterion (1–10 SBs) with left side dominance.

Conclusions: A high incidence of SBs and FBs in Greeks is highlighted, indicating racial variation. The meticulous knowledge of location, frequency and number of SBs is essential for clinicians intervening in the skull, anthropologists and forensic surgeons investigating child abuse cases.

**P-100****Is the level and body side depend on development at bifidity at spinous processes in cervical spine?**

Kamil Ludwisiak<sup>1</sup>, Michał Podgórski<sup>2</sup>, Ludomir Stefańczyk<sup>3</sup>, Robert Haładaj<sup>4</sup>, Łukasz Olewnik<sup>4</sup>, Przemysław Kiciński<sup>5</sup>, Michał Polgaj<sup>5</sup>, Agata Majos<sup>1</sup>

<sup>1</sup>Department of Diagnostic Imaging of the Central Clinical Hospital of the Medical University of Lodz, Lodz, Poland; <sup>2</sup>Department of Diagnostic Imaging, Polish Mother's Memorial Hospital-Research Institute, Lodz, Poland; <sup>3</sup>Department of Radiology and Diagnostic Imaging, Medical University of Lodz, Lodz, Poland; <sup>4</sup>Department of Normal and Clinical Anatomy, Interfaculty Department of Anatomy and Histology, Medical University of Lodz, Lodz, Poland; <sup>5</sup>Department of Angiology, Interfaculty Department of Anatomy and Histology, Medical University of Lodz, Lodz, Poland

**Introduction:** Our studies provide one of the first detailed quantitative analysis of morphology of the spinous processes in the cervical spine. **Materials and methods:** We analyzed computed tomography examinations of the cervical spine performed in 200 adult patients. To determine the exact dimensions of the spinous process and to characterize morphology of bifurcation the following parameters were used: length of the spinous process base, length and width of the spinous process branch. We proposed a new parameter—the branching coefficient.

**Result:** The total length and width of the spinous process branch parameters differed significantly between the body sides—on the left side was significantly longer and wither then on the right side ( $p = 0.0034$  and  $p = 0.0029$ , respectively). The spinous process base was significantly longer in CII and CVII than in the other vertebrae ( $p < 0.0001$ ). The spinous process branches were significantly longer in CVI and CVII than in the other vertebrae ( $p < 0.0001$ ). The maximum branch width did not differ significantly between the vertebrae ( $p = 0.5964$  for the right side, and  $p = 0.5956$  for the left). The branching coefficient was significantly higher for CII on the right side and for CII and CIV on the left side than for the other vertebrae, whereas, for CVI-CVII vertebrae it was significantly lower for both sides ( $p < 0.0001$ ,  $p < 0.0001$ , respectively). There were no significant differences between the sexes in any of the analyzed parameters. **Conclusion:** The application of the objectified, quantitative parameters based on morphometry allows for accurate characteristics of spinous process bifidity in the cervical region.

**P-102****Endoscopic endovascular visualisation: a new method for anatomical exploration of the cavernous sinus and dorello's canal**

Jacek Kunicki<sup>1</sup>, Bogdan Ciszek<sup>2</sup>, Pawel Krajewski<sup>3</sup>

<sup>1</sup>Department of Neurosurgery, Neurosurgical and Skull Base Anatomy Laboratory; Center of Oncology Institute, Warsaw, Poland; <sup>2</sup>Department of Descriptive and Clinical Anatomy, Medical University of Warsaw, Warsaw, Poland; <sup>3</sup>Department of Forensic Pathology, Medical University of Warsaw, Warsaw, Poland

**Introduction:** The anatomy of the cavernous sinus (CS) and the area of Dorello canal (DC) have been extensively described with standard anatomical dissections. Endoscopic techniques attract clinicians and anatomists to visualize complex and hard to reach topographical

areas. The aim of the study was evaluation of feasibility and image quality of a rigid optical endoscope for anatomic examination of internal structure of intact cavernous sinus and abducens nerve canal (Dorello's canal).

**Materials and methods:** The skull base tissue blocks with both cavernous sinuses from 30 fresh adult human cadavers were obtained during autopsies, the internal carotid arteries were injected with colored latex. The fresh specimens were examined endoscopically without fixation with rigid endoscopes (2.7 mm) with different optics (0 and 30°). The area was inspected through 2 portals : first the endoscope was inserted into the lumen of the inferior petrosal sinus from below, the second portal for CS/DC inspection was created in the area of the oculomotor triangle.

**Results:** Out of 60 examined cavernous sinuses the visualisation with endoscopic endovascular method was possible in 49 sides.(81.6%). The main obstacles were : lack or hypoplasia of inferior petrosal sinus 5/60(8.3%), excessive fat tissue filling the cavernous sinus 3/60 (5%) and residual trombi/clots attached to sinus walls 3/60 (5%).The internal structures and walls of the CS and DCwere accurately visualised.

**Conclusions:** The endoscopic encovascular visualisation allows visualisation of intact cavernous sinus for anatomic descriptions on separated sinus specimens and accurately reveals its internal relations.

**P-103****Spatial distribution of the palatopharyngeus in consideration of the role of the swallowing**

Keiko Fukino<sup>1</sup>, Masahiro Tsutsumi<sup>2</sup>, Akimoto Nimura<sup>3</sup>, Jose Sanudo<sup>4</sup>, Takashi Ono<sup>1</sup>, Keiichi Akita<sup>2</sup>

<sup>1</sup>Department of Orthodontic Science, Tokyo Medical and Dental University, Tokyo, Japan; <sup>2</sup>Department of Clinical Anatomy, Tokyo Medical and Dental University, Tokyo, Japan; <sup>3</sup>Department of Functional Joint Anatomy, Tokyo Medical and Dental University, Tokyo, Japan; <sup>4</sup>Departamento de Anatomía y Embriología Humanas Facultad de Medicina Universidad Complutense de Madrid, Madrid, Spain

**Introduction:** On the basis of the proximal attachment and direction of muscle bundles, we have clarified that the palatopharyngeus could play a major role in the velopharyngeal closure. Although some anatomical studies suggested that the palatopharyngeus also contribute to the swallowing based on the connection of the palatopharyngeus to the esophagus, the precise distribution of the palatopharyngeus below the level of the epiglottis still remains unclear. The current study aimed to investigate the spatial distribution of the palatopharyngeus, particularly its attachment on the esophageal entrance.

**Materials and methods:** Fourteen halves of 8 heads from Japanese cadavers were used.

**Results:** Two part of the palatopharyngeus, inferior and superior ones, originated from the inferior and superior surface of the soft palate, respectively. The inferior part ran anteroinferiorly to form the anterior part of the palatopharyngeal arch, and inserted to a part of the thyroid cartilage and the epiglottis. The superior part ran posteriorly in the superior region of pharynx and also inferoposteriorly in the middle region of the pharynx to form the posterior part of the arch. In addition, the superior part partially extended inferiorly to the inferior region of the pharynx and the internal surface of the circular muscle layer of the upper esophagus.

**Conclusions:** The sheet-like palatopharyngeus consisted of the muscle bundles expanding in the inner layer of the pharynx and esophageal

entrance. The palatopharyngeus might contribute to not only the velopharyngeal closure but also the esophagus opening.

## P-104

### Clinical anatomy of the stellate ganglion in menopausal symptoms treatment

Félix J. De Paz<sup>1</sup>, Josep M. Potau<sup>2</sup>, Isabel San José<sup>1</sup>, Roberto Cabo<sup>3</sup>, Mercedes Barbosa<sup>1</sup>, Miguel A. Galán<sup>4</sup>, Federico Montero<sup>4</sup>, María Pérez<sup>5</sup>

<sup>1</sup>Department of Anatomy and Radiology, University of Valladolid, Valladolid, Spain; <sup>2</sup>Unit of Human Anatomy and Embryology, University of Barcelona, Barcelona, Spain; <sup>3</sup>Department of Morphology and Cell Biology, SINPOS Group, University of Oviedo, Oviedo, Spain; <sup>4</sup>“Unidad de Estrategias de Afrontamiento Activo para el Dolor en Atención Primaria”, Primary Care Management Valladolid East, Valladolid, Spain; <sup>5</sup>Anesthesiology and Resuscitation, Hospital Clínico Universitario, Valladolid, Spain

**Introduction:** The stellate or cervicothoracic ganglion is a structure which is 1–2.5 cm in length and originates from the fusion of the lower cervical ganglion and the first thoracic ganglion in 80% of the cases. Whenever a ganglion blockade through blocking puncture is performed, it can lead to serious life-threatening complications, especially when it is done blindly, due to the anatomical disposition in proximity to critical structures (carotid artery). Ultrasonography is a cheap technique, which can be done at the bedside of the patient. It allows direct and real-time visualization of both the ganglion and adjacent structures and of the needle and the local anesthetic diffusion.

**Materials and methods:** During the first phase, we dissected six necks in order to obtain the exact location of the stellate ganglion. Later, we performed a transverse prospective study in 60 patients divided into two groups; one group served as the control group, while the other group underwent ganglion blockade with ropivacaine. Using ultrasonography, we performed stellate ganglion blockades in several critical clinical cases that were associated to sympathetic system overstimulation such as: arrhythmia storm, complex regional pain syndrome or menopausal symptoms.

**Results:** Ultrasound-guided stellate ganglion blockade technique with ropivacaine 0.2% (10 ml) has been shown to be useful in the treatment of complex regional pain, menopausal symptoms and post-traumatic stress, as well as Arrhythmic Storm (continuous infusion of 6 ml/h).

**Conclusions:** The precise anatomical location of the stellate ganglion is important, clinically, because its ultrasound-guided blockade is useful in blocking sympathetic hyperstimulation syndromes.

## P-105

### Regional thickness of facial skin and superficial fat: application to the minimally invasive procedures

Kang-Woo Lee<sup>1</sup>, You-Soo Kim<sup>2</sup>, Ji-Soo Kim<sup>3</sup>, Young-Chun Gil<sup>4</sup>, Tansatit Tanvaa<sup>5</sup>, Dong Hoon Shin<sup>2</sup>, Hee-Jin Kim<sup>1</sup>

<sup>1</sup>Division in Anatomy and Developmental Biology, Department of Oral Biology, Human Identification Research Institute, BK21 PLUS Project, Yonsei University College of Dentistry, Seoul, Republic of South Korea; <sup>2</sup>Department of Anatomy, Institute of Forensic Science,

Seoul National University College of Medicine, Seoul, South Korea, Republic of South Korea; <sup>3</sup>YSBio Co. Ltd., Dr. Youth Clinic, Seoul, Republic of South Korea; <sup>4</sup>Department of Anatomy, Chungbuk National University School of Medicine, Cheongju, Republic of South Korea; <sup>5</sup>Chula Soft Cadaver Surgical Training Center and Department of Anatomy, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand

**Introduction:** Various recently introduced minimally invasive treatment modalities are now widely used for enhancing the aging face. In a special, filler is used to increase the volume of tissue, and so understanding the regional thickness and distribution of the facial superficial fat is essential for optimizing minimally invasive procedures. The aim of this study was to establish the overall facial skin and superficial fat thicknesses using a 3D scanning system.

**Materials and methods:** From 53 adult Korean and Thai embalmed adult cadavers, the undissected and serially-dissected facial specimens were scanned and reconstructed. The facial skin and superficial fat thicknesses on seven facial regions were calculated from the superimposed images.

**Results:** The facial skin tended to become thicker in the order of the radix and dorsum, and the temple, supraorbital, forehead, perioral, cheek, and infraorbital areas. The skin was thinnest at radix and dorsum ( $1.51 \pm 0.55$  mm), and thickest in infraorbital region ( $1.97 \pm 0.84$  mm). The facial superficial fat thickness tended to increase in the order of the radix and dorsum, supraorbital, forehead, temple, cheek, infraorbital, and perioral regions. The superficial fat was thinnest at the radix and dorsum ( $1.61 \pm 1.07$  mm), and thickest in the perioral region ( $5.14 \pm 3.31$  mm). The superficial fat was thinnest at the rhinion ( $0.85 \pm 0.62$  mm) and thickest in the perioral region lateral to nasolabial fold ( $8.17 \pm 3.02$  mm).

**Conclusion:** The present findings indicate that 3D scanning system can yield crucial anatomical information about depths of the facial skin and superficial fat layers for utilization in various clinical procedures.

## P-106

### Intervention in dysphagia based on anatomical knowledge

Natividad García Atarés<sup>1</sup>, Félix Jesús De Paz Fernández<sup>1</sup>, Patricia Murciego Rubio<sup>2</sup>

<sup>1</sup>Faculty of Medicine, University of Valladolid, Valladolid, Spain; <sup>2</sup>Centro Hospitalario Padre Benito Menni, Valladolid, Spain

**Introduction:** Swallowing is a complex mechanical act which is coordinated by the nervous system and enabling food to move forward from the mouth to the stomach. In some patients including the elderly, oncological and neurological patients, swallowing can fail and lead to serious complications: choking, respiratory infections, malnutrition and others. Anatomical knowledge is necessary for the correct evaluation and intervention of dysphagia.

**Materials and methods:** Anatomical dissection of corpse in formol. Manuals and anatomical atlases. Application to patients with dysphagia of both active and passive orofacial and myofunctional therapy techniques.

**Results:** The study and the anatomical dissection are useful to learn the structures taking part in swallowing: dental arches, chewing muscles, salivary glands, orofacial and lingual musculature, palate, larynx, pharynx and esophagus; vascularization and innervation of the same and organization of sensory and motor pathways that regulate them. The specialized logopedic treatment (speech and language therapy) of dysphagia which is based on rehabilitative and

compensatory techniques improves the processes involved in swallowing by means of muscular and sensitive work, and thus:

- Reduces the risk of choking and cardiorespiratory arrest.
- Reduces respiratory infections due to aspirations.
- It enables to remove early the alternative feeds.
- Contributes to recover family and social life.

**Conclusions:** The logopedic intervention of the dysphagia which is based on the action on the main structures taking part in swallowing improves the feeding process, reducing or avoiding serious complications and preserving an acceptable quality of life.

## P-107

### The morphological study of the formation of tissues of the peri-implant zone at new method of vestibuloplasty

Dmitry Lysov<sup>1</sup>, Igor Markov<sup>1</sup>, Radik Khayrullin<sup>2</sup>, Sergey Bulanov<sup>1</sup>

<sup>1</sup>Medical University REAVIZ, Samara, Russian Federation;

<sup>2</sup>Ulyanovsk State University, Ulyanovsk, Russian Federation

**Introduction:** The inflammation and the periimplantitis are directly related to the deficiency of the gum tissue, its anatomical structure and the quality of oral mucosal auto-transplant at dental implantation. The purpose of the study is to develop a new method of vestibuloplasty of the formation of a peri-implant buffer zone and a morphological rationale for its effectiveness for introduction into the clinic.

**Materials and methods:** The experiments were performed on outbred adult and old dogs on ethical standards. Biopsy specimens of the hard palate mucosa were collected from animals during surgical interventions in the oral cavity or during euthanasia. For initiation of angiogenesis in buffer zones of the mucous membrane of the gums of old dogs, a special nano-sized composite material with a collagen matrix and the author's method of forming auto-transplant of the oral mucosa was used.

**Results:** In the study of biopsy specimens of the peri-implant gum tissues after the operation of the vestibuloplasty performed by microscopic methods, the absence of gingival tissue recession and soft tissue deficiency was established. Histological study of biopsy specimens revealed a high level of vascularization. The obtained results indicate the biological compatibility of the material used with the bone tissue of the alveolar process and its active initiation of angio- and osteogenesis. Peri-implant provisional regenerates underwent three stages of integration: fibro-integration, osteointegration fibro-osteointegration.

**Conclusions:** The developed method of vestibuloplasty is promising for testing and use in dental surgical practice to improve the clinical and aesthetic results of the implantation of the gum tissues.

## P-109

### Variability of foramen mastoideum and its clinical relevance

David Kachlik<sup>1</sup>, Roxane Riemer<sup>1</sup>, Martin Hamp<sup>2</sup>, Katerina Kikalova<sup>3</sup>, Matej Halaj<sup>2</sup>, Ondrej Nanka<sup>4</sup>

<sup>1</sup>Department of Anatomy, Second Faculty of Medicine, Charles University, Prague, Czech Republic; <sup>2</sup>Department of Neurosurgery, Faculty of Medicine and Dentistry, Palacky University Olomouc and University Hospital Olomouc, Olomouc, Czech Republic;

<sup>3</sup>Department of Anatomy, Faculty of Medicine and Dentistry, Palacky University Olomouc, Olomouc, Czech Republic; <sup>4</sup>Institute of Anatomy, First Faculty of Medicine, Charles University, Prague, Czech Republic

**Introduction:** Foramen mastoideum contains a large emissary vein and a small artery. Vena emissaria mastoidea is a venous communication between intracranial and extracranial venous system. It is clinically relevant in neurosurgery due to its variable number and location in the area of sutura occipitomastoidea. It can become a source of significant bleeding during surgical approach through processus mastoideus (retrosigmoid craniotomy) to reach pathologies localized in angulus pontocerebellaris. The aim was to provide particular morphological data about variability of foramen mastoideum. **Materials and methods:** 295 skulls obtained from six collections in Czech Republic were studied. Quantitative and qualitative parameters of foramen mastoideum were evaluated depending on gender and laterality. Individual distances of foramen from defined surface landmarks of the skull region as well as diameters were measured and statistically compared.

**Results:** The most common type of the foramen mastoideum featured two external openings (present in 41.2%), the second most common with one external opening was observed in 26.9% and the third with three external openings was recorded in 21.7%. The differences between right and left sides were not statistically relevant but between sexes they were: in women there was a lower number of openings on the right side, and lesser distances from the external opening were observed when evaluating qualitative parameters for defined surface landmarks. Average size of the external opening diameter was 1.3 mm.

**Conclusions:** The reported anatomical variability of foramen mastoideum can serve for evaluation of pre-operative planning using imaging methods before neurosurgical intervention in this region.

## P-110

### Subsurface microvessels in gingiva of patients with different biotypes

Gaia Pellegrini<sup>1</sup>, Elena Canciani<sup>1</sup>, Giacomo Begnoni<sup>1</sup>, Aurora Cristofalo<sup>1</sup>, Dolaji Henin<sup>1</sup>, Mariachiara Perrotta<sup>1</sup>, Luis Guilherme Fiorin<sup>2</sup>, Claudia Dellavia<sup>1</sup>

<sup>1</sup>Dept. of Biomedical Surgical and Dental Sciences, Università degli Studi di Milano, Milan, Italy; <sup>2</sup>Department of Surgery and Integrated Clinic, São Paulo State University (UNESP), School of Dentistry, Araçatuba, Brazil

**Introduction:** Gingival vascularization and biotype play a key role on the success of periodontal and prosthetic therapy. Aim of the present study was to characterize the distribution and to quantify microvessels in gingiva of patients with different biotypes by capillaroscopy.

**Materials and methods:** Microphotographs (200 ×) of free and adherent gingiva were taken in correspondence of upper incisors of 22 healthy volunteers. Structure and organization of microvessels were assessed. In 10 randomly selected microphotographs of the attached gingiva of each patient the amount of visible microvessels per mm<sup>2</sup> (VMN) were calculated. At the clinical observation study population was divided in four groups according to the biotype (thin, medium, thick and very-thick). Between groups statistical analysis (Kruskal–Wallis test and Mann–Withney test) was performed for data on VMN. **Results:** At the clinical observation, subjects were distributed among biotype groups as follows: 0 thin, 8 medium (7 females, 1 males), 6 (3

females, 3 males) thick and 8 (4 females, 4 males) very-thick. At the observation with capillaroscopy, microvessels appeared as tortuous capillary loops perpendicular to the gingival margin or as a network running parallel to the profile of the gingival margin. VMN resulted  $56.98 \pm 5.48$  for medium,  $51.22 \pm 4.54$  for thick and  $48.21 \pm 5.22$  for very-thick group and differences were significant (Kruskal–Wallis test  $p < 0.05$ ). VMN in medium group resulted significantly higher than in very thick group (Mann–Withney test  $p < 0.05$ ).

Conclusions: Higher amount of microvessels observed in subjects with medium biotype may explain their higher predisposition to develop inflammation and recession of the gingival margin.

## P-112

### Anatomical study of distribution of arterial and nerve of the subscapularis muscle using Sihler's staining technique

Hyun-Jin Kwon<sup>1</sup>, Tae-Hyeon Cho<sup>2</sup>, Hun-Mu Yang<sup>1</sup>, Sung-Yoon Won<sup>3</sup>

<sup>1</sup>Department of Anatomy, Yonsei University College of Medicine, Seoul, Republic of South Korea; <sup>2</sup>Yonsei University College of Medicine, Seoul, Republic of South Korea; <sup>3</sup>Department of Occupational Therapy, Semyung University, Jecheon, Republic of South Korea

Introduction: Nowadays, during or after surgical procedures of subscapularis can be caused the complications damaged by nerve and artery. In this present study was to establish nerve and artery distribution map in the subscapularis by using a Sihler's staining technique and suggest an effective and safe surgical approach during subscapularis. Mapping of nerve and artery distribution in the subscapularis, particularly it can be eliminated subjectivity among observers and provide surgeon with more accurate and objective landmark.

Materials and methods: The staining was performed from respectively ten specimens to establish nerve and artery distribution map in the subscapularis.

Results: First, the subscapularis is typically innervated by the upper and lower subscapularis nerve and additionally innervated by the axillary nerve (4/10) and thoracodorsal nerve (2/10). Second, the subscapularis is generally received arterial supply of the subscapular artery and additionally observed lateral axillary artery branches (7/10), posterior circumflex artery (50%), lateral thoracic artery (40%), circumflex scapular artery (40%), suprascapular artery (30%) and dorsal scapular artery (20%). Then, we classified into three types in anterior facet and three types in posterior face, respectively.

Conclusions: This study recommended anatomical information of the subscapularis and it will be help clinicians to avoid complications during and after surgical procedures.

## P-113

### Anatomic position of the pterion on either surface

Mehmet Ali Guner<sup>1</sup>, Ali Can Korkmaz<sup>2</sup>, Aysun Uz<sup>2</sup>, Luis Filgueira<sup>3</sup>

<sup>1</sup>University of Health Sciences Faculty of Medicine, Ankara, Turkey; <sup>2</sup>Ankara University School of Medicine, Ankara, Turkey; <sup>3</sup>University of Fribourg, Fribourg, Switzerland

Introduction: There are many studies in literature related with externally conjunction variations of the bones that forming pterion.

However there is not any relevant study concerned with intracranial localization of pterion. Intracranial localization of pterion and its surgical importance was investigated.

Materials and methods: Anterior and posterior edges of inner pterion were carefully drilled outwards to compare these points with outer structures. The drill was externally placed over the anterior and posterior edges of outer pterion, and these points were drilled through the bone perpendicular to the skull surface. Then the position of the drill holes was determined on the inner surface. Thus the relationship between the pterions and groove for middle meningeal artery (MMA) was evaluated. The lengths of pterions and the vertical distances between midpoints of inner and outer pterions with the inferior temporal line were measured.

Results: The mean vertical distance between the midpoint of inner and outer pterions with the inferior temporal line was 21.8 and 14.5 mm respectively. The drill holes of anterior and posterior edges of outer pterion were passed superior to the groove for MMA at 12 dried skulls (24%), inferior to the groove for MMA at 8 dried skulls (16%) and penetrated at 30 dried skulls (60%) internally. The distances between the anterior and posterior points of pterion were 10.84 mm (5.58–18.20) internally and 8.88 mm (3.47–17.49) externally.

Conclusions: It was to consider the relation between both inner and outer pterions with the bony structures adjacent to pterion while performing pterional approaches.

## P-114

### Normal and variant anatomy of vertebrobasilar system and its clinical significance in Uttar Pradesh region: a ct angiographic study

Sarah Sko Sangma<sup>1</sup>, Prof. Jyoti Chopra<sup>2</sup>, Prof. Hira Lal<sup>3</sup>, Arvind Kumar Pankaj<sup>2</sup>, Garima Sehgal<sup>2</sup>

<sup>1</sup>All India Institute Of Medical Sciences, New Delhi, India; <sup>2</sup>King George's Medical University, Lucknow, India; <sup>3</sup>Sanjay Gandhi Postgraduate Institute Of Medical Sciences, Lucknow, India

Introduction: Arterial supply of brain consists of anterior and posterior circulations. Anterior circulation comprises of Internal carotid artery and its branches. Posterior circulation comprises of Vertebrobasilar system (VBS) and it contributes about 20% of arterial blood supply to brain. Variations of VBS are quite common. These variations include abnormal origin, aplasia, hypoplasia and duplication. The present study is undertaken with an aim to study normal anatomy and variations of the VBS in Uttar Pradesh region as depicted by CT angiography.

Materials and methods: Head and neck CT angiographic study of 100 subjects, of all age groups of either sex was done at KGMC, Lucknow.

Results: In 93% cases variations of VBS was noticed. Unilateral VA (vertebral artery) hypoplasia was observed in 16%. In 22% Basilar artery (BA) was formed at PMJ (pontomedullary junction), 15% proximal to PMJ and 55% distal to PMJ. In 8% single VA continued as BA. Hypoplasia of BA was seen in 1 case. Unilateral AICA (anterior inferior cerebellar artery) hypoplasia was observed in 13% cases and bilateral in 5%. Unilateral AICA apalsia was observed in 20% cases whereas bilateral in 5%. In 8% unilateral PCA (posterior cerebral artery) hypoplasia was observed and bilateral PCA hypoplasia was seen in 2%. SCA (superior cerebellar artery) hypoplasia, aplasia, fenestration or duplication was not observed.

Conclusion: A detailed knowledge of vascular variations is not only useful to surgeons in planning their shunt operations but also keeps

away inadvertent vascular traumas during surgeries and avoids potential diagnostic pitfalls.

## P-115

### Morphological evaluation of marginal tubercle of zygomatic bone with bony landmarks of lateral orbital region

Aysun Uz<sup>1</sup>, Ali Can Korkmaz<sup>1</sup>, Mehmet Ali Guner<sup>2</sup>, Luis Filgueira<sup>3</sup>

<sup>1</sup>Ankara University School of Medicine, Ankara, Turkey; <sup>2</sup>University of Health Sciences Faculty of Medicine, Ankara, Turkey; <sup>3</sup>University of Fribourg, Fribourg, Switzerland

**Introduction:** The aim of present study is to identify palpable bony landmarks in the lateral wall of the orbital cavity such as the marginal tubercle (MT) of zygomatic bone, the Whitnall's tubercle (WT), the zygomatic arch (ZA) and the lateral rim of the orbit.

**Materials and methods:** The marginal tubercle's distance from the frontozygomatic suture (FZS), the most lateral point of the orbital rim (mlOR), lateral orbital rim horizontally and zygomatic arch vertically were measured on thirty dried skulls (sixty orbits) and a Caucasian adult male head cadaver was dissected to correlate between bony landmarks and soft tissue structures. The shape of the Whitnall's tubercle was investigated in each orbit.

**Results:** The shape of WT was flat in 32 orbits, apparent in fourteen orbits and imperceptible or absent in fourteen orbits. The mean and standard deviation of the distance MT-OR, MT-FZS, MT-ZA and MT-mlOR on the right side were respectively  $12.02 \pm 1.75$  mm,  $12.34 \pm 1.56$  mm,  $13.88 \pm 1.67$  mm and  $11.32 \pm 1.57$  mm and on left side were  $11.57 \pm 1.75$  mm,  $11.77 \pm 1.49$  mm,  $14.18 \pm 1.75$  mm,  $10.53 \pm 1.45$  mm. The r value of MT-OR, MT-FZS, MT-ZA and MT-mlOR between right and left orbits were 0.891, 0.633, 0.638 and 0.814. Furthermore, the meaningful correlation of the distances in the same side was only found between MT-OR and MT-FZS and were 0.763 on right side and 0.731 on left side.

**Conclusions:** The present study which emphasized the importance of the bony landmarks on the lateral orbital region revealed the mean, standard deviation and correlation in between abovementioned to guide surgeons before planning operations.

## P-117

### Stereological evaluation of the transvers foramen and vertebral foramen in atlas

Sevda Lafcı Fahrioğlu, Oben Acay, Musa Muhtaroglu, Selda Önderoğlu

Near East University, Nicosia, Cyprus

**Introduction:** The transvers foramen is a characteristic morphological feature for a cervical vertebra which includes the vertebral artery, vertebral vein and sympathetic nerves. They may vary in size and shape, or they may not be present completely. The transverse foramen in the atlas is the last hole in which the anatomical structures pass to the base of cranium. The vertebral foramen in the atlas is the last part of the vertebral canal which contains medulla spinalis. The brain stem begins immediately after the level of foramen magnum. Because of

the anatomical features of these structures which are located between the skull base and the vertebral column, are very important in surgery, radiology and anatomically.

**Materials and methods:** The diameters and areas of the transverse and vertebral foramina in atlas and their ratio were examined in one hundred twenty CT scans.

**Results:** Asymmetry of the right and left half of the vertebral foramen was recorded.

**Conclusions:** The morphological measurements, areas and its ratio of the transvers and vertebral foramina in atlas will contribute to the surgical procedures, radiological evaluations and anatomical information.

## P-119

### Morphology of the vasa nervorum of the porcine heart

Vladimír Musil<sup>1</sup>, Petr Zach<sup>2</sup>, Josef Šach<sup>3</sup>, Jana Vránová<sup>4</sup>, Zdeněk Suchomel<sup>5</sup>, Václav Kudrna<sup>6</sup>, Jitka Riedlová<sup>2</sup>, Jana Mrzálková<sup>2</sup>, David Kachlík<sup>7</sup>, Josef Stingl<sup>2</sup>

<sup>1</sup>Charles University, Third Faculty of Medicine, Centre of Scientific Information, Prague, Czech Republic; <sup>2</sup>Charles University, Third Faculty of Medicine, Department of Anatomy, Prague, Czech Republic; <sup>3</sup>Charles University, Third Faculty of Medicine, Department of Pathology, Prague, Czech Republic; <sup>4</sup>Charles University, Third Faculty of Medicine, Department of Medical Biophysics and Informatics, Prague, Czech Republic; <sup>5</sup>Department of Pediatrics, Hospital Teplice, Teplice, Czech Republic; <sup>6</sup>Institute of Animal Science, Prague, Czech Republic; <sup>7</sup>Charles University, Second Faculty of Medicine, Department of Anatomy, Prague, Czech Republic

**Introduction:** In the recent clinical and anatomical literature there is an absolute lack of data about the morphology of vasa nervorum of cardiac nerves. The goal of the study was to perform a histological analysis of the vascular supply of the subepicardial cardiac nerves and the Purkinje fibres in porcine hearts.

**Materials and methods:** The study was performed on 20 hearts of healthy pigs using light microscopy and four types of staining. Sections from the upper, middle and lower parts of the anterior interventricular sulcus were examined. In each section we recorded the number of nerve fibres, their thickness and the number of accompanying blood vessels.

**Results:** In total 317 nerve fibres were identified, with a range in diameter of 15–347 µm. The vasa nervorum were found in 75% of cases. In 43.75% of cases the vasa nervorum supplied perivascular nerves and in 56.25% they supplied freely coursing subepicardial nerves. The presence or absence of the vasa nervorum was not dependent on topographical location or the thickness of the nerve fibres. The vasa nervorum were not found, apart from one exception, in any of the analysed subendocardial complexes of Purkinje fibres.

**Conclusions:** The majority of the subepicardial nerves of porcine hearts have well developed vasa nervorum. These vessels may play a significant role in the modulation of cardiac nerves via retrograde application of neuro-stimulating medications. Vasa nervorum were not identified supplying any of the Purkinje fibres.

The work was supported by projects of Charles University Q41 and Q16.

**P-120****Left origin of the right coronary artery: a rare case in cardiac anatomy**

Gregory Tsoucalas<sup>1</sup>, Eleni Panagouli<sup>2</sup>, Ioannis Kaffes<sup>3</sup>, Vaso Argyrouli<sup>3</sup>, Vasilios Thomaidis<sup>1</sup>, Alike Fiska<sup>1</sup>

<sup>1</sup>Democritus University of Thrace, Alexandroupolis, Greece;

<sup>2</sup>National and Kapodistrian University of Athens, Athens, Greece;

<sup>3</sup>Iaso Thessalias, Larissa, Greece

**Introduction:** The right and left coronary arteries (CA, RCA-LCA) originate from the right and left coronary sinuses, respectively. The RCA supplies the right atrium, right ventricle and parts of the left chambers and atrioventricular septum. Meanwhile, the LCA supplies a lower myocardial volume, almost all the left ventricle and atrium and most of the interventricular septum. It gives rise to two main branches: the anterior interventricular and the circumflex artery. We describe a rare case of an abnormal origin of the RCA from the left posterior sinus together with the LCA, giving the impression of a double LCA.

**Materials and methods:** The variation was randomly discovered during a coronary angiography in a male patient aged 51 due to pathology during a cardiac exercise stress test.

**Results:** A common stem was observed, originating from the left posterior sinus, giving rise to two branches. The first was considered as the LCA, presenting the expected branching pattern and course, while the second turned to the anterior surface of the heart, passing behind the pulmonary artery, reaching the atrioventricular groove. It then followed a branching pattern similar to the RCA, which it seemed to replace, as no RCA was risen from the anterior (right coronary) sinus.

**Conclusions:** An unexpected origin of a CA from the opposite sinus is reported with an incidence of 0.84%, with that of the RCA arising from the left sinus ranging between 0.019% and 0.49%. It may lead to complications during interventional procedures, myocardial ischemia and even sudden cardiac arrest.

**P-121****Anatomy of the coronary sinus ostium**

Julija Zhivadnikovik, Marija Papazova, Niki Matveeva, Biljana Zajirova, Elizabeta Chadikovska, Ace Dodevski, Biljana Bojadzieva

*Institute of Anatomy, Medical Faculty, Univ. Ss" Cyril and Methodius", Skopje, Macedonia*

**Introduction:** The ostium of the coronary sinus (OCS) is a significant landmark in the anatomy of the right atrium. The aim of this study was to present the diameter of OCS, its location inside the base of the triangle of Koch and the degree of development of the Thebesian valve.

**Materials and methods:** The examination was made on 100 human hearts obtained after autopsies and fixed in 10% formaldehyde. The diameters of the OCS were directly measured to the nearest millimeter using a caliper. The anatomical details of the Thebesian valve were documented in each case in terms of the shape and extent of coverage of the OCS. According to their shapes, the valves have been

classified as semilunar, fenestrated and band-like. According to the extent of coverage of the OCS the valves were classified as covering less than 15% of the OCS (residual), between 15 and 75% (partial) and more than 75% of the ostium.

**Results:** The main value of the length of the base of the triangle of Koch (side b) was  $20.2 \pm 3.6$  mm, of the segment b1— $3.3 \pm 1.6$  mm, b2— $9.3 \pm 1.8$  mm, b3— $8 \pm 2.8$  mm.

Thebesian valve was absent in 14 cases, residual in 30 cases, partial in 48 cases and in 8 specimens the valve covered more than 75% of the ostium.

**Conclusion:** The knowledge of these anatomical variations of the CSO and the Thebesian valve may be useful in overcoming the difficulties in clinical practice.

**P-122****Direct emergency of the conus artery from an independent ostium. Observations based on a Spanish sample**

Carme Rissech, Anna Carrera, Francisco Reina

*Faculty of Medicine, University of Girona, Girona, Spain*

The objective of this study was to evaluate the ostium origin of the conus artery.

**Materials and methods:** Twenty-five adult hearts from current Spanish individuals belonging to the Anatomical Unit of the Faculty of Medicine in the University of Girona (Girona, Spain) were analysed. We dissected, photographed, and macroscopically examined both coronary arteries and the conus artery. We particularly observed their ostium origin inside the aorta valves in each heart.

**Results:** Three of the 25 individuals analysed (12.0%) showed a directly emergence of the conus artery from a discrete ostium in the right sinus of Valsalva. This prevalence is similar to that observed in Japanese (10%) and lower than that observed in Americans (50%), Britons (38%) and Pakistanis (27%). The evaluated anatomical variant is one of the less malignant coronary malformations. Although some of the coronary malformations do not have clinical effects under normal circumstances, they usually are related to sudden death and because of this, the possibility of any coronary artery malformation should be considered and eliminated in young individuals showing thoracic pain, palpitations, dyspnea or syncope of stress.

**Conclusions:** Depending on the trajectory of the conus artery, the evaluated anatomical variant is one of the less malignant coronary malformations. However, because the relationship of coronary artery malformations and the cases of sudden death, it is important to rule out any coronary artery malformation in young patients with thoracic pain, palpitations, dyspnea or syncope of stress.

**P-123****Anatomical variants of the distribution of subepicardial fat tissue and its relationship with lymphatic capillaries in human heart**

Igor Markov<sup>1</sup>, Nikolay Lysov<sup>1</sup>, Radik Khayrullin<sup>2</sup>

<sup>1</sup>Medical University Reaviz, Samara, Russian Federation; <sup>2</sup>Ulyanovsk State University, Ulyanovsk, Russian Federation

**Introduction:** The subepicardial fat tissue and lymphatic capillaries are important for the neurovascular regulation of the subepicardial parts of the coronary arteries and for the development of coronary disease. The objective of the study is to determine the architecture of fat tissue and the lymphatic bed in the subepicardium.

**Materials and methods:** By macroscopic and microscopic methods of the heart in 57 cases of autopsies of adulthood was studied, in which diseases of the cardiovascular system and the pathology of fat metabolism were not diagnosed at the lifetime.

**Results:** Three anatomical variants that characterize the intensity and distribution of subepicardial fat tissue were identified. In the first variant (9 cases), the fat tissue is located in the coronary groove and surrounds the neurovascular complexes. In the second variant (11 cases), the fat tissue is located on the lateral surfaces of the ventricles and at the apex of the heart. In the third variant (37 cases), the heart is uniformly enclosed on all sides into a thin case of fat tissue with thinning in the anterior and posterior walls of the left ventricle. In all cases, specific microstructural features of the relationship of fat tissue cells with the walls of lymphatic capillaries are established.

**Conclusions:** The identified variants of fatty tissue distribution and its relationship with the lymphatic microvessels bed in the subepicardium may reflect different mechanisms of blood flow regulation in the subepicardial part of the coronary arteries of the heart and be important for the development of heart pathology.

## P-125

### Anatomical differences in the organization of intertrabecular spaces of ventricles of the human heart

Igor Markov<sup>1</sup>, Tatyana Malykhina<sup>1</sup>, Radik Khayrullin<sup>2</sup>

<sup>1</sup>Medical University Reaviz, Samara, Russian Federation; <sup>2</sup>Ulyanovsk State University, Ulyanovsk, Russian Federation

**Introduction:** The study of the ratio of volumes of heart chambers has important for understanding the mechanisms of myocardial contraction at change in circulating blood volume and pressure. The aim of the study is to determine the ratio of volumes of intertrabecular spaces (ITS) of the myocardium in ventricles as additional volumes.

**Materials and methods:** By the injection of coronary vessels with a solution of Paris blue dye and method of corrosive replicas investigated volumes of ITS of the ventricles of 60 hearts obtained in the process of standard autopsy.

**Results:** The topographic features of distribution and orientation of ITS of various shapes and sizes in the inner wall of ventricles of the heart have been established. ITS from the chamber of the left ventricle penetrate only into the subendocardial layers and consist 10% of overall volume, whereas the ITS from the chamber of the right ventricle enter the outer layer of the myocardium and consist 16%, respectively. A quantitative indicator is proposed for assessing the degree of development of myocardial trabeculae.

**Conclusions:** The spiral geometry of the ITS contributes to the twisting of outflowing blood flows in ventricles of the heart, their stabilization and acceleration into systole and the slowing of carrying flows into diastole. The differences in the organization of the ICC in left and right ventricles consist in a slower movement of the bringing blood flow and a faster release of the outgoing blood flow into the aorta in the left ventricle compared to the right one.

## P-126

### Morphometric data of the superior peroneal retinaculum for surgical repair and reconstruction

Pimpimon Dangintawat<sup>1</sup>, Jirun Apinun<sup>2</sup>, Thanasil Huanmanop<sup>1</sup>, Sithiporn Agthong<sup>1</sup>, Vilai Chentanez<sup>1</sup>

<sup>1</sup>Department of Anatomy, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand; <sup>2</sup>Department of Orthopedics, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand

**Introduction:** This study was conducted to investigate the characteristics, attachments and morphometric parameters of the superior peroneal retinaculum (SPR).

**Materials and methods:** The SPR of 109 embalmed cadaveric legs were dissected in prone position. Morphology and morphometric details were recorded. The occurrence of peroneal tendon tear was noted.

**Results:** The SPR might be a single band or split into proximal and distal bands to insert on the posterior intermuscular septum and lateral wall of calcaneus. Based on the characteristics and insertion pattern, it could be divided into 3 types: type I (subtype Ia and Ib) (double bands), type II (single band) and type III (single band) with the prevalence of 57.80% (12.84%, 44.04%), 1.83%, and 41.28%. Symmetrical pattern was found in 52.73% with type III as the most common. Average lengths of SPR inserted on the posterior intermuscular septum and on the lateral wall of the calcaneus were  $22.05 \pm 3.99$  and  $28.41 \pm 5.49$  mm. The widest part of the SPR was at its origin with an average of  $18.37 \pm 4.13$  mm. The mean upward and downward angles were  $10.02 \pm 5.80$  and  $40.75 \pm 18.98$  degrees. The average coordinates (X, Y) of the midpoint of origin, the insertion on the posterior intermuscular septum and the lateral wall of calcaneus measured from the tip of fibula were reported. Prevalence of peroneus brevis tendon tear was 12.84% and associated with SPR type Ib.

**Conclusions:** Precise information of the characteristic, morphometric data and coordinates of attachment sites are essential for specifying the precise area of SPR reattachment and reconstruction.

## P-128

### Prevalence and significance of linburg-comstock variation in general population

Mirela Eric<sup>1</sup>, Kaissar Yammine<sup>2</sup>, Georg Feigl<sup>3</sup>, Dušica Marić<sup>1</sup>, Nikola Vučinić<sup>1</sup>, Vipin Gosh<sup>4</sup>

<sup>1</sup>Department of Anatomy, Faculty of Medicine, University of Novi Sad, Novi Sad, Serbia; <sup>2</sup>Department of Orthopedics, Lebanese American University Medical Center-Rizk Hospital, Lebanese American University School of Medicine; The Center for Evidence-Based Anatomy, Sport & Orthopedic Research, Beirut, Lebanon; <sup>3</sup>Institute of Macroscopic and Clinical Anatomy, Medical University of Graz, Graz, Austria; <sup>4</sup>Faculty of Medicine, University of Novi Sad, Novi Sad, Serbia

**Introduction:** Linburg-Comstock variation, the tendinous interconnection between flexor pollicis longus and flexor digitorum profundus, is known to have a wide frequency ranges. Its prevalence

is reported with a range of 13–66%. The aim of the study was to assess this variation in general population and to correlate it with gender and side.

**Materials and methods:** This prospective study included 215 subjects (82 males and 133 females). Two clinical tests were conducted to diagnose the variation and to detect any related symptomatology. The primary outcome is set to be the prevalence of LCV. Secondary outcomes were defined as gender-based prevalence, side-based prevalence, and LCV prevalence association with gender and side.

**Results:** LCV was clinically diagnosed in 130 (60.47%) participants. Unilateral and bilateral prevalence were of 17.21% and 43.26%, respectively, yielding a statistically significant difference. Right-sided and left-sided presence was calculated at 7.44% and 9.77%. Bilateral prevalence was statistically more common in females. Right-sided LCV was found to be more frequent in males while left-sided LCV was more prevalent in females. The index finger was the most commonly involved with prevalence of 91.03%. Symmetry was noted in 67.74% of subjects.

**Conclusion:** The results of our study demonstrated a relatively high prevalence of the LCV. We noted a few unusual cases and this finding point to the existence of the broader spectrum of LCV and complexity of the flexor apparatus of the hand. Because of possibility of false positive result during clinical testing we suggest to use expanded clinical method.

## P-130

### Evaluation of the sciatic nerve location regarding its relationship to the piriformis muscle: a cadaveric study

*Perin Wanae-Loh, Sithiporn Agthong, Vilai Chentanez, Thanasil Huanmanop*

*Department of Anatomy, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand*

**Introduction:** The localization of the sciatic nerve (SN) is essential for the achievement of several procedures performed in the gluteal region. This study proposed to investigate the location of the SN regarding its relationship to the piriformis (SN-PM) by the line joining the posterior superior iliac spine (PSIS), ischial tuberosity (IT) and greater trochanter (GT).

**Materials and methods:** SN-PM relationship was examined in 102 cadavers (55 males, 47 females). Distances between PSIS, IT, and GT were measured. Midpoints of SN at the lower edge of PM ( $S_1$ ) and IT-GT ( $S_2$ ) were marked. Perpendicular distances from  $S_1$  to PSIS-GT ( $S_1$ -R) and to PSIS-IT ( $S_1$ -Q), were measured. PSIS-R, PSIS-Q and IT- $S_2$  were measured and calculated into percentage of PSIS-GT, PSIS-IT and IT-GT.

**Results:** Three types of SN-PM (a, b, c) were obtained. The mean of PSIS-IT, IT-GT, and PSIS-GT were  $129.63 \pm 11.89$ ,  $73.02 \pm 10.20$  and  $151.34 \pm 14.78$  mm, respectively. A statistically significant difference of PSIS-IT in type a and type b ( $p = 0.013$ ) was noted. Localization of SN by percentage of distance between PSIS, IT and GT showed significant difference only in PSIS-Q of type a and type b. Therefore, SN at  $S_1$  located at the point of  $54.19 \pm 6.10\%$  of PSIS-GT from PSIS (R) with a distance of  $82.11 \pm 13.04$  mm perpendicular to PSIS-GT ( $S_1$ -R). The SN at  $S_2$  located at the point of  $37.87 \pm 8.27\%$  of IT-GT from IT. No significant difference was found between types.

**Conclusion:** SN can be localized by the PSIS, IT and GT without statistical significant difference between type a, b and c of SN-PM relationships.

## P-131

### Guideline for botulinum toxin injections in the effective treatment of peroneal spasticity

*You-Jin Choi<sup>1</sup>, Tae-Hyeon Cho<sup>2</sup>, Sung-Yoon Won<sup>3</sup>, Hun-Mu Yang<sup>2</sup>*

*<sup>1</sup>Division in Anatomy and Developmental Biology, Department of Oral Biology, Human Identification Research Institute, BK21 PLUS Project, Yonsei University College of Dentistry, Seoul, Republic of South Korea; <sup>2</sup>Department of Anatomy, Yonsei University College of Medicine, Seoul, Republic of South Korea; <sup>3</sup>Department of Occupational Therapy, Semyung University, Jecheon, Republic of South Korea*

**Introduction:** The present study used a modified Sihler's staining method to analyze the nerve distributions of the peroneus muscle with the aim of identifying the most effective sites for injecting BoNT-A to treat peroneal spasticity.

**Materials and methods:** Ten specimens of the peroneus longus and brevis were stained in this study. To present our findings more effectively, we divided the peroneal muscles into four quarters, which were defined as sections 1, 2, 3, and 4 starting from the proximal part of the leg.

**Results:** There were one, two, and three nerve entry points in one (10%), six (60%), and three (30%) of the peroneus longus specimens, respectively, and in four (40%), five (50%), and one (10%) of the peroneus brevis specimens. We counted the number of nerve endings in each section: 321 and 195 points were identified in the peroneus longus and brevis, respectively. The density of nerve endings was highest in section 2 of the peroneus longus ( $147/321$ , 46%) and in section 3 of the peroneus brevis ( $78/195$ , 40%).

**Conclusion:** The landmarks used in this study (the fibular head and lateral malleolus) are easily palpable on the skin surface, allowing clinicians to target the effective injection site (section 2) without requiring ultrasound guidance, especially for the peroneus longus. However, in the case of the peroneus brevis it is necessary to identify the muscle origin using ultrasound before injecting BoNT-A.

## P-133

### The comparison of the frequency of the anatomical forms of the talus in modern populations

*Radik Khayrullin<sup>1</sup>, Alisa Safullina<sup>2</sup>, Farkhad Khayrullin<sup>1</sup>*

*<sup>1</sup>Ulyanovsk State University, Ulyanovsk, Russian Federation; <sup>2</sup>Bashkir Republic Hospital No 2, Ufa, Russian Federation*

**Introduction:** Ankle injuries are often accompanied by talus fractures. One of the important anatomical predictors of these pathologies is the shape of the talus. The aim of the study is to establish the frequency of distribution of the main anatomical forms of the talus in accordance with various classifications in the modern population for comparison with clinical-statistical data.

**Materials and methods:** The material was talar bones of 60 people (40 men and 20 women) obtained in the production of forensic medical examination. The anatomical shape of the talus bones was determined by the types of articular facets, squatting edges and the shape of the block part. The data obtained were compared with data for other populations using by formulas of the power of similarity and difference, based on the mathematical theory of sets.

**Results:** It was established that the second type of the talus bone has the highest frequency, in which the anterior and medial articular

facets are separated by a margin (58.2%), and also the talar bones with a lateral type of squat edge (32.8%) and a continuous type of block expansion parts of the bone (41.3%).

Conclusions: The comparison of the obtained data with data of other authors and with the results of clinical-statistical data for these populations showed statistically significant differences. The data obtained show that the frequency of different forms of the anatomical form of the talus can reflect the different frequency of the talus and of the ankle joint injuries in different groups of people.

## P-134

### Anatomic postural evaluation of the Turkish cypriot women with beta thalasemia major living in cyprus

*Sevda Lafci Fahrioglu<sup>1</sup>, Emine Can<sup>2</sup>, Ender Angin<sup>3</sup>, Musa Muhtaroglu<sup>1</sup>*

<sup>1</sup>Near East University, Faculty of Medicine, Anatomy Department, Nicosia, Cyprus; <sup>2</sup>Dr. Burhan Nalbantoglu State Hospital, Nicosia, Nicosia, Cyprus; <sup>3</sup>Eastern Mediterranean University, Faculty of Health Sciences, Famagusta, Cyprus

Introduction: The aim of this study is evaluation and comparison of the anatomical posture in females which are healthy and females diagnosed with Beta thalasemia major living in Cyprus.

Materials and methods: Experiment group consisting of females diagnosed with beta thalasemic major by the hematologist formed the control group of randomly chosen healthy female individual. The power analysis was used to determine the number of people that were included into the groups. 30 healthy and 30 beta thalasemic major individual were used in the study. New York Postural Analysis Method and flexibility tests were applied for body alignment and flexibility. 13 parts of the body observed and evaluated. The comparison of  $\beta$  thalasemia and healthy group was done with ki square testing.

Results: In terms of NYPAM know definite differences were observed between the groups ( $X^2 = 2.222$ ;  $p = 0.329$ ) A medium level of postural defect was observed among individuals.

Conclusion: As the conclusion of the study we can say that, to lower the risk of postural defect and to motivate the patients for a healthier daily life. They should be encouraged to do the appropriate exercise programmes under the guidance of related health specialists.

## P-135

### Capsular morphology of the posterior rotator interval: a novel anatomical study

*Elle Põldoja<sup>1</sup>, Madis Rahu<sup>1</sup>, Kristo Kask<sup>2</sup>, Jüri-Toomas Kartus<sup>3</sup>, Imke Weyers<sup>4</sup>, Ivo Kolts<sup>1</sup>*

<sup>1</sup>University of Tartu, Tartu, Estonia; <sup>2</sup>Department of Orthopaedics, Tallinn, Estonia; <sup>3</sup>Orthopaedic Department, Gothenburg, Sweden; <sup>4</sup>Institute of Anatomy, Lübeck, Germany

Introduction: The morphology of the posterior rotator interval (PRI) has been rarely studied, despite its potential surgical importance. The PRI is the part of the shoulder joint capsule located between the supraspinatus and infraspinatus tendons medially and; laterally, were the capsule and tendons fuse (Miller et al. 2003). The morphology of the joint capsule has not been defined in this region. Therefore, the

purpose of this anatomical study was to elucidate the structure of the shoulder joint capsule in the PRI.

Methods: Seven cadaveric shoulder specimens (using alcohol–formalin–glycerol fixation) with a mean age of 75.6 ( $\pm$  7.9) years (2F/5M) were used. The acromion was excised and the PRI exposed. The capsule was meticulously dissected to identify ligamentous/soft tissue structures in PRI.

Results: In all specimens, the glenocapsular ligament was found in the joint capsule in the PRI. The middle portion of this intrinsic ligament was seen in the PRI as it coursed between its attachments sites medially to the supraglenoid tubercle/neck of the scapula and laterally to the humeral semicircular ligament (rotator cable) between the middle and inferior facets of the greater tubercle of the humerus. The glenocapsular ligament was found to consist of one single or two parallel ligamentous bands.

Conclusions: The intrinsic glenocapsular ligament, was found to be a key component of the joint capsule within the PRI. Clinical studies are needed to determine the importance of the glenocapsular ligament for the surgical outcomes.

## P-137

### Osseous epigenetic variations of the upper limb in a castillian population (Spain)

*Juan José Ruiz, Teresa Carro, Agustín Mayo, Juan Francisco Pastor*

*University of Valladolid, Valladolid, Spain*

Introduction: The epigenetic bony variations are known from the galenic period. They were considered as atavistic traits or developmental anomalies. They are currently considered to be influenced by genetics and the environment.

Materials and methods: Five bone variations of the collection of the Anatomical Museum, University of Valladolid, have been studied. 87 skeletons: 51 men and 36 women with ages between 33 and 94 years. The variables studied are:

- Acromial facet (CAA).
- Suprascapular hole (ASE).
- Circumflex groove (SC).
- Supracondylar humeral process (PSET).
- Septal hole (AS).

Results: Incidence of variations:

AGE	CAA (%)	ASE (%)	SC (%)	PSET (%)	AS (%)
30–39	0	0	0	0	50
40–49	0	0	21.4	0	21.4
50–59	25	8	69.2	0	0
60–69	31.1	2.8	40.4	0	18.4
70–79	16.8	4.1	41.2	0	0
80–89	32.5	0	42.9	0	8.2
90–99	25	25	75	0	0

Conclusions: The CAA is presented from the 50 decade, relating to advanced ages. ASE occurs, mostly, in the 90 decade (the older, older ossified). SC, as a result of the impression of the circumflex artery, is

more evident the more continuous is the pressure of the artery. It also influences the hardening of the vessel with age. The PSET: no case has been found. AS, more present in the 30 and 40 decades, decreases with age.

## P-138

### Differences in the footprint and biomechanics of control foot and foot of patients with obesity and psychiatric disorders

Raquel Mayordomo Acevedo<sup>1</sup>, Ana M<sup>a</sup> Pérez Pico<sup>1</sup>, Esther Mingorance Álvarez<sup>2</sup>

<sup>1</sup>Universidad de Extremadura, Plasencia, Spain; <sup>2</sup>Universidad de Extremadura, Cáceres, Spain

**Introduction:** Plantar pressures measurement provides specific information on the foot contact surface. Pressure determines the damage caused by force since force describes the overall load effect and pressure describes a potentially damaging effect on the tissue. Examination of the footprint is made by pressure platforms and clinical examination. The present work proposes the analysis of footprints of different patients comparing with control footprints in order to improve the ambulation.

**Materials and methods:** Sample consisted of 4 women with morbid obesity, 2 women with psychiatric disorders and 3 control healthy women of the same age and weight. The morphological and dynamic differences were observed on the footprint made with a pressures platform giving information about the distribution of plantar pressures.

**Results:** All obese patients supported at least one finger on the floor and had more contact surface than the rest of the women measured. Barycentre was located posterior and the footprint showed a flatfoot in obese and psychiatric patients in contrast to cavus foot and centered barycentre of control women. Higher pressure and load distribution were observed on the hind foot of psychiatric and obese women than in control women. Regarding the dynamics, differences were observed with a slower and more chaotic march on psychiatric and obese women than in control women.

**Conclusions:** Despite the low sample size, differences in footprints were found. The preliminary results suggest the relevance of the footprint analysis in order to help qualified professionals to perform the most appropriate orthotic treatment for patients with different pathologies.

## P-139

### Evaluation of the delto-fulcral triangle model in the Arab population of Dubai

Nerissa Naidoo<sup>1</sup>, Milan Handl<sup>2</sup>, Roderick Nieva<sup>2</sup>

<sup>1</sup>Mohammed Bin Rashid University, Dubai, United Arab Emirates;

<sup>2</sup>Dubai Bone and Joint Center, Dubai, United Arab Emirates

**Introduction:** Although the biomechanical concept of the “balanced” glenohumeral complex continues to be altered by morphometric differences of the scapula, the recent of the delto-fulcral triangle (DFT)

model considers both static and dynamic stabilisers and portrays a window for subacromial evaluation. By incorporating the reproducible DFT model, this study aimed to investigate the morphometric features of the “Arab shoulder”.

**Materials and methods:** A total of fifty (n = 50) lateral outlet-view radiographs of the superior shoulder region, representative of both normal and degenerative cases, were retrospectively analysed.

**Results:** In the degenerative group, four out of six morphometric DFT parameters were distinctively larger, viz. sides 1 and 3, angles 1 and 2. Interestingly, the decreased lateral acromial length and larger angle of the supraspinatus outlet were characteristic of the degenerative type and confirmed that the lateral acromion landmark is more posteriorly placed than that of the normal group. This indicated that the deltoid muscle is disequibrated in the body of degenerative cases, thus necessitating escape of the humeral head in the antero-superior or postero-inferior directions, which is generally observed in cases of glenohumeral osteoarthritis and cuff-tear arthropathy, respectively. Furthermore, both the normal and degenerative groups of the Arab population depicted an identical pattern in the dimensions of the DFT. **Conclusions:** The novelty of this study lies in its unique applicability to the Arab population and may contribute to a standard reference database that leads to the advancement of treatment for better patient outcomes in orthopaedic practice.

## P-141

### Anatomical study of the palmar carpal ligament focused on the layers of the antebrachial fascia

Yoko Tabira<sup>1</sup>, Koichi Watanabe<sup>1</sup>, Tsuyoshi Saga<sup>1</sup>, Joe Iwanaga<sup>2</sup>, Koh-Ichi Yamaki<sup>1</sup>

<sup>1</sup>Kurume University School of Medicine, Fukuoka, Japan; <sup>2</sup>Seattle Science Foundation, Seattle, United States

**Introduction:** The antebrachial fascia (ABF) on the palmar surface of the wrist includes a structure called the flexor retinaculum that is actually a bi-laminar structure comprising the palmar carpal ligament (PCL) and transverse carpal ligament. These ligaments form Gyon’s canal and the carpal tunnel, respectively. The purpose of this study was to clarify the anatomical structure of the PCL with a focus on the layers of the ABF.

**Materials and methods:** The observation and measurements of the hand and PCL were performed in ten hands and forearms obtained from five preserved cadavers.

**Results:** The ABF on the palmar surface of the wrist was found to form a compartment that covers the flexor carpi radialis (FCR), palmaris longus, and flexor carpi ulnaris (FCU) muscles as well as the ulnar artery and nerve. Specifically, in the compartment there is a fibrous arch extending between the FCR and FCU, and the palmaris longus muscle is located in the superficial layer of this arch. This fibrous arch continues in the radial styloid process after covering the radial artery on the radial side and in the deep fascia on the ulnar side. As a result, in part of Gyon’s canal, the ABF is divided into two layers, and a fascia what is called PCL exists between two layers of the ABF.

**Conclusions:** The layer structure in the palmar surface of the ABF varies according to the location. We believe that surgeons operating in this region should take these anatomic structures into account.

**P-142****Comparison of septal anatomy studies throughout the body; application for compartments of the foot**

Georga K. Bruechert<sup>1</sup>, Casper G. Thorpe Lewis<sup>1</sup>, William H.B. Edwards<sup>2</sup>, Quentin A. Fogg<sup>1</sup>

<sup>1</sup>The University of Melbourne, Melbourne, Australia; <sup>2</sup>Epworth Hospital, Melbourne, Australia

**Introduction:** There is no gold standard technique to visualise and quantify septae throughout the body. There have been numerous studies assessing the septae for different anatomical areas. However, there are few studies that have assessed the plantar septae within the foot and no consensus on the number and arrangement of plantar compartments. This study will analyse techniques used elsewhere in the body in terms of their applicability to clearly define plantar compartments.

**Materials and methods:** A comprehensive and critical review of the literature was conducted. Maxillofacial, heart, upper limb and lower limb studies were considered, and compared with standard CT and MR imaging of cadaveric feet.

**Results:** Computer tomography (CT), magnetic resonance imaging (MRI), ultrasound and dissection were commonly used to assess septae throughout the body. Extreme tissue contrast provided the clearest differentiation of septae. This was most evident in the maxillary sinus and heart, where fluid/air against the septal margins created optimal contrast. Marginal soft tissues, or limited fluid volume, in other areas made the septae more difficult to precisely define. Cadaveric feet, without septum-specific treatment, were equally imprecise to interpret.

**Conclusions:** Maxillary sinus and heart investigations were clearly superior for septal visualisation. Therefore, creating a septum:air interface may enhance septal identification. Direct comparisons throughout diverse regions of the body will inform the design of further plantar foot studies. Such novel approaches may be applied to other regions of the body and may influence a broad variety of studies.

**P-143****The attachments of the adductor hallucis heads onto the lateral sesamoid**

Casper G. Thorpe Lewis<sup>1</sup>, Georga K. Bruechert<sup>1</sup>, William H.B. Edwards<sup>2</sup>, Quentin A. Fogg<sup>1</sup>

<sup>1</sup>The University of Melbourne, Melbourne, Australia; <sup>2</sup>Epworth Hospital, Melbourne, Australia

**Introduction:** Hallucal attachments of the adductor hallucis (AH) muscle are of clinical interest for soft tissue releases in hallux valgus (HV) surgery. Some studies report only a proximal phalanx (PPh) attachment, others that both AH heads attach in various ways to the lateral sesamoid, surrounding soft tissues and even the plantar plate. Quantifying the exact attachment sites for both heads will allow better understanding of their biomechanical function. This will inform surgical management options for conditions such as HV and related conditions. This may prevent complications such as hallux varus or cock-up toe deformity.

**Materials and methods:** Embalmed feet (n = 10) were dissected to the muscle bellies of the AH. Their tendons were followed to the distal attachments using a fascicular approach under magnification (7–36 ×).

**Results:** The oblique head (OH) of the AH muscle was larger and attached medially to the proximal pole and laterally to the lateral sesamoidal surface with fibres continuing onwards to the PPh. The transverse head (TH) was smaller, with tendinous fibres attached onto the oblique AH tendon. The OH was the only footprint identifiable onto the bony surface of the lateral sesamoid, although the TH contributed to its tendinous pull.

**Conclusions:** The nature of the OH and TH attachments to the lateral sesamoid is understudied and needs clarification. A better understanding could reduce complications in podiatric surgery. These data suggest that the OH is the main functional muscle attachment to the lateral sesamoid, although both need further investigation.

**P-144****The attachments of the deep transverse metatarsal ligament onto the lateral sesamoid**

Casper G. Thorpe Lewis<sup>1</sup>, Georga K. Bruechert<sup>1</sup>, William H.B. Edwards<sup>2</sup>, Quentin A. Fogg<sup>1</sup>

<sup>1</sup>The University of Melbourne, Melbourne, Australia; <sup>2</sup>Epworth Hospital, Melbourne, Australia

**Introduction:** The deep transverse metatarsal ligament (DTMTL) plays a crucial role in maintaining distal intermetatarsal distance and stabilising metatarsophalangeal joints (MTPJ). Its release for hallux valgus (HV) surgery has been disputed because of post-operative complications, such as hallux varus. There is a paucity of information regarding the DTMTL attachment to the hallux; this study aims to quantify the relationship between these tissues.

**Methods:** Embalmed feet (n = 10) were dissected in both dorsal and plantar approaches onto the second metatarsal plantar plate (PP) and the lateral sesamoid. A fascicular dissection was used, tracing individual fascicles under magnification (7–36 ×) from the second metatarsal PP to the lateral sesamoid bone, to outline the footprint of the DTMTL. This footprint was then modelled in a 3D virtual space using a microscribe.

**Results:** The DTMTL attached onto the plantar aspect of the lateral sesamoid, and then the second metatarsal PP. The DTMTL contributed to three structures, immediately lateral and plantar it contributed to two septae: one loose and fatty that separated neurovascular structures, the other formed the flexor tunnel for the second metatarsal. The third structure was a band of tissue that ran from the DTMTL dorsally towards the extensor aponeurosis just lateral to the distal tendinous attachment of the transverse head of the adductor hallucis muscle.

**Conclusions:** The DTMTL attachment to the lateral sesamoid is complex and should not be disregarded in HV surgery. A greater understanding of this anatomy will allow improvement in the repair of HV and may reduce complications.

**P-145****Method of the marking of finger's intersegments flexion folds**

Andrey Gal'chin<sup>1</sup>, Radik Khayrullin<sup>2</sup>

<sup>1</sup>Ulyanovsk Regional Oncology Hospital, Ulyanovsk, Russian Federation; <sup>2</sup>Ulyanovsk State University, Ulyanovsk, Russian Federation

**Introduction:** In an adult hand the finger's intersegments flexion folds (IFS) do not coincide with the plane of joining of articular surfaces or the transverse axis of the joint. This creates difficulties in planning of operations on phalangeal joints of the hand and inaccurate skin incisions can be the source of subsequent non-functional rehabilitation of joints. The purpose of the study is to develop a method of landmarks to determine the correspondence of IFS and joint spaces of interphalangeal and metacarpophalangeal joints of the hand during X-ray examination.

**Materials and methods:** For the study, we used the capabilities and options of the standard X-ray machine in the DICOM format at X-rays of 140 patients.

**Results:** The landmarks method was tested and developed in which, prior to carrying out an X-ray study of the hand, a special marker is superimposed on the palmar IFS of hands. The marker is positioned on the palmar side and conditions for its fixation are determined. If necessary, IFS of the palmar side of fingers to which the marker was attached must necessarily correspond to the finger segments to those which are measured with the electronic caliper. The distance from the X-ray source is 90 cm.

**Conclusions:** X-rays image of the hand obtained with the imposition of a special marker make it possible to get a clear data about of the relationship between the palmar IFS and structural elements of interphalangeal and metacarpophalangeal joints of the hand when planning surgical interventions and conducting relevant studies.

## P-146

### De mena, a new system stabilized to measure the functionality of the hand by means of force captors: design and validation

Rafael De Mena Poveda<sup>1</sup>, Rafael De Mena Sarrío<sup>1</sup>, Matilde Campos Aranda<sup>2</sup>, Matilde Moreno Cascales<sup>3</sup>, Miguel Fdez-Villacañas Marín<sup>3</sup>

<sup>1</sup>Instituto Traumatológico del Sureste, Murcia, Spain; <sup>2</sup>Dpto. CC. Sociosanitarias. Universidad de Murcia, Campus de Espinardo. Murcia, Spain; <sup>3</sup>Dpto. Anatomía Humana. Fac. Medicina. Universidad de Murcia., Campus de Espinardo. Murcia, Spain

**Introduction:** The current state of the evaluation of hand strength to determine its functionality is discussed. The results obtained with different evaluation systems and with the position of the upper limb for the exploration condition disparate data.

**Materials and methods:** Using the De Mena stabilizer to achieve a fixed and maintained position, 50 hands have been studied measuring the forces with strain gauges.

**Measurements were:** (A) tip pinch where thumb tip to three-phalanx fingertip, (B) thumb pad to lateral aspect of middle phalanx of index finger, (C) independent flexion of each of the three-phalanx fingers. In addition, measures were taken with the Jamar Pinch Gauge.

**Results:** A wide range of measures were carried out with the purpose to evaluate the ability of the system to obtain the force values at each finger. A total of 2300 measurements were performed in order to do the validation of the system. No significant differences were found between observers and at different times. The inter-class correlation coefficients for each of the measurements on each finger were never less than 0.76. The correlation coefficient between the measurements with the Jamar and the DeMena was 0.959 with a  $p < 0.0001$ .

**Conclusions:** 1- The De Mena designed system obtains valid, reliable and reproducible measurements of the forces exerted by the hand fingers. 2- The system De Mena allows to measure, with precision, the forces exerted individually by the hand's fingers in fixed and stable exploration positions in addition to those common in the clinic.

## P-147

### Idiopathic rotational deformities of lower extremities: assessment, biomechanics and surgical treatment

Ekaterina Zmeeva

Lomonosov Moscow State University, Moscow, Russian Federation

**Introduction:** The purpose of this research is to survey published studies about the rare disease which is referred to as rotational deformities of lower extremities. It is usually accompanied by pain in hip and patellofemoral joints or tibia. Etiology of this disease has not been clarified.

**Materials and methods:** The methodology for this study was a critical review of research literature in Pubmed database about rotational deformities of lower extremities.

**Results:** Rotational deformities in transverse plane frequently remain undetected via visual examination therefore the diagnosis of this condition is made with accurate techniques CT and MRI. The combination of internal femoral anteversion and external tibial rotation causes abnormal turned inward axis of patellofemoral joint motion. Increased medial femoral anteversion creates laterally directed forces in patellofemoral joint and leads to internally oriented gait which is compensated by lateral tibial torsion to maintain normal foot position during locomotion. External tibial rotation influences the lever arm of feet decreasing power generation at ankle and the force of soleus muscle. This results in osteoarthritis of hip and patellofemoral joints treated by endoprosthesis implantation in the long run. When internal femoral anteversion is more than 20° and external tibial rotation is more than 25° and conservative treatment is inefficient derotation osteotomy is the treatment of choice.

**Conclusions:** Numerous studies have revealed that surgical treatment of rotational deformities normalises the biomechanics of extremities, relieves pain improving the quality of life for years. More research is required to understand the causes of this disease.

## P-148

### Morphometric and immunohistochemical study of muscle aging

Gordana Starcevic Klasan<sup>1</sup>, Marina Nikolic<sup>1</sup>, Tamara Soic Vranic<sup>1</sup>, Snjezana Bajek<sup>1</sup>, Juraj Arbanas<sup>1</sup>, Lea Nikolic<sup>2</sup>, Jasminka Giacometti<sup>2</sup>, Romana Jerkovic<sup>1</sup>

<sup>1</sup>Department of Anatomy, Faculty of Medicine, University of Rijeka, Rijeka, Croatia; <sup>2</sup>Department of Biotechnology, University of Rijeka, Rijeka, Croatia

**Introduction:** Sarcopenia is a term for the loss of skeletal muscle mass, quality and performance associated with normal aging that can lead to frailty in the elderly. Contributing to physical frailty are skeletal muscle atrophy, declining strength, increasing fatigability and susceptibility to injury. For healthy elderly persons, the decrease in muscle mass results from a loss in the total number of fibers per muscle as well as a decrease in the mean cross sectional area of the remaining fibers. The aim of this study was to determine age-related changes in three human muscles with different function and location in the body.

**Materials and methods:** The cross sectional area and the percentage of fibers type I, type IIA and type IIX were studied in vastus lateralis, deltoid and external intercostal muscle. Muscle samples were obtained from 30 male subjects, aged 20–80 years. Fiber types were

defined immunohistochemically, using monoclonal antibodies specific for each type of fibers.

Results: All muscle fiber types showed the reduction in the fiber size in all three examined muscles. In all muscles the proportion of type I and type IIA was changed, but not in type IIX. With increasing age results showed the increase in proportion of type I, while proportion of type IIA fibers decreased, with vastus lateralis muscle being the most affected.

Conclusions: These results suggest that age-related muscle atrophy is not a general phenomenon, and does not affect all muscles equally.

## P-149

### Biomechanical analysis of walk in healthy individuals and individuals affected by the lower back pain syndrome—a preliminary study

*Hrvoje Vlahovic<sup>1</sup>, Jasna Arbanas<sup>2</sup>, Gordana Starcevic Klaskan<sup>3</sup>, Romana Jerkovic<sup>3</sup>, Daniela Malnar<sup>3</sup>, Juraj Arbanas<sup>3</sup>*

<sup>1</sup>Department of Physiotherapy, Faculty of Health Studies, University of Rijeka, Rijeka, Croatia; <sup>2</sup>Clinical Hospital Center Rijeka, Rijeka, Croatia; <sup>3</sup>Department of Anatomy, Faculty of Medicine, University of Rijeka, Rijeka, Croatia

Introduction: The lower back pain syndrome (LBS) is a chronic health problem that compromises physical function, and especially affects the walk. The goal of this study was to analyze the kinetic and kinematic parameters of pace in healthy people and people affected with LBS.

Materials and methods: In the group of 20 patients with LBS kinematic data of the walk were collected using three-dimensional motion analysis system with eight video cameras of 100 Hz and two cameras of 30 Hz. Kinetic data were collected with one platform force (1000 Hz). The same measurements were provided on 10 healthy people of the control group. Respondents with LBP filled the standardized questionnaires for pain and disablement (Roland Morris and Oswestry Disability Index Questionnaires).

Results: The average walking speed was significantly lower, the step length was significantly shorter and vertical ground reaction force was significantly lower in the patients group than in control group. The results obtained with the Oswestry index in the patients group significantly positive correlated with the stance time and swing time of the right leg while on the left side no statistically significant correlations were observed.

Conclusions: LBS affects quality of walk in all spatio-temporal parameters. Moreover, the left and right legs are unequally affected during the walk in patients with LBS. These results give us a basis for future studies regarding the effectiveness of various invasive and noninvasive therapeutic procedures in patients with LBS.

## P-150

### Correlation of the subchondral mineralization distribution in the proximal and distal finger joints with ct osteoabsorptiometry within two healthy and ill populations

*Alejandro Giesenow, Magdalena Müller-Gerbl*

*University of Basel, Department of Biomedicine, Anatomic Institute, Research Group Musculoskeletal, Basel, Switzerland*

Introduction: Computed Tomography Osteoabsorptiometry (CT-OAM) allows the determination of the mineralization distribution of the subchondral bone plate as a marker for the long-term loading history of a joint (M. Müller-Gerbl et al., 1990). In the present study, we examine the distal (DIP) and proximal (PIP) interphalangeal joint using CT-OAM. In a previous study, differences were observed in the metacarpophalangeal joint between female healthy individuals and rheumatoid arthritis patients (Meirer et al. 2004).

Materials and methods: 21 macerated hand bones were examined to determinate those had degenerative change and those not. This bones were analysed by CT-OAM as established (Müller-Gerbl 2010). In a subsequent step, we analysed with CT-OAM the hands from a group of female healthy individuals and with rheumatoid arthritis. From this 2 groups, a distribution pattern for healthy and diseased finger joints was created and compared with the result of the mazeriert bones.

Results: The same pattern was recognized between healthy and ill population in both groups. In the basis and caput of PIP and caput of DIP joints: decrease of the radial–ulnar muster and increase of the tricentric and monocentric musters in the ill population. In the basis of DIP joints: decrease of radial–ulnar and tricentric muster, and increase in the monocentric musters in the ill population.

Conclusions: This study is the first to combine CT-OAM of the PIP and DIP joints with clinical correlation. Findings may serve as a basis for further studies and better diagnostics and treatment in degenerative disorders.

## P-151

### Study of the profunda femoral artery's bridging veins

*Alejandro Russo, María Ignatov, Leticia Vazquez, Agustín Cabrera, Eduardo Olivera*

*Departamento de Anatomía, Facultad de Medicina, Universidad de la República, Montevideo, Uruguay*

Introduction: Surgical revascularization of the profunda femoral artery (PFA) is nowadays still performed via open approach. This type of procedure usually requires control of the bridging veins (BV) that travel superficially to the PFA. This maneuver avoids bleeding that may become massive during the surgery. The objective of this paper is to study the BV that travel superficially to the PFA.

Materials and methods: 15 femoral triangles of adult formalin fixed cadavers were studied. In each of them it was registered: presence of BV, number of BV per case, diameter of each BV and distance between the BV and the origin of the PFA.

Results: BV were found in 14 of the 15 femoral triangles (93%). The number of BV per femoral triangle was mean 3 (range 1–5). Diameter of the BV registered was 5.9 mm (range 1–14 mm). Distance between the bv and the origin of the PFA was mean 30 mm (range 0–72 mm).

Conclusions: BV were found in the majority of the cases studied, in average there was 3 BV per case. The diameter of the BV found was in average 5.9 mm and the mean distanced between the PFA origin and the BV was of 3 mm. The anatomic relationships between the BV and the PFA as here presented are important because during the surgical exposure of the PFA, the BV may be a source of bleeding and thus surgical complications. Keeping in mind our findings may facilitate control and ligation of the BV while performing PFA revascularization surgery.

**P-152****OA-IFP stem cells contribute to histopathological features of osteoarthritic joints: an in vitro study**

Veronica Macchi<sup>1</sup>, Elena Stocco<sup>1</sup>, Silvia Barbon<sup>1</sup>, Lucia Petrelli<sup>1</sup>, Elisa Belluzzi<sup>2</sup>, Marta Favero<sup>3</sup>, Rosa Di Liddo<sup>4</sup>, Monica Piccione<sup>4</sup>, Teresa Conconi Maria<sup>4</sup>, Assunta Pozzuoli<sup>2</sup>, Andrea Porzionato<sup>1</sup>, Pietro Ruggieri<sup>2</sup>, Raffaele De Caro<sup>1</sup>

<sup>1</sup>Section of Human Anatomy, Department Neurosciences, University of Padua, Padua, Italy; <sup>2</sup>Musculoskeletal Pathology and Oncology Laboratory, Department of Orthopedics and Orthopedic Oncology, Padova, Italy; <sup>3</sup>Rheumatology Unit, Department of Medicine-DIMED, University Hospital of Padova, Padova, Italy; <sup>4</sup>Department of Pharmaceutical and Pharmacological Sciences, University of Padua, Padua, Italy

**Introduction:** In osteoarthritic (OA) patients, the infrapatellar fat pad (IFP) shows increased inflammatory infiltration, vascularization and thickness of the interlobular septa also supported by higher levels of VEGF, MCP-1 and IL-6 proteins. The aim of this study was to understand the contribute of OA-IFP cells to common histopathological features of OA joints.

**Methods:** Nine OA patients undergoing arthroplasty were enrolled in this study (average age = 72.8; average BMI = 30.2). After isolation, OA-IFP cells were broadly characterized for morphology and ultrastructure by optical and transmission electron microscope (TEM); immunophenotype by cytofluorimetric analysis; gene profile through RT-qPCR; plasticity by assessing adipogenic, chondrogenic, osteogenic differentiative potential and collagen production ability; metabolic activity and proliferation evaluating responsiveness to microenvironmental OA stimuli.

**Results:** OA-IFP cells displayed a spindle-like morphology and tendency to form colonies; high metabolic activity and constant proliferation rate in culture; self-renewal potential associated to expression of STAT3, Notch, c-Myc, OCT-4, KLF4, NANOG. Moreover, specific OA-IFP cells immunophenotype revealed positivity for CD34, CD44, CD105, PDGFR $\beta$ , VEGFR2, FGFR2, IL1R, IL6R, HLA-DR suggesting derivation from adipose tissue or vascular endothelial compartment, a high level of microenvironmental responsiveness and an inflammation-activated state. Plasticity was proved assessing adipogenic/chondrogenic/osteogenic differentiative potential and collagen production ability. Exposure of OA-IFP cells to a cocktail of soluble and mechanical stimuli demonstrated their ability to organize resembling the thickened septa of OA-IFPs.

**Conclusions:** Taken together, our data suggested that OA-IFP cells contribute to IFP anatomy in OA and may represent an interesting in vitro model of the OA disease.

**P-153****Intra- and inter-rater reliability of ultrasound measurements of abdominal muscle and fasciae thickness**

Carmelo Pirri<sup>1</sup>, Carla Stecco<sup>2</sup>, Caterina Fede<sup>2</sup>, Chenglei Fan<sup>2</sup>, Veronica Macchi<sup>2</sup>, Andrea Porzionato<sup>2</sup>, Calogero Foti<sup>1</sup>, Raffaele De Caro<sup>2</sup>

<sup>1</sup>Physical and Rehabilitation Medicine, University of Rome “Tor Vergata”, Padova, Italy; <sup>2</sup>Department of Neuroscience, University of Padova, Padova, Italy

**Introduction:** Real time Ultrasound (US) imaging is being increasingly utilized by Physical and Rehabilitation Medicine (PRM) specialists to assess abdominal muscle in healthy subjects and in patients with low back pain (LBP). The current study set out to evaluate the intra- and inter-rater reliability of US measurements not only of the thickness of the abdominal muscles and fasciae.

**Materials and methods:** three specialists with different levels of training in US measurement techniques followed a standard protocol based on four reference anatomic landmarks to perform US examinations of the abdominal muscles and fasciae of a healthy volunteer in resting and dynamic condition. Each of the specialists measured 17 anatomical structures six times during two sessions (three per session). Their intra-rater reliability was assessed by evaluating the range of relative error and the coefficient of variation (CV). The inter-rater reliability was evaluated using the Kruskal–Wallis test at probability levels of 0.05 and 0.01.

**Results:** there were no significant differences between the measurements that the three raters registered (inter-rater reliability) with the exception of those referring to the anterior fascia of the external oblique muscle (p-value < 0.01), the fascia between the external and internal oblique muscles (p-value < 0.05) and the fascia between the internal oblique and the transversus abdominis muscles (p-value < 0.05).

**Conclusions:** knowledge about the fascial anatomy of the abdominal wall is essential to carrying out accurate US examinations. These findings confirm that US imaging is a reliable, non-invasive, cost-effective instrument for evaluating the abdominal muscles/fasciae.

**P-154****Sensibility of the fasciae to sex hormone levels**

Caterina Fede, Lucia Petrelli, Damiana Incendi, Carla Stecco, Raffaele De Caro

Department of Neuroscience, Section of Anatomy, University of Padua, Padua, Italy

**Introduction:** It is now recognized that women suffer from myofascial pains to a greater extent than men, and that the muscular fasciae can respond to hormonal stimuli, thanks to the expression of sex hormones receptors, but how the fasciae can modify their structure under hormonal stimulation is not clear.

**Materials and methods:** In this work an immunocytochemical analysis of collagen-I, collagen-III and fibrillin were carried out on fibroblasts isolated from human fascia lata after an in vitro treatment with different levels of sex hormones  $\beta$ -estradiol and/or relaxin-1, according to the different phases of a woman period (follicular, periovulatory, luteal, post-menopausal phases and pregnancy).

**Results:** We have demonstrated for the first time that cells of fascia can modulate the production of the extracellular matrix according to the hormone levels, when treated with  $\beta$ -estradiol: collagen I goes down from 6% of positivity of the follicular phase to 1.9 in the periovulatory phase. But, when in the cell culture Relaxin-1 was added, the production of extracellular matrix decreased and it was maintained at the same level (1.7% of collagen I, both with follicular and periovulatory levels of hormones).

**Conclusions:** These results confirmed the antifibrotic function of Relaxin-1 by the ability to reduce matrix synthesis, and help to explain why women with hormonal dysfunctions may have myofascial pains by the dysregulation of extracellular matrix production.

**P-155****The crural interosseous membrane re-visited: a histological and microscopic study**

Chenglei Fan<sup>1</sup>, Joseph Morley<sup>2</sup>, Kena Mcdermott<sup>2</sup>, Caterina Fede<sup>1</sup>, Emmett Hughes<sup>2</sup>, Carla Stecco<sup>2</sup>, Lucia Petrelli<sup>1</sup>, Andrea Porzionato<sup>1</sup>, Veronica Macchi<sup>1</sup>, Raffaele De Caro<sup>1</sup>

<sup>1</sup>Department of Neurosciences, Institute of Human Anatomy, University of Padova, Padova, Italy; <sup>2</sup>University of Bridgeport School of Chiropractic, New York, United States

**Introduction:** The aim of this study was to characterize the microscopic structure and sensory nerve endings of crural interosseous membrane (IM).

**Methods:** 13 IMs from 7 cadavers were analyzed (approved by the local ethical committee, ‘Body Donation Program’ at University of Bridgeport). Organization of the collagen fibers, IM’s thickness and distribution of elastic fibers were histologically and microscopically analyzed. The distribution of nerve elements was analyzed after staining with S100 antibody.

**Results:** The IM is mainly a two-layer collagen structure with collagen fibers of adjacent layers orientated along different directions, forming angles of 30.5 1.7° at proximal and 26.6 2.1° at distal part respectively (N = 13; P 0.05). The percentage of elastic fibers between the two layers and inside the collagen layer is 10.6 0.5% and 2.2 0.1%, respectively (N = 39; P < 0.001). The IM’s thickness at proximal, middle, and distal parts is 268.5 18.6 μm; 293.2 12.5 μm; 365.3 19.3 μm, respectively (N = 13; Proximal vs Distal: P 0.001; Middle vs Distal: P 0.05). Nerve elements were present and located both inside and on the surface of IM, whereas mechanoreceptors are mainly located on the surface of IM. Free nerve endings (33.3 5.0/cm<sup>2</sup>) and Ruffini corpuscles (3.4 0.6/cm<sup>2</sup>) were the predominant sensory elements, while Pacinian corpuscles (1.3 0.7/cm<sup>2</sup>) were rarely found (N = 39).

**Conclusion:** The type of mechanoreceptors found suggests that crural IM may play a role in proprioception. The free nerve endings and Ruffini corpuscles may perceive changes in IM tension in relation to the various muscular attachment. Whilst, Pacinian corpuscles on the surface of IM are probably responsible for sensing pressure changes within the anterior and posterior compartments.

**P-156****History of museums in human anatomy and histology and embryology departments of national medical university**

Liudmyla Sokurenko<sup>1</sup>, Viktoria Lavrynenko<sup>2</sup>, Yurii Chaykovsky<sup>3</sup>, Mykola Bezshanko<sup>3</sup>, Iryna Dzevluska<sup>3</sup>, Rostyslav Kaminsky<sup>3</sup>, Olexandr Kovalchuk<sup>1</sup>, Yevhenii Khrapachevskiy<sup>4</sup>, Tetyana Lachtadyr<sup>3</sup>, Iryna Lipatnikova<sup>3</sup>, Ruzhena Matkivska<sup>3</sup>, Valentyn Prymachenko<sup>3</sup>, Alla Synytska<sup>3</sup>, Iryna Tymoshenko<sup>3</sup>, Valentyn Tytarenko<sup>3</sup>

<sup>1</sup>Bogomolets National Medical University, Taras Shevchenko National University of Kyiv, Kyiv, Ukraine; <sup>2</sup>Taras Shevchenko National University of Kyiv, Kyiv, Ukraine; <sup>3</sup>Bogomolets National Medical University, Kyiv, Ukraine; <sup>4</sup>The International Academy of Ecology and Medicine, Kyiv, Ukraine

**Introduction:** The Department of Human Anatomy in Kyiv was founded in 1841. The first head of the department was M. Kozlov, who began classes on anatomy at the newly formed medical faculty of St. Volodymyr University. The Department of Histology and Embryology was founded in 1868, P. Peremezko was the first head of the department.

**Materials and methods:** The purpose of our study was to find out the stages of formation of collections in morphological departments in Kyiv, using the archival data of the university and departments as well as literary sources.

**Results:** The Faculty of Medicine was organized and transferred from the Vilnius Medical and Surgical Academy, from which the preparations of the Vilnius Anatomical Museum were transported. Subsequently, by the efforts of the professors of the Kyiv anatomical school, the fundamental and educational anatomical museums of the department were created, and unique anatomical and histological preparations were made. Professor Peremezhno began to assemble collections, continued by professors of the histological school. But the idea of organizing the Museum of Microscopes and the embryological museum belongs to the prominent Ukrainian histologist, Professor M. I. Zazibin. The museum exhibits models of microscopes of the XVII–XVIII centuries as well as microscopes of the XIX–XX centuries.

**Conclusion:** So, the Museums of Microscopes, Embryology, Fundamental and Educational Anatomical Museums have been founded in O.O. Bogomolets National Medical University since 1841.

**P-157****Anthropological landmarks and anthropometric characteristics of human skulls**

Bojana Krstonošić, Siniša S. Babović, Radmila Perić, Sonja Žigić, Dragana Radošević

University of Novi Sad, Faculty of Medicine, Department of Anatomy, Novi Sad, Serbia

**Introduction:** Morphometric analysis of the human skulls has its importance in anthropology, helping in describing morphological and functional differences among human groups. Also, it is important in clinical practice, especially when it comes to the treatment of congenital and posttraumatic deformities. In such way, the aim of this study was to describe the cranial anthropological landmarks, to measure the cranial diameters and calculate derived indices which quantify human skull morphology.

**Materials and methods:** This study included 27 skulls (cranial bases) and 22 lower jaws, as a part of the Osteological collection of the Department of Anatomy at Faculty of Medicine in Novi Sad. Sex determination of the skulls was evaluate using Protocol for visual assessment modified from Ferembach and Buikstra. All the measurements were done using Vernier caliper with a least count of 0.05 mm.

**Results:** The results of the study showed that there was statistically significant difference between male and female skulls for several parameters: upper facial height, facial breadth, BrPr length, interorbital length, orbital height and mastoid length. According to the cranial index, predominant type of the skull was brachycranium in males vs. brachycranium and mesocranium in females. Predominant type of the nasal region was leptorrhine for both sexes. Orbital type was predominantly mesosim in males vs. microsims in females.

Conclusion: Morphometric analysis of the human skulls has shown the existence of variations between sexes. Their importance in plastic and reconstructive surgery, maxillofacial surgery and ophthalmology, as well as the existence of variations between races has been discussed.

## P-158

### Digital index in women with breast cancer

Mirjana Udicki, Biljana Srdić Galić, Ivana Starčević, Dragan Turanjanin, Zorka Drvendžija

University of Novi Sad, Faculty of Medicine, Department of Anatomy, Novi Sad, Serbia

Introduction: Digit ratio (2D:4D), the ratio of second-to-fourth finger lengths, established in utero, shows positive correlation with prenatal level of oestrogen. Since the breast cancer is related to excessive and prolonged exposure to oestrogen, digit ratio might be considered as useful marker in breast cancer risk assessment.

Aim: The aim of the present study was to compare digit ratio in women with breast cancer and healthy controls.

Materials and methods: The study group consisted of 55 women diagnosed with breast cancer aged between 29 and 84 years (average age:  $58.56 \pm 11.94$  years) while the control group included 64 healthy women aged between 20 and 67 years (average age:  $49.63 \pm 12.94$  years). Participants were asked about the age at menarche and menopause, afterwards the length of second and fourth fingers were measured and the digit ratios were calculated for both hands.

Results: Digit ratio was significantly higher on both right and left hand in breast cancer patients compared to healthy controls (right hand:  $1.00 \pm 0.04$  vs.  $0.99 \pm 0.03$ ; left hand:  $1.02 \pm 0.04$  vs.  $1.01 \pm 0.03$ ). Negative statistically significant correlation between digit ratio and the age at menarche was observed, but only for left hand ( $r = -0.185$ ).

Conclusion: The fact that women with breast cancer had higher 2D:4D in both hands might be associated with their higher prenatal exposure to oestrogen. These results might confirmed the importance of digit ratio as a marker in breast cancer risk assessment.

## P-159

### Skeletal congenital abnormalities induced by nickel chloride hexahydrate on balb/c albino mice embryos during organogenetic period

Nancy El Sekily, Ahmed Ayad, Nesrine El-Homosany, Amal Abou Elmagd

Anatomy and Embryology Department, Faculty of Medicine, Alexandria, Egypt

#### Abstract

Introduction: Nickel is an essential metal and its compounds are widely used in industry and commerce. The development of industrialization has led to increased emission of nickel into environment causing teratogenesis in the developing embryos. This study aimed to

investigate the toxic and teratogenic effects of nickel on Balb/C albino mice embryos during organogenetic period.

Materials and methods: This study was carried out on forty pregnant female albino mice; they were randomly divided into four equal groups:

Group I (control group), group II, III, IV (experimental groups): each group contains ten mice received 46.125 mg, 92.25 mg, 184 mg Ni/kg body weight, per day respectively by orogastric tube for successive 8 days started from the 6<sup>th</sup> gestational day. The extracted lived fetuses were examined externally, then doubled stained and prepared for skeletal examination by dissecting microscope.

Results: The numbers of live-birth pups decreased significantly, but there was significant increase in resorption sites in all nickel treated groups compared to control group. At the same time there was significant increase in still-birth fetuses in group IV. Double stained fetal skeleton showed incomplete ossification of skull bones, unossified interparietal bone, open arch of atlas, incomplete ossification of vertebrae, supernumerary lumbar rib, incomplete ossification of ribs and sternbrae, incomplete ossification of bones of forelimb, incomplete ossification of bones of hindlimb, unossified carpals, metacarpals, tarsals, metatarsals and phalanges in nickel treated groups, compared to control group.

Conclusion: Nickel results in number of skeletal congenital abnormalities indicating its teratogenic effect.

## P-160

### Role of physique factors in the diversity of the dimensions of internal organs in teenagers

Andrey Pugovkin<sup>1</sup>, Valeriy Erkudov<sup>1</sup>, Alexey Volkov<sup>2</sup>, Oxana Musaeva<sup>2</sup>, Sergey Lytaev<sup>1</sup>

<sup>1</sup>St. Petersburg State Pediatric Medical University, St. Petersburg, Russian Federation; <sup>2</sup>City Outpatient Hospital N<sup>o</sup> 109, St. Petersburg, Russian Federation

The constitutional typing (leptosomic, mesosomic or hypersomic somatotype) was carried out in 421 teenagers 13–17 years old (196 females and 225 males) alike with ultrasonic morphometric measurement of the abdominal internal organs and thyroid gland. The study revealed statistically valid but diverse differences of parameters measured in teenagers with different somatotypes. For example, in males (but not females) with leptosomic (but not mesosomic or hypersomic) constitutional type there occurred significant differences in the size of pancreas, liver, gall bladder, spleen, thyroid gland. These diversity may be individual traits, or result from pubertal humoral instability in growth and development or technical errors of ultrasonic morphometry. Clinical substantiation of interactions between constitution and the dimensions of internal organs gives the opportunity for creation of anatomical standards for morphometric studies of the internal organs in connection with their constitutional characteristics. Clinical application of such standards can help to avoid errors in the conclusions about hypo- or hypertrophy of the internal organs. But the results of this study also demonstrate the variability of interrelations between constitutional type and the size of internal organs in youngsters of particular age and sex. Thus constitution-dependent sonographic diagnostical standards for the internal organs can be regarded only as recommendations at least until the

detailed investigation of the links between the status of internal organs and constitutional type.

## P-161

### Triceps brachii muscle insertion space found in anatomical dissection, plastination and magnetic resonance image

Flávia Emi Akamatsu, José Renato Negrão, Marcelo Bordalo Rodrigues, Ana Maria Itezerote, Samir Omar Saleh, Flávio Hojaij, Mauro Andrade, Alfredo Luiz Jacomo

University of São Paulo, São Paulo, Brazil

**Introduction:** The anatomy of the distal insertion of the brachii triceps muscle in the olecranon has been object of recent investigations. Thus we describe the anatomy of the triceps brachii muscle tendon (TBMT) by dissection and plastination slices, retrospective review of elbow magnetic resonance image (MRI) was made with the objective of answer these inquiries.

**Methods:** Thirty-four elbows (30 males and 4 females) were dissected in order to assess details of the triceps brachii insertion. Elbow plastination slices were analysed to see if there was some space on the TBMT. A total of 21 randomly selected MRI scans (13 males and 08 females between the ages of 11 and 77) were evaluated by three observers. The analyzes were performed using IBM-SPSS for Windows software version 22.0 and charted using Microsoft-Excel 2010 software.

**Result:** The triceps tendon near its insertion in the olecranon showed a space in all the specimens dissected and so did in plastination slices evaluation. We measured the longitudinal length of this area and found a coefficient of variation of less than 10% for all measurements. The RM results showed a space near its insertion too. The agreement between observers confirmed the presence of this space.

**Conclusion:** This area, not previously described, may account for some misdiagnosis in imaging studies of the elbow and its knowledge may be essential to avoid incorrect diagnosis and unnecessary therapeutic approaches.

## P-162

### Teratogenic effect of nickel chloride hexahydrate on embryos of albino mice

Nesrine Mostafa El-Homosany, Nancy Mohamed El-Sekily, Ahmed El-Saeed Ayad, Amal Abd El-Monsef Abou Elmagd

Faculty of Medicine, Alexandria University, Alexandria, Egypt

**Introduction:** Nickel is one of the heavy metals that crosses the placental barrier, and causes teratogenic effect in the developing embryos. The aim of this Work is to assess the effect of nickel chloride hexahydrate on Balb/C albino mice embryos during organogenetic period.

**Materials and methods:** Nickel was administered by orogastric tube according to daily dose of each group and body weight of mice for 8 days started from the 6th gestational day. Based on LD50, Ni doses

(46.125, 92.25, and 184) mg Ni/kg b. wt. were used. Cesarean section was done on GD 18. The uterine horns were examined.

**Results:** A dose-dependent decrease in the mean of body weight gain of the pregnant mice and fetuses during the gestation period was observed. Number of implant sites and placental weight at all nickel treated group were reduced significantly compared to control group. Average number of live fetuses/mice reduced significantly at all nickel treated group compared to control group with concomitant increase in the percentage of resorbed fetuses. Exposure increased the fetal congenital anomalies as, hydrocephaly, open eyelids, anophthalmia, microphthalmia, exophthalmia, and umbilical hernia.

**Conclusion:** nickel has teratogenic effect of during organogenetic period.

## P-165

### Overweight and obesity ratios in the anthropological study of Czech breastfed children

Jitka Riedlová<sup>1</sup>, Markéta Paulová<sup>2</sup>, Jana Vignerová<sup>3</sup>, Petr Zach<sup>1</sup>, Vladimír Musil<sup>4</sup>, Bohuslav Procházka<sup>5</sup>, Renáta Růžková<sup>6</sup>, Dagmar Schneiderová<sup>7</sup>

<sup>1</sup>Department of Anatomy, Third Faculty of Medicine, Charles University, Prague, Czech Republic; <sup>2</sup>National Institute of Public Health, Prague, Czech Republic; <sup>3</sup>National Lactation Centre, Prague, Czech Republic; <sup>4</sup>Centre of Scientific Information, Prague, Czech Republic; <sup>5</sup>General Practitioner For Children And Adolescents, Kutná Hora, Czech Republic; <sup>6</sup>General Practitioner For Children And Adolescents, Prague, Czech Republic; <sup>7</sup>Department of Hygiene, Prague, Czech Republic

**Materials and methods:** In the years 2008–2011, a study of Czech long-term breastfed children's growth with participation of 43 pediatricians from the whole Czech Republic was accomplished. Out of the 1765 children included in the study, 889 were exclusively breastfed for 6 and more months, and out of these, 788 underwent a regular preventive examination in the 6 month. During that examination, overweight was found in 24 children exclusively breastfed for 6 and more months (i.e. in 3%) and obesity was found in 8 children (i.e. in 1%) only.

**Results:** The number of long-term breastfed children with overweight as well as those with obesity was far below the expected ratio given by the growth norm (7% overweight, 3% obesity). Besides, numbers of overweight or obese infants further declined with age. So, only 3 (0.4%) out of the fully breastfed children for at least 6 months remained obese even after the last examination in the 18th month and only 8 (1%) stayed in the overweight range in this age.

**Conclusion:** These results of the representative current study of Czech long-term breastfed children's growth confirm previous conclusions of WHO, American Academy of Pediatrics, United States Breastfeeding Committee, Academy of Breastfeeding Medicine and other specialized institutions and foreign authors—breastfeeding, apart from abundance of positive health factors for both mothers and children—also works as one of the preventive factors against obesity onset.

The study was supported by the project of Charles University Q16 and IGA MZ ČR NS 9974-4/2008.

**P-166****Sex and age differences of the somatotype in macedonian adolescent population**

*Biljana Bojadzieva Stojanoska, Marija Papazova, Julija Zhivadinovik, Biljana Zafirova, Elizabeta Chadikovska, Biljana Trpkovska, Ace Dodevski*

*Institute of Anatomy, Faculty of Medicine, SS Cyril and Methodius University, Skopje, Macedonia*

**Introduction:** Changes in somatotype in child and adolescent period of growth and development will contribute for better understanding of variations in body shape and composition in adult period. The aim of this study was to evaluate the somatotype in Macedonian adolescent population.

**Materials and methods:** This study included 895 adolescent students (475 males and 420 females) at the age of 15–18 years. Ten anthropometric parameters: body height, weight, elbow and knee diameter, triceps, subscapular, supraspinale and calf skinfold, arm and calf circumferences were measured to assess the somatotype according to Heat–Carter somatotyping method. For evaluation of somatotype software package Somatotype–Calculation and Analysis V1.1. Monte Goulding, Sweat Technologies, Mitchell Park, South Australia was used. Testing of sex and age-specific differences was done with analysis of variance. Differences for  $p < 0.05$  were considered to be statistically significant.

**Results:** The results obtained shows a significant sex difference ( $p < 0.05$ ) for mesomorph component in all age groups and for ectomorph component at the age of 17 years in favor of males, and for endomorph component at the age of 15, 16 and 17 years in favor of females. In all age groups the most of females were more endomorphic (balanced endomorph and mesomorphic endomorph). In males most of the participants belonged to mesomorph-endomorph and endomorphic mesomorph somatotype.

**Conclusions:** We found sex differences of somatotypes in Macedonian adolescents 15–18-years old. The obtained values can be use in physic investigations for better understanding of changes in body composition between both sexes.

**P-167****Anthropometrical indexes as nutritional indicators in children**

*Biljana Zafirova, Julija Zhivadinovik, Marija Papazova, Elizabeta Chadikovska, Biljana Trpkovska, Biljana Bojadzieva Stojanoska, Ace Dodevski*

*Institute of Anatomy, Faculty of Medicine, SS Cyril and Methodius University, Skopje, Macedonia*

**Introduction:** In order to prevent and reduce the increasing trend of obesity, anthropometric variables of growth and nutritional status in children have to be constantly monitored. The aim of our study was evaluation of sex-specific differences of anthropometrical indexes that were used as indicators for assessment of nutritional status in children aged 8.

**Examinees and methods:** The study included 212 healthy children (106 boys, 106 girls) aged 8 from Macedonian nationality. With

standard methodology (IBP) were taken following body measurements (body weight, height, mid upper arm circumferences–MUAC and skinfolds thickness triceps–SFTr and subscapular–SFSc), and according to standard formulas were calculated: weight-for-age (BW), height-for-age (BH), body mass index-for-age (BMI), mid upper arm circumferences-for age (MUAC), and skinfolds thickness-for-age (SFTr and SFSc).

**Results:** Results showed sex-specific differences in a large number of the examined anthropometrical parameters (BW, BH, BMI) in favour of the boys. On the other hand, skinfolds thickness (SFTr and SFSc) were significantly higher in girls. Values of the 50th percentile in boys were as follows: 30 kg for BW, 131 cm for BH, 17.3 kg/m<sup>2</sup> for BMI, 18 cm for MUAC, 5.5 mm for SFSc, and 8.6 mm for SFTr. The values of these parameters in girls were: 29 kg for BW, 129.2 cm for BH, 16.8 kg/m<sup>2</sup> for BMI, 18.5 cm for MUAC, 6.9 mm for SFSc and 10.2 for SFTr.

**Conclusions:** These results can be used as criteria for the assessment and detection of deviations in the nutritional status in children aged 8.

**P-168****Qualitative examination of anthropometrical parameters in preschool children**

*Biljana Trpkovska, Biljana Zafirova, Marija Papazova, Julija Zhivadinovik, Biljana Bojadzieva Stojanoska, Elizabeta Chadikovska, Ace Dodevski*

*Institute of Anatomy, Faculty of Medicine, SS Cyril and Methodius University, Skopje, Macedonia*

**Introduction:** Growth monitoring and promotion of optional growth are essential components of primary health care for children. The aim of this research is to present qualitative examination of anthropometrical parameters in preschool children and provide the information on the prevalence of different categories of growth and nutritional status during the childhood.

**Materials and methods:** The study included 220 healthy preschool children (110 boys and 110 girls). Stature and body weight were measured, and the BMI value was calculated. Ten anthropometric parameters were measured such as body weight, body height, longitudinal and transversal diameters and skin folds for triceps and scapula. We used self-organizing maps for additional qualitative examination of the results.

**Results:** Values at the 50th percentile in our children from both nationalities for the weight-for-age index were 20 kg. The height-for-age index values corresponding to the 50th percentile showed slightly higher values in our female subjects 115.0 cm, and those in our male subjects was 110 cm. The values of 50th percentile of BMI in our females subjects was 15.7 kg/m<sup>2</sup>, whereas in our males was 16.1 kg/m<sup>2</sup>. The values of 50th percentile of BMI in our females subjects from muslims nationalities was 16.2 kg/m<sup>2</sup>, whereas in males was 16.68 kg/m<sup>2</sup>.

**Conclusions:** These results show that obesity prevention is recommended, and the detected values could be applied for evaluation of deviations in growth and nutritional status in preschool children.

**P-170****Differences on anthropometric indexes in people with sedentary lifestyles and running people**

Daniel Navas Harrison<sup>1</sup>, Ana M<sup>a</sup> Pérez Pico<sup>2</sup>, Esther Mingorance Álvarez<sup>3</sup>, Raquel Mayordomo Acevedo<sup>2</sup>

<sup>1</sup>Clínica Podología Navas, Málaga, Spain; <sup>2</sup>Universidad de Extremadura, Plasencia, Spain; <sup>3</sup>Universidad de Extremadura, Cáceres, Spain

**Introduction:** Anthropometry is a science that analyses the composition and structure of the human body and it is a valuable tool to determine the physical benefits of performing a certain exercise. The main objective of the present work is to obtain the anthropometric indexes in two populations and evaluate the differences between people who do exercise and those who do not. Thus, determine if anthropometry is a useful tool to assess differences between populations.

**Methodology:** 172 people between 25 and 32 years, without significant difference in weight, were measured (134 people were sedentary and 38 do running at least 2 days and 4.29 h per week). The perimeters and folds of the upper and lower trends were measured and anthropometric indexes were obtained: Body Mass Index (BMI), Cormic Index (CI), Ponderal Index (PI), Relative Index of Lower Limbs (RILL), fat percentage, bone mass, and residual mass.

**Results:** There was no difference in the perimeter of the arm or chest. In the hip and waist perimeter showed higher significant values on sedentary people. Significant differences were found in the BMI (lower in those who do running) and in all measured anthropometric indexes. Those who do running regularly manage to develop their lower trend more, lower fat percentage and greater bone, muscle, and residual mass.

**Conclusions:** The anthropometric indexes allow distinguishing between populations and constituting a very useful diagnostic tool to monitor the anatomical evolution of persons and thus be able to evaluate their somatotype and health status.

**P-171****Movement and anthropometric analysis in the youth population**

Rita Maria Serra<sup>1</sup>, Valeria Pomponi<sup>1</sup>, Giovanni Maria Pittorru<sup>2</sup>, Andrea Virgilio<sup>2</sup>, Laura Saderi<sup>3</sup>, Marina Dettori<sup>3</sup>, Giovanni Sotgiu<sup>3</sup>, Pasquale Bandiera<sup>1</sup>

<sup>1</sup>Department of Biomedical Sciences, University of Sassari-Sassari, Italy; <sup>2</sup>Centro Studi CUS Sassari, Sassari, Italy; <sup>3</sup>Clinical Epidemiology and Medical Statistics Unit, Dept of Medical, Surgical and Experimental Medicine, University of Sassari-Sassari, Italy

**Introduction:** The World Health Observatory (WHO) has published the guidelines to indicate the levels of physical activity recommended to be healthy in the age groups: 5–17 years, 18–64 years and over 65. The expected benefits area greater physical and mental well-being. The Body Mass consists of Fat Free Mass (FFM) and Fat Mass (FM): FFM includes TBW (total body water), bones, non-bone mineral and proteins. FM includes all the lipids present in the human body. FFM and FM are calculated on the total weight; FM should not exceed 25% of the body weight and FFM at least 75% of the total weight. **Materials and methods:** The 211 students (52 females, 159 males) with age range 15–18 years underwent motor tests (initial T0, intermediate T1, final T2) as twenty meters from standing (speed), long

jump (explosive force lower limbs), 2 kg medicine ball thrown forward (upper limbs force). Anthropometric measurements as total height (ST), weight, subscapular, tricipital and abdominal plicometry, thoracic perimeter (PT), abdominal perimeter (PA), perimeter of the basin (PB), perimeter of the triceps, perimeter of the thigh and perimeter of the calf were taken in order to understand the physical state of the examined subjects. The final aim of the project was to understand the benefits of sport on the examined subjects.

**Results:** All values (BMI, FFM, FM and fat percentage) were statistically significant, except for the fat percentage in females. The increase in values could be related to growth and, for lean mass, to constant physical activity.

**P-172****Anatomical variations of the vertebrobasilar system in an amphitheater of a colombian university**

García Orjuela, Danilo Alejandro

Universidad De Ciencias Aplicadas y Ambientales, Bogotá, Colombia

**Introduction:** Vascular structures of the posterior fosa exhibit significant anatomical variability among studies. Given the importance of their function regarding blood supply of the brainstem and the posterior part of the brain, the description and comprehension of the anatomical vascular variants (posterior circulation) results crucial. To the best of our knowledge there are not studies involving Colombian population.

**Materials and methods:** The objective of this study was to describe the vascular anatomical variants of the vertebrobasilar system in the amphitheater of a colombian university. Six encephalons were obtained for analysis by convenience sampling in the amphitheater of the university at Bogotá, Colombia; number of vessels, diameter, longitude and trajectory were measured.

**Results:** Four out of six encephalons showed anatomical variants. Vertebral arteries displayed asymmetry in their diameter up to 1.85 mm. Posteroinferior cerebellar arteries emerged directly from the basilar artery in the 16.6% of the cases. In 8.33% of the cases the superior cerebellar artery constituted a common trunk with the posterior cerebral artery. Duplication of the superior cerebellar artery was found in 25% of the cases.

**Conclusions:** Anatomical variants were found in 2/3 of the cases. The most common was the duplication of the superior cerebellar artery.

**P-173****Angiogenesis and inflammation in the skin of patients with diabetic neuropathy**

Yolanda García Mesa<sup>1</sup>, Mario González Gay<sup>2</sup>, Irene García Martínez<sup>2</sup>, Jorge Feito<sup>3</sup>, Giuseppina Salvo<sup>4</sup>, Eliseo Viña<sup>5</sup>, Jorge García Piqueras<sup>1</sup>, Roberto Cabo<sup>1</sup>, Jose Antonio Vega Álvarez<sup>1</sup>, Olivia García Suárez<sup>1</sup>

<sup>1</sup>Universidad de Oviedo, Oviedo, Spain; <sup>2</sup>Fundación Hospital de Jove, Gijón, Spain; <sup>3</sup>Complejo Asistencial de Salamanca, Salamanca, Spain; <sup>4</sup>Università di Messina, Messina, Italy; <sup>5</sup>Hospital de Cabuñes, Gijón, Spain

**Introduction:** Inflammatory processes and microcirculatory changes are associated to the evolution of diabetic neuropathy (DN). The

present study was designed to evaluate the quantitative and immunohistochemical characteristics of the cutaneous blood vessels, as well as the frequency of inflammatory infiltrates in the skin of subjects suffering DN.

**Materials and methods:** Simple immunohistochemistry and double immunofluorescence techniques were performed in glabrous foot skin samples from subjects diagnosed of neuropathy associated to type 2 diabetes and aged-matched controls using antibodies against immature (anti-CD34) and mature (anti-CD31) endothelial cells as well as anti-actin (used to identify the smooth muscle cells). Thereafter the density of micro-vessels/mm<sup>2</sup> was established using automatic quantitative methods. Additionally, sections were stained with H&E to show inflammatory infiltrate.

**Results:** In the skin of subjects undergoing DN infiltrates of inflammatory cells were regularly found. In addition, there was a significant increase in the density of cutaneous of blood vessels of subjects suffering DN in comparison with the control ones, especially of CD34(+) capillaries. The walls of those capillaries were thicker than in controls.

**Conclusions:** Present results suggest that DN is associated to cutaneous inflammation of neo-angiogenesis which might account for some of the clinical sensory symptoms of this disease.

## P-174

### Interfascicular septum of the calcaneal tunnel and its relationship with the plantar nerves: a cadaveric study

Tae-Hyeon Cho<sup>1</sup>, Hyun-Jin Kwon<sup>1</sup>, Sung-Yoon Won<sup>2</sup>

<sup>1</sup>Department of Anatomy, Yonsei University College of Medicine, Seoul, Republic of South Korea; <sup>2</sup>Department of Occupational Therapy, Semyung University, Jecheon, Republic of South Korea

**Introduction:** The relationship between the plantar nerves and internal fascial structure of the calcaneal tunnel is clinically important to alleviate pain of the sole. The study aimed to investigate the three-dimensional (3D) anatomy of the calcaneal tunnel and its internal fascial septal structure by using micro-computed tomography (mCT) with a phosphotungstic acid preparation, histologic examination and ultrasound-guided simulation.

**Materials and methods:** Twenty-one fixed cadavers and three frozen fresh cadavers (13 men and 11 women, mean age 82.1 years) were used in this study. The 3D images of the calcaneal tunnel harvested by mCT were analyzed in detail. Modified Masson trichrome staining and serial sectional dissection after ultrasound-guided injection were conducted to verify the 3D anatomy.

**Results:** Within the calcaneal tunnel, the interfascicular septum (IFS) commenced proximal to the malleolar-calcaneal line and distal to the bifurcation of the tibial nerve into the plantar nerves. The medial and lateral plantar nerves were separated by the IFS, which divided the calcaneal tunnel into two compartments. The plantar nerves were ramified into two or three branches within each compartment. The IFS terminated around the talocalcaneonavicular joint, and the plantar nerves traveled into the sole.

**Conclusions:** A medical intervention for alleviating pain of the sole should be performed in consideration of the calcaneal tunnel compartmentation and related nerve proceeding.

## P-175

### Anatomical variations of the sacroiliac joint by computed tomography

Rodrigo Teran Garza<sup>1</sup>, Adrián Manuel Verdines Perez<sup>1</sup>, Cesar Tamez Garza<sup>2</sup>, Alejandro Quiroga Garza<sup>1</sup>, Ricardo Pinales Razo<sup>2</sup>, José Félix Vilchez Cavazos<sup>3</sup>, Rodrigo Enrique Elizondo Omaña<sup>1</sup>, Santos Gúzman López<sup>1</sup>

<sup>1</sup>Universidad Autonoma de Nuevo Leon, Facultad de Medicina, Human Anatomy Department, Monterrey, Nuevo León, Mexico;

<sup>2</sup>Universidad Autonoma de Nuevo Leon, Facultad de Medicina, Radiology Department, Monterrey, Nuevo León, Mexico;

<sup>3</sup>Universidad Autonoma de Nuevo Leon, Facultad de Medicina, Orthopedics and Traumatology Department, Monterrey, Nuevo León, Mexico

**Introduction:** The sacroiliac joint (SIJ) connects the axial skeleton with the pelvis. It is one of the most complex joints to be assessed by radiological image, and may be affected by diverse pathologies. Our objective was to identify the prevalence of SIJ anatomical variants using CT and compare it with previous studies.

**Methods:** We performed a retrospective study was made based on pelvic and/or abdominal CT that allowed the complete visualization of the SIJ. SIJ space was measured, and variants were classified as: Accessory SIJ, ileosacral complex, bipartite bony plate, semicircular defect, iliac bony plate, and ossification centers.

**Results:** 400 CT scans were included for analysis. The mean age was 49 years, 180 (45%) were men and 220 (55%) women. More than half (209, 52.2%) of the patients presented an anatomical variant, and were more predominant in women (65.4% vs 36.2%), as well as those older than 40 years of age (60% vs 40%). The mean joint space was similar between sides (right 2.41 ± 0.65 mm vs. left 2.37 ± 0.65 mm). Incidence was 19.8% accessory SIJ, 6.5% ileosacral complex, 12.3% bipartite bony plate, 8% semicircular defect, 5% iliac bony plate, and 0.8% for ossification centers. No statistically significant differences were found comparing the space with the variables of gender, age, or type of variant.

**Conclusion:** The prevalence of anatomical variants of the SIJ is high in the Hispanic population, higher in women and those older than 40 years.

## P-177

### Anatomical and three-dimensional study of lumen of the seminal vesicle

Je-Sung Lee, Tae-Jun Ha, Wu-Chul Song

Department of Anatomy, Konkuk University School of Medicine, Seoul, Republic of South Korea

**Abstract**

**Purpose:** The seminal vesicle is gland producing semen. The seminal vesicle is a dense coiled tube with irregular diverticula. The present study aimed to classify the structural of seminal vesicle through three-dimensional reconstruction.

**Method:** Twenty-five seminal vesicles harvested from twenty formalin-embalmed cadavers were investigated. The seminal vesicle with ampulla of the ductus deference was dissected. The total length and width of the seminal vesicle are measured. The whole seminal vesicle was embedded in paraffin, the block was cut with an interval of 500  $\mu\text{m}$ , and photographed the sectioned surface. The section images of the seminal vesicle were reconstructed three-dimensionally using 'Reconstruct' computer software.

**Results:** The seminal vesicles were of variable sizes. The right seminal vesicle was little larger than the left one. The lumen was complex coiled and had the main strand and a formed ascending branch, a descending branch.

**Conclusion:** The seminal vesicle was known to have a complex coiled tube structure in with irregular diverticula. The present study showed a branched in the coiled tube and a diverticulum attached to it. Three-dimensional reconstruction is a useful technique to visualize multiple points. In addition, it is possible to reconstruct and specify just desired parts to observe and classify them. Moreover, various viewpoints were able to distinguish this more clearly and form the lumen of the seminal vesicle.

## P-178

### Puboprostatic ligament as an important suspensory structure in the retropubic space

Soo-Jung Kim<sup>1</sup>, Hyun-Min Choi<sup>2</sup>, Hyeon-Joo Kim<sup>1</sup>, Hee-Jun Yang<sup>1</sup>, So-Young Jung<sup>1</sup>, Jang-Hwan Kim<sup>3</sup>, Hye-Yeon Lee<sup>1</sup>

<sup>1</sup>Department of Anatomy, Yonsei University College of Medicine, Seoul, Republic of South Korea; <sup>2</sup>Graduate School, Yonsei University, Seoul, Republic of South Korea; <sup>3</sup>Department of Urology, Yonsei University College of Medicine, Seoul, Republic of South Korea

**Introduction:** The puboprostatic ligament is one of the most important supporting structures between the pubic bone and prostate gland in the retropubic space.

**Materials and methods:** To provide the precise anatomy of the ligament for the radical prostatectomy, 31 pelvis of adult male cadavers were anatomically investigated to figure out the shape, number and location of the ligament.

**Results:** The pelvis showed the bilaterally single (61.3%), bilaterally double (19.4%) or mixed (19.4%) ligaments. The ligament was mostly a band shape (type I, 53.8%). Some of them appeared as  $\lambda$ -shape (type II, 36.3%) or Y-shape (type III, 8.8%). The band shaped puboprostatic ligaments were observed more frequently in the specimen with double ligaments, while the  $\lambda$ -shaped puboprostatic ligament was observed more frequently in the cases with single ligament. The superficial branch of the deep dorsal vein ran through the interval between both ligaments. The average distance between both puboprostatic ligaments was 8.1 mm at the pubic site and 14.1 mm at prostate site. The distance was narrower when the specimen had double puboprostatic ligaments in both sides. The neurovascular bundle ran beneath the puboprostatic ligament, and it frequently pierced the lateral band of the ligament when the ligament was  $\lambda$ -shape.

**Conclusions:** It is believed that the pelvis with bilateral double puboprostatic ligaments would have advantages in urogenital competence after surgery. Importance of the lateral band should be focused as a supporter and a landmark of the neurovascular structure.

## P-180

### The lesser pelvis anatomy in human male fetuses on the 16–22 weeks of the development

Ludmila Shalikova, Yulia Gulina, Diana Liashchenko

Orenburg State Medical University, Orenburg, Russian Federation

The progress of the intrauterine operations on the fetal pelvic organs and nursing of deeply premature neonates dictate to obtain new anatomical data of the lesser pelvis in the prenatal stage. The purpose of this research work is the studying of the lesser pelvis anatomy and topography of its structures on material of the 30 male fetuses of 16–22 weeks of development without congenital malformations. The set of morphological methods as macromicroscopic preparation, method of cuts according to N. I. Pirogov, histological method was used. It was revealed that the transverse diameter of the pelvic inlet averages  $14.7 \pm 0.5$  mm, the anatomical conjugate is  $13.1 \pm 0.8$  mm, the obstetric conjugate is  $12.4 \pm 0.9$  mm, the diagonal conjugate is  $14.6 \pm 0.7$  mm. The urinary bladder has a dimension of  $9.81 \pm 0.3$  mm height and  $4.33 \pm 0.15$  mm width. The urinary bladder is continued to urachus without explicit transition. The average value of the diameter of urachus is  $2.85 \pm 0.1$  mm. The prostate is located just below the urinary bladder, has  $3.35 \pm 0.12$  mm width and  $2.50 \pm 0.15$  mm height. The length of the testis was found out to be  $6.95 \pm 0.35$  mm and the width of the testis— $3.75 \pm 0.18$  mm. The length of the gubernaculum from the testis to transverse fascia was measured about 3.16 mm on right and 3.28 on left. The detailed knowledge of the developmental anatomy of the lesser pelvis will help clinicians to deal better with the problems related to this anatomical region.

## P-181

### Intraspinal thoracic nerve root connections

Zora Haviarova<sup>1</sup>, Viktor Matejčík<sup>2</sup>, Roman Kuruc<sup>3</sup>, Filip Halgaš<sup>2</sup>, Juraj Šteňo<sup>2</sup>

<sup>1</sup>Institute of Anatomy, Faculty of Medicine, Comenius University, Bratislava, Slovakia; <sup>2</sup>Department of Neurosurgery, Faculty of Medicine, Comenius University, Bratislava, Slovakia; <sup>3</sup>Institute of Forensic Medicine, Faculty of Medicine, Comenius University, Bratislava, Slovakia

**Introduction:** Studies of intraspinal nerve root connections are primarily focused on lumbosacral and cervical regions, rarely to thoracic region. Just few studies have reported intradural and extradural communications between the adjacent roots. Such communications

are primarily between dorsal rootlets while ventral root intercommunications have rarely been reported. We have described such thoracic nerve roots interconnections in the reference to the normal, prefixed or postfixed type of brachial and lumbosacral plexuses.

**Materials and methods:** Study was performed on 43 cadavers within 24 h after death (32 males, 11 females). Bodies were dissected in a prone position, with wide and long laminectomy revealing full spinal canal for bilateral examinations of each spinal nerve root from origin to its exit through intervertebral foramen or sacral hiatus. Uncommon extradural and intradural features in the thoracic region were followed and documented.

**Results:** Totally 15 extraordinary features were observed by the thoracic spinal nerve roots including: communicating branches between dorsal and ventral roots respectively, multiple communication, common or close double spacing of roots from 1 segment, roots asymmetry, atypical spacing of roots 2 roots in 1 neuroforamen, extradural communications. All features are described according to the plexus type.

**Conclusion:** It's necessary to know not only the „standard anatomical image“, but also show what life brings in the clinics every day and on which the whole varying pathology depends. Obtained observations may be helpful in explaining the differences between the clinical picture and generally accepted anatomical standards.

## P-182

### Anatomical variations of the ciliary ganglion location

Robert Hatadaj<sup>1</sup>, Grzegorz Wysiadecki<sup>1</sup>, Michał Polguj<sup>2</sup>, Mirosław Topol<sup>1</sup>

<sup>1</sup>Medical University of Lodz, Department of Normal and Clinical Anatomy, Lodz, Poland; <sup>2</sup>Medical University of Lodz, Department of Angiology, Lodz, Poland

**Introduction:** The ciliary ganglion is a parasympathetic ganglion located just behind the eye in the posterior orbit. It has the shape of a four-sided, gray-pink plate with a length of about 2 mm. It lies in the depth of the orbit, approximately on the border of its posterior and middle one-third part, on the lateral surface of the optic nerve, medially from the lateral rectus muscle. Sympathetic, parasympathetic and sensory fibers pass through this ganglion where the parasympathetic fibers are switched to postganglionic axons which run in the short ciliary nerves and innervate two eye muscles: the sphincter of the iris and the ciliary muscle.

**Materials and methods:** 20 orbits were dissected. The orbital content was removed en bloc. The lateral rectus muscle was detached from its insertion and reflected. After removal of the orbital fat, the ciliary ganglion was visualized. Its location, regarding the distance between the point of the optic nerve emerging from the back of an eyeball and the common tendinous ring, was assessed.

**Results:** The location of the ciliary ganglion varied from 40% to 84% (mean = 68%, median = 70%, SD = 13%) of the distance between the point of the optic nerve emerging from the eyeball and the common tendinous ring.

**Conclusions:** The ciliary ganglion occupies relatively constant position regarding the optic nerve. In most cases it can be found in the distal third of the orbit.

## P-183

### Supplementary findings regarding innervation of the lateral rectus muscle based on sihler's staining technique

Robert Hatadaj<sup>1</sup>, Michał Polguj<sup>2</sup>, Mirosław Topol<sup>1</sup>

<sup>1</sup>Medical University of Lodz, Department of Normal and Clinical Anatomy, Lodz, Poland; <sup>2</sup>Medical University of Lodz, Department of Angiology, Lodz, Poland

**Introduction:** The latest research suggests, that abducens nerve may be divided into superior and inferior groups of sub-branches, which reach functionally distinct superior and inferior compartments of the lateral rectus muscle. The aim of the study was to examine innervation of the lateral rectus muscle, including the detailed distribution of the intramuscular sub-branches of the abducens nerve.

**Materials and methods:** 20 specimens of the lateral rectus muscle were harvested (with the orbital segment of the abducens nerve), fixed in 10% formalin solution and stained using Sihler's whole mount nerve staining technique.

**Results:** Sub-branches running to the lateral rectus demonstrated a division into two groups, supplying the superior and inferior compartments of the muscle respectively. Both groups of sub-branches form a characteristic 'tuft' branching pattern ending within the proximal half of the lateral rectus muscle. However, some smaller branches run as far as the insertion of the muscle. Recurrent sub-branches coursed also to the origin of the muscle. The sub-branches running within the muscle as far as its origin and insertion may be also associated with tendon innervation.

**Conclusions:** The abducens nerve may contain topographically distinct branches that may innervate separate functional compartments of the lateral rectus muscle. Smaller branches reach the attachments of the muscle.

## P-184

### Localization of the mechanosensitive ion channel piezo2 in the human gastrointestinal tract

Yolanda García Mesa<sup>1</sup>, Jorge Feito<sup>2</sup>, Eliseo Viña<sup>3</sup>, Jorge García Piqueras<sup>1</sup>, Simón Ordóñez<sup>4</sup>, Francisco Javier Pérez Moltó<sup>5</sup>, Jose Antonio Vega Álvarez<sup>1</sup>, Olivia García Suárez<sup>1</sup>

<sup>1</sup>Universidad de Oviedo, Oviedo, Spain; <sup>2</sup>Complejo Asistencial Universitario De Salamanca, Salamanca, Spain; <sup>3</sup>Hospital de Cabueñes, Gijón, Spain; <sup>4</sup>Clínica Ordóñez, Oviedo, Spain; <sup>5</sup>Universidad de Valencia, Valencia, Spain

**Introduction:** Piezo2 is a non-selective cationic ion-channel that is directly activated by mechanical forces. It has been detected in both sensory neurons and mechanoreceptors, but also in non-neuronal cells. Mechanosensation is critical for normal gastrointestinal (GUT) function. Interestingly, Piezo2 has been found in murine GUT epithelial cells and enterochromaffin cells (EC) 1.2, and preliminary data from our laboratory have demonstrated the occurrence of Piezo2 in the enteric nervous system. Here we have investigated the occurrence and distribution of Piezo2 in the human GUT.

**Materials and methods:** Samples of the different segments of the human GUT were taken from autopsies or surgical specimens of subjects free of known GUT pathology. Single immunohistochemistry and double immunofluorescence techniques were used to detect Piezo2 in enterochromaffin cells using antibodies directed against Piezo2 and chromogranin A (used to label the store granules of the enterochromaffin cells).

**Results:** Piezo2 positivity was detected along the GUT. It was present in both enterochromaffin cells and epithelial cells of the stomach, small intestine and large intestine. Double immunofluorescence demonstrated that only a subset of enterochromaffin cells contain Piezo2 associated to cytoplasm vesicles.

**Conclusions:** Mechanical forces are important for normal GUT function and abnormalities in mechanosensation are lined to GUT pathologies. The occurrence of Piezo2 in both enterochromaffin and epithelial cells suggest a role of this ion channel in the regulation of GUT functions, presumably the release of some neuroactive molecules like serotonin3.

## P-185

### Better neuroanatomy education with silicone section plastinates

Mustafa F. Sargon

Department of Anatomy, Faculty of Medicine, Atilim University, Atilim University, Ankara, Turkey

**Introduction:** Plastination preserves the biological tissues with completely visible surface and high durability for many years. These plastinates are devoid of harmful effects of formalin and they serve as excellent teaching tools in anatomy education. Additionally, plastination is a good choice for learning cross-sectional anatomy.

**Materials and methods:** Transverse and coronal sections of brains about 5–6 mm in thickness were taken from fixed human brains. Then; the routine silicone plastination technique including dehydration, forced impregnation and hardening were applied to all of the brain sections.

**Results:** Section plastinates are mostly performed by epoxy and polyester resin plastination techniques. In both of these techniques, the thickness of the plastinates can be decreased more than the silicone sections. However; the silicone plastinates also have some advantages to epoxy and polyester plastinates, when compared from the view of neuroanatomy education. By the examination of the silicone brain section plastinates; the students have the chance of examining the real brain sections for many hours instead of the schematic drawings found in many atlases. Silicone section plastinates of brain also detailed the real anatomy seen in the few neuroanatomical models.

**Conclusions:** Plastination is an excellent choice in neuroanatomy education and by the help of some thicker silicone plastinate sections; neuroanatomy can be learned much more easy and successfully.

## P-187

### Morphological-functional characterization of gelatinous substance of spinal cord

Alejandro Mendoza Puente, Raquel Béjar Garza, Irene Meester, María Treviño Alanís, Gerardo Rivera Silva

Universidad de Monterrey, San Pedro Garza García, Mexico

**Introduction:** Pain signals processing occurs at the Rexed laminae I-IV in the dorsal horn of the spinal cord. Lamina II corresponds to the gelatinous substance (GS), that is responsible for editing and modulation of pain. Several chronic pain diseases remain with unknown etiopathophysiology, like fibromyalgia and reflex sympathetic dystrophy. The objective is to establish the different morphological-functional zones and connections of the GS associated with chronic pain.

**Materials and methods:** We realized a systematic review about GS located into Rexed lamina II, to know the elements that could be related to unspecific and specific chronic pain. Using Scopus and Medline platforms, we reviewed 45 articles (originals and reviews) from 1952 to 2018, with the keywords: gelatinous substance of spinal cord, Rexed lamina II, chronic pain, unspecific pain, and chronic pain syndrome.

**Results:** We mapped the different regions: nucleus proprius with its freely branching dendrites prolonging in all directions; pericornual cells; islet cells; stalked cells; GS neuropil; glomeruli; and nerve endings which input to the dorsal margin of the GS, the initial branching of some of these fibers takes place immediately under Lissauer's zone. Therefore, these fibers send collaterals (peptidergic subpopulations) that could be correlated to unspecific chronic pain diseases, due to the high concentrations of substance P and opioid receptors, which are crucial in the modulation and edition of pain.

**Conclusion:** The GS determines which pattern of sensations could be deciphered as painful. Therefore, this lamina should be studied as a critical and specific affected zone in painful illnesses with unknown etiology.

## P-188

### Applied MRI anatomy and morphometry of normal lumbar spine vertebral foramina for safe transforaminal lumbar puncture procedures

Alexander Khalaf<sup>1</sup>, Vivek Yedavalli<sup>1</sup>, Mika Jain<sup>2</sup>, Tarik Massoud<sup>1</sup>

<sup>1</sup>Stanford University School of Medicine, Stanford, United States;

<sup>2</sup>Stanford University, Stanford, United States

**Introduction:** Transforaminal lumbar puncture (TFLP) offers an alternative access route to the lumbar subarachnoid cistern. Safe fluoroscopic insertion of a percutaneous needle through a lumbar vertebral foramen (VF) should avoid the exiting spinal nerve and surrounding vascular pedicles. A crescentic region in the posterior aspect of VF is considered an ideal needle target for TFLP, but the anatomical basis of this has not been analyzed previously. To enhance TFLP safety, we define the morphometry of normal lumbar VFs and locations of neurovascular structures in the VF posterior crescent.

**Materials and methods:** We retrospectively reviewed high-resolution T2-weighted lumbar spine MRIs of 20 normal adults. We established morphometric dimensions on magnified images for each VF from L1 to L5 bilaterally. We segmented the VF posterior crescent into three parts, and measured the areas occupied by the neurovascular structures within each segment. We statistically correlated the presence/absence of neurovascular structures in each crescent segment using a Chi-square test.

**Results:** The mean morphometrics for all 160 VFs in 4 males and 16 females (similar mean ages) were: area  $122.3 \pm 27.4 \text{ mm}^2$ ; height  $18.8 \pm 2.1 \text{ mm}$ ; and width at mid-disc level  $6.0 \pm 2.0 \text{ mm}$ . The area proportion of each VF posterior crescent segment (upper, middle, lower) free of neurovascular structures was: 7.4%, 34%, and 12.2%. 'Precise crescent segment' and 'presence or absence of neurovascular structures' were highly dependent variables ( $X^2 = 39.9$ ,  $p < 0.005$ ).

**Conclusions:** The middle segment of the VF posterior crescent is significantly most devoid of neurovascular structures, and will more often be a clear target for needle placement during safe TFLP.

## P-189

### Anatomy of the human spinal cord at the 20–22 weeks of the prenatal period of the ontogenesis

Victoria Galiakbarova, Lyudmila Shalikova, Diana Liashchenko

Orenburg State Medical University, Orenburg, Russian Federation

Spina bifida is one of the frequent congenital defect. Closing the fetus's back early, 20–25 weeks, may allow some nerve function to be restored in pregnancy. The aim of this study is to identify the anatomical features of the fetal human spinal cord on material of 15 person fetuses of both sexes of 20–22 weeks of development without congenital malformations. The macromicroscopic preparation and morphometry are used for studying. It was revealed that the spinal cord of the fetus has its own features. The length of the spinal cord is  $87.85 \pm 11.5$  mm. The maximal value of the cervical enlargement is  $3.39 \pm 0.23$  mm on the level of the C6 vertebral body, while the maximum value of lumbar enlargement ( $3.85 \pm 0.31$  mm) was observed at the level of the L2 body. The fetal spinal cord is finished at the level of L3-L5 vertebrae by the conus medullaris, its transverse size is  $1.05 \pm 0.12$  mm. The spinal roots in the cervical region go horizontally, and have an oblique downward course in the thoracic and lumbosacral regions. The real length of the spinal roots is more the length of the roots in the dura mater in 2–2.5 times. The position of the spine segments relative to the vertebral column does not correspond to the rule of Shipo at this stage of prenatal ontogenesis. Results of research show the need for further study of the fetal spine anatomy in order to form the morphological base for prenatal diagnosis and surgical correction of the congenital neural tube malformations.

## P-190

### Morphological study of the basivertebral foramina of true vertebrae in a Greek population

Maria Tzika<sup>1</sup>, George Paraskevas<sup>1</sup>, Maria Piagkou<sup>2</sup>, Konstantinos Natsis<sup>1</sup>

<sup>1</sup>Department of Anatomy and Surgical Anatomy, Aristotle University of Thessaloniki, Thessaloniki, Greece; <sup>2</sup>Department of Anatomy and Surgical Anatomy, School of Medicine, National and Kapodistrian University of Athens, Athens, Greece

**Introduction:** The basivertebral foramina (BVF) are openings at the posterior aspect of vertebral bodies, responsible for the vessel supply of the vertebrae. There is lack of data concerning BVF morphology. The current study examines the BVF morphology and morphometry in dry specimens.

**Materials and methods:** BVF number, size and distribution were noted in 1581 adult disarticulated vertebrae (70 skeletons).

**Results:** C<sub>1</sub> vertebrae did not present BVF (3.4%). A BVF was present in 45.1% in total (unilaterally in 4.7%). BVF septation was found in 4.4%. Two BVF were observed in 36.9%, 3BVF in 3.8% and 4BVF in 0.6%, presenting variable morphology and distribution. Only a single case of 5 BVF was noted. Isolated small foramina (< 1 mm) were

found in 10.1% (44.2% in C<sub>3</sub>). Two BVF were found in 72.2% of C<sub>2</sub>, in 65.7% of C<sub>6</sub>-T<sub>1</sub>, in 61% of L<sub>4</sub> and L<sub>5</sub> and in 51.7% of C<sub>4</sub>. A BVF was found in 76.8–86.6% of T<sub>10</sub>-L<sub>1</sub>, in 57.4–63.8% of T<sub>3</sub>-T<sub>6</sub> and in 49.3–52.9% of T<sub>7</sub>-T<sub>9</sub>. L<sub>2</sub> and L<sub>3</sub> presented a BVF in 60.9% and 51.5%, respectively. The mean BVF size, where a BVF occurred was statistically significant greater than in cases with two BVF.

**Conclusions:** Literature concerning BVF morphology is obscure, while their clinical impact is undeniable. The study showed that some vertebral levels presented specific BVF patterns; two BVF were found in 72.2% of C<sub>2</sub>, whereas a BVF was found in 76.8–86.6% of T<sub>10</sub>-L<sub>1</sub>. On the contrary, C<sub>3</sub>, C<sub>5</sub>, T<sub>2</sub> and T<sub>7</sub> presented the greatest variability, as no subtype exceeded 50%.

## P-192

### Transmission and scanning electron microscopic examination of liquid specimens: techniques and evaluation methods

Mustafa F. Sargon

Department of Anatomy, Faculty of Medicine, Atilim University, Ankara, Turkey

**Introduction:** The most difficult technique in transmission (TEM) and scanning (SEM) electron microscopy is the examination of liquid specimens. In the study; different techniques for the examination of liquid samples and evaluation methods are described.

**Materials and methods:** Liquid specimens are put into 5% glutaraldehyde for fixation. Then; centrifugation must be applied to samples for the collection of biological materials at the bottom of tube. Speed and duration of centrifugation has a great importance for the preservation of biological specimens and it must be done in every step.

**Results:** Both for TEM and SEM; second fixation is done by osmium tetroxide and dehydration is done by alcohol series. Then; in TEM pre-embedding step is done by propylene oxide and embedding procedure is performed in the same tube by epoxy resin embedding media. Following polymerisation; the semi thin and ultrathin sections of the samples are taken by an ultra-microtome and these sections are stained by double contrast staining methods. Then the examination of liquid samples can be done under the transmission electron microscope safely. In SEM; following dehydration; air-drying is the only way for the preservation of the material. After air-drying; sputtering is done just similar with the routine sputtering method and then; the ultrastructural analysis of liquid samples can be done under the scanning electron microscope very successfully.

**Conclusions:** Liquid samples' ultrastructure has a great importance in many experiments. Therefore; the most successful ultrastructural analysing techniques are described in order to help to researchers who are dealing with liquid samples.

## P-195

### Anatomists and biomedical engineers on the same task: fabrication of the human bone implants by the method of anatomical features (MAF)

Stojanka Arsić<sup>1</sup>, Miroslav Trajanović<sup>2</sup>, Nikola Vitković<sup>2</sup>, Miloš Stojković<sup>2</sup>, Milica Tufegdžić<sup>3</sup>, Milorad Mitković<sup>4</sup>

<sup>1</sup>University of Niš, Faculty of Medicine, Department of Anatomy, Niš, Serbia; <sup>2</sup>University of Niš, Faculty of Mechanical Engineering,

Department for production and IT, Niš, Serbia; <sup>3</sup>College of Applied Mechanical Engineering, Trstenik, Department of Information Technology, Serbia; <sup>4</sup>University Clinical Center, Orthopedic Clinic, Niš, Serbia

**Introduction:** Parametric models of the bones obtained from the set of the morphometric parameters are of the great importance especially for the 3D geometrical modeling of the damage bone parts after the fractures, bone destruction in malignancy processes etc. 3D geometrical bone models are also used for preoperative planning of the corrective osteotomies, preoperative training of the surgeons and the production of the personalized implants fabricated by Additive Manufacturing (AM) from different biocompatible materials.

**Materials and methods:** Method of anatomical features (MAF) was used for the creation of 3D geometrical models of the human bones. It implies precisely defining anatomical landmarks—different points on the bone and distances between them usually called Referential Geometrical Entities (RGEs). The numerical values of the measured morphometric parameters are the base of “bone parameterization” and represent an input for obtaining parametric bone model using statistical procedures or artificial neural networks.

**Results:** We present 3D geometrical models of the femur, tibia, fibula, mandible, hip bone and a patient-customized implant of the sternum created by the (MAF).

**Conclusions:** Morphometric parameterization as a part of the (MAF) is the base for “digital morphometry” of the bones and creation of the (3D) geometrical bone models using corresponding software (CAD—Computer Aided Design). This methodology is also used for the modeling of some prosthesis and surgical devices.

## P-196

### The effect of co-administration of *Vitex doniana* and sniper pesticide on the lungs of adult female wistar rats

Jervas Ekezie<sup>1</sup>, Felix Ovie Ogbo<sup>2</sup>, Louisa Oketah Ifeoma<sup>2</sup>, Chisomaga Eke Chiwuikem<sup>3</sup>, Williams Osuchukwu Ikechukwu<sup>4</sup>

<sup>1</sup>Department of Anatomy, Faculty of Basic Medical Sciences, Federal University of Technology Owerri, Nigeria; <sup>2</sup>Department of Anatomy, Faculty of Basic Medical Sciences Nnamdi Azikiwe University Nigeria, NNEWI, College of Health Sciences, Nigeria; <sup>3</sup>Department of Prosthetics and Orthotics, Federal University of Technology, Owerri, Nigeria, OWERRI, FUTO, Nigeria; <sup>4</sup>Department of Prosthetics and Orthotics, Federal University of Technology, Owerri, Nigeria, OWERRI/FUTO, Nicaragua

**Introduction:** Sniper is a brand name for Dichlorvos, an insecticide used indoors. The aim of this study was to investigate the effect of co-administration of methanolic leaf extract of *Vitex doniana* (MLEVD) and sniper on the lungs of adult female Wistar rats.

**Materials and methods:** Ethical approval was obtained from the Ethical Committee of the College. Twenty female rats weighing 100–250 kg were divided into 5 groups of 4 rats each. Group A served as control, group B were exposed to 5 ml vapour of Sniper for 5 min, group C received 500 mg/kg of MLEVD, group D were exposed to 5 ml vapour of Sniper for 5 min and 250 mg/kg of MLEVD while group E were exposed to 5 ml vapour of Sniper for 5 min and 500 mg/kg of MLEVD. MLEVD administrations were orally prior to exposure to Sniper. Physical observation recorded low feed intake in group B, hypersensitivity in groups B, D and E; sneezing in groups C and E. Mortality rate was high in group B. At the end of the experiment the rats were anaesthetized, the lungs were harvested and weighed; sections were made.

**Results:** There was significant decrease in the weight difference of the treated groups compared to control. Only rats in group D had significant increase in the relative organ weight. Histological findings showed severe lung damage in the animals treated with sniper alone. These effects were reduced in the co-administered groups.

**Conclusions:** MLEVD has a protective dose-dependent effect against lung damage following exposure to sniper.

## P-197

### Anatomical variants of the aortic arch

Mariana Tapia Nández<sup>1</sup>, Germán Alfonso Landeros García<sup>1</sup>, Alejandro Quiroga Garza<sup>1</sup>, Ricardo Pinales Razo<sup>2</sup>, Guillermo Elizondo Riojas<sup>2</sup>, Bernardo Fernández Rodarte<sup>1</sup>, Rodrigo Enrique Elizondo Omaña<sup>1</sup>, Santos Guzmán López<sup>1</sup>

<sup>1</sup>Universidad Autonoma de Nuevo Leon, Facultad de Medicina, Human Anatomy Department, Monterrey, Nuevo León, Mexico; <sup>2</sup>Universidad Autonoma de Nuevo Leon, Facultad de Medicina, Radiology Department, Monterrey, Nuevo León, Mexico

**Introduction:** The aortic arch has a predominant branching pattern in the general population, however, variants of this pattern have been widely studied in different populations, with a general prevalence between 5 and 35%. The purpose of this study is to determine the prevalence of variants in the ramification of the aortic arch in our local population in order to facilitate the performance of surgical procedures related to this area.

**Materials and methods:** A total of 220 computed tomography angiography were retrospectively analyzed to determine the number of arteries originating within the limits of the aortic arch. The branching pattern was recorded. The most cranial vertebral level of the aortic arch was measured, as well as the diameter of the aorta in the proximal, middle and distal segments. Results were stratified and analyzed by gender.

**Results:** Our population showed a variation in the typical branching pattern of the aortic arch of 22.3% (49). Common Trunk (TC), Left Subclavian (SI) of 13.6% (30); Brachiocephalic Trunk (TB), Left Common Carotid (CCI), Left Vertebral (VI), Left Subclavian (SI) of 7.3% (16). The most prevalent branching pattern with 77.7% (171) involves the following arteries in a sense from anterior to posterior and from right to left: TB, CCI, SI.

**Conclusion:** When comparing our Results with other studies, our population has one of the highest prevalence in the branching pattern, even so, the order of frequency in each type of variant, shows figures similar to other studies.

## P-198

### Accessory right crus of diaphragm: a rare variation

Jessy J P, Sarah Sangma, Saroj Kaler, Neerja Rani

All India Institute of Medical Sciences, Delhi, India

**Introduction:** Diaphragm develops from septum transversum, pleuroperitoneal membranes, dorsal mesentery and muscular ingrowths from lateral body walls between 3rd to 8th weeks of intrauterine life. The right and left crus attaches to lumbar vertebrae and develops from muscle fibres which grow into oesophageal mesentery thus enclosing oesophageal hiatus. Various anomalies involving diaphragm like

Bochdalek, Morgagni's, Hiatal hernia and agenesis are frequently reported. Duplication and anomalies involving crura are rare and asymptomatic and found incidentally during routine dissection and radiological imaging.

**Materials and methods:** The present case was observed during routine dissection for MBBS graduates in an adult male cadaver of 65 years at All India Institute Of Medical Sciences, Delhi, India.

**Results:** The right crus of the diaphragm was duplicated and seen as separate muscle belly having medial and lateral parts. The distal attachment was tendinous to the third lumbar vertebrae. The length of muscular part varied, with medial part being 8.5 cm and lateral part being 10.5 cm. The accessory muscular lateral part of right crus merged with medial part at second lumbar vertebrae. The tendon of the accessory crus was shorter than the medial part. The right crus contributed for the formation of oesophageal hiatus. The left crus was found to be normal.

**Conclusion:** Knowledge of this variation is important in understanding the gastrointestinal physiology and pathological conditions (tumours, vascular abnormalities, abscesses) which facilitate diagnosis of disease processes within this often overlooked anatomical structure.

## P-199

### The evaluation of thoracic angles with anthropometric measurement of the thorax and pulmonary functions in patients with multiple sclerosis

Musa Muhtaroglu<sup>1</sup>, Sevda Lafci Fahrioglu<sup>1</sup>, Ferda Selcuk Muhtaroglu<sup>2</sup>, Nedim Sezgin Ilgi<sup>1</sup>

<sup>1</sup>Near East University, Faculty of Medicine, Anatomy Department, Nicosia, Cyprus; <sup>2</sup>Dr. Burhan Nalbantoglu State Hospital, Neurology Department, Nicosia, Cyprus

**Introduction:** The aim of this study is to analyze the anthropometric measurements of the thorax, which included the thoracic angle, along with respiratory functions in patients with multiple sclerosis (MS) as compared to healthy controls within the Turkish speaking Cypriot population.

**Materials and methods:** This study consisted of 40 patients with MS, with an EDSS score below 5, between the ages of 18–55 years and a control group consisting of 41 patients with the similar demographic and physical characteristics. Pulmonary function tests of the patients and the control group were measured with Spida 5 Spirometry device with ATS and ERS criteria. Thoracic angles were evaluated with Baseline Digital Inclometer.

**Results:** There was a statistically significant difference between the thoracic angle, chest circumference and pulmonary functions in MS patients and healthy subjects ( $p < 0.05$ ). We found that respiratory function tests of the MS decreased significantly over time, more than in healthy individuals. In addition to decreased pulmonary functions, the MS group has a higher chest circumference (98.23/94.17 MS vs normal, respectively) and the higher thoracic kyphosis angle (41.56°/35.70°MS vs normal, respectively).

**Conclusions:** There is very limited research on the vertebral column abnormalities in MS patients. There are studies showing pulmonary function failure in MS patients with EDSS scores higher than our

patient population. In our study, we showed that an increase in thoracic angle is accompanied by a change in pulmonary function including a decrease in FVC even in patients with MS with EDSS scores less than 5.

## P-200

### Intravital changes after pneumonectomy and different types of postpneumonectomy cavity plasty

Liashchenko Sergei, Vasukov Michail, Vasukov Anatoly, Filippov Maxim, Karasartov Talgat

Orenburg State Medical University, Orenburg, Russian Federation

Intraoperative plasty of a postpneumonectomy cavity was carried out to reduce mediastinum organs dislocation. The research was conducted on 15 rabbits. The first set of experiments included the left-side pneumonectomy. In the second and third sets pneumonectomy and intraoperative plasty on 1/3 and 2/3 volumes of the operative cavity were performed. The plasty was carried out with viscous implant. In the postoperative period, the control was carried out with CT-scan in 1, 3, 6, 12 months. On CT-scans the sizes of lungs, the area and volume of the remained lung were estimated. In the first set, the volume increased from 45.8 cm<sup>3</sup> to 68.5 cm<sup>3</sup> in a month, reaching a maximum by 6 months of 89.7 cm<sup>3</sup>, and decreasing by 12 months up to 84.1 cm<sup>3</sup>. In the second set, the right lung volume was 50.1 cm<sup>3</sup>, after plasty in 1/3 volumes of a cavity average values increased and reached maximum by sixth month—64.5 cm<sup>3</sup> and by 12 months decreased up to 61.0 cm<sup>3</sup>. Under 2/3 cavity volume plasty, the tendency the remained lung volume increased from 47.1 cm<sup>3</sup> to 69.5 cm<sup>3</sup> by 6th month and decreased to 64.5 cm<sup>3</sup> in a year. Right lung after pneumonectomy has grown by 83%, in the second and third sets after plasty—by 65% and 48%. The heart dislocation was by 11 mm in the first set and in the second one—by 2.7 mm.

## P-201

### Tracheal deviation in goitre complicated with lateral cervical abscess

Poshi Klodiana Haxhiraj Adela

Endocrinology Department, University Hospital Mother Tereza, Hospital University Mother Tereza, Albania

**Introduction:** We report the case of a 55 years old woman with features of subacute thyroiditis complicated with lateral cervical abscess and right deviation of the trachea.

**Case description:** History: The patient, a 55 years old woman from Shkodra, presented at the Emergency Room. She had a history with thyroid disease. Physical Examination: The patient appeared weak, dehydrated, agitated and in bed position. Neck was red, swelled and painful at touch especially in the area of the thyroid gland. A CT scan it showed an enlarged non well defined mass (78 × 95 mm) in the outer layer of the capsule of the left lobe of the thyroid. The mass had a

fluid density with septum and air vesicles on the inside. It shifted right the oropharynx and trachea. The CT scan showed few submandibular lymph nodules, small subpleural nodules and minimal pulmonary fibrotic changes. During the examination it was evident an almost uniform right deviation of the respiratory tract. The CT scan concluded left lateral cervical abscess. During the hospitalization the abscess drained naturally and the patient felt immediately better. Six months after, the patient was fine.

**Discussion:** The presence of the massive abscess in the left lateral part of the neck pushes the oropharynx and trachea aside resulting in the deviation shown in diagnostic imaging but the lack of constriction and the uniformity of the respiratory tract suggests the possibility that the anomaly was present before the disease and it was diagnosed along the primary condition.