

### EXPRESSION OF NEUROPEPTIDES FOLLOWING ROTATOR CUFF TEAR



Mitsufumi Nakawaki, Tomonori Kenmoku, Kentaro Uchida, Naoshige Nagura, Ryo Tazawa, Kenji Onuma, Koji Sukegawa, Gen Inoue, Masashi Takaso, Department of Orthopaedic Surgery, Kitasato University, School of Medicine, Sagami-hara, Japan

**Objective:** Rotator cuff tears (RCTs) are often associated with severe shoulder pain. However, the mechanism of pain in RCTs is still unknown. In recent years, it has been reported that various neuropeptides, including calcitonin gene-related peptides (CGRP), are involved in knee and hip pain. To reveal the novel mechanism for pain caused by RCTs, we investigated the expression of neuropeptides in a rat RCT model.

**Method:** Forty-eight 9-week-old Sprague-Dawley (SD) male rats were divided into intact and RCT groups. At 1, 3, 7, 14, 21, and 56 days, rotator cuff were harvested from intact and RCT groups for real-time PCR analysis of CGRP, apelin, galanin, neuropeptide Y (NPY), neuropeptide FF (NPFF), nociceptin (NOC) (n = 8).

**Results:** No expression of CGRP was observed in the cuff tissue. Expression of apelin and galanin increased from day 1 postoperatively, and the expression of NPY, NPFF, NOC significantly increased compared with the control from day 7 after the operation. Expression of NPY decreased to the same level as the control 56 days after surgery, but high expression was observed in apelin, galanin, NPFF, and NOC on day 56.

**Discussion and Conclusion:** Increased expression of various neuropeptides was observed in the early stages of rupture in a rat RCT model. Elevated expression of apelin, galanin, NPFF, and NOC was observed 56 days after surgery. These factors have been reported to be involved in osteoarthritic and cancer pain, suggesting the increase of these neuropeptides may be involved in RCT pain.

### PITCHING DIFFERENCES BETWEEN JAPAN AND US HIGH-LEVEL BASEBALL PITCHERS



Takanori Oi<sup>a,b,c</sup>, Yohei Takagi<sup>a</sup>, Hiroaki Inui<sup>b</sup>, Glenn Fleisig<sup>c</sup>, Katsuya Nobuhara<sup>b</sup>, Shinichi Yoshiya<sup>a</sup>. <sup>a</sup>Department of Orthopaedics Surgery, Hyogo College of Medicine, Nishinomiya, Japan; <sup>b</sup>Nobuhara Hospital and Institute of Biomechanics, Tatsuno, Japan; <sup>c</sup>American Sports Medicine Institute, Birmingham, AL, USA

We analyzed and compared pitching motion between United States and Japanese pitchers. The subjects were 19 Japanese professional and semi-professional pitchers with ball speeds over 120 km / hr and 19 pitchers of minor league (MiLB) with similar age and competition level. The throwing motion of each pitcher from Japan and the US was captured using 7 and 12 high-speed cameras, respectively. Data were entered in Bio-Pitch and analyzed. Height, body mass, and ball velocity were all significantly larger in US pitchers. Kinematically, there was a significant difference in the ratio of the stride length to the height, the pelvic rotation angle at the lead foot contact, lead foot contact position, the shoulder joint abduction angle in the arm acceleration phase, and the elbow joint flexion angle. In kinematic mechanics, the maximum internal shoulder rotation angular velocity and the maximum elbow extension angular velocity were larger in Japanese pitchers during the arm acceleration phase. In addition, when corrected by height and mass, there was a significant difference only in the force and torque applied anterior to the shoulder joint, which were greater in Japanese pitchers compared to that in US pitchers. This result suggests that there is a higher chance of injury anterior to the shoulder joint in Japanese pitchers than in US pitchers.

### COMPARISON OF INTRAARTICULAR STRESS DISTRIBUTION BETWEEN BRISTOW AND LатарJET PROCEDURES



Hirota Sano<sup>a</sup>, Tatsuro Komatsuda<sup>b</sup>, Hiroo Abe<sup>a</sup>, Jun Kumagai<sup>c</sup>, <sup>a</sup>Division of Orthopaedics, Sendai City Hospital, Sendai, Japan; <sup>b</sup>North Sendai Orthopaedic Clinic, Sendai, Japan; <sup>c</sup>Department of Orthopaedic Surgery, Akaiishi Hospital, Shiogama, Japan

**Purpose:** To clarify the alteration of intraarticular stress distribution after Bristow and Latarjet procedures.

**Methods:** Both Bristow and Latarjet procedures were simulated on the finite element models of 6 shoulders with a 25% glenoid defect. A compressive load (50 N) was applied to the humerus, towards the glenoid surface, and elastic analysis was performed to clarify the intraarticular distribution of equivalent stress.

**Results:** Mean equivalent stress in the glenoid cartilage was significantly lower in both the Bristow and Latarjet models than in the preoperative model (p = 0.03). A high-stress concentration newly appeared in the humeral head cartilage, particularly in the area facing the grafted coracoid. In the Latarjet model, a reduced equivalent stress was seen in the proximal part of the grafted coracoid. Interestingly, a stress concentration was seen in the mid-part of the inserted screw in the Bristow model.

**Discussion and Conclusion:** In this study, the equivalent stress in the glenoid cartilage was reduced due to the enlargement of articular surfaces after both Bristow and Latarjet procedures. On the other hand, a new stress concentration appeared in the humeral head cartilage after these procedures, which may contribute to the development of postoperative osteoarthritis. In the Latarjet procedure, the reduction of equivalent stress in the proximal part of the grafted coracoid seemed to be caused by stress shielding, which may eventually lead to osteolysis. In the Bristow procedure, surgeons should be aware of the risk of breakage of the inserted screw.

### SHOULDER AND ELBOW PAIN IN JUNIOR HIGH SCHOOL BASEBALL PLAYERS - RESULTS OF A NATIONWIDE SURVEY



Kenji Takagishi<sup>a</sup>, Tetsuya Matsuura<sup>b</sup>, Takashi Masatomi<sup>c</sup>, Etsuo Chosa<sup>d</sup>, Tsuyoshi Tajika<sup>e</sup>, Tetsu Iwama<sup>f</sup>, Mikihiko Watanabe<sup>g</sup>, Toshiro Otani<sup>h</sup>, Katsunori Inagaki<sup>i</sup>, Moroe Beppu<sup>j</sup>. <sup>a</sup>Department of Orthopaedic Surgery, Saint-Pierre Hospital, Takasaki, Japan; <sup>b</sup>Department of Orthopaedic Surgery, Tokushima University, Tokushima, Japan; <sup>c</sup>Department of Orthopaedic Surgery, Yukioka Hospital, Osaka, Japan; <sup>d</sup>Department of Orthopaedic Surgery, Miyazaki University, Miyazaki, Japan; <sup>e</sup>Department of Orthopaedic Surgery, Gunma University Graduate School of Medicine, Maebashi, Japan; <sup>f</sup>Iwama Orthopaedic Clinic, Yokohama, Japan; <sup>g</sup>Department of Orthopaedic Surgery and Sports Medicine Orthopaedic Surgery, Tokyo Asuka Hospital, Tokyo, Japan; <sup>h</sup>Institute for Integrated Sports Medicine, School of Medicine, Keio University, Tokyo, Japan; <sup>i</sup>Department of Orthopaedic Surgery, Showa University School of Medicine, Tokyo, Japan; <sup>j</sup>Department of Orthopaedic Surgery, St. Marianna Medical University, Kawasaki, Japan

**Background:** We conducted a questionnaire survey among baseball players at junior high schools across Japan, to understand the practice conditions of players, examining the risk factors of shoulder and elbow pain in baseball players.

**Methods:** The survey was conducted among junior high school baseball players as members of the Baseball Federation of Japan in September 2016.

**Results:** A total of 11,134 junior high school baseball players belonging to 495 teams responded to the survey. Among these, 4,004 players trained every day of the week and 1,151 players played baseball games every month with no off-season. Among the 9,752 players who did not have shoulder or elbow pain in the spring and summer of 2015, 28.0% experienced shoulder and elbow pain during the previous year. Players that were at risk for shoulder and elbow pain were: pitchers and catchers, second-year students, players who threw 70 or more balls per day, players who individually trained at home for longer than one hour, and players who played on average more than 10 games monthly.

**Conclusion:** Japanese junior high school baseball players, according to this study, are thought to train too much. It is important for coaches to train multiple pitchers and catchers and not allow them to throw 70 or more full-power balls per day, participate in 10 or more games per month, and individually train at home for longer than one hour.