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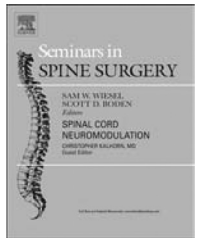

Spinescope

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1. Symptomatic adjacent level disease requiring surgery: analysis of 10-year results from a prospective, randomized, clinical trial comparing cervical disc arthroplasty to anterior cervical fusion

March, 2019

Ten-year follow up data from the US Food and Drug Administration investigational device exemption trial comparing BRYAN® Cervical Disc arthroplasty to anterior cervical discectomy and fusion demonstrated that disc arthroplasty maintained range of motion and improvements in overall success and neck disability. One of the primary justifications for the increase cost of cervical disc arthroplasty was the hope that it would decrease adjacent segment degeneration. Ghobrial et al. formed this study to compare the 10-year rates of symptomatic adjacent level disease requiring surgery.

Prospective randomized trial data were analyzed comparing BRYAN® Cervical Disc arthroplasty to ACDF for single-level cervical disc disease with concordant radiculopathy or myelopathy with clinicoradiographic analysis at 10 years. Secondarily, 84-month data were pooled with PRESTIGE® Cervical Disc arthroplasty study data to provide overall rates of symptomatic adjacent level disease requiring surgery.

Significantly greater overall success was maintained at every postoperative interval with an overall success rate of 81.3% with BRYAN® disc and 66.3% with ACDF ($P = 0.005$) without loss of motion preservation. Reoperation at adjacent levels up to the 120-month visit was 9.7% in the arthroplasty group and 15.8% in the ACDF group ($P = 0.15$). The combined data from BRYAN® and Prestige ST demonstrated that the combined disc groups had a lower rate of second surgeries at the adjacent levels, up to the 84-month visit, compared to the combined ACDF control groups (6.9% vs 11.7%; $P = 0.02$).

On the basis of these data the authors conclude that compared with anterior cervical discectomy and fusion, fewer patients with the BRYAN® disc required surgery for symptomatic adjacent level degeneration, but this did not achieve statistical significance. Combination with data from another arthroplasty device did show significant differences in adjacent segment disease requiring surgery as early as seven years. It is important to note that even in the combined group there was still a 7% incidence of adjacent segment degeneration requiring surgery suggesting that an arthroplasty decreases the adjacent segment surgical rate well under 50% compared to that associated with an ACDF.

George M. Ghobrial, MD, William F. Lavelle, MD, Jeffrey E. Florman, MD, K. Daniel Riew, MD, Allan D. Levi, MD, PhD, Neurosugery Volume 84, Number 2, February 2019: 347–354.

2. Adjacent disc degeneration after lumbar total disc replacement or nonoperative treatment

Total disc replacement was introduced as a motion-preserving alternative to spinal fusion. The hope is that adjacent segment disc degeneration might be less frequent with arthroplasty compared to fusion, however adjacent segment disc degeneration may develop naturally regardless of any surgery, and no randomized study has assessed the long-term development of adjacent segment degeneration after total disc arthroplasty vs nonoperative treatment. The aim of this study was to assess the long-term development of adjacent segment disc degeneration after lumbar total disc replacement or nonoperative treatment, and to analyze the association between adjacent segment degeneration and clinical outcome.

The authors performed a randomized controlled multicenter trial with 8-year follow-up. The study included 126 of the 173 patients with chronic low back pain originally included in a randomized study comparing total disc replacement with multidisciplinary rehabilitation. Magnetic resonance imaging of the lumbar spine was performed before treatment and at 8-year follow-up. Adjacent segment degeneration was categorized as increased or not increased based on evaluation of Modic changes, disc height reduction, disc contour, herniation size, nucleus pulposus signal, and posterior high intensity zones. The authors used a χ^2 test or a Fisher exact test to compare crude proportions and multiple linear regressions to analyze the association between increased adjacent segment degeneration and change in Oswestry Disability Index from pre-treatment to follow-up.

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Adjacent segment degeneration increased in 23 of 57 patients (40%) treated nonoperatively and 29 of 69 patients (42%) treated with total disc replacement. The authors found no significant associations between adjacent segment disc degeneration increase and the change in Oswestry Disability Index.

On the basis of these data the authors conclude that increased adjacent segment disc degeneration occurred with similar frequency after total disc replacement and after nonoperative treatment. The development of adjacent segment degenerative disc changes was not related to the clinical outcome at 8-year follow-up. This study suggests the significant percentage of adjacent segment disc degeneration may be related to natural aging and progression rather than the aftermath of a spinal fusion. This suggests that disc arthroplasty in the lumbar spine may not be able to significantly impact the rate of adjacent segment degeneration.

Håvard Furunes, MD, Christian Hellum, PhD, Ansgar Espeland, PhD, Jens Ivar Brox, PhD, Milada Cvancarova Småstuen, PhD, Linda Berg, PhD, and Kjersti Storheim, PhD, SPINE Volume 43, Number 24, pp 1695–1703, 2018.

3. Laminectomy alone versus fusion for grade 1 lumbar spondylolisthesis in 426 patients from the prospective Quality Outcomes Database

Degenerative lumbar spondylolisthesis has a prevalence of 11.5% in the United States. Several studies have suggested that lumbar arthrodesis should accompany decompression. The AANS launched the Quality Outcomes Database, a prospective longitudinal registry, to measure the safety and quality of spine surgery. Using the Quality Outcomes Database the authors compared the initial 12-month outcome data for patients undergoing fusion and those undergoing laminectomy alone for grade 1 degenerative lumbar spondylolisthesis.

Data from12 top enrolling sites were analyzed and 426 patients undergoing elective single-level spine surgery for degenerative grade 1 lumbar spondylolisthesis were identified. Baseline, 3-month, and 12-month follow-up data were collected and compared, including baseline clinical characteristics, readmission rates, reoperation rates, and patient related outcomes including Oswestry Disability Index, back and leg numeric rating scale, and EQ-5D results.

A total of 342 (80.3%) patients underwent fusion, with the remaining 84 (19.7%) undergoing decompression alone. The fusion cohort was younger (61 vs 70 years), had a higher mean body mass index (31 vs 28) and had a greater proportion of patients with back pain as a major component of their initial presentation (88% vs 61%). There were no differences in 12-month reoperation rates (4.4% vs 6.0%) and 3-month readmission rates (3.5% vs 1.2%). At 12 months, both cohorts improved significantly with regard to all outcome measures. In adjusted analysis, fusion procedures were associated with a superior 12-month Oswestry Disability Index.

On the basis of these data the authors conclude that surgery for grade 1 lumbar spondylolisthesis, with or without fusion, was associated with significant improvements in disability, back and leg pain, and quality of life at 12 months. When adjusting for covariates, fusion surgery was associated with superior Oswestry Disability Index at 12 months. The primary limitation of this study with it being based on a registry is that there was likely selection bias of the patients that underwent fusion and those that underwent laminectomy alone. In addition, the literature suggests that the benefit of fusion may not become evident for at least 3-5 years following surgery.

Andrew K. Chan, MD, Erica F. Bisson, MD, MPH, Mohamad Bydon, MD, Steven D, Glassman, MD, Kevin T. Foley, MD, Eric A. Potts, MD, Christopher I. Shaffrey, MD, Mark E. Shaffrey, MD, Domagoj Coric, MD, John J. Knightly, MD, Paul Park, MD, Michael Y. Wang, MD, Kai-Ming Fu, MD, PhD, Jonathan R. Slotkin, MD, Anthony L. Asher, MD, Michael S. Virk, MD, PhD, Panagiotis Kerezoudis, MD, MS, Silky Chotai, MD, Anthony M. DiGiorgio, DO, MHA, Regis W. Haid, MD, and Praveen V. Mummaneni, MD, JNS SPINE 30: 234–241, 2019.

4. Randomized trial of sacroiliac joint arthrodesis compared with conservative management for chronic low back pain attributed to the sacroiliac joint

Sacroiliac pain is increasingly recognized as a potential cause of low back pain. Diagnosis of symptomatic sacroiliac joint problems is challenging and arthrodesis has not been clearly documented to be a predictable treatment. The authors compared the safety and effectiveness of minimally invasive sacroiliac joint arthrodesis using triangular titanium implants with conservative managements in patients with chronic sacroiliac joint pain.

This study was a prospective, multicenter randomized controlled trial of adults with chronic sacroiliac joint pain assigned to either conservative management or sacroiliac joint arthrodesis with triangular titanium implants. The study end points included self-rated low back pain (visual analog scale), Oswestry Disability Index, and quality of life. Ninety percent of subjects in both groups completed the study.

Between June of 2013 and May of 2015, 103 subjects were randomly assigned to receive conservative management (n = 51) or sacroiliac joint arthrodesis (n = 52). At 2 years, the mean low back pain improved by 45 points after sacroiliac joint arthrodesis and only 11 points after conservative management with a mean difference between groups of 34 points ($P < 0.0001$). The mean Oswestry Disability Index improved by 26 points after sacroiliac joint arthrodesis and only 8 points after conservative management, with a mean difference between groups of 18 points ($P < 0.0001$). Subjects in the conservative management group, after crossover to the surgical procedure, showed improvements in all measures similar to those originally assigned to the sacroiliac joint arthrodesis group. Analysis of computed tomographic imaging at 12 months following arthrodesis showed radiolucencies adjacent to 8 implants (4.0% of all implants).

On the basis of these data the authors conclude that for patients with chronic sacroiliac joint pain due to joint degeneration or disruption, minimally invasive sacroiliac joint arthrodesis with triangular titanium implants was safe and more effective throughout 2 years in improving pain, disability, and quality of life compared with conservative management. The durability of these results long term are yet to be established and uniform and consistent diagnostic tests for sacroiliac joint still remain a potential challenge.

Julius Dengler, MD, Djaya Kools, MD, Robert Pflugmacher, MD, Alessandro Gasbarrini, MD, Domenico Prestamburgo, MD, Paolo Gaetani, MD, Daniel Cher, MD, Eddie Van Eeckhoven, PharmD, Mårten Annertz, MD, PhD, and Bengt Sturesson, MD, PhD, The Journal of Bone And Joint Surgery 2019, 101: 400–411.

5. Dose-response and efficacy of spinal manipulation for care of cervicogenic headache: a dual-center randomized controlled trial

The optimal number of visits for the care of cervicogenic headache with spinal manipulative therapy is not known. Few studies that carefully examine the dose-response of spinal manipulative therapy in the face of cervicogenic headache which is considered to be a secondary headache related to a neck disorder. This may be found in up to 18% of the chronic headache population. The authors performed the present study to identify the dose-response relationship between visits for spinal manipulation therapy and chronic cervicogenic headache outcomes by comparison with a light-massage control group.

The authors performed a two-site, open-label randomized controlled trial. There were 256 adult participants with chronic cervicogenic headache. Participants were randomized to four dose levels of chiropractic spinal manipulation therapy: 0, 6, 12, or 18 sessions. They were treated three times per week for six weeks and received a focused light-massage control at sessions when spinal manipulation therapy was not assigned.

A linear dose-response was observed for all follow-ups, a reduction of approximately one cervicogenic headache day/four weeks per additional six spinal manipulation therapy visits ($P < 0.05$). A maximal effective dose could not be determined. Cervicogenic headache days/4 weeks were reduced from about 16 to 8 for the highest and most effective dose of 18 spinal manipulation therapy visits. Differences between other spinal manipulation therapy doses and control were smaller in magnitude.

On the basis of these data the authors conclude that there was a linear dose-response relationship between spinal manipulation therapy visits and days with cervicogenic headache. For the highest and most effective dose of 18 spinal manipulation therapy visits, cervicogenic headache days were reduced by half and about 3 more days per month than the light-massage control group patients.

Mitchell Haas, DC, MA, Gert Bronfort, DC, PhD, Roni Evans, DC, PhD, Craig Schulz, DC, MS, Darcy Vavrek, ND, MS, Leslie Takaki, MA, Linda Hanson, DC, MS, Brent Leininger, DC, MS, Moni B. Neradilek, MD, The Spine Journal 2018, 1741–1754.

6. Does intrawound vancomycin powder reduce surgical site infection after posterior instrumented spinal surgery? A propensity score-matched analysis

Recent reports suggest that placing vancomycin powder into surgical wounds before closure can prevent surgical site infections in spinal surgery. The authors performed a study aimed to evaluate if intrawound vancomycin powder could prevent surgical site infection after spinal surgery with posterior instrumentation.

The authors performed a multicenter retrospective cohort study using propensity score matching. They reviewed all spinal surgeries performed with posterior instrumentation from July 2012 to December 2014 at 11 institutions with patients greater than 15 years of age. Demographic and operative data and microbiological findings of surgical site infections cases were analyzed. After a preliminary whole-cohort analysis the authors performed one-to-one propensity score matching to adjust for the differences between the two groups and then compared the incidence of surgical site infections between the matched groups.

A total of 2,859 patients were included in the study. In the vancomycin and control groups (n = 694 and n = 2165, respectively), 12 (1.73%) and 21 (0.97%) patients developed surgical site infections, respectively, but the difference was not statistically significant ($P = 0.10$). During the propensity score-matched analysis, 507 pairs were analyzed. No significant change in the rate of surgical site infections was seen between the vancomycin and control groups (1.58% vs 1.78%).

On the basis of these data the authors conclude that intrawound application of vancomycin powder was not associated with a significant decrease in the incidence of surgical site infections after posterior instrumented spinal surgeries in a propensity score-matched analysis. However, the rate of infections caused by Staphylococcus species was lower in the vancomycin group.

Chiaki Horii, MD, Takashi Yamazaki, MD, Hiroyuki Oka, MD, PhD, Seiichi Azuma, MD, Satoshi Ogihara, MD, PhD, Rentaro Okazaki, MD, PhD, Naohiro Kawamura, MD, PhD, Yuichi Takano, MD, PhD, Jiro Morii, MD, Yujiro Takeshita, MD, Toru Maruyama, MD, PhD, Kiyofumi Yamakawa, MD, PhD, Motoaki Murakami, MD, Yasushi Oshima, MD PhD, Sakae Tanaka, MD, PhD, The Spine Journal 2018, 2205–2212.

7. The impact of prophylactic intraoperative vancomycin powder on microbial profile, antibiotic regimen, length of stay, and reoperation rate in elective spine surgery

There is growing concern that the microbial profile of surgical site infection in the setting of prophylactic vancomycin powder may favor more resistant and uncommon organisms. In addition it is unclear in non-trauma spine fusion surgery whether vancomycin is effective. The authors performed this study to demonstrate the impact of prophylactic intraoperative vancomycin powder on microbial profile, antibiotic regimen, length of stay, and reoperation rate in spine surgical site infection.

The authors performed a retrospective cohort study from a patient sample that included 115 postoperative spine patients who were required to return to the operating room for surgical site infection. This review consisted of patients that underwent posterior thoracic and/or lumbar spine surgery between 2010 and 2017. Those undergoing surgical treatment of surgical site infections were identified and divided into two

groups consisting of those that were treated with intraoperative vancomycin and those that were not. The organism profile for each group was compared along with the other the other parameters.

There were 5909 procedures performed during the study period. One hundred and fifteen surgical site infections were identified, resulting in a 1.9% infection rate. Prophylactic vancomycin powder was used in the index procedure for 42 of those 115 infection cases. 23.8% of cultures in the vancomycin group were polymicrobial and 16.7% were gram-negative compared with 9.6% and 4.1% in the untreated group, respectively. In the vancomycin treated group, 26.1% of patients underwent repeat irrigation and debridement compared with 38.4% in the untreated group. There was no difference in the mean length of stay in the vancomycin treated group and the untreated group.

On the basis of these data the authors concluded that vancomycin powder was associated with a higher prevalence of gram-negative and polymicrobial organisms in patients that ultimately developed postoperative surgical site infections. However, this did not adversely affect the need for multiple reoperations, antibiotic regimen, or length of stay for these patients.

Zachary J. Grabel, MD, Allison Boden, BA, Dale N. Segal, MD, Stephanie Boden, BA, Andrew H. Milby, MD, John G. Heller, MD, The Spine Journal 19 (2019); 261–266.

8. Opioid dependence and prolonged length of stay in lumbar fusion

Opioids are the most commonly prescribed drug class to treat low back pain. Few studies have examined the impact of opioid dependence on spinal fusion outcomes. The authors performed a retrospective cohort study utilizing the National Inpatient Sample (NIS) from 2003 to 2014 to investigate the association of opioid dependence with prolonged length of stay, costs, and surgical complications in elective one or two level lumbar fusion.

Data from 1,826,868 adult elective one-to-two level lumbar fusion discharges in the NIS from 2003 to 2014 were studied. Discharges were categorized into an opioid-dependent or unaffected cohort based on the presence or absence of an International Classification of Disease, Ninth Revision-Clinical Modification code for opioid dependence.

Seven thousand nine hundred sixty-four (0.44%) discharges included a diagnosis of opioid dependence. The incidence of opioid dependence increased from 2003 to 2014. Opioid dependence was associated with an adjusted 2.1 times higher odds of prolonged length of stay. Opioid-dependent discharges accrued higher costs and had higher frequencies of infection, device-related complications, hematoma- or seroma-related complications, acute posthemorrhagic anemia, and pulmonary insufficiency.

On the basis of these data the authors conclude that this nationally-representative study suggests that opioid dependence is associated with prolonged length of stay in lumbar fusion. In addition opioid dependence is associated with higher costs and higher frequencies of surgical complications. Further work is needed to determine the optimal method to treat opioid-dependent patients who require lumbar fusion.

Allyson Tank, BS, Jonathan Hobbs, MD, Edwin Ramos, MD, and Daniel S. Rubin, MD, SPINE Volume 43, Number 24, pp 1739–1745.

9. Prediction of complications, readmission, and revision surgery based on duration of preoperative opioid use

Preoperative opioid use results in adverse outcomes and higher costs after elective surgery. However, duration thresholds for higher risk are not entirely known. The purpose of this study was to determine the number and duration of preoperative opioid prescriptions in order to estimate the risk of postoperative adverse events after major joint replacement and lumbar spine fusion.

National insurance claims data (2007–2015) were used to identify primary total knee arthroplasties, total hip arthroplasties, and 1 or 2-level posterior lumbar spinal fusions performed for degenerative disease. The effect of preoperative opioid burden (naïve, $\leq$3 months, >3 to 6 months, >6 months but stopped 3 months before surgery, and >6 months of continuous use) on the risks of various adverse outcomes was studied using Cox proportional hazards analysis with adjustments for demographic and clinical covariates.

A total of 58,082 patients stratified into 3 cohorts including total knee, total hip and 10,681 patients with a 1 or 2-level posterior lumbar fusion. Preoperative opioid prescription for >6 months was associated with a higher risk of all-cause and pain-related emergency department visits, wound dehiscence/infection, and hospital readmission within 90 days as well as revision surgery within 1 year following posterior lumbar fusion. Stopping the opioid prescription 3 months preoperatively for chronic users resulted in a significant reduction in the risk of adverse outcomes, with the greatest impact seen after total hip arthroplasty and posterior lumbar fusion.

On the basis of these data the authors conclude that patients with a preoperative opioid prescription for up to 3 months before a major arthroplasty or a 1 or 2-level lumbar fusion had a similar risk of adverse outcomes as opioid-naïve patients. However, >6 months of opioid use was associated with a higher risk of adverse outcomes, a 3-month prescription-free period before the surgery appeared to mitigate this risk for chronic users.

Nikhil Jain, MD, John L. Brock, BA, Azeem Tariq Malik, MBBS, Frank M. Phillips, MD, and Safdar N. Khan, MD, The Journal of Bone and Joint Surgery, Incorporated, 2019; 101:384–391.

10. IN BRIEF

The duration of symptoms does not impact clinical outcomes following lumbar decompression surgery

The success of surgical interventions for lumbar spinal stenosis varies depending on numerous factors. The existing literature does not provide a clear indication of the outcome of lumbar decompression surgery in regard to duration of symptoms secondary to nerve root compression. The authors performed a retrospective cohort analysis to assess whether

duration of symptoms has an effect on clinical outcomes in patients undergoing lumbar decompression. Two hundred ten patients were assessed who underwent primary lumbar laminectomy from 2008 to 2015 by one of two senior spine surgeons. The patients were divided into groups on the basis of duration of symptoms less than 1 year or 1 year or greater. 108 patients had symptoms of greater than 1 year and 102 with a duration of symptoms more than 1 year. On multivariate analysis, patients with greater than 1 year of symptoms presented with significantly lower SF-12 scores. No significant differences existed in other outcome survey scores. Reoperation rates were not significantly different and both groups reported high levels of satisfaction. On the basis of these data the authors conclude that symptom chronicity did not significantly affect postoperative clinical outcomes, reoperation times, or patient satisfaction.

Kamran Movassaghi, MD, Bryce A. Basques, MD, Philip K. Louie, MD, Jannat M. Khan, BS, Peter B. Derman, MD, Michael T. Nolte, MD, Justin C. Paul, MD, Edward J. Goldberg, MD, and Howard S. An, MD, Spine volume 44, Number 5, pp 305–308.

11. Robotic-assisted pedicle screw placement fails to reduce overall postoperative complications in fusion surgery

Surgeons have increasingly adopted robotic-assisted lumbar spinal fusion due to indications that robotic-assisted surgery can reduce pedicle screw misplacement. This study aimed to compare the rates of perioperative complications between robotic-assisted and conventional lumbar spine fusion. A total of 520 patients undergoing lumbar fusion were analyzed. This study screened hospital discharges in the United States from 2010 to 2014 using the National Inpatient Sample and the Nationwide Inpatient Sample. Univariate and multivariate logistic regression were used to compare risks of major and minor complications. The authors matched 257 robot-assisted patients with an equal number of patients undergoing conventional lumbar fusion. Minor complications occurred in 16.7% of cases in the conventional group and 31.9% of cases in the robotic group. Major complications occurred in 6.6% of the conventional cases compared with 8.2% of robotic-assisted cases. For robotic-assisted fusion, multivariate analysis revealed that there was no difference in the likelihood of major complications or minor complications. On the basis of these data the authors conclude that in a statistically matched cohort, patients who underwent robotic-assisted lumbar fusion had similar rates of major and minor complications compared to patients who underwent conventional lumbar fusion.

Alexander M. Lieber, BA, Gregory J. Kirchner, MPH, Yehuda E. Kerbel, MD, Amrit S. Khalsa, MD, The Spine Journal 2019, 212–217.

12. Elevated glycohemoglobin HbA1c is associated with low back pain in nonoverweight diabetics

Low back pain is a common complaint in clinical practice of multifactorial origin. Although obesity has been thought to contribute to low back pain probably by altering the distribution of mechanical loads on the spine, the additional contribution of obesity-related conditions such as diabetes mellitus to low back pain has not been thoroughly examined. The authors performed a retrospective analysis of prospectively collected National Health and Nutrition Examination Survey data to characterize associations between low back pain, diabetes mellitus, and body mass index (BMI) in adults. 11,756 participants were reviewed with low back pain reported from 1999 to 2004. Increasing HbA1c did not increase the odds of reporting low back pain in the full cohort. However, multivariate logistic regression of the 6 subpopulations revealed that the odds of low back pain significantly increased with increasing HbA1c levels in normal weight diabetics. No other subpopulations reported significant relationships between low back pain and HbA1c. Low back pain was also significantly associated with BMI for normal weight diabetics and also for obese subjects regardless of their diabetes status. On the basis of these data the authors conclude that low back pain is significantly related to diabetes status but this relationship is complex and may interact with BMI. The results support the concept that low back pain may be improved in normal weight diabetic subjects with improved glycemic control and weight loss, and that all obese low back pain subjects may benefit from improved weight loss alone.

Alexander Real, BS, Chierika Ukogu, BA, Divya Krishnamoorthy, PhD, Nicole Zubizarreta, MPH, Samuel K. Cho, MD, Andrew C. Hecht, MD, James C. Iatridis, PhD, The Spine Journal 2019, 225–231.

13. Prophylactic perioperative dexamethasone decreases the incidence of postoperative C5 palsies after a posterior cervical laminectomy and fusion

Postoperative C5 palsy is a well-known complication of cervical decompression procedures. Studies have shown that posterior laminectomy and fusions confer the greatest risk of C5 palsy. The authors hypothesized that prophylactic perioperative dexamethasone will decrease the rate of postoperative C5 palsy in patients undergoing multilevel posterior cervical laminectomy and fusion. The patient population included all patients undergoing multilevel posterior cervical laminectomy and instrumented fusions for myeloradiculopathy or myelopathy, who also received a course of perioperative dexamethasone. Surgeries occurred between 2012 and 2017 at a single tertiary care center by a single surgeon with at least 1 year follow-up. A total of 189 consecutive patients who underwent multilevel posterior cervical laminectomy and instrumented fusion and received prophylactic perioperative dexamethasone were reviewed. Postoperative C5 palsy occurred in 5 of the 138 patients (3.6%) meeting the inclusion criteria. Patients receiving perioperative dexamethasone had a significantly decreased rate of postoperative C5 palsy compared with those who did not (3.6% vs 9.5%, $P = 0.01$). Age was the only risk factor that was significantly correlated with development of C5 palsy (72.7 vs 61.1, $P = 0.02$). Infection, seroma, and wound complication rates were 2.8%, 2.2%, and 1.4%, respectively, in patients receiving prophylactic dexamethasone. All five patients

receiving dexamethasone who did develop C5 palsy recovered without residual deficit at an average of 17 weeks postoperatively. On the basis of these data the authors conclude that perioperative prophylactic dexamethasone therapy is a safe and effective way to decrease the incidence of C5 palsies in patients who undergo multilevel posterior laminectomy and fusion for myeloradiculopathy or myelopathy.

Malcolm E. Dombrowski, MD, Alejandro Morales-Restrepo, MD, Mitchell S. Fourman, MD, MPhil, Nicholas Vaudreuil, MD, Joon Y. Lee, MD, The Spine Journal 2019, 253–260.

14. Comparison of clinical efficacy of transforaminal and caudal epidural steroid injection in lumbar and lumbosacral disc herniation: a systematic review and meta-analysis

Epidural steroid injection has been used to treat back pain and radicular lumbar pain. The superiority of transforaminal injection to caudal epidural steroid injection remains controversial. The authors performed a systematic review and meta-analysis to investigate this question. A literature search was performed for studies published prior to July of 2017. After reviewing 6711 studies six studies were included in a qualitative synthesis. Among the six studies, four supported the superiority of transforaminal over caudal epidural steroid injections, one article showed no difference and one article supported the superiority of caudal vs transforaminal. A meta-analysis showed short-term and long-term trends towards better clinical efficacy with transforaminal over caudal injections without statistical significance. On the basis of these data the authors conclude that there were better clinical benefits with transforaminal injections than caudal injections but this was possibly because of the ability of the transforaminal injections to deliver medication directly into the target area. Due to a low level of evidence and no significant results on meta-analysis transforaminal epidural steroid injections could only be weakly recommended over caudal injections.

Jung Hwan Lee, MD, PhD, Kyoung-ho Shin, MD, Sung Jin Bahk, MD, Goo Joo Lee, MD, Dong Hwan Kim, MD, PhD, Chang-Hyung Lee, MD, PhD, Du Hwan Kim, MD, PhD, Hee Seung Yang, MD, Sang-Ho Lee, MD, PhD, The Spine Journal 2018, 2343–2353.

15. Low bone-mineral density is a significant risk for proximal junctional failure after surgical correction of adult spinal deformity

Proximal junctional failure is a devastating complication of corrective deformity surgery and often recurs after revision surgery. The authors performed a propensity-matched comparison of risk factors for proximal junctional failure following adult spinal deformity corrective surgery to elucidate the role of bone strength for developing kyphosis. 113 surgically treated adult spinal deformity patients were followed for at least 2 years. Patients were grouped as having mildly low to normal bone mineral density (T-score ≥ -1.5) or significantly low bone mineral density (T-score < -1.5) and were propensity-matched for age, upper and lower instrumented vertebrae, history of spine surgery, and Schwab-Scoliosis Research Society Adult Spinal Deformity classification. Proximal junctional failure was defined as $\geq 20^{\circ}$ increase from baseline of the proximal junction angle with concomitant deterioration of at least one SRS-Schwab sagittal modifier grade, or any type of proximal junctional kyphosis requiring surgery. Proximal junctional kyphosis developed in 22 of 113 patients (19%). In the propensity-matched population the incidence of proximal junctional failure was significantly higher in the low bone mineral density group (33% vs 8%, $P < 0.01$). On the basis of these data the authors conclude that low bone mineral density was a significant risk factor for proximal junctional kyphosis in a propensity-matched cohort study.

Mitsuru Yagi, MD, PhD, Nobuyuki Fujita, MD, PhD, Osahiko Tsuji, MD, PhD, Narihito Nagoshi, MD, PhD, Takashi Asazuma, MD, PhD, Ken Ishii, MD, PhD, Masaya Nakamura, MD, PhD, Morio Matsumoto, MD, PhD, and Kota Watanabe, MD, PhD, SPINE Volume 43, Number 7, pp 485–491.

16. Impact of readmissions in episodic care of adult spinal deformity

Readmissions following adult spinal deformity surgical procedures frequently occur. Existing literature on readmissions is limited. The authors performed this study to determine the most expensive reasons for readmission and to assess the impact on costs. The authors reviewed 695 patients with adult spinal deformity surgery who underwent corrective spine surgical procedures at a single center from 2005 to 2013. Cost data were expressed in 2010 dollars. The mean age of the patients was 50.6 years with 85% of the patients being women and 92% Caucasian. The observed readmission rates were 24% with 8.8% in 30 days and 11.7% in 90 days. The most expensive readmissions and their mean readmission costs were pseudarthrosis, infection, and proximal junctional kyphosis, after adjusting for patient and surgical factors. The mean readmission cost after 2 years was $86,081. Older age and >8 levels fused were independently associated with higher total cost. On the basis of these data the authors conclude that compared with readmission cost due to medical reasons, readmission due to pseudarthrosis increases mean readmission cost by 105%. Readmission due to infection increases mean readmission cost by 72%. Readmission due to proximal junctional kyphosis increases mean readmission cost by 63%. Together these 3 reasons accounted for 73% of readmission costs. These numbers need to be kept in mind in anyone that is attempting to establish bundled pricing strategies for adult spinal deformity.

Samrat Yeramaneni, MBBS, MS, PhD, Jeffrey L. Gum, MD, Leah Y. Carreon, MD, MSc, Eric O. Klineberg, MD, Justin S. Smith, MD, Amit Jain, MD, and Richard A. Hostin, MD, The Journal of Bone And Joint surgery 2018; 100: 487–495.

17. Lumbar spine fusion surgery in solid organ transplant recipients is associated with increased medical complications and mortality

Over the past decade advances in solid organ transplantation have improved graft survival. As such, this patient population

is increasingly eligible for elective lumbar spine fusion procedures to improve quality of life. The authors performed a retrospective database review to characterize the outcomes of solid organ transplant patients after one- or two-level lumbar spine fusions. Data from the full Medicare sample between 2005 and 2014 were used for the study. There were 961 patients in the transplant cohort and 258,342 in the non-solid organ transplant cohort. Seventy-seven percent of the organ transplant patients had prior renal transplant. Solid organ transplant patients had a longer length of stay and a higher 30-day readmission rate compared to non-transplant patients following lumbar spine surgery. In addition solid organ transplant patients experienced a 24% rate of 90-day postoperative major complications and 3%, 1-year mortality which were significantly larger than respective rates in the control population. One-year infection, revision surgery rates, and wound dehiscence rates were not significantly different between the two cohorts. On the basis of these data the authors conclude that spine surgery is associated with significant medical complications and 1-year mortality in the solid organ transplantation population. Although there may be a substantial benefit from lumbar fusion in this organ transplant population, judicious patient selection is of paramount importance.

Raj Amin, MD, Varun Puvanesarajah, MD, Rabia Qureshi, BS, Amit Jain, MD, Khaled Kebaish, MBBCh, Frank H. Shen, MD, and Hamid Hassanzadeh, MD, SPINE Volume 43, Number 9, pp 617–621.