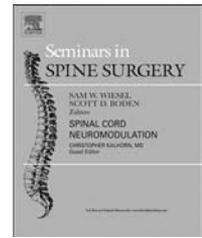


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Spinescope

Scott D. Boden, MD

1. The effect of local versus intravenous corticosteroids on the likelihood of dysphagia and dysphonia following anterior cervical discectomy and fusion

December 2018

Dysphasia and dysphonia are the most common postoperative complications following anterior cervical discectomy and fusion (ACDF). Although most postoperative dysphagia is mild and transient, severe dysphagia can have profound effects on overall patient health and on surgical outcomes. Jenkins et al. performed a study to compare the efficacy of local vs intravenous (IV) steroid administration during ACDF on postoperative dysphagia and dysphonia.

The authors performed a single-blinded, prospective, randomized clinical trial. Seventy-five patients undergoing ACDF with cervical plating were randomized into 3 groups: control with no steroid, IV steroid (10 mg of IV dexamethasone at time of closure), or local steroid (40 mg of local triamcinolone).

Patient demographics were similar in all three groups. Patient related outcomes on postoperative day 1 showed significantly lower scores for dysphonia and neck pain in the local steroid group. At two weeks postoperatively the local steroid cohort showed significantly decreased prevalence of severe dysphasia compared with the control and IV steroid groups. Both steroid groups had significantly less dysphasia when compared to the control group at the 6-week and 3-month time points. At 1 year postoperatively both steroid groups had significantly reduced dysphagia rates compared with the control group.

On the basis of these data the authors conclude that both local and IV steroid administration after cervical plating in ACDF yielded better patient related outcomes for dysphagia compared with a control group that did not receive any steroids. This finding was particularly evident in the reduced number of patients who reported severe dysphagia symptoms following ACDF with local steroid application within the first 2 postoperative weeks.

Tyler James Jenkins, MD, Rueben Nair, MD, Surabhi Bhatt, BC, Brett David Rosenthal, MD, Jason W. Savage, MD, Wellington K. Hsu, MD, and Alpesh A. Patel, MD *The Journal of Bone and Joint Surgery Am.* 100: 1461–72, 2018

2. Long-term outcomes of a large, prospective observational cohort of older adults with back pain

Although back pain is common among older adults there is relatively little research on the course or natural history of back pain in this age group. The authors performed a study to report two year outcomes of older adults initiating primary care treatment for low back pain and to examine the relative importance of patient factors versus medical interventions in predicting two year disability and pain.

The study used a predictive model using data from a prospective observational cohort from a primary care setting. The study included patients aged ≥ 65 years at the time of new primary care visits for back pain. Self-reported two year disability using the Roland–Morris Disability Questionnaire and back pain Numerical Rating Scale were the outcome measures. The authors developed their model using a machine learning least absolute shrinkage and selection operator approach.

Of 4665 patients (89%) with follow up both the Roland–Morris Disability Questionnaire and the back pain Numerical Rating Scale improved slightly. Only 16% reported no back pain or related disability or back pain at 2 years after initial visits. The most consistent predictors of two year Roland–Morris Disability Questionnaire scores and back pain Numerical Rating Scores were 0–90 day change in each respective outcome and patient confidence in improvement.

On the basis of these data patients experienced 50% and 43% improvement in back pain and disability respectively 2 years after their initial visit. However fewer than 20% of patients had complete resolution of their back pain and disability at the time. Therefore baseline patient factors were more important than early interventions in explaining disability and pain after 2 years in older patients with low back pain.

Jeffrey G. Jarvik, MD, Laura S. Gold, Ph.D., Katherine Tan, Janna L. Friedly, MD, Srdjan S. Nedeljkovic, MD, Bryan A. Comstock, MS, Richard A. Deyo, MD, Judith A. Turner, Ph.D., Brian W. Bresnahan, Ph.D., Sean D. Rundell, Ph.D., Kathryn T. James, MPH, David R. Nerenz, Ph.D., Andrew L. Avins, MD, Zoya Bauer, MD, Larry Kessler, ScD, Patrick J. Heagerty, Ph.D. *The Spine Journal* 18 (2018): 1540–1551

3. PREPARE: presurgery physiotherapy for patients with degenerative lumbar spine disorder: a randomized controlled trial

Surgery due to disc herniation or spinal stenosis results mostly in substantial improvement in the short term but potentially diminishing improvement for pain and disability at long term follow up. Prehabilitation has been defined as augmenting functional capacity before surgery which may have beneficial effects on the outcomes after surgery. The authors performed a single-blinded two arm randomized control study to determine if presurgery physiotherapy improves function, pain and health in patients with degenerative lumbar spine disorders scheduled for surgery.

A total of 197 patients were consecutively included at a spine clinic. The inclusion criteria were patients scheduled for surgery because of disc herniation, spinal stenosis, spondylolisthesis, or degenerative disc disease that were 25–80 years of age. Patients were randomized to either presurgery physiotherapy or standardized information with follow up after the presurgery intervention as well as 3 and 12 months post-surgery. The primary outcome measure was Oswestry Disability Index and secondary outcomes included pain intensity, anxiety, depression, fear avoidance, physical activity, and treatment effect.

The presurgery physiotherapy group had better Oswestry Disability Index, Visual Analog Scale, EQ-5D, and hospital anxiety and depression scale depression scores compared with the waiting list group after the presurgery intervention. The improvements were small but larger than the study specific minimal clinically important change in VAS back and leg pain, EQ-5D, and Fear Avoidance Belief Questionnaire-Physical Activity. Post-surgery the only difference between the groups was higher activity level in the physiotherapy group compared with the waiting list group.

On the basis of these data the authors conclude that presurgery physiotherapy decreases pain, risk of avoidance behavior and worsening of psychological well-being and improves quality of life and physical activity levels before surgery compared with waiting list controls. These results were maintained only for activity levels post-surgery. Notwithstanding, presurgery selection, content, dosage of exercises, and importance of being active in a presurgery physiotherapy intervention does warrant further study on the impact of long term outcomes.

Yvonne Lindbäck, RPT, M.Sc., Hans Tropp, MD, Ph.D., Paul Enthoven, RPT, Ph.D., Allan Abbott, RPT, Ph.D., Birgitta Öberg, RPT, Ph.D. *The Spine Journal* 18 (2018): 1347–1355

4. The seven-year cost-effectiveness of anterior cervical discectomy and fusion versus cervical disc arthroplasty

Both anterior cervical discectomy fusion and cervical disc replacement are acceptable surgical options for the treatment of symptomatic cervical disc disease. Prior studies have

demonstrated at least equal effectiveness of cervical disc replacement in large randomized Investigational Device Exemption studies. Short term cost-effectiveness analyses at 5 years have suggested that cervical disc replacement may be the preferred treatment option. The authors performed a Markov model analysis to determine the 7 year cost-effectiveness of single level anterior cervical discectomy infusion versus cervical disc replacement for treatment of cervical disc degeneration.

A Markov model analysis was used to evaluate data from the Mobi-C IDE study incorporating 5 Markov transition states and seven cycles with each cycle set to a length of one year. Transition state probabilities were determined from complication rates as well as index and adjacent segment re-operation rates were the IDE study. Raw SF-12 data were converted to health state utility values using the SF-6D algorithm for 174 cervical disc replacement patients and 79 ACDF patients.

Assuming an ideal operative candidate who is 40 years old and failed appropriate conservative care the seven year cost was \$103,924 for ACDF and \$105,637 for cervical disc replacement. Cervical disc replacement resulted in the generation of 5.33 quality adjusted life years while ACDF generated 5.16 quality adjusted life years. Both ACDF and cervical disc replacement were cost effective but the incremental cost-effectiveness ratio (ICER) was 10,076 per QALY in favor of cervical disc replacement which was less than the willingness to pay threshold of \$50,000 per QALY.

On the basis of these data the authors conclude that ACDF and cervical disc replacement are both cost-effective strategies for the treatment of cervical disc degeneration. However, cervical disc replacement is the more cost-effective procedure at 7 years following surgery but only slightly and because of the slight increase in QALYS.

Jun S. Kim, MD, James Dowdell, MD, Zoe B. Cheung, MD, MS, Varun Arvind, BS, Li Sun, DO, Chanakya Jandhyala, MD, Chierika Ukogu, BS, William Ranson, BS, Samantha Jacobs, BS, Steven McAnany, MD, and Samuel Kang-Wook Cho, MD *Spine* 43, Number 22: 1543–1551

5. Safety of overlapping inpatient orthopaedic surgery

Although overlapping surgery is used to maximize efficiency, more empirical data are needed to guide patient safety. Dy et al. conducted a retrospective cohort study to evaluate the safety of overlapping inpatient orthopaedic surgery, as judged by the occurrence of perioperative complications.

All inpatient orthopaedic surgical procedures performed at 5 academic institutions during the calendar year of 2015 were included. Overlapping surgery was defined as 2 skin incisions open simultaneously for a single surgeon. In comparing patients who underwent overlapping surgery with those who underwent non-overlapping surgery, the primary outcome was the occurrence of a perioperative complication within 30 days of the surgical procedure, and secondary outcomes included all-cause 30-day readmission, length of stay, and mortality. To determine if there was an association between

overlapping surgery and a perioperative complication, the authors tested for non-inferiority of overlapping surgery, assuming a null hypothesis of an increased risk of 50%. The authors used an inverse probability of treatment weighted regression model adjusted for institution, procedure type, demographic characteristics, admission type, admission severity of illness, and clustering by surgeon.

Among 14,135 cases, the frequency of overlapping surgery was 40%. The frequencies of perioperative complications were 1% in the overlapping surgery group and 2% in the non-overlapping surgery group. The overlapping surgery group was non-inferior to the non-overlapping surgery group with reduced odds of perioperative complications. For secondary outcomes there was a significantly lower chance of all-cause 30-day readmission in the overlapping surgery group and shorter length of stay. There was no difference in mortality.

On the basis of these data the authors conclude that overlapping inpatient orthopaedic surgery, which consisted largely of joint replacement and spinal surgery, does not introduce additional perioperative risk for the complications that were evaluated. The suitability of this practice should be determined by individual surgeons and institutions on a case-by-case basis with appropriate informed consent.

Christopher J. Dy, MD, MPH, Daniel A. Osei, MD, M.Sc., Travis G. Maak, MD, Michael B. Gottschalk, MD, Alan L. Zhang, MD, Michael D. Maloney, MD, Angela P. Presson, Ph.D., MS, and Regis J. O'Keefe, MD, Ph.D. *The Journal of Bone and Joint Surgery Am* 2018; 100: 1902–1911

6. Tranexamic acid is efficacious at decreasing the rate of blood loss in adolescent scoliosis surgery

Tranexamic acid is an antifibrinolytic drug that reduces surgical blood loss. Evidence supporting its efficacy in surgery for adolescent idiopathic scoliosis is not robust. Goobie et al. performed a prospective double-blinded trial to validate the clinical efficacy of TXA in surgery for adolescent idiopathic scoliosis.

111 patients with adolescent idiopathic scoliosis were randomized to receive either a placebo or TXA (50-mg/kg loading dose and 10-mg/kg/h infusion). Power analysis indicated that 50 patients per group would provide power to detect at least a 20% difference in blood loss. Two-way analysis of variance was applied to compare blood loss rates using the group-by-time interaction F test.

The risk of clinically relevant blood loss (>20 mL/kg) was more than twice as high in the placebo group than in the TXA group (44% versus 21%). Compared with the placebo group, the TXA group had a 27% reduction in intraoperative blood loss, a significantly lower rate of intraoperative bleeding per hour, less intraoperative blood loss and less, postoperative bleeding into the drain. Six patients who received a placebo and no patient who received TXA required an allogenic blood transfusion. No perioperative adverse events, including thromboembolic events or seizures, were observed.

On the basis of these data the authors conclude that use of TXA in patients undergoing surgery for adolescent idiopathic scoliosis significantly reduced blood loss by 27% compared

with that in the placebo group. The rate of intraoperative blood loss per hour and per level fused and the amount of postoperative blood loss were also significantly lower in the TXA group. More placebo-treated patients received allogenic blood and patients with greater intraoperative blood loss spent a longer time in the hospital suggesting that this should be strongly considered a routine component of adolescent scoliosis surgery.

Susan M. Goobie, MD, FRCPC, David Zurakowski, PhD, Michael P. Glotzbecker, MD, Mary E. McCann, MD, MPH, Daniel Hedequist, MD, Robert M. Brustowicz, MD, Navil F. Sethna, MD, Lawrence I. Karlin, MD, John B. Emans, MD, and M. Timothy Hresko, MD *The Journal of Bone and Joint Surgery Am* 2018; 100: 2024–2032

7. IN BRIEF utility of supine lateral radiographs for assessment of lumbar segmental instability in degenerative lumbar spondylolisthesis

Accurate evaluation of segmental instability is critical to the management of lumbar spondylolisthesis. Standing lateral flexion-extension films were routinely obtained on the belief that they will precipitate forward-backward motion and reveal instability. Tarpada et al. performed a retrospective chart review to determine whether supine lateral radiographs increased the amount of segmental instability visualized in single level lumbar degenerative spondylolisthesis when compared to traditional lateral flexion-extension views. Supine lateral radiographs were added to the routine evaluation and 59 patients were included in this retrospective study. The mean mobility seen with flexion-extension was 5.53% whereas the mean mobility seen with flexion-supine views was 7.83%. This difference was independent of age and body mass index. On the basis of these data the authors conclude that maximal mobility was seen between flexion and supine radiographs in 37 patients, between neutral and supine radiographs in 11 cases and between traditional flexion-extension studies in 11 cases. The authors conclude that incorporation of the supine lateral radiograph in place of an extension radiograph can improve our understanding of segmental mobility when evaluating degenerative spondylolisthesis.

Sandip P. Tarpada, BA, Woojin Cho, MD, Ph.D., Foster Chen, MD, and Louis F. Amorosa, MD *Spine* 43, Number 18: 1275–1280

8. Depression is closely associated with chronic low back pain in patients over 50 years of age

There is increasing evidence supporting an association between depression and low back pain. However, the degree of the association in the general population is poorly understood. Park et al. performed a cross-sectional study to analyze the relationship between the presence and severity of depression and low back pain in a representative sample of the general population using a self-report screening questionnaire for depression. Health surveys and examinations were

conducted on a nationally representative sample ($n = 7550$) of Koreans. Low back pain status was determined by a simple survey response concerning low back pain >30 days during the past 3 months. Depression was defined as individuals with a total score >10 on the Patient Health Questionnaire (PHQ)-9 survey. In the Korean population the prevalence of depression was significantly greater in individuals with low back pain (20.3%) than in those without low back pain (4.5%). On multivariate logistic regression analysis, the presence of depression was significantly associated with low back pain (adjusted odd ratio: 3.93, $P < 0.001$). The risk of low back pain increased with increasing severity of depression. On the basis of these data the authors conclude that depression is more common in patients with low back pain among Koreans.

Sang-Min Park, MD, Ho-Joong Kim, MD, Ph.D., Seonpyo Jang, MD, Hyoungmin Kim, MD, Bong-Soon Chang, MD, PhD, Choon-Ki Lee, MD, and Jin S. Yeom, MD Spine 43, Number 18: 1281–1288

9. Bariatric surgery before elective posterior lumbar fusion is associated with reduced medical complications and infection

Severely obese patients with operative spinal pathology present a challenge to the spine surgeon, given the known increased risk of peri and postoperative complications. Jain et al. performed a retrospective cohort study to determine the impact of bariatric surgery on perioperative complications of posterior lumbar fusion. Patients undergoing posterior lumbar fusion in the State Inpatient Databases of New York, Florida, North Carolina, Nebraska, Utah, and California comprised the patient sample. The authors analyzed 156,517 patients who were categorized into three groups: Group 1 had a history of bariatric surgery and obesity, Group 2 had severe obesity with a body mass index >40 , and Group 3 with patients with normal weight defined as a body mass index of <25 . Logistic and linear multivariate regressions were performed to compare complications and length of stay between the groups. There were 590 patients with bariatric surgery, 5,791 severely obese, and 150,136 non-obese patients. Those with bariatric surgery had significantly lower rates of respiratory failure, urinary tract infection, acute renal failure, and overall medical complications including infection compared with the severely obese group. The bariatric surgery group also had significantly lower hospital length of stay. There were no differences in medical complications when comparing the bariatric surgery group with the non-obese group, however, the bariatric surgery group did have significantly higher rates of infection, reoperation, and readmission. On the basis of these data the authors conclude that bariatric surgery before elective posterior lumbar fusion mitigates risks of medical complications and infection. Although there is still an increased risk of infection, revision surgery, and readmission compared with patients of normal BMI.

Deeptee Jain, MD, Sigurd H. Berven, MD, John Carter, MD, Alan L. Zhang, MD, Vedat Deviren, MD The Spine Journal 18 (2018): 1526–1532

10. Opioids delay healing of spinal fusion: a rabbit posterolateral lumbar fusion model

Opioid use is prevalent in the management of pre- and postoperative pain in patients undergoing spinal fusion. There is evidence that opioids downregulate osteoblasts in vitro, and a previous study found that morphine delays the maturation and remodeling of callus in a rat femur fracture model. However, the effect of opioids on healing of spine fusion have not been investigated previously. Jain et al. performed a preclinical animal study to determine the effects of systemic opioids on the process of spinal fusion healing in the rabbit posterolateral spinal fusion model. Twenty-four adult New Zealand white rabbits were studied. The opioid group received 4 weeks preoperative and 6 weeks postoperative transdermal fentanyl. The control group received only perioperative pain control as necessary. All animals underwent bilateral L5-L6 posterolateral spinal fusion using iliac crest autograft. Animals were euthanized at the 6-week postoperative time point, and assessment of fusion was done by manual palpation, plain radiographs, microcomputed tomography and histology. The fusion scores on manual palpation, radiographs, and microCT were not statistically different between the two groups. Three-dimensional microCT morphometry found that the fusion mass in the opioid group had a lower bone volume, a lower trabecular number and a higher trabecular separation compared with the control group. On the basis of these data the authors conclude that systemic opioids lead to an inferior quality fusion mass with delay in maturation and remodeling at 6 weeks in the rabbit spine fusion model.

Nikhil Jain, MD, Khaled Himed, BS, Jeffrey M. Toth, Ph.D., Karen c. Briley, Ph.D., Frank M. Phillips, MD, Safdar N. Khan, MD The Spine Journal 18 (2018) 1659–1668

11. Revision spine surgery in patients without clinical signs of infection: How often are there occult infections in removed hardware?

Some studies show that patients undergoing revision spine surgery may have a higher rate of infection. Hu et al. performed a retrospective study to examine the incidence of occult infection in revision spine surgeries and its correlation with preoperative inflammatory markers. The authors reviewed all patients who underwent revision spine surgery and hardware removal during a seven year period at a single institution. Patients who had preoperative clinical signs of infection were excluded. The hardware and surrounding tissue culture results were obtained along with preoperative inflammatory markers (ESR, CRP, and procalcitonin) levels were recorded. A total of 162 consecutive patients were included in the study. Seventy-two patients (44.4%) had loose hardware and 88 patients (54.3%) had pseudarthrosis. Postoperatively, the hardware and/or surrounding tissue culture was positive in 15 patients (9.3%). Only four patients with positive cultures had elevated preoperative ESR and CRP levels. Only two patients with positive cultures had elevated preoperative procalcitonin levels. There was no correlation between the patients' preoperative ESR, CRP, procalcitonin levels, and

positive culture results. On the basis of these data the authors conclude that occult infections are present in 9.3% of patients who underwent revision spine surgery and hardware removal although they did not have clinical signs of infection.

Ziaobang Hu, Isador H. Lieberman *European Spine Journal* (2018) 27: 2491–2495

12. Clinical course and prognostic models for the conservative management of cervical radiculopathy: a prospective cohort study

While the natural history of lumbar radiculopathy has been well documented the clinical course for cervical radiculopathy patients managed conservatively has been less well studied. The authors performed a prospective cohort study to describe the clinical course and to develop prognostic models for poor recovery in patients with cervical radiculopathy who are managed conservatively. Sixty-one consecutive adults with cervical radiculopathy were included in the study with 6- and 12-month follow up assessments. About 55% of patients reported to be recovered at 6 and 12 months. All multivariable models contained 2 baseline predictors. Longer symptom duration increased the risk of poor perceived recovery, whereas the presence of paresthesia decreased this risk. A higher neck pain intensity and a longer duration of symptoms increased the risk of poor relief of neck pain. A higher disability score increased the risk of poor relief of disability, and larger active range of rotation toward the affected side decreased this risk. On the basis of these data the authors conclude that the clinical course of cervical radiculopathy appears to be long, with most of the reduction in symptoms occurring within the first 6 months. All prognostic models showed an adequate predictive performance with modest diagnostic accuracy and explained variance.

Marije L. S. Sleijser-Koehorst, Michel W. Coppieters, Martijn W. Heymans, Servan Rooker, Arianne P. Verhagen, Gwendolijne G. M. Scholten-Peeters *European Spine Journal* (2018) 27: 2710–2719

13. Arm pain versus neck pain: a novel ratio as a predictor of post-operative clinical outcomes in cervical radiculopathy patients

Informed patient selection and counseling is key for improving surgical outcomes. Passias et al. performed a retrospective review of prospectively collected data to identify baseline characteristics that were related to improved or worsened postoperative outcomes for patients undergoing surgery for cervical spine radiculopathic pain. The patient sample included cervical spine patients with a diagnosis of “degenerative” that included cervical disc herniation, cervical stenosis, and cervical spondylosis without myelopathy producing cervical radiculopathy. Three hundred and ninety-eight patients were included. Patients with an Arm-to-Neck pain ratio ≤ 1 were less likely to reach improvements in the

2-year Neck Disability Index and SF-36 Physical Component subscores. The other variables that were studied were age, body mass index, gender, history of surgery, baseline Neck Disability Index score, baseline SF-36 Physical Component Summary scores, baseline SF-36 Mental Component Summary scores, Visual Analog Scale Arm score and Visual Analog Neck score. Arm pain greater than neck pain at baseline was associated with both increased odds of post-operative arm pain improvement and SF36 Physical Component Summary improvement. On the basis of these data the authors conclude that baseline arm pain greater than neck pain was determined to have the greatest impact on whether patients met at least 50% improvement in their upper body pain score.

Peter G. Passias, MD, Saqib Hasan, MD, Kris Radcliff, MD, Robert Isaacs, MD, Kristina Bianco, BA, Cyrus M. Jalai, BA, Gregory W. Poorman, BA, Nancy J. Worley, BA, Samantha R. Horn, BA, Anthony Boniello, BA, Peter L. Zhou, BA, Paul M. Arnold, MD, Patrick Hsieh, MD, Alexander R. Vaccaro, MD, Michael C. Gerling, MD *International Journal of Spine Surgery*, Vol 12, No 5, 2018: 629–637

14. Prevalence of preoperative lower urinary tract symptoms in patient undergoing elective lumbar spine surgery

The prevalence of lower urinary tract symptoms is unknown in patients with lumbar spine disease. Lieberman et al. performed a cross-sectional cohort study to determine the prevalence of moderate to severe lower urinary tract symptoms in patients undergoing elective lumbar spine surgery. The authors used the validated International Prostate Symptom Score (IPSS) to assess the lower urinary tract symptom severity among elective lumbar spine surgery patients during the 2015–2017 time period at a single academic institution. Moderate-to-severe lower urinary tract symptom was defined as an IPSS score of 8 or more. Data were obtained from 373 patients undergoing elective lumbar spine surgery and moderate-to-severe urinary symptoms were reported by 46% of these patients (51% of women and 42% of men). Prevalence of moderate-to-severe urinary symptoms increased with age, rising from 38% in patients below 40 years to 57% in patients 70 years or older. Lower urinary tract symptom prevalence according to diagnosis was approximately 50% in spondylolisthesis, stenosis, and scoliosis patients and only 31% in herniated nucleus pulposus patient groups. This difference may have likely been due to the age of patients with these diagnostic characteristics. On the basis of these data the authors conclude that moderate-to-severe urinary tract symptoms are more prevalent than previously recognized in patients with increasing age, in women, and in patients with stenosis, spondylolisthesis, and scoliosis.

Elizabeth G. Lieberman, MD, Ryan M. Boone, MS, Stephanie Radoslovich, BA, Valentina Haj, Jayme Hiratzka, MD, Lynn M. Marshall, ScD, and Jung U. Yoo, MD *Spine Volume* 43, Number 19: 1