Guest Editorial
What's New in Spine Surgery

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The orthopaedic community continues to struggle with the impact of COVID-19 across our profession. Although our society is moving forward, we still see the impact in nursing staffing shortages across hospitals and trends toward outpatient procedures to reduce costs and hospitalization demand. Additionally, we continue to see the effects that COVID-19 had on the research community. Clinical trials were paused and research meetings and conferences were reduced to decrease the risk of COVID-19 transmission. Although almost all clinical trials and meetings have resumed, this gap in our knowledge growth will have a long-lasting impact. Furthermore, it will be years before the nursing staffing levels meet the current demand. These trends will continue to impact our profession for years to come.

This year's annual update on spine surgery focuses on peer-reviewed literature with the highest Levels of Evidence while also surveying the abstracts presented at national meetings over the past 12 months since our last update. The spine surgery literature continues to grow exponentially, with the greatest growth seen within technical articles and case series. However, the number of randomized controlled trials (RCTs), which are difficult to perform in all surgical specialties, continues to grow slowly and in areas that lend themselves to their performance.

Lumbar Spine

The optimal surgical management for lumbar disc herniation, lumbar spinal stenosis, and degenerative spondylolisthesis has been studied extensively in the past year. Hermansen et al. performed a randomized clinical trial of 437 patients with spinal stenosis without concomitant spondylolisthesis[1]. They compared unilateral laminotomy (with crossover), bilateral laminotomy, and laminectomy with spinous process osteotomy as treatment options and found no differences in outcomes or complication rates. In the Swedish Spinal Stenosis Study (SSSS), Karlsson et al. compared the rates of stenosis recurrence, at the adjacent or operative level, on 2-year magnetic resonance imaging (MRI) between groups treated with decompression alone or decompression with fusion[2]. Of the 211 patients originally included, 176 had MRI scans available for review. Karlsson et al. found that new stenosis at the operative and adjacent levels occurred significantly more frequently in the fusion group. This finding persisted even in the presence of preoperative spondylolisthesis. The authors concluded that decompression without fusion is the preferred surgical treatment for lumbar spinal stenosis as well as degenerative spondylolisthesis. In contrast, in a prospective randomized study, Inose et al. reported on long-term (mean follow-up of 12.3 years) outcomes after decompression alone, decompression and fusion, or decompression with stabilization for spondylolisthesis[3]. The authors included 66 of the initial 85 patients and found that the inclusion of instrumentation did not improve patient-reported back pain on the visual analog scale (VAS) at the final follow-up; however, instrumentation was associated with improvements in other outcome measures such as vitality, social functioning, and mental health.

Cheng et al. conducted a prospective randomized trial evaluating transforaminal lumbar interbody fusion (TLIF) treated with isolated foraminal stenosis, with either unilateral or bilateral pedicle screw stabilization[4]. They found significant improvements in the height of the intervertebral disc space and foramen, and in segmental lordosis, regardless of the instrumentation type; however, the bilateral pedicle screw group had significantly longer operative time and higher blood loss. Fusion rates were similar between groups, although, with only 48 patients in total, the study was likely underpowered to detect a difference in pseudarthrosis rates. Patient-reported outcomes were also statistically similar. The authors used these results to argue that unilateral pedicle screw constructs with anterior column support provided similar results to bilateral pedicle screw instrumentation.

Glennie et al. examined the cost-effectiveness of surgical management of lumbar disc herniation causing chronic (defined as 4 to 12 months) radiculopathy from a third-party payer perspective, as determined by the single-payer Canadian health-care system[5]. The authors found that early microdiscectomy was cost-effective for chronic radiculopathy, in that the cost of 1 quality-adjusted life-year (QALY) was lower than the stated $50,000 Canadian dollars willingness-to-pay threshold. The upfront costs were higher, but the outcomes were better overall with the surgical procedure. Therefore, the authors concluded that: "Decision-makers should ensure adequate funding to allow timely access to surgical care given that it is highly likely that early surgical intervention is potentially cost-effective in single-payer systems."

Disclosure: The **Disclosure of Potential Conflicts of Interest** forms are provided with the online version of the article (http://links.lww.com/JBJS/H505).

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Coric et al. reported the results of their multicenter, prospective, randomized study of a new posterior lumbar facet arthroplasty device for the treatment of degenerative spondylolisthesis[6]. The study was an investigational device exemption (IDE) trial performed for the U.S. Food and Drug Administration (FDA) and was designed to compare the outcomes of the Total Posterior Spine (TOPS) System device, which preserves facet joint motion after decompression for stenosis caused by spondylolisthesis, with those of traditional TLIF. Coric et al. found that segmental motion was preserved in the TOPS System group and the outcomes were similar, with the TOPS group reporting a significantly higher overall composite measure for clinical success. The authors concluded that the TOPS System is safe and efficacious as a surgical treatment option for degenerative spondylolisthesis.

Blood Loss and Pain Control

Two randomized trials compared the use of topical tranexamic acid (TXA) to reduce blood loss after lumbar fusion. Jiang et al. injected a multifunctional cocktail of topical anesthetic and topical TXA after fascial closure in the experimental group and injected an equal volume of normal saline solution in the same location in the control group[7]. The experimental group had lower total blood loss (postoperative, total, and hidden) and higher hemoglobin levels on postoperative day 3. In contrast, Maethungkul et al. found that the addition of topical TXA did not reduce postoperative blood loss compared with placebo in patients undergoing palliative decompressive thoracolumbar spinal metastasis surgery[8]. The authors concluded that topical TXA did not provide any additional benefit to reduce blood loss in this patient subpopulation and that prophylactic intravenous TXA was sufficient.

Clohisy et al. compared 2 dosing protocols for intravenous TXA administration in patients undergoing adult spinal deformity surgery: a low dose (10-mg/kg bolus, 1-mg/kg/hr infusion) and a high dose (50-mg/kg bolus, 5-mg/kg/hr infusion)[9]. Fifty-two patients undergoing a minimum of 10 fusion levels or a planned 3-column osteotomy for adult spinal deformity were included. Overall, the high-dose group demonstrated a decreased total blood volume loss compared with the low-dose group. There were no differences in serious adverse events between groups.

Infection

Salimi et al. performed a randomized, prospective study examining the effect of local vancomycin therapy at wound closure on infection rates[10]. They included 375 patients undergoing any type of lumbar spine surgery, including decompression alone and instrumented fusion. They found no significant differences between the groups with and without vancomycin, although gram-negative organisms were more common in the vancomycin group. The authors ultimately concluded that topical vancomycin powder has no demonstrated benefit and may increase the relative rate of gram-negative infections.

Cervical Spine

The optimal surgical treatment for cervical radiculopathy remains controversial. Using a noninferiority study design, the authors of the Foraminotomy ACDF Cost-Effectiveness Trial (FACET) RCT compared patient outcomes between anterior cervical discectomy and fusion (ACDF) and posterior foraminotomy in the setting of unilateral, single-level radiculopathy[11]. In this randomized and blinded study of 265 patients, the primary outcome measures were the Odom score and the VAS arm pain score. The 1-year data, with a 90% follow-up rate, demonstrated that posterior foraminotomy was noninferior to ACDF, with a 10% noninferiority margin. The secondary outcomes demonstrated small between-group differences, most importantly for dysphagia in the anterior group and wound infections in the posterior group. Reoperation rates trended slightly higher in the posterior group (5% compared with 3%). This study suggested adequate short-term outcomes for posterior foraminotomy; however, the study was limited by a lack of longer-term follow-up assessing the durability of these outcomes.

Pain control following posterior cervical surgery remains an active area of research. Standard care currently relies on multimodal analgesia. Two recent studies evaluated augmentation with an erector spinae plane block (ESPB). In a prospective, double-blinded RCT, Kanna et al. evaluated patients who underwent posterior cervical surgery and received standard multimodal analgesia and compared those who had an addition of an ESPB and those who did not[12]. The ESPB group fared significantly better in all primary outcomes, demonstrating improved intraoperative opiate consumption, postoperative pain score, sedation score, and time to mobilization. The authors did not identify any complications with the ESPB administered at the T1 level transverse process using ultrasound guidance. Similarly, Mostafa et al. performed a double-blinded RCT in patients who underwent posterior cervical surgery, with the study group receiving an inter-semispinal plane (ISP) block at the C5 level[13]. The ISP group demonstrated superior outcomes with regard to intraoperative fentanyl consumption, postoperative VAS scores within 12 hours, and the amount of and time to rescue analgesic administration. These studies supported the use of ESPB as a useful adjunct for pain management for posterior cervical surgery.

Prophylaxis for dysphagia and odynophagia after ACDF is also a continued area of interest. A double-blinded RCT compared outcomes following administration of intravenous dexamethasone preoperatively for ACDF with those in a saline solution group[14]. Odynophagia outcome scores and VAS odynophagia scores were significantly better in the dexamethasone group up to 72 hours postoperatively; these results were no longer significant at 2 weeks postoperatively. Notably,

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the study did not address any potential long-term implications of dexamethasone administration.

The debate with regard to the optimal implant for ACDF continues. Recent studies have added to the literature with regard to polyetheretherketone (PEEK) compared with allograft implants and anterior plating compared with stand-alone cages. In a prospective RCT, Villavicencio et al. examined the clinical and radiographic outcomes in patients undergoing ACDF with either PEEK or allograft implants[15]. The authors did not identify a difference in pseudarthrosis rate (10.2% in PEEK compared with 6.5% in allograft) at 24 months. They observed an equivalent rate of subsidence as well. This study largely conformed to the available literature suggesting a minimal difference in the fusion rate between the 2 implant materials. The debate with regard to stand-alone cervical cages was addressed in an RCT performed by Zavras et al.[16]. This prospective randomized trial compared clinical and radiographic outcomes in 1 or 2-level ACDF with or without anterior cervical plating. Fusion and subsidence rates were equivalent across groups. The plating group demonstrated worse rates of dysphagia. However, the 2-level, stand-alone group demonstrated slightly worse patient-reported outcome measures in the early postoperative period. The authors postulated that plating may impact dysphagia rates, but the added stability, particularly in 2-level constructs, may lead to superior patient-reported outcomes in the early recovery period.

Mitigating the risk of subsidence remains a surgical goal for ACDF. The implant-to-bone surface area ratio was evaluated as a potential surgical variable that could impact subsidence rates by Godlewski et al., who determined that subsidence was inversely correlated with the implant-to-bone surface area ratio[17]. The study was limited in that it did not include a comparison with preoperative disc height, bone mineral density, or the type of material used. However, the data suggested that maximizing implant coverage on the vertebral end plate is associated with lower rates of subsidence.

Postoperative Pain Management and Rehabilitation Protocols

Postoperative pain control in the acute and delayed postoperative period in lumbar surgery remains a topic of active research. The use of multimodal analgesia aimed at reducing opioid consumption, postoperative pain scores, and mobilization time is a staple of enhanced recovery after surgery (ERAS) protocols. The ESPB, an expansion on traditional modalities for postoperative pain control, was described by Forero et al. in 2016[18] and its use in lumbar surgery continues to develop. In a randomized clinical trial, Nashibi et al.[19] examined the efficacy of ultrasound-guided ESPB in postoperative lumbar pain control. The authors found that preoperative ESPB after the induction of general anesthesia significantly reduced pain scores, the need for rescue analgesia, and opioid consumption compared with controls. Preoperative ultrasound-guided ESPB compared with intraoperative anesthetic local infiltration was examined by Vergari et al.[20] in 24 patients undergoing lumbar fusion randomly assigned to guided bilateral ESPB or intraoperative intrawound infiltration. The authors found a significant decrease in patient-reported numeric rating pain scores in the recovery room in the ultrasound-guided ESPB group compared with the intraoperative infiltration group. The total amount of requested opioids during hospitalization was also reduced in the guided ESPB group, with no difference noted in adverse events or length of stay.

Renewed interest in the study of ultrasound-guided ESPB with medium and short-acting local anesthetics has led to further investigation of ESPB optimization. Dexmedetomidine is a highly selective, short-acting, alpha-2 agonist with an inhibitory sympathetic and hypotonic effect and its addition to standard peripheral nerve blocks has increased the duration of analgesia and has decreased morphine consumption[21,22]. In a group of 120 randomly assigned patients undergoing open lumbar fusion, Yi-Han et al.[23] found that the addition of 1-μg/kg dexmedetomidine to 20-mL ropivacaine ESPB compared with only 20-mL ropivacaine resulted in greater pain reduction, with notably lower VAS pain scores at 12, 24, and 48 hours postoperatively. The addition of dexmedetomidine did not result in any adverse reactions, increased mean arterial pressure, or changes in heart rate compared with the controls.

In addition to perioperative analgesia, intraoperative epidural analgesic injections have been used to decrease postoperative pain. Thepsoparn et al.[24] compared lower thoracic epidural blocks to controls in patients undergoing lumbar laminectomy and fusion in a blinded RCT. The experimental group demonstrated reduced recovery numeric pain scores, 24-hour morphine consumption, and length of hospital stay. The authors showed no difference in adverse events, although there was a significantly higher incidence of intraoperative hypotension in the intervention group.

Along with expected postoperative pain, a portion of patients may have continued radicular pain following lumbar spine surgery. Currently, spinal cord stimulation is a strategy employed by some clinicians to alleviate chronic postoperative radicular pain, although the literature on its efficacy has been limited[25]. In a placebo-controlled, crossover, randomized clinical trial, Hara et al.[26] studied the effectiveness of spinal cord burst stimulation in patients with refractory radicular pain after lumbar decompressive spine surgery. Patients underwent two 3-month periods with burst stimulation and two 3-month periods with placebo stimulation in a randomized order, with the primary outcome being a change in the Oswestry Disability Index (ODI). Among the 50 patients studied, there was no significant difference ($p = 0.32$) in the primary outcome of change in ODI between the burst stimulation periods (−10.6) and the placebo periods (−9.3). The authors also showed no difference in the secondary outcomes measured, including leg and back pain, quality of life, and physical activity levels. Adverse events were noted in 9 (18%) of the 50 patients, and 4

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(8%) of the 50 patients required surgical intervention. Further investigation is warranted on best-fit modalities to help to treat patients with continued pain and incomplete relief following surgical intervention.

Artificial Intelligence, Robotics, and Augmented Reality

With increased accessibility and affordability of computational power, artificial intelligence has increasingly become part of the spine surgical landscape[27]. The development and validation of machine learning and deep learning are of growing interest in the fields of predictive outcomes and imaging. Yagi et al.[28] established a machine learning model to predict postoperative outcomes of patients undergoing decompressive surgery for lumbar spinal stenosis. Using data collected from 3 institutions and 848 patients with 2-year follow-up, the authors developed a machine learning model using 68 preoperative variables and 5 operative variables. Using an accepted 7:3 ratio for training and testing, 12 predictive models were created, and the top 5 most accurate models were curated for use in the final prediction of postoperative domains. Using only the preoperative and operative defined variables, the top algorithms displayed high correlative linear prediction values (correlation coefficient, 0.95 to 0.97 [relative error, 0.06 to 0.14]) within the domains of postoperative lumbar function, walking ability, mental health, and social life function. In the future, models such as this may allow surgeons to accurately predict outcomes at the time of patient preoperative presentation.

Advances in artificial intelligence and machine learning are also emerging in the field of spine imaging. Machine learning algorithms are structured to recognize patterns with the distinct ability to self-correct and improve over time, mimicking human learning but at much higher processing speeds[29]. Deep learning is a subset of the machine learning algorithm in which artificial neural networks are created because of nonlabeled input or output variables. Learning patterns, associations, and gleaning rules allow deep learning algorithms the ability to analyze unstructured or perceptual data[30]. Park et al.[31] developed a deep learning model to evaluate whether a convolutional neural network (CNN) algorithm can assess for fusion following ACDF. The authors included 187 patients undergoing 1-year postoperative fusion assessment with computed tomographic (CT) scans. Lateral neutral, flexion, and extension cervical radiographs were used as the input images for the development of a CNN, using 130 patients (69.5%) as the training set and 57 patients (30.5%) as the validation set. The CNN-based deep learning model demonstrated an accuracy of 87.1% (area under the receiver operating characteristic curve [AUC], 0.919) when using a single lateral cervical radiograph and 89.5% (AUC, 0.895) when using 3 lateral cervical radiographs. Although the sample size was relatively small, this study was the first to examine fusion using a CNN-DL (deep learning) model and may serve as the foundation for future studies utilizing larger sample sizes. Machine learning algorithms can be expected to be a useful tool in determining cervical pseudarthrosis as research in this area expands.

The diagnosis of cervical spondylotic myelopathy (CSM) aided by machine learning is also of recent interest. Lee et al.[32] used lateral radiographs from 207 patients (96 with MRI scans and clinical confirmation of cervical myelopathy and 111 without myelopathy) to develop a predictive CNN-DL model. The authors found that the accuracy of classification of CSM and non-CSM within the test data set using the CNN model was 87.1% (AUC, 0.864 [95% confidence interval (CI), 0.780 to 0.949]). Although MRI is widely accepted as the gold-standard imaging for the diagnosis of CSM, the application of these deep learning algorithms with routinely made radiographs may aid clinicians in early diagnosis.

Robotic-assisted spine surgery continues to undergo clinical investigation[33]. The safety and accuracy of robotic-assisted traditional pedicle screw placement have been previously shown[34], but its use in newer pedicle trajectories has yet to be established. Robotic-assisted cortical bone trajectory screw placement was investigated by Li et al.[35]. In a series of 81 patients, Li et al. compared fluoroscopy-assisted and robotic-assisted screw placement and reported increased accuracy and decreased superior facet joint violation in the robotic-assisted screw placement group. The authors also demonstrated decreased screw placement time and radiation time. Shahi et al.[36] provided further evidence that robotic-assisted surgical procedures may reduce radiation exposure. They evaluated a retrospective cohort of minimally invasive TLIFs and compared robotic assistance with navigation assistance. The total fluoroscopy time, the total radiation dose, and the percentage of radiation used for the surgical procedure were significantly less in the robotic-assisted group compared with the navigation-assisted group. The total operating room time was equivalent between groups.

Augmented reality surgical navigation is a novel type of navigation that uses video cameras for tracking rather than infrared and reflecting spheres. In general terms, this technology allows surgeons to visualize 3-dimensional, superimposed virtual images by wearing lenses or a headset. In a cadaveric study investigating the accuracy of augmented reality surgical navigation in open and minimally invasive approaches, Felix et al.[37] demonstrated 96% accuracy (Gertzbein-Robbins grade A or B) in the insertion of 124 thoracolumbar-placed pedicle screws. Charles et al.[38] evaluated pedicle screw accuracy using augmented reality surgical navigation in a series of 20 patients undergoing minimally invasive TLIF and found an accuracy of 94%. The authors stated that the lack of distal screw tracking may require additional intraoperative fluoroscopic use. Although further high-level clinical research should be pursued, the continued emergence of robotics, artificial intelligence, and augmented reality may provide surgeons with increased surgical accuracy, decreased radiation exposure, and reliable operative predictions for patients.

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Endoscopic Spine Surgery

Research into endoscopic spine surgery is rapidly expanding. Most surgeons recognize the steep learning curve of endoscopic spine surgery and the difficulties of incorporating it into their own practice, but it is hard to ignore the growing research within this field.

In 2022, Gadjradj et al. demonstrated the noninferiority of percutaneous transforaminal endoscopic discectomy to conventional open microdiscectomy[39]. Although they observed favorable trends in the endoscopic group, this RCT of 179 patients undergoing percutaneous transforaminal endoscopic discectomy demonstrated that this is a reasonable alternative to the more conventional open approach. This RCT also offered unique insight into the learning curve for the procedures. Surgeons were required to be supervised by a senior surgeon for their first 10 to 15 endoscopic surgical cases, and then the surgeons' first 50 cases (including those supervised) were excluded from the analysis. There appears to be a reasonable learning curve for endoscopic spine surgery. Additionally, Chen et al.[40] published an RCT demonstrating equivalent results between endoscopic surgery and open surgery for disc herniations. In aggregate, these studies continue to support the expansion of endoscopic spine surgery. Recently, we have also seen endoscopic spine surgery performed for TLIF, and we expect further expansion of this technology moving forward.

Evidence-Based Orthopaedics

The editorial staff of *JBJS* reviewed a large number of recently published studies related to the musculoskeletal system that received a higher Level of Evidence grade. In addition to articles cited already in this update, 4 other articles relevant to spine surgery are appended to this review after the standard bibliography, with a brief commentary about each article to help guide your further reading, in an evidence-based fashion, in this subspecialty area.

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Evidence-Based Orthopaedics

Claus CF, Lytle E, Lawless M, Tong D, Sigler D, Garmo L, Slavnic D, Jasinski J, McCabe RW, Kaufmann A, Anton G, Yoon E, Alsalahi A, Kado K, Bono P, Carr DA, Kelkar P, Houseman C, Richards B, Soo TM. The effect of ketorolac on posterior minimally invasive transforaminal lumbar interbody fusion: an interim analysis from a randomized, double-blinded, placebo-controlled trial. *Spine J.* 2022 Jan;22(1):8-18.

This is an interim analysis of a prospective, randomized, double-blinded, placebo-controlled trial evaluating the use of postoperative ketorolac on postoperative pain control and fusion rates after minimally invasive TLIF. It is a noninferiority designed study powered to detect a 15% difference in fusion rate, with an estimated sample size of 600. This interim analysis involves the first 292 patients. In this analysis, there was no significant difference in the fusion rates between the ketorolac group and the control group at 6 months ($p = 0.79$) and 1 year ($p = 0.53$). Secondary outcomes significantly favored the ketorolac group, with decreased mean opioid consumption and mean length of hospital stay. This study offered valuable insight into the effect of postoperative ketorolac after TLIF on pseudarthrosis rates and clinical outcomes. Notably, the interim analysis remained underpowered to adequately detect a difference in fusion rates, and we anticipate that the final analysis will provide a robust answer on this important clinical question.

Mohanty S, Barchick S, Kadiyala M, Lad M, Rouhi AD, Vadali C, Albayar A, Ozturk AK, Khalsa A, Saifi C, Casper DS. Should patients with lumbar stenosis and grade I spondylolisthesis be treated differently based on spinopelvic alignment? A retrospective, two-year, propensity matched, comparison of patient-reported outcome measures and clinical outcomes from multiple sites within a single health system. *Spine J.* 2023 Jan;23(1):92-104.

The debate with regard to fusion for degenerative spondylolisthesis continues. Taken on a population level, fusion likely offers some functional benefits to patients. However, a subset of patients may not need fusion for degenerative spondylolisthesis. This study sought to determine whether spinal-pelvic mismatch is 1 criterion that may influence the need for fusion. The authors retrospectively analyzed prospective data. Patients were divided into high and low pelvic incidence minus lumbar lordosis (PILL) mismatch cohorts with a cutoff of 10°. Patient-reported outcomes were compared between patients who underwent laminectomy with fusion and those who underwent laminectomy alone in the high and low PILL groups. This study found that the addition of fusion in the high PILL group resulted in significantly superior patient-reported outcomes at 1 year, whereas the addition of fusion in the low PILL group resulted in significantly worse patient-reported outcomes at 1 year. In the high PILL group, patients who underwent fusion demonstrated a lower reoperation rate. Conversely, in the low PILL group, patients who underwent fusion demonstrated a higher reoperation rate. This study is the first to suggest that spinal pelvic harmony may influence patient outcomes after fusion for degenerative spondylolisthesis. The addition of fusion in the high PILL mismatch cohorts demonstrated significant advantages over laminectomy alone for patient-reported outcomes as well as reoperation rates. This study helps to more narrowly define patients who will benefit most from fusion in this heterogeneous pathology.

WHAT'S NEW IN SPINE SURGERY

Park SM, Lee HJ, Park HJ, Choi JY, Kwon O, Lee S, Kim HJ, Yeom JS. Biportal endoscopic versus microscopic discectomy for lumbar herniated disc: a randomized controlled trial. *Spine J.* 2023;23(1):18-26.

This is a noninferiority study comparing patient-reported outcomes in patients undergoing microdiscectomy or biportal endoscopic discectomy. The primary outcome was the ODI score at 12 months postoperatively. The study was powered to detect a 12.8-point difference in ODI scores, based on the minimally important clinical difference. Secondary outcomes included patient-reported outcomes, surgical outcomes, and adverse events. The primary outcome analysis demonstrated noninferiority of ODI scores at 1 year in the endoscopic group. The secondary outcome analysis demonstrated slightly better VAS scores immediately postoperatively in the endoscopic group. However, narcotic use and hospital stay were equivalent. Ultimately, this study showed that the long-term disability rates were similar between microdiscectomy and biportal endoscopic discectomy, although long-term disability from this procedure is generally low from the start. Short-term pain scores were potentially superior in the endoscopic group, although this study was not designed to address this question. Adverse events were equivalent, with the important note that these surgeons were outside of the steep learning curve associated with this procedure.

Xiong GX, Collins JE, Ferrone ML, Schoenfeld AJ. Prospective comparison of one-year survival in patients treated operatively and nonoperatively for spinal metastatic disease: results of the prospective observational study of spinal metastasis treatment (POST). *Spine J.* 2023 Jan;23(1):14-7.

The debate continues with regard to surgical management of spinal metastases. Xiong et al. prospectively measured the survival rates of patients treated operatively or nonoperatively within the Prospective Observational Study of Spinal Metastases Treatment (POST) group. The primary outcome measured in the study was the 1-year survival rate. A propensity score for surgical intervention was used to control for confounding variables. This propensity score included age, sex, comorbidities, primary tumor, neurologic symptoms, and the validated New England Spinal Metastasis Score. This study evaluated 87 patients treated operatively and 122 patients treated nonoperatively. There were no significant baseline demographic differences. There were 7 crossovers from nonoperative management to operative management. In the operatively treated group, the unadjusted analysis demonstrated a 1-year mortality rate of 46%, compared with 54% in the nonoperatively treated group, which did not reach significance. The propensity score adjustment slightly increased the mortality benefit in the operatively treated group, but this also did not reach significance. Ultimately, a post hoc power analysis showed that a sample size of 1,200 patients would be needed to reach significance. This is a well-designed study with prospective data attempting to determine whether surgical intervention offers a mortality benefit in patients with spinal metastases. This study adds to the important work in this notoriously difficult area of study.