date, most studies of prone LLIF are of poor quality and without long-term follow up; and as such, the complication profile related to this novel approach is not well known.

METHODS: A systematic review of the literature and a meta-analysis were conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. All studies reporting prone LLIF were assessed for inclusion. Studies not reporting complication rates were excluded.

RESULTS: A total of 10 studies met inclusion criteria and were included in the analysis. Overall, 286 patients were treated with prone LLIF across these studies with an average of 1.3 (0.2) levels per patient. There were 18 reported intra-operative complications including cage subsidence (3.8%), rupture of the anterior longitudinal ligament (ALL) (2.3%), cage repositioning (2.1%), aborted prone interbody placement (0.82%), and durotomy (0.6%). There were no reported major vascular or peritoneal injuries. A total of 68 post-operative complications occurred. These included thigh/groin sensory symptoms (13.3%), hip flexor weakness (17.8%), wound infection (1.9%), psoas hematoma (1.3%), motor neural injury (1.2%), and revision surgery (3.8%).

CONCLUSIONS: Single position LLIF in the prone position appears to be a safe surgical approach with a low complication profile. Longer term follow up and prospective studies are needed in order to better characterize long-term complication rates related to this approach.

490 Beyond Placement of Pedicle Screws - New Applications for Robotics in Spine Surgery: A Multi-Surgeon, Single-Institution Experience
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INTRODUCTION: Interest in robotic-assisted spine surgery has grown as surgeon comfort and technology have evolved to maximize the benefits of time-saving and precision. However, the Food and Drug Administration (FDA) has currently only approved robotics to assist in determining the ideal trajectory for pedicle screw placement after extensive research supporting its efficacy and efficiency. To be considered a durable and effective option, robotics need to expand beyond the indication of just placing pedicle screws.

METHODS: We will explore accessing Kambin’s Triangle in percutaneous transforaminal interbody fusion (percLIF), iliac fixation in metastatic cancer, and sacroiliac (SI) fusions. Each of these topics will be covered in-depth with associated background information and subsequent discussion.

RESULTS: Without the need for laminectomies or facetectomies, minimal tissue disruption was attained by using RA instrumentation finely tuned to each patient’s unique spinal landscape for percLIF. In the cases of iliac fixation, the use of S2AI screws was precluded by the extensive damage to the sacrum. Therefore, a modified iliac screw entry point was utilized with an entry point slightly more medial than the traditional method, with a pre-planned trajectory of the screws using robot assistance. For SI joint fusion, we review our group at Duke University’s published case series displaying the “off-label” use of the robot, which is the first reported case series of its kind in the literature.

CONCLUSIONS: We show that with a proper understanding of its limitations, robots can help surgeons perform difficult surgeries in a safe manner.

491 Durability of Short Segment Instrumentation With Vertebrectomy in the Setting of Metastatic Disease to the Thoracic Spine
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INTRODUCTION: Current treatment of spinal metastases in the thoracic spine requiring vertebrectomy entails pedicle screw fixation at least two levels above and below the level of reconstruction.

METHODS: We reviewed a series of 30 patients treated for single-level, non-junctional (T2 to T11) thoracic spinal metastasis via single level vertebrectomy with posterior short segment instrumentation. The primary outcome was need for reoperation due to construct failure. Secondary outcomes included local tumor recurrence, pain scores, neurological function, estimated blood loss, operative time, length of hospital stay, and post-operative wound complications.

RESULTS: The most common primary tumor origin was non-small cell lung carcinoma (n = 9). All patients had a SINS score of at least 10 and Bilsky Grade of 2 or 3. Mean intraoperative blood loss was 605 mL (range 50 – 1200 mL) and mean operative time was 260.73 minutes (range 169 to 442 minutes). Two patients suffered perioperative complications but there was no construct failure or need for revision surgery at any time during the follow-up period. Mean length of follow-up was 24 months (range 1-65 months). An overall improvement in pain was seen postoperatively (7.67 versus 2.77, p < 0.001) and no patient experienced worsening neurological function. Average length of stay was six days. Three patients in this cohort had local tumor recurrence, although both of these patients suffered from a radioresistant tumor pathology.

CONCLUSIONS: Our results encourage consideration of this less invasive technique in the management of patients suffering from metastatic disease requiring vertebrectomy and reconstruction in the non-junctional thoracic spine.

492 Periprocedural Polypharmacy in Lumbar Fusions Performed Under Spinal Anesthesia Compared to General Anesthesia
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INTRODUCTION: Lumbar spinal surgery is most often performed under general endotracheal anesthesia (GEA), however spinal anesthesia
(SA) is a safe and effective alternative. Postoperative cognitive dysfunction (POCD) is a complication of GEA and the risk of POCD is associated with anesthetic modality and perioperative polypharmacy. Despite the many benefits of SA described in the literature, its efficacy in decreasing polypharmacy has not yet been determined.

**METHODS:** Demographic and procedural data of 424 patients undergoing single TLIF via GEA (n = 186) and SA (n = 238) were extracted from our institution’s electronic medical record. We investigated perioperative medication types, number of intraoperative hypotensive episodes, vasopressor requirement, and overall number of perioperative medications used between the two patient groups.

**RESULTS:** The number of perioperative medications differed significantly between the two cohorts with the SA cohort receiving a mean of 4.5 medications and the GEA cohort receiving a mean of 10.5 medications (p < 0.0001). This reduction in perioperative medications remained significant after a multivariable analysis to control for confounders (p < 0.001 for all variables). Use of vasopressors was significantly reduced in the SA cohort (p < 0.001), which coincided with a significant reduction in hypotensive episodes in the SA cohort (p < 0.001). Patients undergoing TLIF via GEA had 3.6 times greater odds of experiencing a hypotensive episode intraoperatively (OR = 3.62, 95% CI [2.38-5.49]).

**CONCLUSIONS:** Spinal anesthesia is associated with a significant reduction in hypotensive episodes in the SA cohort (p < 0.001), which coincided with a significant reduction in perioperative medications (p < 0.0001). This reduction in perioperative medications has not yet been determined.

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**One and Two-Level Robotic MIS TLIF With Expandable Implants Demonstrates a Favorable Safety Profile and Improved Alignment Parameters**

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**INTRODUCTION:** Minimally invasive surgery (MIS) transforaminal lumbar interbody fusion (TLIF) is an established technique, but continues to evolve with the development of expandable titanium cages and robotic screw insertion.

**METHODS:** This retrospective case series assessed clinical data, complications, and radiographic outcomes at short term follow-up. Screw placement was performed using intraoperative 3D imaging and robotic navigation, and TLIFs were performed via complete facetectomy from a unilateral trajectory in line with pedicle screws using titanium expandable cages.

**RESULTS:** 22 patients, 32 levels, and 108 inserted screws were analyzed. Implants included curved cages in 14 levels, 2 straight cages (diverging “V” pattern) in 12 levels, and a single straight cage in 6 levels. 21/22 patients (95%) had decreased pain. 4/22 patients (18%) experienced complications including deep infection causing screw pullout (requiring revision), painful radiculopathy, contact dermatitis (glue), and UTI. 108/108 screws (100%) showed excellent position. Increases were observed in average segmental lordosis (4.3 ± 4.9°), anterior disc height (6.6 ± 3.5 mm), posterior disc height (4.1 ± 2.1 mm), and foraminal height (5.0 ± 3.1 mm). Improved alignment was observed in 3/3 patients (100%) with SVA > 50 mm (78.3 ± 13.3 mm to 41.7 ± 14.3 mm), 3/4 (75%) with pelvic tilt >= 25° (30.3 ± 1.5° to 22.7 ± 4.0°), 5/5 (100%) with lumbo-pelvic mismatch > 10° (PI – LL: 21.4 ± 2.1° to 9.8 ± 8.5°), 13/13 (100%) with anterolisthesis (6.5 ± 2.3 mm to 1.8 ± 1.9 mm), and 4/4 (100%) with segmental coronal imbalance > 5° (8.0 ± 3.2° to 2.8 ± 1.3°).

**CONCLUSIONS:** Robotic MIS TLIF with expandable cages has a favorable safety profile, successful short-term clinical results, and is effective at correcting mild spinal malalignment.

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**Comparison of Disc Height Restoration and Subsidence Rates Between Static Versus Expandable Titanium Cages for Lateral Lumbar Interbody Fusion**

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**INTRODUCTION:** It has been shown that expandable cages for transforaminal lumbar interbody fusion (TLIF) are associated with increased rates of subsidence. However, as lateral lumbar interbody fusion (LLIF) cages offer substantially larger footprints, this may offset the risks.

**METHODS:** A retrospective review was performed of a consecutive adult patients undergoing LLIF with either static or expandable cages from 2013-2021. Demographics and surgical details were collected. Posterior disc height (PDH), subsidence, and fusions status were compared between patients with static and expandable cages. Follow-up were reported at minimum 6-months and 1-year.

**RESULTS:** A total of 120 patients had 173 cages implanted: 96 patients with 143 static cages vs. 24 patients with 30 expandable cages. Mean age was 63.4 and 62.4% were male. There were no significant differences in age, gender, BMI, smoking, or osteoporosis. Overall, PDH was significantly increased following LLIF (4.1 v 7.4 mm, p < 0.001). Static and expandable cage types had similar magnitudes (3.7 v 3.3 mm, p = 0.311) and percentage (89.0% v 121.5%, p = 0.127) change in PDH, respectively. Overall incidence of cage subsidence at 6-months and 1-year was 6.9% and 10.4% respectively. There was no significant difference in subsidence rates between cage types at 6 months (7.0% v 6.7%, p = 0.949) and 1-year (11.2 v 6.7%, p = 0.461). Radiographic evidence of fusion was present in 92.7% of cases at 1-year, and both cage types achieved similar fusion rates as well (92.2% v 95.6%, p = 0.555).

**CONCLUSIONS:** LLIF static and expandable cages offer similar PDH restoration depending on surgical goals. Expandable cages seem to be less prone to subsidence than smaller TLIF cage counterparts and offer similar fusion rates to static cages. Larger cohort studies are warranted to further validate these findings which are ongoing.