

NPH database. We selected patients who had both NPH and question of Parkinsonism due to tremor. **Results:** Six patients with both NPH diagnosis and tremor were identified. Three patients were treated for Parkinson's disease and followed by neurology. After shunting, all three improved and attempt was made to wean medications, which led to functional decline. The other three patients improved with shunting and after titration of the shunt had resolution of tremor. **Conclusions:** We provide evidence that NPH can result in tremor, treatable by shunting. We also emphasize that those patients do exist who have both diseases. This likely exists along a continuum. Careful consideration of NPH should be undertaken in those patients with suspected Parkinson's disease and imaging findings reminiscent of NPH.

SPINE AND PERIPHERAL NERVE SURGERY

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Back "pane" secondary to glass coffee table mishap: a very unusual penetrating injury to the thoracic dura without spinal cord injury

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Background: Non-gunshot wound penetrating injury to the spinal canal have been known to have variable injury patterns with respect to trajectory and depth. **Methods:** We present a case of a penetrating glass fragment injury to the T11-12 level with a cerebrospinal fluid leak. **Results:** A T11-12 bilateral laminectomy and duraplasty with motor-evoked potential monitoring was performed to remove the foreign object and associated hematoma. The clinical presentation and surgical management are discussed with respect to other non-gunshot-related penetrating spine injuries in the literature. **Conclusions:** This case demonstrates a very rare injury pattern, as the vast majority of intradural penetrating injuries to the thoracic spine result in complete or incomplete spinal cord injury. This patient was neurologically intact, which is remarkable, given the 7cm glass fragment crossing the thoracic spinal canal transversely from the right to left.

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Enhancing patient understanding of spinal conditions through advanced imaging platforms

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Background: In spite of the shift towards "personalized medicine," ambulatory medicine lags behind the cutting edge technology employed in non-medical fields to convey information in unique ways to enhance customer interactions. Furthermore, the complex nature of neurosurgical concepts can be difficult to convey within the confines of a short outpatient visit. These factors, coupled with potentially long wait times, can limit a patient's engagement in the treatment process. We propose that application of advanced video platforms will empower patients to feel that neurosurgical concepts are accessible and understandable and enable the face-to-face time with the physician to begin at a more sophisticated level, ultimately improving patient

engagement. **Methods:** 3D modeling, animation, and video game design were used in conjunction with tablet computers and VR headsets to create a video-driven "choose-your-own-adventure style patient experience" with initial use during waiting times prior to face-to-face interaction with the neurosurgery providers. **Results:** 3D modeling, animation, and virtual reality were successfully implemented in the Northwestern Medicine neurosurgery clinic with positive impact on patient engagement, including preliminary improvements in multiple patient satisfaction/"Likelihood to Recommend" scores. **Conclusions:** Advanced imaging platforms, including 3D modeling, animation, and virtual reality show great promise in improving patient engagement, patient retention, and "Likelihood to Recommend" scores.

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Preventing C5 palsy after cervical decompression by nerve root untethering and intraforaminal ligament release

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Background: Postoperative C5 palsy (C5P) is a common complication after cervical decompression, potentially related to nerve root tethering. To our knowledge, this is the first study to investigate this hypothesis by comparing C5/C6 root translation and tension before and after root untethering by cutting cervical intraforaminal ligaments (IFL). **Methods:** Six cadaveric dissections were performed. Nerve roots were exposed and translation and tension measured after the roots and spinal-cord were dorsally displaced 5mm before and after IFL cutting. These were also measured during shoulder depression to simulate intraoperative positioning. Clinical feasibility of IFL release was examined by comparing standard and extended foraminotomies to compare resultant root translation. **Results:** IFL-cutting increased translation at both C5/C6 roots (P=0.001). There was no difference between root levels (P=0.33). IFL-cutting increased translation upon shoulder depression at both C5/C6 roots (P=0.003) with a difference also being found between root levels (P=0.02). An extended cervical foraminotomy was technically feasible which enabled complete IFL release and root untethering, whereas a standard foraminotomy did not. **Conclusions:** IFL-cutting increases root translation, suggesting they are either protective (preventing peripheral nerve strain from being transmitted to the spinal-cord) or harmful (by tethering intraforaminal nerve roots and potentially contributing to postoperative C5P) depending on the clinical context.

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Percutaneous cortical screws: a novel approach to posterior spinal stabilization

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Background: Pedicle screw (PS) fixation is considered the gold-standard for spine stabilization. However, minimally invasive surgery (MIS) and cortical screw (CS) fixation have become commonplace. The biomechanical and safety profiles of CS compared to PS have yet to be determined. To our knowledge, this is the first study

to describe a novel percutaneous CS approach and compare its safety and accuracy to PS fixation. **Methods:** Standard percutaneous PS fixation was performed using fluoroscopy from L1-L5 on one-side with percutaneous CS being placed on the other-side (10-instrumented PS and CS levels each). Anatomical confirmation and comparison of pedicle breach incidence was performed afterward via open dissection. **Results:** Dissection revealed no breaches of either construct. As such, no statistical comparison was possible. At one-level however, a CS was seen breaching the posterior-third lateral vertebral body under the superior end-plate. A couple of exposed screw threads were visualized well away from any entering and/or exiting foraminal or extra-spinal neurovascular structures. **Conclusions:** MIS and CS-based constructs are relatively new fixation techniques. We describe a novel percutaneous CS technique incorporating advantages of both MIS and CS-constructs. Although no difference was found in pedicle breach incidence, further study comparing these techniques and rigorous patient selection for application are necessary.

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Does a multidisciplinary triage pathway facilitate better outcomes after spine surgery?

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Background: The Saskatchewan Spine Pathway (SSP) facilitates timelier imaging and more appropriate surgical referrals. In this prospective study, pre- and post-operative wait times, satisfaction, and outcomes were compared between SSP and conventionally referred surgical patients. **Methods:** A prospective matched cohort comparison of 150 patients (SSP group n=75; conventional group n=75) undergoing elective lumbar surgery for mechanical back and leg pain between 2011 and 2016 was performed with 1 year follow-up. Outcomes were measured with patient questionnaires, Oswestry disability index (ODI), visual analogue back and leg pain scores (VAS), and EuroQol Group 5 –Dimension self-report (EQ5D). **Results:** Baseline measures were the same in both groups. Wait times to see the surgeon and for surgery were the same, and wait time for MRI was significantly shorter for the SSP group ($p<0.001$). SSP patients utilized more non-operative treatment strategies such as physiotherapy ($p<0.04$), and had higher satisfaction with pre-surgical care ($p=0.03$). Good surgical outcomes were obtained in both groups with no significant differences. **Conclusions:** There are minimal differences in post-surgical outcomes for SSP patients versus conventionally referred patients; however, the SSP facilitates significantly shorter wait times for MRI and non-operative treatment strategies. Pre-surgical patient satisfaction is significantly higher among SSP patients.

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Is a positive nerve root sedimentation sign associated with better outcomes after lumbar laminectomy?

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Background: The nerve root sedimentation sign (SedSign) has been correlated with clinically significant lumbar spinal stenosis (LSS), and promoted as a possible prognostic indicator. However,

diagnostic methods were not clearly defined in prior reports. In this study, the clinically validated Saskatchewan Spine Pathway enabled diagnosis of neurogenic claudication due to LSS. The objective was to compare the outcome of lumbar laminectomy for neurogenic claudication with respect to SedSign. **Methods:** This was a retrospective analysis of prospectively-collected data in patients with neurogenic claudication who underwent lumbar laminectomy. Outcome measures included Oswestry Disability Index, Visual Analogue Scale (VAS) for back and leg pain, and EuroQol 5-Dimension questionnaire. **Results:** Laminectomy was performed in 106 patients, and 60 were SedSign positive. Outcomes did not differ with respect to SedSign for all outcome measures, in non-instrumented and instrumented cohorts. Improvement in walking distance was associated with dural cross-sectional area of stenosis ($p=0.02$). VAS back and leg improvements were associated with back dominant ($p=0.038$) and leg dominant ($p=0.0036$) pain. **Conclusions:** This is the largest analysis of SedSign with respect to operative outcomes, and the only study with validated criteria for defining neurogenic claudication. Although other radiological and clinical factors are associated with improvements, SedSign did not correlate with laminectomy outcome.

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Minimally invasive MetrX microdiscectomy for lumbar disc herniation: review of long-term outcomes

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Background: Lumbar microdiscectomy is amongst the most common neurosurgical techniques. In Saskatoon, minimally invasive microdiscectomy using the MetrX tubular retractor system has become a routinely performed procedure. While the outcomes of microdiscectomy are known to be similar to open technique, long term outcomes have not been reported. **Methods:** We performed a retrospective study of 160 minimally invasive microdiscectomies. We excluded subjects with cauda equina syndrome, redo surgery, fusions, and multi-level decompressions. We used one-way ANOVA to compare VAS, ODI, SF36, and EQ5D scores at pre-operative, 6-week postoperative, and long-term timepoints. **Results:** The mean pre-operative back pain VAS score was 6.23+/-2.63, 6-week post-operative follow-up VAS was 3.21+/-2.49, and long-term follow-up VAS was 2.56+/-2.45. The mean preoperative leg pain VAS score was 7.66+/-1.99, 6-week follow-up VAS was 3.56+/-2.79, final follow-up VAS was 2.20+/-2.57. The mean preoperative ODI score was 60.41+/-13.97; falling to 32.54+/-20.57 at 6-week follow up, and further to 24.50+/-20.97 at long term follow up. The mean baseline EQ5D quality of life score was 46.4+/-18.1, 68.9+/-20.2 at 6-week follow up and 69.3+/-20.3 at final review. Data reached statistical significance. **Conclusions:** We report good outcomes for minimally invasive microdiscectomy that are as durable as published results using open technique.