

in application, and temporal trends of usage. *Methods:* A prospectively-collected database of provincial insurance billables and diagnostic codes was reviewed retrospectively, from 2002-2014. Patients undergoing instrumented spinal fusions or percutaneous vertebroplasty/kyphoplasty were identified. Fee and diagnostic codes were applied to distinguish surgical indication and approach. The use of intra-operative navigation was determined for each case. *Results:* We identified 4607 instrumented spinal fusions in our cohort. Most cases were performed by orthopedic surgeons (63.2%) and the remainder by neurosurgeons. Of 2239 cases with identifiable etiology, CAN was utilized in 8.8%, predominantly for trauma and degenerative pathologies rather than deformity. In univariate analyses, CAN was used more often by neurosurgeons (21.0% vs. 12.4%, $p < 0.001$), in academic institutions (15.9% vs. 12.3%, $p < 0.001$), and when performed in/after 2010 (18.9% vs. 8.9%, $p < 0.001$). Differences by specialty and year remained significant in multiple logistic regression. *Conclusions:* Spinal CAN has proven benefit for instrumentation accuracy, but is used preferentially by academic neurosurgeons. Significant gains must be made in cost and usability to improve access across disciplines and institutions.

P.089

A comparison of perioperative complication rates in adult spinal deformity correction with one versus two surgeons

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Background: Morbidity can be high in the management of adult spinal deformity patients. Complications include blood loss (EBL), durotomy, radicular pain, and postoperative hardware failure. Utilization of one versus two spinal surgeons in spinal deformity correction reduces overall perioperative morbidity is unclear. *Methods:* All procedures were performed by surgeons at a single institution between January 2012-2015. Patients were followed for a minimum of one year and maximum of four years. We retrospectively reviewed 60 cases of adult spinal deformity. Our cohort was divided into 1 versus 2 surgeons (12 vs 48 cases). We analyzed these cases for estimated blood loss and peri-operative complications. *Results:* Cases involving long thoracic to pelvis correction (T3-T6) was 20.8% in the 2 surgeons group and 8.3% in the 1 surgeon group. The EBL > 3.0 L for 1 versus 2 surgeon groups were 25% and 41.6% respectively. Major complications in the 1 versus 2 surgeon group were 25% and 47.9% and the revision rates were 25% versus 37.5%. The percentage of minor complications in the 1 versus 2 surgeon group was 33.3% versus 14.6%. *Conclusions:* Utilizing two surgeons did not reduce complication rates. Procedures performed by two surgeons were more extensive deformity corrections. The extent of correction is the likely explanation for differing complication rates.

P.090

The predictors of patient morbidity after adult spinal deformity correction: bone mineral density and the extent of deformity correction

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Background: Instrumentation failure (IF) such proximal junctional kyphosis/failure or distal junctional failure (PJK/PJF/DJF), rod fracture and screw-loosening can cause morbidity in patients with spinal deformity correction. Factors such as bone mineral density (BMD) or region of deformity correction may play a role in postoperative IF. *Methods:* We reviewed the relationship between IF and BMD or extent of spinal deformity. IF includes PJK/PJF/DJF, fractured rod, screw-loosening, radiculopathy, and non-union. BMD groups included Normal, osteopenia/osteoporosis, and Unknown. The extent of correction included Lumbar, Short Thoracolumbar (5-8 levels), Long Thoracolumbar (8 to 12 levels), and Cervical-thoracic. *Results:* 60 patients (41:19 F:M) were included, with average age of 65. Total IF = 29 patients (48.3%). Normal BMD in N=14, with half of them (50.0%) developing IF; Low BMD in N=15, with one-third of them (33.3%) developing IF. Lumbar correction was performed in N=19, with IF in 36.8%; Short Thoracolumbar correction was performed in N=28, with IF in 46.4%; Long Thoracolumbar correction was performed in N=11, with IF in 81.8%; and Cervical correction in N=2, with no postoperative IF. *Conclusions:* Patients that received long-segment thoracolumbar had the highest rates of postoperative morbidity. We did not demonstrate an association between abnormal BMD and postoperative IF. A larger study would be needed for further investigations.

P.091

Anterior surgical fixation for cervical spine flexion-distraction injuries

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Background: Optimal surgical management for flexion-distraction cervical spine injuries remains controversial with anterior, posterior, and circumferential fixation being accepted. Here, we examined risk factors for clinical and radiographic failure in patients with one segment cervical flexion-distraction injuries having undergone anterior surgical fixation. *Methods:* A retrospective review of 57 consecutive patients undergoing anterior fixation for cervical flexion-distraction injuries between 2008-2012 was performed. The primary outcome was the number of patients requiring additional surgical stabilization and/or radiographic failure. Data collected included age, gender, mechanism and level of injury, facet pattern injury, and vertebral endplate fracture. *Results:* Six patients failed clinically and/or radiographically (11%). Four patients (7%) required additional posterior fixation. Two patients identified met radiographic failure criteria, however had fused radiographically, were stable clinically, and no further treatment was pursued. Progressive kyphosis and translation correlated with need for revision ($p < 0.05$ and $p = 0.02$,

respectively). No differences were identified for all other clinical and radiological factors assessed. *Conclusions:* This study supports the growing body of evidence for anterior fixation alone for flexion-distraction injuries. Findings suggest that measurements including segmental translation and kyphosis may predict radiographic failure and need for further surgical stabilization in some patients. Assessment for independent risk factors for anterior approach failure with a validated predictive scoring model should be considered.

P.092

Hirayama Disease: a diagnostic and therapeutic challenge

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Background: Hirayama disease (HD) is characterized by progressive cervical myelopathy caused by repetitive neck flexion leading to forward displacement of the posterior dural sack with compression and injury of the spinal cord. Typically, the C7-T1 myotomes become weak and atrophic, while sparing sensation. Here we present two Canadian cases of this rare entity. *Methods:* Two cases of HD are presented and literature reviewed, showing the diagnostic and therapeutic challenges of this disease. *Results:* Case 1 is a 17-year-old male professional singer and musician. He presented with bilateral progressive hand weakness, which was aggravated while playing the violin. Cervical MRI showed increased T2-weighted signaling at C5-7, but a correct diagnosis could not be identified. Eventually, dynamic cervical MRI showed the compression and he underwent an anterior cervical discectomy and fusion (ACDF) at C5-C6 and C6-C7 without complications.

Case 2 is a 19-year-old female with progressive right hand weakness. After numerous investigations, a dynamic cervical MRI diagnosed her with HD with classic findings and she underwent an ACDF at C6-C7 without complications. *Conclusions:* Hirayama's disease is rare, but should be kept in mind when cervical cord signal changes cannot be explained by standard MRI. Dynamic MRI is imperative to correct diagnosis and anterior fusion shows good outcomes in its management.

P.093

Thorascopic assisted resection of dumbbell nerve sheath tumors

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Background: Surgery to remove dumbbell nerve sheath tumors (NST) is complex, and is accompanied by significant operative and perioperative challenges. Historically, resection of dumbbell NST required large operations involving opening the chest and laminectomy, often accompanied by instrumentation. We describe a case series of 5 patients who underwent single stage thorascopic-guided resection of dumbbell schwannoma at our institution. *Methods:* 5 cases presented consisted of moderate to large NST, which contained intraforaminal components. Tumor location ranged from T3-T9, with most tumors spanning 2-3 vertebral bodies. Presentation ranged from discomfort/pain (most common) to one presentation of neurologic deficit with difficulty with ambulation. *Results:* Thorascopic assisted resection accomplished gross total resection in 4 of the 5 cases. In all

cases there was no significant neurologic deficit, although one patient reported transient numbness following the operation and all patients made significant improvement post operatively. The length of stay for these cases ranged from 1-6 days. *Conclusions:* Thorascopic assisted resection of dumbbell NST can be performed safely and with good outcomes by using the corridor the tumor produces. This approach reduces the need for instrumentation, length of stay and post operative complication rates relative to traditional approaches. To perform this approach effectively, good co-operation between the neurosurgeon and thoracic surgeon needs to be present.

P.094

Spinal dural repair: a Canadian questionnaire

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Background: Iatrogenic dural tear a complication of spinal surgery with significant morbidity and cost to the healthcare system. The optimal management is unclear, and therefore we aimed to survey current practices among Canadian practitioners. *Methods:* A questionnaire was administered to members of the Canadian Neurological Surgeon's Society designed to explore methods of closure of iatrogenic durotomy. *Results:* Spinal surgeons were surveyed with a 55% response rate (n = 91). For pinhole sized tears there is a trend toward sealant fixation(36.7%). Medium and large sized tears are predominantly closed with sutures and sealant(67% and 80%, respectively). Anterior tears are managed using sealant alone(48%). Posterior tears are treated with a combination of sutures and sealant(73.8%). Nerve root tears are treated with either sealant alone(50%). Most respondents recommended bed rest for at least 24 hours in the setting of medium(73.2%) and large(89.1%) dural tears. *Conclusions:* This study elucidates the areas of uncertainty with regard to iatrogenic dural tear management. There is disagreement regarding management of anterior and nerve root tears, pin-hole sized tears in any location of the spine, and whether patients should be admitted to hospital or on bed-rest following a pin-hole sized dural tear. There is a need for a robust comparative research study of dural repair strategies.

P.095

Soft tissue preserving direct multilevel pars repair using the 'Smiley Face' technique with 3D optical imaging based intraoperative spinal navigation

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Background: Two broad categories for the surgical management of symptomatic spondylolysis exist: decompression, or direct reduction and fixation. Direct fixation can maintain mobility and leads to improved outcomes over spinal fusion. The 'smiley face' technique is a direct fixation method of pars defect repair that uses one bent rod to reduce the number of linkage points and simplify the construct. *Methods:* Bilateral pars defects at L3 and L5 were repaired using the 'smiley face' technique. Patient reported outcomes, including the Oswestry Disability Index (ODI) and visual analog scale (VAS) scores for back and leg pain were assessed preoperatively and again at 6