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J.A.N.E Award Presentation

100. Geriatric Co-Management Reduces Peri-Operative Complications and Shortens Duration of Hospital Stay After Lumbar Spine Surgery: A Prospective Single Institutional Experience

Owoicho Adogwa, MD, MPH; Aladine A. Elsamadicy, BE; Victoria Vuong, MS; Jessica Rose Moreno, RN, BSN; Joseph S. Cheng, MD, MS; Isaac O. Karikari, MD; Carlos Antonio Bagley, MD

Introduction: Geriatric patients undergoing lumbar spine surgery they are at risk for adverse outcomes, such as delirium, and in turn, contribute to the risk of functional decline, nursing home admission, and death. Whether pre- and peri-operative geriatric co-care reduces the incidence of in-hospital complications and length of stay after elective lumbar spine surgery remains unknown.

Methods: A unique model of shared-care for elderly patients undergoing lumbar fusion surgery was implemented at a major academic medical center. The Peri-operative Optimization of Senior Health Program (POSH) was launched with the aim of improving outcomes in elderly patients (>65 years-old) undergoing lumbar spine surgery. In this model, a geriatrician evaluates elderly patients pre-operatively and follows them daily throughout the course of their hospital stay to manage medical complications and coordinate multidisciplinary rehabilitation, with neurosurgical input. We retrospectively review the first 100 cases after the initiation of the POSH-protocol and compared them with the immediately preceding 25 cases to assess the incidence of peri-operative complications and clinical outcomes.

Results: One hundred and twenty-five patients undergoing lumbar decompression and fusion were enrolled in this study. Baseline characteristics were similar between both cohorts. The length of in-hospital stay was 30% lower in the POSH cohort (6.13 vs. 8.72 days, p=0.06). The duration of time between surgery and patient mobilization was significantly shorter in POSH-cohort compared to the non-POSH cohort (1.57 days vs. 2.77 days,p=0.02); and the number of steps ambulated on day of discharge was 2-fold higher in the POSH cohort (p=0.04). Compared to the non-POSH cohort, the majority of patients in the POSH cohort were discharged home (POSH:54% vs. non-Posh:24%,p=0.01).

Conclusion: In our experience, geriatric co-management significantly reduces the incidence of post-operative complications, shortens duration of in-hospital stay, and contributes to improved peri-operative functional status in elderly patients undergoing elective spinal surgery for correction of adult degenerative scoliosis.

Mayfield Basic Science Award Presentation

101. Comparison of Pre-Operation DTI, T2SI Versus T2SI Plus DTI in a Large Series of CSM Patients for Assessment of Disease Severity and Prognostication of Recovery

Saman Shabani, BS, MD; Ha Nguyen, MD; Shekar N. Kurpad, MD, PhD

Introduction: Cervical spondylotic myelopathy (CSM) is a common cause of spinal cord dysfunction. Recently it has been shown diffusion tensor imaging (DTI) might be a better biomarker compare to T2 signal intensity (T2SI) on magnetic resonance imaging (MRI) for CSM. However, there has not been any study to our knowledge to assess combination of both T2SI and DTI in conjunction to determine disease severity and recovery.

Methods: A retrospective analysis of 44 patients with preoperative DTI was done. Presence or absence of T2SI at the level of maximum compression (LMC) was determined. Normalized T2SI (NT2SI) regardless of presence or absence of T2SI at (LMC) was determined by calculating T2SI at LMC/T2SI at level of foramen magnum. LMC NT2SI, +/- T2SI, and fractional anisotropy (FA) were obtained and correlated to preop mJOA and ?mJOA at 3, 6, 12, 24 months. Regression analysis and independent t-tests were used for analysis of the data.

Results: There was a significant correlation between preop mJOA and LMC FA (P=0.048). There was no significant correlations between preop mJOA and presence of T2SI. With regards to delta mJOA, significant relationships were discovered with LMC FA at 12 months ($p < 0.05$); on the contrary, there were no significant relationships associated with NT2SI or presence of T2SI. Combining NT2SI or presence of T2SI to LMC FA in multivariate linear regression analysis also did not improve the predictive value significantly, compared to using LMC FA alone.

Conclusion: In this larger retrospective study of CSM patients, FA at LMC shows to be a better biomarker for determining the disease severity, and both short and long term outcomes compared to T2SI at LMC. Moreover, combined FA and T2SI did not have superiority compare to FA alone in these subgroup of patients.

Mayfield Clinical Science Award Presentation

102. Intrathecal Morphine Following Lumbar Fusion: A Randomized, Placebo-Controlled Trial

Daniel Yavin, MD; Perry Pawandeep Singh Dhaliwal, MD; Tara Whittaker, BN; Geoffrey S. Hawboldt, MD; Gordon Jewett, BSc, PhD; Steven Casha, MD, PhD; Stephan Jean du Plessis

Introduction: Despite the potential for faster postoperative recovery and the ease of direct intraoperative injection into the exposed dura, intrathecal morphine is rarely provided in lumbar spine surgery.

Methods: In this double-blind trial, we randomly assigned 150 patients undergoing instrumented lumbar fusion for degenerative indications to receive a single intrathecal injection of morphine (0.2 mg) or placebo (normal saline) immediately prior to wound closure. An oblique injection technique was used to reduce the risk of precipitating a cerebrospinal fluid leak. The primary outcome was pain measured on the visual-analogue scale during the first 24 hours after surgery. Secondary outcomes included respiratory depression and treatment-related side effects. An intention-to-treat, repeated-measures analysis was used to estimate outcomes.

Results: The baseline characteristics of the groups were similar. Intrathecal morphine reduced pain both at rest (32% area under the curves [AUCs] difference, P<0.002) and with movement (22% AUCs difference, P<0.02) during the initial 24 hours after surgery. The risk of respiratory depression was not increased by intrathecal morphine

(hazard ratio, 0.86; 95% confidence interval, 0.44 to 1.68; P=0.66). Postoperative opioid requirements were reduced with intrathecal morphine (P<0.03). Other than a trend towards increased intermittent catheterization in patients assigned to intrathecal morphine (P=0.09), treatment-related side effects did not significantly differ between the groups. The early benefits of intrathecal morphine on postoperative pain were no longer apparent after 48 hours.

Conclusion: A single intrathecal injection of 0.2 mg of morphine safely reduces postoperative pain following lumbar fusion. (Funded by the Alberta Spine Foundation; ClinicalTrials.gov number, NCT01053039.)

Kline Peripheral Nerve Award Presentation

103. Prediction Algorithm for Surgical Intervention in Neonatal Brachial Plexus Palsy

Thomas J. Wilson, MD; Kate Chang; Lynda Jun-San Yang, MD, PhD

Introduction: Neonatal brachial plexus palsy (NBPP) results in reduced function of the affected arm with profound ramifications on quality of life. Advances in surgical technique have shown improvements in outcomes for appropriately selected patients. Patient selection, however, remains difficult. Our objective was to develop a decision algorithm that could be applied at the individual patient level, early in life, to reliably predict persistent NBPP that would benefit from surgery.

Methods: Retrospective review of NBPP patients was undertaken. Maternal and neonatal factors were entered into the C5.0 statistical package in R. A 60/40 model was employed, whereby 60% of randomized data were used to train the decision tree, while the remaining 40% were used to test the decision tree. The outcome of interest for the decision tree was a severe lesion meeting requirements for surgical candidacy.

Results: A decision tree prediction algorithm was generated from the entered variables (Figure 1). Variables utilized in the final decision tree included presence of Horner's syndrome, presence of a pseudomeningocele, Narakas grade, clavicle fracture at birth, birth weight >9 lbs., and induction or augmentation of labor. Sensitivity of the decision tree was 0.71, specificity 0.96, positive predictive value 0.94, negative predictive value 0.79, and F1 score 0.81.

Conclusion: We developed a decision tree prediction algorithm that can be applied shortly after birth to determine surgical candidacy of patients with NBPP, the first of its kind utilizing only maternal and neonatal factors. This conservative decision tree can be used to offer early surgical intervention for appropriate candidates.

Charles Kuntz Scholar Award Presentations (Abstracts 104–123)

104. Minimally Effective Dose of Bone Morphogenetic Protein (BMP) in Minimally Invasive (MIS) Lumbar Interbody Fusions 757 Patients in a Dose-finding Statistical Modeling Cohort Study

Evan Joseph Lytle, DO; Doris Tong, MD; Lisa Govila; Roger F. Gonda, MD; John Nofar, BA; Clifford Michael Houseman, DO; Teck-Mun Soo, MD

Introduction: With increasing doses of BMP, the risk of adverse events increases. We seek to demonstrate the minimal effective BMP dose to achieve a fusion in MIS.

Methods: From 2009-2014, we reviewed the charts of consecutive patients who underwent MIS lumbar Interbody fusion in a longitudinal cohort study. We excluded patients without radiographic (XR) follow up =3m postop. Dose of BMP/interspace was determined. Fusion was determined by XR evaluated by neuroradiologists. A pilot study was performed to determine the baseline fusion rate in our local population for a sample size with a=0.05 and power=0.8. We used multiple logistic regression with fusion =3m and =6m as the dependent variable and BMP dose per interspace, single vs. multi-level, specific level, postop XR interval, smoking, gender, age as covariates. We satisfied the assumption tests and Wald test was used. The Exp(ß) coefficient was used to show change in the odds of fusion for one-unit change in an independent variable when all other independent variables are kept constant. Minimally effective dose of BMP/level was determined by 95% CI between different dose ranges. We considered a p-value of 0.0125 to compensate for multiple comparisons.

Results: There were 858 interspaces among 757 unique patient encounters (Table 1). Average dose was 1.08mg/level (Table 2). Gender, dose/level, and single vs. multi-level fusion were significant predictors for fusion =3m postop (Table 3). Dose/level and Single vs. multi-level fusion were significant predictors for fusion =6m postop (Table 4). Overall fusion rate =3m postop was 93.8% (95% CI 0.92-0.95) (Table 5) vs. 93.5% (95% CI 0.92-0.95) (Table 6) at =6m postop.

Conclusion: BMP dose/level and single vs. multi-level fusion were significant predictors for fusion =6m postoperatively. We found that the effective fusion rate of 91% (95%CI: 0.87-0.95) was achieved at dose less than 1.05mg (size of XXS) per level.

105. Vitamin D in Multi-level Anterior Cervical Fusion: Interim Results from a Multi-Center Comparative Effectiveness Study

Doniel Drazin, MD, MA; Christine Piper; Zachary Rollins Barnard, MD; Lorenzo Rinaldo, MD, PhD; Alexandre Rasouli, MD; Mohamad Bydon, MD; William E. Krauss, MD; Michelle J. Clarke, MD; Joseph R. O'Brien, MD, MPH; Warren Yu; Edward K. Nomoto, MD; Daniel Norvell; Ray M. Chu, MD; Robert S. Pashman, MD; Eli M. Baron, MD; Terrence T. Kim, MD; J. Patrick Johnson, MD, MS

Introduction: Vitamin D deficiency is common in patients presenting for spinal surgery. It has been unclear whether this abnormality affects spinal fusion outcomes.

Methods: In a multi-center prospective comparative effectiveness study, we assessed vitamin D levels in patients undergoing multi-level anterior cervical discectomy and fusion. Exclusion criteria included previous cervical spine surgery, posterior approach and bone morphogenic protein product use. The primary outcome measure was vitamin D level. Participants were classified into two groups based on CDC criteria: normal (>30ng/mL) or subnormal (<29.9ng/mL) level, determined by vitamin D (serum 25-OHD) test. Post-operative fusion was assessed by upright lateral cervical spine flexion-extension radiographs. Patients were followed for 1 year.

Results: Of 97 enrolled patients, 42 have had complete follow-up. There were no significant differences in baseline or operative characteristics between the groups. A greater proportion of patients with vitamin D deficiency underwent revision (86%) compared to those with normal levels (17%). This was statistically significant (p=.007). Mean vitamin D level of revision patients was 25.3 ± 9.0 compared to 35.7 ± 15.5 for non-revision patients. This was statistically significant (p=.04). There was no statistically significant association between age, BMI, gender, length of stay, or surgical level and the risk for revision. In patients with spondylolysis as their primary diagnosis, the revision risk was 50% (n=6) compared to 13% (n=4) for non-spondylolysis patients. All 12 revisions occurred in non-smokers. In a multivariable logistic regression model, patients with normal vitamin D levels were at lower odds of undergoing revision. This was statistically significant (odd ratio = .04, 95% confidence interval: .004-.39; p=.006).