Oral Presentations

100. In Situ Placement of High-Dose rhBMP-2 within Spine Tumors Slows Tumor Growth and Decreases Onset to Paralysis in a Rat Model of Metastatic Breast Cancer

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Introduction: Recombinant human bone morphogenic proteins (rhBMPs) are FDA-approved for specific spinal fusion procedures, but use is contraindicated in spine tumor resection beds due to unclear interaction between tumor tissue and such growth factors. Interestingly, a number of studies suggest that BMPs may slow growth of adenocarcinomas in vitro, and adenocarcinomas represent the majority of histopathologies found in bony spine tumors. In this study, we hypothesized that high concentration rhBMP-2 placed in an intraosseous spine tumor rat model could show tumor suppression and prolong onset to paralysis in such animals.

Methods: 21 female nude athymic rats were randomized into three groups. Group 1 (n=7) underwent transperitoneal exposure and implantation of breast adenocarcinoma (CRL-1666) into the L6 lumbar spine segment, followed by implantation of 15 micrograms of rhBMP-2. Group 2 (n=7) underwent exposure and tumor implantation on the lumbar spine, but no local treatment with rhBMP-2. Group 3 (n=7) solely underwent exposure of the lumbar spine. The Basso-Beattie-Bresnahan (BBB) scale was used to monitor daily motor function regression and time to paresis (BBB score<7).

Results: No animals in Group 1 were paretic by day 15 (median BBB score of 20, p<0.0027). All animals in Group 2 were paretic by day 15 (median BBB score of 0, p=0.0024) with a mean time to paresis (±SD) of 13.5±1.4 days. Time to paresis was significantly different between Group 1 and Group 2 (p<0.001). Group 3 (control) exhibited no neurological motor deficit. Gross and microscopic tumor volume was also significantly (p=0.048) different between Groups 1 and 2.

Conclusion: This study shows that high-dose administration of local rhBMP-2 in a rat spine tumor model of breast cancer not only fails to stimulate local tumor growth, but also decreases local tumor growth and onset of paresis in animals. This is the first preclinical experiment showing that local placement of rhBMP-2 in a spine tumor bed may slow tumor progression and delay associated neurological decline.

101. The Effect of Surgery on Health Related Quality of Life and Functional Outcome in Patients with Metastatic Epidural Spinal Cord Compression: Initial Results of the AOSpine North America Prospective Multicenter Study

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Introduction: Metastatic epidural spinal cord compression (MESC) is common and recent studies have provided evidence that in selected patients combined surgery and radiotherapy provides the optimal neurosurgical recovery. However, patients with MESC have relatively short life-expectancy and face numerous challenges. Hence, the impact of surgery on improving quality of life outcomes in the setting of MESC is less clear.

Methods: 72 surgical patients were enrolled in a prospective multi-center, cohort study involving 8 sites in North America. Outcomes were assessed using the pain assessments, ASIA scale, SF-36v2, and EQ-5D.

Results: Average age was 58 years (SD 11), 65% were males. Common primary sites were lungs (32%), prostate (15%), breast (11%), and kidney (11%). The baseline EQ5D was .38; SF36PCS 32; SF36MCS 39, VAS Pain 6.1; ASIA Impairment grade at baseline was 35% (E), 45% (D), 14% (C), 3% (B) and 3% (A). Median survival was 157 days; 93% survived one month; 62% survived 3 months, 41% survived 9 months, 32% survived 12 months. Among the surviving patients, the average improvement at 3 month was for .23 for EQ5D (P< .001), 26 for ODI (P < .001) , 2.6 for VAS Pain (P < .05). Also, there was a significant improvement in ASIA Impairment grade (P < .05). There was no significant change in SF36 PCS and MCS. The gains in EQ5D, ODI and VAS Pain were maintained in patients who survived 6 months.

Conclusion: Surgically treated patients with MESC have poor survival. Among the surviving patients, the surgical treatment is associated with improvement in symptoms and functional outcomes. However, this does not translate into significant gains in overall health related quality of life. Individuals with less than three month life expectancy may be less than ideal candidates for surgical intervention. Further follow-up and a larger sample size in this ongoing study will help to identify subgroups of patients who may benefit from the surgical intervention.
102. Survival of Patients with Malignant Primary Osseous Spinal Neoplasms from the Surveillance, Epidemiology, and End Results (SEER) Database from 1973-2005

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Introduction: Malignant primary osseous spinal neoplasms are aggressive tumors which remain associated with poor outcomes. To date, prognosis is based upon small single center series. In order to assess national trends in histology-specific survival, we reviewed survival data spanning 30 years from the surveillance, epidemiology, and end results (SEER) registry.

Methods: The SEER registry (1973-2003) was queried to identify primary spinal chordoma, chondrosarcoma, osteosarcoma, or Ewing’s sarcoma via ICD-O-2 coding. Survival was assessed via Cox proportional-hazards regression analysis.

Results: 1,892 patients were identified with primary osseous spinal neoplasms (414 chordoma, 579 chondrosarcoma, 430 osteosarcoma, 469 Ewing’s sarcoma). Chordomas presented in older (59±17, p<0.01) and Ewing’s Sarcoma in younger (19±11, p<0.01) patients versus other tumors. The incidence of each tumor type remained similar per decade. African Americans comprised a significantly greater proportion of osteosarcoma than other tumors (9.6 vs. 3.5%, p<0.01). Mobile spine versus sacrum was more often location for chordomas than other tumors (47% vs. 23%, p<0.05). Osteosarcoma and Ewing’s Sarcoma were 3-fold more likely to present with metastasis (31% vs. 8%), Surgical resection was performed more frequently for chordoma (88%) and chondrosarcoma (88%) than osteosarcoma (61%) and Ewing’s (53%). Median survival was histology specific (Osteosarcoma: 11mo, Ewing’s: 26mo, chondrosarcoma: 37mo; chordoma: 50mo) Survival was worse in patients with metastasis at presentation, Figure1, but unaffected by site (mobile spine versus sacrum/pelvis)Figure2. More recent year of diagnosis was associated with greater utilization of surgery (OR1.23, p<0.001) and improved survival for isolated spinal Ewing’s sarcoma (HR, 0.95, p=0.001), chondrosarcoma (HR, 0.98, p=0.009), and chordoma (HR, 0.98, p=0.10) but was not associated with increased utilization of surgery (OR 1.01, p=0.43) or survival for osteosarcoma, Figure3.

Conclusion: In our analysis of a 30-year U.S. population based cancer registry (SEER), we provide nationally representative prognostic and survival data for malignant primary spinal osseous neoplasm. Use of surgery and overall survival has improved for isolated spine tumors with advancements in care over the past four decades. These results may be helpful in providing historical controls for understanding the efficacy of new treatment paradigms patient education and guiding level of aggressiveness in treatment strategies.

103. Electrical Stimulation Enhances Axon and Nerve Regeneration

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Introduction: Axon regeneration after peripheral nerve injury is delayed and incomplete. Brief low frequency electrical stimulation (ES) applied immediately after injury is known to improve axonal regeneration. With these findings, we aimed to explore several new features of this interesting property.

Methods: We examined early axon and Schwann cell (SC) outgrowth beyond transection sciatic nerve injuries in mice comparing sham ES to brief ES (3V, 20Hz, and pulse width 0.1 ms for 1 hr) delivered only at the time of injury. In a second approach to examine early axon outgrowth, an identical protocol was examined using harvested adult rat sensory neurons in vitro stimulated over a novel microelectrode array construct.

Results: We identified accelerated outgrowth beyond the repair site of both axons and SCs following ES. These early benefits translated into an ongoing impact of ES on regeneration. There was enhanced myelinated axon repopulation by 21 days across transection sites, with higher numbers of retrogradely labelled motor neurons regenerating their axons. In thy-1 GFP mice with fluorescent peripheral axons, we confirmed the early impact on outgrowth and identified earlier arrival of GFP cutaneous axons in peripheral senory targets. This was strongly correlated with more rapid recovery of mechanical and thermal sensation in the foot and of compound muscle action potentials beyond the injury site. The in vitro paradigm identified robust immediate rises in neurite initiation of the stimulated neurons and improved outgrowth as compared to control conditions.

Conclusion: These data support the robust role of brief ES following peripheral nerve trunk injuries in promoting axon initiation and outgrowth after transection, in axon maturation and in repopulation of targets. This is a wider repertoire of impact than previously known and its replication in vitro supports the hypothesis that a neuron specific reprogrammed injury response is recruited by the ES protocol.

104. Efficacy and Active Ingredients in an Epidural Analogic Paste after Lumbar Decompression: A Prospective Randomized Double-Blind Controlled Trial

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Introduction: The purpose of this study was to evaluate the efficacy and active components of a previously described epidural analogic paste in controlling post-operative pain and facilitating early discharge from hospital after lumbar decompressive surgery.

Methods: A prospective randomized double-blind controlled trial was conducted. Two-hundred and one patients were randomized to one of four epidural analgesic pastes at the time of lumbar spinal surgery: combo paste (morphine + methylprednisolone), steroid paste (methylprednisolone alone), morphine paste (morphine alone), and placebo. The primary outcome measures used were narcotic and non-narcotic use and McGill Pain Questionnaire (MPQ). Secondary outcome measures were: modified ASIA score, SF-36, time to ambulation and discharge from hospital.

Results: Administration of combo paste and steroid paste, but not morphine paste resulted in a statistically significant reduction in mean PPI and PPI components of the MPQ in the first 3 days after surgery. Narcotic analogic consumption was reduced on post-operative day 1 in the combo paste and steroid paste groups. No difference in time to ambulation or discharge, general health perception, ABPI scores, or neurological recovery was observed.

Conclusion: We have demonstrated the efficacy of epidural analgesic paste containing methylprednisolone acetate to produce a robust post-operative analgesic effect. This paste should be considered for use in patients undergoing routine lumbar decompressive surgery.

105. Radiographic Same-Level Recurrent Disc Herniation After Lumbar Discectomy: Prospective Longitudinal Study With Two-Year Follow-Up

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Introduction: To date, the incidence of radiographic same-level