Abstracts

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The Use of "Scrambler Therapy" for Failed Back Surgery Syndrome

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Background: Failed back surgery syndrome (FBSS) is a condition of patients who have not had a successful outcome with back surgery and continue to experience back or leg pain following spine surgery. The treatment of FBSS includes, repeat surgery, nerve blocks, including epidural steroid injections, and other spine injections with or without various medications such as opioids and neuropathic pain medications in addition to physical therapy. Unfortunately, the pain relief is often inadequate regardless of the conventional therapies used.

Objective: the objective of this study was to investigate the effect of a new device called, "Scrambler Therapy" which is FDA cleared pain therapy medical device for alleviating pain.

Methods: This protocol was approved by our institutional review board. Ten patients with FBSS were enrolled into this pilot study. After obtaining consent, baseline VAS of pain intensity was documented and the subjects were treated with ten sessions of scrambler therapy. Each session lasted for 60 minutes. Pain intensity was evaluated and for 12 weeks

Results: The result of our study is summarized in the figure. There was about 28% pain reduction after 9 days of treatment which could be clinically significant for some patients.

Conclusions: This is the first pilot study that demonstrates Scrambler Therapy appears to reduce pain in FBSS patients with no side effect. However, further studies with more subjects need to be done in order to investigate if this technology is indeed a novel treatment for this unfortunate group of patients.

Disclosure: The study was supported by the Dept. of Anesthesia, Univ. of Miami LM Miller School of Medicine. The equipment/machine was donnated by Competitive Technologies, Inc.

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Spinal Cord Stimulation in the Setting of Brachial Plexopathy: A Case Report

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Background: Spinal Cord Stimulators (SCS) have been applied to a variety of pain disorders including cancer pain, spinal cord injury, phantom limb pain, Comples Regional Pain Syndrome, Multiple Sclerosis and failed-back syndrome. Anatomical placement of SCS leads depends on the location of the painful region with the goal of inhibiting pain pathways in the dorsal horn nucleus. In literature reviews, successful treatment of patients in whom SCS systems were implanted for chronic pain was defined as either greater than 50% pain relief or significant reductions in VAS score. As this treatment strategy is utilized and tested over a span of chronic pain conditions, new applications are arising. Treatment of Brachial Plexopathy in the setting of root avulsions has been marginally represented in the SCS literature, however plexopathy in the setting of chemoradiation or metastatic disease has not. The incidence o! f plexopathy in the setting of both chemoradiation and metastasis of breast cancer in particular has a mean interval of six years, with the initial symptom being sensory complaints. Studies have reported the incidence of plexopathy following radiation to be remarkably high. Radiation-induced plexopathy seems to be in part the result of fibrous tissue severely constricting the nerve bundles, but can also be due to thickening of the endoneurium, extensive loss of myelin, disappearance of axis cylinders, and hyalinization or obliteration of blood vessels. There is a significant correlation between the incidence of chronic pain in the arm ipsilateral to tumor location and radiotherapy to the region of the brachial plexus. This is especially true in breast-conservation techniques that tend to be linked to a higher use of radiotherapy than total mastectomies. More patients report lymphedema, chronic pain and weakness (usually localized to the upper trunk) in the ipsilateral ! arm if they received any radiotherapy to the region of the bra! chial plexus. Pain, sensory disturbances, edema, and muscle weakness, usually prevails however the reported incidence of these vary. Our case report demonstrates the use of SCS in the setting of chronic pain secondary to brachial plexopathy with positive results.

Objective: To report a case of positive pain relief in the setting of radiation or metastatic induced brachial plexopathy using a Spinal Cord Stimulator.

Methods: N/A

Results: This is the case of a 66 year old female who presented with chronic right upper extremity pain associated with brachial plexopathy secondary to breast cancer infiltration and radiation therapy. Patient was diagnosed with breast cancer in 1994. She had underwent lumpectomy and had chemoradiation however tumor recurrence occurred in 2000 which required another course of chemotherapy. Approximately 11 years after being diagnosed, patient reported gradual symptoms of neck pain, numbness and tingling across multiple dermatomes in her ipsilateral arm. She began complaining of increasing parasthesias including intermittent burning and electric sensations in her distal hand and forearm that intensified at night. She also noted mild lymphedema of her upper extremity along with weakness and deficits in active range of motion at the level of the shoulder. MRI of the brachial plexus revealed mild thickenin! g and definition of the proximal aspect of the brachial plexus consistent with plexopathy. Patient had been on numerous pain medications with only minimal relief. The decision was made to try treating the symptoms with Spinal cord stimulator implantation. Patient had a spinal cord stimulator (SCS) implantated with leads reaching the level of the C4 vertebrae. After post-op programming of the SCS, patient experienced a resolution of her neck pain as well as a decrease in her lymphedema. She also noted a 50% decrease in her VAS and less weakness. Many of her pain medications were removed from her regimen however she still requires some pharmacologic treatment for her pain. Over all her pain level and level of function had improved.

Conclusions: This case illustrates that the patient with chronic pain and edema secondary to brachial plexopathy can achieve pain and symptom relief with the use of a spinal cord stimulator. Though pain relief wasn't complete, perhaps a manageable combination of SCS and pharmacotherapy is the optimal treatment for these chronic pain syndromes.

Disclosure: N/A

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Spinal Cord Stimulation Therapy for Failed Back Surgery Syndrome; Retrospective Study of Pre and Post SCS Implant Patients

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Background: Failed back surgery syndrome (FBSS) is used to describe persistent recurring low back pain with or without radicular symptoms, in patients who have undergone one or more surgeries on a lumbar disk. For many, FBSS treatment options are limited. Although spinal cord stimulation (SCS) has been shown to be an effective treatment in the relief of intractable neuropathic pain, more research is needed to assess SCS effectiveness in increasing a patient's functional status. Thorough social, psychological, and physical screenings are required before SCS therapy. This pilot study is an initial step towards a comprehensive analysis, using our institution's extensive electronic health record (EHR), to analyze different variables contributing to the effectiveness of SCS.

Objective: Our goal is to examine patient outcomes following SCS therapy for a preliminary study. This pilot study will be followed by larger more extensive studies using our institution's available EHR data. Present study aims include:

- Examine SCS patient characteristics and demographics, such as age, gender, marital status and employment status.
- Examine SCS therapy outcomes using standardized questionnaires for disability ratings (Oswestry Disability Index), pain levels (Visual Analog Scale Back and Leg), depression status (Prime-Med PHQ-2), and quality of life measures, pre-implant and 5-13 months post SCS implantation.
- Explore the relationships between patient demographics and measures found through questionnaires; Oswestry Disability Index (ODI), Visual Analog Scale Back and Leg (VAS), Prime-Med PHQ-2, and quality of life (QOL) both pre and post implantation of SCS.

Methods: This study utilized a retrospective review of EHR data to identify and compare the above-mentioned factors. Pre and post-implantation standardized questionnaires assessed disability ratings, pain levels, depression status and quality of life. Inclusion criteria included all FBSS patients who had completed a pre-SCS trial questionnaire between June 1, 2008 and November 10, 2010 and who received SCS therapy. Excluded patients included those who did not complete either pre nor post-implantation questionnaires and patients treated with SCS for a diagnosis other than FBSS. Those younger than 18 years old and older than 89 years old, at the trial period, were also excluded from this research study. Categorical variables were tested using Chi-Square test and Mantel-Haenszel test (for ordinal categorical variables) and continuous variables were tested using Wilcoxon's rank sum test between the two groups. Continuous variables were summarized using median with inter-quartile range (25th-75th percentile).

Results: Sixty eight patients answered all the pre-implantation questionnaires and 20 patients answered all the pre and post implantation questionnaires, resulting in paired test analysis. Our study sample size consisted of 68 patients with 39 males and 29 females. The average age was 54 years. Out of the sample population 44% indicated to be on disability, 39% indicated unemployment, and 16% indicated employment at the time of SCS trial. For patient who answered both the pre and post questionnaires significant findings were discovered. Post-implantation scores of ODI ($p=0.0001$), VAS-Back ($p\leq0.001$) and VAS-Leg ($p=0.0098$) were significantly lower than pre-implantation resulting in lower disability ratings and less pain in the back and/or legs after the SCS implant.

Generalized Linear Models were utilized to explore relationships of patient demographics with SCS outcome measures. ODI scores at post-implantation were 5.4 points lower than pre-implantation, even after adjusting for patient demographics ($p<0.01$).

Older age, males, and non-married patients had higher VAS-Back scores ($p<0.01$). Similar observations were made for VAS-Leg scores. Patients with disability, compared to those without disability, rated higher VAS-Leg pain after SCS implantation ($p<0.01$).

Conclusions: Although the sample size was small, the objectives of this retrospective research study were achieved. Pre-

liminary data suggest that males, older age groups, and non-married cohorts achieve less pain relief from SCS therapy for FBSS. Post implant scores of ODI and VAS Back and Leg were significantly lower than pre-implantation scores. Our results are consistent with previously published data. In future research stages additional predictive factors may be identified, associated with successful SCS therapy outcomes for treatment of FBSS.

Disclosure: The investigators and staff who participated in this research study do not have anything to disclose in relation to participation and/or publication of this study.

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Feasibility of Peripheral Nerve Stimulation in the Retrocrural Space: A Cadaveric Study

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Background: Current interventional approaches for the treatment of chronic abdominal pain have clinical limitations. Direct electrical stimulation of the celiac plexus has previously been attempted by Srikantha et al. for the treatment of chronic abdominal pain. However, the stimulation was achieved using Seldinger wires, leaving the question of whether an implantable stimulator could successfully be used in the treatment of chronic abdominal pain.

Objective: In this study we attempted to first determine whether it was technically feasible to place spinal cord stimulator leads into the retrocrural space as an initial step in the development of a new treatment modality for chronic abdominal pain.

Methods: The placement of the leads was attempted on a unembalmed cadaver placed in the prone position. Under fluoroscopic guidance, the L2 and L3 vertebral bodies were identified and entry point was 7 cm lateral to the spinous processes on each side of L2-3 were marked. L2-3 level entry point was chosen to give the needle a steep angle so the lead can be threaded easier. 14g Tuohy needles were advanced towards antero-lateral border of the L1 vertebral body. Subsequently, Boston Scientific leads were successfully placed into the retrocrural space at the level of T11-12 adjacent to the anatomical position of the splachnic nerves.

Results: We were able to advance the spinal cord stimulator leads satisfactorily into the retrocrural space. It would seem that it is technically feasible to place SCS leads into the proximity of the splanchnic nerves or the celiac plexus. Final positioning of the leads was confirmed with AP and lateral fluoroscopic views.

Conclusions: This study demonstrates that it is technically possible to place electrical stimulation leads into the retrocrural space. Given that neuromodulation and peripheral nerve stimulation has been successfully been used to treat other forms of chronic pain, the technical data obtained from our study may represent an initial step toward the development of a novel treatment method for chronic non malignant abdominal pain.

Disclosure: Authors of this study do not have financial or personal relationships with commercial entities that may have a direct or indirect interest in this presentation. The stimulator leads were provided by Boston Scientific free of charge.

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Improvement in PTSD Symptoms within 30 Minutes of Stellate Ganglion Block (SGB)

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Background: Stellate ganglion block (SGB) reduces sympathetic nervous system activity in the head, neck, upper extremity and thorax. It is a common treatment for complex regional pain syndrome (CRPS) and has recently been used to treat post-traumatic stress disorder (PTSD) (Lipov 2008, Mulvaney 2010). The aim of this study was to evaluate the effect of SGB on PTSD symptoms 30 minutes after the procedure given that relief from CRPS pain is usually evident within the first 10 minutes of the SGB procedure (Kapral 1995). Similarity of response is predicted based on the common stress-based etiology of both syndromes (Lipov 2009, Grande 2004), and the postulated central origin of CRPS (Bogduk 2001). As further evidence of a common neurological pathway for PTSD and CRPS, recent work has shown that both chronic pain and psychiatric conditions are responsive to a common pain medication, acetamin! ophen (Dewall 2010). Finally, functional MRI has identified a common cortical structure responsible for the discomfort of CRPS (Lipov 2009), PTSD (Lipov 2009), and social rejection (Dewall 2010).

Methods: Patients with evidence of moderate to severe PTSD, as measured by the PTSD Check List (PCL), were eligible for the procedure. This validated, 17-item scaled test has a maximal score of 85 and is commonly used to screen for PTSD, establish a diagnosis, and evaluate the efficacy of treatment. Patients with a score of 50 or more, the usual cut-off for diagnosis of PTSD, were eligible for inclusion in this study. Because conventional treatments for PTSD (polypharmacy and cognitive behavior therapy) do not deliver immediate results, no post-SGB evaluation tool was available. Thus, the existing PCL was adapted to the immediate post-treatment period by eliminating two questions pertaining to the effects of SGB on sleep. The 7 selected patients underwent SGB using the fluoroscopic-guided technique (7 mL bupivacaine 0.5%) to the anterior lateral body of the right C6. No sedation was used during the procedur! e. Thirty minutes after the procedure, the PCL was re-administered to assess PTSD severity.

Results: Of the seven patients treated, six demonstrated a $\geq$ 50% reduction in severity compared to their baseline PCL score (Student's paired t-test $p<0.01$). The seventh patient demonstrated a reduction of 29%. For all of the patients, the post-procedure modified PCL score fell below the cutoff for a diagnosis of PTSD, even when the additional two sleep-related responses are included in the summary score. These results are similar to those noted during a pilot study at Walter Reed Army Medical Center (private communication).

Conclusions: Fluoroscopic-guided SGB appears to provide significant relief of PTSD symptoms within 30 minutes, a response period similar to that of CRPS treatment. If these findings are validated in larger controlled trials, it would further confirm the common mechanism proposed to explain the effect of SGB on both PTSD and CRPS.

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Reduction in Narcotic Pain Medications Correlated to Pain Relief and Patient Satisfaction Post-Vertebroplasty: Results from a Prospective, Randomized, Controlled IDE Study

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Background: A prospective, randomized, controlled 256 patient U.S. multi-center study demonstrated pain relief and functional improvement post-vertebroplasty in both treatment and control groups. The treatment group was randomized to receive a bioactive bone augmentation composite material (Cortoss™, Orthovita, Inc., Malvern, PA) and their results were compared to a control group treated with PMMA (Spineplex™ Radiopaque Bone Cement, Stryker, Kalamazoo, MI).

Objective: Presented here is an analysis of the proportion of patients on narcotic pain medications to manage their pain before and after vertebroplasty correlated to their level of pain relief and satisfaction with vertebroplasty 24 months after undergoing the procedure.

Methods: 256 pts were enrolled, 162 Cortoss and 94 PMMA. All had painful VCFs for at least four weeks but no longer than 1 year. To be included in the study, their self-assessed baseline Visual Analog pain Scale (VAS) had to be 50mm or greater on a 100mm scale. Pain success was defined as a >20 point decrease on VAS from baseline and a score ≤50mm. Patients were followed for a minimum of 24 months post-vertebroplasty. Pain medication information was collected at baseline and followed over time. Opioid medications were classified as mild or major, as specified below: Mild Opioids Major Opioids, Codeine Morphine, Hydrocodone Methadone, Oxycodone Fentanyl, Darvocet Meperidone, Percocet Hydromorphone, Ultram, Ultracet, Vicodin

Patient satisfaction data was collected at each follow-up visit, beginning at 1-week post-vertebroplasty. Patients were asked to rate their level of satisfaction as "Very Satisfied", "Somewhat Satisfied", "Not Satisfied" or "Too Early to Tell" and if they would undergo another vertebroplasty.

Results: At baseline, 86% of participants were taking narcotic medications for vertebral compression fracture pain before undergoing vertebroplasty. The mean study entry VAS score was 79.6/100 in the treatment group and 78.0/100 in the PMMA control group. Pain improvement was demonstrated in both groups and was durable over time. A statistically significant difference in VAS pain scores was seen in the Cortoss group at the 3 month post-vertebroplasty timepoint. Likewise, narcotic medication usage in both groups decreased overtime. From baseline to 24 months, the percentage of patients using mild opioids decreased from 77.8% pre-vertebroplasty to 19.5% at the end of the study. At the 24-month timepoint, only 4 patients (3.3%) were using major opioids. When surveyed for their level of satisfaction with vertebroplasty, 95% of the treatment group and 94.2% of the control group were satisfied with their re! sults. 86% of patients responded that they would undergo vertebroplasty again.

Conclusions: Narcotic use in the study population dropped dramatically after vertebroplasty. Both the treatment and control group participants experienced considerable pain relief post vertebroplasty, with the steepest drop in pain occurring immediately post-treatment. Pain relief in both groups continued to the end of the study. At the 24 month timepoint the most commonly used analgesic was acetaminophen. The almost immediate and durable pain relief provided to the participants in this study resulted in a significant decrease in the use of narcotic medications and a high level of patient satisfaction.

Disclosure: This study was supported by Orthovita, Inc., Malvern, PA

References: N/A

High Frequency Neurostimulation to Treat Neuroma Pain

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Background: Chronic pain in a residual limb due to excessive neural activity in severed nerves after amputation is often intractable. Recent research showed that nerve conduction can be reversibly blocked by high-frequency alternating current in animal models. This report covers a case from the first-in-man study on electrical nerve block for management of amputation pain.

Objective: To utilize high frequency alternating current via an implanted peripheral nerve cuff place directly on a nerve proximal to a neuroma to see if it is possible to create a reliable and reproducible nerve block.

Methods: The test subject wasis a male in his 70s with chronic intractable right amputation stump pain. He had a right below-knee amputation after a accident with an industrial lawn mower. Screening test showed significant pain relief on administering local anesthetic block of the tibial and common peroneal nerve using ultrasound guidance. During a 30-min surgery, two cuff electrodes of 8- and 5-mm diameter were wrapped around the tibial and common peroneal nerve respectively via an incision in the middle of the popliteal fossa. The leads exited at the side of the thigh to connect to an external waveform generator.

Results: During weekly in-clinic testing, both spontaneous and induced (by manually pressing the neuroma) pain was reduced significantly within minutes of application of the 10-kHz blocking current to the tibial nerve, eventually returning to baseline intensity or below in approximately 10 minutes. Electrical block of the common peroneal nerve did not reduce the pain. During the 4th week of the study, a portable custom waveform external pulse generator was used in home to deliver 10-min block at the push of a button by the subject. A total of thirteen 10-min therapy sessions were used in 6 days with significant pain reduction in every session. The subject reported significant improvement in his daily activity and sleep. Pain scores drop from a VAS of an average of 7 to 0 - 1 with the electric nerve block. The implanted electrodes were removed in 30 days per protocol without any signs of nerve damage.

Conclusions: This is a first in human feasibility trial of high frequency neuromodulation to create a depolarizing electric nerve block via a peripheral nerve cuff. The data from this initial feasibility trial showed the potential clinical benefit of high frequency electric nerve block to treat post amputation neuroma pain.

Disclosure: This study was funded by Neuros Medical

References: None- This is an observational first in human feasbility trial of a new neuromodulation technique. Since it has not been done before in humans there are no references from prior studies.

Percutaneous Lumbar Decompression Delivers Safety and Long Term Effect

Timothy Deer, MD

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Background: Lumbar spinal stenosis (LSS) with symptomatic neurogenic claudication exists in well over one million people at any given time. A result of hypertrophic ligamentum flavum, facet hypertrophy, disc protrusion and other comorbidities, it is found predominately in patients aged sixty years and older. As such, the need to correct this growing problem with a minimally invasive, low risk, light sedation procedure is apparent. The mild procedure provides such a choice. Using a dorsal approach, percutaneous access is used to achieve a small laminotomy followed by hypertrophic ligamentum flavum resection. The procedure is performed with epidurogram and fluoroscopic image guidance.

Objective: To assess long term outcomes following percutaneous decompression using mild.

Methods: Seventy-eight patients were treated for LSS in this IRB-approved, prospective, 14-center study. Validated outcomes instruments including Visual Analog Score (VAS), Oswestry Disability Index (ODI), Zurich Claudication Questionnaire (ZCQ), and SF-12v2® Health Survey were used. Safety was closely monitored. Outcomes were assessed at baseline, weeks one, six, twelve and twenty-six. Post-study follow-up was obtained for all patients who were available at Year One.

Results: Through one year, no serious mild safety issues were reported in this study. At Year One, patients achieved significant pain reduction as measured by VAS, ZCQ and SF-12v2. Physical function and mobility improvement as measured by ODI, ZCQ and SF-12v2 was significant.

Conclusions: Based on long term results, mild is a safe procedure, improving mobility, providing pain reduction and achieving high levels of satisfaction in the LSS patient.

Disclosure: consultant for Vertos Medical

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Use of transcutaneous electrical nerve stimulation (TENS) for pain control in oncologic patients with sacral tumors

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Background: Soft tissue sarcomas present a unique challenge in the treatment of cancer pain. While surgical resection of the sarcoma can often provide improved pain relief, in certain sarcomas, 54% of patients continue to experience pain unrelieved with analgesics. Recent studies on metastatic bone cancer pain have shown decreased pain in patients with the use of TENS.

Objective: We present a case series of TENS used in the treatment of sarcoma related cancer pain, specifically detailing the different methods by which to apply TENS and the different methods by which TENS may work.

Methods: Eight patients suffering from sarcoma related cancer pain received TENS as a possible adjunct in the treatment of their pain. In each case, patients had no history of seizures and had no implanted stimulating device (such as a cardiac pacemaker). A four lead trial was performed for thirty minutes. 2.0 x 3.5 inch electrode pads were typically applied over the region of discomfort. Electrode pad placement was also adjusted in patients with one-sided buttock pain, such that two of the four pads were placed around the sacroiliac joint. Only high frequency TENS (greater than 80 Hz) was offered to our patients.

Prior to the trial, patients were given a standard pain questionnaire at our institution, which incorporated a visual analog scale (VAS 0-100 mm scale) score, numerical rating pain (NRP) scale, portions of the McGill pain questionnaire (a set of 15 neuropathic pain symptoms in the following scale; none/mild/moderate/severe), and the brief pain inventory short form questionnaire. Reassessment of the patient's response occurred between one and two months. Functional improvement was also recorded at the revisit.

Results: Eight case presentations are reviewed below. In all cases but one, TENS proved efficacious in improving pain symptoms. In the seven cases where TENS proved beneficial, therapy was stopped on one patient. That patient was discovered to have recurrent, widespread sarcoma at locations other than at the TENS application site. All other patients otherwise experienced no adverse affects with the use of TENS. (Each case will be presented in the poster presentation with improvement of the pain scores, etc.)

Conclusions: Our initial results prove promising for the use of TENS in the treatment of sarcoma related cancer pain. TENS provides an easy, inexpensive method for treating pain with minimal risk to the user. Further research is needed to determine the efficacy of TENS in this patient population, with our initial results supporting the development of larger clinical trials. Given the difficulty of implementing and blinding placebo TENS, we believe future trials of crossover design would best establish the efficacy of TENS on sarcoma pain.

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Use of Platelet Rich Plasma for non-operative management of biciptal tendinopathy in wheelchair users: A Case Series

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Presenter: Nomen Azeem, MD

First Author Affiliations: National Rehabilitation Hospital

Background: 5 patients between ages 18-65 with spinal cord injury greater than one year with shoulder pain less than six months that are wheelchair users.

Objective: To assess whether platelet rich plasma injection can provide pain relief, decreased use of oral pain medication, and increased function in patients with bicipital tendinopathy.

Methods: Each participant meeting initial inclusion criteria met with the principal investigator for interview. A baseline physical exam of the shoulder score (PESS) was obtained, followed by an ultrasound examination of the shoulder (USPRS). After completing the initial ultrasound screening to confirm biceps tendon pathology was completed, data collection including demographics, duration of SCI, level of completeness of SCI, visual analog score (VAS) for pain, recent functional status, and tendon diameter of bicep was obtained. Patients then underwent a unilateral ultrasound guided bicipital tendon sheath injection of authologous platelet rich plasma (PRP) into the symptomatic biceps tendon sheath. The patients were then contacted by phone at two, four, and six weeks post injection to assess for any adverse reactions, updated pain scores, and functional status. At 8 weeks post injection the patients returned! to the clinic for repeat PESS, USPRS, VAS, and functional status survey.

Results: All five participants reported complete resolution of shoulder pain, increased functionality, with no reported adverse effects. All participants decreased or discontinued the use of over the counter or prescription pain medications for shoulder pain following the PRP injection. On followup physical assessment, all participants demonstrated increased range of motion and resolution of pain in symptomatic shoulders. Ultrasound examination of symptomatic shoulders in all participants revealed resolution of tendon tears, edema, and and improved fibrin patterning. These changes were not noted in the non-injection arm.

Conclusions: PRP may present a safe, predictable, effective, non-toxic, biocompatible, autologous, non-operative treatment option for shoulder tendinopathy in paraplegic patients that are wheelchair users, but requires further investigation to its potential application in this population.

Disclosure: none

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Observations on Morphine Co-Prescriptions and Non-Prescription Medications in a Pain Patient Population

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Presenter: Murray Rosenthal, DO
Author Affiliations: Millennium Research Institute, University of California San Diego Department of Pathology and Laboratory Medicine

Background: Morphine is a commonly prescribed pain medication, often along with other medications. The adherence to prescribed morphine and the use of other non-prescribed medications has not been fully described1.

Objective: In an attempt to better understand the relationship between these medications and adherence, we examined the morphine and co-medication prescribing practices of physicians treating pain patients using data from 517,623 specimens collected from March 2008 through September 2010.

Methods: We supplemented these observations with urine drug testing data for the medications or medication classes listed in Table 1 (1-4).

Results: There were 46,445 specimens where morphine was listed as the prescribed medication (Table 2). Of these, 38,556 or 83% tested positive for the prescribed medication. For this group, 30,669 specimens had other opiates listed. The observed number of specimens with other opiates 38,380; that is 25% more opiate medications than actually prescribed. The co-prescribed benzodiazepines were listed at 13,850, but 19,596 specimens had benzodiazepines detected in them. About 17% of patients prescribed morphine in this population were not taking their medication (Table 2). Other medications present in specimens greater than the prescribed number included methadone, amphetamine, and tapentadol. The limitation of this study is that it is retrospective and not prospective.

In addition, we were able to identify 15,942 samples from patients taking non-prescribed morphine and were able to establish their co-ingested medications using the same urine drug testing methods (Table 3). We observed that the major prescriptions were other opiates and benzodiazepines followed by carisoprodol. However the major non-prescribed medications for this group were the benzodiazepines.

Conclusions: Based on these observations, it appears that the patients prescribed morphine may have been supplementing their morphine with other, non-prescribed medications. These included methadone, the benzodiazepines, amphetamine, and other opiates. The clinical importance of uncovering non-prescription medication use cannot be over emphasized. This information may help reduce morbidity and mortality in patients on chronic opioid therapy.

Disclosure: Millennium Research Institute

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Conversion of Chronic Pain Patients From Full-Opiate Agonists to Sublingual Buprenorphine

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Presenter: Danielle Daitch
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Background: Sublingual buprenorphine (buprenorphine SL) is a preparation that has been used to treat opiate dependence. In addition, the Drug Enforcement Administration (DEA) has acknowledged the legality of an off-label use treat pain with the sublingual buprenorphine preparation. Buprenorphine SL is unique among the opiate-class of analgesics; this compound has a high affinity for the mu-receptor yet only partially activates it. Thus, buprenorphine SL can provide analgesia, yet minimize opiate side effects. Many patients on high doses of opiate medication develop opiate-induced hyperalgesia (OIH). Buprenorphine SL, on the other hand, may even be anti-hyperalgesic.

Objective: To determine the effectiveness of converting patients from traditional full agonist opiate medication to sublingual buprenorphine, as well as identify patient groups that are most likely to benefit from this therapy. These patients who underwent conversion either had developed tolerance with diminished analgesia or were experiencing side effects on their opiate medication.

Methods: Retrospective data from clinical records was taken on 104 de-identified chronic pain patients (60 male and 44 female, age 21-78) who had previously treated with opiate-agonist drugs and were converted to buprenorphine SL in tablet form during the study. Chronic pain was defined as persisting pain for at least six months. Data collected from patient profiles included age, sex, diagnosis, medication history, pre-induction opioid intake, reason for detoxification, pre-induction Clinical Opiate Withdrawal Score (COWS), and if applicable, cause of buprenorphine SL discontinuation. Pain levels and Quality of Life scores were recorded before and after conversion to buprenorphine SL.

Results: After initiation of buprenorphine SL therapy for more than two months, the mean pain scores on a scale from 0-10 decreased by 2.3 points ($p<0.001$). Patient Quality of Life (QOL scale) was not significantly affected by buprenorphine SL therapy ($p=0.14$). The success rate was highest for patients using morphine, oxycodone, and fentanyl before buprenorphine SL induction. These patient groups had a 3.7 point decrease in pain for patients taking morphine, 2.5 point decrease in pain for patients taking oxycodone, and 2.2 point decrease for patients using fentanyl. The least pain reduction was seen in the patient group using oxymorphone before conversion, with a 1.1 point decrease in pain. Patients using between 100-199mg morphine equivalent per day experienced the greatest reduction (2.7 points) in pain scores. Patients using between 200 and 299mg morphine equivalent before buprenorphine SL induction exh! ibited a decrease of over 2 points on average. Patients using >400mg morphine equivalent reported the most minimal reduction in pain scores, on average 1.1 point decrease.

Conclusions: Patients continuing buprenorphine SL therapy for more than 60 days reported significant decreases in pain (2.3 points). Patients on doses of opiate medication between 100-199mg morphine equivalents) seemed to fare better with conversion to buprenorphine SL than patients on the highest doses (>400mg morphine equivalents). The opiate drug used by the patient before buprenorphine SL induction appears to have some effect on buprenorphine SL conversion success. Patients previously taking morphine, oxycodone, and fentanyl had the greatest decrease in pain after conversion to buprenorphine SL.

Disclosure: N/A

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Evaluation of the Incidence of Intravascular Uptake in Cervical Interlaminar Epidural Steroid Injections

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Background: Intravascular uptake has been previously reported with cervical interlaminar epidural steroid injections despite negative aspiration. In most cases intravascular uptake is identified with the use of live contrast. Digital subtraction angiography is another commonly used method of detection of intravascular uptake. There is published evidence that the use of DSA improves the detection rate of intravascular injection during cervical transforaminal epidural steroid injections. However the incidence of intravascular injection with cervical interlaminar epidural steroid injections has not been reported. Also, there has not been published evidence of the clear benefit of DSA in the detection intravascular injection with cervical interlaminar epidural steroid injections.

Objective: The purpose of this study is to investigate the incidence of intravascular uptake during interlaminar cervical epidural steroid injections.

Methods: All cervical epidural steroid injections were performed via an interlaminar approach at the C7-T1 level using a loss of resistance technique. Detection of intravascular injection was achieved with aspiration, use of live contrast, and digital subtraction. The detection of intravascular injection was recorded for each of the above methods. If intravascular injection was detected with a combination of two or more of the above methods, the first positive method was recorded.

Results: 6 out of 135(4.4% incidence) injections showed intravascular uptake. In 2 out of the 6 cases of intravascular injection, direct aspiration was the first positive method identifying intravascular uptake. In 4 out of the 6 cases, aspiration was negative and live contrast was the first positive method identifying intravascular uptake. There were no incidents of intravascular uptake where digital subtraction was the first and only method of positive identification of intravascular uptake.

Conclusions: Live contrast appears to be the best method of detecting potential intravascular injection during fluoroscopic guided cervical interlaminar epidural steroid injections. Digital subtraction angiography does not appear to offer any added benefit in the detection of intravascular injection during interlaminar cervical epidural steroid injections.

Disclosure: N/A

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A Randomized, Placebo Controlled Study to Assess the Efficacy of Lateral Branch Denervation for Chronic Sacroiliac Joint Pain

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Background: Sacroiliac joint pain represents a significant and under-addressed medical condition, currently devoid of a consistently reliable treatment modality. A growing body of literature supports the use of cooled radiofrequency denervation.1,2

Objective: To compare lateral branch denervation to a sham treatment for chronic sacroiliac joint pain.

Methods: Randomized, placebo-controlled study of 51 patients with injection confirmed sacroiliac joint pain. Lesions performed with SInergy System (Kimberly Clark) at S1-S3 lateral branches and L5 Dorsal Ramus. Treated subjects were followed for 9-months, sham subjects for 3-months. Subjects and assessors were blinded until 3-months. The principal outcome measures were pain (VAS, SF-36BP), physical function (SF-36PF), disability (ODI), quality of life (AQoL) and treatment success.

Results: Statistically significant changes in pain, physical function, disability and quality of life were found at 3-months follow-up, with all changes favoring the lateral branch neurotomy group. At 3-months follow-up, 47% of treated patients and 6% of sham subjects achieved treatment success. At 6- and 9-months, respectively, 38% and 56% of treated subjects achieved treatment success.

Conclusions: Treatment group showed significant improvements in pain/disability/physical function/quality of life as compared to the sham group. Duration and magnitude of relief was consistent with previous studies, with current results showing benefits extending beyond 9-months.1,2

Disclosure: Study was sponsored by Baylis Medical Company.

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Advanced Pain Life Support Training

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Background: Pain procedure-related emergencies are rare but serious complications that can arise from the administration of local anesthetic drugs, contrast material or sedation. Recently, using simulation a growing number of non-anesthesiologists (e.g. physiatrists, radiologists, neurologists, psychiatrists) who have less training and experience in such emergent situations are providing interventional pain services. Although these are "minimally invasive" procedures, they are "maximally dangerous", and unrecognized or inappropriately managed complications can be lethal.

Objective: The goal of this project is to provide pain physicians with an opportunity to practice managing life-threatening complications associated with pain management procedures.

Methods: We developed an interactive, case-based 4-h course based on the teaching methods of the Advanced Cardiac Life Support (ACLS) course. The course consisted of four parts: 1. Didactic training 2. Practice hands-on session (ISIS) 3. Pain Mega code (ISIS), 4. Post test. Simulated emergencies played out in real time, and corrective actions were taken. Upon completion of the course, students were anonymously surveyed on the perceived educational value of the resuscitation course.

Results: 11 fellows participated in the training. They significantly improved on assessing the possible complications associated with different procedures, recognizing the early signs of the emergency situation and then intervening early in an event, using various alternative techniques to manage the situation, and optimizing resource management skills. All fellows believed the course was delivered at an appropriate level for them, that it was a worthwhile use of their time, and that it should be a mandatory course repeated over a time in their fellowship.

Conclusions: Simulation is a highly effective way of learning, provoking active thinking and prompt response to challenges. Utilizing the simulation facility, mannequins (SimMan) and monitoring equipment provide the ideal environment to train providers to be able to effectively recognize and manage the emergencies associated with pain procedures, and to achieve the final goal of improved patient safety. Fellows can learn from appropriately designed APLS courses and believe it should be mandatory in their training.

Disclosure: None

References: None

Preoperative motion-related pain in cancer patients with extraspinal metastases treated by percutaneous osteoplasty

Kyung-Hoon Kim, In-Yeob Baek, Jae-Eun Kim, Kyeong-Jo Byeon, Hyun-Jung Lee, Sang-Wook Shin, Seong-Wan Baik

Presenter: Kyung-Hoon Kim
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Background: Percutaneous osteoplasty (POP) as a technical extension of percutaneous vertebroplasty (PVP) has been used as a treatment for painful extraspinal metastatic lesions besides the vertebrae. PVPs are performed in weight-bearing vertebrae; extraspinal POPs are usually performed in non-weight-bearing flat bones. Pain on extraspinal lesions may not be provoked by weight-bearing position but be provoked by specific motion. This study was performed to evaluate patient motion-related pain (MRP) and the resulting pain-related impairment (PRI) by specific motion according to the involved sites where extraspinal POP was performed.

Objective: Percutaneous osteoplasty (POP) as a technical extension of percutaneous vertebroplasty (PVP) has been used as a treatment for painful extraspinal metastatic lesions besides the vertebrae. PVPs are performed in weight-bearing vertebrae; extraspinal POPs are usually performed in non-weight-bearing flat bones. Pain on extraspinal lesions may not be provoked by weight-bearing position but be provoked by specific motion. This study was performed to evaluate patient motion-related pain (MRP) and the resulting pain-related impairment (PRI) by specific motion according to the involved sites where extraspinal POP was performed.

Methods: We performed a retrospective study that evaluated the MRP and resultant PRI by reviewing the charts of 66 patients treated with 70 extraspinal POPs. The numeric rating scale (NRS) scores in 5 different positions including while lying on the back, lying on the affected side, sitting, standing, and walking and the Karnofsky performance scale (KPS) scores before and after POP were used to evaluate MRP and PRI, respectively.

Results: The postoperative mean NRS scores became significantly lower when patients were in specific 1 of the 5 positions: lying on their affected side following scapuloplasty; sitting following ischioplasty; lying on their affected side in ilioplasty; and lying on their affected side following costoplasty. The mean KPS scores in all patients became higher after POP.

Conclusions: The characteristic preoperative MRP and the resulting PRI according to the involved sites in cancer patients with extraspinal metastases developed by specific motion and alleviated pain and impairment by POP, if the cancer did not involve the joints.

Disclosure: This study was supported by a 2-year grant from Pusan National Univeristy.

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Occipital Nerve Stimulation for the Treatment of Chronic Headaches

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Background: Occipital Nerve Stimulation for the Treatment of Chronic Headaches

Objective: A multidisciplinary approach produces the best long term result when treating chronic headaches. Occipital nerve stimulation (ONS) has shown promise as documented by multiple case reports and case series studies. Rigorous formal ONS trials are currently underway. We present our experience with the use of ONS for the treatment of a variety of chronic headache disorders.

Methods: This data was collected from the University of South Florida College of Medicine and its affiliated medical institutions. All patients were referred from the Tampa General Hospital Headache and Pain Center to the Interventional Pain Clinic at the H. Lee Moffitt Cancer Center and Research Institute

Results: A total of 18 patients underwent percutaneous trial ONS and 16 were implanted after completing a successful trial. The breakdown of their diagnoses included eight chronic migraine headaches, three cluster headaches, one hemicrania continua, one post-traumatic headache, one post-craniotomy headache, and one occipital neuralgia. Two trials for chronic migraine were unsuccessful.

Conclusions: Complications included one scar revision for a painful lead site and one infection requiring system exchange. Several patients have required repeated reprogramming for shifting lead stimulation. Longest follow-up has been nine months involving two patients who continue to report successful ONS as defined by greater than 50% overall improvement in their headache symptomatology. In summary, there is growing clinical evidence that ONS is beneficial in the treatment of chronic headache and should be considered in a well defined subgroup of refractory chronic headache patients.

Disclosure: None

References: None

Encore Presentation: This poster/abstract won 3rd place at the West Virginia Society of Interventional Pain Physicians “PAIN 2011” conference in Huntington Beach, CA

Periodic Pain and Psychosis with Missed-diagnosis of Acute Porphyria: A Case Report and Review of Literature

Gaurav Jain, M.D., Jeffrey Bennett, M.D., David Resch, M.D., John Godwin, M.D.

Presenter: Gaurav Jain, M.D.
Author Affiliations: Department of Internal Medicine and Psychiatry, Southern Illinois University School of Medicine, Springfield, IL.

Background: Porphyrias form a group of rare inherited metabolic disorders, each resulting from a partial deficiency of a specific enzyme in the heme biosynthesis pathway. Acute porphyrias are often misdiagnosed; most commonly they present as atypical intermittent acute abdominal pain and neuropsychiatric symptoms.

Objective: The authors reviewed the literature on missed diagnosis of acute porphyrias in patients with pain and neuropsychiatric manifestations, and provided an overview on the current understanding of diagnosis and management.

Methods: A case report of a patient with hereditary coproporphyria, one of the acute porphyrias, is presented to illustrate the broad manifestations, unsuspected diagnosis, difficulties in laboratory diagnosis, and the role of pain physician in the management of porphyria.

Results: The identification of clinical and biochemical abnormalities supporting the diagnosis of acute porphyria and the involvement of pain team in the management lead to quick recovery, avoided frequent relapse and improved quality of life.

Conclusions: Clinicians should suspect acute porphyrias in patients presenting with variable neuropsychiatric symptoms and unexplained pain. Utilization of pain team is often helpful in the proper management of these patients. Many pain and psychiatric medications are frequently associated with porphyria exacerbation. Proper identification can lead to decrease worsening associated with porphyrinogenic agents, appropriate management, and a better patient outcome.

Disclosure: Oral presentation of this case was made in the clinical vignette competition at the Association of Medicine and Psychiatry Conference, Chicago, 2010. There is no potential conflict of interest by any authors.

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How To Effectively Reduce Radiation Exposure to Physicians Performing Interventional Pain Management Procedures

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Background: More than 4 million interventional pain management procedures (IPMPs) are offered each year in the USA, with the majority of IPMPs performed under fluoroscopic guidance. Even though the amount of radiation exposure in each single IPMP may be relatively low, it has been reported that accumulation of stochastic and non-stochastic effects due to chronic radiation exposure can lead to injuries to skin, muscle and lens, cancer, genetic changes or even death1-3.

Objective: The goal of this study was to investigate the methods to effectively reduce radiation exposure to physicians performing IPMPs.

Methods: We retrospectively collected and compared the data of radiation exposure from two interventional pain physicians in one private pain management practice in North Florida from December 2008 to September 2010 from two of their offices.

Results: Both physicians were board-certified pain specialists with pain fellowship training. Physician A and B performed a total of 3599 and 1027 IPMPs respectively during this 21-month period.

In both offices, five radiation protection equipments were available: a double-sided under-table shield (32" x 28"), an adjustable mobile shield (48" x 24"), a lead apron, a thyroid shield and a full-monti face protector. Physician A used all five equipments for all IPMPs, while the physician B used all but mobile shield for all IPMPs.

Each physician always put a radiation-monitoring badge (Quantum Products) with his name over the shoulder during each IPMP. The badges were sent to Mirion Technologies (DGS) INC, Irvine, CA for quantitative measurement every three months. The reports were then sent to our practice.

In the 21-month period, there were a total of 14 radiation exposure reports for each physician. For Physician A, 12 out of 14 reports found zero radiation exposure (deep tissue, eye and shoulders), even for those periods when Physician A performed 450 to 500 IPMPs in each office. The highest radiation exposure was 12.7 millirems in one office in a three-month period. Average radiation exposure per procedure for Physician A was 0.0094 millirems.

Physician B performed a total of 1027 IPMPs in the two offices during this period without using the mobile radiation shield. 13 out of 14 reports found higher radiation exposure (deep tissue, eye and shoulders), ranging from 15 to 264 millirem for each three-month period. Average radiation exposure per procedure for Physician B was 0.9510 millirems, which is 101.2 times higher ($p < 0.001$) than that of Physician A.

Conclusions: While the long-term risk of the radiation exposure to interventional pain specialists is still unclear, it is important to decrease the radiation exposure as much as possible. The results of the current study found that a mobile lead shield can probably decrease the radiation exposure to physicians by as much as 100 times. With the combination of an under-table shield, a mobile shield and a lead apron, it is possible to reduce the measured radiation exposure to zero even when a physician is performing more than 500 IPMPs in a three-month period.

Disclosure: N/A

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Evaluation of practice patterns of facet joint interventions in the United States with particular reference to Medicare guidelines

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Background: Different guidelines have been proposed in the performance of facet joint interventions by different societies and organizations, but no clear cut practice patterns are available for review for either the payers (insurance carriers) or the physicians. Medicare LCD (local coverage determination) for Pain Management is a widely used resource, but it is not known how individual physician practices comply with Medicare LCD requirements.

Objective: To determine if physicians followed Medicare LCD guidelines in performing facet interventions.

Methods: An institutional review board approved, internet based questionnaire based on assessing facet joint interventions was emailed on the ASIPP (American Society of Interventional Pain Physicians) website for 3 consecutive weeks in 2009 (10/7/2009-10/21/2009). Results were tabulated and compared to the Medicare LCD requirements.

Results: Response was obtained from 102 physicians. 2 international responses were rejected, as the purpose was to obtain U.S. practice patterns. 99% utilized the facet interventions for both diagnostic and therapeutic purposes, while only 1 respondent used it exclusively for therapeutic purposes. Among the 100 respondents, 100 performed facet joint interventions. Facet interventions are performed mainly in the lumbar area, but other areas are also quite common. 99% performed medial branch blocks, vs. 1% performing it intra-articularly. For medial branch blocks, both lumbar and cervical medial branch blocks were used (68% vs. 63%). 85% of respondents also performed intra-articular injections, most commonly in the lumbar region (69%) Interestingly, only 23% respondents performed sacral intra-articular injections. 52% used only local anesthetic for diagnostic purposes, whereas 43% used both local anesthetic a! nd steroids for diagnostic injections. Both single diagnostic and double diagnostic blocks were used. When double diagnostic blocks were used, no consensus was obtained in using same local anesthetic vs. different local anesthetics. None of the respondents used placebo injections. Majority used bupivacaine as the local anesthetic both times. 48% performed one radiofrequency ablation of the medial branches in a given year on one patient and 41% performed radiofrequency ablation of the medial branches twice in a year. 71% of respondents never performed pulsed radiofrequency ablation of the medial branches. 60% of the respondents used 6 months as the minimal time interval between each radiofrequency ablation. 55% gave pain diaries to their patients. 49% of the respondents noted that 4-5 hours of pain relief was the minimal acceptable hours of pain relief. 44% noted that 50% pain relief was the minimal acceptable pain relief, in variance from the 80% pain relief required by Med! icare LCD.

Conclusions: This survey to the interventional pain community revealed several important practice patterns that varied across the respondents. Several practice patterns were in variance with Medicare LCD. Such surveys may gain importance in the future to standardize practice patterns.

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Novel Approach for Cooled Radiofrequency in the Treatment of Sacroiliitis

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Background: The prevalence of sacroiliac joint as a source of chronic low back pain has been implicated in 10-27% of cases. (Ruert MP, 2009) Chronic sacroiliac joint pain is best managed with a multidisciplinary approach which includes physical therapy, intraarticular steroid injection and cooled radiofrequency treatment. (Vanelderen P, 2010)

Objective: Proposed additional steps, to previously described cooled radiofrequency of sacroiliac joint by Kapural et al 2008.

Methods: Kapural et al documented significant reduction in pain scores and improvement in daily activities with cooled radiofrequency for the treatment of chronic sacroiliitis after diagnosis was confirmed with fluoroscopically guided SI joint injection. (Kapural L, 2008) The SI cooled radiofrequency procedure Kapural described involves identifying the S1, S2 and S3 sacral foramina with three 27-gauge 3.5 inch Quincke needles under anterior-posterior imaging as a reference point. Application of a circular stainless steel ruler was applied to measure the distance between the introducer and the aperture of posterior sacral foramina prior to insertion of the introducer along the lateral edge of the posterior foramen. The introducer depth is then fixed with the depth marker. The RF probe is inserted with the position verified to be dorsal to the posterior sacral foramen on lateral fluoroscopy. Heating the RF! probe 60'C for 150 seconds times two or three lesions spaced 1 cm apart at each sacral level.

Technical difficulties with Kapural et al described methods include movement of circular stainless steel ruler during introducer placement, increasing the likelihood of inaccurate needle placement within the posterior sacral foramen. In addition, movement of the circular stainless steel ruler can lead to prolonged duration of procedure.

We propose application of compound benzoin tincture USP, 10% to the skin prior to application of the circular stainless steel ruler, the reference spinal needle may then be removed. A single tegaderm is applied to further secure the circular stainless steel ruler. After placement of the introducer along the posterior sacral foramina with fixed depth marker, RF probe is inserted with position of the probe verified to be along the dorsal aperture of posterior sacral foramen under fluoroscopy. Heating protocol is initiated.

Results: No results for this poster case presentation

Conclusions: The proposed additional steps, to the previously described cooled radiofrequency of sacroiliac joint by Kapural, with compound benzoin tincture USP, 10% and tegaderm to secure the circular stainless steel ruler ensuring the measured distance for the posterior sacral foramen is accurate, preventing any untoward ventral nerve root complications and improving procedure efficiency.

Disclosure: None

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Occupational Risk Factors for Neck Pain in the United States Adult Population

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Background: Design: This population-based complex survey study uses the National Health Interview Survey data collected during the period from 2004 to 2008 that randomly sampled non-institutionalized adults of the United States, applying weights necessary to make accurate population prevalence estimates.
Setting: Non-institutionalized population of the United States.

Objective: Risk factors for neck pain have been widely proposed, most of which focusing on biomechanical stress on the spine. This is a comprehensive assessment of all occupations at risk and factors associated with Neck Pain in US.

Methods: Participants: A nationally representative sample of 97,869 workers between the age of 18 and 65 were included in the study.
Interventions: Not applicable.
Main Outcome Measures: Self-reported neck pain in the past three months; occupation categories were based on US census bureau coding of Standard Occupation Classification.

Results: A total of 97,869 workers between the age of 18 and 65 completed the question of both occupation and neck pain in the past three months. Neck pain was reported in 14,936 participants, same pain denied in 82,848. Eighty five participants could not give a clear answer of neck pain status. Based on weighted data, occupations are significantly associated with neck pain. After controlling for age, gender and race, compared with a reference group of respondents with Computer and Mathematical Occupations, participants working in Healthcare Support Occupations were 1.51 times (95% CI 1.27-1.79) more likely to develop neck pain, while the likelihood was 1.37 times higher (95% CI 1.16-1.61) in Construction and Extraction Occupations, 1.36 times higher in (95% CI 1.16-1.60) in Transportation and Material Moving Occupations, 1.34 times higher (95% CI 1.12-1.60) in Installation, Maintenance, and Repair Occupati! ons, and 1.27 times higher (95% CI 1.08-1.50) in Building and Grounds Cleaning and Maintenance Occupations. The low risk occupations include Education, Training, and Library Occupations, Healthcare Practitioners and Technical Occupations, Architecture and Engineering Occupations, and Management Occupations.

Conclusions: The findings of this study provide important stratification of occupational risk for neck pain. Provisional rehabilitation should take into consideration of the occupational risk and design appropriate preventative measures in biomechanics education and environmental change.

Disclosure: none

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