Epidural Steroid Injections for Radiculopathy +/- Back Pain in Children and Adolescents: Pilot Study of Safety and Short-Term Outcomes and Description of Techniques

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Introduction: Radiculopathy (R) +/- back pain (BP) is more prevalent among adults than adolescents and is rare in children. Epidural steroid injections (ESIs) are commonly used for adults with lumbar R +/- BP or cervical R +/- neck pain. At our pediatric tertiary hospital, ESIs have become a component of our multidisciplinary treatment approach for children and adolescents with R +/- BP in the past 4 years. No previous case series of pediatric ESIs could be identified. As a pilot phase of a larger combined retrospective-prospective study of a cohort of adolescents with R +/-BP treated over 10 years, we reviewed experience with pediatric ESIs.

Methods: With IRB approval, demographic, diagnostic, procedural, and outcome variables were reviewed from electronic medical records of all patients receiving ESIs under the supervision of a single pediatric anesthesiologist/pain physician from January, 2003 through October, 2006. We included patients with an onset of symptoms and treatment at age \( \leq 18 \), even if subsequent interventions occurred after age 18. Patients were referred from a pediatric neurosurgeon specializing in spine disorders, a pediatric sports medicine clinic, and a pediatric orthopedic spine surgery program following a variety of types of prior conservative treatment. Categorical data are presented as numbers and/or percentages, rank-ordered data are presented as medians +/- interquartile ranges (IQRs) and ranges.

Results: 94 ESI procedures were performed among 51 children and adolescents. The patient group included 18 males (35%) and 33 females (65%). Age at the onset of symptoms ranged from 3 to 18 years (median age 15 years, IQR 14-16), though the youngest patient receiving an ESI was 7 years old at the time of the procedure. Among the 45 patients with symptomatic lumbar R correlating with MRI-confirmed disc bulge or herniation, discs involved included: L4-L5 22 (49%), L5-S1 20 (44%), and L3-4 3 (7%). 5 patients received ESIs for R +/- BP and/or neck pain associated with presumed arachnoiditis or spinal stenosis after prior spine surgery unrelated to disc disease, including previous scoliosis repair (2), cervical fusion for Klippel-Feil anomaly (1), and intraspinal tumor resection (2). 4 additional patients received ESIs following previous disc surgery. 49 ESIs (all lumbar) were performed by transforaminal approaches, 43 ESIs were performed by interlaminar approaches, and 2 were performed by caudal approaches. Among the interlaminar approaches, 5 were performed in patients who had undergone prior thoracic and/or cervical spine surgery by cephalad advancement of catheters following entry to the epidural space at non-operated levels caudal to the site of previous surgery. Two additional patients with sacral anomalies and sacral R + BP, one with diastematomyelia and one with neurofibromatosis, respectively, had cephalad advancement of caudal catheters to the S1 or S2 level. All but one patient received conscious sedation for the procedures, and all were performed using fluoroscopic guidance in AP, lateral, and (for transforaminal approaches) oblique views, along with contrast epidurography. An epidural pattern of contrast spread was confirmed in all cases. The predominant sedatives used were midazolam and fentanyl; selected patients requiring additional sedation received either propofol, nitrous oxide, or remifentanil. Where diagnostic information from selective nerve root blockade was required, fentanyl was omitted from the sedation regimen, and remifentanil or nitrous oxide was used to provide analgesia for the injection, in order to avoid confounding effects of residual systemic analgesia following the procedure. Early in the series,
methylprednisolone depot was commonly administered as the steroid; by 2005, aqueous triamcinolone (median dose 80 mg) was used exclusively. One case of emesis occurred during sedation; this did not lead to aspiration pneumonitis or other sequelae. No infections, allergic reactions, dural punctures or systemic steroid-related complications were identified. 4 patients reported paresthesias at the time of needle advancement or injection; all resolved with needle repositioning, and no nerve root injuries were identified.

Among the 42 patients with lumbar disc disease who underwent ESIs prior to any spine surgery, 10 (24%) have subsequently undergone operative microdiscectomy following treatment with ESIs. Two patients who had received preoperative ESIs received additional ESIs after operative microdiscectomy. Functional outcomes are being assessed by structured questionnaires and follow-up interviews; these results will be reported at the meeting.

Discussion: Preliminary evidence suggests that ESIs can be performed in sedated children and adolescents with R +/- BP with good safety. Consistent with emerging practice in adult pain clinics, our preferred technique in a majority of cases involves transforaminal (TF) approaches to lumbar (but not cervical) ESIs in the prone position using fluoroscopic guidance. In view of the initial impression of good safety of ESIs performed in this manner, it appears appropriate to consider prospective, controlled clinical trials of ESIs as a component of multi-modal treatment for adolescents with R +/- BP.