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Modified Epidural Adhesiolysis Protocol for the Treatment of Refractory Low Back Pain - A Case Series

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Background: Scar tissue can form within the epidural space following surgical trauma, infection, annular tearing, hematoma formation, and disc herniation. When epidural fibrosis (EF) is present, it can render nerve roots more susceptible to entrapment, compression, and tension—each of which can potentially contribute to low back and radicular pain in the lower extremities. In the past, several different epidural adhesiolysis protocols have been described to treat such pain.

Case Report: Three patients with chronic low back and radicular pain, and evidence of EF underwent a modified epidural adhesiolysis protocol over a single visit. All 3 patients reported greater than 50% pain relief for at least 3 months following treatment with the modified epidural adhesiolysis protocol.

Conclusion: These case results suggest that the proposed modified epidural adhesiolysis can provide significant relief of axial and radicular pain in a cost effective and accessible manner for this patient population.

Key words: Back pain, adhesiolysis protocol, vertebrogenic pain, epidural fibrosis, failed back surgery syndrome, post laminectomy syndrome

BACKGROUND

Epidural fibrosis (EF) is defined as the development of nonphysiologic scar tissue within the epidural space due to local inflammation provoked by tissue trauma (1). Such trauma is often associated with surgical procedures, with studies reporting that the likelihood of developing some degree of EF following lumbar surgery is as high as 91% (2). For this reason, the presence of EF is thought to be a major risk factor for the development of failed back surgery or post laminectomy syndrome. Indeed, 83.3 to 91% of patients with chronic postoperative back pain have been found to have epidural scarring in the region of their pain (2).

Surgery isn't the only condition that can lead to the development of EF. It can also occur following infection, annular tearing, hematoma formation, and disc herniation (3,4). Regardless of the cause, the presence of EF within the lumbar region of a patient's spine can render the spinal cord, cauda equina, and nerve roots more susceptible to entrapment, compression, and tension—each of which can potentially contribute to low back and radicular pain in the lower extremities. It has also been hypothesized that EF can alter the vascular supply to the nerve root which can result in ischemic injury (1). Finally, it is thought that EF can limit the spread of medications within the epidural space intended to treat the very pain that it can produce, limiting the efficacy of procedures such as transforaminal and interlaminar epidural steroid injections (5).

In 1989, Racz and Holubec proposed an epidural

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adhesiolysis protocol to treat pain caused by the development of EF in the lumbar region (6). Since then, several different modifications to this protocol have been proposed (7-15). This article describes a small series of patients with evidence of EF who underwent treatment with a modified epidural adhesiolysis protocol that can be performed over a 1-hour procedure visit.

CASES

Three patients with chronic low back and radicular pain were selected to undergo a modified epidural adhesiolysis protocol over a single 1-hour clinic visit in 2022. Each of these patients received prior treatment with at least one lumbar interlaminar epidural steroid injection without significant relief and had evidence of EF.

Patient 1 had previously undergone treatment with L2-4 Posterior Lumbar Interbody Fusion (PLIF). He continued to have significant pain despite surgical intervention. Magnetic resonance imaging (MRI) findings were significant for degenerative changes following his surgery as well as bilateral foraminal stenosis at the L5/S1 disc space with bilateral L5 nerve root compression.

Patient 2 developed chronic low back pain following a parachuting accident. His pain was exacerbated with lumbar forward flexion and sitting. MRI findings were significant for Modic Type II changes at the L5-S1 levels.

Patient 3 endorsed chronic radicular low back pain following a 30-foot fall. He underwent 3 microdiscectomy surgeries and an L5-S1 fusion without significant relief. MRI findings were significant for degenerative changes following his prior surgeries and bilateral neuroforaminal narrowing at L5-S1. The patient underwent 2 unsuccessful spinal cord stimulator (SCS) trials following his surgical interventions.

Protocol

Each patient was placed prone on the fluoroscopic table. The low back and posterior sacral area were prepped with chlorhexidine gluconate 2% and isopropyl alcohol 70% antiseptic solution and draped in the usual sterile fashion. Vital signs were monitored throughout the procedure. The sacrum and sacral hiatus were identified using fluoroscopy with the C-arm in the lateral view. The skin and subcutaneous tissues were infiltrated with a total of 5 mL of 1% lidocaine over the sacral hiatus entry point. A 16-gauge, 3.5-inch epidural needle was placed through the sacral hiatus, into the caudal canal. After negative aspiration, approximately 4 mL of nonionic, water-soluble contrast was injected through the needle in lateral and anterior posterior views to visualize the contrast spread in the epidural space. A 19-gauge, 14-inch radiopaque epidural catheter was advanced through the epidural needle to the targeted lumbar epidural space under fluoroscopic guidance. After negative aspiration for CSF and blood, another 2 mL of contrast was injected through the catheter into the epidural space to confirm placement. Subsequently, 4-5 mL of preservative-free 0.2% ropivacaine was injected as a test dose and to increase tolerance for the subsequent use of hypertonic saline. After a time interval of approximately 5 minutes, a motor test was performed to confirm no significant blockade. This was followed by an injection of the remaining solutions in the following sequence: 1) 4-7 mL of 600-1000 units hyaluronidase in preservative-free normal saline; 2) 4 mL of steroid (6 mg betamethasone or 10 mg dexamethasone) in 0.2% ropivacaine; 3) 4 mL mixture of 0.2% ropivacaine/10% saline in 1:1 ratio; 4) 3-6 mL mixture of 6 mg betamethasone/0.2% ropivacaine/10% saline in 1:1:1 or 1:2:3 ratio. A repeat motor check was performed after solution number 3 was administered (at this point, a noticeable difference in strength can be expected if a significant motor block were to occur). Post-injection fluoroscopy was utilized to demonstrate appropriate washout of contrast. Subsequently, the catheter and needle were removed. The patients' backs were cleaned, and bandages were applied at the needle puncture sites. The patients were monitored for 20 minutes post-procedure. There were no adverse events.

RESULTS

Patient 1 underwent modified epidural adhesiolysis twice after failing multiple interlaminar epidural steroid injections (ILESI) for low back pain. The first procedure directed to the left L5 lateral recess provided greater than 50% reduction in symptoms sustained over 4 months. The subsequent second procedure, aimed at the right inferior L5-S1 disc, provided greater than 50% reduction in pain over the course of 14 months and has since not required another procedure for low back pain symptoms. Patient 2, after many unsuccessful ILESI and radiofrequency ablations, underwent modified epidural adhesiolysis a total of 4 times. Other than the 2nd procedure, the patient reported significant pain relief of > 50% sustained well over 3 months, stating the procedure was the "best one yet" for symptom relief. Patient 3, after 2 SCS trials, has undergone several

modified epidural adhesiolysis procedures aimed at the right and left L5-S1 disc. After each procedure, patient 3 has reported 50-80% pain relief that lasted at least 3 months, often resulting in reducing pain medication usage.

DISCUSSION

Epidural adhesiolysis has been described for treatment of post laminectomy syndrome and failed back syndrome. The medications utilized (corticosteroids, local anesthetics, hyaluronidase, and hypertonic saline) are thought to break down scar tissue and decrease swelling in the epidural space. Classically, the epidural adhesiolysis protocol consists of a series of injections over 2 days in an inpatient setting (7). As described, the solutions administered on day one includes hyaluronidase, local anesthetic, and steroid, followed by a 15-30 minute infusion of 10% saline. Day 2 includes 2 sessions separated by 4-6 hours, each consisting of local anesthetic and a 10% saline infusion.

The modified epidural adhesiolysis procedure described in this case series is an adaptation that can be completed in a 30- to 60-minute outpatient clinic setting (Table 1). The series of medications administered in the epidural space is critical, although the volumes administered may vary based on observed contrast spread and patient experience. Specifically, the first injectate of 0.2% ropivacaine serves as a test dose to detect intrathecal spread, as well as to help with patient comfort and tolerance of subsequent injectates. For post laminectomy syndrome and failed back syndrome, larger volumes of solutions are favored based on patient tolerance. However, if patients experience significant pressure during slow administration, then volume may be limited. For discogenic pain, smaller volumes may be favored for targeted drug delivery at the specific disc level, particularly if contrast is observed to spread at the target level. However, if the catheter cannot be advanced to the target level, then larger volumes may be used to allow the spread of medications to the target level.

EF can develop after surgery, infection, hematoma, annular tearing, or disc herniation. One of the proposed benefits of advancing an epidural catheter via a caudal approach is the potential to access the ventral epidural space and place injectate closer to the sinuvertebral nerve. Thus, this case series also demonstrates the potential use of this protocol for the treatment of vertebrogenic back pain.

CONCLUSION

The therapeutic effects experienced by these 3 patients from the modified epidural adhesiolysis procedure warrant further studies with larger sample sizes to illustrate the potential benefits of this procedure, especially in patients with prior trauma and/or surgeries. Furthermore, the potential use of this protocol for the treatment of vertebrogenic pain should be explored. Future studies also comparing the original adhesiolysis procedure with the modified version could also illustrate the cost-savings and efficiency benefit of this unique procedure protocol.

Table 1. A Comparison of traditional vs modified epidural adhesiolysis protocols.

Traditional Protocol	Modified Protocol
Day 1	0.2% ropivacaine 4-5 mL
Hyaluronidase 1500 units in PFNS	Hyaluronidase 600-1000 units in PFNS
Local anesthetic/steroid 10 mL	Local anesthetic/steroid 4 mL
Wait 20-30 min	0.2% ropivacaine/10% saline 4 mL (1:1)
10% saline 10 mL inf over 15-30 min	Steroid/0.2% ropi/10% saline 3-6 mL (1:1:1 or 1:2:3)
Day 2	
0.2% ropivacaine 10 mL	
10% saline 10 mL inf over 15-30 min	
Wait 4-6 hours	
0.2% ropivacaine 10 mL	
10% saline 10 mL inf over 15-30 min	

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