

Persistent radiculopathy diagnosed and treated with epidural endoscopy*

LLOYD R. SABERSKI and LUKE M. KITAHATA

Department of Anesthesiology, The Yale School of Medicine, New Haven, CT 06510, USA

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Introduction

Caudal epidural endoscopy has recently been introduced as an alternative technique for directed injection of epidural steroids and lysis of adhesions [1]. It has the distinct advantage of providing a three-dimensional color view of nerve roots, blood vessels, and the dura mater with or without pathologic adhesions. This improves targeting and probably serves as an advantage over standard epidural steroid injections and perhaps even two-dimensional fluoroscopic manipulations of the epidural space [2]. In order to achieve successful placement of the catheter for injection and the flushing away of fibrinous material, it is necessary to direct the catheter and normal saline stream to the lesions under consideration. However, the fiberoptic catheter inserted through the vein dilator is difficult to steer despite gentle curves on the end of the fiberscope and various clock- and counterclockwise rotations (Fig. 1). Therefore, it is essential to develop a more efficient and reliable means of steering. This has been accomplished with development of the multilumen steering handle (Fig. 2), currently available from Myelotec (Alpharetta, Georgia, USA) under a U.S. Food and Drug Administration (F.D.A.) Investigational Device Protocol, through which a fiberoptic bundle is placed. Described

in this case report is the clinical application of this steering handle and fiberoptic catheter system in a patient suffering from intractable lumbar radiculopathy.

Case report

A 60-year-old housewife had been suffering from progressively worsening symptoms of right lumbar radiculopathy over several years. In 1970 a successful discectomy with fusion had been performed at the L4-5 and L5-S1 levels. She continued to have a tolerable level of discomfort until 1992, when her leg pain began to increase. No new antecedent injury was readily recognized. Magnetic resonance imaging (MRI) showed evidence of a good fusion and no presence of disc herniations. Referral was made for a series of lumbar epidural steroid injections which did not provide appreciable symptom relief. As her symptoms were poorly controlled with oral analgesics, referral was made for alternative management. Upon initial evaluation at the Yale Center for Pain Management, the patient complained of activity-related pain radiating down the lateral aspect of her right leg to the ankle. She noted that walking and climbing stairs markedly exacerbated the pain, which she described as sharp and shooting. She characterized the pain as a 9/10 on the visual analog scale (VAS). Physical examination was noteworthy for a positive sciatic tension sign reproducing right leg symptoms and decreased pin-prick and cold sensation in the right L5 and S1 dermatomes. Her reflexes were intact and normal. A review of the MRI indicated the presence of an extradural scar adjacent to the right L5 and S1 nerve roots. The patient was diagnosed as having radiculopathy and was prescribed amitriptyline with increasing doses. This had little effect on her symptoms, and a series of volumetric caudal steroid injections were recommended [3]. The first caudal injection consisted of 30cc 0.03% bupivacaine containing 40mg of

Address correspondence to: L. R. Saberski, Yale Center for Pain Management, 333 Cedar Street, New Haven, CT 06510, USA

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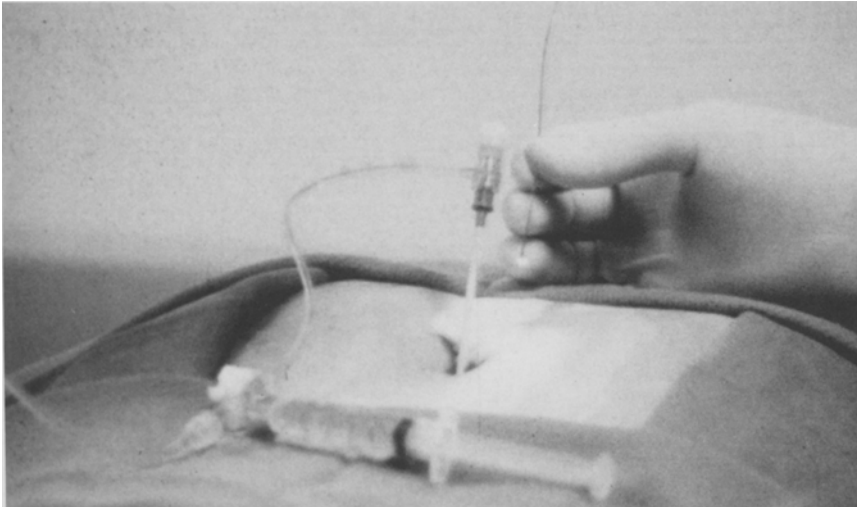


Fig. 1. A 2-mm × 17.8-cm vein dilator catheter through the sacral hiatus serves as the entry for the naked fiberscope

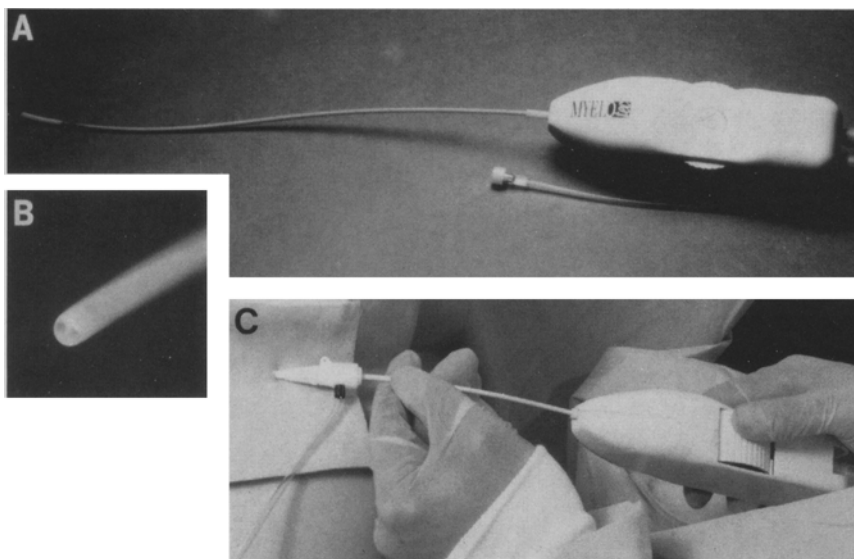


Fig. 2. Multilumen steering handle by Myelotec. **A** Steering lever. **B** Distal lumens. **C** Steering handle containing fiberscope inserted through the sacral introducer

supernatant-removed triamcinolone diacetate [4]. This alleviated her symptoms for approximately 2 weeks. A second volumetric caudal injection with 36cc of the same solution was given at 4 weeks after the initial injection. This reduced her VAS from 9/10 to 6/10. A third volumetric caudal injection at 40cc was given at 6 weeks. At 8-week follow-up the patient noted improved symptoms, reporting a continued VAS of 6/10. Physical examination, however, still showed sciatic tension. For this reason the patient was felt to be a good candidate for lumbar epiduroscopy.

With the patient awake and lightly sedated in the prone position, the sacral area was prepared and draped as a sterile field. The caudal canal was entered through the sacral hiatus with a 17-gauge Tuohy needle after injecting 2ml of 0.5% bupivacaine (Fig. 3). A 0.9-mm guide wire was inserted through the needle and advanced with fluoroscopic guidance to the level of the

right L5-S1 neuroforamen (Fig. 4). An introducer sheath over a 2-mm × 17.8-cm vein dilator was then advanced over the guide wire. Once the sheath and vein dilator were advanced to the tip of the guide wire, the guide wire and dilator were removed. At that point the steering handle containing the fiberscope was placed inside the introducer sheath. In order to keep the epidural space distended, a 15-ml bolus of normal saline was followed by a continuous injection by applying gentle pressure on the syringe plunger. The steering handle was advanced to the end of the introducer sheath. At that point the video image revealed dense fibrinous material in the area where one might expect to find the nerve root. Gentle streams of irrigation were easily directed at this material. A small amount of cottony material moved away from the root area, but the dense connective tissue did not move. The steering handle allowed for maneuvering cephalad and lateral to the

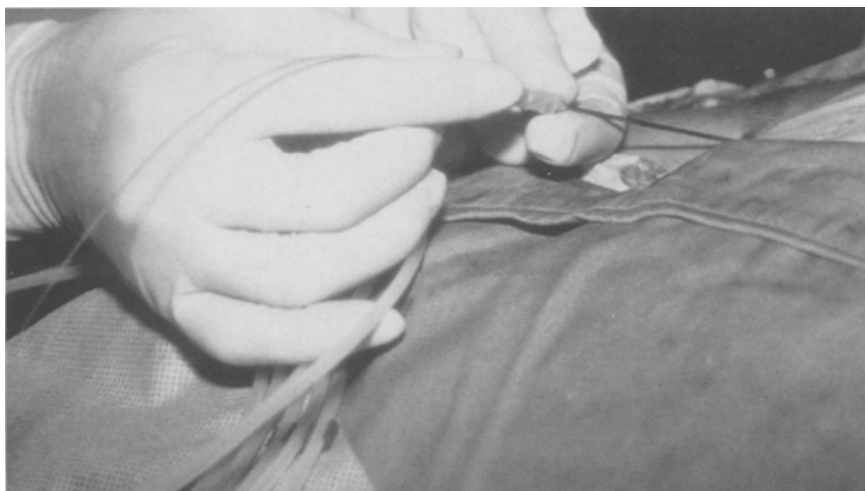


Fig. 3. 17-gauge Tuohy needle, inserted through the sacral hiatus, is used to thread 0.9mm guide wire

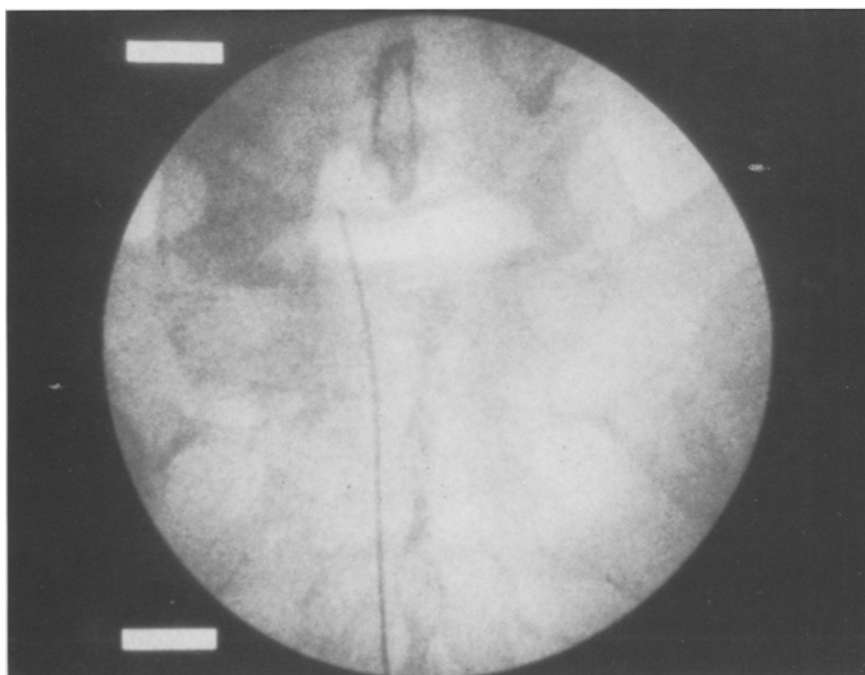


Fig. 4. Fluoroscopic image of guide wire threading

adhesion, permitting the normal saline streams to approach the root area from multiple different directions. After 60ml of normal saline irrigation, 60mg of supernatant-extracted triamcinolone in 5ml as described above [4] was directed at the root area from multiple directions. Subsequently, the devices were removed atraumatically.

Upon evaluation in the recovery room the patient reported relief of her usual leg pain but presence of discomfort at the insertion site. Physical examination showed negative signs of sciatic tension although there had been no epidural use of local anesthetic. On follow-up at 24h, the patient had no pain whatsoever. One year later the patient continued to be pain-free from radiculopathy.

Discussion

This case report illustrates our previous finding [5] that the epidural space can be accessed safely with flexible fiberoptic catheters, and that use of a steering handle facilitates steering and allows for a more complete visualization of the right L5 root area. Thus the caudad, lateral, and cephalad borders of the adhered tissue were examined. Observation suggested that the adhered tissue could be characterized into dense nonmoving tissue and cottony movable material based on the appearance in the normal saline-distended epidural space and on the response to streams of normal saline irrigation.

The patient's dramatic response probably represents a mechanical change in the architecture of the adhered

tissue in and around the right L5 root area. This is felt to be the case since signs of sciatic tension immediately became negative in spite of the fact that no local anesthetic had been injected. Nor could such a dramatic change be ascribed to the normal saline or triamcinolone injections. Thus, it is likely that the stream of normal saline with the concomitant hydrostatic pressure that had developed in the epidural space caused a lysis of adhesion in a similar manner to the Racz technique [3]. It is likely that the adhesions were not completely removed, but the movement of the cottony material followed by the direct application of steroid may have allowed the adhered tissue planes to glide upon one another better and may thus have accounted for the immediate change. Such observations are confirmed by the work of Ooi et al. [6] who showed that roots clumped down from arachnoiditis did not move back and forth through neuroforamen during a Laseque's test. In order to maintain such an improved clinical status, it would be necessary to inhibit further connective tissue deposition. The long-term success in this case and others with true sciatic tension resulted from the successful prevention of connective tissue deposition by steroids or perhaps from the mechanical lysis caused by hydrostatic pressure.

In conclusion, we have succeeded in the direct visualization of the lumbosacral epidural space and its pathology using the steerable introducer. This newly developed device has enabled us to directly visualize and treat pathology in the lumbosacral epidural space which has persisted in spite of numerous previous treatments. This report, the first demonstration of its kind, provides a valuable additional treatment modality and promises significant improvement in the treatment of lumbosacral radiculopathy.

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