Use of an Angiographic Catheter in Place of the Racz Epidural Catheter in the Lysis of Epidural Space Adhesions

A Technical Note

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Summary

This technical note describes lysis of adhesions in the epidural space with the use of a 5F vascular catheter inserted on a 0.35-inch guide passed through the sacral foramen. Commonly employed in the administration of anesthetics, a vascular catheter can be advantageously used in place of the Racz epidural catheter, with a potential reduction in damage to the nerve structures of the sacral canal.

Introduction

Lysis of adhesions in the epidural space is most often performed according to the technique described by Racz et al¹⁻³. The technique involves epidurography, neurolysis and administration of drugs and saline solution into the epidural space of the affected nerve root. The access route is usually through the sacral hiatus. A Racz catheter (Epidmed International, Gloverville, NY, USA) is inserted and advanced through a 16-G RK needle (Epidmed International) to lyse fibrous adhesions under fluoroscopic guidance with organo-iodate contrast dye. Local anesthetics and cortisone are administered via the catheter into the epidural space. Hypertonic saline solution is then slowly injected in stepwise fashion to mechanically disintegrate the fibrous adhesions. In the routine Racz technique, the procedure is repeated on the second and third days with the recommended administration of hyaluronidase¹⁻⁶ instead of steroids¹⁻⁵.

Fibrous adhesions can form around the nerve roots of the lumbar spine after surgery and are often the cause of lower back pain, also referred to as the failed back surgery syndrome.

We propose an alternative procedure to the Racz catheter, wherein a 5F vascular catheter is advanced over a 0.035-inch coaxial directable guide inserted into the epidural space through the sacral foramen and passed cephalad under fluoroscopic guidance. In our opinion, vascular catheters offer the advantage of optimal flexibility with smaller diameter, making them potentially less traumatic than those commonly used in neurolysis with the Racz catheter.

Materials and Methods

A patient who had undergone left hemilaminectomy at L4 for disc herniation (L4-L5) was referred to our unit because of chronic low back pain that had arisen about six months after the operation and had gradually worsened.

Lumbar computed tomography (CT) revealed thickening of the soft tissues surrounding the pre- and intraforaminal portions of the left L4 nerve root, initially attributed to fibrous tissue reaction following surgery. This was thought to be the cause of the patient's chronic pain which was exacerbated by mechanical stretching of the nerve root during spinal movement. The patient consented to undergo a minimally invasive procedure.

The patient was positioned prone on the operating table. The sacral hiatus was located by

Figure 1 Fluoroscopic sagittal image shows the technical approach of epidural lysis through the sacral foramen using a 16 G needle.

Figure 2 Contrast agent administration shows the classic Christmas tree pattern along the spinal nerve roots once the needle is successfully placed in the anterior epidural space.

palpation and the overlying skin and subcutaneous tissues were sterilized and a local anesthetic applied. A 5F vascular introducer kit was prepared. A 16G needle was inserted into the sacral foramen by access through the right paramedian and contralateral to the side of the affected nerve root (Figure 1). Under fluoroscopic guidance, the needle was advanced into the epidural space and the contrast dye dispersed, producing the classic Christmas tree pattern (Figure 2). The stylet was then removed and a short 0.035-inch guidewire was inserted over which the introducer was passed. The dilator was removed from the introducer and a 5F vascular catheter was inserted into the introducer and advanced cephalad under fluoroscopic guidance with stepwise administration of contrast agent to visualize the epidural space (Figure 3). The tip of the fibrous adhesion appeared as a sharp interruption in the epidural opacifi-

cation of a spinal branch (Figure 4). The catheter and the guidewire were then directed manually toward the site and delicately advanced and retracted to free the nerve root from the surrounding fibrous adhesions (Figure 5). Release of the nerve root was visualized by the discharge of contrast dye along its course (Figure 6). A vial of dexamethasone and a vial of local anesthetic (naropin) were then administered. The access site was then medicated and control visits were scheduled at three and six months. Complete relief of pain symptoms was maintained at both follow-up assessments.

Discussion

Racz et al.⁵ hypothesized that nerve root pain in a setting of epidural fibrous adhesions was linked to inflammation, edema, fibrosis,

Figure 3 Lateral view shows positioning of a 5F introducer in the anterior epidural space. The correct positioning of the device is documented by the contrast enhancement running along the dorsal wall of vertebral sacral bodies.

Figure 4 A sudden arrest of contrast flow along the left spinal root of L4 suggests the presence of fibrous adhesions surrounding the nerve.

and venous congestion of the nerve root; mechanical compression on the posterior longitudinal ligament, the annulus fibrosus and the nerve root; and reduced or lack of nutrients to the nerve root, all of which could cause chronic pain in patients with low back pain. Accordingly, pain therapy is with local administration of anti-inflammatories, steroids, local anesthetics and eventually hypertonic saline solution and hyaluronidase to induce lysis of adhesions.

Vascular microcatheters are widely used in invasive vascular procedures as their optimal flexibility and small diameter allow them to reach distal arterial branches. Similarly, vascular catheters may also be employed to reach epidural spaces at a remarkable distance from the insertion site, including the cervical spaces, with minimal risk of injury to the spinal nerve roots and the spinal cord. This technique was described with lumbar access via an interlami-

nar approach⁷, wherein a F2.3 catheter was inserted over a 0.018-inch guide under fluoroscopic control. A much easier access is through the sacral foramen, a technique we routinely use in the treatment of low back pain.

Classical neurolysis is performed by mechanically disintegrating the fibrous adhesions by means of injection of a hypertonic saline solution which distends and breaks the fibers surrounding the nerve roots, thus opening the perineural space.

In the case presented here, instead of spraying a jet of saline solution, we used a stiff 0.035-inch guidewire over which a vascular catheter was passed and then both advanced cephalad through paths of least resistance into the fibrous formation and along the course of the nerve root to open the perineural space. Following lysis of the adhesions, we administered medications commonly used for treating

↑ *Figure 5* Repeated back and forth movement of the guidewire and catheter throughout the spinal foramen causes mechanical lysis of the fibrous adhesions around the spinal root.

Figure 6 A free flow of contrast along the treated nerve → root is evidence of successful epidural lysis. The contrast flow is seen in the anterior-posterior view as a laminar opacity crossing the left wall of L4.

low back pain such as corticosteroids and narpin. Hyaluronidase and hypertonic solution were not given because the hyaluronidase is known to cause allergic reactions and hypertonic solution is associated with a risk of injury to the nervous system if inadvertently injected into the subarachnoid space.

In our experience, the main advantages of using a vascular catheter instead of the Racz catheter are a reduced diameter, major flexibility and elasticity which lead to a better maneuverability also due to the use of a coaxial guide and to the curve of the final tip of the catheter which allows it to be placed in the desired foramen. To us these factors reduce the risk of

trauma and allow a better delivery of drugs (steroids and anaesthetics) around the desired spinal nerve. Small cavities created around the spinal nerve by the repeated mechanical movement of the guidewire allow a better distribution of drugs and interstitial drainage.

Conclusion

In our experience, the use of a 5F vascular catheter passed over a 0.035-inch guide and inserted into the anterior epidural space may be a valid alternative in the lysis of adhesions and the treatment of low back pain.

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