

Difficulty in the removal of epidural catheter for labor analgesia

ABSTRACT

For labor pain management epidural analgesia is a popular and an effective method. Difficult removal of epidural catheters occasionally occurs, and several maneuvers have been recommended. The purpose of this article is to raise awareness of the problem of retained epidural catheter fragments and identify the potential impact of complications.

Key words: Catheter knotting; epidural; labor analgesia

Introduction

Epidural analgesia in labor is an extremely effective and popular treatment for labor pain. However, difficulty in removing the epidural catheter may occasionally arise. Management of epidural catheter extraction has been reported, but there are no clear management guidelines. A variety of techniques have been described to facilitate removal. These include change of patient position, slow traction, and continued traction over extended time, wiggling motions, and waiting for the catheter to dislodge by itself.^[2-5] Injection of saline has also been reported to facilitate difficult epidural catheter removal, and if all failed, its whereabouts may be determined by radiological imaging.

Case Report

A 28-year-old woman, morbid obese with body mass index 38, American Society of Anesthesiologists(ASA) Class II, gravida 4 para 2, 40 + 6 weeks of gestation scheduled for elective induction of labor due to post dates. To provide adequate analgesia to facilitate labor, an epidural catheter

was planned. While sitting, midline approach, at L3 – L4 vertebral interspace, the epidural space was identified using the loss of resistance to saline technique, using an 18-gauge needle with Portex® Epidural Maxipack Catheter (Smiths Medical ASD, Inc. Keene, NH 03431, USA), space found at 8 cm, and the catheter pushed in another 5 cm, to a total of 13 cm mark at the skin without any difficulty. An epidural test dose of 3 mL of 2% lidocaine with 1:200,000 epinephrine indicated positively that the epidural catheter was neither intrathecally nor intravascularly placed. The patient tolerated the procedure well with satisfactory pain control. After 3 h of normal spontaneously vaginal delivery, when it was time for the catheter to be removed, the anesthesia registrar encountered difficulty in removing the catheter and had two failed attempts. The covering consultant anesthesiologist who came to help the registrar also encountered difficulty, even with the patient assuming either the sitting position with flexed back or the lateral decubitus flexion position. The patient sitting on her bed in squatting position with knee touching chest, in this position catheter came out easily. The

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catheter was intact but became elongated because of pulling it for removal. The patient was discharged 1 day later without any neurological sequel.

Discussion

Difficult removal of epidural catheters occasionally occurs, and several maneuvers have been recommended. There are several causes of problematic epidural catheter removal, such as catheter breakage or knotting,^[1,2] which might require a surgical intervention. In a case report of unsuccessful removal of an epidural catheter in a postpartum patient following an epidural analgesia in labor, which ultimately required surgical intervention and fenestration ligamentum flavum to remove the epidural catheter, which was done through a small incision (1 inch), a fenestration of ligamentum flavum was performed and a knotted and looped epidural catheter was removed. The patient was discharged next day, and in the follow-up and subsequent visits, the patient recovered well with no other complaints.^[3]

To evaluate the difficult removal of the catheter, we administered normal saline through the catheter to exclude the possibility of catheter knotting because the catheter had been inserted 5 cm into the epidural space. The possibility of catheter knotting increases with the increased length of epidural catheter in the epidural space.^[4] An epidural catheter may be deflected by anatomical obstacles and can curl back on itself. The catheter can become entangled with nerve roots, blood vessels, lumbar fascia, posterior vertebral arches, vertebral processes, and facet joints. Excessive catheter threading may increase the likelihood of entanglement. Kinking of an epidural catheter might occur at any point between the skin and the epidural space.

There are numerous case reports of shearing or tearing epidural catheters, especially in chronic pain procedures.^[5] Shearing can be caused by withdrawing a catheter through a needle

introducer, slicing the catheter into two pieces [Figure 1]. The catheter may also tear as it catches the barbs of an unsharpened needle. There are a number of explanations why a catheter may shear or tear. These include the application of undue force while removing a catheter, shearing of the catheter by the needle when attempts are made to withdraw the catheter through the introducer needle, nicking of the catheter by an imperfection on the bevel of the needle, shredding of the catheter when the needle is advanced over a previously placed catheter, weakness of the catheter produced by imperfections in manufacturing, and damage to a catheter occurring after placement.

The patient position can be a factor leading to increased force required to insert or remove an epidural catheter. The sitting position places more forces on the spine, creating increasing resistance on withdrawal. The force required to remove a lumbar catheter is 2.5 times more in the sitting position than in the lateral position. In our case, the patient was obese and not fully relaxed enough to open intervertebral space. This might be a reason for difficult removal, on assuming squatting position with knee with chest removed easily. We believe that the cause of the difficult removal of the epidural catheter in this case might have resulted from an unusual and unwanted deeper anchorage of the catheter along the anterior epidural space during placement secondary to trauma to epidural catheters on insertion or removal may result in shearing or breakage [Figure 2].

Manufacturers provide precautionary warnings on their labels, including a warning that excessive or undue withdrawal force should not be used. The maximal withdrawal force, in Newton, is generally not listed in terms of exerted pressure or technique on manufacturer labeling. These pressures can be measured clinically using a portable force gauge. Clinically, the average normal force required to remove an epidural catheter is 2.04 N (1 N is ~ 0.225 lb of force).^[7] Although there is no evidence of neurologic sequelae from a sheared catheter, many reports still advocate eventual surgical removal.

The literature suggests the following options: (1) using slow continuous force at all times; (2) discontinuing application of force if the catheter begins to stretch and reapplying traction several hours later; (3) placing of the patient in

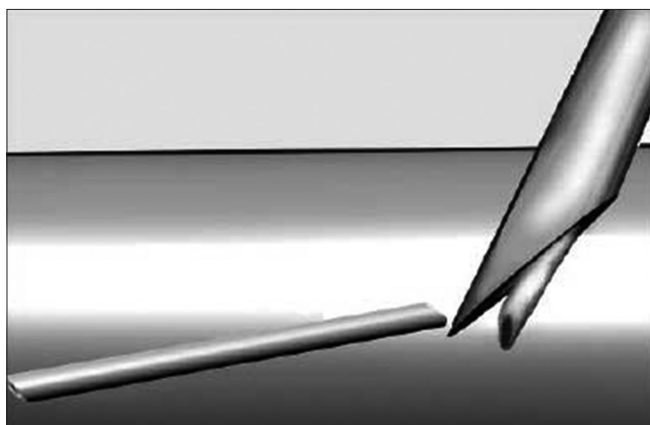


Figure 1: Shearing of epidural catheter by needle tip



Figure 2: The elongated epidural catheter after difficult removal

the same position as insertion; (4) placing the patient in the lateral decubitus position if possible; (5) attempting to remove in extreme flexion if the previous interventions are not efficacious; (6) attempting extension if flexion fails; (7) attempting removal after injection of preservative-free normal saline through the catheter; (8) considering the use of a convex surgical frame; (9) considering computed tomographic scan to identify the etiology of entrapment; (10) considering leaving a retained epidural catheter in place in adult patients; (11) providing patient education regarding “red flags” to watch out for; and (12) neurosurgical consultation for all cases in which the catheter fragment is in the spinal canal.

Pierre *et al.*^[4] reported a case in which there was difficulty removing an entrapped epidural catheter in a postpartum woman approximately 7.5 h after insertion. It was found that cessation of traction for 3 h facilitated subsequent easy removal. This finding is interesting because it suggests that epidural catheters used for a prolonged period (i.e., >24 h) may behave differently with applied traction than those epidural catheters that are used only for a short period, perhaps secondary to inflammation and subsequent fibrosis or catheter migration.^[6]

Epidural catheters that are threaded more than 5 cm into the epidural space have an increased likelihood of knotting. If the epidural catheter breaks during the removal, the surgical removal should be considered first. The best practice is to assure the patient that neurological complications are quite rare and inform the patient of treatments available in such cases. It is reasonable to remove the epidural catheter surgically in children to reduce the possibility of neurological problems through growth and development or in adults with definite neurological symptoms as well as in cases in which the catheter tip is located in the dura.^[8]

Conclusion

The purpose of this article is to raise awareness of the problem of retained epidural catheter fragments and identify the potential impact of complications. It also informs nurse anesthetists how to prevent potential problems through good practices, encourages the practice of recording catheter retention in medical records and informing patients of retained devices, and promotes the reporting of such incidents.

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Conflicts of interest

There are no conflicts of interest.

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