Transforaminal escape of a lumbar epidural catheter

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A patient is presented whose lumbar epidural catheter was found to lie in the paravertebral tissues during a right radical nephrectomy. The catheter had been placed with the patient awake and the procedure performed in a routine fashion without difficulty or indication of catheter malposition. Four ml of 2% CO₂ lidocaine were initially injected as a test dose without any demonstrable effect. After the induction of general anaesthesia, fentanyl 100 µg and 0.25% bupivacaine 10 ml were injected slowly into the catheter. Previous studies suggest that transforaminal escape of an epidural catheter occurs after 1–6% of insertions. It may occur without nerve root symptoms during catheter placement. The authors recommend that epidural catheters be introduced whilst the patients are awake and an effective block demonstrated before induction of general anaesthesia.

Ce rapport clinique décrit un patient chez qui un cathéter inséré dans l'espace péridural avant l'induction anesthésique a été retrouvé dans les tissus paravertébraux au cours d'une néphrectomie radicale droite. L'insertion du cathéter s'est faite sans difficulté et sans évidence de faux trajet. Une dose test de 4 ml de lidocaïne 2% carbonatée fut d'abord injectée par le cathéter sans effet secondaire. Après l'induction d'une anesthésie générale, 100 µg de fentanyl et 10 ml de bupivacaine 0,25% ont été injectés lentement par le cathéter. Des études antérieures ont démontré que 1 à 6% des cathéters insérés dans l'espace péridural pouvaient migrer à travers les trous de conjugaison. Ceci n'est pas toujours accompagné de symptômes indiquant une atteinte des racines nerveuses. Les auteurs recommandent que l'insertion des cathéters périduraux se fassent chez le patient

éveillé et qu'un bloc sensitif et/ou moteur soit mis en évidence avant l'induction d'une anesthésie générale.

Case report

A 79-yr-old woman presented for a right radical nephrectomy due to renal cell carcinoma. She had a history of coronary artery disease, hypertension, non insulin dependent diabetes mellitus and peripheral vascular disease. She had no previous history of back or spine pathology. After obtaining the patient's consent, it was decided to utilize a combined regional and general anaesthetic technique. The epidural catheter was also to be used for postoperative pain control.

Upon arrival in the operating room, an intravenous catheter was placed and blood pressure, ECG, and pulse oximetry monitors were connected. She was placed on her left side and her back was prepared and draped. Using a sterile technique, the L₄₋₅ lumbar interspace was identified and a 17-gauge Tuohy needle was inserted in the midline. The epidural space was located with a loss of resistance technique using an air filled glass syringe. A 20-gauge epidural catheter (Preferred Medical Products – closed end, multi-port, nylon catheter without stylet) was threaded in a cephalad direction without resistance 4 cm beyond the needle tip. At no time did the patient complain of pain or paraesthesia. The Tuohy needle was removed and the catheter was secured to the patient's back.

The patient then resumed a supine position. After confirming a negative aspiration for blood and/or CSF, 2% CO₂ lidocaine, 4 ml, was infused via the catheter. After four minutes there was no evidence of subarachnoid block and general anaesthesia was induced with fentanyl, 100 µg, followed by thiopentone, 275 mg. Muscle relaxation was achieved with vecuronium, 6 mg, and the trachea was intubated. Anaesthesia was maintained with 50% nitrous oxide, and isoflurane, 0.5–1.5%. Shortly after induction, fentanyl, 100 µg in 8 ml saline and bupivacaine 0.25% (without epinephrine), 10 ml, were slowly infused into the epidural catheter. This did not produce any change in blood pressure.

Surgery proceeded via a right subcostal incision with the patient in the supine position. The right kidney was removed and near the end of the operation, when the

Key words

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FIGURE Epidural catheter being lifted by surgeon's forceps. IVC: inferior vena cava.

surgeon was examining the renal bed, the distal portion of the epidural catheter was seen. The tip of the catheter was lying parallel to the inferior vena cava at the L₂–L₃ level. Retrograde dissection revealed the catheter emerging from the anterior vertebral fascia at the L₃–L₄ level (Figure). Verification was achieved by injecting normal saline through the catheter. It was then easily removed by the anaesthetist under direct vision.

The patient was awakened and her postoperative course was uneventful.

Discussion

The lateral boundaries of the epidural space consist mainly of the periosteum of the vertebral pedicles and the intervertebral foramina. The nerve roots exit from each foramen covered with epineurium which is continuous with the dura. Surrounding the nerves at the foramen is the lobulated areolar tissue of the epidural fat. The density of this areolar tissue varies considerably but there is no tissue or ligament to prevent the escape of local anaesthetic (or a catheter) from the intervertebral foramen. With advancing age, this areolar fat becomes a recognizable "operculum" that effectively blocks off these spaces.¹

In 1960, Hehre *et al.*² reported a series of 1780 epidural catheters with a 2% failure rate. Fourteen of the 36 nonfunctioning epidurals were made functional by partially withdrawing the catheters. Twenty-two others were left untouched and their positions were confirmed radiologically. Sixteen of these were found to have emerged through the intervertebral foramina. Only half of these patients experienced paraesthesia during catheter insertion.

Sanchez *et al.*³ performed a similar radiological study in 1967 with 90 catheters inserted to distances ranging from

8 to 16 cm. He had a 6% incidence of transforaminal catheter exit. Similarly, Bridenbaugh *et al.*,⁴ in a series of 198 epidural catheters, described an incidence of transforaminal escape of 4.5%. Moir and Willocks⁵ demonstrated an incidence of clinical catheter failure of only 1% in a series of 30 obstetrical patients.

This case illustrates what may be one of the more common causes of epidural catheter failure. Migration can occur without eliciting paraesthesia during insertion and in the absence of threading an excessive length of catheter into the epidural space. In an effort to avoid catheter complications or failure, we suggest that epidural catheters be placed in awake patients. Small doses of local anaesthetic should be injected to rule out subarachnoid or intravenous injection. Then, a slightly larger dose of local anaesthetic should be injected to demonstrate an appropriate blockade before anaesthesia is induced. This will insure that catheters utilized during general anaesthesia are in the epidural space.

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