Knotted epidural catheter in an infant: A case report

Sir,
Epidural analgesia has many beneficial effects in the paediatric population. In clinical practice, it is commonly used to augment general anaesthesia and to manage postoperative pain.\(^1\) This is a relatively safe procedure; however, adverse events such as dural punctures, spinal haematomas or epidural abscesses have been reported.\(^2\) Among the various issues the anaesthesiologist may face while dealing with epidural catheters, breakage or coiling and knotting of the catheter is a rare but troublesome event.

A 5-month-old healthy male infant weighing 5 kg presented with Hirschsprung’s disease and was admitted for levelling biopsy and Duhamel procedure. Medical history was insignificant with normal physical examination and laboratory investigations. Epidural catheter insertion was planned for intraoperative and postoperative analgesia.

Anaesthesia was induced with thiopentone 25 mg and fentanyl 10 µg, and tracheal intubation was facilitated with atracurium 2.5 mg. A 3.5-mm micro-cuff endotracheal tube was passed. Anaesthesia was maintained with \(\text{N}_2\text{O}, \text{O}_2\) and isoflurane1% with intermittent positive pressure ventilation.

In the left lateral position, with all aseptic precautions, the epidural space was identified by loss of resistance technique at L2–L3 level using B. BRAUN Perican® 20-gauge Tuohy needle, and a 24-gauge catheter was introduced 9 cm beyond the tip. As the Tuohy needle was being removed, the catheter was continuously threaded. After removal of the Tuohy needle, an attempt was made to withdraw the catheter such that 4 cm of catheter remained inside the epidural space. However, a significant resistance was encountered at 9 cm in spite of steady and persistent traction. Various methods were tried for the removal of catheter, but none showed results. A computerised tomography scan was done, and the level of catheter was identified. After consultation with neurosurgeon and discussion with the parents, consent was taken for laminotomy, and the catheter was retrieved by a neurosurgeon. As seen in Figure 1, a loop had formed at 9 cm with the knot.
Regional anaesthesia in neonates and infants has several advantages including reduction in the requirement of systemic opioids and inhalational anaesthetic agents, reduced post-surgical pain and facilitation of early extubation.[3]

Knotting of catheter is a very rare complication with the incidence of 0.0015%. [4] Most cases (88%) involved obstetric patients. [4] Knotting of catheter is related to leaving the catheter too much inside the space. [4] In most cases, it occurs during catheter removal; however, in this case, it occurred during insertion while withdrawing of the catheter to its correct length.

Bromage reported that the catheter tends to be deflected by blood vessels and nerve roots that lie in its path and as a result curl up or double back. This is more common in the lumbar region than in thoracic. This may be because of oblique direction of the needle required in thoracic epidural insertion. [5]

In this case, 9 cm of catheter was inserted before the Tuohy needle was removed. As the Tuohy needle was withdrawn, the catheter was continuously threaded and the speed of catheter insertion was faster than the speed of the Tuohy needle removal. Therefore, the actual length of the catheter in the epidural space was greater before pulling it back and was 10 cm. Leaving the catheter <4 cm in length in the epidural space may avoid this complication. [6]

Once the knot is noticed or difficulty with removal of catheter encountered, there are various options to consider such as gentle, firm and constant traction, or changing the position from flexion to extension to loosen the adhesions, or topical application of hot packs to soften the tissues, or saline injection while pulling the catheter and passing the guidewire into the catheter to increase the rigidity of the catheter. [3] Removal can be done by making a small incision at insertion site. Ultrasound may help in identification of subcutaneous epidural knot.

Some textbooks recommend leaving the sequestered catheter in place instead of attempting surgical removal because epidural catheters are manufactured of biologically inert materials. This is reasonable in adults, but not in children. In a growing child, the indwelling time of catheter is longer and it may lead to erosion of dura, infection, fibrosis and irritation of nerve tissues. Alternatively, removal of epidural fragment by laminectomy can be considered. It should be kept in mind that, in an infant, this may disrupt spinal development and lead to scoliosis. [7]

If the catheter is sheared during removal, it has been suggested that catheter fragment may be left in situ and the residual part will become eventually fibrosed with limited risk of harm to the patient. Continuous monitoring is suggested given the risk of infection related to a retained foreign body. [8]

Despite the numerous advantages of neuraxial analgesia, complications can occur during the placement. As noted in this case, blind advancement and over-threading may result in inadvertent knot formation. Excessive threading of the catheter in the epidural space may result in knotting, malposition and displacement. Hence, caution has to be exercised while threading the catheter.

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Conflicts of interest
There are no conflicts of interest.

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Sir,

A 52-year-old post-menopausal female belonging to American Society of Anesthesiologists Physical Status Class 1, weighing 50 kg, diagnosed with renal cell carcinoma, presented to us for right laparoscopic partial nephrectomy under general anaesthesia. On pre-anaesthetic workup, she had no known allergies, and all investigations were within normal limits. She gave a history of attaining menopause 2 years back. Protocol-based anxiolytics and antacids were given to the patient on the night before surgery. An 18-gauge intravenous (i.v.) cannula was secured in left upper limb using transparent Tegaderm™ dressing. Anaesthesia was induced with injection fentanyl 100 µg, propofol 100 mg and vecuronium 5 mg i.v. The trachea was intubated with 7.5 mm cuffed endotracheal tube (ETT) which was secured using Durapore™ tape, while taking care of any skin puckering and skin tension. After applying ointment in both the eyes, eyelids were taped using Durapore™ tape. After this, patient was given right lateral kidney position. Special care was taken to avoid any pressure.

Intra-operative episodes of hot flushes can raise the temperature of facial skin making it more prone for injury. Adhesive tapes can be made of synthetic rubber, acrylate or silicone. Acrylate-based adhesives are commonly used to secure the ETT and to tape the eyelids. These tapes can cause allergic dermatitis, contact dermatitis and mechanical injuries. Risk factors for such adhesive-induced skin injuries include patients on chronic steroid therapy, use of exfoliating agent, prolonged surgeries, prone positioning and extremes of age.

Menopause renders the skin around face, genital area and lower limb prone for injury. Decrease in oestrogen level causes a decrease in polymerisation of glycosaminoglycans and degeneration of elastin fibres. It also causes a reduction in Type 1 and Type 3 collagen fibres with reversal of Type 3 to Type 1 collagen ratio which leads to skin atrophy.

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