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International Journal of Clinical Anesthesiology

Short communication

Knotting of Epidural Catheter in a Newborn - A Report and Brief Review of Paediatric Epidural Catheters

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Submitted: 04 May 2017

Accepted: 31 May 2017

Published: 02 June 2017

ISSN: 2333-6641

Abstract

Epidural analgesia is now being routinely used for thoracic and abdominal surgeries in children including neonates. Continuous infusion can be given through an epidural catheter placed in lumbar or thoracic epidural space.

Recently, we encountered a rare complication of catheter knotting during removal of an epidural catheter (EC) in a newborn. We report this case and review some paediatric ECs available in the market in order to understand why knotting happens and what can be done to prevent it.

INTRODUCTION

In our institution, we routinely use epidural analgesia for thoracic and abdominal surgeries in children. Recently, we encountered a rare complication during removal of an epidural catheter (EC) in a newborn. We report this case and review some paediatric ECs available in the market in order to understand why knotting happens and what can be done to prevent it.

CASE REPORT

Following written informed consent from the parents, a one-day old full term baby, weight 2.8 Kg, diagnosed as ileal atresia was brought for laparotomy. After general anaesthesia, a 24 G EC was inserted through 20 G 50 mm Tuohy needle (Perifix ® ONE B. Braun Melsungen, Germany) at L 3-4 level in lateral position. The epidural space was 8 mm from skin by the loss of resistance (LOR) technique. The EC was subcutaneously tunneled for 3 cm laterally and fixed with the 10 cm mark at skin. A continuous infusion of 0.125% bupivacaine with 1µg/ml fentanyl was started at 0.2ml/h after ruling out intravascular placement, and continued in the post-operative period. There was no requirement of any other analgesia or sedation. After 48 h, when the EC was pulled out there was resistance and it was removed with some gentle force. The local area did not show evidence of any trauma. On inspection, a tight knot was seen at the distal end; 9 mm from the catheter tip and the EC distal to the knot was overstretched and thinned out, as shown in Figure 1 and 2.

We hypothesize that the EC coiled during insertion but the knot formed during its removal. It is made of polyamide that makes it highly flexible and kink resistant (www.bbraun.com), so it coiled and later stretched on being pulled out against resistance. Due to absence of lumbar lordosis, infants may have an advantage during catheter advancement but coiling is still not very uncommon [1]. In order to avoid knotting, coiling must be prevented by inserting minimal length of catheter (at the risk of

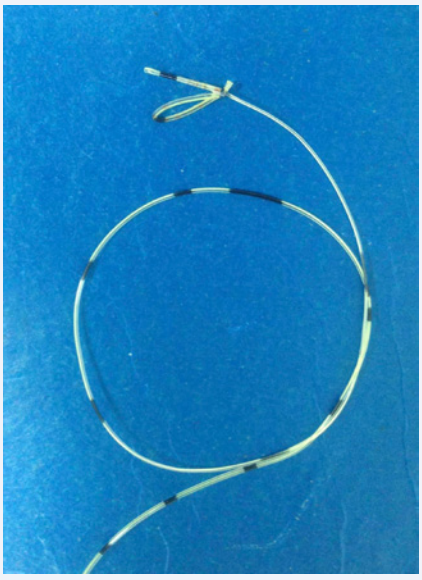

Figure 1 The epidural catheter with the distal knot.

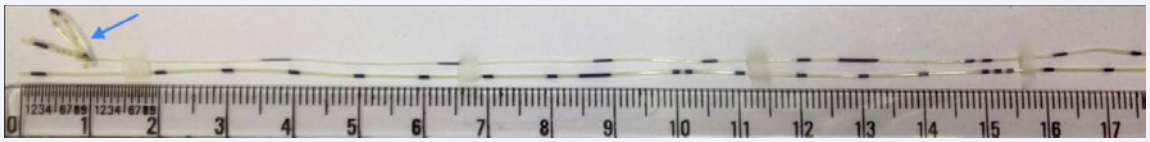

Figure 2 24 G Epidural catheters. Top: stretched out catheter, distal knot (arrow); Below: similar unused catheter.

catheter extrusion during placement, or later while positioning the patient) (at the risk of dural puncture and damage to the spinal cord in thoracic and lumbar insertions, in the absence of technical expertise) or using ultrasound guidance wherever feasible [2]. Subcutaneous tunneling is an easy way to secure a minimally placed epidural catheter in children. It anchors the catheter and prevents an accidental extrusion.

Coiling may not be noticed until the time for removal of the epidural catheter as in the case described. The drugs can be easily injected through the catheter for a few days in spite of the coiling. When the catheter is pulled out, there may be knotting at the coiled out portion. Further pulling of the catheter would tighten the knot and stretch out the catheter. Extra force would be required to remove the catheter, with a risk of catheter breakage reroute. Therefore, it is also advised to thoroughly inspect the catheter tip after removal in every case.

REVIEW OF PEDIATRIC EPIDURAL CATHETERS

We reviewed three commonly used pediatric ECs available in the market such as Braun (B. Braun Melsungen, Germany), Portex (Smiths Medical International Ltd Kent, UK) and Vygon (Vygon Ecouen, France) who have specially designed EC for children. The needle is shorter (50 mm) and thinner (Braun 20 G; Portex 18/19/20 G/vygon 19 G) than that in adults and is marked at shorter intervals (5 mm). The catheters are available in 20 (Braun, Portex)/22 (Vygon)/24 (Braun) G sizes and are made of polyamide/polyurethrane/nylon that makes them soft, flexible, and kink resistant. Those EC with closed tip (Braun, in some countries Portex) and lateral eyes are likely to be less traumatic and may prevent intravenous migration. All these ECs are clear (Braun), transparent (Portex), or translucent (Vygon). Vygon EC has a radiopaque line for radiologic confirmation of catheter position. Standard markings at 1 cm interval and those at 10, 15, and 20 cm help in determining the length of EC inserted. The ECs have a marking at or near the distal tip that confirms full catheter removal. Braun EC has two additional marks, one to indicate the position where the catheter leaves the needle tip and the other to indicate correct catheter length inside the connector. The length of ECs is sufficient for subcutaneous tunneling and securing (Braun 720 mm; Portex 650 mm; Vygon 400 mm with a tubing and injection port attached via a short needle). The epidural minipacks come with a 10 ml LOR syringe, 0.2 µm flat transparent small sized filter with Luer lock, and a convenient snap-on connector.

CONCLUSION

In conclusion, epidural catheters are now available in small sizes and are specially designed to add safety to their placement. They may stretch and thin out when pulled out but are unlikely to break off unless great force is applied. They prevent kinking, local trauma, and intravenous migration but at the same time their susceptibility to coil on insertion and knot on removal cannot be ignored.

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Cite this article

Goyal R (2017) Knotting of Epidural Catheter in a Newborn- A Report and Brief Review of Paediatric Epidural Catheters. Int J Clin Anesthesiol 5(3): 1071.