CASE REPORT

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Knotted and Surgically Removed Epidural Catheter

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ABSTRACT Epidural catheter placement is a procedure performed for anesthesia and/or continuous analgesia. Although rare, complications may develop at different stages of the procedure. Catheter damage and displacement throughout the follow-up period, knotting, challenging removal during removal, intrathecal or intravascular implantation, unsuccessful catheter placement, and the development of epidural hemorrhage are a few of these. The epidural catheter knotting complication is quite rare. In this article, we report a case in which we placed a lumbar epidural catheter for postoperative analgesia in a patient with an undisplaced fracture extending from the right iliac wing to the acetabulum and a right displaced distal femur fracture and then removed the knotted catheter without complications.

Keywords: Analgesia; epidural; catheters; complications

Some complications may develop during insertion/removal of the epidural catheter. Catheter damage and displacement throughout the follow-up period, knotting, challenging removal during removal, intrathecal or intravascular implantation, unsuccessful catheter placement, and the development of epidural hemorrhage are a few of these.[1]

A number of factors, such as the anatomy of the epidural space, the catheter's diameter, tensile strength, and flexibility, as well as the depth and difficulty of insertion, can occasionally make catheter removal challenging.[2]

The epidural catheter knotting complication is quite rare. In one study, the incidence was reported as 0.00015%.[3]

The aim of this article is to present an epidural catheter that had to be surgically removed due to severe resistance during withdrawal and was found to be knotted.

CASE REPORTS

A 58 year-old male patient, whose informed consent was obtained, was operated for an undisplaced fracture extending from the right iliac wing to the acetabulum and a right displaced distal femur fracture. He had no known comorbidities. For postoperative analgesia, a 20 gauge Thouhy needle and epidural catheter (Egemen® International Co.Ltd, Türkiye-Epifix® Mini Set) were applied through the L4-5 interval in the lateral position. The epidural catheter was fixed to the skin at 13 cm. No complication was observed during insertion of the epidural catheter and during the follow-up. For analgesia, bupivacaine (VEM Pharmaceuticals Inc.,Türkiye) 0.5% (5 ml)+

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0.9% NaCl (5 ml) total 10 ml bolus application was performed intermittently. No resistance was encountered during injection from the catheter in the following days. On the 5th day of follow-up, epidural catheter removal was planned because of dynamic VAS 2. After the catheter was withdrawn up to 9 cm, resistance to withdrawal was encountered. Different body positions (flexion, extension, rotation) were tried. However, resistance to pull out continued. In order to determine the location of the catheter, the catheter was detected with radiopaque by scopy. The opacity was determined to be at the level of the facet joint at the L4 level (Figure 1). It was thought to be stuck in the facet joint.

After the necessary markings were made, the neurosurgeon made a skin incision 2 cm lateral to the catheter entry site under local anesthesia.

It was seen that the catheter was knotted in the neighborhood of the L3-4 facet joint and stuck in the joint (Figure 2).

When removed, it was found that the catheter was knotted 1 cm proximal to the tip (Figure 3).

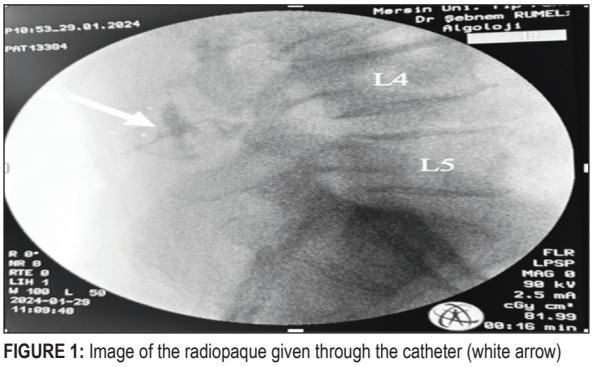

FIGURE 1: Image of the radiopaque given through the catheter (white arrow)

FIGURE 2: Surgical removal of the catheter

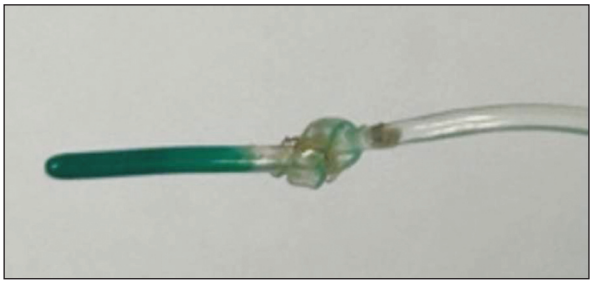

FIGURE 3: Knot proximal to the catheter

He was observed for 24 hours for complications. The patient was discharged the next day.

DISCUSSION

In our case, the epidural catheter was difficult to withdraw due to its stuckness in the facet joint as well as the existence of a knot.

In many reports related with epidural catheters that develop knots, it has been reported that excessive advancement of the catheter into the epidural space may be a factor leading to knot formation.[3-5] It has been reported that catheters advanced more than 4.5 cm in the lumbar epidural space have an increased tendency to change direction, a twist or ring may form, which may facilitate knot formation.[6] In addition, excessive advancement of the catheter may result in dislodgement from the intervertebral foramen, entanglement around the nerve or a combination of these complications.[7] Lim et al. found that 13% of the lumbar catheters placed in a group of 45 men were advanced more than 4 cm without coiling and coiling occurred at an average length of 2.8 cm from the catheter tip.[8] In one study, based on 18 case reports, the frequency of knotted catheters was estimated to be 1: 2,000-30,000.[9] In line with our case study, 87% of the knots occur less than 3 cm from the catheter tip.[9] We think that excessive advancement of the epidural catheter may have facilitated knot formation in our case.

The position of the patient during insertion of the epidural catheter, the region of the vertebral column where the catheter was inserted and the experience of the practitioner were not evaluated as risk factors. However, we think that the angle of entry during the advancement of the needle, especially in

the lateral position, is important. The needle can easily pass through all the layers in front of it because of its hard structure. However, it may not be possible to keep the catheter in the same line after the needle is removed due to its flexible structure. The catheter line during lateral entry may be different from the line in supine or prone position. This is the underlying reason for the recommended position changes during withdrawal. In our case, we think that the reason for the catheter getting stuck in the facet joint during withdrawal was the angulation during withdrawal because the needle entry site was far from the midline.

Removal of the epidural catheter should be performed by experienced physicians. The withdrawal procedure should be terminated if the patient experiences pain, paresthesia, or catheter strain. A case report that was recently published emphasized that, in cases where paramedian catheters are difficult to remove, the patient can be placed in a lateral decubitus position with the catheter on top. This will cause the lower extremity on the side where the catheter is located to flex from the hip and push forward, while the scapula on the same side is pushed downward and backward from the shoulder. This will lead to the facet joints to separate, allowing the catheter to be removed.[10]

In another publication, the median approach was recommended to prevent entanglement of paramedian catheters in the nerve roots, facet joints and posterior vertebral arches.[11] Park et al. emphasized that the patient should take the same position as during catheter insertion, the catheter should be tried to be removed in the lateral decubitus position and a constant and continuous force should be applied when the catheter is withdrawn.[1] Gadalla et al. suggested that the catheter could be removed more easily under general anesthesia and with complete muscle relaxation.[12] In the literature, there are publications reporting that it was removed with complete muscle relaxation in cases where the catheter was not knotted but could not be removed due to impingement in the paraspinous muscles.[13]

Surgery should be considered if the catheter rupture during withdrawal, fails to remove even after stretching, or the patient exhibits neurological symptoms.[14] The catheter of our patient was surgically removed because of the risk of breakage.

Administering saline through the catheter and attempting to pull it out is another solution recommendation in the event that removal becomes challenging. Resistance to fluid flow may also be a useful indicator of whether or not the catheter is knotted.[15] In contrast, no resistance was experienced in our case when administering radiopaque material or giving bolus injections during follow-up. We believed that the fluid flow was delivered through different holes in the epidural catheter because of its various holes and soft knot.

We believe that in order to minimize the possibility of knot formation, it is crucial to remove the epidural catheter from the epidural space before it is longer than 5 cm, as many articles have indicated.

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Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Şebnem Rumeli;* ***Design:*** *Şebnem Rumeli, Mesut Bakır;* ***Control/Supervision:*** *Şebnem Rumeli, Mesut Bakır;* ***Data Collection and/or Processing:*** *Nureddin Teker, Mehmet Ertargın;* ***Analysis and/or Interpretation:*** *Şebnem Rumeli, Mesut Bakır, Derya Karataş;* ***Literature Review:*** *Nureddin Teker, Mehmet Ertargın;* ***Writing the Article:*** *Nureddin Teker, Mehmet Ertargın;* ***Critical Review:*** *Derya Karataş, Nureddin Teker;* ***References and Fundings:*** *Nureddin Teker, Derya Karataş;* ***Materials:*** *Derya Karataş, Mehmet Ertargın.*

REFERENCES

1. Park JT, Cho DW, Lee YB. Knotting of a cervical epidural catheter in the patient with post-herpetic neuralgia: a rare complication. J Lifestyle Med. 2017;7(1):41-4. [Crossref] [PubMed] [PMC]
2. Khadka B, Sharma A, Regmi A, Ghimire A, Bhattarai PR. Removing knotted or stuck epidural catheters: a systematic review of case reports. Anesth Pain Med (Seoul). 2023;18(3):315-24. [Crossref] [PubMed] [PMC]
3. Fibuch EE, McNitt JD, Cussen T. Knotting of the Theracath after an uneventful epidural insertion for cesarean delivery. Anesthesiology. 1990;73(6):1293. [PubMed]
4. Blass NH, Roberts RB, Wiley JK. The case of the errant epidural catheter. Anesthesiology. 1981;54(5):419-21. [PubMed]
5. Striebel HW, Dopjans D. Verknotung eines periduralkatheters [Knotting of a peridural catheter]. Reg Anaesth. 1991;14(6):104-5. German. [PubMed]
6. Macfarlane J, Paech MJ. Another knotted epidural catheter. Anaesth Intensive Care. 2002;30(2):240-3. [Crossref] [PubMed]
7. Browne RA, Politi VL. Knotting of an epidural catheter: a case report. Can Anaesth Soc J. 1979;26(2):142-4. [Crossref] [PubMed]
8. Lim YJ, Bahk JH, Ahn WS, Lee SC. Coiling of lumbar epidural catheters. Acta Anaesthesiol Scand. 2002;46(5):603-6. [Crossref] [PubMed]
9. Brichant JF, Bonhomme V, Hans P. On knots in epidural catheters: a case report and a review of the literature. Int J Obstet Anesth. 2006;15(2):159-62. [Crossref] [PubMed]
10. Deng NH, Chen XC, Quan SB. Unique method for removal of knotted lumbar epidural catheter: a case report. World J Clin Cases. 2024;12(10):1824-9. [Crossref] [PubMed] [PMC]
11. Hruska J, Darke M. Management of an entrapped epidural catheter. Cureus. 2024;16(3):e56919. [Crossref] [PubMed] [PMC]
12. Gadalla F. Removal of a tenacious epidural catheter. Anesth Analg. 1992;75(6):1071-2. [Link]
13. Costa C, Fonseca S, Guedes L, Leão A, Sousa A. Epidural catheter anchored in the posterior lateral epidural space: how to manage it. Rev Esp Anestesiol Reanim (Engl Ed). 2018;65(1):59-61. English, Spanish. [Crossref] [PubMed]
14. Al-Kayed O, Al-Bouti F, Ababneh MO. Surgical removal of a looped and knotted epidural catheter in a postpartum patient—a case report. Middle East J Anaesthesiol. 2008;19(4):913-8. [PubMed]
15. Aslanidis T, Fileli A, Pyrgos P. Management and visualization of a kinked epidural catheter. Hippokratia. 2010;14(4):294-6. [Crossref] [PubMed] [PMC]