Doi: 10.5152/TJAR.2021.119

Case Report
Pain

Turkish Journal of Anaesthesiology & Reanimation

Prompt Detection of Intravascular Migration of Cervical Epidural Catheter in Superior Vena Cava Avoids Impending Disaster!

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Cite this article as: Diwan S, Nair A. Prompt Detection of Intravascular Migration of Cervical Epidural Catheter in Superior Vena Cava Avoids Impending Disaster! Turk J Anaesthesiol Reanim 2021; 49(2): 166-8.

Abstract

The intravascular migration of a multihole epidural catheter can have catastrophic consequences. The consequences can be even more exaggerated if the catheter is placed at the cervical or high thoracic region. We suggest a cautious approach before injection of a bolus of local anaesthetic. Whenever in doubt, the exact position of the catheter should be checked using fluoroscopy and contrast injection. In this case report, we have described our experience with an inadvertently placed intravascular cervical epidural catheter.

Keywords: Blood vessels, epidural, fluoroscopy, local anesthesia

Introduction

The intravascular placement of an epidural catheter is an undesirable complication, which can be catastrophic if left undetected. The confirmatory tests such as aspiration of blood, test dose with lidocaine: adrenaline or other drugs, meniscus test, and electrical stimulation are not foolproof. We describe a case in which we encountered an epidural catheter placed at the thoracic level finding its way to the superior vena cava. Computed tomography (CT) scan with contrast helped us in detecting this migration.

Case Presentation

A 54-year-old woman (height: 154 cm, weight: 58 kg) who sustained bilateral multiple rib fractures (MRFs) following trauma (left 3rd to 8th, right 4th to 10th ribs) was referred to us for pain management. There was no flail chest, and oxygen saturation was maintained at 95% with oxygen via face mask at 6 L/min. She had right pneumothorax for which an intercostal drain was placed. No lung parenchymal injuries were detected on CT scan. Apart from diabetes mellitus, she did not have any other comorbidities. She had severe pain at the fracture site, with a visual analogue scale of 7 of 10 on the right and 8 of 10 on the left side. Results of laboratory testing and electrocardiogram (ECG) were within the normal range.

In view of bilateral MRFs, after obtaining an informed consent from the patient, we chose a thoracic epidural at the level of T3-4 with the intention of placing the tip of the catheter directed cephalad. During the procedure, routine monitoring including ECG, pulse oximeter and non-invasive blood pressure was established. After 2 failed attempts, it was decided to head in for a cervical epidural and with 90 degrees bevel rotation to direct the catheter tip caudal towards the thoracic epidural area. In the sitting position, the cervical epidural space was located at the level of C7-T1, with loss of resistance to air with an 18G Tuohy needle. A 20G catheter was inserted, which was

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Received: 19.11.2019
Accepted: 01.04.2020

unusually smooth to a length of 7 cm. No blood or clear fluid was detected on slow and stable aspiration. In the supine position after aspiration, a bolus of 3 mL of 2% lidocaine and 5 µg/mL adrenaline was injected in the epidural space as a test dose. The heart rate decreased from a basal 102 per minute to 80 per minute (20% decrease) with a stable blood pressure.

To understand the reason, we decided to perform a CT scan with contrast after obtaining an informed consent from the patient and a waiver for imaging. The CT scan was performed by injecting 3 mL omnipaque (300 mgL/mL), which is a radio-opaque contrast with 10 mL 0.9% saline, through the epidural catheter. The epidural catheter could not be visualised in the cervical and thoracic epidural space (Figure 1a and 1b). A repeat contrast-saline injection did not produce any contrast-enhanced images. The radiologist alerted us regarding a probable intravascular catheter placement. As the dead space of the epidural catheter from proximal to its distal end is 0.2 mL, we injected 0.2 mL contrast in the epidural catheter, and CT images were obtained to delineate the catheter. The CT images were analysed in axial, coronal and sagittal planes. The images revealed that the catheter had entered in the right cervical epidural space. Images also revealed that the tip of the catheter was in the superior vena cava, travelling a distance of 7 cm from the epidural canal. The epidural catheter tip perforated the vertebral vein in the foramen transversarium and through the brachiocephalic vein landed in the superior vena cava (Figure 1c and 1d). We decided to remove the epidural catheter and chose the bilateral ultrasound erector spinae plane block as an alternative technique. During removal, a continuous aspiration revealed blood in the catheter.

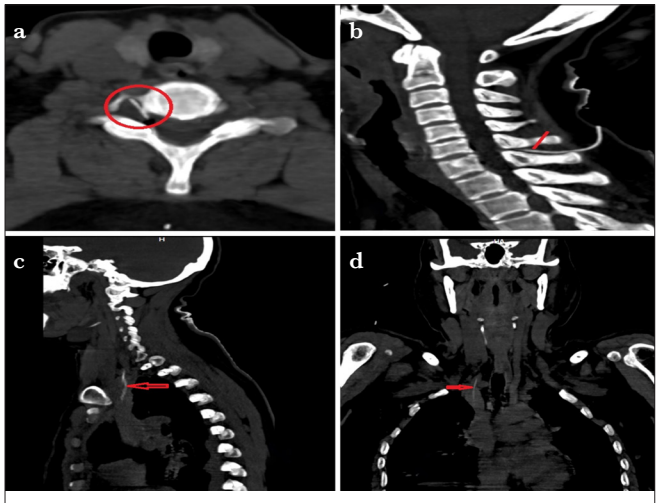

Figure 1. (a) The epidural catheter entering the C6-7 interspinous space in the sagittal view; (b) The epidural catheter leaving the foramen transversarium in the axial view; (c) and (d) The epidural catheter seen in the superior vena cava (red arrow), which could have entered after traversing the vertebral vein in the foramen transversarium.

Main Points:

- The present case report describes an inadvertently placed cervical epidural catheter in the superior vena cava.
- We suggest avoiding the rotation of the needle hub caudally in the cervical epidural space to decrease the incidence of lateral exit from the cervical foramen.
- We suggest the use of fluoroscopy and injection of contrast through the catheter when in doubt.

Discussion

The intravascular placement of an epidural catheter is a potentially fatal complication of epidural anaesthesia. Approximately 1% of intravascular catheters go undetected. The incidence as confirmed by fluoroscopy is up to 1.5% (1). Soft-tip catheters are associated with a lower incidence of intravascular migration (2). Aspiration with multiorifice catheters detects intravascular placement to a better extent than with single-orifice catheters (3). In our case, the multihole catheter did not yield a positive for blood on aspiration on multiple occasions, and a test dose led to a decrease in the heart rate in when in a supine position. The meniscus test performed to verify correct epidural catheter placement to rule out an intravascular, intrathecal or intraligamentous location has sensitivity of 97.4% and specificity of 100% (4). The distension of cervical epidural space before multihole soft-tip catheter placement pushes away vascular structures from the tip of the catheter. Along with lidocaine: adrenaline, other drugs that have been studied as test dose for the intravascular placement of catheters are fentanyl, isoproterenol and ephedrine (5). Saline distension of the epidural space before catheter insertion decreases the incidence of intravascular migration (6). In our case, the meniscus test and saline distension was not applied. Another expensive alternative would be the stimulating catheter. Intravenous placement is confirmed if stimulation is persisting or recurring at pre-test levels (7). Published data assessing the sensitivity and specificity of this test are not available at present.

Although the optimal distance recommended for threading an epidural catheter is 5 cm or less for the lumbar epidural space, no recommendations are available for cervical epidurals. In our case, the catheter was threaded up to 7 cm in the epidural space, which could be the reason behind intravascular entry.

Conclusion

To conclude, there should be a high index of suspicion for anticipating intravascular entry of epidural catheters. We

suggest avoiding the rotation of needle hub caudally in the cervical epidural space to decrease the incidence of lateral exit from the cervical foramen. If CT scan is not available, fluoroscopy with contrast can delineate either the epidural space or the contrast-filled vascular lumen in doubtful situations.

Informed Consent: Written informed consent was obtained from the patient who participated in this case.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept - S.D..; Design - S.D., A.N.; Supervision - S.D.; Resource - S.D.; Materials - S.D..; Data Collection and/or Processing - S.D., A.N.; Analysis and/or Interpretation - S.D.; Literature Search - A.N.; Writing - S.D.; Critical Reviews - A.N.

Conflict of Interest: The authors have no conflicts of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

References

1. Bell DN, Leslie K. Detection of intravascular epidural catheter placement: A review. Anaesth Intensive Care 2007; 35: 335-41. [Crossref]
2. Jaime F, Mandell GL, Vallejo MC, Ramanathan S. Uniport soft-tip, open-ended catheters versus multiport firm-tipped close-ended catheters for epidural labor analgesia: A quality assurance study. J Clin Anesth 2000; 12: 89-93. [Crossref]
3. Michael S, Richmond MN, Birks RJ. A comparison between open-end (single hole) and closed- end (three lateral holes) epidural catheters. Complications and quality of sensory blockade. Anaesthesia 1989; 44: 578-80. [Crossref]
4. Shah J.L. A test to show correct placement of epidural catheter. Anaesthesia 1982; 37: 426-27. [Crossref]
5. Guay J. The epidural test dose: A review. Anesth Analg 2006; 102: 921-29. [Crossref]
6. Gadalla F, Lee SH, Choi KC, Fong J, Gomillion MC, Leighton BL. Injecting saline through the epidural needle decreases the iv epidural catheter placement rate during combined spinal-epidural labour analgesia. Can J Anesth 2003; 50: 382-85. [Crossref]
7. Tsui BC, Gupta S, Finucane B. Confirmation of epidural catheter placement using nerve stimulation. Can J Anaesth 1998; 45: 640-44. [Crossref]