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CASE REPORT

Utility of Transesophageal Echocardiography in Confirmation of Spread of Local Anesthetic in the Epidural Space

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ABSTRACT

A 30-years-old female with diagnosis of carcinoid tumor of right bronchus was planned to undergo right pneumonectomy under combined epidural and general anesthesia. A pediatric transesophageal echocardiography (TEE) probe was inserted for intraoperative monitoring of the right ventricular function. It also showed spinal canal structures (dura matter, epidural and subarachnoid space and spinal cord) and helped in visualization of local anesthetic spread in the epidural space.

Keywords: Epidural, Local anesthetic spread, Transesophageal echocardiography.

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INTRODUCTION

Epidural block is commonly used for thoracic surgery as it provides excellent analgesia and has shown to decrease postoperative morbidity and mortality.[1] One major concern with use of epidural block is uneven and unsatisfactory effect. Precise location of epidural catheter at target level overcomes this issue.

Surface ultrasound has been found useful up to 6-month of age only.[2,3] TEE has been used successfully in children up to 4 years of age but there is no report of its use in adults.[4] We describe a case where intraoperative TEE performed for ventricular function evaluation during pneumonectomy also helped in confirmation of local anesthetic spread in the epidural space.

CASE REPORT

A 30-year-old female, weighing 90 kg, with diagnosis of right intermediate bronchus carcinoid was planned for right lower and middle lobectomy. An 20G epidural catheter (Perifix standard- B Braun medical) was inserted at T6-7 level, 6 cm into the epidural space after manual localization (loss of resistance technique) of epidural space at 7 cm form skin. After induction of anesthesia a 37F left double lumen endotracheal tube was passed into the trachea. The surgical plan was changed to right pneumonectomy following right posterolateral thoracotomy. A pediatric size TEE probe (Philips S7) was inserted into the esophagus to assess the right ventricular function. During TEE examination we could see spinal canal structures and verify spread of local anesthetic in the epidural space.

To visualize spinal cord structures the TEE probe was rotated to approximately 180° from mid-esophageal four chamber view until the descending thoracic aorta was identified, followed by an additional rotation of 10 to 20°. The depth was decreased to 3 to 4 cm and gain was increased to allow for appreciation of an image of the spinal canal. The image of spinal canal was identified by presence of pulsation in subarachnoid space together with spinal cord and duramater. The pulsation of anterior and posterior spinal artery was appreciable but it was not possible to pinpoint the epidural catheter. The TEE probe was pulled up to the origin of descending thoracic aorta that corresponds to T4 level and same maneuver was done to visualize the spinal cord structure. As the TEE probe was pulled up from T6-7 to T4-5 intervertebral space the spinal cord structure initially disappears to reappear again as the TEE probe transducer faces the intervertebral disk. Subsequently, 5 ml of normal saline was injected under aseptic precautions through the epidural catheter at a rate of 1 ml/3s to visually confirm the position of epidural catheter in the epidural space at T5-6 level. There was expansion of epidural space during injection of normal saline (Fig. 1 and Video 1) which disappeared immediately as soon as injection was stopped (Fig. 2 and Video 1). The injected saline initially appeared

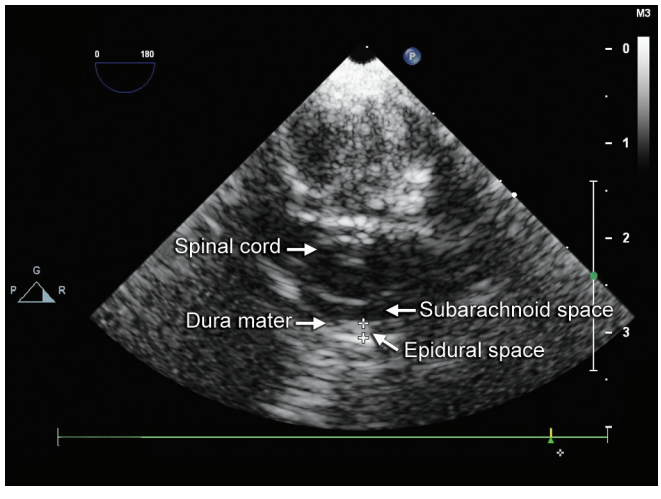

Fig. 1: Descending thoracic short-axis view with 10 to 20° left rotation at T4 level (beginning of descending thoracic aorta) shows expanded epidural space (0.15 cm) during injection of normal saline through epidural catheter

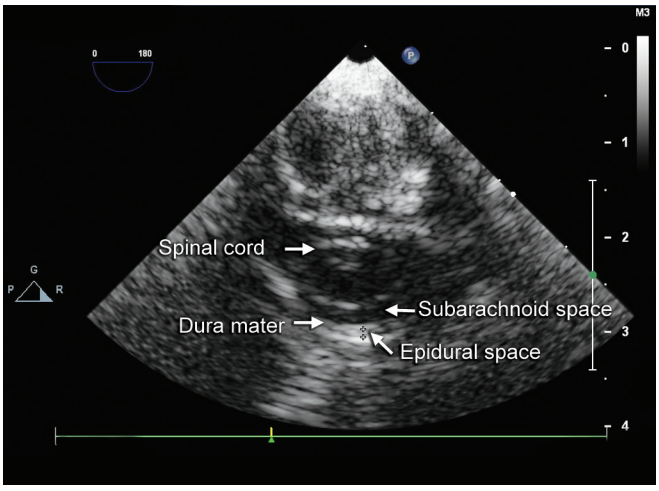

Fig. 2: Descending thoracic short axis view with 10 to 20° left rotation at T4 level (beginning of descending thoracic aorta) shows spinal cord, dura mater, subarachnoid space and epidural space (0.08 cm) soon after injection of normal saline through epidural catheter

in posterior side of epidural space and then spread to other sides. TEE probe was moved one vertebral level above (T4-5) the previous injection site and maneuver was repeated using local anesthetic to distinctly verify the catheter tip position and its localization (anterior, posterior or lateral) in the epidural space.

DISCUSSION

In this report, we were able to visualize the spinal canal structures (subarchnoid space, spinal cord and duramater) and the spread of local anesthetic agent into the epidural space using TEE. Although the epidural catheter was not visualized, the position of epidural catheter was confirmed by expansion of epidural space with injection of saline.

Precise placement of thoracic epidural catheters is required to optimize postoperative analgesia and minimize its adverse effects. A number of methods like radiological fluoroscopy, epidural electrocardiography (epidural ECG), epidural electrical stimulation (EST) for muscle contraction and surface ultrasonography, etc. have been used to confirm epidural catheter location.[5,6] These procedures are not used commonly due to inherent problems. Surface ultrasonography has been used in pediatric patients but its usefulness is limited by patient's age.[2,3] Its utility decreases after 6 months of age due to ossification of vertebrae that interferes with ultrasound beam.[3] Ueda et al[4] showed that TEE can overcome this age limitation of the surface ultrasonography and successfully demonstrated ability of TEE to localize the epidural catheter in patients up to the age of 4 years. TEE generates the image of the spinal canal through intervertebral disk, thus generating a clear view even in older age groups. Though there are few reports for visualization of spinal canal structures using TEE in adults.[7,8] Its utility to verify the position of epidural catheter in the epidural space and spread of local anesthetics has not been shown so far in adults. Ueda et al[4] were able to visualize epidural catheter in the epidural space while it was being inserted and injection of saline through epidural catheter led to expansion of the epidural space showing clear relative position of epidural catheter in the epidural space in his pediatric patients. In contrast in our adult patient visualization of epidural catheter was not clear, also saline injection through epidural catheter caused only temporary expansion of epidural space. This could be related to anatomic changes in epidural space with increase in age. As there is increase in extradural compliance and decreased in resistance with advancing age, the injected saline spread rapidly into the epidural space leading to rapid disappearance of expansion of epidural space in contrast to children.[9]

In this report, we demonstrated usefulness of TEE as a potential alternative method for confirmation of epidural catheter position in addition to provide monitoring for myocardial function. Other advantages of this procedure are that it provides the real-time imaging of anesthetic injected within the epidural space. It is also possible to confirm the catheter location (anterior, posterior or lateral) in epidural space, which could affect the spread of local anesthetic and its effect on adequacy of analgesic effect.

CONCLUSION

TEE may be a useful tool to visualize the structures of spinal canal and for confirmation of spread of saline/local anesthetic in the epidural space in adults.

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