Intrapleural migration of paravertebral catheter in spite of ultrasound guidance

Sir,

Perioperative thoracic paravertebral (PV) analgesia has been used for surgical procedures of the thorax and the upper abdomen. Its effectiveness has been shown to be equal or even superior to that of epidural analgesia for postthoracotomy pain.[1-3]

Many complications have been reported with PV block (PVB) such as the risk of dural puncture, nerve lesions, and hypotension.[4,5] The chances of pleural puncture and pneumothorax have also been reported. The incidence of pleural puncture has varied from 0.8% to 1.1%, and the incidence of pneumothorax has been reported to be around 0.5%.[6,7]

Use of ultrasound for placement of thoracic PVB has been well described in literature.[8,9] The use of ultrasonography (USG) will not only reduce the complications but also the number of attempts and hence, the time required for accurate placement.

This is an interesting case of inadvertent intrapleural catheter migration while placement of PV catheter under USG.

A 27-year-old young male was posted for the right lung metastasectomy. He is a diagnosed case of osteosarcoma right femur. He had undergone limb sparing surgical excision and six cycles of chemotherapy (cisplatin-doxorubicin based). On follow-up positron emission tomography scans, he had metastatic lung nodules and the patient was posted for right posterolateral muscle-sparing thoracotomy.

The patient was taken up in operation theater and routine anesthesia monitors, i.e., electrocardiography, noninvasive blood pressure, and pulse oximetry were attached. The patient was planned for PVB. After surgical disinfection, the PV space along with the transverse process was identified after scanning laterally to locate the ribs using ultrasound guidance, and the point of entry was marked at T7 spine. Transportable ultrasound equipment and a 50 mm linear probe were used. The depth of the PV space was noted to be at around 3 cm from the skin.

A 16 gauge Tuohy needle was advanced in the paramedian position until contact with transverse process was made. Stylet was withdrawn, and the needle walk off the transverse process in the cephalad direction until loss of contact with the bone. The needle was advanced further until the loss of resistance was obtained at 4 cm.

The epidural catheter was threaded easily except for an initial resistance until blood was noted in the epidural catheter. The catheter was slightly withdrawn and fixed at 12 cm. Negative aspiration was done to rule out intravascular or intrathecal leak. Ultrasound was used to confirm appropriate catheter position. Catheter not visualized on ultrasound.

The patient was positioned supine and the airway secured using a 35 Fr left-sided double lumen tube. An infusion of ropivacaine 0.25% was started via the PV catheter. The patient was positioned in left lateral decubitus position. The right lung was isolated and deflated, and thoracotomy was done. The epidural catheter was found lying in the thoracic cavity below the lung [Figure 1]. No further drug was given via the epidural catheter. Since the intercostal drain was already in place after thoracotomy, there was no need for any further radiological examinations to rule out pneumothorax. He was managed with intravenous morphine, paracetamol and diclofenac potassium in the postoperative (PO) period. The PO course was uneventful and was discharged on 7th PO day.

After the surgery, the entry point was reassessed and was noted to be around 5 cm from the midline. The catheter was withdrawn postoperatively.

DISCUSSION

For management of PO acute thoracotomy pain and its sequelae, the PVB is preferred over thoracic epidural analgesia technique. However, USG should be used in coordination with the anatomical and clinical landmarks to avoid complications as in our case.

The depth of the PV space on USG was marked at 3 cm. Hence, the inability to obtain loss of resistance at the expected distance should have prompted a reassessment of space.

Several formulae have been mentioned to estimate the distance of the puncture point from the midline based on various parameters, for example, body weight, height, and age, especially in children.[10] An average estimate of the distance from the midline is about 2.5–3 cm. On repeat measurement in the PO period, the distance from
the midline was noted to be 5 cm. In all possibility, the contact was made with the rib instead of transverse process, and the intercostals muscles were pierced, and loss of resistance obtained at 4 cm was the distinct “pop” of the pleural give way.

Marhofer et al. in their anatomy based description of the technique have described the average distance of the internal intercostal muscle from the skin to be 2.5 cm and the average distance of the pleura from the skin to be 3.2 cm at T6 level. These estimates provide a rough guide for the technique.

The unusually easy threading of the epidural catheter after an initial resistance, up to 12 cm could have been possible only in the intrapleural space. This is beyond the recommended 2–3 cm catheter placement in PV space. The inability to confirm the appropriate catheter position on ultrasound was also a clue for the misplacement of the catheter.

We decided against the maintenance of the intrapleural catheter in view of a malpositioned catheter, extensive lung surgery, and risk of adhesions.

We would like to highlight the usefulness of USG and also the insertion technique of PV catheter. As in our case, the USG screening was used to locate the depth of PV space at 3 cm. It can also be used to visualize real-time deposition of the drug and catheter position in the correct space. Insertion of catheter beyond 2–3 cm and against resistance increased chances of malposition into the pleura. It is also very prudent that after USG screening, the anatomical landmarks should be reassessed as in our case the distance from the midline was marked at 5 cm against the recommended 2.5–3 cm.

Hence, the use of USG screening along with landmark assessment is a noninvasive yet effective technique of assessment PV space and catheter placement.

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**Conflicts of interest**
There are no conflicts of interest.

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