Spread of local anesthetic after thoracic erector spinae and thoracic paravertebral block in patients with multiple posterolateral rib fractures

Sir,

Several regional anesthesia techniques are used in clinical practice to offer pain relief in patients who sustain multiple posterolateral ribs fractures (MPLRF) as a result of polytrauma. Each technique has its advantages and offers reasonable pain relief, reduces the worsening of acute lung injury as a result of hypoventilation, facilitates chest physiotherapy, and reduces the overall cost of treatment. Continuous thoracic paravertebral block (ThPVB) and thoracic epidural analgesia (TEA) has been used for years successfully in managing such situations.\cite{1,2} TEA is contraindicated in patients with suspected spinal cord injury under evaluation and coagulopathies. ThPVBs do not act in the presence of hemorrhage in thoracic paravertebral space (PVS) secondary to posterior rib fractures. An alternative recently incorporated in pain relief for rib fracture management is ultrasound (US)-guided serratus anterior plane block (SAPB).\cite{3} However, SAPB is restricted for lateral rib fractures. Recently, the thoracic erector spinae plane block (ESPB) has been used successfully in managing pain due to multiple rib fractures.\cite{4} ESPBs act particularly on dorsal rami, and, in the case of MPLRFs, single injection followed by catheter infusion acts at multiple levels. Here, we have described using eight images the pattern of contrast spread of LA during a continuous ThPVB and a continuous ESPB at the thoracic level. Informed consent was obtained from patients prior to administering the block, for contrast-enhanced computed tomography (CT) studies and for using the images in a scientific journal.
A waiver was offered for CT contrast studies. Continuous blocks were performed in four patients (two ThPVB and two thoracic ESPB) who sustained MPLRF. There were no major bone fractures, abdominal or head injury, and had a Glasgow Coma Scale of 15/15 on admission to the intensive care unit. The US-guided ThPVB was performed by the intercostal approach\(^5\) and US-guided ESPB was performed deep to erector spinae muscle (ESM). A linear array, a high-frequency US probe (13-6 MHz, Sonosite Inc.) was used for the blocks.

At 12 h after achieving a visual analog scale (VAS) of less than 4, a CT contrast study was performed by injecting 5 mL of radio-opaque contrast diluted with 0.9% 20 mL normal saline (a volume of 25 mL) through an indwelling catheter in the ESP. Through the paravertebral catheter, 5 mL of radio-opaque contrast diluted with 0.9% 20 mL normal saline (a volume of 25 mL) was injected. The images were reported by a consultant radiologist.

On reviewing CT contrast images of thoracic ESPB patients, the axial section revealed the contrast flow from deep to ESM into the PVS at two levels but no contrast in the epidural space in all planes. The contrast did appear in the PVS in the coronal and the sagittal sections [Figure 1].

In the ThPVB, the spread was visualized in the anterior and posterior epidural space in the axial section in the first patient.

In the second patient, in the coronal section, the contrast was lateralized in the epidural space. In both patients, the contrast had traveled across the three thoracic intervertebral foramina in the axial and coronal sections [Figure 2].

The ESPB is a dorsal rami block. Extensive spread and block can occur as a result of LA spread across the ESP. Cadaveric and radiocontrast studies depict a dorsal and a ventral spread into the PVS.\(^6,7\) In our case series, the spread from the ESPB was in the thoracic PVS in both the patients at the level of T5.

To conclude, the pain relief offered by a thoracic ESPB in a patient with MPLRF is due to the paravertebral spread of LA and an occasional epidural spread. Dense blocks from injections into the thoracic PVS results from blockade of motor, sensory and sympathetic nerves in the PVS and a simultaneous spread into the epidural space.

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Conflicts of interest
There are no conflicts of interest.

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Different standards of the variable pitch for oxygen saturation with pulse rate and heart rate monitoring: An avoidable complication

Sir,

After installing the new multipara monitor Drager infinity C700 in our operation theatres, during anesthetic management of a 6-month-old infant, oxygen desaturation from 98% to 80% went unnoticed as the anesthesiologist was busy positioning the infant and there was no change in the pitch of pulse tone during desaturation. After scrutinizing the features of the Drager infinity C700 monitor, we found that the monitor's default pulse tone source was from electrocardiography (ECG) and in case of desaturation, there would be no change in the pitch of pulse tone. The monitor gives an audible alarm only when the oxygen saturation ($\text{SpO}_2$) falls below the set lower alarm limit for $\text{SpO}_2$.

Variable pitch pulse tone will be active if pulse tone source is manually changed to $\text{SpO}_2$, as it is not a default setting in the Drager infinity C700 monitor. Hence, one has to manually change the source of the pulse tone to pulse oximeter after switching on the monitor every time, to have the audible pulse tone change during variation of $\text{SpO}_2$. In case the pulse tone source is not changed to $\text{SpO}_2$ after switching on the monitor, it can lead to unnoticed desaturation during intubation or any procedure, especially if a single anesthesiologist is managing the case.

Although we are trained to differentiate variable pitch of $\text{SpO}_2$ during anesthesia management, we propose that the Drager infinity C700 monitor manufacturers should consider changing the monitor's default pulse tone source from ECG to $\text{SpO}_2$ and may incorporate the variable pitch pulse tone for the ECG source as well. This will ensure the safety of the patient in the operating room as per the American Society of Anesthesiologists (ASA) standard of basic monitoring during anesthesia.

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