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Letter to the Editor

Ultrasound-Guided Thoracic Paravertebral Block Experience in a Child

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Dear Editor,

Postoperative pain treatment is very important in childhood. In addition to classical blocks, paravertebral block is unilaterally or bilaterally used for analgesia during and after thoracal and abdominal surgeries.

The paravertebral space contains neural structures, including anterior and posterior branches of the intercostal nerves, the nerves of the sympathetic chain, *rami communicantes* and *Luschka* nerves supplying the intervertebral disc. These bare nerve endings are easily affected by local anaesthetics. Paravertebral block is performed with the conventional loss of resistance technique. However, its use in children is limited compared to adults because it is difficult to predict the distance to the pleura and the loss of resistance in children, particularly during thoracic paravertebral block practice. With the use of ultrasonography in peripheral nerve blocks, paravertebral block can now be performed by direct observation through ultrasound. Ultrasound-guided paravertebral block practices have been reported in children (1, 2). We aimed to share our first experience in ultrasound-guided paravertebral block application.

A 3.5-year-old girl, who weighed 16 kg and presented with a complaint of cough and who was pre-diagnosed with hereditary right cystic lung disease, was taken to the operating room primarily for bronchoscopy and then, if necessary, for thoracotomy. The patient was premedicated by administering midazolam 1 mg intravenously (iv). Following monitorization, induction was performed with propofol and rocuronium and bronchoscopy was initiated. During the procedure with a rigid bronchoscope, anaesthesia was continued with a sevoflurane/air and remifentanil infusion. Abundant mucopurulent secretion was aspirated because of chronic lung infection. It was decided to perform lobectomy with thoracotomy from the right fourth intercostal space. Bronchoscopy was stopped, and the patient was placed in the left lateral decubitus position. High-frequency *linear probe* (MyLab5-LA523E, Esaote SpA, Italy) was placed in the paravertebral space in the longitudinal and paramedian position and at the thoracal 7 level, and transverse process, intercostal ligaments, the *seashore sign*, the pleura and the pleural space were observed (Figure 1). A Stimuplex A 50 mm (B.Braun, Melsungen, Germany) was pushed forward from a lateral to medial direction using the in-plane method and was advanced towards the paravertebral space. While passing through tissues with the needle under the guidance of ultrasound for anatomic coordination, 1 mL 0.9% NaCl was administered twice and the level of the needle tip in the tissues was identified (Figure 2). After entering into the targeted area, aspiration was performed and then the block was performed by administering 0.5 mL kg^{-1} bupivacaine (0.25%). Meanwhile, the 'step sign', which indicates the collapse of the pleura, was observed by expanding the paravertebral space with fluid under ultrasound guidance (Figure 2). During blockade, no blood aspiration was observed and no hypotension occurred. After the beginning of the surgery, remifentanil infusion was discontinued. The anaesthesia of the patient, who was haemodynamically stable for 2.5 h, was maintained with a 2% concentration of sevoflurane (in oxygen/air) and rocuronium. After the operation, the patient was monitored in the recovery room for 1 h following extubation. She experienced pain in her throat due to the rigid bronchoscopy but did not complain of incision pain, and her respiratory depth was adequate. The patient was monitored with the Children's Hospital of Eastern Ontario Pain Scale (CHEOPS) (4: no pain; 13: very severe) for 24 h. During the 6 h following the moment of blockade, she experienced no pain. It was observed that she was comfortable in the clinic, and she did not have any complications. In the 6th hour, she began to complain of pain, and her pain evaluation score was 7. Therefore, she was administered 15 mg kg^{-1} paracetamol iv After 1 h, her pain score was evaluated to be 9, and she was administered 20 mg tramadole iv. The same dose was repeated again after 6 h.

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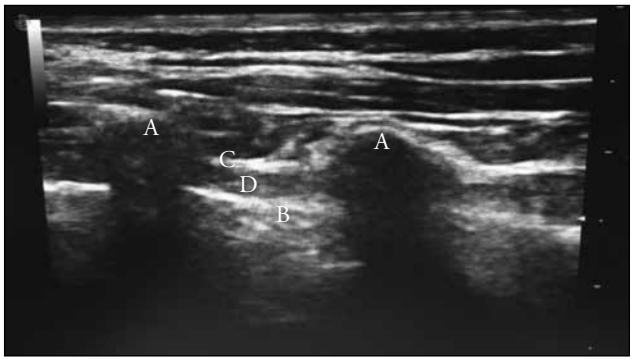

Figure 1. Before block A: processus transversus, B: pleura, C: intercostal membrane, D: paravertebral space

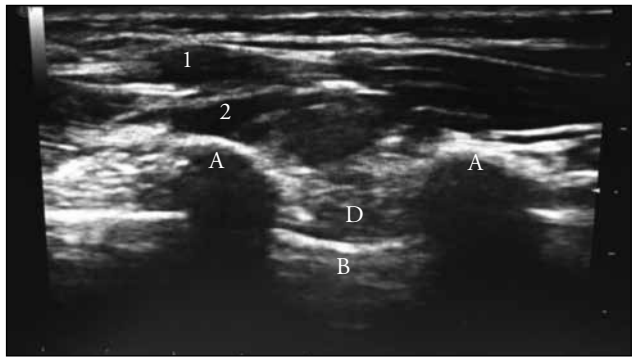

Figure 2. After block A: processus transversus, B:pleura, D: paravertebral space 1,2: 0.9% NaCl was given for control

The CHEOPS pain scores were between 4 and 9 (the score of 9 was observed just once) during 24 h.

There was no need for additional analgesia during surgery in the space in which many derivations innervated with a single-dose drug, easy extubation and respiration due to adequate analgesia after thoracotomy occur; hence, this plus the maintenance of 6-h analgesia are important gains. If paravertebral block is to be performed, patient comfort can be increased with the routine use of systemic analgesics before the end of analgesia time. In our case, if an opioid had been administered instead of paracetamol at the 6th hour, i.e. when her pain began, and additional paracetamol had been administered every 6 h, better pain scores would have been obtained.

In a case report of a 10-year-old child (weight, 40 kg), a lateral spread between the T4-5 and T10-11 levels and parallel to the spine, which covers the longitudinal and intercostal nerves, was observed with 10 mL contrast substance injected into the paravertebral space through a catheter inserted at the level of T10 (3). On the other hand, in a study performed on cadaver babies, a strong relationship was reported between the volume injected as a paravertebral single-dose at the thoracolumbar level and the number of segments with spread. It has been specified that the most appropriate volume to cover the segments between T10 and L1 is 0.2–0.3 mL kg^{-1} (4). Hence, it was possible to provide analgesia in the thoracal segments with the volume of 0.5 mL kg^{-1} given from the T7 level in our case.

Paravertebral block can be performed through a unilateral or bilateral single dose or catheter. The analgesic action time of single-dose paravertebral block practice is not clearly reported in previous studies. It is reported that the addition of other drugs to a local anaesthetic for prolonging the duration of analgesia obtained by administering a single-dose into the paravertebral space does not provide an advantage (5). It is possible to obtain analgesia for days by providing continuous infusion through the insertion of a catheter. However, because the paravertebral space is too close to the skin in young children (less than 1 cm), the drug administered may leak from the skin and the catheter may easily change place and may be accidentally displaced. Therefore, if it is planned to insert a catheter in young children, these possibilities must be considered. Some complications such as pneumothorax, pleural puncture and vascular injury are possible, but ultrasound guidance reduces these risks.

To avoid the side effects of central block in patients who use an anti-coagulant and whose anatomy is not suitable, paravertebral block can be used in the early postoperative period because it provides adequate analgesia. It is an effective analgesia method that can be preferred for providing patient comfort and respiratory rehabilitation provided that a proper combination is established with systematic analgesics. The use of ultrasound makes this block more effective and safer for use in children.

Informed Consent: Written informed consent was obtained from the parents of the patients who participated in this study.

Peer-review: Externally peer-reviewed.

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