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CASE REPORT

Intrathecal injection in the difficult patient guided by ultrasonography: Two case reports

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SUMMARY

Intrathecal injection is traditionally performed by identifying the interlaminar spaces using anatomical landmarks. However, obesity, previous spinal surgery, the presence of deformity, or age-related changes may hinder the detection of these landmarks. Poor or failed identification of anatomical landmarks leads to difficulties in performing the neuraxial technique, an increased number of needle insertions, and associated complications. In this study, we discuss our experience with ultrasonography-guided neuraxial block in two patients: one with super morbid obesity (BMI >50) and the other with severe scoliosis (Cobb angle >50°).

Keywords: Intrathecal injection; obesity; scoliosis; ultrasonography.

Introduction

Obesity, in patients with previous spinal surgery, deformity, or degenerative changes, and poor detection or inability to detect anatomical landmarks prior to the procedure is an indicator of the difficulty of the neuraxial technique.[1,2] Increased number of needle insertions should be minimized in order to prevent complications such as epidural hematoma, paresthesia, and postdural spinal headache.[1,3] In patients with obesity and severe scoliosis, it may be difficult and not safe to apply neuraxial techniques without imaging methods such as ultrasonography (USG), fluoroscopy, and computed tomography.[4] In this study, we aimed to present our ultrasound-guided neuraxial block experience in two difficult patients, including a morbidly obese adult and a child with scoliosis.

Case Reports

Case 1 – The first case was a 37-year-old male with a body mass index (BMI) of 56.5 kg/m^2 (weight: 200 kg, height: 188 cm). An endoscopic ureteral stone operation was planned by the urologist. In the preoperative evaluation, the patient, who had diabetes mellitus and hypertension, was classified as physical status III according to the American Society of Anesthesiology (ASA). He had a Mallampati score of 4 and limited neck motion. Chest X-ray was normal, electrocardiogram showed normal sinus rhythm, and laboratory values were within normal limits. His vital signs were heart rate: 85 beats/min, blood pressure: 177/126 mmHg, and peripheral oxygen saturation: 98%.

Spinal anesthesia was planned for the operation, and the patient was placed in a sitting position. The interspinous spaces could not be palpated in the examination performed based on anatomical landmarks (Fig. 1). Using a USG convex probe (Samsung HS50 [Seoul, South Korea]), the L3–4 range was identified in the vertical plane starting from the sacrum. The USG convex probe was then placed horizontally. The midline and L3–4 space were marked laterally using USG, and the junction point of these marks was determined as the injection site. The distance to the anterior wall of the intrathecal space was measured as 8.08 cm and to the posterior wall as 6.83 cm (Fig. 2).

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Figure 1. Case-1 direct abdominal X-ray.

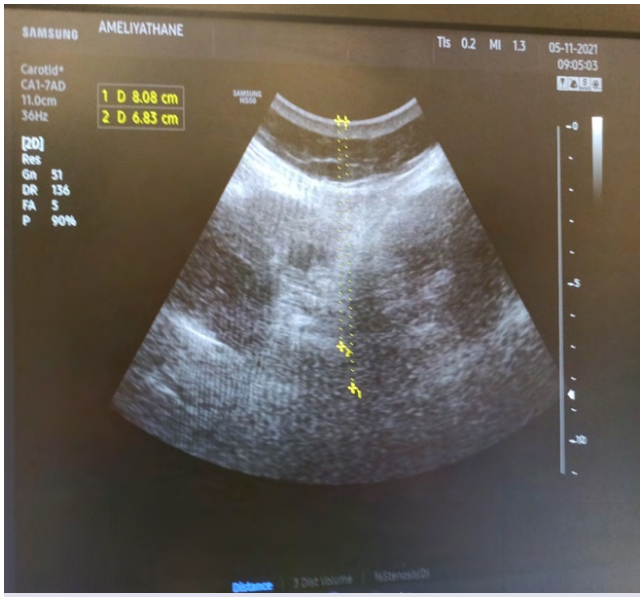

Figure 2. Case-1 neuraxial imaging with USG.

After skin sterilization with 10% povidone-iodine, the intrathecal space was accessed with a single puncture at the marked site. A 25 G 120 mm spinal needle was used for the spinal puncture. Upon observation of clear cerebrospinal fluid (CSF) flow, 11.5 mg bupivacaine and 25 mcg fentanyl were administered. The patient was then placed in the supine position, and sensory block at the thoracic 6 level was confirmed with a pinprick test, after which surgery was initiated. For sedation, 2 mg midazolam was administered. The operation lasted 35 minutes.

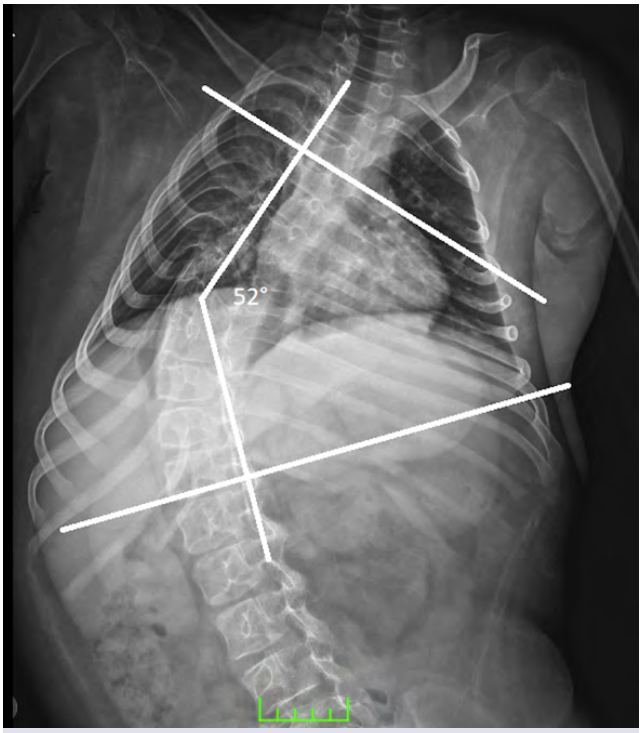

Figure 3. Case-2 scoliosis graphic.

A single dose of 0.5 mg atropine and 5 mg ephedrine was administered to the patient who became hypotensive (79/43 mmHg) and bradycardic (48 beats/min). He was transferred to the urology service when the sensory block level decreased below the T10 level at the postoperative 80th minute and his hemodynamic parameters remained stable.

Case 2 – The second case was a 12-year-old pediatric patient whose body weight for height was 133%. He was diagnosed with SMA Type-2 at six months of age. His general condition was good, he was conscious, there was no deformity in the extremities, and he had severe scoliosis (Fig. 3). Neurologically, muscle strength was 1/5 in the upper extremities and 2/5 in the lower extremities. Deep tendon reflexes (DTRs) were hypoactive, no pathological reflexes were observed, and cranial nerves were intact. Other system examinations were unremarkable.

We were consulted because nusinersen treatment could not be administered intrathecally due to scoliosis. The patient was monitored in the prone position under operating room conditions. Heart rate was 123 beats/min, blood pressure was 108/82 mmHg, and peripheral oxygen saturation was 98%. Propofol 50 mg and remifentanil 20 mcg were administered for sedation.

The spinal axis was visualized using C-arm scopy, and right-sided entry was planned since the spinous processes were deviated to the left. The L3–4 space was marked with the guidance of a USG convex probe (Samsung HS50 [Seoul, South Korea]), and the posterior wall of the intrathecal space was visualized paravertebrally. Simultaneously with the ultrasound probe, a 20 G 90 mm needle was inserted into the intrathecal space using the in-plane technique in a single attempt. A cerebrospinal fluid (CSF) sample was obtained, and the dose of nusinersen determined by the patient's neurologist was injected. After the procedure, the patient was transferred to the clinic.

Discussion

Intrathecal injection is traditionally performed using anatomical landmarks, the neuraxial midline, intercristal line, and identification of the interlaminar spaces by lumbar interspinous palpation. The difficulty of the technique is also related to the quality of palpation of anatomical signs. These difficulties can lead to multiple needle insertions and related complications.[1]

Obesity is an increasingly important public health problem in the World.[5] BMI>40 is defined as morbidly obese, and BMI>50 is defined as super morbidly obese.[6] It is a cause of increased perioperative mortality and morbidity due to cardiopulmonary physiological changes and comorbidities. In order to suppress airway manipulations, opioid use, and the surgical stress response, regional anesthesia is preferred in suitable types of surgery. However, obesity—due to difficult positioning, difficult palpation of anatomical signs, and the need for special equipment—can lead to repetitive attempts and unsuccessful blocks.[5] Although ultrasonography is an easily accessible, radiation-free, and relatively low-cost technique in surgical settings, it has its own limitations.

In obese patients, while ultrasound waves travel more in soft tissues, the resolution decreases, and the image becomes less clear. Chin et al.,[1] in a study conducted in a non-obstetric population with BMI>35, weak or non-palpable spinous processes, moderate or severe scoliosis, and difficult anatomical signs, who had undergone lumbar surgery before, found that ultrasonography facilitated spinal anesthesia performance. Ghisi et al.[7] showed that ultrasonographic imaging reduces the number of needle passes and provides guidance in obese patients. In the super morbidly obese patient, measurements were taken in the position where the intrathecal space was best visualized. Before the procedure, the needle entry point was marked with USG at the midline and lateral level. The caudal-to-cranial needle angle was aligned with the position of the USG probe. The subarachnoid space was accessed in a single attempt.

In patients with abnormal spinal anatomy other than obesity, reducing the number of needle passes provides an advantage by improving the success rate on the first attempt and utilizing anatomical landmarks without prolonging the total procedure time.[8] A systematic evaluation including the patient's history, physical examination, and previous radiological imaging to determine the type and severity of scoliosis affects the success of the neuraxial procedure. Scoliosis is defined as a lateral curvature of the spine greater than 10°. It is classified as mild (11–25°), moderate (25–50°), and severe (>50°) according to the degree of lateral curvature (Cobb angle). Imaging methods are recommended for neuraxial procedures, especially in cases of severe scoliosis. Considering the anatomy of the scoliotic spine, a paramedian approach from the convex side of the scoliosis is recommended, and the chance of success increases with USG.[4]

Although it is possible to evaluate anatomical changes with preoperative radiography, this technical information may not be easily translated into procedural performance. In such cases, USG can be preferred as an easily accessible imaging tool under operating room conditions.[8] In the second case, in the patient with severe scoliosis (>50°), the level and convex side of the scoliosis were determined using C-arm scopy, and paravertebral intervention was performed under USG guidance.

As a result, we think that the probability of success in neuraxial technique applications will increase with USG in patients with anatomical abnormalities or landmarks that are difficult to palpate. Although there are supportive studies on this subject, better-planned randomized controlled studies will facilitate the integration of this practice into routine clinical use.

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References

1. Chin KJ, Perlas A, Chan V, Brown-Shreves D, Koshkin A, Vaishnav V. Ultrasound imaging facilitates spinal anesthesia in adults with difficult surface anatomic landmarks. Anesthesiology 2011;115:94-101. [CrossRef]
2. Li M, Ni X, Xu Z, Shen F, Song Y, Li Q, et al. Ultrasound-assisted technology versus the conventional landmark location method in spinal anesthesia for cesarean delivery in obese parturients: A randomized controlled trial. Anesth Analg 2019;129:155-61. [CrossRef]
3. Oh TT, Ikhsan M, Tan KK, Rehena S, Han NR, Sia ATH, et al. A novel approach to neuraxial anesthesia: Application of an automated ultrasound spinal landmark identification. BMC Anesthesiol 2019;19:57. [CrossRef]
4. Bowens C, Dobie KH, Devin CJ, Corey JM. An approach to neuraxial anaesthesia for the severely scoliotic spine. Br J Anaesth 2013;111:807-11. [CrossRef]
5. Şalvız EA. Regional anesthesia in adult patients with obesity. JARSS [Article in Turkish] 2020;28:219-30.
6. Cho A, So J, Ko EY, Choi D. Spinal anesthesia for cesarean section in a super morbidly obese parturient: A case report. Medicine (Baltimore) 2020;99:e21435. [CrossRef]
7. Ghisi D, Tomasi M, Giannone S, Luppi A, Aurini L, Toccaceli L, et al. A randomized comparison between accuro and palpation-guided spinal anesthesia for obese patients undergoing orthopedic surgery. Reg Anesth Pain Med 2020;45:63-6. [CrossRef]
8. Park SK, Bae J, Yoo S, Kim WH, Lim YJ, Bahk JH, et al. Ultrasound-assisted versus landmark-guided spinal anesthesia in patients with abnormal spinal anatomy: A randomized controlled trial. Anesth Analg 2020;130:787-95. [CrossRef]