

CASE REPORT

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Ultrasound-guided erector spinae plane block for postoperative analgesia in patients undergoing various types of surgery

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Abstract

Ultrasound-guided erector spinae plane (ESP) block is regional anesthesia technique for the management of thoracic and abdominal neuropathic pain. ESP block may also be a good option to provide postoperative analgesia. In this case report, we describe our experiences of ESP block used for postoperative analgesia in three patients undergoing laparoscopic-assisted percutaneous nephrolithotomy (PCNL), laparoscopic-assisted total abdominal hysterectomy (TAH), and a unilateral total mastectomy. In all three patients, ESP block provided effective analgesia and increased patient satisfaction according to their pain management scores (numerical rating scale [NRS]).

Keywords: Postoperative analgesia, erector spinae plane block, percutaneous nephrolithotomy, total abdominal hysterectomy, mastectomy

Introduction

Ultrasound-guided Erector Spinae Plane (ESP) block was first defined by Forero in 2016 as a regional anesthesia technique for the pain management of thoracic neuropathic pain [1]. Paravertebral block, oblique subcostal transversus abdominis plane block, and transversus abdominis plane block are preferred as other types of block used in regional anesthesia techniques. As ESP is a newly described block, it has been used to provide postoperative analgesia only in a limited number of surgeries. Previous studies based on single case reports concluded that ESP was beneficial in postoperative analgesia in patients undergoing thoracic and abdominal surgeries [2, 3]. According to other studies, effective postoperative analgesia may be achieved by applying the ESP block at the T4–5 level in breast surgery and the T7 level in abdominal surgeries [3–5]. Depending on the type of surgery, unilateral, bilateral, or continuous infiltration techniques may be preferred. A previous study asserted that bilateral ESP block in bariatric surgery provided visceral abdominal analgesia [4].

There are ongoing studies on the levels of ESP block that should be applied and the doses of the drug that should be administered. In the literature, there are several case reports of ESP block for thoracic and abdominal surgeries. No previous studies have described the use of ESP block in a total abdominal hysterectomy (TAH). Herein, we describe our ESP block experiences preferred for postoperative analgesia in patients undergoing unilateral total mastectomy for breast cancer, laparoscopic-assisted percutaneous nephrolithotomy (PCNL) for large kidney stones, and laparoscopic-assisted TAH for uterine myomas.

Case reports

Written informed consent form was signed by all patients. As these are case reports, the need for ethics board approval was waived by our institute.

Case 1

A male patient (age: 48yr; height: 165cm; weight: 68kg) was scheduled to undergo PCNL for large kidney stones in his right kidney. The patient (American Society of Anesthesiology (ASA) class 1) reported in his medical history that he had undergone surgery 4y earlier for an inguinal hernia and had experienced serious postoperative pain. Therefore, a decision was taken to

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apply ESP block, together with routinely applied tramadol and paracetamol as pain management (1mg/kg, iv and 15mg/kg, iv, respectively). Following the induction of anesthesia (propofol, fentanyl, and rocuronium) the patient was intubated and placed in the prone position. After the skin was sterilized, linear transducer of ultrasound (high-frequency) (Mindray DP 9900 plus; Mindray Bio-Medical Electronics, Shenzhen, China) was placed over the spinous process of the 7th thoracic vertebra in the sagittal plane, ipsilaterally. The transducer was moved 2.5cm laterally on the parasagittal plane to visualize the transverse process, and the entrance point of the needle was marked on the skin. A premixed preparation of 0.5% bupivacaine (15ml) and saline (5ml) with epinephrine (1:200.000) was then injected between the transverse process and erector spinae muscles using a 22-gauge, 80-mm block needle (SonoTap; Pajunk, Geisingen, Germany). ESP block was applied only on the right side. The surgical procedure lasted 105min. Tramadol and paracetamol were administered i.v. at the aforementioned doses when skin suturing began. Following extubation, the patient was followed in postanesthesia care unit. The patient's Numeric Rating Scale (NRS) was 0/10 at rest and coughing. NRS value was less than 3 during the first 24 h in general ward (Figure 1). Paracetamol (15 mg/kg, iv) was administered for postoperative analgesia for the first 24h. A rescue analgesia regimen (diclofenac, 75mg, im) did not administered. On the third postoperative day, the patient was discharged.

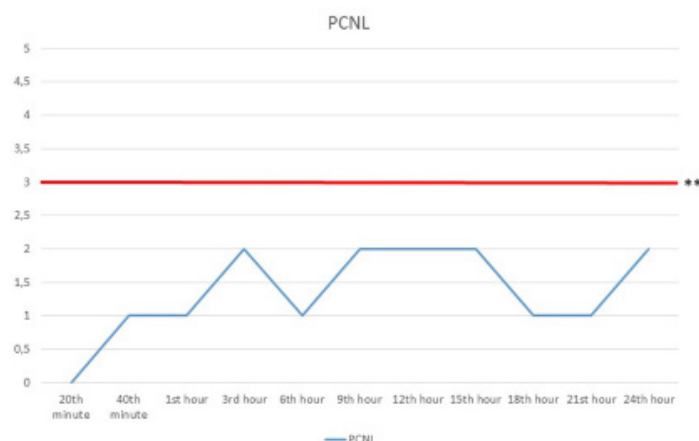


Figure 1. NRS scores at rest, for patient undergone PCNL at various time points of follow up

PCNL; Percutaneous Nephrolithotomy

**The red line shows limit of administration of rescue analgesia

Case 2

A female patient (age: 42yr; height: 160 cm; weight: 56kg) with uterine myomas was scheduled to undergo TAH. The patient had no a history of surgery, but took medication for hypertension and anxiety. The patient was ASA class 1. ESP block was planned for postoperative analgesia management, in addition to our multimodal analgesia protocol. Anesthesia induction was similar with Case 1. Ultrasound-guided bilateral ESP block was performed at the 7th thoracic vertebral level in the sagittal plane in the prone position. A mixture of 0.5% bupivacaine (10ml) and saline (10ml) with epinephrine (1:200.000) was injected between the transverse process and erector spinae muscles using a 21-gauge insulated needle. The other side was injected with the same mixture. The total surgical time was 90 min. Tenoxicam (20mg, i.v.), in addition

to paracetamol (1g), was given perioperatively. The patient was followed in postanesthesia care unit after extubation. The patient's score on the NRS was 1/10 at rest and coughing. After 30min, paracetamol (1g, i.v.) was ordered every 8h postoperatively. Tramadol (1mg/kg, i.v.) was planned for rescue analgesia. The NRS score was <3/10 during 12h of follow-up. After this time, rescue analgesia was applied every 13h when the NRS score was 4/10 (Figure 2). After 72h postsurgery, the patient was discharged from the hospital with prescription pain medication.

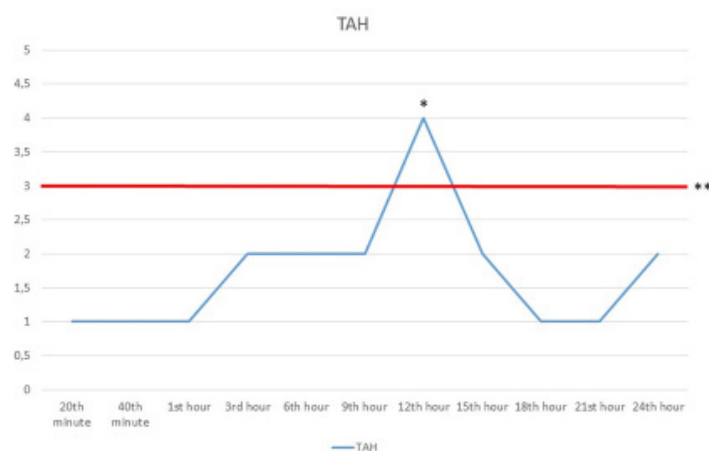


Figure 2. NRS scores at rest, for patient undergone TAH at various time points of follow up

TAH; Total Abdominal Hysterectomy

*Time of administration of Rescue analgesia, in case of NRS<3/10

**The red line shows limit of administration of rescue analgesia

Case 3

A female patient (age: 56yr; height: 160cm; weight: 45kg) with left breast cancer and a history of 20 pack/y smoking was due to undergo a left total mastectomy. According to the patient's history, she had undergone liver transplantation 4y earlier due to liver failure. The patient's liver function and coagulation tests were normal. ESP block was selected with the aim of decreasing postoperative analgesic drug administration. After placing to prone position, and midazolam (2mg, i.v.) and fentanyl (20mcg) were administered for providing sedation during the ESP block. The patient's skin was anesthetized with 3 ml of lidocaine. Ultrasound-guided ESP block was performed at the 4th thoracic vertebral level preoperatively in the operating theatre. The block drug, 0.5% bupivacaine (20ml), was injected between the transverse process and erector spinae muscles. After 30 min, the pinprick test revealed sensorial block at the T1 and T8 dermatomes. Anesthesia was induced in the same manner as in cases 1 and 2. Surgery was completed within 90 min, without complications. Paracetamol (1g, i.v.) and ibuprofen (800mg, i.v.) were administered when skin suturing began. After extubation, the patient was transferred to postanesthesia care unit. The patient's NRS score on coughing and at rest was 2/10. The patient's NRS score was <3/10 during the first 24h of follow-up (Figure 3). Paracetamol (1g, i.v.) was ordered every 8h postoperatively. For rescue analgesia, ibuprofen was planned (800mg, i.v.). However, ibuprofen was not required during the first 24h. After 72 h postsurgery, the patient was discharged from the hospital with prescription pain medication.

The ESP block has been successfully applied in these three cases. No postoperative nausea or vomiting was observed in the patients.

Local anesthetic at different doses and saline mixtures were preferred according to surgery type. In all cases, the same linear transducer (high-frequency) was used and placed at different thoracic vertebral levels according to the type of surgery. The needle was advanced between the transverse process and erector spinae muscle using the in-plane technique. The correct location was confirmed by hydrodissection with lidocaine 1% (1ml). No significant motor block or complications were observed in any of the patients. In the present cases, the ESP block was not administered using the continuous catheter technique. However, intermittent continuous infusion via a catheter may be useful during hospital stays longer than 24h.

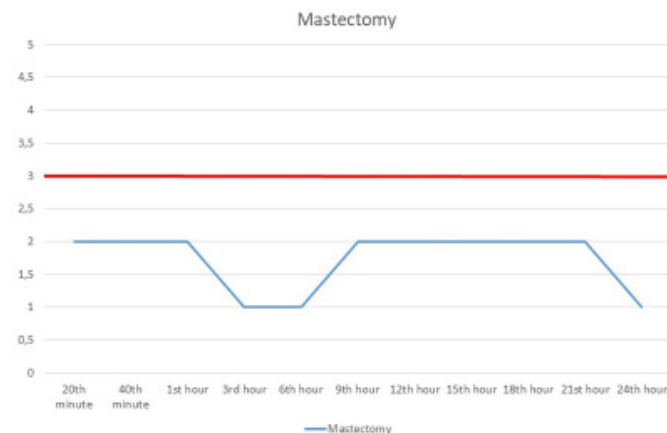


Figure 3. NRS scores at rest, for patient undergone Mastectomy at various time points of follow up

**The red line shows limit of administration of rescue analgesia

Discussion

We considered that ESP block may be effective in somatic visceral pain after abdominal and thoracic surgeries. We described three cases of the application of ESP block in laparoscopic-assisted PCNL for large kidney stones, laparoscopic-assisted total abdominal hysterectomy (TAH) for multiple uterine myomas, and a unilateral total mastectomy for breast cancer. The three cases demonstrate that ESP block can provide sufficient and effective long-lasting analgesia in PCNL, TAH, and mastectomy surgeries.

PCNL is a surgical procedure used as a treatment for large kidney stones. Analgesia management is important in PCNL, which is associated with severe pain and discomfort postoperatively [6]. In a previous study, the total amount of morphine consumption in the 24-h period after PCNL was 43mg [6]. Intravenous opioids or nonsteroidal anti-inflammatory drugs are generally preferred in the management of analgesia in PCNL. Although paravertebral and intercostal blocks are used for postoperative analgesia in PCNL [7], these are adequate, and an ideal analgesia method has yet to be determined. In a previous study, Kim et al. selected the 9th thoracic vertebral level when performing ESP block in patients undergoing PCNL [2]. In the present study (case 1), we performed ESP block at the 7th thoracic vertebral level because renal pain is transmitted via the T10–L1 spinal nerves, whereas ureter pain is conducted through the T10–L2 spinal nerves. In addition, cutaneous innervation of the incision site is predominantly supplied by T10–11 spinal nerves [8].

Previous studies showed that ESP block provided effective analgesia after abdominal and thoracic surgeries [1, 3]. It provided

effective postoperative analgesia when performed at the T4–5 level for breast and thoracic surgeries and at the T7 level for abdominal surgery [3–5]. As shown in case 3 in the present study, after the application of the ESP block, the local anesthetic spread two to three levels in the cranial direction and three to four levels in the caudal direction. Therefore, this dissipation should not be ignored to reduce complications and provide effective analgesia. Excessive elevation of the block level may lead to the development of complications. The dose and volume of the drug may contribute to the extent of this spread. Further studies are needed to clarify the optimum dosage and volume of the drug, the thoracic and lumbar vertebral level of ESP block according to the type of surgery, and the potential for complications.

ESP block has been reported previously for TAH in few cases. We selected the T10 thoracic vertebral level to perform ESP block because uterine pain is conducted through the T10–L1 spinal nerves. According to the literature, ESP block provides effective analgesia for somatic and visceral pain after a mastectomy [9]. In cases 2 and 3, respectively, we performed the ESP block bilaterally (TAH) and unilaterally (mastectomy). Randomized controlled blinded trials are needed to demonstrate the safety, effectiveness, efficacy, and effective volume of analgesics in ESP block. ESP block should be considered a good candidate to provide postoperative analgesia in major surgeries, such as total abdominal hysterectomies and mastectomies.

Conclusion

Ultrasound-guided ESP block is a peripheral nerve block that can easily be applied in appropriate cases to provide long-term analgesia. ESP block may be a good option to provide postoperative analgesia. In patients undergoing PCNL, a TAH, and a mastectomy, ESP provided effective analgesia and increased patient satisfaction. Prospective further studies on the efficacy of ESP in postoperative analgesia after chest and abdominal surgeries are needed.

This study was presented as an oral presentation at the 53rd National Congress of the Turkish Society of Anesthesiology and Reanimation. (TARK 2019, 7-10 November 2019, Antalya, Turkey).

Conflict of interests

The authors declare that they have no competing interests.

Financial Disclosure

All authors declare no financial support.

Informed Consent

Written consent was obtained from the patient and his parents.

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