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ORIGINAL ARTICLE

Role of Patient Positioning and Ultrasound Probe Selection in Erectro Spinea Plan Block.

Tarek S. Hemaida, Rehab Ahmed Kassem*, Ayman Mohammady Eldemrdash , Mohammed S. Ali, Soudy S. Hammad ,

Anesthesiology, Surgical Intensive Care and Pain Medicine Department, Faculty of Medicine, Aswan University

ABSTRACT

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***Corresponding author:**

Rehab Ahmed Kassem

Mobile: 01155620747

E-mail:
rehabk311@gmail.com

Introduction: Patients having open kidney procedures might benefit greatly from erector spinae plane block (ESPB) as a postoperative treatment. Our objective was to assess the effects of the patient's posture and the kind of US probe utilized in the ESPB. **Methods:** This retrospective study involved 60 individuals who had renal exploratory procedures. Both lateral and supine positions were used for the ESPB procedures. Since US was used for ESPB, either a linear or curved prob was used. **Results:** Regarding the block's time and simplicity of execution, there were notable variations across the four groups. There were only two recorded failures in sitting postures, compared to four in lateral positions. In addition, only six of the 13 individuals complained of pain at the injection site when they were seated. **Conclusion:** We recommend using the sitting position in ESPB with the straight US prob, and if the lateral position has been chosen, curved probe is recommended.

INTRODUCTION

Regional anesthetic techniques are commonly recommended for pain control during open nephrectomy because they improve patient satisfaction and lessen the requirement for parenteral opioids. (1)

Erector spinae plane block (ESPB) was initially reported by Forero et al. (2016) as a treatment for thoracic neuropathic pain. **(6)** It has been widely used in adults and children at different levels for a number of reasons, such as open kidney surgery, thoracic and breast surgery (T4-5), upper abdominal surgery (T7-8), and chronic shoulder discomfort (T2), even though it has only recently been documented in the literature. **(1)(5)(16)**.

ESB is a novel, user-friendly, safe, and efficient regional anesthetic technique for the management of pain after a mastectomy. ESB at T4 efficiently reduces pain and the requirement for postoperative analgesics by blocking the anterior cutaneous branches of the intercostal nerves. **(2)(22).** ESB showed pain relief in individuals with numerous unilateral rib fractures. The injection has an analgesic effect and exhibits paravertebral and cephalocaudal LA spread that extends to the intercostal nerve origin. **(9)**. Although ESP block is frequently used for chronic pain and severe postoperative pain, there are reports of it being used as a surgical anesthetic method in small operations, such as lipoma excision in the Para scapular region under ESP block at T4. **(3).**

It's still unclear how much local anesthetic (LA) should be administered precisely for ESB. Using a high volume (20–40 ml) is advised. Most commonly used are ropivacaine and bupivacaine.

The safe maximum doses for ropivacaine and buprevacaine are respectively 2 mg/kg and 3 mg/kg (maximum 300 mg). Better LA dispersion in the facial plane, deep into the muscle, would result from a higher volume.**(10).**

It may be difficult to position a patient with back injuries. Additionally, the injectate's poor dispersion may cause variations in the block's duration and intensity. Possible remedies for this include continuous infusion, the use of LA adjuvants, or catheter implantation, which allows for several injections.**(19).**

Bilateral blocks would be required for incisions that extend across the midline because ESB only provides unilateral analgesia. Not to mention the possibility of an accidental intravascular injection or systemic absorption of a significant quantity of LA administered. Aspirating often before and during LA injection helps prevent these uncommon occurrences. The patient's ideal body weight should be used to calculate the LA dose.**(19)(13)**. ESP block has several advantages over traditional neuroaxis-near techniques. First off, it is simple to use ultrasonography to visualize the erector spinae muscle, and it is easy to aim the needle at it. Because of this, the method is highly applicable. Because the key structures (principal veins, pleura, or dura) that are vulnerable to severe consequences from injury are situated distant from the blockage target, the second advantage is the minimal danger of consequences. Additionally, it is a part of multimodal analgesia, which promotes recovery after surgery.(**11)**.

Bilateral ESPB reduces the requirement for rescue analgesia and total opioid consumption while successfully managing postoperative pain for stomach surgeries, as well as incisional and ventral hernias. **(11)(19).**

The patient can execute ESPB in a variety of postures, including sitting, lateral, or prone. The patient can more easily identify landmarks and feel more comfortable while they are seated. **(18)**.

We aim to compare the effectiveness of lateral and sitting positions in patients undergoing ESPB and type of ultrasound probe selected.

PATIENTS AND METHODS

This retrospective cohort was carried out using the medical data of 60 individuals who had renal exploratory procedures performed at Aswan University Hospital. Patients with bleeding problems and block site infections were not included.

Under general anesthesia (GA), the patients underwent ESPB following the technique described by Vadera and Mistry (**20)** either in the lateral position or supine position. As ESPB was performed using US using linear or curved prob.

And the ease of performing the block measured by numerical scale from 1 to 10 [1 the easiest and 10 the most difficult], duration of the performing the block [excluding time of sterilization], failure rate and injection site pain were recorded.

Statistical analysis was done by R 4.4.2. Quantitative parametric data were presented as mean and standard deviation (SD) and were analyzed by ANOVA (F) test with post hoc test (Bonferroni). A two tailed P value < 0.05 was considered statistically significant.

RESULTS

In this retrospective cohort, we included 60 patients underwent open renal surgery under GA. Patients received ESPB either in lateral or Sitting position while using either Linear or curved prob.

Regarding to the demographic data, the mean age of the included participants was 42.25 years of them 41 were males. Table 1

Table 1: Demographic data of the participants included

	Lateral Linear	Lateral Curved	Sitting Linear	Sitting Curved
	n = 15	n = 15	n = 15	n = 15
Age	43.6 (11.1)	36.4 (10.7)	45.5 (15.2)	43.5 (12.4)
BMI	28.8 (2.3)	29.7 (3)	28.3 (2.3)	29.5 (2.8)
Sex (Male)	10 (66.7%)	9 (60.0%)	10 (66.7%)	12 (80.0%)

Regarding the ease of performing the block, we found that there were significant differences between the four groups in terms of both the ease and duration to perform the block. Table 2

Table 2: The ease of performing the block

	Lateral Linear	Lateral Curved	Sitting Linear	Sitting Curved	
	n = 15	n = 15	n = 15	n = 15	
Ease	5.1 (1.7)	4.4 (1.9)	3.3 (0.9)	6.5 (1.8)	< 0.001
Duration	16.9 (2.9)	14.1 (3.7)	10.3 (2.4)	13.1 (2.9)	< 0.001

Post-hoc analysis showed that there was significant difference between Lateral Curved Vs Sitting Curved, Lateral Linear Vs Sitting Linear and Sitting Linear Vs Sitting Curved, while the other pairwise comparison was statistically insignificant. Table 3

Table 3: Pairwise comparison of the Ease of performance

Pairwise comparison	Mean difference [95% CI]	**p-value**
Lateral Curved Vs Sitting Curved	-2.133 [-3.759, -0.507]	0.004
Lateral Curved Vs Sitting Linear	1.067 [-0.559, 2.693]	0.469
Lateral Linear Vs Lateral Curved	0.733 [-0.893, 2.359]	1
Lateral Linear Vs Sitting Curved	-1.4 [-3.026, 0.226]	0.132
Lateral Linear Vs Sitting Linear	1.8 [0.174, 3.426]	0.022
Sitting Linear Vs Sitting Curved	-3.2 [-4.826, -1.574]	0.001

Post-hoc analysis showed that there was significant difference between Lateral Curved Vs Sitting Linear, Lateral Linear Vs Sitting Curved and Lateral Linear Vs Sitting Linear, while the other pairwise comparison was statistically insignificant. Table 4

Table 4: Pairwise comparison of the duration of performance

Pairwise comparison	Mean difference [95% CI]	**p-value**
Lateral Curved Vs Sitting Curved	1.067 [-1.941, 4.074]	1
Lateral Curved Vs Sitting Linear	3.8 [0.793, 6.807]	0.006
Lateral Linear Vs Lateral Curved	2.733 [-0.274, 5.741]	0.096
Lateral Linear Vs Sitting Curved	3.8 [0.793, 6.807]	0.006
Lateral Linear Vs Sitting Linear	6.533 [3.526, 9.541]	0.001
Sitting Linear Vs Sitting Curved	-2.733 [-5.741, 0.274]	0.096

There were 4 failed cases in the lateral position, while only 2 in sitting positions. Moreover, there were 13 cases complaining from injection site pain, while only 6 cases were in sitting positions.

Table 5: Complications of the operations

	Lateral Linear	Lateral Curved	Sitting Linear	Sitting Curved
	n = 15	n = 15	n = 15	n = 15
Injection site Pain	5 (33.3%)	7 (46.7%)	3 (20.0%)	3 (20.0%)
Fail	3 (20.0%)	1 (6.7%)	0 (0.0%)	2 (13.3%)

DISCUSSION

According to the International Association for Studying Pain (IASP), pain is a stressful experience that involves sensory, emotional, cognitive, and social aspects and is associated with either existing or potential tissue damage.**(21)**.

A wide section of the cerebral cortex called the "pain matrix," which includes the thalamus, anterior cingulate cortex, and somatosensory area (S1 & S2), is activated during acute pain activation. The cerebral cortex produces affective and emotional responses, whereas the thalamus is responsible for processing sensory discrimination. This describes how a person's emotions, beliefs, genetics, and cognitive processes (such distraction or catastrophizing) may all affect how painful they feel.**(12).**

Acute postoperative pain treatment has repercussions that impact both mental and physical functionality. Postoperative pain can have a variety of effects on the respiratory system, including decreased lung capacity, tidal volume, functional residual capacity (FRC), hypertonia of the abdominal muscles, and altered diaphragm function. Furthermore, a patient's dread of discomfort may keep them from coughing or taking deep breaths, which may result in atelectasis and a buildup of secretions.**(8).**

Since kidney transplant surgery is linked to moderate to severe postoperative discomfort, effective pain management is essential. The concerns of hypotension from pain management approaches interfering with graft perfusion, concomitant coagulopathy, and/or altered pharmacokinetics and pharmacodynamics due to disease processes make choosing an analgesic strategy even more challenging. Poor pain management during surgery is associated with discharge, agitation, delirium, and a delayed recovery. Therefore, in order to promote early recovery and reduce postoperative effects, it is essential yet challenging to administer suitable postoperative analgesia.**(7)(14).**

The novel ultrasound-guided ESB technique for treating acute and persistent thoracic pain was recently presented. In the ESP block regional anesthesia technique, local anesthetic (LA) is injected between the transverse process and erector spinae muscle under ultrasound guidance to block the dorsal and ventral rami of the intercostal and abdominal nerves.**(15).**

According to a study by Sharipova et al. on kidney transplant patients, erector spinae plane block (ESPB) at T10 and T11 levels significantly lowers the pain intensity (numeric rating score) after 6, 12, 18, and 24 hours after surgery. Additionally, compared to the control group, the ESPB group used a lot less morphine within the first 24 hours (4.7 ± 6.2 mg vs. 15.9 ± 7.1 mg).**(17).**

Our study showed that there were significant differences between the four groups in terms of both the ease and duration to perform the block. Moreover, there was significant difference between Lateral Curved Vs Sitting Curved, Lateral Linear Vs Sitting Linear and Sitting Linear Vs Sitting Curved, while the other pairwise comparison was statistically insignificant. Also, there was significant difference between Lateral Curved Vs Sitting Linear, Lateral Linear Vs Sitting Curved and Lateral Linear Vs Sitting Linear, while the other pairwise comparison was statistically insignificant.

Our study showed that there were 4 failed cases in the lateral position, while only 2 in sitting positions. Moreover, there were 13 cases complaining from injection site pain, while only 6 cases were in sitting positions.

According to our knowledge, this is the first study to investigate the rule of patient position and

type of probe used in ESPB in patients undergoing renal surgeries.

CONCLUSION

In ESPB, we advise utilizing the sitting position with the linear US probe; if the lateral position has been selected, we advise using the curved probe.

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