Egyptian Journal of Anaesthesia

Vol. 41, 2025
ISSN: 1110-1849 (print)
ISSN: 1687-1804 (online)
DOI: 10.21608/egja.2025.356518.1011

ORIGINAL ARTICLE

The Efficacy of Ultrasound-Guided Single-Level Versus Dual Level Erector Spinae Plane for Postoperative Pain after Whipple Operation: Randomized Clinical Trial

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Background A whipple surgery causes a high rate of postoperative pain. This research aimed to assess and compare the effects of Single-level versus Dual-level injection for the Erector Spinae Plane Block (ESPB) on postoperative pain management following whipple surgery.

Patients and Methods This prospective, double-blind, randomized study involved sixty adult patients between the ages of 18 and 70, which were scheduled for a Whipple procedure under general anesthesia in Minia University Hospital. All patients had an ESPB using four 10ml syringes, each contained 5ml bupivacaine (25mg), 2ml lidocaine (40mg), and 3ml saline (0.9%). The patients were equally grouped into two groups. Group I had two syringe injections at T8 on each side, whereas Group II received one syringe injection at T7 and another at T9 on each side. The primary outcome was the first rescue analgesic request time and the secondary outcomes were the Visual Analogue Scale (VAS), the total amount of rescue analgesic, patients‘ satisfaction, and any complication which were documented.

Results The first time an analgesic was required was longer in dual-level ESPB (p<0.001), with considerably lower resting VAS at 6, 8, 10 and 18 hours (p<0.001) and dynamic VAS at 1, 2, 4, 6, 8 and 24 hours (p<0.001) and lesser total fentanyl demand (p<0.001) than the single-level ESPB. However, single-level show significantly shorter procedure time (p<0.001). The groups' levels of patient satisfaction were comparable between groups with no side effects.

Conclusions Dual-level ESPB led to significantly lower total fentanyl consumption, reduced postoperative analgesic needs, and lower VAS pain scores at certain time intervals compared to single-level ESPB.

Keywords Erector Spinae Plane Block, Postoperative, Single and injection, Whipple operation.
Egyptian Journal of Anaesthesia 2025,

INTRODUCTION

Abdominal surgery is among the commonest surgical procedures and associated with significant postoperative pain. The main barrier to early postoperative ambulation following surgery is postoperative pain, which also lengthens hospital stays and raises the risk of venous thromboembolism and pulmonary problems. Following abdominal procedures, the most common type of postoperative pain is parietal discomfort. To reduce severe pain, large dosages of opioids are needed, but they are not well tolerated. Both managing postoperative pain and reducing the negative effects of high dosages of a single painkiller are accomplished through the use of multimodal analgesia [1].

If left untreated, severe stomach pain following major abdominal surgery with an upper abdominal incision might result in shallow breathing, atelectasis, secretion retention, and a lack of cooperation during physical therapy. In addition to the evident physical consequences, this increases the likelihood that patients will experience difficulties following surgery, which can prolong their recovery period and have negative financial and social effects from insufficient pain management [2].

An interfascial block known as the Erector Spinae Plane block (ESPB) was recently reported. In this block, a local anesthetic is applied below the erector spinae muscle's plane, close to the point where the spinal neurons exit the spine just before they begin to split [3].

LA produces visceral and somatic abdominal analgesia when it is injected at the lower thoracic level because it blocks the ventral and dorsal rami of spinal nerves as well as the connecting rami of the sympathetic fibers. It accomplishes this by entering the thoracic paravertebral space anteriorly through the intertransverse connective tissue. Its efficacy in treating postoperative thoracic and abdominal pain has been demonstrated in some papers [3].

We hypothesized that single level ESPB could provide effective postoperative pain control in patients undergoing abdominal surgery, so we think dual levels may provide better quality of analgesia. Based on this hypothesis, this clinical trial's design is to evaluate and also compare the effectiveness of single-level and double-level injectable erector spinae plane block in patients undergoing Whipple surgery for management of postoperative pain with primary objective is the timing of first rescue analgesic request postoperative and secondary objective is total rescue analgesic consumption 24h postoperative, pain score, patient satisfaction.

PATIENTS AND METHODS

65 patients of both sexes, ages 18 to 70, with American Society of Anesthesiologists (ASA) physical status II–III, who were scheduled for an elective whipple procedure participated in this randomized, prospective, double-blind controlled trial.

The Institutional Ethical Committee accepted the study with approval number 474:10/2022. Written informed permission has been acquired from each patient. The study was done at Minia University Hospitals, Egypt from December 2022 to May 2023, and before enrollment of first patient we registered it at clinicaltrials.gov ID: (NCT05633329).

The exclusion criteria comprised several factors such as: known allergies to all opioid medications, extreme obesity (body mass index >40 kg/m^2), known allergies to local anesthetics, and opioid dependency. Individuals with coagulation abnormalities, poor heart, renal or respiratory function, wounds from skin infections at the needle insertion site, mental illnesses, and individuals who declined to participate were among the patients.

Randomization and blinding:

Using the sealed envelope approach, Computer-generated randomization numbers were used to divide the patients into two equal groups at random in parallel. Group I: Patients had a bilateral single-level ESPB using four 10-milliliter syringes, two of which were injected at T8 on each side and included five milliliters each of bupivacaine (25mg), 2ml lidocaine (40mg), and 3ml saline (0.9). Group II: participants had a bilateral dual-level ESPB using four 10-milliliter syringes, one at T7 and another at T9 on each side, each containing five milliliters of bupivacaine (25mg), two milliliters of lidocaine (40mg), and three milliliters of saline 0.9%.

The medications were prepared and injected by an anesthetist not included in the management of the patient or data collection. Patients and data assessor were blinded by the study design.

Preoperative Assessment Every patient had a clinical examination, medical history, and standard laboratory testing. The trial's concept and the Visual Analog Pain Scale (VAS) were explained to the patients.

Intraoperative Management: Every patient had connected to a temperature probe, pulse oximetry, capnography, non-invasive blood pressure monitoring, and electrocardiography (ECG).

Preoperatively, during the skin incision, and intraoperatively every five minutes until the procedure was finished, mean arterial pressure (MAP) and heart rate (HR) were recorded. IV fluids and premedication (two milligrams of midazolam) were administered intravenously to all patients through 18-gauge cannula which was introduced into the upper limb. Following the induction of G A, a central venous catheter was implanted.

Fentanyl (2µg/kg IV), propofol (1-2mg/kg IV), and atracurium (0.5mg/kg IV) were used to induce anesthesia in all patients, and the trachea was subsequently intubated. To avoid postoperative nausea and vomiting, 4mg of ondansetron and 8mg of dexamethasone were administered intravenously to each patient.

MAC (1-2) Isoflurane in a 50% oxygen and 50% air combination was used to maintain anesthesia, and atracurium was added incrementally as needed. End-tidal

CO2 (EtCO2) was kept between 35 and 40mmHg by adjusting the ventilator's settings. Fentanyl 0.5µg/kg was used to offer further analgesia in cases when the patient's heart rate or blood pressure increased by more than 20% over baseline. Before making a skin incision, ESPB was carried out following the induction of GA.

When the patients were under general anesthesia, blocks were carried out right away after anesthesia to guarantee that they were blinded to group allocation. Postoperative care providers and outcome assessors were also blinded to group assignments. The patient was given a regional block, but the type was not specified to the post-anesthesia care unit (PACU) nurses, as was customary in the research area. Block was performed with a US machine (M-turbo, sonosite, USA) by a well-trained anesthesiologist with good experience in regional block under complete aseptic technique.

Ultrasound guided ESPB:

Patient was positioned on his side with a pillow under him to straight the spine. Three centimeters laterally to the T8 spinous process, the transducer was positioned longitudinally in a cephalad-to-caudal direction prior to surgery. The hyperechoic transverse process's shadow exposed the superficial anatomy of the trapezius and erector spinae muscles. The skin was then anesthetized with 3 milliliters of 2% lidocaine. The research design called for injecting 5ml of bupivacaine 0.5% +2ml of lidocaine 2% +3ml of saline 0.9% into the fascial plane on the deep (anterior) side of the erector spinae muscle using a 20-gauge block needle positioned in-plane in a cephalad-to-caudad orientation. The erector spinae muscle was raised out of the bone shadow of the transverse process by fluid diffusion, to confirm the positioning of the needle tip. The same was done for dual level erector spinae block but at level T7 and T9 spinous process (Figure 1,2).

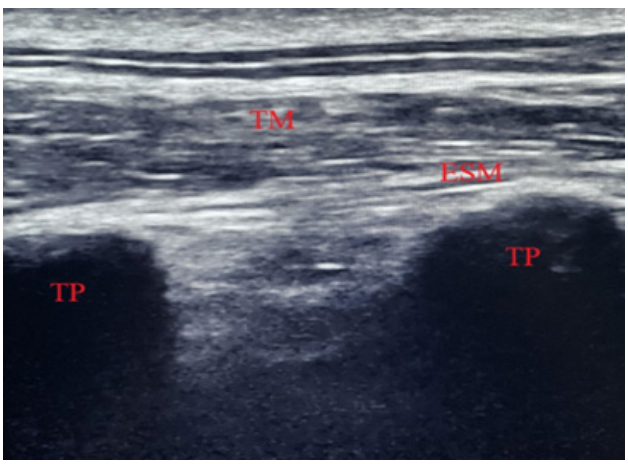

Figure 1: Ultrasound image of ESPB (Minia university hospital) TM: trapezius muscle, TP: transverse process, ESM: erector spinae muscle.

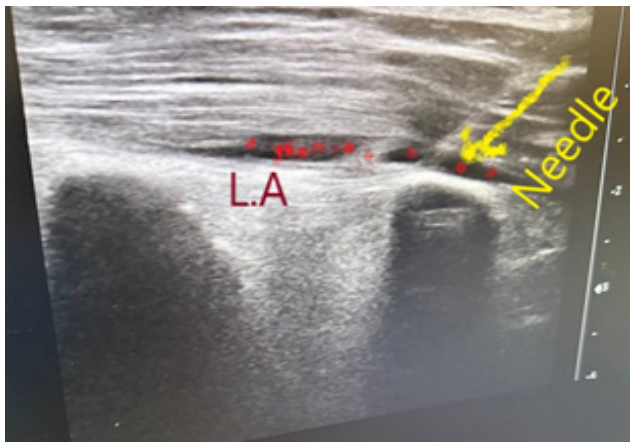

Figure 2: Ultrasound image of local anesthetic spread (L.A: local anesthetic, needle).

The isoflurane was stopped once the skin closure was finished, and 0.01mg/kg atropine and 0.05mg/kg neostigmine were given intravenously in order to reverse the neuromuscular blockage. The patients were moved to the postoperative care unit upon complete recovery, where they received postoperative treatment and hemodynamic monitoring.

Postoperative Management

Postoperative Management After surgery, in the post-anesthesia care unit (PACU), the VAS (used to measure postoperative pain) was recorded for 1, 2, 4, 6, 8, 12, 18, and 24 hours. The analgesic regime was standardized for all patients. Our usual routine analgesia regimen for abdominal surgery includes i.v paracetamol 1g every 8h, i.v diclofenac sodium 75mg every 12h over 30min and If the VAS was more than 3, rescue analgesia was administered as IV fentanyl boluses (0.5µg/kg). If the analgesia was not adequate (VAS ≥4 for 30min after fentanyl injection) another dose of rescue analgesia was given. The first rescue analgesic request time and the total amount of rescue analgesic used in the first twenty-four hours after surgery were noted.

A five-point scale with the options "very dissatisfied," "dissatisfied," "unsure," "satisfied," and "very satisfied" was used to gauge the patients' level of satisfaction with the anesthetic technique and postoperative analgesia.

Postoperative nausea and vomiting (PONV) (managed with Ondansetron 0.15mg/kg intravenously over 15 minutes), intraoperative hypotension (defined as MAP <20% of baseline readings, managed with ephedrine 5mg IV and/or normal saline IVI), bradycardia (defined as heart rate less than 50 beats/min, managed with atropine 0.6mg IV), and complications associated with ESBP (e.g., pneumothorax, direct injury to the spinal cord, hematoma, and infection) were all recorded as adverse events.

Outcomes

The primary outcome was the time to first postoperative rescue analgesia. The secondary outcomes included resting and dynamic (during cough or deep respiration) VAS scores within the first 24 hours postoperatively, the amount of rescue analgesics used throughout the entire 24-hour period following surgery, patients' satisfaction, and the incidence of any adverse effects.

Sample Size Calculation:

The sample size computation was performed by Universität Kiel, Germany's G*Power 3.1.9.2. After conducting a pilot study with ten patients in each group, we discovered that group I's mean time of first analgesic request was 10.1±3, whereas group II's mean time was 12.1±2.3. It was established that 30 patients in each group would yield 80% power for the Independent Sample *T*-test at the significance level of 0.05. In order to account for individuals who dropped out or deviated from the norm, 65 patients in all were included in the research.

Statistical analysis:

The statistical package software IBM SPSS version 25 was used to analyze the data. For quantitative data, the expressions mean±SD for parametric data and median and IQR for non-parametric data, lowest and maximum range, and for qualitative data, both number and percentage. The Mann-Whitney test was used to examine non-parametric quantitative data, and the Independent Samples *T*-test was used to examine parametric quantitative data between the two groups. Using the Wilcoxon Signed rank test, the analysis between periods within each group was conducted. On the other hand, for categorical variable comparison, the Chi-square test was used. Statistical significance was established when the *P*-value was less than 0.05.

RESULTS

In this study, 65 participants were enrolled. Two individuals experienced coagulopathy, and three patients declined to take part in this study. Two equal parallel groups of 60 patients were randomly assigned, with 30 patients in each group. All patients completed the study procedure and 24h follow up and their data under analysis (Figure 3).

Age, weight, sex distribution, and ASA categorization did not show significant difference between the two studied groups. The procedure's duration differed significantly. Such as, with dual-level ESPB taking a longer mean time (4.5 minutes) than single-level ESPB (4 minutes) (p<0.001*) (Table 1).

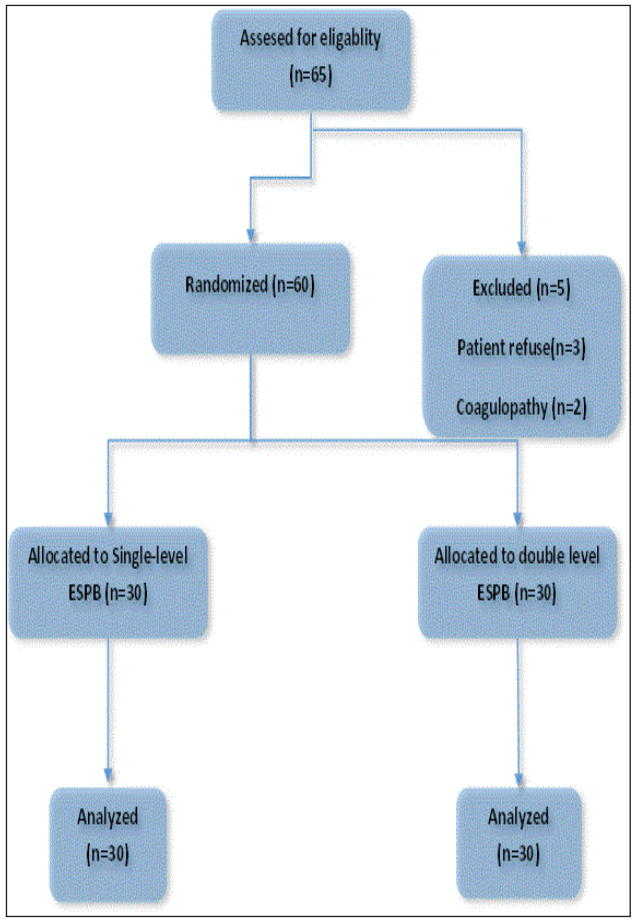

Figure 3: Flowchart of the study.

Table 1: Patient characteristics and time of procedure between groups:

		Single level ESPB	Dual level ESPB	*P* value
		N= 30	*N*= 30	
Age	Range Mean±SD	(51-69) 60.2±6.1	(50-69) 59.3±5.4	0.545
Sex	Male Female	15(50%) 15(50%)	16(53.3%) 14(46.7%)	0.796
Weight	Range Mean±SD	(70-90) 78.5±6.5	(65-90) 74±15.4	0.145
ASA	ASA II ASA III	16(53.3%) 14(46.7%)	17(56.7%) 13(43.3%)	0.371
Time of procedure (min)	Range Mean±SD	(3.5-4.3) 4±0.2	(4.1-5) 4.5±0.2	<0.001*

Independent Samples *T*-test for parametric quantitative data between the two groups. Mann-Whitney test for non-parametric quantitative data between the two groups. Chi-square test for qualitative data between the two groups; *: Significant level at *P* value <0.05.

VAS at rest, at 6, 8, 10 and 18 hours, dual-level exhibited significantly lower VAS scores compared to single-level ESPB. However, in 2, 4, 12 hours, and 24 hours, there are no significant differences between the groups. Additionally, at 6, 8, and 10 hours, the p-values were highly significant differences (p<0.001) in VAS scores among the group (Table 2).

Table 2: The VAS at rest between groups:

VAS at rest		Single level ESPB	Dual level ESPB	*P* value
		N= 30	*N*= 30	
1 H	Median IQR	1 (1-1)	1 (1-1)	0.317
2 H	Median IQR	1 (1-1)	1 (1-1)	0.317
4 H	Median IQR	1 # (1-2)	1 (1-1)	0.013
6 H	Median IQR	2 # (1-3)	1 # (1-2)	<0.001*
8 H	Median IQR	3 # (2-4)	2 # (1-2)	<0.001*
10 H	Median IQR	4 # (3-4)	2 # (2-3.3)	<0.001*
12 H	Median IQR	3 # (2-4)	3 # (2-4)	0.704
18 H	Median IQR	3 # (3-4)	2 # (2-4)	0.030*
24 H	Median IQR	2 # (2-2)	2 # (2-2)	0.379

Mann-Whitney test for non-parametric quantitative data between the two groups; Wilcoxon Signed Rank test for non-parametric quantitative data between two times within each group; #: Significant difference in comparison of each time with the time of 1hr within each group; *: Significant level at *P* value <0.05.

The dynamic VAS, dual-level demonstrated significantly lower VAS scores compared to single-level ESPB across all time points, with p-values <0.001. However, at 10, 12, 18, and 24 hours, the differences became non-significant (p>0.05) (Table 3).

Dual-level ESPB demonstrated a significantly longer time to first analgesic requirement (median of 12 hours) compared to (median of 10 hours), as indicated by a highly significant p-value of <0.001*. Moreover, dual-level also exhibited a significantly lower total fentanyl requirement (median of 75mcg) compared to single-level ESPB (median of 125mcg), with a highly significant p-value of <0.001* (Table 4).

While there was a trend indicating that a higher percentage of patients in dual-level ESPB reported "Excellent" satisfaction (70%) compared to single-level ESPB (50%), the difference was not found to be statistically significant, (p-value= 0.114) (Table 5).

No side effects were observed between groups.

Table 3: The Dynamic VAS (during cough or deep respiration) outcome between groups:

Dynamic VAS		Single level ESPB	Dual level ESPB	*P* value
		N= 30	*N*= 30	
1 H	Median IQR	2 (2-3)	1 (1-1)	<0.001*
2 H	Median IQR	3 # (2-3)	1 # (1-2)	<0.001*
4 H	Median IQR	4 # (3-4)	1 # (1-2)	<0.001*
6 H	Median IQR	5 # (4-6)	2 # (2-3)	<0.001*
8 H	Median IQR	4 # (4-5.3)	3 # (3-3.3)	<0.001*
10 H	Median IQR	4 # (3.8-5)	4 # (4-5)	0.529
12 H	Median IQR	4 # (4-5)	4 # (3-5)	0.822
18 H	Median IQR	5 # (3-5)	4 # (3-5)	0.143
24 H	Median IQR	3 # (3-4)	3 # (3-3)	0.001*

Mann-Whitney test for non-parametric quantitative data between the two groups; Wilcoxon Signed Rank test for non-parametric quantitative data between two times within each group; #: Significant difference in comparison of each time with the time of 1hr within each group; *: Significant level at *P* value <0.05.

Table 4: The analgesic outcome between groups:

		Single level ESPB	Dual level ESPB	*P* value
		N= 30	*N*= 30	
time of first analgesic requirement (h)	Median IQR	10 (9-11.3)	12 (11.8-18)	<0.001*
total fentanyl requirement(mcg)	Median IQR	125 (110-142.5)	75 (60-90)	<0.001*

Group I: Single-level ESPB; Group II: dual-level ESPB; Values are presented as median interquartile range (IQR); *: Significant difference between groups at p value <0.05 by Mann-Whitney U test.

Table 5: Patients' satisfaction score between groups:

		Single level ESPB	Dual level ESPB	*P* value
		N= 30	*N*= 30	
Patient Satisfaction	Good	15(50%)	9(30%)	0.114
	Excellent	15(50%)	21(70%)	

Group I: Single-level ESPB; Group II: dual-level ESPB; Values are presented as number and percentage (n %); *: Significant difference between groups at *p* value <0.05 by Pearson chi-square.

DISCUSSION

The current study evaluated the analgesic efficacy between dual and single level ESPB after Whipple surgery and demonstrated that Dual-level ESPB was associated with a significantly longer time to the first analgesic requirement (median of 12 hours) compared to single-level ESPB (median of 10 hours), as indicated by a highly significant *p*-value of <0.001*. Furthermore, the dual-level ESPB group had a significantly lower total fentanyl requirement (median of 75mcg) compared to the single-level ESPB group (median of 110mcg), also with a highly significant *p*-value of <0.001*.

LA produces visceral and somatic abdominal analgesia when it is injected at the lower thoracic level because it blocks the ventral and dorsal rami of spinal nerves as well as the connecting rami of the sympathetic fibers [4].

It accomplishes this by the direct effect of local anesthetics via physical diffusion and distribution to neural structures in the fascial plane beneath the erector spinae muscles and surrounding tissue compartments is most likely the main mechanism. Evidence of injectate diffusion to the ventral rami of spinal nerves, albeit with variation among investigations, supports the physiologic plausibility of this process. Furthermore, the dorsal rami are consistently involved. Also, it performs this through entering the thoracic paravertebral space anteriorly through the intertransverse connective tissue [5].

Adhikary *et al.,* 2018 performed a single-injection ESPB at the T5 spinal level on three newly deceased patients. They discovered that 20mL of a radiocontrast dye combination results in intercostal diffusion from 5 to 9 levels and neural foraminal and epidural spread for 2 to 5 levels, which could have similar clinical effects to thoracic paravertebral blocking [1].

In order to promote LA dispersion into the paravertebral area, several authors have observed advantages from technical improvements made to ESPB, such as the use of multiple level injections, double injection technique, and injections close to the costotransverse ligament during breast surgeries [6,7].

Our findings concurred with those of Elbarbary *et al.,* 2023, they studied the efficacy of ESPB versus TAPB on seventy patients subjected to abdominal surgery. They concluded that ESPB provided potent analgesic effect, longer pain management and less opioid consumption [2].

Also, Cai *et al.,* 2020 published a systematic review and meta-analysis based on a clinical study searched the efficacy of ESPB versus placebo depend on study published on PubMed, Cochrane Library, China National Knowledge Infrastructure (CNKI), Embase and Wanfang Database. After 1041 patients from 18 randomized controlled trials (RCTs) were examined, they concluded that ESPB demonstrated excellent postoperative analgesic benefits, lowering early postoperative complications in abdominal, thoracic, and spinal operations [8].

Kusse *et al.,* 2024 studied the efficacy of ESPB versus rectus sheath block on 72 patients subjected to midline abdominal surgery. They demonstrated that erector spinae plane blocks functioned better than rectus sheath blocks to alleviate postoperative pain after midline abdominal surgery [9].

Fu *et al.,* 2020 researched the effect of ESPB on 60 patients undergoing hepatectomy. Patients were divided into two equal groups—ESPB and control group—at random. They finished the study that after a hepatectomy, ESP block using ropivacaine successfully decreased early postoperative discomfort and enhanced recovery [10].

This agrees with Tulgar *et al.,* 2018 who investigated the effects of two-dose ESPB at bilevel versus single-dose ESPB at single-level on intraoperative and postoperative opioid use and pain ratings in thoracotomy patients. The use of bi-level injections was demonstrated to reduce opioid usage [11].

This aligns with the findings of Aksu *et al.,* 2019 shown that morphine consumption in the sixth, twelve-, and twenty-four-hours following surgery was considerably reduced by two dosages of ESPB. When comparing the postoperative 24-hour morphine intake with the Control group, it decreased by 75% overall [12].

The purpose of Abdelgalil *et al.,* 2022 study was to assess how well ESPB managed immediate postoperative pain during open nephrectomy for kidney cancers. Two equal groups were randomly allocated to the cases. For 48 hours, E Group received ongoing unilateral ESPB prior to surgery (20mL bolus of bupivacaine 0.25%, followed by 6mL/h 0.1%). Intravenous (IV) morphine (0.01mg/kg/h) for patient-controlled analgesia (PCA) was administered to Group C. They discovered that group E used significantly

less morphine overall in the first 48 hours after surgery and less fentanyl intraoperatively than C group. Compared to group C, group E had a significantly longer wait time before requesting an analgesic (P<0.001). During both movement and rest, group E's VAS were substantially less than those of group C [3].

On the other hand, patients with single-level ESPB used less morphine throughout the 24-hour postoperative period, according to Tuğcugil *et al.,* 2021 Given that 20ml of local anesthetic was distributed sufficiently both paravertebrally and craniocaudally in their investigation, they believed that pain ratings were satisfactory, and opioid intake was modest. The greater pain ratings and morphine intake might be the result of the local anesthetic's 10ml not being dispersed evenly enough [13].

According to a study by Gürkan *et al.,* 2018 morphine intake may be reduced by a single shot ESPB using 20ml of LA at the T4 level. The average amount of morphine used throughout the postoperative 24-hour period was 5.76mg, compared to 16.6mg in the control group. It was determined that a 65% reduction was clinically and statistically significant [14].

According to Abdelhamid *et al.,* 2020, obese patients who had undergone sleeve gastrectomy surgery, ultrasound-guided single-shot T9 erector spinae plane block lower the use of opioids both during and after surgery when compared to both the transversus abdominis plane block through subcostal approach and the control group [4].

In our study, VAS at rest, at 6, 8, 10 and 18 hours, dual-level ESPB exhibited significantly lower VAS scores compared to single-level ESPB (p-values <0.05). However, at 12 hours and 24 hours, the groups do not differ significantly from one another. Additionally, at 6, 8, and 10 hours, the p-values were highly significant differences (p<0.001) in VAS scores between the groups.

With p-values less than 0.001, the dual-level ESPB group in our study with dynamic VAS showed substantially lower VAS scores than the single-level ESPB group at all-time points. Nevertheless, the differences stopped being significant at 10, 12 and 18 hours (p>0.05).

This is in line with Tulgar *et al.,* 2018 who observed that bi-level injections improved the pain ratings. In contrast to our work, they employed a larger amount (30ml) of local anesthetic. Bi-level application may have allowed for sufficient dissemination since a large amount of local anesthetic is employed [11]. Unsimilar to the research of Tulgar *et al.,* (2019), we used a larger concentration in a smaller volume [15].

This contrasts with Tuğcugil *et al.,* 2021 who aimed to ascertain the effects of two doses of 10 milliliters of 0.5% bupivacaine given from T4-T6 level and a single dosage of 20 milliliters of 0.5% bupivacaine given at T5 level on postoperative pain. They showed that those who received single-level ESPB experienced decreased discomfort after thoracotomy surgery [13].

Chin *et al.,* 2017 observed decreased pain ratings in the initial twenty-four hours and oral morphine intake in four patients having laparoscopic ventral hernia repair after performing ESPB at T7 level. In one of their cases, they documented dermatomes spread from T6 to T12 [16].

According to Peng *et al.,* 2020 the ESPB exhibits differential blockage properties. Both cutaneous sensory block and analgesia without motor block have been documented (18). Variable findings of ESPB dermatomal spread were found in a study of case reports using dermatomal analysis (9). Since its dermatomal distribution is unpredictable, more clinical studies are needed to evaluate this. According to a recent narrative review, the direct influence of LA on ESP and nearby tissue compartments through physical spread and diffusion is the mechanism behind ESPB. It also emphasizes how a variety of factors lead to unpredictability and variability [17].

The purpose of Rao Kadam *et al.,* 2021 was to evaluate the effectiveness of ESPB against wound infiltration (WI) for postoperative analgesia following laparoscopic assisted colonic surgery. They found that both during coughing and when at rest, the PACU numerical rating score (NRS) did not significantly change depending on the therapy (p-values of 0.595 and 0.382, respectively). The initial 24-hour NRS at rest and coughing did not show any significant differences either (p-values 0.285 and 0.431, respectively) [18].

Also, our study revealed a noteworthy variation in the procedure's duration, albeit not clinically significant; it was approximately 30 seconds. The dual-level ESPB group exhibited a greater mean duration (4.5 minutes) than the single-level ESPB group (4 minutes), as supported by a highly significant p-value (<0.001).

Although there was a tendency in our study showing that more patients in the dual-level ESPB group (70%) than in the single-level ESPB group (50%) rated "Excellent" satisfaction, the difference did not achieve statistical significance (p-value= 0.114).

LIMITATIONS

Although the block was performed by a well-trained anesthetist with good experience in regional blocks and

a good separation of facial plane with good expansion of local anesthetic longitudinal, yet the extension of the sensory blockade was not assessed because the two blocks were done after patient received general anesthesia. Small sample size of the study therefore, further studies with a bigger sample size are required.

CONCLUSION

Dual-level ESPB was associated with a longer technical duration but resulted in significantly lower total fentanyl consumption, delayed postoperative analgesic requirements, lower VAS pain scores at specific time intervals, and higher patient satisfaction compared to single-level ESPB.

FINANCIAL SUPPORT AND SPONSORSHIP

Nil.

CONFLICTS OF INTEREST

There are no conflicts of interest.

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