Ultrasound Guided Erector Spinae Plane Block versus Subcostal Transversus Abdominis Plane Block in Perioperative Analgesia for Laparoscopic Cholecystectomy: A Prospective, Randomized, Controlled Clinical Trial

Abstract

Background: Laparoscopic surgery (LC) is a surgical method that has many advantages since it involves smaller incisions with less bleeding and ileus in the postoperative period and provides faster recovery and reduced hospital stay. **This study aimed to** compare between the effectiveness of Erector spinae plane block (ESPB) and Oblique subcostal transversus abdominis plane block (OSTAPB) under ultrasound guidance. **Methods:** This prospective randomized study was conducted on 60 patients with American Society of Anaesthesiology (ASA) physical status I-III, Between the ages of 18-60 years who were presented with patients scheduled for elective LC surgery, presented to Benha university hospital. Patients were equally randomized into two groups: group 1 (ESPB): 30 patients received ultrasound guided ESP block and group 2 (OSTAPB): 30 patients received ultrasound guided OSTAP block. **Results**: The time of the 1st rescue analgesic requirement was significantly delayed in ESPB group compared to OSTAPB group ($P<0.001$), and the total meperidine requirements was significantly lower in ESPB group compared to OSTAPB group ($P<0.001$). Numerical rating scale (NRS) at 4, 6 and 12 hours was significantly lower in ESPB group compared to OSTAPB group ($P<0.05$), with no significant difference between both groups at PACU, 30 minutes, 2 hours and 24 hours. Incidence of PONV was significantly lower in ESPB group compared to OSTAPB group ($P=0.014$). **Conclusion:** ESPB is superior to OSTAPB as it provides lower pain scores total analgesic consumption and a longer duration of analgesia with Fewer postoperative adverse effects the after laparoscopic cholecystectomy.

Keywords: Ultrasound Guided Erector Spinae Plane Block, Subcostal Transversus Abdominis Plane Block, Perioperative Analgesia , Laparoscopic Cholecystectomy.

Introduction

Laparoscopic surgery (LC) is a surgical method that has many advantages since it involves smaller incisions with less bleeding and ileus in the postoperative period, and provides faster recovery and reduced hospital stay. Although one of the major advantages of laparoscopy is less postoperative pain, it does not completely disappear and can be severe. Therefore, it is still considered as an important issue (1).

Pain after LC is associated with phrenic nerve irritation due to abdominal tension, port- site incision, and CO2 insufflation. Therefore, pain that occurs after the removal of the gallbladder is of both visceral and somatic origin (2). If not adequately treated, acute postoperative pain is associated with an increased risk of myocardial ischemia, thromboembolic and pulmonary complications, changes in the immune system due to

opioid use, prolonged hospital stay, and chronic pain. Thus, pain should be treated before the development of central nervous system hyperexcitability and peripheral hypersensitivity (3).

In addition to non-steroidal anti-inflammatory drugs, various regional alternatives such as the paravertebral block, transversus abdominis plane block (TAPB), derivatives of TABP [subcostal TAPB (STAPBs) and oblique STAPB (OSTAPB)], and erector spinae plane block (ESPB) have been used to reduce side effects of opioids as part of multimodal analgesia according to the Enhanced Recovery After Surgery (ERAS) protocol (4). However, TAPB, STAPB, and OSTAPB have been shown to be insufficient in some cases since they are mostly effective in relieving somatic pain (5).

ESPB has been indicated to be effective in postoperative pain in various surgical procedures, including LC, in which ventral and dorsal rami are affected. Also after injection of the local anesthetic agent, spread of drug extend cranially and caudally over several dermatomal levels producing widespread analgesia (6).

The purpose of this study was to compare between the effectiveness of ESPB and OSTAPB under ultrasound guidance, this was assessed by intraoperative fentanyl consumption by monitoring (blood pressure, heart rate), post-operative rescue analgesia by numerical rating score(NRS), total opioid consumption postoperative walking time, and duration of hospital stay and any complication in the 1st 24 hours between the two groups were compared.

Patients and methods

This prospective randomized study was conducted on 60 patients at Benha university hospital throughout the period from June 2022 to June 2023 An informed written consent was obtained from the patients. Every patient received an explanation of the purpose of the study and had a secret code number. The study was done after being approved by the Research Ethics Committee, Faculty of Medicine, Benha University.

Inclusion criteria were patients with American Society of Anesthesiology (ASA) physical status I-III, between the ages of 18-60 years and who were scheduled for elective LC surgery

Exclusion criteria were patient refusal, patients with infection at the block site, with repeated surgery, coagulopathy and bleeding diathesis, morbid obesity (BMI > 35 kg/m^2), local anesthetic allergy, pregnancy, systemic infection, conversion to open surgery, decreased pulmonary reserve, major cardiac disorders, urgent surgery kidney and liver dysfunction, previous history of opioid use, preexisting neurological deficiencies, and psychiatric diseases.

Randomization was performed according to computer-generated random number tables, and allocation to treatment group was done using the sealed opaque envelope technique. According to randomization, patients were divided into two groups to receive either ultrasound guided ESP block or OSTAP block; **Group 1 (ESPB):** in this group 30 patients received ultrasound guided ESP block and **Group 2 (OSTAPB):** in this group 30 patients received ultrasound guided OSTAP block.

All studied cases were subjected to the following: demographic characteristics including [Age, weight, height, BMI, ASA physical status), and duration of surgery], **[**Personal history; name, age, gender and body mass index (BMI), Present history: course of the disease and duration, Past history of any medical condition or previous hospital admission and Family history of similar condition]. **Full clinical examination:** [Complete general examination: including [vital signs (blood pressure, temperature, heart rate), and neurological examination. **Routine laboratory investigations [**complete blood count, random Blood Glucose level Urine analysis, coagulation profile, kidney function tests, liver function tests and arterial blood gases].

Preoperative visit: One day before the intervention, all the patients were interviewed to explain the procedure. Also, routine investigations were done.

Anesthetic technique: Premedication and general anesthesia induction and maintenance were the same for all patients. Both groups were monitored including pulse oximetry, electrocardiography (ECG), and noninvasive arterial pressure measurement prior to induction of anesthesia. Premedication was performed with an intravenous (iv) injection of midazolam 1-2mg. Anesthesia induction was achieved with intravenous (IV) 2mg / kg propofol, 0.5-lug / kg fentanyl and muscle relaxation with 0.5mg /kg Atracuirium. Anesthesia was maintained with a 0.6-0.8 age-corrected minimal alveolar concentration (MAC) (tidal volume = 8mL / kg, frequency = 12 Breath/min) with sevoflurane in a 40-60% O2-air mixture. After the transverse process of the vertebra was visualized, a 22-gauge 10cm stimuplex needle was advanced toward the interfascial plane between the erector spinae and the transverse process. Consequently, the separation caused by hydro-dissection was confirmed by administering 0.5—1 mL of fluid. Then, a local anesthetic containing 20 mL of (0.25% bupivacaine+4 mg dexamethasone) The craniocaudal spreading of the local anesthetic was observed, the same procedure was reiterated on the other side. At the operation room.

Monitoring was done by A 5-Lead ECG, arterial blood pressure monitoring: Non-Invasive Blood Pressure monitoring, Invasive Blood Pressure monitoring: (according to the surgery and patient condition) was applied by conducting the arterial Line to the pressure -tubing-transducer system which was flushed by heparinized saline (0.5-1 unit of heparin per ml of saline). Pulse oximeter was placed over the finger of the patient.

ESPB: The block was applied after administering anesthesia induction, the lower end of the scapula and the spinous process of the T7 vertebra was located while the patient was in a prone position. A high-frequency linear ultrasound (US) probe shielded with a sterile sheath was placed sagittally on the spinous process of the T7 vertebra, and then slid 3 cm laterally in the parasagittal region. A 22G 10-cm needle (Stimuplex A, B Braun, Melsungen, Germany) was inserted using an In - plane approach. The tip of the needle was placed into the fascial plane on the deep (anterior) aspect of the erector spinae muscle. The location of the needle tip was confirmed by visible fluid spread lifting the erector spinae muscle off the bony shadow of the transverse process on ultrasonographic imaging. A volume of 20 mL of LA mixture was injected. Due to reports that ESPB blocks visceral pain especially that of peritoneal distention, and as at least one trocar is placed in the midline, the same procedure was repeated for the opposite side.

OSTAPB: The US probe was placed under the xiphoid in the midline of the abdomen and moved subcostally laterally until the transverse abdominis muscle started under the rectus abdominis muscle. At the level of the anterior axillary line, a 22-gauge 10 cm stimuplex needle was guided toward the plane, and separation caused by hydrodissection was confirmed by administering 1 mL of fluid, Then, injected. After confirming the correct placement of the needle and the negative aspiration probe, the rest of the local anesthetic at the same volume was bilaterally. The block was performed bilaterally. Surgery commenced after 15 minutes of the completion of the block and consisted of the introduction of the 4 supraumbilically ports (two 5 mm ports and two 10 mm ports) and the achievement of cholecystectomy.

Rescue fentanyl doses of 100 μg were repeated depending on hemodynamic parameters (increase of MAP and HR with over 15% from baseline values). Intraoperative non-opioid analgesia was administered with acetaminophen 15–20 mg/kg, 15 minutes before the end of the surgery. At the end of the surgery, the neuromuscular block was reversed with neostigmine 0.04 mg/kg and atropine 0.01 mg/kg. Extubation was performed with the patient awake with TOF = 90%.

Postoperative pain management: Postoperative analgesia was assessed using (NRS) pain scores. NRS is an 11-point scale ranging from "0" representing lack of pain ("no pain") to "10" representing extreme pain ("as severe as you can imagine" or "worst pain imaginable"). Meperidine 50 mg IV was administered if the NRS pain score was > 3/10 at PACU. If the NRS pain score was = 3/10 in ward, (IV 25mg meperidine) was administered.

Outcome measures: Outcome measures were NRS pain scores at PACU and 30 min as well as at the 2, 4, 6, 12, 24 h both at rest and when coughing and postoperative analgesia requirements (paracetamol, tramadol, and rescue analgesics). Time of 1st rescue analgesic requirement and total meperidine requirements. Length of PACU stay (min), Length of hospital stay (hours), Time to achieve unassisted walking (hours). In addition to the above measures, shoulder pain during the first 24 h and presence of postoperative nausea and vomiting were noted. Incidence of complications (Pruritus, Somnolence, Respiratory depression and Local anesthetic toxicity) related to the technique. Patients' satisfaction with postoperative analgesia after 24 hours postoperatively according to a 'five-point Likert scale satisfaction score (poor = 0, fair = 1, good = 2, excellent= 3) (7).

Approval code: 14-04-2022

Statistical analysis: Statistical analysis was done by SPSS v28 (IBM©, Armonk, NY, USA). The Shapiro-Wilks test and histograms were used to evaluate the normality of the distribution of data. Quantitative parametric data were presented as mean and standard deviation (SD) and were analyzed by unpaired student t-test. Quantitative non-parametric data were presented as the median and interquartile range (IQR) and were analyzed by Mann Whitney-test. Qualitative variables were presented as frequency and percentage (%) and analyzed using the Chi-square test or Fisher's exact test when appropriate. A two-tailed P value < 0.05 was considered statistically significant.

Results

In this study, 97 patients were assessed for eligibility, 24 patients did not meet the criteria and 13 patients refused to participate in the study. The remaining 60 patients were randomly allocated into 2 equal groups (30 patients each group). All allocated patients were followed-up and analyzed statistically. **Figure 1**

There was an insignificant difference between both groups regarding the baseline characteristics including (age, sex, weight, height, BMI and ASA). the clinical examination of vital signs including HR, SBP and DBP was insignificantly different between both groups. surgery time was insignificantly different between both groups. **Table 1**

The total intraoperative Fentanyl consumption was significantly lower in ESPB group compared to OSTAPB group ($P<0.001$). the time of the 1st rescue analgesic requirement was significantly delayed in ESPB group compared to OSTAPB group ($P<0.001$), and the total meperidine requirements was significantly lower in ESPB group compared to OSTAPB group ($P<0.001$). Regarding the postoperative pain assessment NRS at 4, 6 and 12 hours was significantly lower in ESPB group compared to OSTAPB group ($P<0.05$), with no significant difference between both groups at PACU, 30 minutes, 2 hours and 24 hours. **Table 2; Figure 2**

Regarding the outcome, length of PACU stay and length of hospital stay were significantly shorter in ESPB group compared to OSTAPB group ($P<0.001$, 0.032). Moreover, time to achieve unassisted walking was significantly earlier in ESPB group compared to OSTAPB group ($P<0.001$). Regarding the adverse events, PONV occurred in 3 (10%) patients in ESPB group and 11 (36.67%) patients in OSTAPB group. Postoperative adverse events including pruritus, somnolence, respiratory depression and local anesthetic toxicity were not encountered in any of the studied groups. Incidence of PONV was significantly lower in ESPB group compared to OSTAPB group ($P=0.014$). **Table 3**

The satisfaction was significantly different between both groups, showing significantly better satisfaction in ESPB group compared to OSTAPB group ($P=0.009$). **Table 4**

Discussion

Several therapeutic modalities including nonsteroidal anti-inflammatory drugs, dexamethasone, gabapentinoids, opioids, local anesthetic infiltration to port sites, and transversus abdominis plane block (TAP) have been used to attenuate postoperative pain caused by LC. Previously, several studies have reported that ultrasound-guided oblique subcostal abdominis plane (US-OSTAP) and ultrasound-guided erector spinae plane (US-ESP) blocks reduced postoperative pain scores and opioid consumption in the first 24 h after LC (8).

The erector spinae plane block (ESPB) was first described in 2016 for the management of thoracic neuropathic pain and has subsequently been used for acute pain control after surgery. Subsequently, meta-analyses have demonstrated that ESPB may provide effective postoperative analgesia in patients undergoing LC (9).

OSTAPB is one of the suitable regional anesthetic techniques used for postoperative analgesia in LC but found not so effective. Although OSTAPB provides analgesia for somatic pain and parietal pain of almost the entire anterior abdomen, it is ineffective in reliving visceral pain (10).

According to our study, surgery time was insignificantly different between both groups. The total intraoperative fentanyl consumption was significantly lower in ESPB group compared to OSTAPB group ($P<0.001$).

This came in agreement with Ozdemir et al. reported that surgery time was insignificantly different between ESPB and OSTAPB groups.The total intraoperative fentanyl consumption was significantly lower in ESPB group compared to OSTAPB group ($P<0.0001$) (11).

Additionally, Altıparmak et al.(12) reported that surgery time was insignificantly different between ESPB and OSTAPB groups. However, the Intraoperative fentanyl need was insignificantly different between both groups.

In the current study, the postoperative pain assessment at rest and movement was assessed. The numerical rating scale (NRS) at 4, 6 and 12 hours was significantly lower in ESPB group compared to OSTAPB group ($P<0.05$), with no significant difference between both groups at post anesthesia care unit (PACU) and 24 hours.

In parallel with us, Ali et al. (13) found that NRS scores at the postoperative 12th and 24th hours were insignificantly different between ESPB and OSTAPB groups.

Additionally, (11) revealed that the NRS at 4, 6 and 12 hours was significantly lower in ESPB group compared to OSTAPB group. However in disagreement with us, the NRS at post anesthesia care unit (PACU) and 24 hours was significantly lower in ESPB group compared to OSTAPB group.

Moreover, Engineer et al.(14) reported that postoperative NRS scores were found to be significantly lower in the ESPB group compared to the OSTAP group up to 12 h postoperatively.

In agreement with us, Tulgar et al.(15) showed that NRS scores for 24 h were compared between ESPB, OSTAPB, and control groups, no statistically significant difference was found ($P > 0.05$). While there was a statistically significant difference between NRS for the 0–3-h time frame ($P<0.001$), there was no statistically significant difference for 3–12-h and 12–24-h time frames ($P > 0.05$).

According to our findings, the time of the 1st rescue analgesic requirement was significantly delayed in ESPB group compared to OSTAPB group ($P<0.001$), and the total meperidine requirements was significantly lower in ESPB group compared to OSTAPB group ($P<0.001$).

Our findings came in agreement with (11) who reported that the time of the 1st rescue analgesic requirement was significantly delayed in ESPB group compared to OSTAPB

group (P<0.02). In alignment with our findings, Routray et al.(10) revealed that that the time of the rescue analgesic requirement was significantly lower in ESPB group compared to OSTAPB (p=0.028).

In contrast with us, Altıparmak et al. (12) showed that although, rescue analgesic requirement was higher in the OSTAP group (48 mg) than ESP group (24 mg) at the postoperative 24th hour, the time of the 1st rescue analgesic was insignificantly different between ESPB and OSTAPB groups.

Regarding to the outcome in the present study, length of PACU stay and length of hospital stay were significantly shorter in ESPB group compared to OSTAPB group (P<0.001, 0.032). Moreover, time to achieve unassisted walking was significantly earlier in ESPB group compared to OSTAPB group (P<0.001).

In agreement with our findings, Ozdemir et al. (11) demonstrated that PACU stay, length of hospital stay, and time to achieve unassisted walking were significantly shorter in ESPB group compared to OSTAPB group (P<0.0001).

Regarding the adverse events in the present study, postoperative nausea and vomiting (PONV) occurred in 3 (10%) patients in ESPB group and 11 (36.67%) patients in OSTAPB group. Incidence of PONV was significantly lower in ESPB group compared to OSTAPB group (P=0.014). Postoperative adverse events including pruritus, somnolence, respiratory depression and local anesthetic toxicity were not encountered in any of the studied groups. The satisfaction was significantly different between both groups, showing significantly better satisfaction in ESPB group compared to OSTAPB group (P=0.009).

This came in accordance with Mounika et al. (16) who stated that the patient satisfaction score as per the feedback was significantly higher in ESPB group than in OSTAPB group. This difference in score was also found to be statistically significant ($p \leq 0.001$). It was found that in ESPB group none of the patients reported nausea and vomiting in the post-operative period, while it was reported among 9 (13.04%) of the patients in OSTAPB group. This difference was also found to be statistically significant (p=0.0058).

In line with our results, Qi-hong et al .(17) found that PONV incidence was significantly lower in ESPB group compared to OSTAPB group (P<0.01). They revealed a significantly better satisfaction score in ESPB group compared to OSTAPB group (P<0.01).

In contrast with us, Routray et al. (10) reported that PONV and sedation incidence was insignificantly different between ESPB and OSTAPB groups.

Our study had some limitations as relatively small sample size, short follow up period, single-center study, and the lack of a no-intervention control group.

Conclusion

ESPB is superior to OSTAPB as it provides lower pain scores total analgesic consumption and a longer duration of analgesia Fewer postoperative adverse effects the after

laparoscopic cholecystectomy. We recommended that Larger multi-center studies sample size is recommended for more accurate results with Longer duration of follow up.

Sources of funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Author contribution

Authors contributed equally to the study**.**

Conflicts of interest

No conflicts of interest

References

1. Karaca Ö, Pınar HU. Efficacy of Ultrasound-Guided Erector Spinae Plane Block for Postoperative Analgesia in Laparoscopic Cholecystectomy: A Retrospective Cohort Study. Journal of Anesthesia/Anestezi Dergisi (JARSS). 2020;28.
2. Karaca O, Pınar HU, Turk E, Dogan R, Ahiskalioglu A, Solak SK. Effects of Single-Dose Preemptive Pregabalin and Intravenous Ibuprofen on Postoperative Opioid Consumption and Acute Pain after Laparoscopic Cholecystectomy. J Invest Surg. 2019;32:189-95.
3. Tulgar S, Selvi O, Kapakli MS. Erector Spinae Plane Block for Different Laparoscopic Abdominal Surgeries: Case Series. Case Rep Anesthesiol. 2018;2018:3947281.
4. Taketa Y, Irisawa Y, Fujitani T. Ultrasound-guided erector spinae plane block elicits sensory loss around the lateral, but not the parasternal, portion of the thorax. J Clin Anesth. 2018;47:84-5.
5. Altıparmak B, Korkmaz Toker M, Uysal A. Potential mechanism for bilateral sensory effects after unilateral erector spinae plane blockade in patients undergoing laparoscopic cholecystectomy. Can J Anaesth. 2020;67:161-2.
6. Hannig KE, Jessen C, Soni UK, Børglum J, Bendtsen TF. Erector Spinae Plane Block for Elective Laparoscopic Cholecystectomy in the Ambulatory Surgical Setting. Case Rep Anesthesiol. 2018;2018:5492527.
7. Buli B, Gashaw A, Gebeyehu G, Abrar M, Gerbessa B. Patient satisfaction with post-operative pain management and associated factors among surgical patients at Tikur Anbessa Specialized Hospital: Cross-sectional study. Ann Med Surg (Lond). 2022;79:104087.
8. Eftekhariyazdi M, Ansari M, Darvishi-Khezri H, Zardosht R. Pharmacological methods of postoperative pain management after laparoscopic cholecystectomy: a review of meta-analyses. Surgical Laparoscopy Endoscopy & Percutaneous Techniques. 2020;30:534-41.
9. Koo C-H, Hwang J-Y, Shin H-J, Ryu J-H. The effects of erector spinae plane block in terms of postoperative analgesia in patients undergoing laparoscopic cholecystectomy: a meta-analysis of randomized controlled trials. Journal of clinical medicine. 2020;9:2928.
10. Routray SS, Mohanty R, Pradhan K, Pani S. Evaluation of efficacy of ultrasound guided erector spinae plane block and oblique subcostal transversus abdominis plane block for

postoperative analgesia in laparoscopic cholecystectomy. Panacea J Med Sci. 2020;10:128-34.
11. Ozdemir H, Araz C, Karaca O, Turk E. Comparison of ultrasound-guided erector spinae plane block and subcostal transversus abdominis plane block for postoperative analgesia after laparoscopic cholecystectomy: a randomized, controlled trial. Journal of InvestIgatIve surgery. 2022;35:870-7.
12. Altıparmak B, Korkmaz Toker M, Uysal AI, Kuşçu Y, Gümüş Demirbilek S. Ultrasound-guided erector spinae plane block versus oblique subcostal transversus abdominis plane block for postoperative analgesia of adult patients undergoing laparoscopic cholecystectomy: Randomized, controlled trial. J Clin Anesth. 2019;57:31-6.
13. Ali M, Yasin B, Khan S, Ali I, Abdullah H, Tarar HM. Ultrasound-Guided Erector Spinae Plane Block versus Oblique Subcostal Transversus Abdominis Plane Block for Post-Operative Analgesia of Adult Patients Undergoing Laparoscopic Cholecystectomy. Pakistan Armed Forces Medical Journal. 2023;73:1245.
14. Engineer SR, Devanand A, Kulkarni M. Comparative study of the efficacy of ultrasound-guided erector spinae block and oblique subcostal transversus abdominis plane block for postoperative analgesia after laparoscopic cholecystectomy. Ain-Shams Journal of Anesthesiology. 2022;14:84.
15. Tulgar S, Kapakli MS, Kose HC, Senturk O, Selvi O, Serifsoy TE, et al. Evaluation of Ultrasound-Guided Erector Spinae Plane Block and Oblique Subcostal Transversus Abdominis Plane Block in Laparoscopic Cholecystectomy: Randomized, Controlled, Prospective Study. Anesth Essays Res. 2019;13:50-6.
16. Mounika V, Sahu L, Mishra K, Mohapatra PS. A Comparative Evaluation of Post-operative Pain Management Using Erector Spinae Plane Block and Oblique Transverse Abdominis Plane Block in Patients Undergoing Laparoscopic Cholecystectomy. Cureus. 2023;15:e35750.
17. Qi-hong S, Xu-yan Z, Xu S, Yan-jun C, Ke L, Rong W. Comparison of Ultrasound-Guided Erector Spinae Plane Block and Oblique Subcostal Transverse Abdominis Plane Block for Postoperative Analgesia in Elderly Patients After Laparoscopic Colorectal Surgery: A Prospective Randomized Study. Pain and Therapy. 2021;10:1709-18.

Table 1: Baseline characteristics, vital signs and surgery time of the studied groups

		ESPB group (n=30)	OSTAPB group (n=30)	P value
Age (years)		44.63 ± 8.76	45.63 ± 9.09	0.656
Sex	**Male**	3 (10%)	7 (23.34%)	0.165
	Female	27 (90 %)	23 (76.66 %)	
Weight (Kg)		74.63 ± 9.2	73.09 ± 8.76	0.498
Height (m)		1.67 ± 0.04	1.66 ± 0.04	0.474
BMI (Kg/m^2)		26.77 ± 3.44	26.46 ± 3.16	0.706
ASA	**ASA I**	11 (36.67%)	9 (30%)	0.347
	ASA II	10 (33.33%)	3 (10%)	
	ASA III	9 (30%)	8 (26.67%)	
HR (beats/min)		82.06 ± 6.43	82.59 ± 7.42	0.761
SBP (mmHg)		122.5 ± 10.16	124.38 ± 10.45	0.470
DBP (mmHg)		75.94 ± 9.11	75 ± 9.16	0.683
Surgery time (min)		52.22 ± 4.53	52.34 ± 4.92	0.916

Data presented as mean ± SD or frequency (%), HR: heart rate, SBP: systolic blood pressure, DBP: diastolic blood pressure, BMI: body mass index, ASA: American Society of Anesthesiologists.

Table 2: Total intraoperative fentanyl consumption and postoperative rescue analgesic requirements and NRS of the studied groups

		ESPB group (n=30)	OSTAPB group (n=30)	P value
Total Fentanyl consumption (mg)		69.33 ± 10.80	76.67 ± 9.94	**<0.001***
Time of 1st rescue analgesic requirement (hr)		10.5 ± 2.64	6.44 ± 3.12	**<0.001***
Total meperidine requirements (mg)		32.81 ± 24.13	59.38 ± 29.61	**<0.001***
		50 (0-50)	50 (50-100)	
NRS	**At PACU**	2 (1-3)	2 (1-3)	0.892
	30 min	2 (1-3)	2 (1-2.75)	0.265
	2 hours	2 (1.25-3)	2 (2-3)	0.868
	4 hours	2 (1-3)	3 (2-4)	**0.001***
	6 hours	2.5 (2-3)	3.5 (3-5)	**0.003***
	12 hours	3 (2-3.25)	4 (3-5)	**0.005***
	24 hours	2 (1-2.25)	2 (1-3)	0.251

Data presented as mean ± SD or median (IQR), NRS: numerical rating scale, PACU: post anesthesia care unit, *: statistically significant as p value <0.05.

Table 3: Outcome and adverse effects of the studied groups

		ESPB group (n=30)	OSTAPB group (n=30)	P value
Length of PACU stay (min)		16.84 ± 4.54	26.66 ± 2.44	**<0.001***
Length of hospital stay (hours)		18 ± 3.37	19.72 ± 2.9	**0.032***
Time to achieve unassisted walking (hours)		121.66 ± 6.05	164.03 ± 10.3	**<0.001***
Adverse events	**PONV**	3 (10%)	11 (36.67%)	**0.014***
	Pruritus	0 (0%)	0 (0%)	---
	Somnolence	0 (0%)	0 (0%)	---
	Respiratory depression	0 (0%)	0 (0%)	---
	Local anaesthetic toxicity	0 (0%)	0 (0%)	---

PACU: post anesthesia care unit, PONV: postoperative nausea and vomiting, *: statistically significant as p value <0.05.

Table 4: Satisfaction of the studied groups

	ESPB group (n=30)	OSTAPB group (n=30)	P value
Very satisfied	18 (60%)	7 (23.33%)	**0.020***
Satisfied	8 (26.67%)	8 (26.67%)	
Neutral	3 (10%)	9 (30%)	
Dissatisfied	1 (3.33%)	4 (13.33%)	
Extremely dissatisfied	0 (0%)	2 (6.67%)	

*: statistically significant as P value <0.05

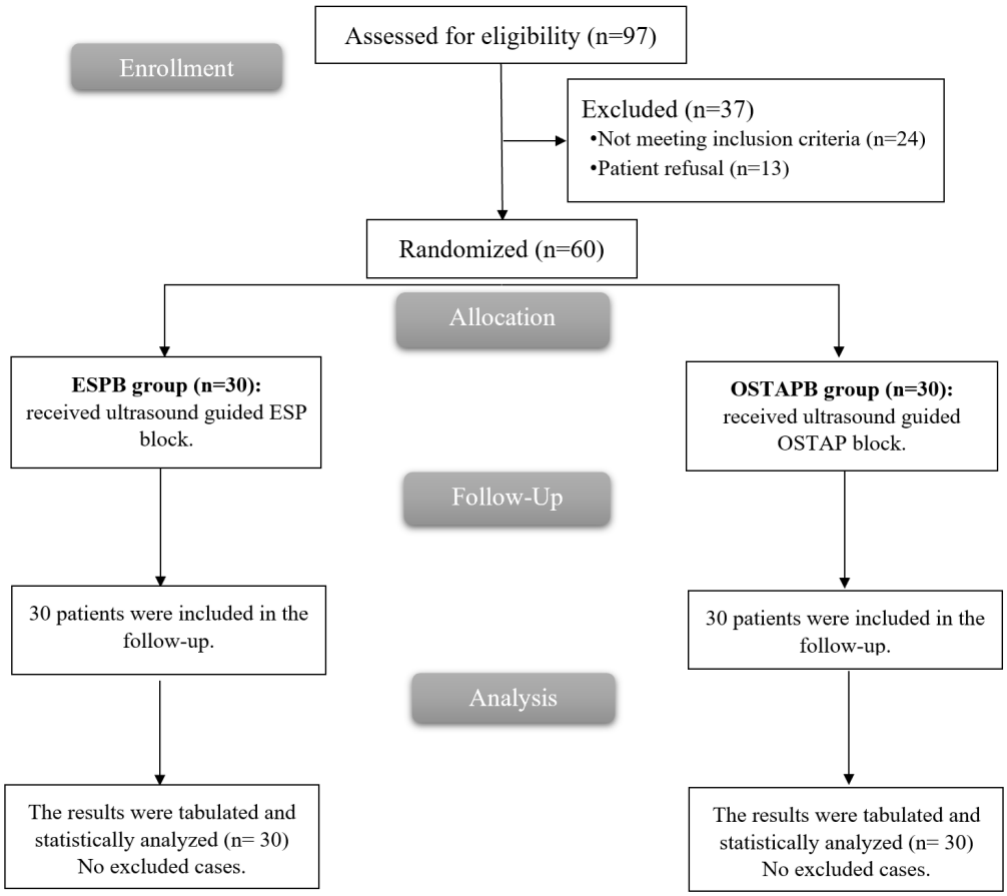

Figure 1: CONSORT flowchart of the enrolled patients

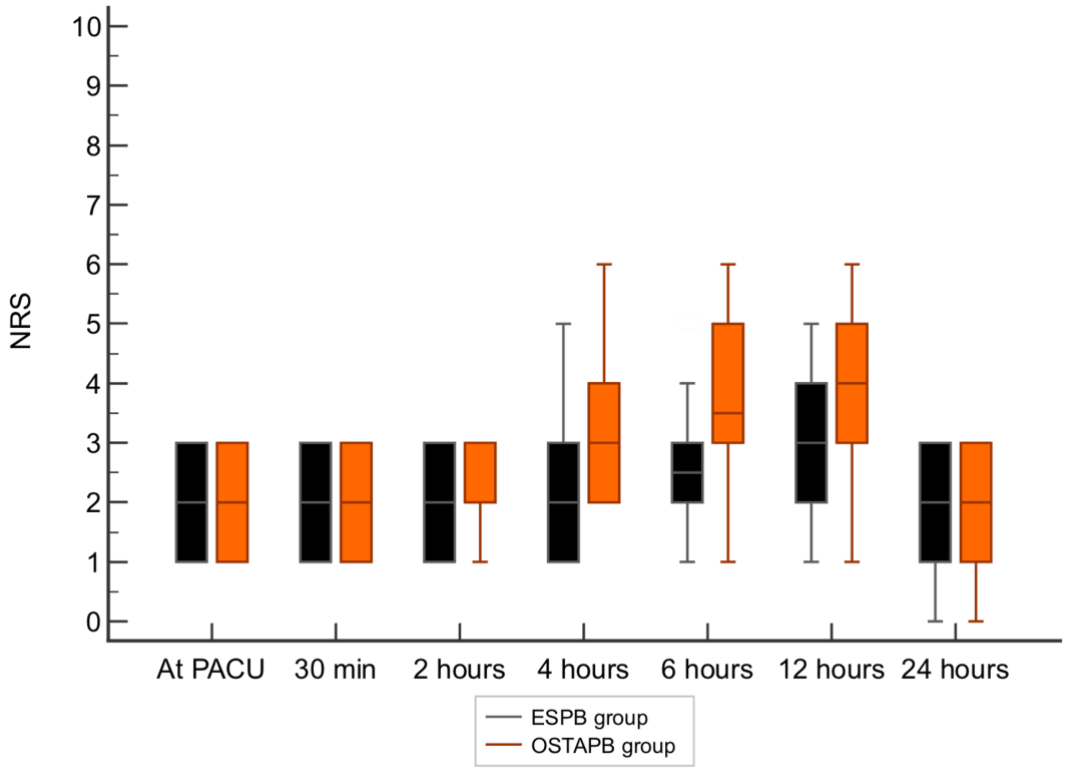

Figure 2: NRS of the studied groups