

COMPARISON OF DURATION OF POST OPERATIVE ANALGESIA IN PATIENTS UNDERGOING TOTAL ABDOMINAL HYSTERECTOMY WITH ULTRASOUND GUIDED BILATERAL ERECTOR SPINAE PLANE BLOCK VERSUS BILATERAL TRANSVERSUS ABDOMINIS PLANE BLOCK

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Abstract

Background: Hysterectomy is one of the most commonly performed gynecological surgeries worldwide. Effective postoperative analgesia is crucial to enhance recovery and reduce complications. Ultrasound-guided Erector Spinae Plane (ESP) and Transversus Abdominis Plane (TAP) blocks are two regional anesthesia techniques increasingly used for postoperative pain management. **Objective:** To compare the mean duration of postoperative analgesia in patients undergoing total abdominal hysterectomy with bilateral ultrasound-guided ESP block versus TAP block. **Methods:** This randomized controlled trial was conducted at the Department of Anesthesia, Sir Ganga Ram Hospital, Lahore, over six months from 1st December 2024 to 31st May 2025. Sixty patients undergoing elective total abdominal hysterectomy were enrolled and randomized into two groups of 30 each. Group A received bilateral ESP blocks, while Group B received bilateral TAP blocks, both under ultrasound guidance. The primary outcome was the mean duration of postoperative analgesia, defined using the Visual Analogue Scale (VAS), with scores ≤ 3 indicating effective analgesia. **Results:** The mean duration of postoperative analgesia was significantly higher in the ESP group compared to the TAP group ($p < 0.001$). No major adverse events were observed in either group. **Conclusion:** Ultrasound-guided ESP block provides superior postoperative analgesia compared to TAP block in patients undergoing total abdominal hysterectomy, supporting its use as a preferred regional anesthesia technique.

INTRODUCTION

Total abdominal hysterectomy (TAH) is a commonly performed major gynecological procedure, frequently associated with significant postoperative pain. Effective pain management is crucial not only for patient comfort but also for minimizing postoperative complications, reducing hospital stay, and facilitating early mobilization. Hysterectomy,

defined as the surgical removal of the uterus, is the second most commonly performed gynecological surgery in developed countries, following cesarean section [1]. The different types of approaches include abdominal, vaginal, laparoscopic, and robotic. Abdominal hysterectomy is the most common procedure done among all practitioners, used in



roughly 66% of cases, while vaginal and laparoscopic aa make up 22% and 12% respectively [2]. There is considerable variation by country in the rate of hysterectomy: In Germany it is between 2.13 to 3.62 per 1000 women, expanding to 5.4 per 1000 in the United States. India's estimates are significantly higher at 20.7 per 1000 women with an average age of 36 years [3]. Pakistan comes right behind with a figure of 6.6 in every 1000 women [4]. A majority of these treatments that are carried out are rather benign, including fibroid uterus (leiomyomas), abnormal uterine bleeding, hyperplasia of the endometrium, chronic pelvic pain, dyspareunia, and conservatively-resistant endometriosis [5]. One of the most essential aspects of post-operative care is postoperative pain. The adverse effects of uncontrolled acute pain include the patient taking a long time to heal, developing morbidity, a long hospital stay, opioid use, and subsequent postsurgical pain [6]. Peripheral nerve blocks have grown to be an important constituent in multimodal surgery for pain in the abdomen. Local anesthetic injection entered between internal oblique muscles and the transversus abdominis muscles is used in such anesthesia techniques as Transversus abdominis plane (TAP) block developed by Rafi in 2001, which blocks T6-L1 thoracolumbar nerves that supply the anterior abdominal wall [7]. Later, the erector spinae plane (ESP) block is a new promising method of regional anesthesia. It was described by Forero et al. in 2016 and allows analgesia by injecting the local anesthetic in the fascial plane at the back of the erector spinae muscle and allows the distribution of the local anesthetic to the dorsal and ventral rami of proximal spinal nerves [8]. The most recent studies have been promising. In the study by Shukla et al, a greater mean analgesia time was seen with ESP block (4.73 0.7 hours) versus TAP block (2.60 0.51 hours) ($p < 0.001$) [9]. The time to first morphine request was also considerably higher by 14.81 (3.52) hours in the ESP group than in TAP (10.58 (2.35) hours) according to Kamel et al. [10].

Objective

To compare the duration of postoperative analgesia in patients undergoing total abdominal hysterectomy with bilateral ultrasound-guided erector spinae plane

(ESP) block versus bilateral transversus abdominis plane (TAP) block.

Methodology

This randomized controlled trial was conducted at the Department of Anesthesia, Sir Ganga Ram Hospital, Lahore from 1st December 2024 to 31st May 2025 commencing after the approval of the research synopsis. A total of 60 female patients undergoing elective total abdominal hysterectomy were included in the trial, with 30 patients in each group. The sample size was calculated based on a power of 80% and a 5% margin of error, utilizing previously reported mean durations of postoperative analgesia from existing literature.

Inclusion Criteria

Female patients aged between 35 and 60 years, with an ASA status of I or II, and a body mass index (BMI) ranging from 18 to 32 kg/m² were included. Only those who were scheduled for elective open total abdominal hysterectomy and who provided written informed consent to participate in the study were included.

Exclusion Criteria

Patients with ASA status of III or IV, indicating severe systemic disease, mental impairments affecting pain assessment, or allergies to local anesthetics were also excluded. Additionally, patients who refused to receive the block or had localized skin infections at the injection site were excluded.

Data Collection Procedure

Following approval from the institutional ethical committee, eligible patients presenting to the anesthesia outpatient department were enrolled in the study. Patients were randomly allocated into two groups using computer-generated tables: Group A received a bilateral erector spinae plane (ESP) block with 20 ml of local anesthetic per side, while Group B received a bilateral transversus abdominis plane (TAP) block with 20 ml per side. All patients underwent standard intraoperative monitoring and anesthesia protocols. The nerve blocks were performed under ultrasound guidance using strict aseptic precautions. Postoperative pain was assessed

every 30 minutes using the Visual Analogue Scale (VAS).

Data Analysis

Data were entered and analyzed using SPSS version 22. Numerical variables such as age, BMI, duration of surgery, and duration of postoperative analgesia were presented as mean $\pm$ standard deviation (SD), and comparisons between the two groups were made using the independent sample t-test, with a p-value $\leq$ 0.05 considered statistically significant. Categorical

variables, including ASA status, were presented as frequencies and percentages.

Results

The mean age was 48.2 ± 6.5 years in the ESP block group and 47.8 ± 5.9 years in the TAP block group, with no significant difference ($p = 0.73$). BMI and ASA physical status distributions were also similar between groups, with most patients classified as ASA I. The mean duration of surgery was slightly higher in the ESP group but did not show statistical significance ($p = 0.52$), indicating both groups were demographically balanced.

Table 1: Demographic and Clinical Characteristics of Patients (n = 60)

Characteristic	ESP Block Group (n = 30)	TAP Block Group (n = 30)	p-value
Age (years), Mean $\pm$ SD	48.2 ± 6.5	47.8 ± 5.9	0.73
BMI (kg/m ²), Mean $\pm$ SD	27.1 ± 3.2	26.8 ± 3.5	0.66
ASA Physical Status			
– ASA I, n (%)	18 (60.0%)	19 (63.3%)	0.78
– ASA II, n (%)	12 (40.0%)	11 (36.7%)	
Duration of Surgery (min)	110 ± 15.4	108 ± 16.1	0.52

Patients in the ESP block group experienced a mean analgesia duration of 11.6 ± 2.3 hours, whereas the TAP block group reported 7.8 ± 1.9 hours ($p <$

0.001). This result indicates that the ESP block provides substantially longer postoperative pain relief compared to the TAP block.

Table 2: Comparison of Mean Duration of Postoperative Analgesia

Outcome	ESP Block Group (n = 30)	TAP Block Group (n = 30)	p-value
Duration of Analgesia (hrs)	11.6 ± 2.3	7.8 ± 1.9	< 0.001

At 30 minutes post-surgery, the ESP group had a mean VAS of 2.1 ± 0.7 versus 3.4 ± 0.9 in the TAP group. This difference persisted at 2, 6, and 12 hours

postoperatively, with all p-values < 0.001 , confirming the superior analgesic efficacy of the ESP block throughout the postoperative period.

Table 3: Postoperative Pain Scores at Different Time Intervals (VAS Score Mean $\pm$ SD)

Time After Surgery	ESP Block Group (n = 30)	TAP Block Group (n = 30)	p-value
30 minutes	2.1 ± 0.7	3.4 ± 0.9	< 0.001
2 hours	2.8 ± 0.8	4.2 ± 1.0	< 0.001
6 hours	3.1 ± 1.0	5.0 ± 1.2	< 0.001
12 hours	3.9 ± 1.2	5.6 ± 1.4	< 0.001

No local site infections were reported. Hematoma occurred in 1 patient from each group (3.3%), and hypotension was slightly more frequent in the ESP group (6.7%) compared to the TAP group (3.3%),

though this difference was not statistically significant ($p = 0.55$). The total complication rate was slightly higher in the ESP group but without a meaningful difference ($p = 0.64$), suggesting both techniques are generally safe.

Table 4: Frequency of Block-Related Complications

Complication	ESP Block Group (n = 30)	TAP Block Group (n = 30)	p-value
Local site infection, n (%)	0 (0.0%)	0 (0.0%)	—
Hematoma, n (%)	1 (3.3%)	1 (3.3%)	1.00
Hypotension, n (%)	2 (6.7%)	1 (3.3%)	0.55
Total Complications, n (%)	3 (10.0%)	2 (6.7%)	0.64

Discussion

Our study demonstrates that ultrasound-guided erector spinae plane (ESP) block provides significantly longer postoperative analgesia compared to the transversus abdominis plane (TAP) block in patients undergoing total abdominal hysterectomy (TAH). In this randomized controlled trial, the postoperative analgesia used lasted longer in bilateral participants than in TAP block in the meantime of total abdominal hysterectomy. Mean time of analgesia in ESP group was 11.6 $\pm$ 2.3 hours in comparison to 7.8 $\pm$ 1.9 hours in TAP group ($p < 0.001$) [11]. This disparity supports a higher analgesic efficacy of ESP block in accordance with the current studies that indicate a broader dermatomal coverage and somatic as well as pain control because the ESP block is capable of alleviating both somatic and visceral pains, and TAP block is applicable to the pain of the anterior abdominal wall only. These findings were further confirmed by post operative scores of pain using Visual Analogue Scale which were measured every thirty minutes [12]. The VAS scores of the patients on the ESP group were statistically significant at all points of observation ($p < 0.001$) up to 12 hours after surgery, as the operations on the ESP group were recorded to have lower VAS scores than the conventional group. This has been noted to support the established literature, that ESP block allows longer and more consistent pain alleviation of major abdominal surgery. It can be suggested that the prosthetic effect observed must be the due to spread of the local anesthesia along the dorsal and ventral rami of the spinal nerves arcing enabled by ESP block [13].

Moreover, the demographic features such as age, BMI, ASA status, and surgery length were shown to be statistically similar in both populations, which means that these factors could not act as confounders in the primary outcome [14]. Notably, the safety profile of the both blocks was similar.

Hematoma and Hypotension (minor complications) were usually rare and did not differ between the two groups showing no statistically significant variations [15]. There was no report of local site infection and this implies that the two methods are generally safe and without extra risks with ultrasound guidance and maintained in a sterile environment [16]. Previous research has similarly reported the ESP block's advantage over TAP block in abdominal surgeries regarding analgesia duration and quality of pain control [17]. However, some studies have noted variations in block efficacy based on local anesthetic volume, concentration, and individual patient anatomy, which should be acknowledged as potential influencing factors [18]. The primary limitation of this study is its relatively small sample size, which may limit the generalizability of the findings to broader patient populations. Additionally, the study was conducted at a single center, introducing potential institutional bias related to technique and patient management protocols. The assessment of postoperative pain relied on the Visual Analogue Scale, a subjective measure that may vary between individuals.

Conclusion

It is concluded that bilateral ultrasound-guided erector spinae plane (ESP) block provides significantly longer postoperative analgesia and better pain control compared to transversus abdominis plane (TAP) block in patients undergoing total abdominal hysterectomy. Patients receiving the ESP block experienced lower pain scores throughout the first 12 hours postoperatively without an increased risk of block-related complications.

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