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Original Article

Efficacy of Erector Spinae Block Versus Transversus Abdominis Plane Block in Post Operative Pain Control After Laparoscopic Cholecystectomy

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ABSTRACT

Objective: To compare post-operative analgesic efficacy of ultrasound guided erector spinae block versus transversus abdominis plane block in patients undergoing laparoscopic cholecystectomy.
Study Design: Quasi-experimental study.
Place and Duration of Study: Department of Anesthesia, Combined Military Hospital, Rawalpindi Pakistan, from May to Oct 2022.
Methodology: Our patients were divided into erector spinae block Group (Group ESP) (n=20) and transversus abdominis plane block Group (Group TAP) (n=20). After the surgery, before extubating, a consultant anesthetist with at least 5 years of regional block experience, performed the blocks in selected patients under ultrasound guidance following standard techniques and protocols.
Results: Duration of surgery between both Groups was comparable, with a mean time of 128.5±5.1 minutes in the ESP versus 127.3±5.7 minutes in the TAP Group (p=0.13). However, time to first rescue analgesia was significantly increased in ESP Group at 238.5±5.1 minutes versus 174.1±6.0 minutes in TAP Group (p=0.0001). Consequently, total analgesia requirement was also significantly decreased in ESP Group with 4.6±0.5 mg in 24 hours versus 8.2±0.9 mg in 24 hours in TAP Group (p=0.0001). Mean HDU stay was also decreased significantly between ESP and TAP Group, being 27.8± 2.3 hours versus 44.25±5.5 hours (p=0.0001).
Conclusion: ESP block provides superior analgesia, good adverse effect profile, early mobilization and decreased hospital stay when compared to TAP block for laparoscopic cholecystectomy.

Keywords: Analgesia, Erector Spinae block, Laparoscopic cholecystectomy, Transversus abdominis block

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INTRODUCTION

The introduction of minimally invasive surgery has revolutionized the surgical paradigm,[1] as these surgeries have resulted in lesser complications, tolerable adverse effect profile and improved patient compliance, resulting in lesser hospital stay due to better pain relief and early mobilization.[2] Laparoscopic cholecystectomy has, therefore, gained worldwide popularity because of its superiority to open cholecystectomy,[3] which has resulted in the procedure being done routinely in surgical centers. The average age of patients presenting for laparoscopic cholecystectomy is between 35-55 years with a predilection towards the female gender.[4] Due to its minimally invasive approach through a laparoscope, the average post-surgery stay of patients is now less than 48 hours,[5] but one of the major reasons for delay in discharge, is post-procedure pain.[6] Therefore, better approaches are constantly being introduced to improve patient satisfaction and early mobilization among which the transversus abdominis plane block is the most common regional block used for post-operative pain for abdominal procedures,[7] which has largely decreased the need for intravenous opioids and analgesics, leading to decreased systemic effects of these drugs.[8] The erector spinae block has been introduced relatively recently and various studies have proved its efficacy in post-operative pain relief in abdominal surgeries.[9] Introduced in 2016, it is now the preferred modality of choice for anterior lateral and posterior abdominal procedures with a better analgesic and adverse effect profile than other regional techniques.[10] Thus, the objective of this study was to compare the post-operative analgesic efficacy of ultrasound guided erector spinae plane block versus transversus abdominis plane block in patients undergoing laparoscopic cholecystectomy.

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METHODOLOGY

This quasi-experimental study was carried out at the Department of Anesthesiology, Combined Military Hospital (CMH), Rawalpindi Pakistan, from May to October 2022, after obtaining approval from the institutional Ethics Review Board, vide letter no. 257. We included 40 patients in the study as our minimum sample size was calculated to be 33, as per WHO calculator, keeping the confidence interval at 95%, power of test at 90%, with mean time difference for first rescue analgesia between both the regional techniques after laparoscopic cholecystectomy at 80±15 minutes, with population variance at 10, 000.[11] Non-probability consecutive sampling via lottery method was employed to recruit participants.

Inclusion Criteria: We included all male and female patients, between the ages of 25 to 55 years, having American Society of Anesthesiologists (ASA) I and II classification, presenting in the surgical department for elective cholecystectomy for diagnosed cholelithiasis.

Exclusion Criteria: All patients with metastatic disease, major cardiac or respiratory disease, low ejection fraction, post chemotherapy, allergy to lignocaine or adrenaline, unwilling to be included in the study, infection at site of block, coagulation disorders, ineffective regional block, and failure to perform block after three consecutive attempts were excluded.

The enrolled patients were divided into the erector spinae plane block (ESP) Group (ESP Group) (n=20) and the transversus abdominis plane block (TAP) Group (TAP Group) (n=20). Informed written consent was taken, and patients in both groups were explained in detail about the procedure and possible complications. Standard monitoring with non-invasive blood pressure, heart rate, capnography and ECG was done on participants in both groups. Anesthesia was induced in both groups with IV Propofol 2 mg/kg and IV Atracurium 0.5 mg/kg with maintenance done using 50% oxygen with Isoflurane at 1.0 minimum alveolar concentration (MAC). Patients were extubated after neostigmine 0.05 mg/kg and glycopyrrolate 0.01 mg/kg were given for reversal of the neuromuscular block. After the end of surgery, before extubating, a consultant anesthetist with at least 5 years of regional block experience, performed the blocks in the selected patients under ultrasound guidance following the standard techniques and protocols furnished by New York School of Regional Anesthesia (NYSORA).[12,13] Post-operatively, patients were kept in the High Dependency Unit (HDU) and observed for post-operative pain every hour for the next 24 hours. Once pain on the Visual Analog Scale (VAS) reached 5, 0.5 mg/kg of nalbuphine was given and total dose in 24 hours was calculated. Patient satisfaction was evaluated and recorded at 24 hours after surgery on a 7-point Likert scale (1- Extremely dissatisfied, 2- Very dissatisfied, 3- Dissatisfied, 4- Neither satisfied nor dissatisfied, 5- Satisfied, 6- Very satisfied, 7- Extremely satisfied) in both groups. Demographic data was statistically described in terms of Mean±SD, along with frequencies and percentages, when appropriate. We applied t-test to compare means between both groups along with chi-square to compare median values for statistical significance. A *p*-value of <0.05 was considered statistically significant. All statistical calculations were performed using Statistical Package for the Social Sciences (SPSS) version 26.0.

RESULTS

A total of 40 patients were included in our study and divided into two groups, namely ESP Group (n=20) and TAP Group (n=20). Mean age of patients in the ESP Group was 38.85±4.8 years versus 39.80±5.0 years in the TAP Group. Mean weight of patients in the ESP Group was 68.10±4.0 kg versus 67.95±3.9 kg in the TAP Group as shown in Table-I. The duration of surgery between both groups was comparable, with a mean time of 128.50±6.56 minutes in the ESP Group versus 127.30±5.72 minutes in the TAP Group (*p*=0.131). However, the time to first rescue analgesia was significantly increased in the ESP Group at 238.50±5.11 minutes versus 174.10±6.06 minutes in the TAP Group (*p*=0.001). Consequently, the total analgesia requirement was also significantly decreased in the ESP Group with 4.60±0.59 mg in 24 hours versus 8.20±0.95 mg in 24 hours in the TAP Group (*p*=0.001). Mean HDU stay was also decreased significantly between the ESP and TAP Groups; 27.80±2.39 hours versus 44.25±5.50 hours (*p*=0.001) which is also shown in Table-II. When the patients gave their objective assessment on a Likert scale for overall pain relief satisfaction after the surgery, these patient scores were comprehensively more satisfied in the ESP Group, with a median Likert satisfaction score of 6.0 (IQR=1) versus a score of 4.0 (IQR=1.0) in the TAP Group (*p* 0.009). The adverse effect profile showed that nausea, vomiting, and sedation post-operatively was

comparable between both groups with no significant patient discomfort observed, as shown in Table-IV.

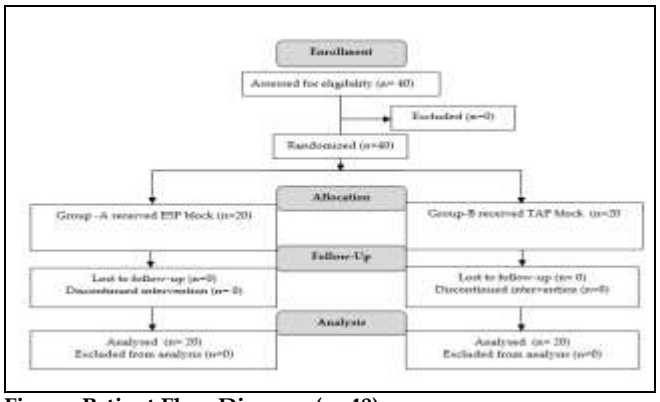

Figure: Patient Flow Diagram (n=40)

Table-I: Age and Height Characteristics Between Both Groups (n=40)

VARIABLE	ESP GROUP (n=20)	TAP GROUP (n=20)	*p*-value (≤0.05)
Mean Age (Years)	38.85±4.89	39.80±5.05	0.589
Mean Weight (kg)	68.10±4.09	67.95±3.92	0.720

Table-II: Comparison of Operative Parameters Between Both Groups (n=40)

VARIABLE	ESP GROUP (n=20)	TAP GROUP (n=20)	*p*-value (≤0.05)
Duration of Surgery (Minutes)	128.50±6.56	127.30±5.72	0.131
Mean Time To First Dose Rescue Analgesia (Minutes)	238.50±5.11	174.10±6.06	0.001
Mean Volume of Analgesia Given In HDU (mg/24 Hr)	4.60±0.59	8.20±0.95	0.001
Mean HDU Stay (Hours)	27.80±2.39	44.25±5.50	0.001
Median Patient Satisfaction Score For Pain Relief (24 Hours) (Likert Scale)	6.00 (IQR=1.00)	4.00 (IQR=1.00)	0.009

**HDU: High Dependency Unit*

Table-III: Satisfaction Score for Both Groups in Pain Relief After 24 Hours (n=40)

LIKERT SCALE SCORE	ESP GROUP (n=20)	TAP GROUP (n=20)
01 (Extremely Dissatisfied)	0	0
02 (Very Dissatisfied)	0	0
03 (Dissatisfied)	0	01 (5%)
04 (Neither Satisfied Nor Dissatisfied)	0	13(65%)
05 (Satisfied)	02(10%)	06(30%)
06 (Very Satisfied)	13(65%)	0
07 (Extremely Dissatisfied)	05(25%)	0
Total	20(100%)	20(100%)

Table-IV: Incidence of Side Effects Between Both Groups (n=40)

SIDE EFFECT	ESP GROUP (n=20)	TAP GROUP (n=20)
Nausea	02(10%)	02(10%)
Vomiting	01(5%)	03(15%)
Sedation (post-operative)	06(30%)	05(25%)

DISCUSSSION

The study was carried out at a tertiary care hospital receiving a major burden of clientele under its load, to find alternate analgesic approaches to be offered to patients presenting for laparoscopic cholecystectomy which accounted for around half of laparoscopic general surgeries in our setup. We observed that ESP block proved to be a superior analgesic modality with respect to time to first dose and total analgesia needed post-operatively, similar to another study.[14] This can be attributed to the better spread of local anesthetic between the abdominal layers and better anterior and posterior spread of the drug when compared to TAP block technique, as found in literature,[15] which also provides good somatic and visceral reduction of pain pathways.[16] These results were in line with a study carried out by another institution.[17] We observed that ESP block was a superior modality for various abdominal surgeries in which the posterior spread of local anesthetic was required. In contrast to TAP block, the ESP block could extend to the paravertebral spaces especially in the thoracic region, providing an added pain pathway blockade resulting in better pain reduction as reported in another study,[18] which was especially true in prolonged colorectal surgeries resulting in excellent patient satisfaction, as also reported by another researcher.[19]

LIMITATIONS OF STUDY

This study was a single center study; however, a multi-center study would result in a wider demographic area with more confirmative results. Unfortunately, the expertise required for successfully doing a block requires more patient prep-time and experienced regional block consultants, who are often not readily available in our area.

CONCLUSION

ESP block provides superior analgesia, good adverse effect profile, early mobilization and decreased hospital stay when compared to TAP block for laparoscopic cholecystectomy.

Conflict of Interest: None.

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Authors Contribution

Following authors have made substantial contributions to the manuscript as under:

FH & MS: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

SQAS & SQ: Conception, data analysis, drafting the manuscript, approval of the final version to be published.

MMR & MHS: Data acquisition, critical review, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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