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Original Research Article

"COMPARISON OF ERECTOR SPINAE BLOCK VERSUS EPIDURAL BLOCK IN POSTOPERATIVE PAIN MANAGEMENT IN LAPAROSCOPIC CHOLECYSTECTOMY"

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Name of Author:
Dr Hamza Ashraf Zia[1], Dr Riffat Saeed[2]

Affiliation: [1]*Sheikh zayed Hospital Lahore*
[2]*Sheikh zayed Hospital Lahore.*

Corresponding Author:

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Abstract: ***Background:*** For postoperative pain in LC, different regional anaesthesia options are available. In order to decide, which approach is better for postoperative analgesia, the current study compared erector spinae plane block (ESPB) versus epidural block (EB) in postoperative pain management in patients undergoing laproscopic cholecystectomy (LC). ***Materials and Methods:*** This was a randomized clinical trial, conducted at the Anesthesia department of Sheikh Zayed Hospital, Lahore, from April, 2025 to September, 2025. A total of 320 patients were enrolled after written informed consent. Patients in Group A (n=160) received ESPBand Group B received EB. LC was carried out according to standard protocols. Patients were followed up at 0, 6, 12, 18 and 24 hours and pain scores and need for rescue analgesia was assessed. ***Results:*** Patients in Group A and Group B had median (IQR) ages of 36 (12) and 35 (12) years, respectively. At 0 hours, Group A's median (IQR) NRS score was 7 (2), whereas Group B's was 6 (1) ($p<0.001$); at 24 hours, they were 2 (1) and 0 (0), respectively ($p<0.001$). Rescue analgesia was needed in 30 (18.8%) patients in Group A and 12 (7.5%) patients in Group B ($p=0.003$). ***Conclusions:*** In patients who underwent LC, EB was significantly associated with lesser pain scores over 24 hours and lesser rate of need for rescue analgesia compared to ESPB.

Keywords: Erector spinae plane block, Post operative pain, Thoracic epidural

INTRODUCTION

The most popular surgical method for managing cholelithiasis is laparoscopic cholecystectomy (LC)[1]. Some people nevertheless have moderate-to-severe postoperative pain despite the fact that it is less intrusive, is linked with a shorter stay at the hospital and heals more quickly than open surgery. Following LC, acute pain can be somatic, parietal, or referred and can be brought on by several circumstances such as insufflation of carbon dioxide, resection of gall bladder and insertion of trocar[2]. Some people (17% to 40%, depending on the study) may have chronic or persistent pain if it is managed incorrectly[3]. As a result, different medications have been utilized all over the world to treat postoperative pain[4].

The management of pain following thoracic and upper abdominal procedures continues to be a difficult task for modern anesthesiologists[5]. Regional anaesthesia benefits greatly from the multimodal analgesic approach, which is a well-rounded and efficient perioperative pain control strategy. For the purpose of reducing postoperative pain, multimodal treatments include analgesic drugs, regional anaesthesia, and regional analgesia[6]. During surgery, regional anaesthesia minimises the need for systemic drugs, such as opioids, to treat postoperative pain. For postoperative pain in LC, regional anaesthesia

options include fascial, paravertebral, and epidural plane blocks. Nevertheless, there is a chance of complications like hematoma, pneumothorax, and epidural abscess with epidural and paravertebral blocks[7].

During abdominal procedures, facial plane blocks such as the erector spinae plane block (ESPB), rectus sheath block and transversus abdominis plane block (TAP) might lessen postoperative pain. Fascial plane blocks, as opposed to epidural blocks, can prevent sympathetic block, hypotension and epidural haemorrhage in individuals with coagulopathy[8]. Fascial plane block is becoming more and more popular among anesthesiologists as a part of multimodal analgesic regimens since it can block sympathetic nerve fibres as well as the ventral rami of spinal nerves. It is also safer and easier to conduct than paravertebral block[9,10].

The studies conducted in the past yielded conflicting results regarding the use of ESP block or epidural block for postoperative pain management and there is ongoing debate about the efficacy of the novel approach i.e. ESP block over the well-practiced epidural block. Few studies have directly compared the effect of ESP on postoperative pain with already well-established approaches such as epidural. Furthermore, there is dearth of information with respect to their effect on postoperative pain in patients undergoing laparoscopic cholecystectomy as well as there is paucity of local data. Therefore, the current study aimed to compare ESPB versus epidural block in the management of pain postoperatively in terms of mean numeric rating scale score and frequency of need of rescue analgesia in patients undergoing laproscopic cholecystectomy. The results of the study would guide anesthesiologists about a better approach that is more effective in reducing post-operative pain and is associated with lesser need of rescue analgesia, which will help in quick recovery of the patient and improve patient's satisfaction with the procedure.

MATERIALS AND METHODS:

This was a randomized clinical trial. The study was carried out at the Anesthesia department of Sheikh Zayed Hospital, Lahore, after taking approval from the Ethical Review Committee, for a duration of 6 months i.e. from April, 2025 to September, 2025. A total of 320 patients were enrolled who underwent elective laparoscopic cholecystectomy. A sample of 320 patients (160 in each group) was calculated, keeping 95% confidence interval, 5% margin of error and expected mean NRS score in the ESP block group as 3.69±2.44 and in the epidural block group as 0.53±1.23[4]. Non-probability consecutive sampling technique was used.

Inclusion criteria: The study comprised patients with ASA grades I and II who underwent elective LC and were between the ages of 18 and 60.

Exclusion criteria: Individuals undergoing intraoperative cholangiography, posterior biliary tract management, or urgent/emergency cholecystectomy; those with ASA grade III or higher; Patients with hepatic failure (defined by the presence of cirrhosis on abdominal ultrasound) or renal failure (eGFR<60 mL/min/1.73m^2), patients with Body mass index of ≥35 kg/m^2 and patients who were using anticoagulants, anticonvulsants were excluded from the study.

The primary outcome measure to be assessed was the mean numeric rating scale pain score at 24 hours. Numeric rating scale required the patient to rate their pain on a defined scale from 0–10, where 0 was no pain, 1-3 was mild pain, 4 to 6 was moderate pain and 7 to 10 was severe pain (annexure attached). The secondary outcome measure to be assessed was the frequency of need of rescue analgesia over 24 hours (i.e. NRS score of ≥4 indicated the need of rescue analgesia).

After providing written informed consent, all patients were included in the study. A pre-made proforma was used to record the clinical examination results and a detailed history. Every patient's anesthesia fitness was measured. Patients were split into two groups at random by lottery method, with 160 individuals in each group. After venous access, all patients underwent aseptic measures, mild sedation (25–75 micrograms IV fentanyl and 1–5 milligrams midazolam), monitoring (pulse oximetry, cardioscopy, and noninvasive pressure), supplementation of oxygen, and proper positioning with the assistance of an assistant. In Group A, patients got bilateral erector spinae plane blocks (ESPB). Group B patients had epidural anaesthesia with 1 mg of morphine and 20 mL of 0.5% ropivacaine. Patients in both groups were blinded to the block technique applied. Anaesthesia by epidural was administered. Using a Tuohy 18G median needle at the level of T8-T9, epidural anaesthesia was administered. A test dose of 4 mL of 2% lidocaine with vasoconstrictor was also given. While the patient was seated during the ESP block, the T8 transverse process was identified by counting the first through eighth ribs in the longitudinal parasagittal direction using a high frequency, 5 to 13 MHz linear transducer. The transverse process tip of T8 was then located by pulling the instrument medially. The needle tip was positioned between the transverse process of T8 and the anterior fascia of the spinal erector muscle after the 22G 5 cm needle was inserted into the plane in a craniocaudal direction, passing through the skin, subcutaneous tissue, and muscle layers (the greater dorsal muscle fascia, the trapeze muscle, and the spinal erector muscle). By

dispersing 0.5 to 1 mL of saline solution and observing a linear fluid dispersion, the spinal erector muscle plane was investigated. A 20 mL injection of 0.5% ropivacaine came next. There was a bilateral approach. 3 mcg/kg of fentanyl, 0.4 mg/kg of atracurium, and 1 to 2 mg/kg of propofol were used to induce general anesthesia in both groups after epidural anesthesia or ESP block. Following that, each patient had a laparoscopic cholecystectomy performed by a single skilled surgeon in accordance with standard protocol. Following the patients' transfer to the post-anesthetic care unit, the NRS score was recorded. The patients were also examined at 6, 12, 18 and 24 hours to assess the NRS score and the need for rescue analgesia (as per operational definition). The results of both groups were recorded, compared and analysed.

Version 25.0 of the Statistical Package for Social Sciences was used to analyze the data. The quantitative data, including age, BMI, and the numerical rating pain score at 0 and 24 hours, were reported as median and interquartile range (IQR) after the Shapiro-Wilk test revealed that the data was not normally distributed. Qualitative information was displayed as frequency and percentage, including gender, pain intensity, and requirement for rescue analgesia. The Mann Whitney-U test was used to compare the median numerical rating scale scores of the two groups; a p value of 0.05 was deemed significant. The Chi square test was used to compare the two groups' requirement for rescue analgesia, and a p value of 0.05 was deemed significant.

RESULTS

A total of 320 patients were enrolled. The median (IQR) age of the patients in Group A was 36 (12) years and in Group B was 35 (12) years. The median (IQR) BMI in Group A was 25.8 (5.68) kg/m^2 and in Group B was 24.8 (5.85) kg/m^2. The median (IQR) NRS score in Group A at 0 hour was 7 (2), at 6 hours was 5 (1), at 12 hours was 4 (1), at 18 hours was 3 (1) and at 24 hours it was 2 (1). The median (IQR) NRS score in Group B at 0 hour was 6 (1), at 6 hours was 4 (1), at 12 hours was 2 (1), at 18 hours was 1 (1) and at 24 hours was 0 (0) and the difference between both groups in terms of median NRS score at different intervals postoperatively was statistically significant (p<0.001) (Table-I).

The baseline and clinical characteristics of the patients in both groups are described in Table-II.
Comparison of need for rescue analgesia revealed that in Group A, rescue analgesia was needed in 30 (18.8%) patients and in Group B, 12 (7.5%) patients needed rescue analgesia and this difference was statistically significant (p=0.003) (Table-III).

Table-I: Baseline demographic features and pain scores at different interval in both groups (n=320)

Variable	Group A (ESPB) n=160	Group B (Epidural block) n=160	Mann Whitney U test (Z) Value	p Value
Age (in years)	36 (12)	35 (12)	-	-
BMI (in Kg/m^2)	25.8 (5.68)	25.8 (5.85)	-	-
NRS score at 0 hours	7 (2)	6 (1)	-6.968	<0.001
NRS score at 6 hours	5 (1)	4 (1)	-9.426	<0.001
NRS score at 12 hours	4 (1)	2 (1)	-13.121	<0.001
NRS score at 18 hours	3 (1)	1 (1)	-13.032	<0.001
NRS score at 24 hours	2 (1)	0 (0)	-14.106	<0.001

Table-II: Baseline and clinical characteristics of the patients in both groups (n=320)

Variable	Group A (ESPB) n=160	Group B (Epidural block) n=160
Age group:		
18 to 40 years	113 (70.6%)	121 (75.6%)
41 to 60 years	47 (29.4%)	39 (24.4%)
BMI category:		
Normal	61 (38.1%)	67 (41.8%)
Overweight	65 (40.6%)	55 (34.4%)
Obese	34 (21.3%)	28 (23.8%)
Gender:		
Male	76 (47.5%)	82 (51.3%)
Female	84 (52.5%)	78 (48.7%)
ASA grade:		
I	87 (54.4%)	82 (51.3%)
II	73 (45.6%)	78 (48.7%)
Severity of pain at 0 hours postoperatively:		
No pain	0 (0%)	0 (0%)
Mild pain	0 (0%)	0 (0%)
Moderate pain	47 (29.4%)	89 (55.6%)
Severe pain	113 (70.6%)	71 (44.4%)
Severity of pain at 24 hours postoperatively:		
No pain	6 (3.8%)	122 (76.3%)
Mild pain	154 (96.2%)	38 (23.7%)
Moderate pain	0 (0%)	0 (0%)
Severe pain	0 (0%)	0 (0%)

Table-III: Comparison of both groups in terms of need of rescue analgesia (n=320)

Need of rescue analgesia	Group A (ESPB) n=160	Group B (Epidural block) n=160	p Value
Yes	30 (18.8%)	12 (7.5%)	0.003
No	130 (81.2%)	148 (92.5%)	

DISCUSSION

The current study findings revealed that in patients who underwent LC, there was significant difference in the degree of postoperative pain in patients who received ESPB block compared to those who received epidural block, and epidural block was significantly associated with lower NRS pain scores and lesser rate of need for rescue analgesia. Most of the patients in our study were of age 18 to 40 years, were females, of normal to overweight BMI and had ASA grade I.

ESPB, first described by Forero et al. in 2016, has gained popularity over the past five years11,12. This innovative localized technique produces analgesia by acting on the dorsal and ventral ramis of the spinal neurons, depending on the injection site and level13,14. The local anesthetic distributes over several levels as the erector spinae fascia extends caudally to the sacrum and cranially to the nuchal fascia15,16. Previous research indicates thatESPB

was successful in managing pain after a variety of surgical procedures17,18. Numerous randomized controlled trials showed that ESPB seems to be helpful in lowering pain and enhancing function after abdominal surgery19,20. However, there aren't enough studies in this area. Therefore, our study compared ESPB with epidural block in terms of postoperative pain management in patients who underwent LC.

Our study findings showed a significant difference in the median NRS pain scores and need for rescue analgesia between the two groups and epidural block was significantly associated with lower median NRS pain scores ($p<0.001$) and lesser rates of rescue analgesia requirement ($p=0.003$). In a study, Sakae et al. revealed that in the postoperative period, the mean numeric rating scale score in the ESP block group was 6±1.89 and in the epidural block group was 3±2.29 at 2 hours ($p=0.001$) and at 24 hours, it was 3.69±2.44 in the ESP block group and 0.53±1.23 in the epidural block group ($p=0.001$). The use of rescue opioid analgesic was seen in 43.7% patients in the ESP block group and in 13.3% patients in the epidural block group ($p=0.046$)4. In another study, Lollen et al. revealed that the patients who received epidural block needed significantly lesser doses of rescue analgesia compared to those who had ESPB, however, there were no significant differences in terms of pain scores and hence concluded that epidural block was associated with longer duration of postoperative analgesia compared to ESPB11. These findings are consistent with our study findings that epidural block offered superior analgesia in the postoperative period in patients who underwent LC. El-sherbiny et al. revealed that in patients who had ES, the median (IQR) postoperative visual analog scale (VAS) pain score was 4 (4-5) and in the epidural group it was 5 (4-5) ($p=0.87$)2. These findings are inconsistent with our study results as we found that patients who were in the epidural group, reported significantly lesser pain scores compared to those who were in the ESPB group. This difference may be attributable to the level where the block was performed as that might differ and thus affect the results.

For many years, epidural analgesia has been regarded as the best option for relieving pain following a thoracoabdominal surgery. Since its introduction in 2016, the Erector Spinae Plane Block (ESPB) has drawn a lot of interest due to its effectiveness in thoracic and abdominal procedures. The research currently in publication shows conflicting results; some studies imply that epidural block and ESPB have similar results, while others show that epidural analgesia is preferable. Epidural Analgesia and ESPB were compared in this randomized clinical trial for post-operative pain management after laparoscopic cholecystectomy. The results showed that epidural block had a noticeably longer duration of analgesia than ESPB.

CONCLUSIONS:

Our study results concluded that in patients who underwent LC, epidural block was significantly associated with lesser pain scores over 24 hours and lesser rate of need for rescue analgesia compared to ESPB. To conclusively determine ESPB's efficacy and safety profile in comparison to epidural block, more extensive randomized controlled trials with consistent techniques are required, especially in laparoscopic procedures and other minimally invasive surgeries. ESPB should be regarded as a competitive alternative to epidural block for management of pain postoperatively, especially in patients where epidural block is contraindicated or challenging to administer, given the mounting evidence supporting its effectiveness in a variety of surgical procedures.

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LIMITATIONS:

The study had certain limitations. The study's focus on 24-hour pain alleviation limits our knowledge of long-term analgesic efficacy. Observer bias may be introduced if just the subjects are blinded and the assessor and intervention are not blinded. Due to the skill-dependent nature of both ESPB and epidural block, block efficacy may become variable. Results could be impacted by variations in anesthetic response, surgical methods, and individual pain perception. Although pain scores are assessed, long-term functional outcomes like ambulation or length of hospital stay are not included in the study.

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