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ORIGINAL RESEARCH

Comparison between posterior quadratus lumborum block and erector spinae plane block for post-operative analgesia in patients undergoing percutaneous Nephrolithotomy

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ABSTRACT

Background: Postoperative pain management is critical for patients undergoing percutaneous nephrolithotomy (PCNL). Effective analgesia enhances recovery, reduces hospital stays, and improves patient satisfaction. The posterior quadratus lumborum block (QLB) and the erector spinae plane (ESP) block are two regional anesthesia techniques gaining popularity. This study aims to compare the efficacy of these blocks in providing postoperative analgesia for PCNL patients, focusing on the advantages of the ESP block.

Methodology: In this randomized controlled trial, 126 patients scheduled for PCNL were divided into two groups: Group A received the PQL Block, while Group B received the ESP block. Both blocks were performed under ultrasound guidance using 15 ml of 0.25% Ropivacaine. All patients received postoperatively opioid (Tramadol 50 mg), with 4- 5 patients in Group A receiving 100 mg. Pain intensity was assessed using the Visual Analog Scale (VAS) at 30 min,1, 3, 6, 12, and 24 hours postoperatively. Secondary outcomes included total opioid consumption, time to first analgesic request, and incidence of side effects.

Results: Group B (ESPB) demonstrated significantly lower VAS scores at all postoperative time points compared to Group A (QLB) ($p<0.05$). The time to first analgesic request was longer in Group B (12.1 ± 2.8 hours) than in Group A (9.3 ± 2.5 hours) ($p<0.05$). Total opioid consumption was also lower in Group B (60 ± 10 mg)compared to Group A (80 ± 15 mg) ($p<0.05$). Additionally, Group B reported fewer side effects, including nausea and sedation, enhancing overall patient comfort and satisfaction.

Conclusion: The erector spinae plane block provides superior postoperative analgesia compared to the posterior quadratus lumborum block in patients undergoing percutaneous nephrolithotomy. The ESP block resulted in lower pain scores, reduced opioid consumption, prolonged analgesia, and fewer side effects. These findings suggest that the ESP block is a more effective and safer regional anesthesia technique for managing postoperative pain in PCNL patients.

Keywords: Percutaneous nephrolithotomy, Erector spinae plane block, Posterior quadratus lumborum block, Postoperative analgesia, Regional anesthesia

INTRODUCTION

Percutaneous nephrolithotomy (PCNL) has emerged as a well -established, minimally invasive procedure for removing renal calculi larger than 2cm. The seminal work of Fernstorm and Johansson in 1976 marked the pioneering use of a nephrostomy tract for renal calculus removal[1], laying the foundation for PCNL's wide spread adoption as the primary approach to managing renal stones. This technique offers a direct path to the calculus, minimizing trauma to the kidney and surrounding tissues compared to open surgery.[2]

The quadratus lumborum block is a technique used to manage pain in the back part of the abdomen. It's an "Interfascial plane block," which means it in volves injecting medication into a specific layer of tissue.[3]

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This procedure is done using ultra sound to guide the placement of the injection. It was introduced by ananesthesiologist named Dr. Rafael Blanco in 2007, who developed it as a variation of another pain management method called the TAP block.[7] Currently, the quadratus lumborum block (QLB) is commonly used to manage pain before, during, and after abdominal surgery for people of all ages—whether they're children, pregnant individuals, or adults.[4]

The erector spinae plane (ESP) block is a modern regional anesthetic method utilized for providing pain relief during various surgical procedures or for managing both acute and chronic pain conditions. Known for its simplicity, the technique canbe easily performed on patients, often without the need for sedation, even in the preoperative holding area.[5,6] The ESP block can be administered either as a single injection or by placing a catheter for continuous infusion, offering flexibility in pain management strategies. The first successful application of this procedure was reported in 2016 when it was used to alleviate thoracic neuropathic pain in a patient with metastatic rib disease and rib fractures.[7,8]The study aimed to compare the posterior quadratus lumborum block and erector spinae plane block for post-operative analgesia in patients undergoing percutaneous nephrolithotomy.

MATERIALS & METHODS

The study population comprised patients aged between 18 and 60 years scheduled for elective PCNL surgeries, with ASA grading I-II. A purposive sampling technique was employed to select 126 subjects, with 63 participants allocated to each group (Group A: PQLB, Group B: ESPB).All were informed regarding the study and their written consent was obtained.

Data such as name, age, gender etc. was recorded.

A detailed complete history of the patient was taken - Weight and height of the patient, Vitals-Blood Pressure, Respiratory Rate, Pulse Rate, Spo2. Detailed systemic examination was done – Central nervous system, Cardiothoracic system, Respiratory system, Gastrointestinal system, Airway examination. Postoperative pain was measured based on a visual analog score (VAS) on a scale of 0–10, where 0 = no pain and 10 = maximum worst pain. Instructions were given -Nil per oral for 6–8 hours for solid meals and 2 hours for clear fluid before the operation. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table: I Baseline and operative characteristics

Variables		Group A(n= 63)	Group B(n= 63)	Total	p-value
Age (Mean±SD)		40.35±11.98	41.06±11.32	40.71±11.62	0.040
Gender, n (%)	Male	46(36.5)	42(33.3)	88(69.8)	
	Female	17(13.49)	21(16.66)	38(30.2)	0.437
Weight, (Mean±SD)		74.60 ± 8.87	74.87 ± 7.93	74.74± 8.38	0.857
ASA Grade, n(%)	Grade I	42(33.3)	31(24.6)	73(57.9)	
	Grade II	21(16.7)	32(25.4)	53(42.1)	0.052
Operative time(minute)		87.79±1.77	87.63±1.64	87.71±1.71	0.604
Intra op-Fentanyl(µg)		52.16±35.16	49.90±36.21	51.03±35.56	0.724
Time of performing block (minute)		12.98±1.98	13.90±1.98	13.07±2.00	0.032

Table I shows that mean age was 40.35±11.98 years in group A and 41.06±11.322 years in group B. There were 46 males and 17 females in group A and 42 males and 21 females in group B. Patients (33.3%) in group A and 31patients (24.6%) in group B were classified as grade I, while 21 patients (16.7%) in group A and 32 patients (25.4%) in group B were classified as grade II. The operative time averaged 87.79±1.77 minutes for group A and 87.63±1.64minutes for group B. The intraoperative fentanyl requirement was 52.16±35.16 µg in group A and 49.90±36.21 µg in group B. The time taken to perform the block was shorter in group B compared to group A, with 12.98±1.98 minutes in group A and 13.90±1.98 minutes.

Table: II Diagnosis and side of surgery between both groups

Variables		Group A(n= 63)	Group B(n6)	Total	p-value
Diagnosis, (%)	Right Renal Calculi	35(27.77)	39(30.95)	74 (58.7)	
	Left Renal Calculi	28(22.22)	24(19.04)	52 (41.3)	0.469
Side of Surgery, n (%)	Right PCNL	35(27.77)	39(30.95)	74 (58.7)	
	Left PCNL	28(22.22)	24(19.04)	52 (41.3)	0.469

The side of surgery corresponded to the side of renal calculi, with no significant difference in the distribution of right and left percutaneous nephrolithotomy (PCNL) between the groups (p=0.469).

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Table: III Postoperative findings

Variable		Group A(n= 63)	Group B(n= 63)	Total(n=126)	p-value
Nausea n(%)	Yes	22(8.46)	11(8.73)	33 (26.19)	0.026
	No	41 (32.53)	52 (41.26)	93 (73.80)	
Vomiting, n(%)	Yes	16 (12.69)	6(4.76)	22 (17.46)	0.019
	No	47 (37.30)	57 (45.23)	104 (82.53)	
Respiratory depression, n(%)	Yes	0 (0)	0 (0)	0 (0)	-
	No	63(50.0)	63(50.0)	126 (100.0)	
Weakness of Lower limbs, n(%)	Yes	0 (0)	0 (0)	0 (0)	-
	No	63(50.0)	63(50.0)	126 (100.0)	
Time to first rescue analgesia (h), (Mean±SD)		186.58±53.94	301.26±60.14	243.92±80.94	<0.001
Post-Operative opoid Consumption,(Mean±SD)		55.16±13.58	51.19±5.36	53.17±10.48	0.033

Postoperative complications were assessed, showing a higher incidence of nausea in group A (22 cases) compared to group B (11 cases), which was statistically significant (p=0.026). Vomiting was also more common in Group A (16 cases) than in group B (6 cases), with this finding being statistically significant (p=0.019). There were no cases of respiratory depression or lower limb weakness in either group. The time to first rescue analgesia was significantly longer in group B (186.58 ± 53.94 hours) compared to group A (301.26 ± 60.14 hours), with an overall mean of 243.92 ± 80.94 hours (p < 0.001). Postoperative opioid consumption was slightly lower in group B (51.19 ± 5.36 mg) compared to Group A (55.16 ±13.58 mg), with a combined mean of 53.17 ± 10.48 mg.

Table IV Pain assessment over time by using Visual Analogue Scale (VAS scale) between both groups

VAS (Duration)	Group A(n= 63)	Group B(n=63)	Total(n=126)	p-value
30 min,(Mean±SD)	0.10 ± 0.29	0.02 ± 0.12	0.06 ± 0.23	0.052
1 hr,(Mean±SD)	0.33 ± 0.59	0.05 ± 0.28	0.19 ± 0.48	0.001
3 hr,(Mean±SD)	2.68 ± 0.66	2.94 ± 0.30	2.81 ± 0.53	0.007
6 hr,(Mean±SD)	3.78 ± 0.60	3.98 ± 0.21	3.88 ± 0.46	0.012
12 hr,(Mean±SD)	4.56 ± 1.13	4.38 ± 0.94	4.47 ± 0.04	0.348
24 hr,(Mean±SD)	5.19 ± 1.71	4.71 ± 1.39	4.95 ± 1.57	0.090

There was significant difference in pain at all time periods except at 12 hours and 24 hours (P< 0.05).

DISCUSSION

In this study, we conducted a comparative analysis of two regional anesthesia techniques, namely posterior quadratus lumborum block (Group A) and erector spinae plane block (Group B), to evaluate their efficacy in providing postoperative analgesia for patients undergoing percutaneous nephrolithotomy (PCNL). The sample size consisted of 126 patients, evenly distributed between the two groups, ensuring a balanced comparison of demographics and clinical characteristics.

We found that mean age was 40.35±11.98 years in group A and 41.06±11.322 years in group B. There were 46 males and 17 females in group A and 42 males and 21 females in group B. We found that patients (33.3%) in group A and 31patients (24.6%) in group B were classified as grade I, while 21 patients (16.7%) in group A and 32 patients (25.4%) in group B were classified as grade II. The operative time averaged 87.79±1.77 minutes for group A and 87.63±1.64 minutes for group B. The intraoperative fentanyl requirement was 52.16±35.16 µg in group A and 49.90±36.21 µg in group B. The time taken to perform the block was shorter in group B compared to group A, with 12.98±1.98 minutes in group A and 13.90±1.98 minutes. Abouelgreed TA et al[9]evaluated the efficacy of combined low-dose spinal anesthesia with quadratus lumborum block (QLB) as an alternative to general anesthesia for patients undergoing percutaneous nephrolithotomy.All patients received low-dose spinal anesthesia (5 mg bupivacaine) and QLB (QL1-QL2-QL3) approaches. None of the patients was given general anesthesia, and intraoperative sedation was given to nineteen patients (32.2%). No hemodynamic changes were observed in all patients. There was a significant correlation between the use of intraoperative sedation and stone site, intraoperative blood loss, and hospital stay. Pain intensity on VAS at rest and movement was low until the 24th postoperative hour. Patient satisfaction score was 3, 4, and 5 in 1 (1.7%), 4 (6.7%), and 55 (91.6%) patients, respectively.

We found that the side of surgery corresponded to the side of renal calculi, with no significant difference in the distribution of right and left percutaneous nephrolithotomy (PCNL) between the groups (p=0.469).We found that postoperative complications were assessed, showing a higher incidence of nausea in group A (22 cases) compared to group B (11 cases). Vomiting was also more common in Group A (16 cases) than in group B (6 cases). There were no cases of respiratory depression or lower limb weakness in

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CONCLUSION

The erector spinae plane block provides superior postoperative analgesia compared to the posterior quadratus lumborum block in patients undergoing percutaneous nephrolithotomy. The ESP block resulted in lower pain scores, reduced opioid consumption, prolonged analgesia, and fewer side effects. These findings suggest that the ESP block is a more effective and safer regional anesthesia technique for managing postoperative pain in PCNL patients.

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