

Utilization of Paravertebral Block in Post Operative Analgesia in Cases of Nephrectomy: A Case Series

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Abstract: ***Background:** Nephrectomy, whether partial or radical, is associated with significant postoperative pain. Adequate pain management is crucial for patient comfort and recovery. Paravertebral block (PVB) has emerged as a promising regional anesthesia technique for providing effective analgesia following various surgical procedures. However, its specific role in nephrectomy remains underexplored. **Methods:** We present a case series of 10 patients who underwent nephrectomy and received PVB for postoperative analgesia. Patient demographics, surgical details, PVB technique, postoperative pain scores, opioid consumption, and complications were recorded. **Results:** 10 patients (mean age 45yrs); (6 male and 4 female) underwent nephrectomy and received PVB. The PVB was performed unilaterally at T8 - T9 vertebral level. Postoperative pain scores were significantly reduced in all patients, with 4 pain score after 24 hrs. Opioid consumption was notably decreased postoperatively. No major complications related to PVB were observed in our series. **Conclusion:** Paravertebral block demonstrates promising outcomes for postoperative analgesia following nephrectomy. It effectively reduces postoperative pain scores and opioid consumption, potentially contributing to enhanced recovery and patient satisfaction. Further prospective studies with larger sample sizes are warranted to validate these findings and establish PVB as a standard analgesic modality in nephrectomy patients.*

Keywords: Nephrectomy, Paravertebral block, PVB, postoperative analgesia, opioid consumption, patient recovery, ThPVB

1. Introduction

Paravertebral block (PVB) is a regional anesthesia technique involving the injection of local anesthetic agents into the paravertebral space adjacent to the spinal nerves. It provides unilateral somatic and sympathetic nerve blockade, resulting in effective analgesia with fewer systemic side effects compared to systemic opioids.

Surgical injury is followed by pain, risk of organ dysfunctions, morbidity, prolonged hospital stay (length of stay [LOS]), readmissions, and delayed convalescence (1). Safe and effective postoperative pain management should be on the basis of a plan of care tailored to the individual and the surgical procedure involved, and multimodal regimens are recommended in many situations (2). Use of a procedure-specific, multimodal perioperative pain management provides a rational basis for enhanced postoperative pain control, optimization of analgesia, decrease in adverse effects, and improved patient satisfaction (3). Renal surgery, especially in open nephrectomy is accompanied by severe postoperative pain (4). Adding a single preoperative TPVB to IV PCA provided intraoperative hemodynamic stability after skin incision and improved postoperative pain management significantly by reducing the postoperative pain score and opioid consumption up to 24 hours postoperatively without major complications (5). PVB should be considered an effective strategy to reduce opioid requirement and improve pain control for patients undergoing PCNL (6). Paravertebral blockade (PVB) is versatile and may be applied unilaterally or bilaterally. Unlike thoracic epidural, the PVB technique may be used to avoid contralateral sympathectomy, thereby minimizing hypotension and leading to better preservation of blood pressure. There are no reports on systemic toxicity associated with bilateral PVB despite the need for relatively large doses of local anesthetics (7). Paravertebral block did result in less immediate postoperative pain, but there were no

other significant differences in postoperative outcomes (8). The continuous paravertebral block has equivalent analgesic effects to epidural analgesia, wound infiltration and standard care, but is associated with a lower incidence of nausea and vomiting, hypotension and urinary retention than epidural analgesia (9). Continuous thoracic paravertebral block provides good intraoperative stability with a low anesthetic requirement and reduces postoperative morphine consumption for up to 24 hours. Ultrasound guided technique enhanced the safety of ThPVB and provides analgesia without major complications (10). The application of PVB in renal surgery has been reported recently, and some studies have shown that PVB can effectively control the pain after renal surgery and reduce anesthetic-related complications (11). Therefore, the purpose of these case studies is to evaluate the effect of PVB on pain management after nephrectomy and provide a reference for the selection of analgesic methods after renal surgery.

2. Methodology

1) Case Series:

We present a retrospective analysis of 10 consecutive patients who underwent open nephrectomy and received PVB for postoperative pain management at our institution between 1.08.2023 to 29.02.2024.

Patient demographics, surgical indications, PVB technique, perioperative analgesic requirements, pain scores, complications, and length of hospital stay were recorded.

2) Patient demographics:

- Mean age: 45yrs
- Gender distribution: Male=6; Female=4
- Surgical indications: Renal cell carcinoma (n=6), benign renal mass (n=3), polycystic kidney disease (n=1)
- ASA grading: ASA II (n=6); ASA III (n=4)

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3) Technique of PVB:

- An informed consent has been obtained from all patients for ipsilateral PVB as a method of post operative analgesia for nephrectomy.
- All patients were premedicated and general anaesthesia was administered inducing with propofol 1.5mg/kg and atracurium 0.5mg/kg, followed by endotracheal intubation. After administering general anaesthesia patients were positioned to lateral decubitus position and USG guided PVB was planned.
- After skin disinfection, sterile draping was placed over the patient’s back and the ultrasound probe was sheathed.

The level of the block was the transverse process of T9or T10 of the operating site where a sagittal scan was performed over the paravertebral area at the T9or T10 level and were able to delineate the transverse processes, the ligaments (intertransverse and costotransverse ligaments), and the pleura.

- The block needle was introduced under USG guidance in the long axis of the ultrasound beam (in plane technique) until it contacted the transverse process. Loss of resistance was elicited by advancing the needle above the transverse process with USG guidance.

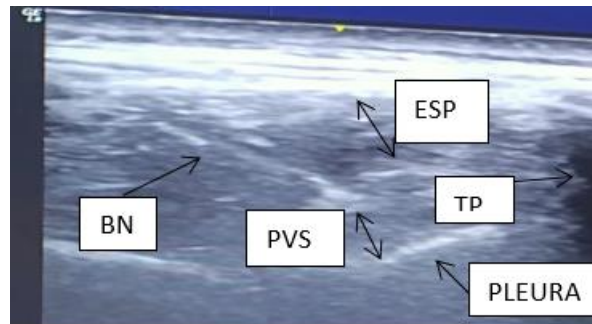


Figure 1: Image of usg guided PVB.

BN- Block Needle;
 ESP-Erector Spinae muscle;
 TP-Transverse process;
 PVS- Paravertebral Space

- After negative aspiration, 30ml of 0.25% ropivacaine mixed with 4mg dexamethasone was injected.
- Anesthesia was maintained over the course of the 2 to 2.5 hours with dexmedetomidine 0.8 mcg/kg/hr. The patients remained hemodynamically stable intraoperative period.
- After completion of surgery all the patients were transferred to PACU and was monitored for pain scores [at 0, 2, 4, 6, 12, 24 hrs], haemodynamic changes, and requirement of rescue analgesia.

4) Perioperative analgesic requirements:

Intraoperative analgesia was achieved with a combination of general anesthesia and PVB. Postoperatively, patients received multimodal analgesia, including nonsteroidal anti-inflammatory drugs (NSAIDs), acetaminophen, and rescue opioids as needed.

3. Results

Patient ID	Age (years)	Gender	ASA Grade	Post - operative Analgesic Requirements	NRS Pain Scores (Immediate Post Op)	NRS Pain scores					Requirements of opioids in first 24hrs (tramadol in mg)
						2 hrs	4 hrs	6 hrs	12 hrs	24 hrs	
Case 1	42	female	2	no	0	0	2	3	2	3	-
Case 2	48	female	2	no	1	1	2	2	3	4	50
Case 3	49	male	3	no	0	0	2	3	3	3	-
Case 4	45	male	2	no	0	1	1	2	2	4	50
Case 5	54	female	3	no	1	1	2	2	3	3	-
Case 6	45	male	3	no	0	1	2	3	3	4	50
Case 7	35	male	2	no	1	1	1	3	3	4	50
Case 8	40	female	2	no	1	1	1	2	3	4	50
Case 9	53	male	3	no	0	1	2	2	2	4	50
Case 10	39	male	2	no	0	1	2	3	2	3	-

- PVB was performed successfully in all cases and adequate sensory blockage achieved, targeting the dermatomes innervating surgical site.
- Intra operative pain was effectively managed in all patients.
- The majority of patients required minimal additional analgesia post - operatively, indicating effective pain control with the paravertebral block.
- Pain scores were consistently low in the immediate post - operative period, indicating effective pain relief (average NRS scoring= 0.4).
- Duration of the hospital stay on an average was 3 days.

Complications: No major complications related to the paravertebral block were observed in any of the patients.

Limitations:

- The study is limited by its retrospective design and small sample size.
- Results may be influenced by variations in patient characteristics and surgical techniques.
- Prospective studies with larger cohorts are needed to validate these findings.

4. Discussion

Paravertebral block offers several advantages for post - operative analgesia in nephrectomy patients. By providing targeted analgesia to the surgical site, PVB can effectively control pain with fewer systemic side effects compared to systemic analgesia. This may lead to improved patient comfort, reduced opioid consumption, and faster recovery. Additionally, PVB may facilitate early mobilization and decrease the risk of post - operative complications associated with inadequate pain control.

Paravertebral block (PVB) has been an established technique for providing analgesia to the chest and abdomen (12). Paravertebral block provided good management of acute postoperative pain and limited neuropathic postoperative disturbances (13). Ultrasound - guided PVB was found to be an effective analgesia compared to tramadol, and no additional complications were encountered (14). preoperative ThPVB was an effective part of a multimodal analgesia regimen for reducing opioid consumption and pain intensity (15). Paravertebral block (PVB) is a successful regional method that has been used for the pain management of several procedures such as thoracotomy, breast surgery, abdominal herniorrhaphy, and lithotripsy and provides non opioid analgesia to the somatic nerve roots in a dermatome distribution with no side effects. Although PVB has been used for many procedures, there is limited data for its use for the management of pain in percutaneous nephrolithotomy operations (16).

5. Conclusion

In this case series, paravertebral block demonstrated efficacy and safety for post - operative analgesia in patients undergoing nephrectomy. The results support the use of PVB as a valuable technique for pain management in this population. Further studies are warranted to validate these

findings and compare PVB with other analgesic approaches in nephrectomy patients.

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