

A Prospective Randomized Comparative Study of Unilateral Paravertebral Block with Conventional Spinal Anesthesia for Inguinal Hernia Repair

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Abstract:

Inguinal hernia repair can be done under different modes of Anaesthesia. An 11-month Patna Medical College & Hospital study compared unilateral paravertebral block (PVB) to spinal anaesthesia for elective inguinal hernia procedures for efficacy, safety, and patient satisfaction. This prospective, randomised comparative study included 87 patients: 43 receiving PVB (Group A) and 44 receiving spinal anaesthesia (Group B). The study investigated intraoperative hemodynamic stability, postoperative pain, analgesic requirements, patient satisfaction, and adverse events. Spinal and PVB anaesthesia provided appropriate surgical anaesthesia. Group A experienced reduced intraoperative hypotension (5% vs. 27%, $p=0.005$) and better hemodynamic stability. Group A had lower postoperative pain levels ($p<0.001$), delayed first analgesics (7.5 ± 2.1 hours vs. 4.3 ± 1.7 hours, $p<0.001$), and took fewer total analgesics (45 ± 15 mg vs. 80 ± 20 mg of Group A exhibited higher patient satisfaction (4.8 ± 0.3 vs. 4.1 ± 0.6 , $p<0.001$) and lower post-dural puncture headache and urine retention rates than Group B. Inguinal hernia surgery may benefit from unilateral paravertebral block over spinal anaesthesia in hemodynamic stability, postoperative discomfort, and patient satisfaction. PVB is advised for this procedure.

Keywords: Inguinal Hernia Repair, Paravertebral Block, Spinal Anesthesia, Postoperative Pain.

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Introduction

With millions of operations performed each year, inguinal hernia repair is one of the most common surgical procedures performed worldwide. [1,2] The anaesthetic used for inguinal hernia repair has a big influence on recovery, perioperative experiences, and patient outcomes. Spinal anaesthesia has long been preferred because it can produce reliable and efficient sensory and motor blocking, which is ideal for fostering the best possible surgical environment. [3] Nevertheless, there are several possible side effects linked to spinal anaesthesia, including hypotension, headaches following a spinal puncture, and retention of urine. Unilateral paravertebral block is a newly developed alternative to spinal anaesthesia (PVB). [4] To produce a unilateral segmental blockage, a local anaesthetic is injected next to the spinal nerves as they leave the intervertebral foramina in this technique of regional anaesthesia. The benefit of this strategy is that it only targets the

surgical site, which may lower the chance of systemic adverse effects and maintain hemodynamic stability. [5] Although PVB has been shown to have potential advantages, its use in the treatment of inguinal hernias is still relatively new compared to the more established field of spinal anaesthesia. [6] In the context of inguinal hernia repair, this prospective, randomised comparative study is to assess the effectiveness, safety, and patient satisfaction of unilateral paravertebral block in comparison to traditional spinal anaesthesia. This study aims to provide important insights that could impact anaesthetic practice and enhance patient care in inguinal hernia procedures by carefully comparing these two anaesthetic approaches. [7,8]

Methodology

Study Design: This research compares the effectiveness, safety, and patient satisfaction of

unilateral PVB with traditional spinal anaesthesia in patients having inguinal hernia surgery. It is structured as a prospective, randomized, comparative trial.

Study Setting: The study will be conducted at Patna Medical College & Hospital over 11 months.

Study Population: The study will include 87 patients scheduled for elective inguinal hernia repair. Patients will be recruited from the general surgery department of Patna Medical College & Hospital.

Inclusion Criteria

1. Patients ages 18-65.
2. ASA physical status I and II.
3. Scheduled elective inguinal hernia surgery.
4. Can give informed consent.

Exclusion Criteria

1. Patients contraindicated for regional anaesthesia.
2. Known coagulopathy or anticoagulant treatment.
3. Block placement infection.
4. Local anaesthetic allergy.
5. Severe spinal defects.
6. Neurological impairments.

At Patna Medical College & Hospital, inguinal hernia repair patients will be randomly randomised to Group A for a unilateral paravertebral block (PVB) and Group B for standard spinal anaesthesia using a computer-generated sequence. The procedures will be done aseptically in sitting or lateral decubitus for both groups. At T10-T12, Group A will get 20-25 mL of 0.5% bupivacaine. The block's efficacy will be judged by the lack of pinpricking. In addition to receiving 3 mL of 0.5% bupivacaine at the L3-L4 or L4-L5 interspace, Group B will undertake sensory and motor blockage tests before surgery.

Regular hemodynamic monitoring and recording are part of intraoperative treatment. The Visual Analogue Scale will measure postoperative pain and morbidity at various intervals. The study will first assess anesthesia adequacy, then hemodynamic stability, pain scores, analgesic needs, patient satisfaction, and adverse events. SPSS will analyze data using the Declaration of Helsinki ethical principles, including prior authorization from all participants.

Results

Two groups were created in a study with eighty-seven patients who had inguinal hernia repairs: Group A included forty-three patients who had a unilateral paravertebral block (PVB), and Group B included forty-four patients who had traditional spinal anaesthesia. Age, gender, height, weight, and

ASA physical status were among the baseline and demographic variables that were comparable in both groups, suggesting that there were no significant differences ($p > 0.05$).

Every patient in both groups received sufficient anaesthesia during the procedure; neither group required further anaesthesia or a switch to general anaesthesia. When compared to Group B, Group A showed noticeably improved hemodynamic stability and a much-reduced incidence of hypotension (5% vs. 27%, $p=0.005$). There were no appreciable differences in heart rate variations between the groups.

At 1, 2, 4, 8, 12, and 24 hours after surgery, Group A recorded significantly lower pain scores than Group B, with mean Visual Analogue Scale (VAS) scores ranging from 1.5 to 2.8 ($p < 0.001$), significantly less than the latter group's scores, which ranged from 3.2 to 4.5. Furthermore, Group A had a longer duration before the first analgesic necessity (7.5 ± 2.1 hours vs. 4.3 ± 1.7 hours, $p < 0.001$) and consumed considerably less analgesics overall in the first 24 hours ($45 \text{ mg} \pm 15 \text{ mg}$ of morphine equivalent vs. $80 \text{ mg} \pm 20 \text{ mg}$, $p < 0.001$).

Twenty-eight hours after surgery, patient satisfaction was assessed on a 5-point Likert scale; Group A scored higher (4.8 ± 0.3) than Group B (4.1 ± 0.6 , $p < 0.001$). In terms of untoward events, hypotension and urine retention occurred much less frequently in Group A than in Group B, with rates of 5% against 27% ($p=0.005$) and 2% versus 20% ($p=0.01$), respectively. Although Group A had fewer cases of post-dural puncture headache, nausea, and vomiting, these changes were not of statistical significance.

Discussion

In patients undergoing inguinal hernia surgery, the purpose of this prospective, randomised comparative study was to compare the effectiveness, safety, and patient satisfaction of unilateral paravertebral block (PVB) vs traditional spinal anaesthesia. [9] Our findings showed that PVB offered a similar level of anaesthetic efficacy to spinal anaesthesia, but with notable benefits for patient satisfaction, hemodynamic stability, and postoperative pain management. [10]

A noteworthy discovery from our investigation was the increased hemodynamic stability noted in the PVB cohort. Patients receiving PVB had a considerably lower incidence of intraoperative hypotension (5%) than patients receiving spinal anaesthesia (27%, $p=0.005$). [11] This result is consistent with other research showing improved hemodynamic characteristics with PVB. For example, Naja et al. (2003) discovered that in patients having treatment of an inguinal hernia,

PVB provided better stable hemodynamics than spinal anaesthesia. [12]

Additionally, our study showed that, when compared to spinal anaesthesia, PVB produced noticeably decreased postoperative pain scores at all time points (1, 2, 4, 8, 12, and 24 hours). [13] In the PVB group, there was also a longer latency to initial analgesic necessity and a lower overall

analgesic use. According to Karmakar et al. (2001), PVB offered better postoperative analgesia for breast surgery than spinal anaesthesia. [14] These results are in line with their findings. PVB has the potential to improve patient comfort and diminish the risk of opioid-related adverse effects, as seen by decreased pain scores and decreased demand for postoperative analgesics. [15]

Table 1: Study to compare the outcomes of unilateral paravertebral block (PVB) and conventional spinal anaesthesia for inguinal hernia repair.

S. No.	Parameter	Group A(PVB)	Group B(Spinal)	p-value
1.	Age (Years)	45.2±12.3	46.1±11.8	>0.05
2.	Gender (M/F)	38/5	40/4	>0.05
3.	Weight (kg)	70.5±8.2	71.2±7.9	>0.05
4.	Height (cm)	170.3±6.1	169.8±5.8	>0.05
5.	ASA Physical Status (I/II)	35/8	36/8	>0.05

On a 5-point Likert scale, patient satisfaction was considerably higher in the PVB group. This is probably the result of reduced side effects and improved postoperative pain management working together. [16] Patients who underwent breast surgery under PVB reported greater satisfaction scores than those who underwent general anaesthesia, according to a comparable study by Klein et al. (2000). This difference was mostly attributable to improved management of pain and fewer side effects. [17]

The PVB group saw a much-decreased incidence of adverse effects, such as urine retention and headaches following a spinal puncture. Post-dural puncture headache was not reported by any patients in the PVB group, while it was 6.8% in the spinal anaesthesia group. [18] This outcome confirms other research' findings that pointed out that PVB is related with lower risks of complications. For instance, compared to epidural anaesthesia, PVB had a decreased incidence of problems in thoracic surgery, according to Richardson et al. (1998). [19]

Although our study offers insightful information, there are certain drawbacks. Although 87 patients is a respectable sample size for drawing some preliminary results, it might not be enough to identify all possible differences and uncommon adverse events. Furthermore, the research was carried out at a single location, which can restrict how broadly applicable the results are. More extensive multicenter studies with bigger sample sizes are necessary to validate these findings and offer stronger supporting data. [20]

Our results are in line with the larger corpus of research that backs PVB's usage as a secure and reliable substitute for spinal anaesthesia in a range of surgical operations. Comparing PVB to other regional anaesthesia procedures, research by Greengrass et al. (1998) and Chelly et al. (2001)

has further shown PVB's effectiveness in producing anaesthesia with fewer adverse effects.

Conclusion

To sum up, this research indicates that unilateral paravertebral block is a feasible and possibly better option for inguinal hernia repair than traditional spinal anaesthesia. In addition to superior hemodynamic stability, improved postoperative pain control, and increased patient satisfaction, PVB provides anaesthetic efficacy that is comparable. These results imply that PVB might be regarded as the preferred anesthetic method for the repair of inguinal hernias, improving patient results and safety.

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