

Evaluation of the Effectiveness and Safety of Unilateral Paravertebral Block Compared to Traditional Spinal Anaesthesia for Inguinal Hernia Repair

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Abstract:

The surgical intervention known as inguinal hernia repair (IHR) is a frequently conducted procedure within the medical field. It can be carried out utilising general anaesthesia, regional anaesthesia, or peripheral nerve block anaesthesia. The utilisation of subarachnoid block is widely prevalent as the primary modality for lower abdominal surgery and orthopaedic surgery. Despite having ample experience, the utilisation of unilateral paravertebral block (PVB) as a primary anaesthetic modality remains suboptimal in the medical field. Consequently, this study was undertaken to assess the effectiveness of Paravertebral block in the context of unilateral inguinal hernia repair, in comparison to spinal anaesthesia. This prospective, randomised, single-blinded case-control study was conducted at the Department of Anaesthesiology, SCB Medical College, Cuttack, India, from April to September 2022, following the acquisition of institutional approval. The study was conducted on a cohort of 30 patients who were scheduled for unilateral inguinal hernia repair.

Keywords: Comparison, Paravertebral Block, Spinal Anaesthesia, Unilateral Inguinal Hernia.

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Introduction

Inguinal herniorrhaphy (IH) is a frequently performed ambulatory surgical procedure. Inguinal hernia is a prevalent condition among males, frequently encountered in medical practise. The management of this pathological condition primarily involves surgical intervention. The procedure can be conducted utilising diverse anaesthetic techniques such as Subarachnoid block, General Anaesthesia, Epidural Anaesthesia, Hernia block either individually or in conjunction, thereby ensuring patient contentment [1, 2]. Spinal anaesthesia offers advantages in attenuating the physiological stress response to surgical procedures, reducing complications in patients at high risk, and facilitating the provision of postoperative analgesia. However, it is important to acknowledge that certain adverse events specific to the cardiovascular system, such as arterial vasodilation, peripheral reflex vasoconstriction, bradycardia, and hypotension, may present challenges [3, 4].

The paravertebral block (PVB) procedure is known for its ability to deliver durable unilateral anaesthesia, maintain hemodynamic stability, facilitate early ambulation, and provide prolonged pain relief [6, 7, 8]. Paravertebral block (PVB) induces ipsilateral segmental analgesia by

administering a local anaesthetic through injection onto the spinal nerve roots adjacent to the vertebral column [9].

The paravertebral block is commonly employed as a method of anaesthesia for various surgical interventions, such as breast surgery, thoracotomy, inguinal hernia repair, and renal surgery. It is particularly utilised in unilateral procedures, as well as in cases of chest trauma involving rib fractures, to provide effective analgesia. The utilisation of paravertebral block as a means of surgical anaesthesia is a viable option for patients with significant co-morbidities such as chest infection and bronchial asthma, who are unable to tolerate general anaesthesia or neuraxial blocks [10, 11]. In the context of inguinal hernia surgery, which is commonly performed under central-neuraxial anaesthesia, the implementation of paravertebral block, with its segmental block characteristics, presents an appealing alternative due to its ability to provide superior hemodynamic control, extended post-operative analgesia, and a reduction in complications such as post-operative nausea and vomiting (PONV), urinary retention, and delayed ambulation [9, 12]. Unilateral procedures, such as thoracotomy, breast surgery, chest wall trauma,

hernia, or renal surgery, are primarily recommended for the application of this technique. The present study was conducted to assess the effectiveness of Paravertebral block in the context of unilateral inguinal hernia repair, in comparison to spinal anaesthesia.

Materials and Methods

This prospective, randomised, single-blinded case-control study was conducted at the Department of Anaesthesiology, SCB Medical College, Cuttack, India, from April to September 2022. The study was conducted on a cohort of 30 patients scheduled for unilateral inguinal hernia repair. A total of 30 adult individuals, aged between 18 and 65 years, who were classified under the American Society of Anesthesiologists Physical Status (ASA PS) I and II, and were scheduled to undergo elective surgery for Inguinal Hernia Repair, were selected for this study.

All patients underwent comprehensive medical evaluations, and those who exhibited normal clinical, haematological, biochemical, and radiological findings were included in the study. Informed consent was duly obtained from all the patients in accordance with established medical and ethical guidelines. All participants were assigned to two groups using a randomization procedure. There are two groups, Group P and Group S, each consisting of 30 individuals who are being studied in a medical and academic context.

Inclusion criteria

- Age: 18-65 years
- Weight: 50-80 kgs
- BMI: < 30 KG/M²
- ASA: I & II
- Diagnosis: Fully reducible direct or indirect inguinal hernia
- Mallampatti score: I & II Patient who gave valid informed consent

Exclusion criteria

- Patient's refusal
- Untreated and uncontrolled systemic illness
- Allergy to Local Anaesthetics
- Coagulopathy
- Thoracic Vertebral disease or deformity
- Chronic analgesic use
- Systemic or local sepsis
- H/O seizures & any neurological deficit
- Psychiatric disease
- Not satisfying inclusion criteria

Statistical Analysis

Descriptive statistics was done for all data and were reported in terms of mean values and percentages. Suitable statistical tests of comparison were done. Continuous variables were analysed with the unpaired t test. Categorical variables were analysed with the Chi-Square Test and Fisher Exact Test. Statistical significance was taken as P < 0.05.

Results

Table 1: Age and sex distribution

Age (In Years)	No of Patients	Percentage
< 40	11	36.67
41-50	8	26.67
51-60	9	30
>60	2	6.67

The highest number of patients [11 (36.67%) in this study belonged to the <40 age group (Table 1).

Table 2: Baseline parameters and intraoperative heart rate

Baseline parameters		
Parameters	Mean	SD
Heart Rate	83.16	9.46
Systolic BP	123.33	11.36
Diastolic BP	81.06	10.52
Map	95.03	8.23
SPO ₂	98.83	0.74
Intraoperative Heart Rate		
Heart Rate	Mean	P value
0min	78.06	0.001
5min	80.26	0.063
10min	73.06	0.001
15min	73.2	0.004
20min	73	0.002
25min	71.2	0.143
30min	71.2	0.004
45min	74.6	0.926
60min	76.06	0.541
75min	69	0.011
90min	80.2	0.195

According to Table 2, the highest mean was observed in the case of systolic blood pressure (123.33, standard deviation = 11.36). Conversely, the lowest mean was observed in diastolic blood pressure (81.06, standard deviation = 10.52). Table 2 further demonstrated that the average intraoperative heart rate exhibited its peak values during the 5-minute (80.26) and 90-minute (80.2) intervals.

Discussion

In the current investigation, a comparative analysis was conducted to assess the efficacy of paravertebral block in contrast to spinal anaesthesia among patients undergoing unilateral inguinal hernia repair. The findings of this study indicate that paravertebral block successfully induced sufficient anaesthesia during the surgical procedure, thereby ensuring the patient's hemodynamic stability. Furthermore, the incidence of postoperative adverse events was minimal, thereby establishing paravertebral block as a favourable anaesthesia modality due to its prolonged analgesic effects.

There was no statistically significant disparity observed in the postoperative systolic blood pressure, diastolic blood pressure, and mean arterial pressure between the two groups. The p-value, which measures the level of statistical significance, was found to be greater than 0.05, indicating that the results were not statistically significant. Drawing inspiration from their previous success with paravertebral block in mitigating chronic pain during breast surgery, Weltz et al. [13] embarked on utilising lumbar paravertebral block for the purpose of inguinal hernia surgeries.

The researchers hypothesised that the utilisation of paravertebral block would be the more favourable approach, as it is associated with an extended duration of sensory block, resulting in minimal postoperative pain and reduced reliance on narcotics. Additionally, paravertebral block is anticipated to result in a lower occurrence of nausea and vomiting, as well as a shorter hospital stay. Hadzic et al. [14] substantiated these findings through a comparative analysis of paravertebral anaesthesia and general anaesthesia in patients undergoing inguinal hernia repair.

In the current investigation, extended analgesic therapy was administered to the patients, resulting in a reduced occurrence of nausea and vomiting. In their study, Naja et al. [15] conducted a comparative analysis to assess the effectiveness of bilateral paravertebral block and mild sedation in comparison to general anaesthesia for ventral hernia surgeries. The findings of their investigation revealed that paravertebral block exhibited superior efficacy in this context. In the current investigation, it was ascertained that the surgical procedure could be

conducted with mild sedation and paravertebral anaesthesia for patients undergoing unilateral inguinal hernia repair.

In a separate study, Naja et al. [15] conducted a comparative analysis between paravertebral block aided by a nerve stimulator and ilio-inguinal nerve block in paediatric patients undergoing herniorrhaphy. The two methodologies were evaluated with regards to intraoperative hemodynamic stability, postoperative pain scores at rest and during physical activity, need for supplementary analgesics, and parental satisfaction. The findings concluded that paravertebral block exhibited superiority over ilio-inguinal nerve block.

The patients initially underwent induction of general anaesthesia followed by administration of regional anaesthesia. A paravertebral block was administered at three distinct levels, namely T12-L1, L1-L2, and L2-L3. The local anaesthetic agent utilised was [insert name of specific drug]. In the current investigation, the administration of a local anaesthetic via injection was performed. Nevertheless, we conducted intramuscular administration across five vertebral levels spanning from the tenth thoracic vertebra (T10) to the second lumbar vertebra (L2), as the adult participants enrolled in the research were solely administered with a mild sedative.

Based on our empirical findings, it is imperative to administer dermatomal blocks at the T12-L1 levels, which align with the anatomical region primarily addressed by the surgical team specialising in inguinal hernia procedures.

To ensure comprehensive anaesthesia in the lower dermatomes at the onset of the surgical procedure, it is imperative to initiate anaesthesia from lower anatomical regions and progressively extend it to the upper regions.

Conclusion

The study has determined that the utilisation of paravertebral block may serve as a viable substitute for spinal anaesthesia in the context of inguinal hernia surgery. This particular approach has demonstrated its capacity to deliver sufficient anaesthesia throughout the perioperative phase, while also offering superior analgesic effects during the postoperative period.

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