

Original Article

A Comparative study on Paravertebral Block with Spinal Anaesthesia in Unilateral Inguinal Hernia Reparation

Mohit Roy¹, Rakesh Modi²

^{1,2}Assistant Professor, Department of Critical Care Medicine and Anaesthesia, National Institute of Medical Science and Research, Jaipur, Rajasthan, India

ABSTRACTS:

Introduction: The paravertebral block (PVB) has been used with success, both as anaesthetic and analgesic techniques, for inguinal herniorrhaphy. PVB provides an analgesia equivalent to extensive peripheral nerve block for inguinal herniorrhaphy, offering an alternative method of postoperative pain management with fewer adverse events. PVB has been found to be more advantageous than conventional spinal anaesthesia for inguinal hernia repair, in terms of early ambulation and better postoperative pain scores. **Materials and Methods:** The study was an experimental double blinded randomized controlled study. After obtaining Institutional ethics committee's approval 60 male patients of age group 18 to 65 years with ASA physical status 1 and 2 scheduled for elective unilateral hernia repair were selected for study. The patients were explained about the procedure and its complications, VAS scoring during the pre operative examination. **Result:** The two groups were statistically comparable with respect to age, weight, preoperative vital parameters, SBP, DBP, SPO2. Intra operatively incidence of hypotension and use of vasopressor was high in group S, 25 patients (50%) as compared to no such incidence in group P. Total consumption of propofol was higher in group P compared to group S ($p < 0.001$). The VAS score was highest at 6 hours for group P ($p < 0.001$) and 4 hours for group S ($p < 0.001$) and was significant at 4, 6 hours. At 12, 24 hours there was no significant difference. The rescue analgesic Tramadol in boluses of 50mg IV was used if VAS score > 4 and repeated every 15 min until pain was relieved (VAS < 3). **Conclusion:** To conclude Paravertebral block can be used as an alternative to spinal anaesthesia in unilateral inguinal hernia repair.

Keywords: Paravertebral block, spinal anaesthesia, inguinal hernia repair.

Corresponding author: Rakesh Modi, Assistant Professor, Department of Critical Care Medicine and Anaesthesia, National Institute of Medical Science and Research, Jaipur, Rajasthan, India

This article may be Cited as: Roy M, Modi R. A Comparative study on Paravertebral Block with Spinal Anaesthesia in Unilateral Inguinal Hernia Reparation. HECS Int J Com Health and Med Res 2017;3(4):42-46.

INTRODUCTION

Paravertebral block is used as anesthesia for surgical procedures like breast surgery, thoracotomy, inguinal hernia repair, renal surgery predominantly in unilateral procedures as well in chest trauma (rib fracture) for analgesia. Paravertebral block can also be used for surgical anesthesia in patients with serious comorbidities like chest infection, bronchial asthma etc who could not tolerate general anesthesia or neuraxial blocks.¹ An inguinal hernia is herniation of loop of the intestine in the inguinal canal and repair of such herniation is one of the commonest surgeries. Repair/surgery of inguinal hernia can be performed under General Anaesthesia (GA) or Regional Anaesthesia (RA).² RA technique includes spinal, epidural or nerve blocks like hernia block (Ilio-hypogastric-Ilioinguinal-Lower intercostals nerves T11 and T12 block) or paravertebral block. Various comorbidities like cardiac, renal, cerebral, endocrine, respiratory etc., may accompany the situation and further complicate anaesthetic management. Treatment of postoperative pain is also an issue in

such high-risk patients.³ Unilateral spinal anaesthesia (unilateral SA) is widely used nowadays for unilateral inguinal hernia repair, providing intense sensory and motor blockade.⁴ Inguinal hernia repair can be performed using various anaesthetic methods alone or in combination and patient satisfaction can be provided. General anaesthesia and various regional anaesthesia methods are approved for inguinal hernia repair. The reasons for preferring regional anaesthesia methods include absence of unconsciousness, absence of respiratory depression, lower rates of postoperative nausea and vomiting, and more rapid recovery.^{5,6} In case of inguinal hernia surgery which is predominantly done under central-neuraxial anesthesia, Paravertebral block which has segmental block offers an attractive alternative in terms of better hemodynamic control, prolonged post-operative analgesia and in decreasing complications like post operative nausea vomiting (PONV), urinary retention and delayed ambulation.⁷ Paravertebral block is also been used in ambulatory surgery unit for inguinal herniorrhaphy

and in outpatient procedures³.⁸The paravertebral block (PVB) has been used with success, both as anaesthetic and analgesic techniques, for inguinal herniorrhaphy.^{9,10} PVB provides an analgesia equivalent to extensive peripheral nerve block for inguinal herniorrhaphy, offering an alternative method of postoperative pain management with fewer adverse events. PVB has been found to be more advantageous than conventional spinal anaesthesia for inguinal hernia repair, in terms of early ambulation and better postoperative pain scores.¹¹

MATERIALS AND METHODS

The study was an experimental double blinded randomized controlled study. After obtaining Institutional ethics committee's approval 60 male patients of age group 18 to 65 years with ASA physical status 1 and 2 scheduled for elective unilateral hernia repair were selected for study. The patients were explained about the procedure and its complications, VAS scoring during the pre operative examination. The exclusion criteria were patient's refusal, significant cardiovascular, respiratory, hepatic, diabetes, metabolic diseases, morbid obesity, coagulation disorders, mental dysfunction and allergy to local anesthetics. Patients were randomly assigned to two groups – P and S, according to a sealed envelope method to receive one of the following two anaesthetic techniques – Paravertebral block (PVB) or Spinal anaesthesia (SA), respectively. Para vertebral block was given as 2 segment block, T10, L1.¹² The patient was positioned in the sitting position. The back should assume kyphosis similar to the position required for neuraxial anesthesia. The patient's feet were rested on a stool to allow for a greater comfort and degree of kyphosis. This increases the distance between the adjacent transverse processes and facilitates advancement of the needle beyond the contact with the transverse process. With aseptic precautions, a point 3 cm. lateral to the cephalad aspect of spinous processes of T10 and L1 was marked. Skin was infiltrated with 2% lignocaine at this point. A 23 G Quincke (QBC) needle was inserted perpendicular to the skin at this point to contact transverse process. The needle was then withdrawn a bit and walked off the transverse process by redirecting the needle to the cephalad or caudad to 1 cm. After negative aspiration of blood and cerebrospinal fluid (CSF), with the help of extension line connected to Quincke (QBC) needle 15 ml of bupivacaine (0.5%) at T10 and 5 ml of bupivacaine (0.5%) at L1 was injected. Patients were repositioned to supine after the procedure. The patients of group S were preloaded with 15ml/kg of IV fluid. Under strict aseptic precautions L3 – L4 level after skin infiltration with 2 % lignocaine sub arachnoid space was approached using 25 G QBC needle. 12.5 mg of 0.5% Bupivacaine (H) injected. After the procedure patients were shifted to supine

position. Level of sensory block was assessed by pinprick and level slightly higher than T 10 would be achieved. Motor blockade was assessed by Modified Bromage score¹³. 0–3 (0- full flexion of knees and feet; 1- just able to flex knees, full flexion of feet; 2 - unable to flex knees, but some flexion of feet possible; 3-unable to move legs or feet). Any episode of hypotension [mean arterial pressure (MAP) <70mmHg] was managed with rush of I.V fluids and 6mg I.V mephentermine and repeated if necessary. Any episode of bradycardia (heart rate < 45/min) was treated with Injection Atropine 0.6 mg I.V. During surgery, patients of both the groups received an I.V infusion of propofol titratable to light sleep with easy arousability. Total dose of propofol used was noted. After surgery, patients were transferred either to the recovery room under strict monitoring or directly to the ward, if the patients met the criteria for transfer adequately. Patients were evaluated using a modified Aldrete score by the recovery room anaesthetist who makes decision regarding the patient's eligibility to bypass recovery going directly to the ward. It includes ability to move extremities, respiratory effort, consciousness, blood pressure and oxygen saturation. Patients were bypassed recovery room only with modified Aldrete score of 9 or more¹⁴. Time to first rescue postoperative analgesia, time to ambulation, total analgesia consumption in first 24 hours and incidence of side effects were measured. Pain was assessed using visual acuity score VAS (0 to 10; 0- no pain 10 – worst pain). All the patients were explained before surgery regarding VAS score. Any time VAS score > 4 were treated with rescue analgesia of injection Tramadol 50 mg. iv repeated if necessary. Inj. Ondansetron 4 mg. iv was given as rescue anti-emetics. Any patient, if not passed urine for more than 3 hours or complaining of urinary retention, was catheterized. Any other complaints and side effects were noted.

RESULT

The two groups were statistically comparable with respect to age, weight, preoperative vital parameters, SBP, DBP, SPO2. Intra operatively incidence of hypotension and use of vasopressor was high in group S, 25 patients (50%) as compared to no such incidence in group P. Total consumption of propofol was higher in group P compared to group S ($p < 0.001$). The VAS score was highest at 6 hours for group P ($p < 0.001$) and 4 hours for group S ($p < 0.001$) and was significant at 4, 6 hours. At 12, 24 hours there was no significant difference. The rescue analgesic Tramadol in boluses of 50mg IV was used if VAS score > 4 and repeated every 15 min until pain was relieved (VAS < 3). Time to the first dose of analgesic was significantly different in the two groups ($P < 0.0001$) and total analgesic consumption in 24 hours also was significant in two groups ($p < 0.001$). The time of ambulation was also

significant between two groups and was higher in group S ($P < 0.001$). 4 patients experienced post operative nausea vomiting (PONV) in group S and 1 patient in group P which was statistically not significant ($p = 0.161$). 5 patients in group S were

catheterized in post operative period due to urinary retention whereas no patients were catheterized in group P ($p = 0.05$ significant). All patients in group P bypassed recovery room.

Table 1: Demographic profile and baseline vital parameters for patients undergoing inguinal hernia repair

PARAMETERS	GROUP P(n =50)	GROUP S(n =50)
AGE (in years)	48±8.21	48±12.98
WEIGHT (in kg.)	61.18±9.98	59.48±9.98
PRE OP SBP (mm of Hg.)	137.42±16.24	134.40±15.06
PRE OP DBP (mm of Hg.)	84.84±7.826	82.26±8.24
PRE OP SPO2 (%)	99.98 ±0.936	99.68±0.898

All tests are Fischer's exact T test. All values are presented as mean±SD.

Group P Paravertebral group, Group S spinal group, SBP Systolic Blood pressure, DBP diastolic blood pressure, SPO2 oxygen saturation, Pre operative.

Table 2: Intra-operative drug requirement in both groups P and S

PARAMETERS	GROUP P	GROUP S
Use of Mephentermine (n & %)	0(0%)	25(50%)*
Propofol dosage (mg.)	168±20	66±10*

For use of Mephentermine Pearson's chi square test was used results presented as no. of patients; For propofol dosage

Fischer's exact T test was used and results described as mean ± SD

Table 3: Postoperative recovery times and adverse events

PARAMETERS	GROUP P	GROUP S
Time to first analgesia(min)	350±40	209±27*
Time to ambulation (min)	251±22	372±19
Total analgesia consumption (Tramadol in mg.)	76±33	162±37
Patients with PONV(n)#	2	6
Urinary catheterization(n)#	0	7
Recovery room bypass(n)#	50	17

*Significant ($p < 0.05$)

#Pearson's chi square test was used. For others Fischer's Exact T test was used. Results presented as mean ± SD, no. of patients (n), total amount in mg.

DISCUSSION

From our study we found 2 segment Paravertebral block (PVB) as an alternative to spinal anaesthesia in unilateral inguinal hernia. This was possible due to segmental nature of Paravertebral block (PVB) and persisting sensory block resulting in prolonged pain relief. Even after ambulation patient had good pain relief which was not seen in spinal anaesthesia due to its non segmental nature and complete block of lower thoracic and lumbar segment block and shorter period of analgesia. The findings were similar to Mandal et al in which they compared PVB with unilateral spinal anaesthesia¹⁵.

Poor recovery room bypass was seen in group S spinal anaesthesia group due to prolonged motor block ($p < 0.001$). Bilateral Spinal anaesthesia (SA) with high dose of Bupivacaine without opioid may explain the delayed ambulation and increased need for recovery room use in the spinal group, probably related to the residual motor and sympathetic blockade. In contrast, ambulation is much earlier after PVB for inguinal hernia repair, probably due to

minimum motor blockade of lower extremities in group P. Propofol consumption was higher in group P when compared to group S due to slower onset of block and due to differential innervations of inguinal sac contents and segmental block.

Bhattacharya P et al used 4 segment Paravertebral block in their study on inguinal hernia¹⁶ and Mandal et al used 2 segment PVB in the study. Saito T and his colleagues favoured single injection, multi-segment Paravertebral block as an alternative to multiple injection technique¹⁷. Although multi-segmental PVB provided good anaesthetic condition, they caused discomfort to patient due to multiple pricks and more chance of pneumothorax in case of higher thoracic levels. Lonnquist and Hildngston described at the level of T 12 psoas muscle interrupted the Paravertebral space¹⁸. So Mandal et al used 2 segment PVB at T 10 and L 1 and we used same method in our study. In the spinal anaesthesia group S the use of intra-operative mephentermine was increased due to hypotension which was not seen in Paravertebral block indicating good hemodynamic

control in PVB group compared to group S. Five patients (16%) of group S required urinary catheterization after 3 h of postoperative period as compared with none in group P. This increased incidence of urinary retention might be related to hypotension which required more frequent volume expansion, as also assumed by Fanelli et al¹⁹. In the postoperative period Paravertebral block could avoid the complications seen with spinal anaesthesia like urinary retention and catheterization, postoperative nausea and vomiting (PONV), post dural puncture headache (PDPH). However use of finer small bore pencil-point needles (25G) decrease incidence of PDPH. Limitations were that Paravertebral block was not routinely practiced was time consuming, chances of failure and higher chances of pneumothorax which increases with increase in number of injections and in thoracic level. The chances of partial block or block failure could be higher due to inexperience with the technique and inconsistent nature of block. We could see patients requiring more propofol in PVB group compared to spinal anaesthesia group. Use of peripheral nerve stimulator (PNS) or ultrasound guidance block could decrease the failure rate and increase the efficiency of block.

CONCLUSION

To conclude Paravertebral block can be used as an alternative to spinal anaesthesia in unilateral inguinal hernia repair. Its efficacy can be seen in better hemodynamic control, prolonged postoperative analgesia, no residual motor blockade, early ambulation and decreased urinary retention. The efficiency of Paravertebral block can further be improved by using Peripheral nerve stimulator (PNS) as well as ultra sound guided block. PVB is advantageous in providing segmental anaesthesia, early ambulation, and prolonged pain relief. In the hands of experts, PVB can be a safe alternative to unilateral SA for unilateral inguinal hernia repair. An anaesthesiologist who is well-conversant with the paramedian epidural block can easily learn PBV. PVB should be practiced under the supervision of experts, so that this technique can be revived well for ambulatory surgery. Although Paravertebral Block requires longer Procedure time, sensory onset and time to reach surgical anaesthesia, complications like nausea, hypotension, bradycardia or urinary retention were significantly lesser as compared to SA. Selective unilateral blockage is observed in Paravertebral Block compared to bilateral and multiple segments blockages in Spinal Anaesthesia. Paravertebral Block with nerve locator significantly prolongs the duration of postoperative analgesia and reduces rate of complications in patients undergoing unilateral uncomplicated inguinal hernia surgery. Success rate can be improved by regular practice, use of ultrasound guidance and nerve stimulators. PVB can become a viable alternative to central neuraxial block when the latter is contraindicated. Paravertebral

block might be an alternative to spinal anaesthesia method in inguinal hernia surgery as it provides adequate anaesthesia during perioperative period and high quality analgesia during the postoperative period.

REFERENCES

1. Beyaz SG, Ozocak H, Ergonenc T, Erdem AF. The thoracic paravertebral block performed for open cholecystectomy operation in order to anesthesia: Two cases. *Anesth Essays Res* 2014; 8: 239-42
2. Kehlet H, White PF. Optimising anaesthesia for inguinal hernioraphy: general, [1] regional or local anesthesia? *Anesth Analg*. 2001;93:1367-69.
3. Mishra M, Mishra SP, Singh SP. Comparison of spinal with paravertebral block for [2] elective open inguinal hernia repair. *World J Med Res*. 2016;5:1-6.
4. Casati A, Moizo E, Marchetti C, Vinciguerra F. A prospective, randomized, double-blind comparison of unilateral spinal anesthesia with hyperbaric bupivacaine, ropivacaine, or levobupivacaine for inguinal herniorrhaphy. *Anesth Analg* 2004;99:1387-92.
5. Cwik J. Postoperative considerations of neuraxial anesthesia. *Anesthesiol Clin* 2012; 30: 433-43.
6. Aklaya F. Postoperative complications and nausea vomiting. *Turkiye Klinikleri J Anest Reanim-Special Topics* 2008; 1: 112-6.
7. Bhattacharya P, Mandal MC, Mukhopadhyay S, Das S, Pal PP, Basu SR. Unilateral paravertebral block: an alternative to conventional spinal anaesthesia for inguinal hernia repair. *Acta Anaesthesiol Scand*. 2010 Feb; 54(2): 246-251.
8. Akcaboy EY, Akcaboy ZN, Gogus N. Ambulatory inguinal herniorrhaphy: Paravertebral block versus spinal anesthesia. *Minerva Anesthesiol*. 2009; 75: 684-91.
9. Weltz CR, Klein SM, Arbo JE, Greengrass RA. Paravertebral block anesthesia for inguinal hernia repair. *World J Surg* 2003;27:425-9.
10. Klein SM, Pietrobon R, Nielsen KC, Steele SM, Warner DS, Moylan JA, et al. Paravertebral somatic nerve block compared with peripheral nerve blocks for outpatient inguinal herniorrhaphy. *Reg Anesth Pain Med* 2002;27:476-80.
11. Bhattacharya P, Mandal MC, Mukhopadhyay S, Das S, Pal PP, Basu SR. Unilateral paravertebral block: An alternative to conventional spinal anaesthesia for inguinal hernia repair. *Acta Anaesthesiol Scand* 2010;54:246-51.
12. MCMandal, SDas, SunilGupta, TRGhosh, SRBasu. Paravertebral block can be an alternative to unilateral spinal anaesthesia for inguinal hernia repair. *Indian J Anaesth* 2011; 55: 584-89.
13. Bromage PR. A comparison of the hydrochloride and carbon dioxide salts of lidocaine and prilocaine in epidural analgesia. *Acta Anaesthesiol Scand* 1965; 16 (Suppl.): 55-69.
14. Marshall SI, Chung F. Discharge criteria and complications after ambulatory surgery. *Anesth Analg* 1999; 88: 508-17.
15. MCMandal, SDas, SunilGupta, TRGhosh, SRBasu. Paravertebral block can be an alternative to unilateral spinal anaesthesia for inguinal hernia repair. *Indian J Anaesth* 2011; 55: 584-89.

16. Bhattacharya P, Mandal MC, Mukhopadhyay S, Das S, Pal PP, Basu SR. Unilateral paravertebral block: an alternative to conventional spinal anaesthesia for inguinal hernia repair. *Acta Anaesthesiol Scand*. 2010 Feb; 54(2): 246-251.
17. Saito T, Den S, Cheema SPS et al. A single injection multisegmental paravertebral block extension of somatosensory and sympathetic block in volunteers. *Acta Anaesthesiol Scand* 2001; 45: 30-3.
18. Lonnqvist PA, MacKenzie J, Soni AK, Conacher ID. Paravertebral blockade: failure rate and complications. *Anaesthesia* 1995; 50: 813-5.
19. Fanelli G, Borghi B, Casati A, Bertini L, Montebugnoli M, Torri G. Unilateral bupivacaine spinal anesthesia for out-patient knee arthroscopy. *Can J Anesth* 2000; 47: 746-51.