Original Article

Clinical trial for the effectiveness of Unilateral Paravertebral Block Versus Unilateral Subarachnoid Block in Unilateral inguinal hernia for Herniorrhaphy

Nikam Sneha G*, Lawhle Sunil S**, Lalwani Dinesh L***, Bhagat Jayal***

* Resident, **Professor & HOD, ***Resident, Punjabrao Deshmukh Memorial Medical College and Hospital, Amravati, Maharashtra (India)

DOI: 10.5455/jrmds.2015334

ABSTRACT

Background: Inguinal Herniorrhaphy is most commonly performed surgical procedurein male. Till now inguinal hernia repair was performed under general, regional, and peripheral nerve blocks. So the concept of paravertebral blocks which provided an excellent alternative anaesthesia technique for hernia repair.

Aim: To study the effectiveness of unilateral paravertebral block versus unilateral subarachnoid block in unilateral inguinal hernias repair.

Materials and Methods: 100 patients of unilateral inguinal hernia where enrolled in the study and randomized into two groups each of 50 patients. Group S (50) receiving subarachnoid block, group P (50) receiving paravertebral block. Time for procedure and onset of action, intraoperative hemodynamics, post-operative analgesia, and ambulation time were compared.

Results: Significant difference was observed in time to perform and onset of action with group P (13.08± 1.31) & (15.94± 1.21) and group S (1.35±0.61) & (5.14±0.76) respectively. No significant difference in hemodynamic parameters and post op analgesia lasted for (324.00±52.84min) in group P and (182.67±40.13min) in group S.

Conclusion: Paravertebral block provides excellent anesthesia with unilateral motor, sympathetic, and prolonged sensory blockade, provide excellent postoperative analgesia, and encourages early ambulation.

Key words: Inguinal hernia, subarachnoid block, paravertebral block, post-operative analgesia

INTRODUCTION

Inguinal Herniorrhaphy is most commonly performed surgical procedure [1] in male and there is increasing trend of performing this surgery on day care basis emphasizing early ambulation.Till now inguinal hernia repair was performed under general, regional, and peripheral nerve blocks [2] including local infiltration. Now a days Fast Track Anaesthesia is a popular technique for this type of ambulatory surgery. The advantage of fast track anaesthesia is patient remain awake, breathing comfortably with stable vital signs upon leaving operation room. Regional and peripheral nerve blocks are excellent technique for ambulatory surgeries.

Subarachnoid block for inguinal Herniorrhaphy has attained wide spread popularity due to advantage of an awake patient and minimal drug and equipment costs. However, it is not an ideal anaesthetic technique for fast-track ambulatory surgery due to concerns regarding undesirable hemodynamic responses, complications like prolonged recovery and prolong hospital stay, urinary retention and post-spinal headache [3].

So the concept of paravertebral block pioneered by Hugo Selheim of Leipzig in 1905 which provided an excellent alternative anaesthesia technique for hernia repair [4]. It provides unilateral anaesthesia and low degree of post-operative analgesia requirement and less post-operative nausea vomiting [5, 6]. Paravertebral block has been administered for unilateral procedures like thoracotomy, breast surgery, chest wall trauma, hernia repair or renal surgery [7,8], cholecystectomy.

Both unilateral subarachnoid block and paravertebral block provide optimal anaesthesia with stable hemodynamic and minimal adverse events, Paravertebral block in addition provides

prolonged post-operative analgesia, early ambulation, low incidence of PONV and patient satisfaction. It is also considered to be a viable alternative in old aged patients with co-morbid condition. But it has some disadvantages like learning curve required, the possibility of block failure and longer time required to perform the block, chances of pneumothorax and inadvertent intravascular injection. More précised block can be given by using nerve stimulator and ultrasonography [3].

In this study we compared hemodynamic stability, duration of postoperative analgesia, incidence of adverse effects and time for ambulation in patients operated for hernia by using paravertebral block and unilateral subarachnoid block as anaesthesia technique.

MATERIAL AND METHODS

After approval from ethical committee, 100 patients of ASA 1 & 2 between the ages of 18 to 65 year were enrolled in the study. They were randomly divided into two groups each having 50 patients.

Group P = Patients with paravertebral block (n=50)
Group S = Patients with subarachnoid block (n=50)

Selection of cases

1. ASA status I and II
2. Age between 18 and 65 years
3. Sex – only males4. Posted for unilateral inguinal hernia surgery.

Exclusion criteria:

1. Bleeding disorders
2. Peripheral neuropathy
3. Morbid obesity
4. Known hypersensitivity to local anaesthetic agent.
5. All complicated, strangulated hernia cases were excluded; only uncomplicated reducible hernia cases were taken.
6. Patients on antihypertensive drugs
7. H/o significant cardiovascular, respiratory, renal, hepatic or metabolic impairment
8. H/o chronic analgesia use

PROCEDURE

Patients under study underwent thorough preoperative assessment including detailed history, physical examination and all necessary investigations.Written informed consent was taken from all patients.Patients were randomized to receive PVB or SAB.Patients were explained the procedure and type of anesthesia which they were going to receive.

Primary:

Intravenous access with 20 gauge i.v cannula taken
IV fluid Ringer lactate started at 10ml/kg.
Equipments' for the procedure:

a) PVB:

23 gauge lumbar puncture needle
0.5% Bupivacaine plain
Two 10ml sterile syringe containing drug
One 5 ml syringe for local infiltration of skin

b) SAB:

25 gauge lumbar puncture needle
One 5 ml syringe
0.5% Bupivacaine heavy

For emergency resuscitation:

The anaesthesia machine, emergency oxygen source (E type cylinders), pipeline o2 supply, working laryngoscope, appropriate size endotracheal tubes and connectorsWorking suction apparatus with suction catheter, Oropharyngeal airways, Intravenous fluids

Drugs: Thiopentone, Diazepam, Succinylcholine, Hydrocortisone, Glycopyrrolate, Atropine, Adrenaline, Aminophylline, Mephenteremine, Calcium gluconate, Sodium bicarbonate.

Monitors:

Pulse Oximeter, Noninvasive blood pressure monitor, Electrocardiogram

PARAVERTEBRAL BLOCK [9, 10]

Blocks were performed by anesthesiologist experienced in the technique, with the patient in sitting position with adequate hemodynamic monitoring like pulse Oximeter, electrocardiogram, and blood pressure monitor. All resuscitation equipment was available by the side of the patient. The superior aspects of the spinous processes of thoracic level T10 to lumbar level L1 were identified. The needle entry site was marked 2.5 to 3 cm lateral to each spinous process ipsilateral to the operative site. The block trolley was arranged and kept nearby. Under all aseptic precautions a skin wheal was raised 2.5 to 3 cm lateral to midline [11, 12].A 23 gauge 8 cm spinal needle was advanced perpendicular to skin in the parasagittal plane until it came in contact with the transverse processes at the depth of 3 to 5 cm. The needle was then withdrawn to the subcutaneous tissue and angled to walk off the caudad edge of the transverse processes. From the caudad edge, it was advanced approximately 0.5 to 1 cm (the thickness of the transverse process). Beyond this point after aspiration of the syringe, 20 ml of total volume of local anesthetic solution (0.5 % of bupivacaine) was injected, with 5ml at each level. This procedure was repeated in T11, T12 and L1. The patient was made supine.

Group S (n=30) (Unilateral Subarachnoid Block)
Under all aseptic precaution patient were positioned lateral on side of operation and unilateral subarachnoid block was given by midline approach by using 25 gauge quinke needle at L_3-L_4 intervertebral space by keeping patient in lateral position with operative site dependent. Inj. Bupivacaine heavy (0.5%) 2.5ml (12 mg) was administered after confirmation of free flow of CSF and patients were kept in lateral position for 15 minutes to achieve dense block unilaterally and then given supine position. Assessment of sensory block was done by pin prick at each minute after the patient was made supine. Sensory onset was considered when there was dull sensation to pin prick at the dermatomal areas of T10 to L1. Complete sensory block was considered when there was complete loss of sensation to pin prick.
Sensory block was graded as –
Grade 0: sharp pin prick felt,
Grade 1: analgesia, dull sensation felt,
Grade 2: anaesthesia, no sensation felt.

Assessment of motor block was carried out by the same observer at each minute by using Bromage Scale.

CRITERIA OF EVALUATION: 1. Ease of Technique 2. Onset of action 3. Intraoperative hemodynamics 4. Duration of analgesia 5. Ambulation time 6. Time for rescue analgesia 7.Side effects

Both the blocks were evaluated by the above mentioned criteria.Ease of technique was assessed from the time taken for performance of block and number of needle pricks required.

Onset of action was defined as, the time taken after completion of block till onset of analgesia. Testing of dermatome distribution was performed using skin sensation within 10 minutes of completing block.Intra-operatively heart rate, blood pressure, SpO2 and respiratory rate were recorded till end of the surgery at o, 2, 4, 6, 10, 15, 30, 60,120mins.Duration of analgesia – Patients were interviewed in the recovery room and in ward after the surgery using visual analog scale for onset of pain at the operative site and requirement of rescue analgesia were recorded. At VAS score 10 is severe pain and 0 is no pain. For VAS ≥4, Inj. Tramadol 50 mg was given intravenously and repeated as and when necessary.

Ambulation time
The patients were observed for the return of perianal sensation, the ability to dorsiflex the foot & regaining of proprioception of the great toe. Patients were also encouraged to ambulate under supervision, provided they had clear mental status, stable haemodynamics, adequate pain relief & no residual motor block & time was noted (Minutes). Side effects likehypotension, bradycardia, PONV, urinary retention and local tenderness were observed post operatively.

Successful Paravertebral block: Paravertebral block was considered successful if: (i) Onset of loss of pinprick discrimination started within 15 minutes, (ii) Sensory block (T_{10}-L_2) was achieved within a maximum time of 30 minutes.

Successful unilateral Subarachnoid block: Surgical anaesthesia (loss of pinprick sensation at L1 and complete motor block) on the dependent side only, while the nondependent side maintained somatic sensibility to the pinprick test at L1 and motor block lesser than the first degree. The motor blockade was evaluated using the Bromage Scale, measured at the peak of sensory block.

Bromage score (3/2/1/0)

Grade	Criteria	Degree of block
0	Free movement of legs and feet	Nil (0%)
1	Just able to flex knees with free movement of feet	Partial (33%)
2	Unable to flex knees, but with free movement of feet	Almost complete (66%)
3	Unable to move legs or feet	Complete (100%)

Statistical analysis was done by using unpaired t-test test.

RESULTS

There is no statistically significant difference between demographic parameters (age, weight, ASA grade) in the two groups. There is significant difference in time to perform the block and onset of action which is 13.08(± 1.31) & 15.94(± 1.21) in group P and 1.35(±0.61) & 5.14(±0.76) in group S respectively. Baseline pulse rate (mean) was 73.72±6.13 beats/min in group P and 75.9±6.11 beats/min in group S. Throughout surgery pulse rate remained stable and comparable in both the groups. Pre-operative systolic blood pressure(mean) was 122.26±6.93 mm of Hg and diastolic blood pressure(mean) was 75.94±6.04 mm of Hg in group P while systolic blood pressure(mean) was 124±5.33 mm of Hg and diastolic blood pressure(mean) was 75.04±4.45 mm

of Hg in group S. There was up to 20% fall in BP in group S in first 10 mins after the block for which fluids were enough.

Table 1: comparative outcomes in both groups

Variable	Group P	Group S	P value
Time to perform (mins)	13.08(± 1.31)	1.35(±0.61)	**P<0.05**
Onset of action (mins)	15.94(± 1.21)	5.14(±0.76)	**P<0.05**
Rescue analgesia (mins)	324.00±52.84	182.67±40.13	p<0.05
Ambulation time (mins)	116.33±19.01	297±34.42	p<0.05

Post-operatively all patients were assessed for pain by using 10 point Visual Analogue Score (VAS). At VAS ≥4, Inj. Tramadol 50 mg IV was supplemented. In Group P, maximum patients had pain at around 300 mins to 360 mins. In group S, pain started around 90 mins to 180 mins. The difference was significant (p<0.05).So duration of post-operative analgesia was longer in group P than group S.

In group P patients were more comfortable in post-operative period as analgesia lasted comparatively longer than patients in group S.

Early ambulation was possible in paravertebral block in comparison to subarachnoid block.

There were less side effect in group P compared to group S.

DISCUSSION

The choice of anaesthetic technique for inguinal hernia depends on several factors like preference of surgeon, anaesthesiologist and cooperation of patient, the complexity and expected duration of the procedure, the feasibility of the technique, intra and postoperative pain control, recovery time, postoperative morbidity and cost efficiency [3].

Subarachnoid block for inguinal hernia has wide spread popularity since it has easy technique, higher success rate, awake comfortable patient, and excellent relaxation, efforts are being made to improve the subarachnoid block technique for ambulatory surgery by reducing the dose of local anaesthetics and the addition of intrathecal opioids to improve pain relief. However, dose reduction can change the success rate and postoperative analgesia; also, opioid addition can cause prolonged recovery and undesirable adverse effects, such as pruritis, nausea, and vomiting. Limiting the block at the operative side (unilateral spinal anaesthesia) by using low doses of hyperbaric solutions can provide higher quality and long duration analgesia, primarily on the operation side [3].

Paravertebral block is a regional technique involving the injection of local anaesthetics immediately lateral to the vertebral column into the space where the spinal cord emerges from the intervertebral foraminae and bifurcates into the dorsal and ventral rami. Unlike subarachnoid block, paravertebral block preserve lower extremities motor function and provides unilateral, segmental anaesthesia of the operative site, prolonged post-operative analgesia, and low incidence of post-operative nausea and vomiting [3].

In this study, the use of paravertebral block as the sole anesthetic technique for the inguinal hernia repair was compared with subarachnoid block.

100 patients were included in the study of ASA 1 & 2 and were randomly allotted into two groups each having 50 patients.Group P: Paravertebral group (n=50) Group S: Subarachnoid group (n=50) .

In our study the time required for performing the procedure was greater in paravertebral group (13.08+1.31) as compared to subarachnoid group (1.35+0.61) starting from point of insertion of needle after preparation of parts. The results obtained were highly significant (p<0.01) indicating greater learning curve for paravertebral block and more skill and expertise. Hadzic Admir et al [13] in his study found similar results with the mean time to perform the paravertebral block of 13±8 mins, while Greengrassetal in his study found the mean time to perform the procedure as 6.6 mins [14].

The onset of action in Group P was 15.94±1.21 and in group S was 5.14±0.76 with p<0.01. The results were highly significant and showed more time was required for paravertebral block onset of action as compared to subarachnoid group, similar finding were seen in two different studies conducted by Akcaboy.E.Y et al [3] and Hadzic Admir et al [13].

The time to start the surgery was same in both the groups with mean of 15.82±1.91 in group p and 15.74±0.80 in group S, thus p>0.05 showing non-significant results, the reason for this was even though the onset of action in Group S was less the patients were kept in lateral position to achieve dense block on side of operation. Thus surgical anaesthesia which is needed is achieved at same time in both the procedure and also the duration of

surgery was same for patients in both the groups so the operation room stay was same for both the groups.

With respect to the pulse rate, it remained stable throughout the surgery and in post-operative period. (p>0.05)

Blood pressure was monitored in both the groups, but significant fall compared to baseline was observed in Group S for first 15 mins after the start of surgery. The decrease in blood pressure was around 20% of baseline and was due to sympathetic blockade, fluid replacement was enough no vasopressor were required. While in Group P blood pressure remained stable throughout. Akcaboy et al [3], Naza et al [15], Chaudhary sujata et al [16] in their individual studies found stable intraoperative haemodynamics as in our study

Post operatively patients were assessed for analgesia using visual analog scale score. At VAS ≥4 inj. Tramadol 50 mg was given. The patients were assessed till the time they received rescue analgesia. In our study some patients in Group P had mild pain at 240 mins (VAS≤3) and no analgesia was required. While 72% patients had pain at 300 mins and 26% had pain beyond 360 mins. In Group S 24% had mild pain at 90 mins no analgesia was required but 20% had pain at 120 mins (VAS ≥4), 56% had pain at 180 mins(VAS ≥4) and 24% had pain at 240 mins (VAS ≥4). These findings were significant (p<0.05). Akcaboy et al [3] in their study found lower VAS score at 4, 6, 12 hrs. In paravertebral group compared to subarachnoid group which was significant and similar to our study.

Thus VAS score was lower in paravertebral block compared to subarachnoid block [2, 3, 15, and 16] in our study.

Rescue analgesia was given when VAS ≥4 so patients in group P demanded in between 280 to 360 mins with the mean of 324±52.84 mins and in Group S 100 to 280 mins with the mean of 182±40.13 mins showing significant results. Akcaboyetal (2009) in this study found time for rescue analgesia was 16.1±7.8 hrs. In paravertebral group and 4.7±2.3 hrs. In subarachnoid group.

Thus duration of analgesia lasted longer in paravertebral block [2, 17]

Also there were reduced requirement of rescue analgesia requirement in paravertebral block due to prolonged analegesia compared to subarachnoid block [2, 3]

MC Mandal et al in their study found time for ambulation in paravertebral group was 225±98 mins and in subarachnoid group was 310±39 mins but in our study ambulation was possible around 116.33±19.01 mins in Group P while it was around 297±34.42 mins in Group S. Paravertebral block provides early ambulation than subarachnoid block [13]. There was less hospital stay in paravertebral block patients [3].

Incidence of post-operative nausea vomiting were about 3.33% in Group P and 6.66% in Group S similar findings were obtained by MC Mandal and et al. Urinary retention was seen in three patients in Group S and two patients in Group P had local tenderness at site of insertion similar to the findings of Naza et al.

Failure rate was 12% and the patient were excluded from the study and general anaesthesia was given.

CONCLUSION

The result of this study shows that

1. Paravertebral block provides excellent anaesthesia with unilateral motor, sympathetic, and prolonged sensory blockade for inguinal hernia repair.
2. It provides stable haemodynamics intraoperative when compared to subarachnoid block.
3. The technique offers an alternative method of anaesthesia that can be instituted preoperatively, with its advantage to provide excellent postoperative analgesia.
4. It encourages early ambulation and less hospital stay without significant side effects.

Thus Paravertebral block can be recommended as a safe and attractive alternative anaesthetic technique for uncomplicated inguinal hernia repair not only in normal patients but also in patients with comorbid conditions.

REFERENCES

1. Amado W J. Anesthesia for hernia surgery. Surgery clinic North America1993;73:427-38.
2. MC Mandal, S Das, Sunil Gupta, TR Ghosh, SR Basu. Paravertebral block can be an alternative to unilateral spinal anaesthesia for inguinal hernia repair. Indian Journal of Anaesthesia 2011;55(6):584-9.
3. Akcaboy E. Y. et al. Ambulatory inguinal Herniorrhaphy: paravertebral block versus spinal anesthesia. Minerva Anesthesiologica 2009;75:684-91.

4. Bansal Parul, Kirtinath Saxena, Bharti Taneja, Bhuwan Sareen. A comparative randomized study of paravertebral block versus infiltration of bupivacaine in modified radical mastectomy. Journal of Anaesthesiology Clinical Pharmacology 2012;28(1):76-80.
5. Kehlet H, White PF. Optimizing anesthesia for inguinal Herniorrhaphy: general, regional or local anesthesia? Anesth Analg 2001;93:1367–9.
6. Weltz C, Klein S, Arbo J, Greengrass R. Paravertebral block anesthesia for inguinal hernia repair. World J Surg 2003;27:425–9.
7. Batra Ravindrakumar, Krithika Krishnan, Anil Agrawal. Paravertebral block. Journal of Anaesthesiology Clinical Pharmacology 2011;27(1):5-11.
8. Prithvi Raj P. Text book of regional anaesthesia (Churchill Livingstone); Cha-20, Peripheral Nerve block. A handbook for use in clinical practice of Medicine and surgery, 4th ed. Springfield Blocks: 360-3.
9. Katz J. Atlas of regional anesthesia, 2 Ed, Norwak CT, Application and Lange, 1994.
10. Moore DC. Regional block. A handbook for use in clinical practice of Medicine and surgery, 4th ed. Springfield, Charles C. Thomas, 1965.
11. Medhat R, Wassef MB, Randazzo T, Ward W. The paravertebral nerve root block for inguinal Herniorrhaphy-a comparison with the field blocks approach. Reg Anesth. 1998. 23:451-6.
12. F Pusch, E Wildling, W Klimscha, C Weinstabl. Sonographic measurement of needle insertion depth in paravertebral blocks in women. British journal of Anaesthesia 2000;85(6):841-3.
13. Hadzic, Admir MD, Beklen, Kerimoglu MD, Karaca, PE MD, et al. Paravertebral Blocks provide superior same-day recovery over anesthesia for patients undergoing inguinal hernia repair. Anesthesia Analgesia. 2006;102:1076-81.
14. Greengrass R. A, S.R. Clendenen, Beth L. Ladlie, Julia E. Crook, Ilana I. Logvinov, and C.B. Robards: Paravertebral blockade for inguinal herniorrhaphy: novice performance of anatomic versus nerve stimulator guided techniques. Jurnalul Roman de Anest Terapie Intensiva. 2011;18(1):5-10.
15. Naza Z. M. A comparison of nerve stimulator guided paravertebral block and ilio-inguinal nerve block for analgesia after inguinal herniorrhaphy in children. Anaesthesia. 2006;61:1064-68.
16. Chaudhary Sujata, Raman Azad, Ashok Kumar, Neena Bhattacharya. Efficacy and effect on autonomic functions by paravertebral block, with/without opioid neuro-augmentation for inguinal herniorrhaphy. Journal of Anaesthesiology Clinical Pharmacology. 2009;25(3):316-20.
17. Akcaboy E. Y, Akcaboy Z.N, Gogus N. Comparison of paravertebral block versus fast-track general anesthesia via laryngeal mask airway in outpatient inguinal herniorrhaphy. Journal of Anesthesia. 2010;24(5):687-93.

Corresponding Author:

DrSneha G Nikam,
Sushrusha hospital, Kediya plot, Jatherpeth, Akola
Maharashtra-444005
Email: snehanikam005@gmail.com

Date of Submission: 26/07/2015
Date of Acceptance: 17/08/2015

How to cite this article: Nikam SG, Lawhle SS, Lalwani DL, Bhagat J. Clinical trial for the effectiveness of Unilateral Paravertebral Block Versus Unilateral Subarachnoid Block in Unilateral inguinal hernia for Herniorrhaphy. J Res Med Den Sci 2015;3(3):176-81.

Source of Support: None
Conflict of Interest: None declared