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COMPARISON OF SUBARACHNOID BLOCK WITH PARAVERTEBRAL BLOCK FOR UNILATERAL INGUINAL HERNIA REPAIR

Anaesthesiology

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ABSTRACT

Aim: To compare subarachnoid block and paravertebral block with respect to duration of analgesia and intraoperative haemodynamic stability in unilateral inguinal hernia repair.

Methods: In this randomised single-blind study, 50 patients about to undergo hernia repair were randomly allocated into two groups. Group P- Paravertebral group, where 25 patients received paravertebral block as the anaesthesia technique and Group S- Spinal group, where 25 patients received spinal anaesthesia as the anaesthesia technique.

Time to perform the block and achieve anaesthesia, mean arterial pressure, SpO2, heart rate and duration of analgesia were noted.

Results were analysed statistically using student's t test to determine the p value and significance of the observations.

Results: In the paravertebral group there was a significant prolongation in the duration of analgesia (347.95+22.39 minutes vs 166.8+16.4 minutes) with statistically insignificant changes in heart rate (78.84 vs 78.24, p value 0.7321) and SpO2 (98 vs 98, p value 1.0) when compared to the subarachnoid group. Mean arterial pressure showed significant variation with a p value 0.0154 (90.4+4.07[P] vs 86.7+5.67[S].

Conclusion: Paravertebral block provides excellent surgical anaesthesia with minimal hemodynamic disturbances and a significantly prolonged duration of post-operative analgesia when compared to subarachnoid block.

KEYWORDS

Paravertebral Block, Subarachnoid Block, Bupivacaine, Surgical Anaesthesia

INTRODUCTION

Spinal anaesthesia is the most common technique of anaesthesia administered for inguinal hernia repair since it is easy, has a quick onset and provides adequate anaesthesia and muscle relaxation. It also has disadvantages though, like unpredictable levels of block, hypotension and post dural puncture headache.

The quest for an alternate technique not associated with its usual side effects like hypotension, bradycardia and post dural puncture headache, yet providing excellent anaesthesia with good muscle relaxation lead to this study comparing paravertebral block with subarachnoid block for inguinal hernia repair.

Paravertebral nerve block produces ipsilateral segmental analgesia through injection of local anaesthetic onto the spinal nerve roots alongside the vertebral column. It is advocated predominantly for unilateral procedures such as thoracotomy, breast surgery, chest wall trauma, hernia repair or renal surgery, although it can be used for bilateral surgeries as well. Paravertebral block has the advantage of prolonged sensory blockade with less hemodynamic disturbances.

AIM OF THE STUDY

To compare paravertebral block with subarachnoid block for unilateral inguinal hernia repair with respect to

a)Duration of analgesia

b)Intraoperative haemodynamic stability

MATERIALS AND METHODS

This randomised single blinded study was conducted at a tertiary care hospital after ethical committee approval from the institution.

INCLUSION CRITERIA

Fifty patients (ASA grade I & II) aged 18-65 years, who consented themselves for unilateral inguinal hernia repair.

EXCLUSION CRITERIA

Known cardiovascular, respiratory, renal, hepatic or metabolic disease, active gastrointestinal reflux, mental dysfunction, morbid obesity, history of substance abuse, chronic analgesic use and history of allergy to local anaesthetics.

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 (P group) and spinal anesthesia (S group), respectively.

Intra- and post-operative data were recorded by residents not participating in the study.

On arrival at the operating room, an intravenous line was established with an 18G iv cannula and routine monitors (pulse oximeter, NIBP, ECG) were attached. Before the procedure, all necessary equipment for general anaesthesia and resuscitation were kept ready in case of a block failure or any complication.

Group P (Paravertebral Block)

Paravertebral block was performed in the sitting position. Pulse, blood pressure, and SpO_2 readings were monitored during placement of the block. Patients assigned to receive PVB were given intravenous midazolam (0.04mg/kg) before block placement to decrease anxiety and discomfort. Intravenous fluid infusion with lactated Ringer's solution (RL) 10ml/kg was started.

The PVB was performed using an 18G Tuohy needle unilaterally using the classic 'loss of resistance' technique with the patient sitting. The superior aspect of the spinous processes of levels T10 to L2 was identified by palpation and a mark was made approximately 2.5 cm lateral to that point. Local injection of lignocaine 10mg/ml was used at the site of needle insertion. After waiting for 3–5 min, a 22G Quincke' needle was inserted perpendicularly to the skin to a depth of 3-5 cm until the transverse process was contacted and it was used as a guide for the 18G Tuohy needle to be inserted in the same direction until the transverse process was contacted.

The needle was then withdrawn a bit and walked off the transverse process and inserted 1–1.5cm deeper to the superior ridge of the transverse process where a 'loss of resistance' was experienced. After negative aspiration for blood, 5 ml of bupivacaine 5mg/ml with Inj.Epinephrine 1:200000 was injected into the paravertebral space. Blocks were placed at five levels (T10, T11, T12, L1, and L2) and a total of 25 ml of bupivacaine was used.

The onset of unilateral pinprick discrimination at 5min and every 5min thereafter up to 30 min was assessed.

The block was 'successful' if following criteria were met:

1. Onset of pinprick discrimination started within 15 min.
2. Sensory block (T10–L2) achieved with in a maximum time of 30min.

Motor block was evaluated intra-operatively using a modified Bromage scale of 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).

Absence of the onset of pinprick discrimination within 15 min was considered as 'block failure'

Group S (Spinal Anaesthesia)

The patients in group S were pre-loaded with 10 ml/kg of RL and were given iv midazolam before the procedure. The monitors were connected and they were administered spinal anesthesia using midline approach with a 25-G Quincke needle at the L3–4 intervertebral space in the sitting position. The subarachnoid injection contained 15mg of 5mg/ml hyperbaric bupivacaine. After giving spinal anesthesia, the patients were placed in supine position for surgery. Sensory block was assessed by pinprick and surgery was allowed to commence when the sensory block was higher than T10.

Peak level of the sensory block was noted. Motor block was evaluated using a modified Bromage scale, measured at the peak of sensory block.

Any episode of hypotension [mean arterial pressure (MAP) <70 mmHg] was managed with 100 ml of intravenous fluid and 6mg of intravenous ephedrine. Any episode of bradycardia [heart rate (HR)<60 beats/min] was closely observed and managed with intravenous atropine (0.6 mg)

At the end of surgery patients were shifted to the recovery room and subsequently to the post operative ward.

OBSERVATION AND RESULTS

Fifty ASA grade I and II patients who were to undergo elective inguinal hernia repair were taken up for our study. They were randomly divided into two groups of 25 each. The S group patients received 3.0ml of 0.5% hyperbaric bupivacaine intrathecally. The P group patients received paravertebral block of T10 – L2 with 0.5% of plain bupivacaine with adrenaline 1:200000.

Three patients (12%) in group P were administered general anaesthesia due to an inadequate block and were excluded from the study and similarly one patient in group S was administered GA after inadequate level and was also excluded from the study. So, data from 46 patients were available for analysis (n=22 in group P and n=24 in group S).

Discrete categorical data are presented as n (%) and median; continuous data are given as mean _ SD. Differences in demographics, surgical, anaesthetic and post-operative data were tested by independent Student's t-test (continuous data) or by Pearson's w2 test and Fisher's exact test as appropriate (categorical data). A P value <0.05 was considered as significant. All analyses were conducted using Epi-Info and SPSS for Windows.

Physical Characteristics

The patients were statistically comparable with respect to age, sex, height and weight in both groups.

Table 1: Time to perform block

Time	Value (Mean±SD) for		'p'value
	P group	S group	
Time to performblock (in minutes)	16.7±1.4	5.5±0.91	<0.0001 Significant

The time to perform the block in group P was 16.7 ± 1.4 minutes, whereas in group S was 5.5 ± 0.91 minutes. The difference is statistically significant as detected by Student't' test – P < 0.05.

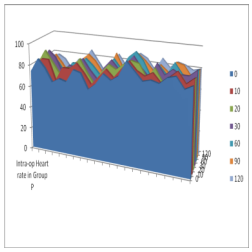
Table 2: Time to surgical anaesthesia

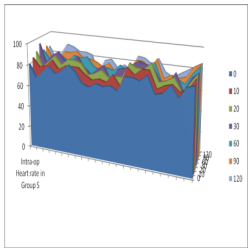
Time	Value(Mean±SD)for		'p'value
	P group	S group	
Time to surgicalanesthesia (in minutes)	14.81±1.68	6.25±0.4	<0.0001 Significant

The time to surgical anaesthesia in group P was 14.81±1.68, whereas in group S was 6.25±0.4 minutes. The difference is statistically significant as detected by Student't' test –P < 0.05.

Table 3: Intra-op Heart rate

Parameter	Value(Mean+SD)for		'p'value
	P group	S group	
Intra-op Heart rate	78.84±6.34	78.24±5.47	0.7321 Not significant

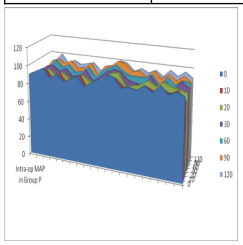


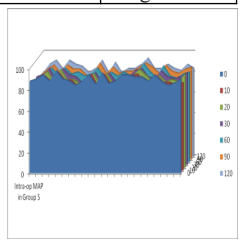


The intra-operative heart rate variability between the two groups P and S are not significant as p >0.05.

Table 4: Intra-op MAP

Parameter	Value(Mean+SD)for		'p'value
	Pgroup	Sgroup	
Intra-op MAP	90.4±4.07	86.7±5.67	0.0154 Significant





The intra-operative Mean Arterial Pressure in group P is 90.4±4.07 mmHg (Mean± SD) while in group S is 86.7±5.67mmHg (Mean±SD). This is statistically significant as there was a decrease in MAP in the S group when compared with the P group as p is 0.0154 (p<0.05).

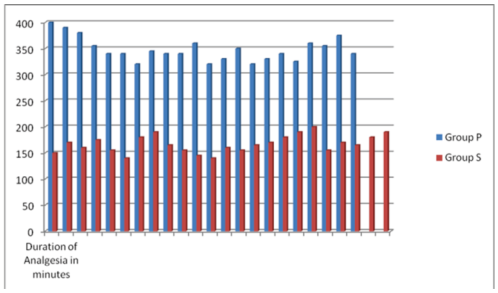
Table 5: Intra-op spO2%

Parameter	Value (Mean+SD)for		'p'value
	P group	Sgroup	
Intra-opsp O2%	98±0.3	98±0.4	1.00000 Not significant

The intra-operative SpO_2 variability is not significant as p is 1.0000.

Table 6: Duration of Analgesia

Parameter	Value (Mean+SD) for		'p'value
	P group	S group	
Duration ofanalgesia (in minutes)	347.95±22.39	166.8±16.4	<0.0001 Significant



The mean duration of analgesia in group P is 347.95±22.39 minutes, whereas in group S is 166.8±16.4 minutes. This implies that the prolonged duration of analgesia in group P when compared with group S is statistically significant as detected by Student't' test – P < 0.05.

DISCUSSION

The main findings from this study were the prolonged duration of analgesia and better intraoperative haemodynamic stability achieved in patients administered with paravertebral block compared to those administered spinal anaesthesia for unilateral inguinal hernia repair. The quality of anaesthesia provided by the paravertebral block was equal in efficacy to that provided by spinal anaesthesia.

Prolonged duration of analgesia is one of the advantages of paravertebral block. The mean duration of analgesia provided by paravertebral block was 347.95±22.39 minutes as compared to subarachnoid block 166.8±16.4 minutes.

Klein et al in 1998 published a case report of 22 patients undergoing outpatient inguinal herniorrhaphy under Paravertebral nerve block of T10 – L2 and demonstrated that bupivacaine paravertebral blocks provided surgical anaesthesia within 15– 30 minutes and prolonged postoperative analgesia with a mean time to first opioid of 22 hours which is strikingly longer than our result. This could be because in their study, they have also used 100-250 microgram of fentanyl as premedication along with midazolam and intermittent intravenous doses of 25 microgram of fentanyl for intravenous sedation. Intravenous ketorolac 30 mg was also administered at the end of surgery.

Weltz et al. documented low pain scores for 48 hours postoperatively. They have also used narcotic premedication and intraoperative supplementation in addition to naproxen 500mg twice daily and acetaminophen with codeine.

Paravertebral block is associated with better intraoperative haemodynamic stability when compared with spinal anaesthesia. This is another advantage of paravertebral blocks. In our study patients in group S had a fall in intraoperative MAP (86.7$\pm$5.67mmHg) from pre-operative MAP (90.2$\pm$3.7mmHg) which is statistically significant when compared with group P as there was not a fall in intraoperative MAP (90.4$\pm$4.07) from preoperative MAP (90.9$\pm$4.4mmHg).

In a nonrandomized study, Naja et al. compared multilevel paravertebral blocks from T12 to L2 versus general anaesthesia versus spinal anaesthesia. Naja et al. have used a combination of local anaesthetics, clonidine and fentanyl for block and intravenous midazolam, propofol for supplemental sedation. The patients in the paravertebral group had better postoperative analgesia and a shorter duration of hospital stay (1.2 days [PVB] vs. 2.9 days [general anaesthesia] vs. 2.5 days [spinal anaesthesia]; p <0.0001).

The most significant finding from this study was the prolonged duration of analgesia achieved with paravertebral block technique compared to subarachnoid block. The quality of block at the dermatomal site of injection is very high. It may also be due to the relative avascularity of the paravertebral space and hence the slow uptake of local anaesthetic.

CONCLUSION

We conclude that paravertebral block, as a technique, provides excellent surgical anaesthesia with minimal hemodynamic disturbances and a significantly prolonged duration of post-operative analgesia when compared to subarachnoid block. Further, due to the same reasons, paravertebral block may be an attractive alternative for relevant surgeries in high risk patients.

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