ORIGINAL RESEARCH PAPER

Anaesthesiology

KEY WORDS: paravertebral block,unilateral subarachnoid block

COMPARISON OF UNILATERAL PARAVERTEBRAL BLOCK VERSUS UNILATERAL SUBARACHNOID BLOCK AS ANAESTHETIC TECHNIQUE FOR INGUINAL HERNIA REPAIR

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ABSTRACT

Background-Paravertebral block is effective mode of anaesthesia and analgesia with minimal side effects.
Methodology-100 patients of ASA 1 & 2 between the age of 18 to 65 years were enrolled in the study. They were randomly divided into two groups (group P and group S)each having 50 patients. Group P received unilateral paravertebral block at T10,T11,T12 and L1 level with 20 ml of 0.5 % of bupivacaine with 5ml at each level. Group S received unilateral spinal anaesthesia at L3-L4 intervertebral with Inj. Bupivacaine heavy (0.5%) 12 mg.Both groups were evaluated for ease of technique,onset of action, intraoperative hemodynamics duration of analgesia ambulation time, time for rescue analgesia ,side effects. Statistical analysis was done by using unpaired t-test test.
Result- learning curve for paravertebral block is greater . onset of action was more for paravertebral block . Intraoperative hemodynamics were stable group P. postoperative analgesia was prolonged in group p and early ambulation was possible in group p. side effects were less in group p compared to group S
Conclusion- Paravertebral block can be recommended as a safe alternative anaesthetic technique for uncomplicated inguinal hernia repair not only in normal patients but also in patients with comorbid conditions.

INTRODUCTION

Inguinal herniorrhaphy is most commonly performed surgical procedure [1] in male with increasing trend of performing this surgery on day care basis.

Regional and peripheral nerve blocks are excellent techniques for ambulatory surgeries. Subarachnoid block for inguinal heniorrhaphy 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, prolonged recovery and discharge from the hospital, urinary retention and post-spinal headache.[3]

So the concept of paravertebral block pioneered by Hugo Selheim of Leipzig in 1905 which provided a excellent alternative anaesthesia technique for hernia repair[4]. It provides unilateral anaesthesia with stable hemodynamics with prolonged postoperative anaesthesia and less post operavtive nausea vomiting[5,6].

But it has some disadvantages like greater learning curve , possibility of block failure, chances of pneumothorax and inadvertent intravascular injection. More précised block can be given by using nerve stimulator and ultrasonography.[3]

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

METHODOLOGY

After approval from ethical committee, 100 patients of ASA 1 & 2 between the age of 18 to 65 years male patients posted for unilateral hernia repair surgery 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) .

Patients with Bleeding disorders,peripheral neuropathy, Morbid obesity, Known hypersensitivity to local anaesthetic agent and all complicated, strangulated hernia cases were excluded from study.

PROCEDURE

Patients underwent thorough preanaesthetic check up ,procedure was explained and written informed consent was taken.Patients were randomized to receive PVB or SAB.

All emergency resuscitation equipment and drugs were kept ready apart from routine anaesthesia checklist.

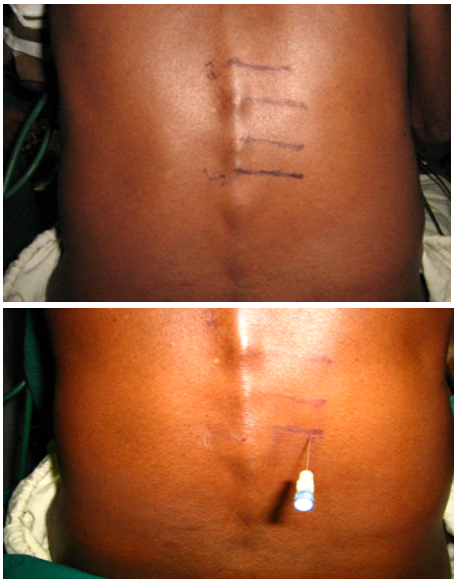
PROCEDURE

All ASA standard monitors were attatched to patient. A 20 G iv was secured and iv Ringer lactate started at 10ml/kg.

GROUP P-PARAVERTEBRAL BLOCK[9,10]

Blocks were performed by Anesthesiologist experienced in the technique, with the patient in sitting position. 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. Under all aseptic precautions a skin wheal was raised 2.5 to 3 cm lateral to midline[20, 21]. A 23G 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 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.

PARAVERTEBRAL BLOCK



Group S (Unilateral Spinal Anaesthesia)
Under all aseptic precaution patient were positioned lateral on side of operation and unilateral spinal anaesthesia was given by midline approach by using 25 gauge quince needle at L3-L4 intervertebral space. 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 and 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.. Both the blocks were evaluated for ease of technique, onset of action, intraoperative hemodynamics,duration of analgesia, ambulation time, time for rescue analgesia and side effects.

Ease of technique was assessed from the time taken for performance of block and number of needle pricks required.Onset of action was defined on the time taken after completion of block till onset of analgesia. Intra-operatively heart rate, blood pressure, SpO2 and respiratory rate were recorded till end of the surgery.

Duration of analgesia – patients were interviewed in the recovery room and in ward after the surgery using visual analogue scale for onset of pain at the operative site and requirement of rescue analgesia were recorded.When VAS score of ≥4 Inj. Tramadol 50 mg given intravenously, repeated as and when necessary. Patients were observed for return of perianal sensation, 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-hypotension, bradycardia, PONV, urinary retention and local tenderness were noted.

Successful Paravertebral block: Paravertebral block was considered successful if: (i) Onset of loss of pinprick discrimination started within 15 minutes, (ii) Sensory block (T10-L2) was achieved within a maximum time of 30 minutes.

Successful unilateral spinal anaesthesia: 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.
Statistical analysis was done by using unpaired t-test test.

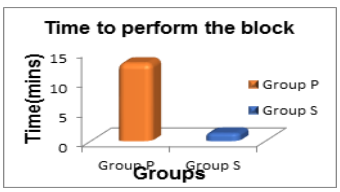
RESULTS

Time perform to block-
The time taken to perform the block in Group P was more i.e between 10 to 15 min (mean =13.08 +1.31) than Group S,which was in between 0.5 to 2 mins (mean of=1.35 + 0.61). It was highly significant with p value < 0.01.

Table 1

Time to perform block(mins)	Group P	Group S	P value
Mean	13.08	1.35	P < 0.01
SD	1.31	0.61	

Graph 1:

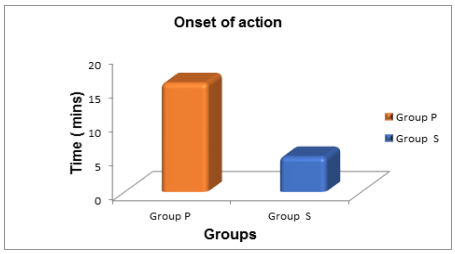


TIME OF ONSET OF ACTION
The time of onset was more in Group P which was in between 14 to 18 mins (mean= 15.94 +1.21) than Group S,which was in between 4 to 7 mins (mean = 5.14 + 0.76) . It was highly significant with p value < 0.01

Table 2

VARIABLE	GROUP P (MEAN+SD)	GROUP S (MEAN +SD)	P VALUE
TIME OF ONSET OF ACTION	15.94+ 1.21	5.14+ 0.76	P<0.01

Graph 2



INTRAOPERATIVE HEART RATE
Throughout surgery pulse rate remained stable and comparable in both the groups.

INTRAOPERATIVE BLOOD PRESSURE

Table 3

Systolic Blood Pressure	Group P (mean +sd)	Group S (mean+ sd)	P value
0 min	122.26 + 6.93	124.42 + 5.33	p>0.05
2 min	120.44 + 6.85	99.56 + 4.24	p<0.05
4 min	119.04 7.13	97 + 3.74	p<0.05
6 min	118.80 + 6.49	95.5 + 3.65	p <0.05
10 min	118.20 + 6.70	110.78 + 5.41	P<0.05
15 min	117.73 + 6.73	113.92 + 4.44	P<0.05
30 min	118.06 +6.40	116.48 + 3.67	p>0.05
60 min	118.31 + 6.56	118.4 + 3.86	p>0.05
90 min	118.92 + 6.30	120.54 +4.23	p>0.05
120 min	118.73 + 6.36	122.5 + 4.57	p>0.05

Graph 3

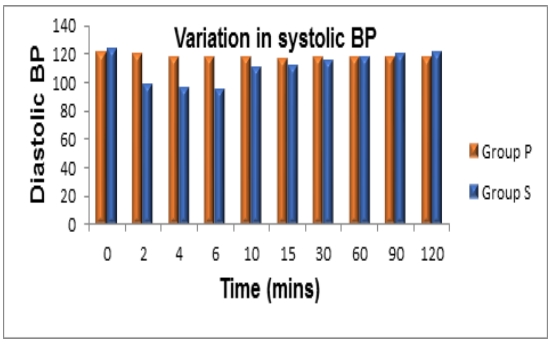
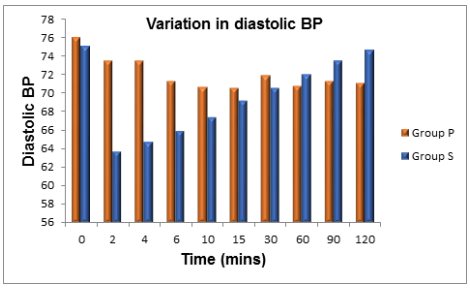


Table 4

Diastolic BP	Group P (mean+ sd)	Group S (mean + sd)	P value
0 min	75.94 + 6.04	75.04 +4.45	p>0.05
2min	73.44 + 6.47	63.64 + 3.27	P<0.05
4 min	73.44 + 5.72	64.74 + 2.86	P<0.05
6 min	71.26 + 5.46	65.88 + 2.81	P<0.05
10min	70.60 + 5.41	67.38 + 3.10	P<0.05
15min	70.48 + 5.38	69.16 + 3.24	P<0.05
30min	71.86 + 5.57	70.5 +3.98	p>0.05

60min	70.74 + 5.87	71.96 + 4.21	p>0.05
90min	71.28 + 5.76	73.48 + 3.93	p>0.05
120 min	71 + 5.50	74.6 +4.16	p>0.05

Graph 4



The significant fall in blood pressure was observed in first 15 minutes in group S in almost all patients compared to baseline value but the fall was not more than 20 % of basal value thereafter patient remained stable till end of the surgery and in immediate post-operative period. Fluid replacement was enough for management of fall in blood pressure ,No vassopressor was required.

In group P no significant fall in blood pressure was observed compared to basal value. Patients remained stable intraoperatively and post operatively.

PAIN ASSESSMENT-VAS
Table 5

Time (mins)	Group P	Group S	P value
0	0	0	p>0.05
15	0	0	p>0.05
30	0	0	p>0.05
60	0	0	p>0.05
120	0	2.7 + 0.99	P<0.05
180	0	3.68 + 0.65	P<0.05
240	2.12 + 0.67	4 + 0	P<0.05
300	3.57 + 0.79	3.98 + 0.14	p>0.05
360	3.88 + 0.44	4 + 0	p>0.05
480	4 + 0	4 + 0	p>0.05
600	4.02 + 0.14	4.02 + 0.14	p>0.05
720	4.18 + 0.39	4 + 0	p>0.05

Post-operative pain was assessed by using 10 point Visual analogue score.

In Group P, 1 patient (2%) experienced pain (VAS> 4) at 240 minutes while 36 patients (72%) had pain at 300 minutes (VAS ≥4) and 13(26%) patients experienced pain at 360 mins.

In group S, 12 patients (24%) had mild pain at 90 minutes while 10 patients (20%) were uncomfortable at 120 minutes when VAS was ≥4, 28(56%) patients experienced pain at 180 mins and 12 patients (24%) had pain at 240 mins when VAS > 4. So duration of post-operative analgesia was longer in group P than group S(p<0.05).

TIME TO RESCUE ANALGESIA

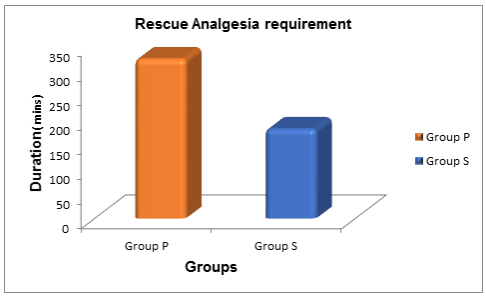
Table 6

Time (mins)	Group P		Group S		P value
	No	%	No	%	
100 – 200	0	0	38	76	
200 – 280	1	2	12	24	**P< 0.05**
280 – 350	36	72	0	0	
>360	13	26	0	0	
Mean	324		182		
SD	52.84		40.13		

Rescue analgesia was required within 280 to 360 minutes (mean 324.00±52.84 minutes) in group P and within 100 to 280 minutes (mean 182.67±40.13 minutes) in group S.

Thus postoperative analgesia lasted longer in group P compared to group S (p<0.05).

Graph 6



AMBULATION TIME
TABLE 7

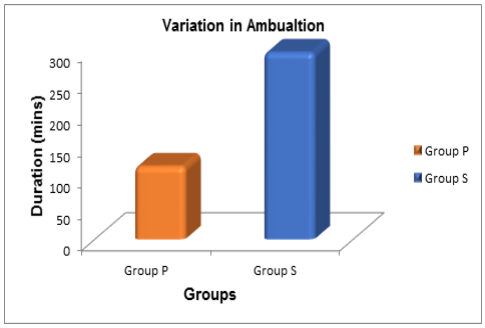
Ambulation time (minutes)	Group P		Group S		P value
	No	%	No	%	
60 – 120	13	26	0	0	
120- 220	37	74	0	0	P< 0.05
220 – 320	0	0	40	80	
320 – 360	0	0	10	20	
Mean	116.33		297		
SD	19.01		34.42		

Patients were made ambulatory within 60 to 220 minutes (mean 116.33±19.01 minutes) in group P and within 220 to 360 minutes (mean 297±34.42 minutes) in group S.

In group S, 40 patients (80%) were made ambulatory within 220 to 320 minutes while 10 patients (20%) within 320 to 360 minutes.

In group P, 13 patients (26%) were made ambulatory within 60 to 120 minutes while 37 patients (74%) within 120 to 220 minutes. Early ambulation was possible in group P compared to group S (p<0.05).

Graph 7



Side Effects
Table 8

Side effects	Group P		Group S	
	No	%	No	%
Nausea	2	3.33	3	6.66
Vomiting	2	3.33	5	10
Local tenderness	2	3.33%	0	0
Urinary retention	0	0	3	6.66

Three patients (6.66%) experienced nausea and five patients (10%) had episode of vomiting in group S while in group P, there were two incidence of nausea (3.33%)and vomiting (3.33%) .group s has more patients of PONV.

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, feasibility of the technique, intra and postoperative pain control, recovery time, postoperative morbidity and cost efficiency.[3]

Spinal anaesthesia for inguinal hernia has wide spread popularity with efforts being made to improve the technique for ambulatory surgery by reducing the dose of local anaesthetics and addition of intrathecal opioids to improve the 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 blocking spinal nerves as it emerges from the intervertebral foraminae and bifurcates into the dorsal and ventral rami. Unlike spinal anaesthesia, paravertebral block preserves 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.

In our study,the time required for performing the procedure was greater in group P(13.08+1.31) as compared to group S(1.35+0.61).Results obtained were highly significant (p<0.01) indicating greater learning curve for paravertebral block and more skill and expertise. Hadzicadmir etal[23] found similar results with the mean time to perform the paravertebral block of (13+8 mins), while Greengrass etal[31] found the mean time to perform the procedure as 6.6 mins.

The onset of action in Group P was (15.94+1.21)mins and in group S was (5.14+0.76)mins with p<0.01. The results were highly significant and showed more time for onset of paravertebral block was required as compared to subarachnoid block group,similar to findings found by Akcaboy.E.Y & etal 3and HadzicAdmir etal[23].

Pulse rate remained stable throughout the surgery and in post operative period. (p>0.05)..Significant fall in blood pressure 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 was required. While in Group P blood pressure remained stable throughout. Similar findings were found by Akcaboy etal[3], Naza etal[22], Chaudhary sujata etal.

Post operatively analgesia was assessed using visual analogue scale score. The patients were assessed for rescue analgesia. In our study some patients in Group P had mild pain at 240mins(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 etal3 in their study found lower VAS score at 4, 6, 12 hrs in paravertebral group compared to subarachnoid group which was significant[2,3,22,26]

Rescue analgesia was given when VAS> 4. So patients in group P demanded it in between(280 to 360) mins with mean (324+52.84 mins) and in Group S,in (100 to 280 mins) with mean of (182+40.13 mins) showing significant results. Akcaboy etal (2009) found time for rescue analgesia of (16.1+7.8 hrs)in paravertebral group and (4.7+2.3 hrs)in subarachnoid group. Thus there was reduced requirement of rescue analgesia requirement in paravertebral block due to prolonged analgesia compared to subarachnoid block.[2,3].

Mandalmac etal in their study found time for ambulation in paravertebral group was at (225+98) mins and in subarachnoid group was at(310+39)mins. But in our study ambulation was possible at around (116.33+19.01) mins in Group P while it was at around (297+34.42) mins in Group S. Paravertebral block provided early ambulation than subarachnoid block[23].

Incidence of post operative nausea, vomiting was about 3.33% in Group P and 6.66% in Group S .Similar findings were obtained by Mandalmac and etal. 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 etal[22]. Failure rate was 12% and the patient were excluded from the study and general anaesthesia was given.

CONCLUSION:

Paravertebral block provides excellent anesthesia with unilateral motor,

sympathetic, and prolonged sensory blockade for inguinal hernia with stable hemodynamics intraoperatively compared to SAB , provides excellent postoperative analgesia ,encourages early ambulation without significant side effects.Thus Paravertebral block can be recommended as a safe alternative anaesthetic technique for uncomplicated inguinal hernia repair in normal as well as in patients with comorbid conditions.

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