Original Research Article

A prospective randomised comparative study of unilateral paravertebral block with conventional spinal anesthesia for inguinal hernia repair

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Abstract

Background: Inguinal hernia repair can be performed under satisfactory anaesthetic conditions using general, regional and peripheral nerve block anaesthesia. Unilateral spinal anaesthesia provides optimal anaesthesia, with stable haemodynamics and minimal adverse events .The paravertebral block being segmental in nature can be expected to produce some advantages and may be a viable technique. **Objective:** Primary objective of the study was to compare the block characteristics-time required for performing the block, time to surgical anesthesia, time to ambulation, time to first analgesic, adverse events between the two groups. Secondary objective is to compare the post operative analgesia between the two groups. **Methodology:** About 60 consenting male patients posted for inguinal hernia repair were randomized into two groups to receive either paravertebral block (Group P, n=30) at T_{10} with 15 ml of 0.5% bupivacaine and at L_1 with 5ml of 0.5% bupivacaine or spinal anesthesia (Group S) with 12.5 mg of 0.5% hyperbaric bupivacaine and primary outcome secondary outcome were noted. **Results:** Time to perform the block and time to reach surgical anesthesia were significantly higher in the patients of group P as compared to group S ($p<0.001$). Time to ambulation was significantly shorter in group P than compared to group S ($p<0.001$). Haemodynamic parameters mean arterial pressure and heart rate were found to be more stable in group P than group S ($p<0.05$). Minimal adverse events were noted in both the group and it was statistically not significant. **Conclusion:** It can be concluded that both spinal anesthesia and paravertebral block can be used for patients undergoing inguinal hernia repair. Spinal anesthesia provides adequate analgesia and motor blockade and also less time to perform block and to reach surgical anesthesia. On the other hand paravertebral block provides good haemodynamic stability as well as less time to ambulation, minimal adverse events, however the expertise related to perform, procedure related time and prolonged onset of effect are the main concerns.

Keywords: Inguinal hernia repair, paravertebral block, spinal anesthesia, haemodynamic stability

Introduction

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 presence of consciousness, absence of respiratory depression, lower rates of post operative nausea and vomiting and more rapid recovery [1]. Regional anaesthetic techniques for inguinal hernia repair include subarachnoid block (SAB) or paravertebral block (PVB) [2].

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SAB is widely used nowadays for unilateral inguinal hernia repair, providing intense sensory and motor blockade [3]. Although spinal anaesthesia has the benefits of suppressing the stress response to surgical intervention, decreasing morbidity in high risk patients and enabling maintenance of analgesia in the post operative period, cardiovascular system specific adverse events such as arterial vasodilation, bradycardia and hypotension may pose a problem [3].

Subarachnoid space can be traversed from the posterior aspect of the body by a midline approach. Till date spinal anaesthesia is mostly performed using a surface landmark based blind midline technique. In this technique the needle is inserted below the lower edge of the spinous process of the selected upper vertebrae and passes through the skin, subcutaneous tissue, supraspinous ligament, interspinous ligament, ligamentum flavum as well as the epidural space until it reaches dura arachnoids and pierces it.PVB involves the unilateral administration of local anaesthetics to the spinal nerve roots alongside the vertebral column in the paravertebral space and related dermatomes without intervening central nervous system [4].The PVB has been used with success , both as anaesthetic and analgesic

techniques, for inguinal herniorrhaphy [5,6]. PVB provides an analgesia equivalent to extensive peripheral nerve block for inguinal herniorrhaphy, offering an alternative method of post operative pain management with fewer adverse events such as hypotension and intrathecal spread [7].A paravertebral block is an advanced nerve block technique. The paravertebral block is a selective block of the nerve roots at the chosen levels. The resultant anesthesia or analgesia is conceptually similar to a "unilateral" epidural anesthesia. Higher or lower levels can be chosen to accomplish a band-like segmental blockade at the desired levels. However, the paravertebral block does not result in hemodynamically significant sympathetic blockade, therefore, hypotension is not commonly seen with this block. This block is used most commonly in our practice for surgical patients undergoing inguinal herniorrhaphy [8]. The walls of the paravertebral space in this region are formed by the parietal pleura or iliopsoas anterolaterally, vertebral body, the intervertebral disc and intervertebral foramen medially and the superior costo-transverse process posteriorly (higher levels). The spinal nerves in the paravertebral space are submerged in the paravertebral adipose tissue. The paravertebral space is continuous with the epidural space medially and the contralateral paravertebral space via the prevertebral fascia. The mechanism of action of paravertebral blockade at this level includes direct penetration of the local anesthetic into the spinal nerve, and medial extension through the intervertebral foramina [9-11]. The aim of the study was to compare paravertebral block with spinal anaesthesia for inguinal hernia repair procedures.

Objective

Primary objectives

1. To compare the block characteristics: Time required for performing the block, time to surgical anaesthesia, time to ambulation, time to the first analgesic, total rescue analgesic consumption between two groups.
2. To compare the adverse effects between two groups-nausea and vomiting, retention of urine, headache.

Secondary objective

To compare post - operative analgesia between two groups

Materials & methods

This prospective, randomised, comparative study was done at NH Rabindranath Tagore International Institute of Cardiac Sciences, a tertiary level multi-speciality hospital, Kolkata. In-patients admitted for elective inguinal hernia repair between age group 18-65 years was included.

In a previous study on comparison between paravertebral block and spinal anaesthesia for inguinal hernia repair by MC Mandal et al [3] the mean time to ambulation for paravertebral block was 225 min with a standard deviation of 98 and the mean for spinal anaesthesia was 310 min with a standard deviation of 39. In this study to reject null hypothesis with a probability (power) (1-β) of 0.95, the calculated minimum sample size was 21 in each group. Taking into account 30% drop out rate.In this study 30 subjects are enrolled in each group. Type 1 error (α) probability with this test of null hypothesisis is 0.05.

Sample Size Calculation

$$n \geq \frac{(Z_{1-\alpha/2} + Z_{1-\beta})^2 (\sigma_1^2 + \sigma_2^2/r)}{(\mu_1 - \mu_2)^2}$$

Alpha (α)	:	0.05
Beta (β)	:	0.05
Mean in group 1 (μ_1)	:	225
Standard Deviation in group 1 (σ_1)	:	98
Mean in group 2 (μ_2)	:	310
Standard Deviation in group 2 (σ_2)	:	39

n is the number of samples

By Calculation

Minimum sample size needed for group 1 :21

Minimum sample size needed for group 2:21

Accounting for 30% dropout, the sample size comes to 30 in each group.The study was done in 2 years time from January 2017 to December 2018.

Inclusion Criteria

1. Patients posted for inguinal hernia repair.
2. ASA physical status I and II.
3. Age between 18 years and 65 years

Exclusion Criteria

Patients with untreated and uncontrolled systemic illnesses like cardiovascular diseases- severe aortic stenosis, severe mitral stenosis, left ventricular outflow obstructions, neurological diseases like demyelinating lesions, respiratory disease, renal or hepatic diseases; infections at block site; morbid obesity; history of substance abuse, chronic analgesic use; history of allergy to local anaesthetics, metabolic disease; mental dysfunction, active gastrointestinal reflux disease and coagulation disorders were excluded from the above study. Patients posted for inguinal hernia repair was randomly assigned into two groups (Group P: Patients receiving paravertebral block and Group S: patients receiving spinal anaesthesia) with the help of a software-generated table of random numbers. The software divided the study sample into two equal groups of 30 patients and randomly allocated each patient. This random allocation was known to the anaesthesiologist and the research guide.

Methodology

Approval from the Institutional ethics committee was obtained and written informed consent from the patient was taken. The subjects were kept nil per mouth for 8 hours. For all the subjects' standard monitoring including electrocardiogram leads, plethysmograph probe, Non-invasive blood pressure and end tidal carbon dioxide were used throughout the operation. About 60 male patients aged 18- 65 years ASA physical status class I and II, posted for elective unilateral inguinal hernia repair were randomly allocated into two groups Group P (patients receiving paravertebral block) and Group S (patients receiving spinal anaesthesia).Group P patients were given paravertebral block at T_{10} segment with 15 ml of bupivacaine (0.5%) and at L_1 segment with 5 ml of bupivacaine (0.5%), and Group S patients were given spinal anaesthesia with 12.5 mg of 0.5% hyperbaric bupivacaine. The same anaesthesiologist was performing the procedure of giving either block. Intra- and post-operative data was recorded.Eight hours fasting was ensured and patients were premedicated with oral ranitidine 150 mg on the night prior to surgery. Patients were preloaded with 10 ml/kg lactated Ringer's solution and given supplemental oxygen (4 L/min) with oxygen mask in the operation room (OR). Standard monitoring included heart rate (HR), non-invasive blood pressure, respiratory rate and oxygen saturation (SpO_2).

In Group P, paravertebral block was performed in the sitting position, at two levels T_{10} and L_1, 15 ml of bupivacaine (0.5%) was injected at T_{10} and 5 ml of bupivacaine (0.5%) at L_1. Then, the patient was turned supine, and the onset of unilateral pinprick discrimination was assessed every 5 min and up to 30 min. The block was considered as 'successful' if the onset of pinprick discrimination started within 15 min (endpoint) or if the sensory block (T_{10}–L_1) was achieved within maximum period of 30 min. Otherwise, it was considered 'block failure' and the patient was given GA and excluded from the study. Motor block was evaluated at the end of surgery 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).

Group S patients were administered spinal anaesthesia in the sitting position using midline approach with a 25 gauge needle at L_3–L_4 intervertebral space with 12.5 mg of hyperbaric bupivacaine. Sensory block was assessed by pinprick from T4 downwards and surgery was allowed to commence when the sensory block was higher than T_{10}. Patients with inadequate block was converted to GA and excluded from the study.

Continuous monitoring of electrocardiogram, HR, systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP) and SpO_2 was done immediately before the block,

after the block (positioned supine) and then every 3 min for 1st 15 min and thereafter every 30 minutes till 1 hour and then hourly till the end of surgery and post-operatively at 15 & 30 minutes. Any episode of hypotension (MAP lower than 20% of baseline value) was treated with IV fluids and if needed, 50 µg bolus of IV phenylephrine was given. Bradycardia (HR <60 beats/min) was closely observed and managed with IV atropine (0.6 mg) if HR was <50 beats/min. Various parameters were noted including time required for performing the block (TRPB) (from draping of the patient to the end of block procedure), time to surgical anaesthesia (TSA) (from end of block to readiness of surgery), duration of surgery (DS) (from the skin incision to the closure of the skin), post-anaesthesia care unit (PACU) transfer time [PTT] (from the end of surgery to transfer to ward). Post-operatively, data was collected at regular intervals of 6 hours after surgery. Time to first post-operative analgesic requirement (duration of post-operative analgesia), total analgesic consumption in the first 24-h period, visual analogue score (VAS), and incidence of side effects (nausea, vomiting, pruritus, headache, urinary retention, etc.) was noted. VAS score >4 was treated with tramadol 50 mg IV and post-operative nausea and vomiting (PONV) was treated with 4 mg of ondansetron IV. VAS score was collected at 6 hourly intervals. Side effects were managed according to standard treatment protocol.

Categorical variables are expressed as Number of patients and percentage of patients and compared across the groups using Pearson's Chi Square test for Independence of Attributes/ Fisher's Exact Test as appropriate. Continuous variables are expressed as mean, median and standard deviation and compared across the groups using Mann-Whitney U test. The statistical software SPSS version 20 has been used for the analysis. An alpha level of 5% has been taken, i.e. if any p value is less than 0.05 it has been considered as significant.

Results

Table 1: Comparison of Age

	Group							
	Spinal			Paravert				
	Mean	Median	Std. Deviation	Mean	Median	Std. Deviation	P Value	Significance
Age (Years)	56.46	55.50	6.35	56.15	58.00	5.57	0.946	Not Significant

Comparison of age between the two groups shows that it is almost similar in the two groups and is statistically not significant (p=0.946) [Table 1].

Table 2: Comparison of ASA Grade

		Group		Total	p Value	Significance
		Spinal	Paravert			
ASA Grade	I	13(46.43)	16(59.26)	29(52.73)	0.341	Not Significant
	II	15(53.57)	11(40.74)	26(47.27)		
Total		28(100)	27(100)	55(100)		

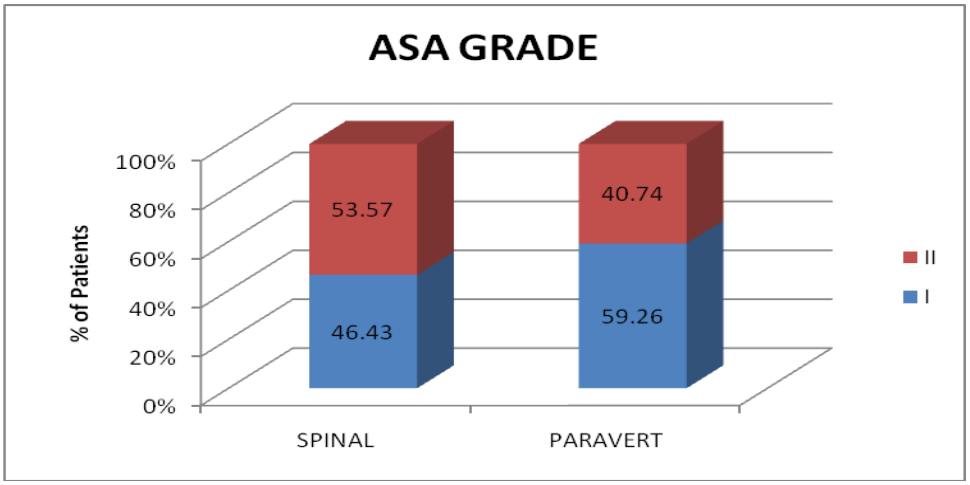


Fig 1: Comparison of ASA grade

Comparison of ASA grading showed that it is similar in the two groups and is statistically not significant (p=0.341) [Table 2/Figure 1].

Table 3: Time to perform block

	Group							
	Spinal			Paravert				
	Mean	Median	Std. Deviation	Mean	Median	Std. Deviation	p Value	Significance
Time to perform block (Mins)	6.71	7.00	0.90	9.96	10.00	1.37	<0.001	Significant

Time to perform block was less in the Spinal group than in the Paravertebral group (p<0.001) [Table 3].

Table 4: Time to surgical anesthesia

	Group							
	Spinal			Paravert				
	Mean	Median	Std. Deviation	Mean	Median	Std. Deviation	p Value	Significance
Time to surgical anesthesia (mins)	10.11	10.00	1.40	19.93	20.00	3.28	<0.001	Significant

Time to surgical anesthesia was less in the Spinal group (10.11 +/- 1.40 mins) than in the Paravertebral group (19.93 +/- 3.28 mins) ant it was found to be statistically significant (p<0.001) [Table 4].

Table 5: Effect on heart rate (BPM)

	Group							
	Spinal			Paravert				
	Mean	Median	Std. Deviation	Mean	Median	Std. Deviation	p Value	Significance
HR [Heart Rate] (BPM) : 0 min	77.04	78.00	5.24	75.22	76.00	4.35	0.106	Not Significant
HR (BPM) : 3 min	70.64	70.00	4.85	74.70	75.00	4.36	0.002	Significant
HR (BPM) : 6 min	70.00	70.00	4.78	73.89	75.00	4.56	0.005	Significant
HR (BPM) : 9 min	68.61	69.00	4.47	72.96	75.00	4.55	0.002	Significant
HR (BPM) : 12 min	67.82	68.00	3.83	72.26	72.00	4.55	0.001	Significant
HR (BPM) : 15 min	67.43	67.00	3.16	71.85	72.00	4.60	<0.001	Significant
HR (BPM) : 30 min	67.61	67.00	3.22	71.33	70.00	4.73	0.003	Significant
HR (BPM) : 60 min	67.61	67.00	3.18	70.85	71.00	4.70	0.009	Significant
HR (BPM) : 120 min	67.39	67.00	3.19	70.93	70.00	4.04	0.002	Significant
HR (BPM) : 150 min	67.43	67.00	3.13	71.07	70.00	4.09	0.001	Significant
HR (BPM) : 300 min	67.57	67.00	2.99	71.19	70.00	4.03	0.001	Significant

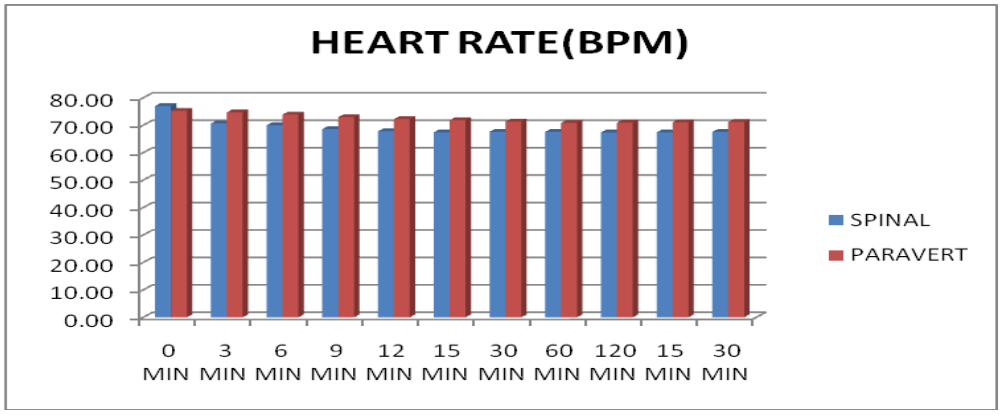
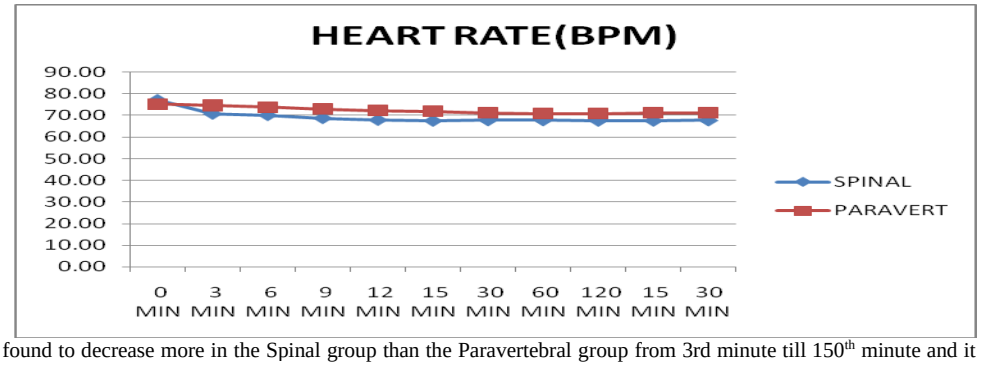


Figure 2: Effect on heart rate (BPM)



Heart rate was found to decrease more in the Spinal group than the Paravertebral group from 3rd minute till 150th minute and it was found to be statistically significant (p<0.05) [Table 5/Figure 2].

Table 6: Effect on blood pressure (MAP)

	Group							
	Spinal			Paravert				
	Mean	Median	Std. Deviation	Mean	Median	Std. Deviation	p Value	Significance
MAP (MM HG) : 0 MIN	89.71	89.50	3.02	88.19	88.00	4.70	0.239	Not Significant
MAP (MM HG) : 3 MIN	87.82	88.00	2.31	88.04	87.00	4.40	0.872	Not Significant
MAP (MM HG) : 6 MIN	85.43	86.00	3.26	87.52	87.00	4.46	0.115	Not Significant
MAP (MM HG) : 9 MIN	84.39	85.00	3.14	86.93	86.00	4.38	0.049	Significant
MAP (MM HG) : 12 MIN	83.50	84.00	3.07	86.37	86.00	4.40	0.014	Significant

MAP (MM HG) : 15 MIN	82.25	84.00	3.51	85.96	85.00	4.31	0.003	Significant
MAP (MM HG) : 30 MIN	80.86	82.00	3.35	85.81	85.00	4.33	<0.001	Significant
MAP (MM HG) : 60 MIN	79.96	80.50	3.51	85.52	85.00	4.15	<0.001	Significant
MAP (MM HG) : 120 MIN	79.54	79.00	3.65	85.52	85.00	3.93	<0.001	Significant
MAP (MM HG) : 15 MIN	78.93	79.00	3.58	85.52	85.00	4.02	<0.001	Significant
MAP (MM HG) : 30 MIN	78.79	79.00	3.45	85.41	85.00	3.84	<0.001	Significant

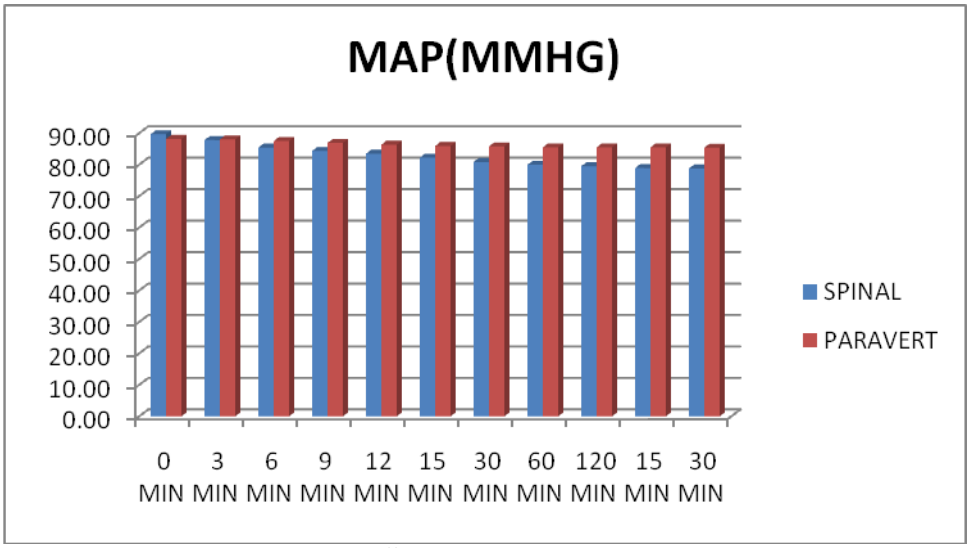
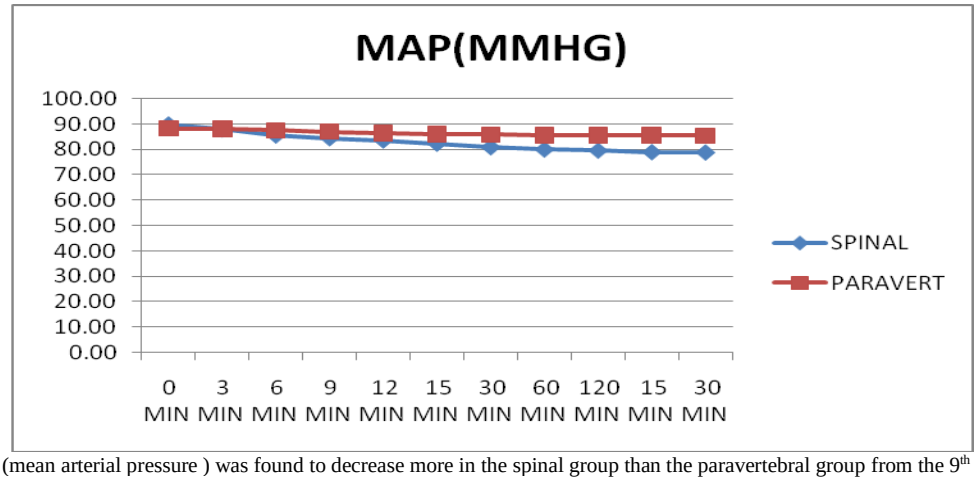


Fig 3: Effect on blood pressure (MAP)



Blood pressure (mean arterial pressure) was found to decrease more in the spinal group than the paravertebral group from the 9th minute till 150th minute and was found to be statistically significant (p<0.05) [Table 6/Figure 3].

Table 7: Effect on SPO2

	GROUP							
	SPINAL			PARAVERT				
	Mean	Median	Std. Deviation	Mean	Median	Std. Deviation	p Value	Significance
SPO2(%) : 0 MIN	99.82	100.00	0.39	99.93	100.00	0.27	0.249	Not Significant
SPO2(%) : 3 MIN	99.82	100.00	0.39	99.93	100.00	0.27	0.249	Not Significant
SPO2(%) : 6 MIN	99.82	100.00	0.39	99.93	100.00	0.27	0.249	Not Significant
SPO2(%) : 9 MIN	99.82	100.00	0.39	99.93	100.00	0.27	0.249	Not Significant
SPO2(%) : 12 MIN	99.82	100.00	0.39	99.93	100.00	0.27	0.249	Not Significant
SPO2(%) : 15 MIN	99.82	100.00	0.39	99.93	100.00	0.27	0.249	Not Significant
SPO2(%) : 30 MIN	99.82	100.00	0.39	99.93	100.00	0.27	0.249	Not Significant

SPO2(%) : 60 MIN	99.82	100.00	0.39	99.93	100.00	0.27	0.249	Not Significant
SPO2(%) : 120 MIN	99.82	100.00	0.39	99.93	100.00	0.27	0.249	Not Significant
SPO2(%) : 15 MIN	99.82	100.00	0.39	99.93	100.00	0.27	0.249	Not Significant
SPO2(%) : 30 MIN	99.82	100.00	0.39	99.93	100.00	0.27	0.249	Not Significant

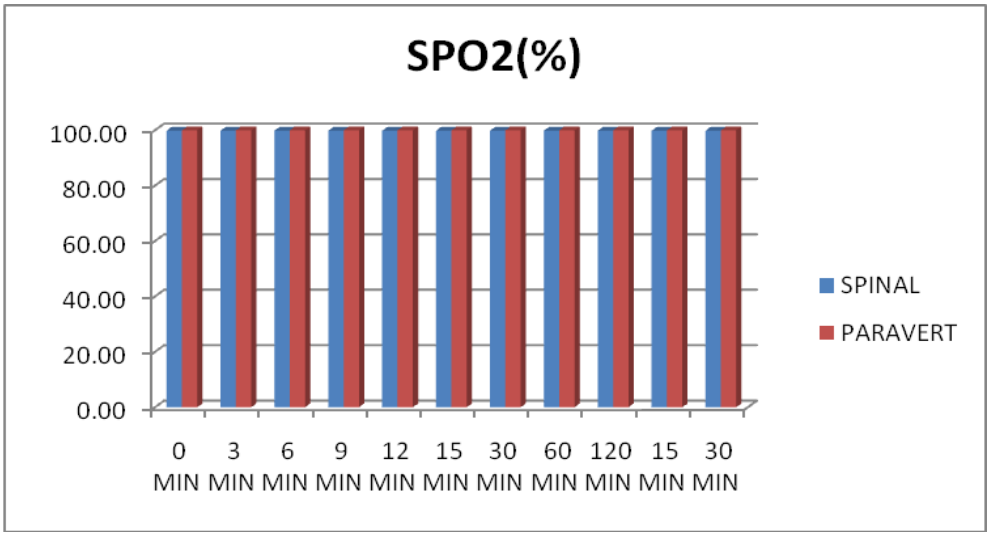
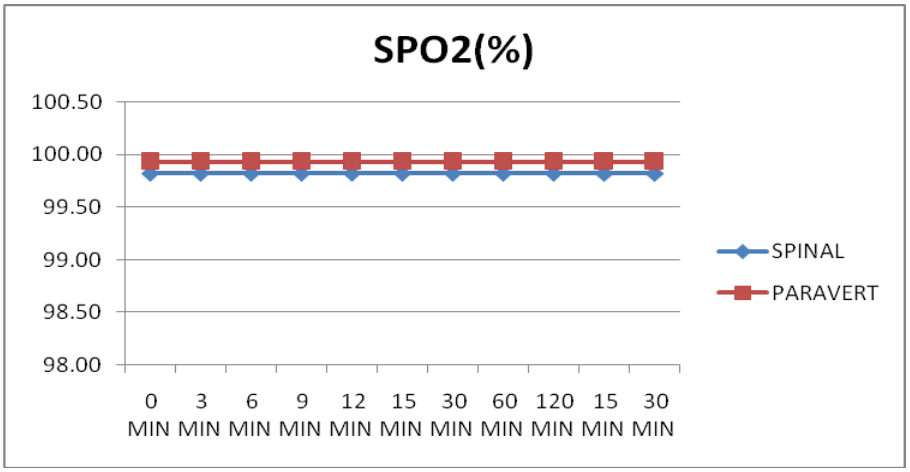


Fig 4: Effect on SPO2



SPO2 was maintained in both the groups and was found to be statistically not significant (p=0.249) [Table 7/Fig.4].

Table 8: Duration of surgery

	Group							
	Spinal			Paravert				
	Mean	Median	Std. Deviation	Mean	Median	Std. Deviation	p Value	Significance
Surgery Duration (mins)	74.79	75.50	4.82	73.00	72.00	2.96	0.076	Not Significant

Duration of surgery was 74.79 +/- 4.82 mins in Spinal group and 73+/- 2.96 mins and it was found to be statistically not significant (p =0.076) [Table 8].

Table 9: Bromage Score at end of surgery

	Group							
	Spinal			Paravert				
	Mean	Median	Std. Deviation	Mean	Median	Std. Deviation	p Value	Significance
Bromage Score end of surgery	2.14	2.00	0.65	0.59	1.00	0.64	<0.001	Significant

Bromage score at the end of surgery was more for Spinal group and less for Paravertebral group (p<0.001) [Table 9].

Table 10: VAS scores

	Group							
	Spinal			Paravert				
	Mean	Median	Std. Deviation	Mean	Median	Std. Deviation	p Value	Significance
VAS score arrival PACU	0.25	0.00	0.44	0.26	0.00	0.45	0.938	Not Significant
VAS score discharge PACU	0.82	1.00	0.55	0.93	1.00	0.55	0.481	Not Significant
VAS 6 HRS	1.07	1.00	0.54	1.07	1.00	0.55	0.983	Not Significant
VAS 12 HRS	1.11	1.00	0.51	1.29	1.00	0.46	0.208	Not Significant
VAS 18 HRS	1.15	1.00	0.36	1.32	1.00	0.48	0.134	Not Significant
VAS 24 HRS	1.07	1.00	0.73	1.86	2.00	0.71	<0.001	Significant

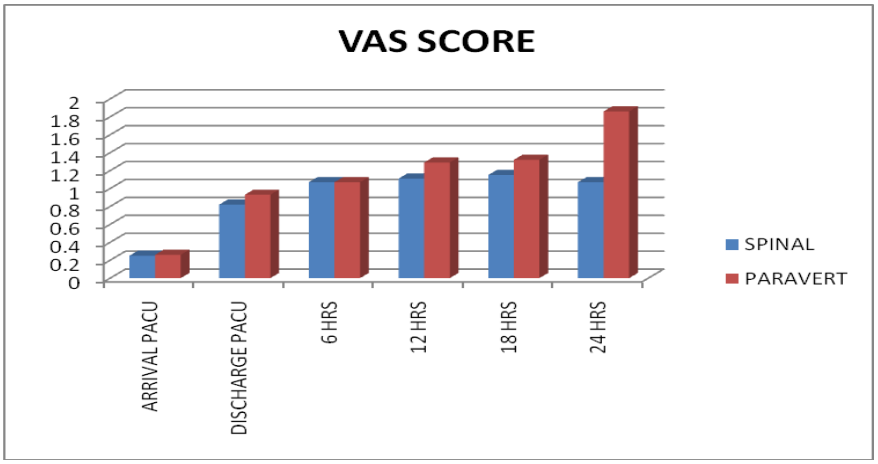
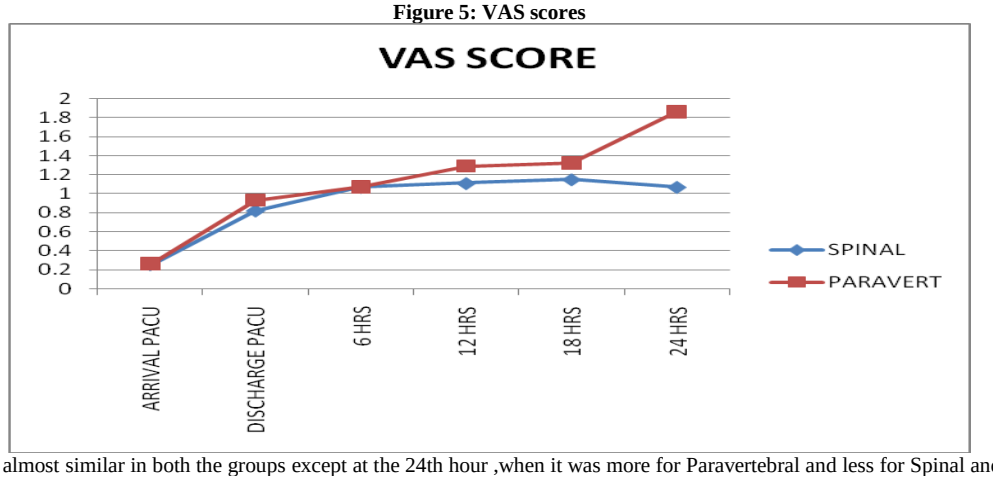


Figure 5: VAS scores



VAS score was almost similar in both the groups except at the 24th hour ,when it was more for Paravertebral and less for Spinal and it was found to be statistically significant (p<0.001) [Table 11/Fig. 5]. Time to Ambulation was less in the paravertebral group (232.63 +/- 43.02 mins) than in the spinal group (312 .68 +/- 27.23 mins) and was found to be statistically significant (p<0.001).

Table 12: Time to first analgesic

	Group							
	Spinal			Paravert				
	Mean	Median	Std. Deviation	Mean	Median	Std. Deviation	p Value	Significance
Time to first analgesic (mins)	219.54	226.00	16.62	335.89	340.00	46.45	<0.001	Significant

Time to first Analgesic was 219.54 mins in the Spinal group and 335.89 mins in the Paravertebral group (and was found to be statistically significant (p<0.001) [Time 12].

Table 13: Time to complete sensory regression

	Group							
	Spinal			Paravert				
	Mean	Median	Std. Deviation	Mean	Median	Std. Deviation	p Value	Significance
Complete sensory regression (mins)	250.07	250.00	15.70	459.56	470.00	47.56	<0.001	Significant

Time to complete sensory regression was 250 .07 +/- 15.70 mins in the Spinal group and 459.56 +/- 47.56 mins and was found to be statistically significant (p<0.001) [Table 13]. Total Rescue Analgesics was 170 mg of tramadol in the Spinal group and 120 mg in the Paravertebral group and was found to be statistically significant (p<0.001) [Table 13].

Discussion

We performed a prospective, randomised, comparative study of paravertebral block with spinal anesthesia for inguinal hernia repair of 60 patients in our institution. We randomly assigned them into two groups by computer generated software into Group P, patients who received paravertebral block and group S with spinal anesthesia. In our study, our aim was to compare the block characteristics, adverse effects between the two groups and to compare the post operative analgesia between the two groups. Randomization and strict inclusion and exclusion criteria were followed to prevent selection bias. In our study we found out that paravertebral block provided more haemodynamic stability as compared to spinal anesthesia. Heart Rate and Blood pressure were maintained in those patients receiving paravertebral block due to less significant sympathetic blockade, while there was fall in both the parameters in the other group due to the sympathetic blockade. We also found out that time to surgical anesthesia was less in spinal group of patients(10.11+/- 1.40 mins) as compared to the paravertebral group (19.93 +/- 3.28 mins) (p< 0.001). Post operative analgesia was almost same in both the groups. Paravertebral block provided early ambulation (232 +/- 43 mins) as compared to spinal anesthesia (312 +/- 27 mins) (p<0.001) as motor blockade was less and preserved lower extremity motor function, provides unilateral, segmental anesthesia. Adverse events were almost minimal in both the groups.In the study by Hadzic et al [12] in 2006 they concluded that paravertebral blocks provide superior same day recovery over general anesthesia for patients undergoing inguinal hernia repair. .More patients in the PVB group (71%) met the criteria to bypass the postanesthetic care unit compared with patients in the GA group (8%; P < 0.001). Only 3 (13%) of patients in the PVB group requested treatment for pain while in the hospital, compared with 12 (50%) patients in the GA group, despite infiltration with local anesthetic (P = 0.005). Patients in the PVB group were able to ambulate earlier (102 +/- 55 minutes) than those in the GA group (213 +/- 108 minutes; P < 0.001). Time-to-home readiness and discharge times were shorter for patients in the PVB group (156 +/- 60 and 253 +/- 37 minutes) compared with those in the GA group (203 +/- 91 and 218 +/- 93 minutes) (P < 0.001). Adverse events (e.g., nausea, vomiting, sore throat) and pain requiring treatment in the first 24 hours occurred less frequently in patients who had received PVB than in those who had received GA. In our study we found out that patients who received paravertebral block were able to ambulate earlier (232 +/- 43 mins) than the other group who received spinal anesthesia (312 +/- 27 mins). Adverse events were also found to be minimal in both the groups. Canan Tulay Isil et al [1] conducted a study in 2014 comparing spinal anaesthesia and paravertebral block on 60 American Society of Anaesthesiologists (ASA) physical status I and II patients with unilateral inguinal hernia repair.They recorded the heart rate and mean arterial pressure during the surgical procedure. Compared to pre-anaesthesia measurements, the decrease in HR and MAP during the 10^{th}–90^{th} minute period was significant in Group SA (p<0.01). In Group PVB, sensory block duration time was higher, whereas paralysis rate was higher in Group SA (p<0.01). Bromage scores were significantly different between the groups (p<0.01). In Group SA, VAS score at the 24^{th} postoperative hour, nausea, and vomiting were significantly higher compared to Group PVB (p<0.01). In our study we found out that compared to pre anesthesia measurements , decrease in HR and MAP during 3rd - 150th minute period was significant in Group S (p< 0.001). Similar to their study we also found out that Bromage scores were different between the two groups(p<0.001). Contrary to their finding we found out that VAS score at 24 th hour was less in Group S (p<0.001) and nausea and vomiting was minimal in both the groups.Sunil Kumar Sinha et al [2] conducted a study in 2016 comparing safety and efficacy of unilateral paravertebral block with conventional spinal anaesthesia for inguinal hernia repair patients among 63 ASA physical status I and II adult male patients. In the study they randomly assigned the patients into two groups. To one group they gave paravertebral block at T_{10},T_{11} ,T_{12},L_1,L_2 levels, 5 ml of 0.5% bupivacaine at each segment and to the other group they gave spinal anaesthesia at L_3-L_4 interspace level with 12.5 mg 0.5% of hyperbaric bupivacaine. They concluded that paravertebral block provides excellent post operative analgesic conditions with lesser adverse effects and shorter time to reach the discharge criteria compared to subarachnoid block. The duration of post-operative analgesia (min) was 384.57 ± 38.67 in Group P and 194.27 ± 20.30 in Group S (p < 0.05). In our study we gave paravertebral block at two levels $T_{10}$and L_1 and got similar post operative analgesic conditions with lesser adverse effects and early ambulation (232 +/-43 mins) as compared to spinal anesthesia (312+/- 27 mins).MC Mandal et al [3] conducted a study In 2011 that paravertebral block can be an alternative to unilateral spinal anaesthesia in inguinal hernia repair patients. Block performance time and time to reach surgical anaesthesia were significantly higher in the patients of group-P (p<0.001). Time to ambulation was significantly shorter in group-P compared to group-S (p<0.001), while postoperative sensory block was prolonged in patients of group-S;(p<0.001). A significantly higher number of patients could bypass the recovery room in group-P compared to group-S, (45% versus 0%, respectively, P<0.001). No statistically significant difference in adverse outcomes was recorded. In our study time to perform block (6.71 +/- 0.90 mins) and time to surgical anesthesia (10.11 +/- 1.40 mins) were significantly lower in Group S as compared to Group P,(p<0.001).Time to ambulation was significantly shorter in group P as compared to group S (p<0.001). Prolonged motor block was seen in group S as compared to group P (p<0.001).Weltz CR et al [5] conducted a study in 2003 regarding paravertebral anaesthesia for inguinal hernia repair patients .Paravertebral block achieved effective anaesthesia in 28 0f 30 patients, conversion to general anaesthesia was performed on 2 failed blocks. No cases of urinary retention.. Duration of sensory block was 13 hours. In our study Paravertebral block achieved effective anaesthesia in 27 out of 30 cases. Duration of sensory block was 459 +/- 47 mins. P. Bhattacharya et al [7] conducted a study in 2010which said that paravertebral block can be an alternative to conventional spinal anaesthesia for inguinal hernia repair. They compared unilateral lumbar paravertebral block with conventional spinal anaesthesia in 60 ASA physical status I and II patients. The time to first post-operative analgesic requirement (primary outcome measure) as 342 +/- 73 min in group P and 222 +/- 22 min in group S (P<0.0001). Time to ambulation was 234 +/- 111 min in group P and 361 +/- 32 min in group S (P<0.0001). Urinary retention requiring catheterization were found in zero (0%) patients in group P compared with five (16%) in group S (P=0.024). In our study we found out that time to ambulation in Group P was (232.63 +/- 43.2) mins and in Group S was (312.6 +/- 27 mins) (p<0.001). Urinary retention requiring catheterization was found in zero (0 %) patients in Group P compared with one (3.28 %) In Group S (P=0.322).

Limitations of the study

We performed the paravertebral block without USG guided, which could have aided us in giving the block. Giving a paravertebral block requires a skilled and experienced anesthesiologist, so wildly acceptance of this technique is difficult. We did not calculate the patient satisfaction score between the two groups.

Conclusion

It can be concluded that both spinal anesthesia and paravertebral block can be used for patients undergoing inguinal hernia repair. Spinal anesthesia provides adequate analgesia and motor blockade and also less time to perform block and to reach surgical anesthesia. On the other hand paravertebral block provides good haemodynamic stability as well as less time to ambulation, minimal adverse events, however the expertise related to perform, procedure related time and

prolonged onset of effect are the main concerns. PVB can be recommended as an alternative anesthetic technique to SA for inguinal hernia repair patients.

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