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ULTRASOUND GUIDED ILIOINGUINAL AND ILIOHYPOGASTRIC NERVE BLOCKS FOR POST OPERATIVE ANALGESIA IN UNILATERAL INGUINAL HERNIA SURGERIES UNDER SPINAL ANAESTHESIA

Anaesthesiology

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ABSTRACT

Background: Inguinal hernioplasty is one of the most common elective surgeries done worldwide nowadays as a day care procedure .Management of acute post opearative pain is necessary to decrease patient morbidity,hospital stay and improve patient satisfaction.Ultrasound guided peripheral nerve blocks offer effective pain relief with minimal systemic effects. However, there's limited research on the use of ultrasound-guided nerve blocks with 0.5% ropivacaine for postoperative pain relief and hence this study. **Objective:** This study was done to evaluate the effect of ultrasound guided ilioinguinal and iliohypogastric nerve blocks with 0.5% ropivacaine on post operative analgesia and subsequent opioid requirements in patients undergoing unilateral open inguinal hernia surgeries under spinal anaesthesia. **Methodology:** In this study, 82 patients in either sex between 20-60 years of age scheduled for unilateral open inguinal hernia repair under spinal anesthesia were included. 41 patients,(groupA) received ilioinguinal and iliohypogastric nerve blocks with 10ml of 0.5% ropivacaine under ultrasound guidance after wound closure. Remaining 41 patients,(GroupB) did not receive any nerve blocks. Patient were shifted to post operative ward and following parameters(time to rescue analgesia, Visual analogue scale(VAS) at rest and movement, total opioids consumed,post operative nausea and vomiting impact scale,Ramsay's sedation score,Modified Aldrete score) were monitored at 0,30,60minutes,2,4,6,12 and 24 post operative hours and compared between the two groups. **Results:** Time to rescue analgesia in group A was significantly higher when compared to groupB($p<0.001$). VAS score at rest was significantly less in group A starting at 2hours and continued till 12 hours post operatively ($p<0.05$). VAS at movement was significantly less up to 6 hours in the post operative period in group A($p<0.05$). Total opioid consumption in group A was significantly less after 24 hours($p<0.05$).A highly significant reduction in opioid consumption was seen during the initial 6 hours of post operative period($p<0.001$).There was a significant reduction in the incidence of nausea, vomiting and sedation in group A during the initial 6 hours of post operative period ($p<0.05$).Patients in group A showed an early recovery and discharge from PACU in the initial 6 hours post operatively. **Conclusion:** This study concluded that ilioinguinal iliohypogastric nerve block with 0.5% ropivacaine at the time of wound closure after inguinal hernioplasty provided superior, longer lasting post operative pain relief which reduces the post operative opioid consumption and the side effects associated with it.

KEYWORDS

Inguinal hernioplasty, spinal anaesthesia, ropivacaine, ilioinguinal iliohypogastric nerve block.

INTRODUCTION

Pain is an exceedingly complex sensation which is difficult to describe and quantify in an effective objective manner. Postoperative pain arises as a consequence of complex physiologic response to tissue damage, viscera distension, or disease[1].Pain following inguinal hernia repair is mainly caused by abdominal wall incision[2]. An ideal post-operative analgesic should be safe, easy to use, providing fast pain relief and long-lasting. In the past, opoids and NSAIDS remained the cornerstone of postoperative analgesia, but they are associated with many adverse side effects. They are not entirely effective in avoiding and treating postoperative pain[1].

Peripheral nerve blocks provide excellent analgesia, with limited systemic effects over the target region. The blocks are usually easy to perform, cheap and very safe[1].Advances in ultrasound technology have allowed direct visualization of peripheral nerves,made the blocks easier to perform and safer than traditional techniqueswith higher success rates[3].

Ropivacaine is a pure S(-)enantiomer developed to minimize potential toxicity and enhance the relative sensory and motor block profiles compared to Bupivacaine, which is a racemate.Ropivacaine is less lipophilic than bupivacaine and therefore has less chance of penetrating large myelinated motor fibres.Thus, the pain-transmitting Aδ and C nerves are selectively inhibited rather than Aβ fibres, which are involved in motor function[4].

Ilioinguinal and iliohypogastric nerve blocks are very popular regional anesthesia techniques[5].Peripheral nerve blocks are widely used during inguinal hernia repair but studies showing the results of ultrasound-guided ilioinguinal and iliohypogastric nerve blocks with ropivacaine for postoperative analgesia are scarce, and hence this study.

MATERIALS AND METHODS

METHODOLOGY

After obtaining institutional ethics committee approval and written informed consent ,a prospective observational study was conducted for 82 patients in either sex between 20-60 years of age scheduled for unilateral open inguinal hernia repair under spinal anesthesia from December 2018 to January 2020.

Inclusion Criteria

- American Society of Anesthesiologist(ASA) class 1 and 2
- Age between 20-60 years of either sex
- Patients with non relapsing unilateral inguinal hernia
- Patients posted for elective open unilateral inguinal hernia repair

Exclusion Criteria

- Patients with known allergy to local anesthetics
- Patients with chronic pain not related to inguinal hernia eg:low backache
- Patients with contraindication to spinal anesthesia
- Patients with obstructed or strangulated inguinal hernia
- Cases with undue prolongation of surgery beyond 2 hours

Patients for study was seen before the day of surgery for preanesthetic assessment.Informed consent from each patient was obtained after explaining the procedure. Routine blood investigations were sent.Patients were premedicated with tablet diazepam 5 mg and tablet ranitidine 150 mg on the night before the day of surgery.

On the day of surgery patients were shifted to operation theatre and ASA standard monitors were connected and preoperative hemodynamic parameters recorded as baseline. Venous access was secured with 18G IV canula and preloaded with normal saline 10ml/kg over 10 minutes.

All patients were given intravenous sedation with 0.02mg/kg of midazolam. Patient were positioned laterally and under strict asepsis using 25G QBSN sub arachnoid block was given in L3-L4 level using 15 mg of 0.5% Bupivacaine(H).

Patient was placed in supine position and ascending sensory level blockade was assessed by response to pin prick every 2 minute.When desired level of sensory block is achieved, surgery was started.Duration of surgery was calculated from skin incision to final

closure.After the wound closure,41 patients (group A) received ilioinguinal and iliohypogastric nerve blocks with 10ml of 0.5% ropivacaine under ultrasound guidance.Remaining 41 patients(group B) did not receive any nerve blocks.All patients were monitored in the post operative period for 24 hours.

Anesthesiologist 1 loaded the drug and gave the block.

Anesthesiologist 2 monitored and collected the data.

Using philips HD 11 XE ultrasound machine,sterile linear probe of frequency(8-12MHz) was placed medial to anterior superior iliac spine,oriented on a line joining anterior superior iliac spine with umbilicus.The three muscle layers were identified.The nerves appeared as hypoechoic ovals between the internal oblique muscle and transversus abdominis muscle.Moving the probe slightly cephalad or caudal to trace the nerves was useful[6].

A skin wheal was made on medial aspect of transducer and a 21G 10cm stimuplex needle was inserted in plane in a medial to lateral orientation through the subcutaneous tissue ,external oblique muscle,internal oblique muscle and was advanced towards the ilioinguinal iliohypogastric nerves.After gentle aspiration,1 to 2 ml of local anesthetic was injected to confirm needle position.After confirming, a total of 10 ml of 0.5% ropivacaine was injected till the nerves were surrounded by the drug on all sides[6].

Completion of injection was considered as the 0 minute for time to rescue analgesia.The duration of USG guided block procedure was calculated from identifying the nerves till the completion of injection of the drug.

Patients were shifted to the post operative ward and the following parameters(time to rescue analgesia, Visual analogue scale(VAS) at rest and movement[7],total opioids consumedin 24 hrs,post operative nausea and vomiting impact scale,Ramsay's sedation score[8], Modified Aldrete score[9]) were monitored at 0min,30min,60min,2,4,6,12 and 24 post operative hours. Visual analogue scale score on movement (patient sitting with legs hanging) was tested once modified bromage score became 0.

The total duration of analgesia of nerve blocks was considered from the time the block is given to the time of rescue analgesia with tramadol 50 mg intravenous when VAS≥4.

The severity of nausea and vomiting was evaluated using a simplified post operative nausea vomiting impact scale[10].1.Have you experienced a feeling of nausea? if yes, has your feeling of nausea interfered with activities of daily living such as,being able to move about freely in bed, being able to get out of bed,being able to walk,eat and drink normally.
0-no nausea
1-sometimes
2-often or most of the time
3-all of the time

2.Have you vomited?
0-not at all
1-once
2-twice
3-three or more times

To calculate the post operative impact scale score(0-6) th e numerical responses to questions 1 and 2 was be added.

SAMPLE SIZE ESTIMATION

The sample size 'n' was calculated from the following formula at 95%confidence interval and 90%power based on Htun TA[1] study.

$$n=\frac{2(Z_\alpha+Z_\beta)^2\sigma^2}{x_1-x_2}$$

Z_α=1.96 at 95% confidence interval
Z_β=1.28 at 90% power
$X_1\pm\sigma_1$ =7.33±3.06
$X_2\pm\sigma_2$=9.22±4.57

$\sigma=\sqrt{\sigma_1^2/2+\sigma_2^2/2}$

n = 82 cases

Results were expressed as mean with standard deviation. Statistical analysis was carried out using ANOVA for repeated measures and t test.

All collected data using proforma was processed into SPSS computer data entry software.

RESULTS

Table No.1: Demographic Data

	Group	N	Mean	Std. Deviation	t test p value	
AGE(years)	Group A	41	41.54	12.046	0.118	NS
	Group B	41	45.27	9.165		
WEIGHT(kg)	Group A	41	68.61	8.567	0.989	NS
	Group B	41	68.63	7.388		
HEIGHT(cm)	Group A	41	170.05	5.626	0.399	NS
	Group B	41	171.15	6.093		
BMI(kg/m^2)	Group A	41	23.9561	2.777	0.479	NS
	Group B	41	23.5837	1.874		

*P value < 0.05 is significant
#P value < 0.001 is highly significant

Table no.1 depicts the comparison of age, weight, height and BMI between the two groups. As shown in the table, there was no significant statistical difference in age, weight, height and BMI between the two groups (p > 0.05).

Table No.2: Duration Of Surgery

	Group	N	Mean	Std. Deviation	t test p value	
Duration Of Surgery	Group A	41	79.39	18.748	0.707	NS
	Group B	41	80.98	19.307		

Table no.2 compares the duration of surgery in both the groups and there was no significant difference in duration of operation between the two groups (p > 0.05).

Table No.3: Time To Rescue Analgesia

	Group	N	Mean	Std. Deviation	t test p value	
Time To Rescue Analgesia	Group A	41	285.37	115.008	0.000	HS
	Group B	41	155.61	74.575		

Table no.3 shows the time to rescue analgesia in both the groups.Time to rescue analgesia in group A was 285.37±115.008 minutes and in group B 155.61±74.575 minutes which is statistically highly significant (p<0.001).

Table No.4: VAS At Rest

Parameter			N	Mean	Std. Deviation	Mann whitney test p value		50th (Median)	IQR	
									25th Percentiles	75th Percentiles
VAS-Rest	0 minute	Group A	41	0.00	0.000	1.000	NS	0.00	0.00	0.00
		Group B	41	0.00	0.000			0.00	0.00	0.00
	30 minute	Group A	41	0.20	0.749	1.000	NS	0.00	0.00	0.00
		Group B	41	0.20	0.749			0.00	0.00	0.00
	1hour	Group A	41	0.39	0.891	0.155	NS	0.00	0.00	0.00
		Group B	41	0.83	1.412			0.00	0.00	2.00
	2hours	Group A	41	1.29	1.401	0.033	Sig	2.00	0.00	2.00
		Group B	41	1.90	1.357			2.00	0.00	3.00
	4hours	Group A	41	2.39	1.262	0.009	HS	2.00	2.00	3.00

		Group B	41	3.24	1.135			3.00	2.00	4.00
	6hours	Group A	41	2.72	1.077	0.028	Sig	3.00	2.50	4.00
		Group B	41	3.22	0.962			3.00	2.50	4.00
	12hours	Group A	41	2.98	0.921	0.044	Sig	3.00	2.00	3.00
		Group B	41	3.44	1.119			3.00	3.00	4.00
	24hours	Group A	41	3.20	0.813	0.261	NS	3.00	2.00	3.50
		Group B	41	3.41	0.865			4.00	3.00	4.00

Table no.4 shows comparison of visual analogue scale score in two groups at rest which shows significant difference during 2,4,6 and 12 hours following the nerve block where the mean VAS score remained less in group A ($p<0.05$).

Table No.5: VAS During Movement

Parameter			N	Mean	Std. Deviation	Mann whitney test p value			IQR	
								50th (Median)	25th Percentiles`	75th Percentiles
VAS-Movement	0 minute	Group A	0							
		Group B	0							
	30 minute	Group A	0							
		Group B	0							
	1hour	Group A	2	3.50	0.707	0.221	NS	3.50	2.25	28.00
		Group B	1	4.00						
	2hours	Group A	21	4.00	1.140	0.011	Sig	4.00	3.00	4.50
		Group B	19	5.00	1.155			5.00	4.00	6.00
	4hours	Group A	41	4.80	1.308	0.002	HS	4.00	4.00	6.00
		Group B	41	5.71	1.209			6.00	4.50	6.00
	6hours	Group A	41	4.96	1.200	0.047	Sig	6.00	5.00	6.00
		Group B	41	5.54	1.433			6.00	4.00	6.00
	12 hours	Group A	41	5.20	1.145	0.127	NS	5.00	4.00	6.00
		Group B	41	5.61	1.282			6.00	4.00	6.00
	24 hours	Group A	41	5.05	1.161	0.052	NS	5.00	4.00	6.00
		Group B	41	5.54	1.206			6.00	4.00	6.00

Table no.5 depicts the visual analogue scale score during movement in two groups where a significant difference was seen during 2,4 and 6 hours following the nerve block procedure with mean VAS score being less in group A which is statistically significant($p<0.05$).

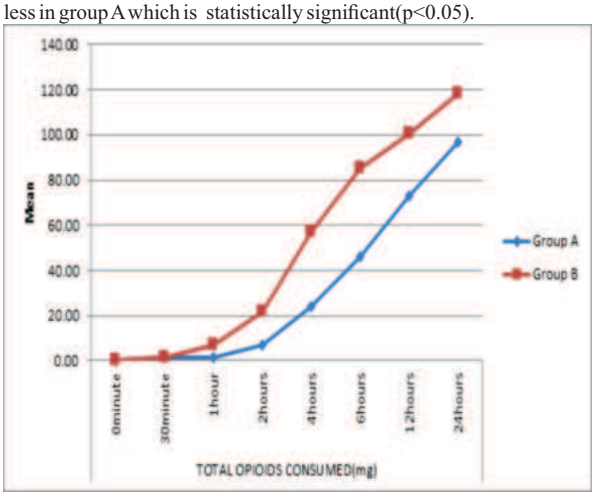

Figure No.1: Total Opioids Consumed

figure no.1 depicts the total opioid consumption in two groups in the post operative period which is statistically highly significant at 2,4,6 hours postoperatively($p<0.001$) and significant at 12 and 24hrs in the post operative period ($p< 0.05$) where patients in group B consumed significantly higher amount of opioids than group A. Mean opioid consumption in group A was 96.59±37.12 mg and in group B 118.44±35.26 mg after 24 hours.($p < 0.05$).

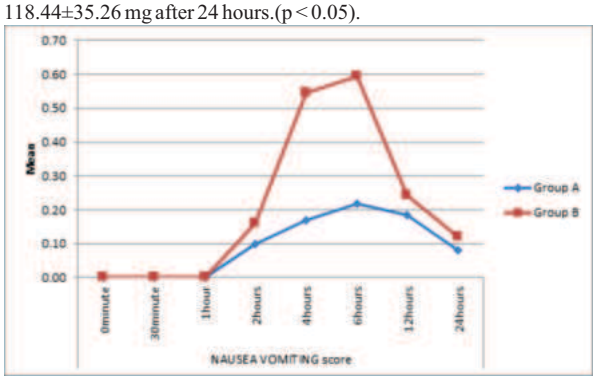

Figure No.2 : Post Operative Nausea Vomiting Score

figure no.2 shows comparison of nausea vomiting scale score in two groups where there is significant difference during 2,4 and 6 hours post operatively depicting higher incidence of nausea and vomiting in group B compared to group A($p<0.05$).

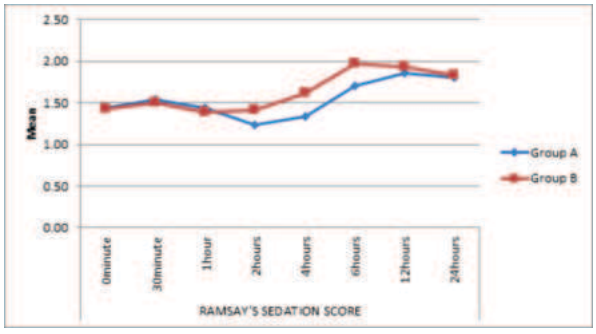

Figure No.3: Post Operative Ramsay Sedation score

figure no.3 illustrates comparison of Ramsay sedation score between the two groups which shows significant difference during 2, 4 and 6 hours post operatively where group B showed higher sedation scores compared to group A($p<0.05$).

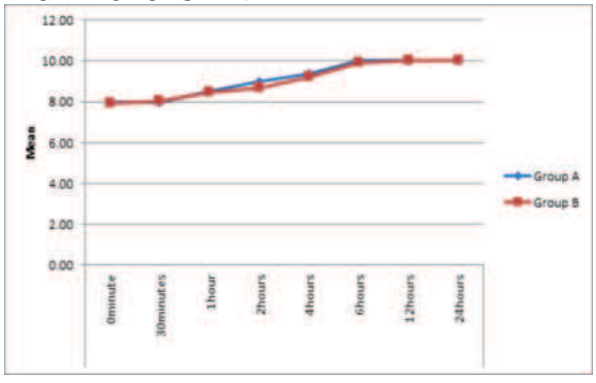

Figure No.4: Post Operative Modified Aldrete Score

figure no.4 shows comparison of post operative modified aldrete score in two groups which shows a statistically significant difference during 2,4 and 6 hours postoperatively,($p < 0.05$).

DISCUSSION

In this prospective observational study, we compared two groups with 41 patients each to determine the efficacy of ipsilateral ultrasound guided ilioinguinal iliohypogastric nerve blocks for post operative analgesia following unilateral open inguinal hernioplasty. This study demonstrated that the group which received ilioinguinal and iliohypogastric nerve blocks had better outcomes in terms of time to rescue analgesia, VAS scores at rest and movement,total opioid consumption, incidence of nausea and vomiting, sedation scores, recovery and discharge from PACU compared to the group which received only spinal anaesthesia before the procedure and intravenous tramadol as rescue analgesic.

In this study we used 10ml of 0.5% ropivacaine as our local anaesthetic for performing nerve block using the benefits of ropivacaine including its long duration of action and relatively less motor blockade compared to sensory block[5].

Demographic data of the two groups showed no statistically significant difference Preoperative baseline physiological variables were comparable between the two groups in this study.

The duration of surgery in two groups showed no significant difference. Group A had a mean time of 79.39±18.74 minutes and group B 80.98±19.30 minutes (p=0.70).

Time to rescue analgesia was compared between the two groups.It was observed that the time to rescue analgesia in group A was prolonged (4.75±1.91 hrs) compared to group B (2.59±1.24 hrs) which is statistically highly significant (p<0.001).This is because patients in group B had an early onset of pain compared to group A which received the block. Parmod kumar[11] et al conducted a study for comparing ilio inguinal, iliohypogastric nerve block with spinal anaesthesia on 80 patients undergoing inguinal hernia repair using 30ml of 0.5% ropivacaine and 1mcg/kg of dexmedetomidine.They observed that the time to rescue analgesia in block group was 6.89±0.22 hours and in spinal group 3.24±0.59 minutes.The larger volume of the drug along with the addition of dexmedetomidine to the block solution lead to the prolonged duration of action of nerve block in their study[12,13].

VAS score at rest in group A was significantly less in the first 8 hours post operatively compared to group B(p<0.05).For the next 8 hours though group A showed a reduced VAS score compared to group B,it was not statistically significant.During the last 8 hour period VAS score was comparable between both the groups. Roshan Radhakrishnan[14] et al in their study using 10ml of 0.75% ropivacaine for ilioinguinal iliohypogastric nerve blocks observed lower VAS scores at rest up to 12 hours post operatively following inguinal hernioplasty. Higher concentration of the drug could be the reason for this reduced VAS scores for longer duration[12].

Mean VAS score during movement(sitting with legs hanging) was found to be significantly less in group A in the first 6 hours post operatively compared to group B(p=0.04).For the remaining post operative period VAS at movement showed no statistically significant difference. Kirthi Kamal[15] et al observed reduced VAS scores during movement(knee flexion) till 10 hours post operatively following ilioinguinal iliohypogastric block with 0.75% ropivacaine. Higher concentration of the drug along with less complex movement could be the reason for reduced VAS scores for longer duration[12].

Post operative opioid consumption during the initial 24 hours was compared between both the groups.It was observed that there was significant reduction in total opioid consumption in group A compared to group B (group A 73.17±29.78 mg and group B 113.41±48.76 mg).A highly significant reduction in opioid consumption was seen in the first 6 hours post operatively in group A 46.34±36.03 mg compared to group B 85.37±43.65 mg.In the remaining post operative period though opioid consumption was more in group B,the difference was not highly significant.This could be because of the lower VAS scores at rest and movement seen in group A during the initial 6 hours post operatively. Dorreya M. Fekry[16] et al in their study comparing ilioinguinal iliohypogastric block with spinal anaesthesia for inguinal hernia surgeries showed that total analgesic requirement in block group was significantly lower that spinal group during the post operative period(p=0.01).

The incidence of nausea and vomiting as a consequence of opioid use[17] was compared in both the groups and it was observed that nausea vomiting scale score was significantly higher in group B during the initial 6 hours post operatively 0.59±0.64 as compared to group A 0.22±0.65.In a study conducted by Melike[18] et al using 0.5% ropivacaine for ilioinguinal iliohypogastric nerve block there was higher incidence of nausea and vomiting in the group which received nerve block using placebo till 8 hours post operatively due to increased opioid consumption.

Sedation following opioid administration is a common side effect[17].In this study,we used Ramsay sedation score to compare sedation among both the groups .It was observed that group B continued to have significantly higher sedation score in the first 6 hours post operatively as compared to group A (1.97±0.41 and 1.71±0.51).In the remaining post operative study period group B continued to have higher sedation scores but was not statistically significant.

Post operative recovery was assessed using modified Aldrete score to determine the time to discharge from PACU. Patients were discharged from PACU when MAS ≥ 9.Patients in group A showed an early recovery and discharge from PACU in the first 6 hours post operatively compared to group B. This can be attributed to the lesser opioid consumption by group A. Roshan Radhakrishnan[14] et al used 0.75% ropivacaine for performing ilioinguinal iliohypogastric nerve blocks and observed that the length of hospitalization in the group which received nerve blocks was lesser compared to the group which did not receive any nerve block with a median difference of 5 hours.

CONCLUSION

This study concluded that ilioinguinal and iliohypogastric nerve blocks with 0.5% ropivacaine at the time of wound closure after inguinal hernioplasty provided superior, longer lasting post operative pain relief with better VAS scores at rest and movement which reduced the post operative opioid consumption and the side effects associated with it. Patients had better post operative pain scores with lesser sedation which resulted in early recovery and discharge from PACU.

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