



A COMPARATIVE EVALUATION OF ULTRASOUND-GUIDED TRANSVERSE ABDOMINIS PLANE BLOCK VERSUS ILIOINGUINAL ILIOHYPOGASTRIC NERVE BLOCK FOR POST-OPERATIVE ANALGESIA IN ADULT PATIENT UNDERGOING INGUINAL HERNIA REPAIR

Anaesthesiology

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ABSTRACT

Background- Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage. Effective postoperative analgesia is an essential component of the care of surgical patients. Inguinal hernia is one of the most common conditions met with in surgical practice with life time prevalence of 25% in men and 2% in women. Following herniorrhaphy, inadequate control of postoperative pain might be a risk factor for the development of chronic pain. Local infiltration of anesthetics and/or opioids, and Regional anesthetic techniques like Ilioinguinal/Iliohypogastric nerve (IIN-IHN) block, or transversus abdominis plane block are few of many analgesic modalities used now a days to achieve optimum postoperative analgesia. Therefore this study is planned to compare the efficacy, duration of analgesia, analgesic consumption in first 24 hrs in ultrasound guided TAP block and ilioinguinal/iliohypogastric nerve block for control of postoperative pain after inguinal hernia surgeries.

Methods- In this observational study, a total of 70 patients were grouped into two groups by computer generated software. We took 75 patients in our study, 2 blocks failed in TAP block group and 3 were failed in IIN-IHN block group; we excluded these 5 patients from our study and Patients were divided into two groups of 35. 35 patients per group were required for the study with $\alpha=0.05$, $\beta=0.20$, 80% power and 95% confidence limit. Data was recorded as per Performa. The data analysis was computer based; SPSS-22 will be used for analysis.

Results- our study results in that US guided IIN-IHN block significantly reduced the intensity of postoperative pain and prolonged the duration of postoperative analgesia in comparison with TAP block, thereby reducing analgesic consumption and associated adverse effects.

KEYWORDS

ilioinguinal/iliohypogastric nerve block, inguinal hernia, transversus abdominis plane block

INTRODUCTION

Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage^[1]. Uncontrolled pain resulting from surgeries leads to endocrine, metabolic and inflammatory responses grouped together as surgical stress response which have adverse effects on various physiological functions^[2]. Effective postoperative analgesia is an essential component of the care of surgical patients^[3]. Inadequate analgesia may be associated with increased perioperative morbidity and mortality^[4].

Regional anaesthesia with local anesthetic agents not only inhibits the stress response to surgery but also influence the postoperative outcome by beneficial effects on organ functions^[5]. Inguinal hernia is one of the most common conditions met with in surgical practice with life time prevalence of 25% in men and 2% in women^[6].

Following inguinal hernia repair, moderate or severe pain may lead to the increased consumption of analgesics which increases the risk of adverse effects especially respiratory depression, emesis, sedation, decreased bowel motility which in turn leads to prolonged hospital stay, unexpected rehospitalization, delay in returning to normal activities and increased economic burden^[7]. Following herniorrhaphy, inadequate control of postoperative pain might be a risk factor for the development of chronic pain^[8].

Multiple approaches including pharmacology have been used in the pain management after inguinal hernia repair but an optimal pain management is yet to be decided^[9].

Multi-modal pain therapy (balanced analgesia) is the recommended technique for treatment of postoperative pain^[10].

Local infiltration of anesthetics and/or opioids, and Regional anesthetic techniques like Ilioinguinal/Iliohypogastric nerve (IIN-IHN) block, or transversus abdominis plane block are few of many analgesic modalities used now a days to achieve optimum postoperative analgesia^[10]. Ilioinguinal/Iliohypogastric nerve block provides good postoperative analgesia following inguinal hernia surgery.^[11]

The transversus abdominis plane (TAP) block is an alternate, easy to perform, and an effective peripheral abdominal field block that blocks the ilioinguinal/ iliohypogastric, and lower intercostal (T7-T11) nerves^[12]. TAP block is a novel technique for blocking the abdominal wall neural afferents via the lumbar triangle of Petit. The objective of a TAP block is to deposit local anesthetics within the plane between the internal oblique (IO) and transversus abdominis (TA) muscles targeting the nerves in this plane^[13]. The TAP block has developed from a landmark-guided technique to ultrasound guided technique. The continuous assessment of the drug injection between IO and TA muscles ensures distribution of the local anesthetics to the nerves underneath the fascia between IO and TA muscles^[14].

It provides good post-operative analgesia and reduces post-operative analgesic requirements, though no significant advantage could be ascertained with continuous techniques^[15].

For ilioinguinal/ iliohypogastric nerve (IIN-IHN) block, the probe was placed obliquely on a line joining anterior superior iliac spine and umbilicus immediately superior to anterior superior iliac spine. After identifying the plane between internal oblique and transversus abdominis, needle tip targeted in plane and drug was administered^[16]. The ultrasound (US) guided nerve block enables accurate needle positioning that may reduce the chance of drug toxicity, require low dose, early onset, increase in time to rescue analgesia and block failure^[17-18]. Most commonly used local anesthetics in peripheral nerve blocks are bupivacaine, lignocaine and ropivacaine.

Therefore this study is planned to compare the efficacy, duration of analgesia, analgesic consumption in first 24 hrs in ultrasound guided TAP block and ilioinguinal/iliohypogastric nerve block for control of postoperative pain after inguinal hernia surgeries.

MATERIAL AND METHODS

Place of study: This study was conducted at the department of Anaesthesiology and Critical Care, Dr. S.N.MEDICAL COLLEGE and associated group of hospitals after getting approval from ethical committee on patients undergoing inguinal hernia repair.

Time of study: It was conducted during a period between June 2019 to Nov 2019.

Design of the Study: The present study was an observational study.

Study Population: A total of 70 patients were grouped into two groups by computer generated software. We took 75 patients in our study, 2 blocks failed in TAP block group and 3 were failed in IIN-IHN block group; we excluded these 5 patients from our study and Patients were divided into two groups of 35. 35 patients per group were required for the study with $\alpha=0.05$, $\beta=0.20$, 80% power and 95% confidence limit.

1. GROUP RT: 35 Patients received TAP block using 20 ml 0.25% inj ropivacaine.

2. GROUP RI: 35 Patients received IIN-IHN block using 20 ml 0.25% inj ropivacaine.

INCLUSION CRITERIA- Patients with ASA grade I and II, between 18-60 years of age, of either sex, BMI 18-25 kg/m², posted for inguinal hernia surgeries with prior informed and written consent given by the patients.

EXCLUSION CRITERIA-

Exclusion criteria included patients with Known hypersensitivity to local anesthetics, Opioid addicts, Any chronic systemic illness, Bleeding diathesis, Anatomical abnormality, Any infection at the regional site, Peripheral neuropathy or neurological deficits

Data Analysis-

Data was recorded as per Performa. The data analysis was computer based; SPSS-22 will be used for analysis. For categoric variables chi-square test was used. For continuous variables independent samples t-test was used. p -value <0.05 was considered as significant.

RESULTS

Table 1: Comparison of time for analgesia

	Group RT (N=35)		Group RI (N=35)		z score	p value
	Median n	Interquartile range (Q1,Q3)	Median n	Interquartile range (Q1,Q3)		
Time for Analgesia (minutes)	410	399, 435	680	665, 685	-43.24	<0.0001

Z test

Table 1 showing comparison of time for analgesia in both the groups which was assessed by patient's demand of analgesic for the first time after the surgery. Unpaired t test was performed and results were expressed as median (interquartile range; Q₁-Q₃). Time for analgesia in group RT and RI were 410(399,435) minutes and 680(665,685) minutes, respectively. This was found to be statistically significant with $p<0.0001$.

Table 2: Comparison of visual analogue scale score in both the groups

VAS score	Group RT (N=35)		Group RI (N=35)		z score	p value
	Median	Interquartile range (Q1,Q3)	Median	Interquartile range (Q1,Q3)		
2hr	0	0,10	0	0,10	-0.383	0.701
4hr	20	14,23	18	16,21	1.716	0.086
6hr	36	35,42	25	20,28	12.58	<0.0001
8hr	43	38,44	30	28,35	10.86	<0.0001
10hr	38	30,36	30	28,34	-5.814	<0.0001
12hr	42	36,44	30	30,34	-10.43	<0.0001
18hr	35	35,37	36	35,38	-1.2	0.23
24hr	40	35,40	38	36,42	2.809	0.614

Z test

Table 2 showing comparison in VAS score of the patients in first 24 hours after surgery. VAS scores were recorded at every 2 hours up to twelfth hour and then 6 hourly thereafter. Z -test was performed to analyze VAS scores. Significance was considered when p value <0.05 . Median VAS scores were found to be significantly better in group RI when compared to group RT from sixth to twelfth hour ($p<0.05$) but no

significant difference was observed between the two groups at second, fourth, eighteenth and twenty fourth hours.

Table 3: Tramadol consumption(mg)

Total tramadol consumption (mg)	Group RT (N=35)		Group RI (N=35)		p value
	N	%	N	%	
100	0	0.00	11	31.43	
200	6	17.14	21	60.00	
300	29	82.86	3	8.57	
Median	300		200		
Range	200-300		100-300		
Mean $\pm$ SD	282.85 $\pm$ 38.23		177.14 $\pm$ 59.83		<0.0001

Unpaired t test

Table 3 shows tramadol consumption in group RT and RI. Unpaired Student's t-test was applied and $p <0.05$ was considered significant. The tramadol consumption in group RT and group RI were 282.85 $\pm$ 38.23 and 177.14 $\pm$ 59.83 mg respectively, with $p<0.05$ (significant).

DISCUSSION

Pain is an intricate cluster of unpleasant sensory, autonomic and behavioural responses. Following inguinal hernia repair, moderate or severe pain may lead to the increased consumption of analgesics.

Callesen et al^[8] discovered moderate or severe pain scores after herniorrhaphy in 60% of cases within 24 hours. It was suggested that following herniorrhaphy, inadequate control of postoperative pain might be a risk factor for the development of chronic pain^[19].

Multi-modal pain therapy (balanced analgesia) is the recommended technique for treatment of postoperative pain^[10]. The rationale for this therapy is to achieve sufficient analgesia due to additive or synergistic effects between different analgesics. Appropriate pain treatment protocols to reduce postoperative morbidity, improve the overall surgical outcome and also decrease hospital costs.

Numerous studies have demonstrated that TAP block reduces post operative opioid consumption and opioid associated side effects. IIN-IHN block is another means of post operative analgesia for lower abdominal surgeries^[20].

IIN-IHN blocks have been shown to be more effective when done under US guidance^[19]. Fredrickson et al^[20] were the first to compare ultrasound guided IIN-IHN block to ultrasound guided TAP block.

Limited studies are there in which postoperative analgesic efficacy of US guided TAP block and IIN-IHN block is compared. We want to confirm the results so we chose to study on this.

Wang et al^[12] conducted a meta-analysis to evaluate the clinical efficacy of US guided ilioinguinal/iliohypogastric nerve or TAP blocks for perioperative analgesia in patients undergoing open inguinal surgery. They concluded that US guided ilioinguinal/ iliohypogastric nerve or TAP blocks were associated with a reduced use of intraoperative additional analgesia and a significant reduction of pain scores during day-stay when compared to landmark based methods.

Sharma et al^[21] conducted a study comparing 0.5% ropivacaine with 0.25% bupivacaine in USG guided TAP Block on patients undergoing abdominal surgeries and found that 0.50% ropivacaine provided longer duration of analgesia as compared to 0.25% bupivacaine ($p=0.045$).

Various aspects related to quality and duration of analgesia i.e. time for analgesia, visual analogue score, total analgesic consumption, effect on hemodynamic parameters and side effects were observed in present study.

Hemodynamic parameters:

The results of our study show that there were minimal variations in preoperative, intraoperative as well as postoperative mean heart rate, blood pressure and oxygen saturation in the three groups, which were statistically not significant. Our results were in agreement with most of the previous similar studies^[22,23,24]. They also didn't find any significant difference in haemodynamic parameters between the group.

Visual analogue scale score:

IIN-IHN block significantly improved the quality of analgesia as observed by improved VAS scores from 6th to 12th hour in group RI as compared to group RT. The median VAS score in group RT and RI at 6hr [36 (35,42) vs 25 (20,28); $p<0.0001$], 8hr [43 (38,44) vs 30 (28,35); $p<0.0001$], 10hr [38 (30,36) vs 30 (28,35); $p<0.0001$] and 12hr [42 (36,44) vs 30 (30,34); $p<0.0001$] were found to be significant. No significant difference was observed in VAS scores in group RT and RI on 2nd hr [0.00(0,5) vs 0.00(0,4); $p=0.701$], 4th hr [20(14,23) vs 18(16,21); $p=0.086$], 18th hr [35(35,37) vs 36(35,38); $p=0.23$] and 24th hr [40(35,40) vs 38(36,42); $p=0.615$]. These observations were consistent with previous studies where better VAS scores were observed in IIN-IHN block groups.^[16,23,24,25]

Kamal K et al.^[16] had concluded that VAS scores were significantly lower in the postoperative period in IIN-IHN block group in comparison with TAP block group at 2hr (1.60±0.62 vs. 0.80±0.58), (p<0.001), 4 hr (1.83±0.48 vs 0.84±0.65, p<0.001), 6hr (2.25±0.49 vs. 1.27±0.68, p<0.001), 8 hr (3.35±0.45 vs. 2.07±0.71, p<0.001) and 10 hr (3.44±0.45 vs. 2.84±0.79, p=0.003) after deposition of block. **Faiz SHR et al.**^[25] concluded that patients who received IIN-IHN block expressed less pain at rest assessed at 4, 8, and 12 hours after deposition of block in comparison with TAP block group (p=0.013).

Tramadol consumption:

In our study IIN-IHN block significantly reduce tramadol consumption in comparison to TAP block. Mean tramadol consumption in group RT (282.85±38.23mg) was significantly higher when compared to group RI (177.14±59.83mg) (p<0.05). These findings were consistent with the the previous studies^[16,23,25].

Kamal K et al.^[16] had concluded that mean dose of tablet diclofenac required 200±35.96 mg in group TAP and 172.5±34.96 mg in group IIN-IHN. This difference was significant with p value=0.04. **Stav A et al.**^[25] had concluded morphine (10.69 vs. 18.76mg, p=0.004) and dipyron (327 vs. 41mg, p<0.001) consumption following PACU discharge and upto 24 hours post-op were significantly reduced in IIN-IHN block group compared with TAP block group. **Ahemed SA et al.**^[23] had concluded the mean tramadol consumption for the TAP group was 52.45±30.5 and for IIN-IHN block group, it was 37.25±27.09 mg; p=0.009.

Time for rescue analgesia:

In our study IIN-IHN block significantly improved the duration of analgesia. The time for analgesia in group RI was 680(665,685) minutes which was significantly longer than 410(399,435) minutes of group RT (p<0.05). This observation was also consistent with findings of previously done studies^[16,23,24].

Kamal K et al.^[16] had concluded the average time after which rescue analgesia was required was 319.8±115.2 min in group TAP and 408±116.4 min in group IIN-IHN (p<0.05). **Ahemed SA et al.**^[23] had concluded the mean first analgesic consumption time was 10.71±7.67 hr for the TAP group and 14.09±8.20 hr for the IIN-IHN block group, with p value of 0.03. **Faiz SHR et al.**^[24] concluded that patients in IIN-IHN block group requested the first dose of analgesic 2.1 hours later than the patients who received TAP block (p=0.034).

IIN-IHN block provides better postoperative analgesia than TAP block, probable explanation given by **Stav A et al** and **Faiz SHR et al.** TAP block is compartmental block and spread of LA is relatively large (T7 to L2) while IIN-IHN block is truncal block and the LA only spreads around the target nerves. Thus we can assume that following IIN-IHN block a relatively high quantity of ropivacaine had spread around target nerves compared with TAP block. It is possible that the quality of nerve block is similar immediately postoperative; however when quantity of LA around and in the nerves decreases, the quality of block changes, i.e. quality of IIN-IHN block improves^[23].

CONCLUSION

We conclude from our study that US guided IIN-IHN block significantly reduced the intensity of postoperative pain and prolonged the duration of postoperative analgesia in comparison with TAP block, thereby reducing analgesic consumption and associated adverse effects.

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