Original Research Article

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Comparison of Efficacy of US Guided TAP Block with US Guided Ilioinguinal Nerve Block for Inguinal Herniorrhaphy

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Abstract

Context: Inguinal hernia surgeries are associated with moderate to severe pain postoperatively and various pain management strategies have been employed. *Aims:* To compare the efficacy of US guided IIN/ILN block with US guided TAP block for postoperative pain management in adult patients undergoing inguinal herniorrhaphy under spinal anaesthesia. *Settings and Design*: Prospective randomised double blinded study. *Methods and Material*: Sixty adult patients undergoing inguinal herniorrhaphy under spinal anaesthesia were randomly allocated into two groups each having thirty patients: group T who received US guided TAP block after the surgery and group I who received USG IIN/IHN block after the surgery. The postoperative visual analogue scale (VAS) was measured at 3,6,9,12, and 24 hours respectively. The time to first request for analgesia was recorded in the groups. *Statistical analysis used*: Student's t test (two tailed, independent) and Chi square /Fisher Exact test were used for statistical analysis. *Results*: The mean VAS scale at rest in Group T at 6, 12 and 24 hours were 2.97±1.85,3.20±1.77 and 4.33±1.67 as compared to 1.57±0.86, 1.83±0.87 and 1.90±0.92 in group I respectively. The mean VAS on movement at 6, 12 and 24 hours in group T were 3.57±2.22 , 4.40±1.83 and 5.23±1.55 respectively as compared to, 2.40±1.00, 3.37±1.35 and 2.70±1.26 respectively in Group I. The mean time to first analgesia was 7.10±3.94 hours in group T as compared to 10.15±4.44 hours in group I. *Conclusions*: US guided IIN/IHN block provides better analgesia and longer duration of analgesia compared to ultrasound guided TAP block for inguinal heriorrhaphy.

Keywords: Ultrasound Transversus Abdominis Plane Block Herniorrhaphy.

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Introduction

Inguinal hernia repair is one of the most commonly performed surgical procedures worldwide [1]. It is associated with moderate to severe postoperative pain, delayed return to normal daily activities and may also cause persistant post surgical pain in 0 to 43% of the patients [2]. Anaesthetic techniques like general anaesthesia, sedation, spinal anaesthesia, ilioinguinal/iliohypogastric (IIN/ILN) block, infiltration of surgical field with a long-acting local anaesthetic (LA) agent [3] and unilateral transverses abdominis plane (TAP) block [4] have been employed to perform this surgery. By landmark based technique the Ilioinginal and iliohypogastric nerves (IIN/IHN) are blocked anteromedial to the anterior superior iliac spine. Despite its seemingly easy application, relatively high failure rate of 10-25% has been reported. A significant increase in the overall success

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rate of adequate blocks has been described using an ultrasound guided (USG) technique [5]. The transversus abdominis plane (TAP) is an intermuscular plane between the internal oblique and transverses abdominis muscles. The TAP block is a regional anaesthesia technique that provides analgesia to the parietal peritoneum as well as to the skin and muscles of the anterior abdominal wall from the T7 to L1 dermatomes. This technique can be easily performed under ultrasound guidance and has been found to be effective in reducing the pain intensity and analgesic consumption after abdominal surgery [6]. Despite its wide range of applications, the role of TAP block in anaesthesia for IHR remains understudied [7]. Few studies are available which compare the efficacy of IIN/IHN block with that TAP block, however conclusions are unequivocal [8,9,10,11]. The aim of this study was to compare the efficacy of USG TAP block with USG IIN/IHN block for postoperative pain management in inguinal hernia repair (IHR).

Materials and Methods

This study is registered at clinical trials registry – India (CTRI/2018/05/013802). After obtaining approval from the institutional ethics committee and written informed consent, sixty American society of Anaesthesiologists (ASA) 1 and 2 patients posted for elective open inguinal herniorrhaphy were included in a prospective, randomised, double blinded, controlled clinical trial. The criteria for enrolling the patients for the study were as follows:

Inclusion Criteria

Patients over 18 years of age

ASA 1 or 2 status

Patients scheduled for elective single sided inguinal hernia repair

Exclusion Criteria

Patient Refusal

Patients with one of the contraindications to spinal anaesthesia and/or peripheral nerve blocks as listed by NYSORA(Newyork School of Regional Anaesthesia).

Patients scheduled for emergency surgery or bilateral inguinal herniorrhaphy.

The patients were randomised by sealed envelope technique to undergo USG TAP block with 0.25% bupivacaine (n=30) 20 ml on the operative side-Group T or USG IIN/IHN block with 0.5 % bupivacaine (n=30) 10 ml on the operative side-Group I. The allocation sequence was generated by random number table. During the preanaesthetic checkup the patients were also instructed about how to make use of a 10mm visual analogue scale (VAS) graded from 0 (no pain) to 10 (most severe pain). All patients received spinal anaesthesia with 0.5% hyperbaric bupivacaine 16 to 18 mg to achieve a dermatomal level of anaesthesia of T6. The postoperative collection of data for the study were done by clinicians who were blinded to the allotment. US guided TAP block was administered to all patients in group T after skin closure. The TAP block was administered by posterior approach using Sonosite ultrasonography machine with a linear array transducer probe (6-13MHz). Patients were then transferred to the post anaesthesia recovery room. US guided IIN/IHN block was given to all patients in group I after skin closure. IIN/IHG block was administered by the in plane approach using the Sonosite ultrasonography machine with a linear array transducer probe (6-13 MHz). Patients were then transferred to the postoperative recovery room. The severity of pain was assessed by an investigator blinded to the allotment at 3, 6, 9, 12 and 24 hours using the visual analogue score (VAS) (0= no pain and 10= worst possible pain).

Rescue analgesia in the form of intravenous tramadol at a dose of 2mg/kg was given to patients on demand or when VAS was more than 4. The parameters studied and compared in both the groups were heart rate, blood pressure VAS at rest and on coughing at 3, 6, 9, 12 and 24 hours. Descriptive and inferential statistical analysis was carried out in this study. Results on continuos measurements are presented as mean±SD (min-max) and results on categorical measurements are presented in number (%). Significance is assessed at 5% level of significance. The following assumptions on data are made. Assumption 1. Dependent variables should be normally distributed. 2. Samples drawn from population should be random and cases of the samples should be independent. Student T test (two tailed, independent) has been used to find the sigificance of study parameters on continuous scale between two groups (intergroup analysis) on metric parameters. Leven's test for homogenicity of variance has been performed to assess the homogenicity of variance. Chi-square/ Fisher exact test has been used to find the significance of study parameters on categorical scale between the two groups, Non-parametric setting for qualitative data analysis. Fisher exact test was used when cell samples are very small. P value:

0.05<p<0.10 means of suggestive significance, P value 0.01<p<0.05 is moderately significant and a p value p ≤ 0.01 is strongly significant. The statistical software namely SPSS18.9 and R environment ver.3.2.2. were used for the analysis of the data and Microsoft word and excel have been used to generate graphs, tables etc.

Results

The demographic data were similar in both the study groups. The subjects in both the groups were well matched with respect to age (Table 1) and weight (Table 2). The mean age in group T was 53±12.44 years and group I was 53.53±11.71 years. All were male patients with mean weight of 65.67±5.73 kg in group T and 65.37±5.88 kg in group I. The heart rate and systolic blood pressure were comparable in the two groups suggesting that both the blocks did not cause any major changes in haemodynamics (Figure 1 and 2). The mean VAS scale at rest at 6 hours for Group T was 2.97±1.85 as compared to 1.57±0.86. The mean VAS scores at rest (Table 3) at 12 hours was 3.20±1.77 in group T as compared to 1.83±0.87 in group I.The VAS scores at 24 hours was 4.33±1.67 in Group T as compared to 1.90±0.92 in Group I.The VAS scores at rest were higher in Group T as compared to Group I at 6, 12 and 24 hours and the difference was statistically significant (Figure 3). The VAS scores were also assessed after making the patients cough and were documented as VAS (movement). The VAS (movement) was 3.57±2.22 in Group T as compared to 2.40±1.00 at 6hours in Group I (Table 4) . The VAS at 12 hours was 4.40±1.83 as compared to 3.37±1.35

Table 1:

Age in Years	Group I	Group II	Total
<30	1 (3.3%)	0 (0%)	1 (1.7%)
30-40	4 (13.3%)	6 (20%)	10 (16.7%)
41-50	6 (20%)	7 (23.3%)	13 (21.7%)
51-60	10 (33.3%)	9 (30%)	19 (31.7%)
61-70	8 (26.7%)	8 (26.7%)	16 (26.7%)
>70	1 (3.3%)	0 (0%)	1 (1.7%)
Total	30 (100%)	30 (100%)	60 (100%)
Mean ± SD	53.93 ± 12.44	53.53 ± 11.71	53.73 ± 11.98

Samples are age matched with p=0.898, Student t test

Table 2:

Weight (kg)	Group I	Group II	Total
51-60	8(26.7%)	7(23.3%)	15(25%)
61-70	17(56.7%)	16(53.3%)	33(55%)
71-80	5(16.7%)	7(23.3%)	12(20%)
Total	30(100%)	30(100%)	60(100%)
Mean ± SD	65.57±5.73	65.37±5.88	65.47±5.76

p=0.894, Not significant, student t test

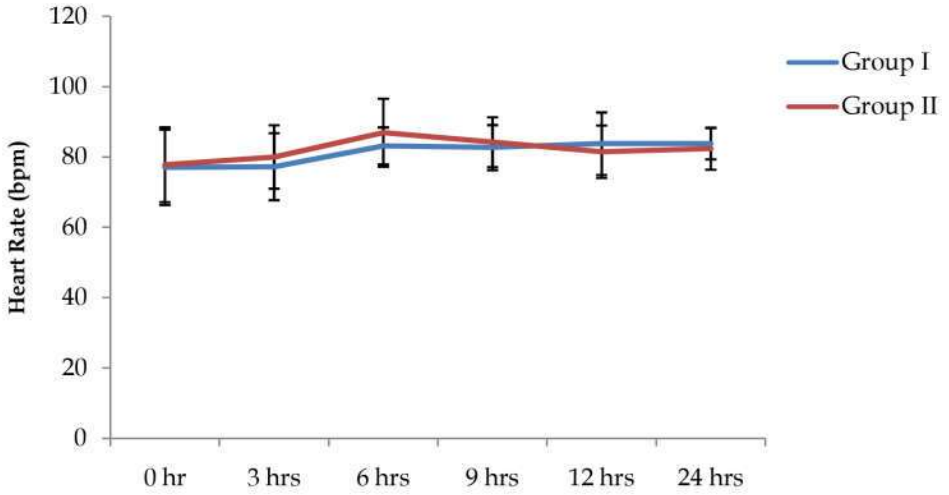

Fig. 1:

Table 3: VAS (REST)- Comparison in two groups of patients studied

VAS (REST)	Group T	Group I	Total	P value
0 hr	0.47±1.25	0.97±0.93	0.72±1.12	0.084+
3 hrs	2.07±1.55	2.13±0.68	2.10±1.19	0.830
6 hrs	2.97±1.85	1.57±0.86	2.27±1.59	<0.001**
9 hrs	2.80±1.40	2.47±1.50	2.63±1.45	0.378
12 hrs	3.20±1.77	1.83±0.87	2.52±1.55	<0.001**
24 hrs	4.33±1.67	1.90±0.92	3.12±1.81	<0.001**

Student t test (Two tailed, Independent)

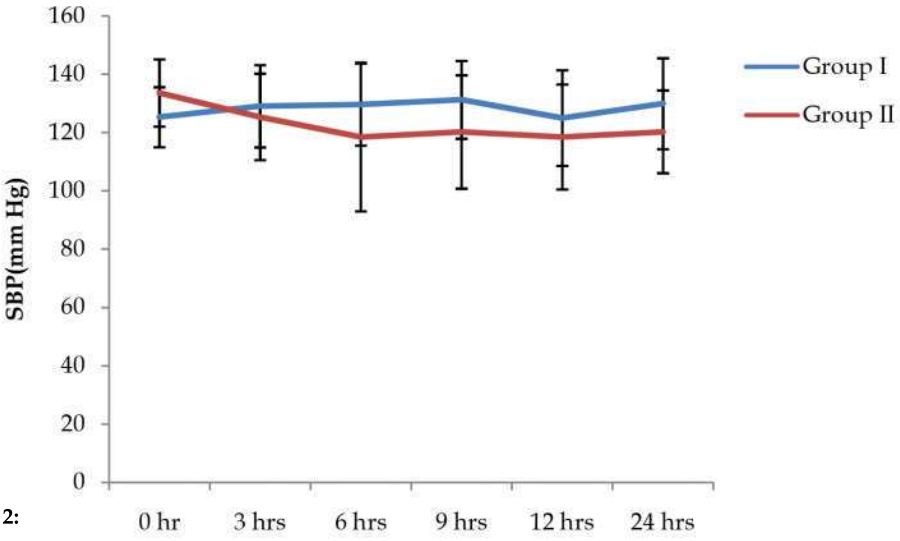

Fig. 2:

Table 4: VAS (Movement)- Comparison in two groups of patients studied

VAS (Movement)	Group T	Group I	Total	P value
0 hr	0.60±1.59	1.47±1.36	1.03±1.53	0.027*
3 hrs	2.83±2.00	2.70±0.88	2.77±1.53	0.739
6 hrs	3.57±2.22	2.40±1.00	2.98±1.81	0.011*
9 hrs	3.90±1.47	3.40±1.71	3.65±1.60	0.230
12 hrs	4.40±1.83	3.37±1.35	3.88±1.68	0.016*
24 hrs	5.23±1.55	2.70±1.26	3.97±1.90	<0.001**

Student t test (Two tailed, Independent

Table 5: Time to first analgesia- Distribution in two groups of patients studied

Time to first analgesia	Group I	Group II	Total
<12	25(83.3%)	16(53.3%)	41(68.3%)
12-24	5(16.7%)	14(46.7%)	19(31.7%)
>24	0(0%)	0(0%)	0(0%)
Total	30(100%)	30(100%)	60(100%)
Mean ±SD	7.10±3.94	10.15±4.44	8.63±4.43

in Group T and I respectively (Table 4). The VAS (movement) at 24 hours was 5.23±1.55 as compared to 2.70±1.26 in group T and I respectively (Table 4). The VAS (movement) was higher in Group T as compared to group I at 24 hours and this difference was statistically significant (Figure 4). The mean time to first analgesia was 7.10±3.94 hours in Group T as compared to 10.15±4.44 hours in Group I. About 83.3% of the patients in Group T requested for rescue analgesia within the first 12 hours post-operatively as compared to 53.3% in Group I (Table 5). This suggests that although the pain scores were lower in Group I the request for analgesia was earlier in Group I as compared to Group T (Figure 5). This difference is statistically significant with a P value of 0.007, as deduced by the student t test (Table 5).

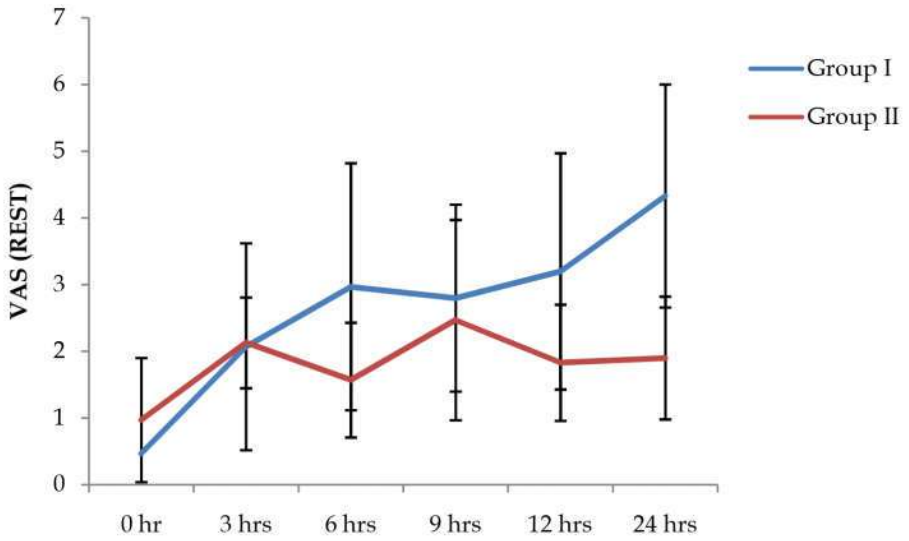

Fig. 3:

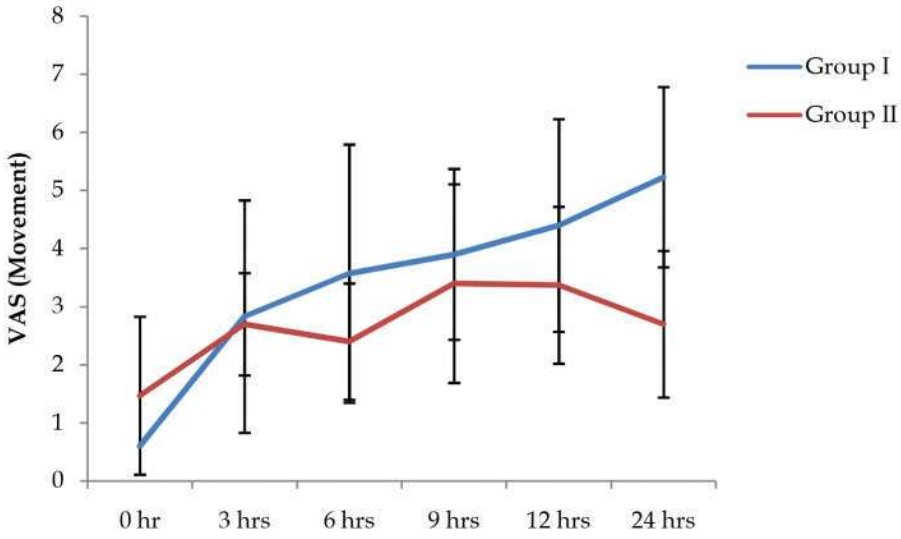

Fig. 4:

Discussion

The inguinal region is primarily innervated by the IIN and IHN [11]. These two nerves exit the lumbar plexus, leaving the psoas major laterally to travel along the anterior surface of the quadratus lumborum muscle before penetrating the transversus abdominis muscle to travel in the transversalis plane [11]. In this plane, LA agents exert action in both the IIN/IHN block and the TAP block at different points along the course of the nerves [12]. Inguinal herniorrhaphy induces parietal pain depending on the IHN distribution. Pareital infiltration usually performed blindly , has been documented to provide pain relief during the first few postoperative hours [13]. However, after the IHN block, the duration of the block is not prolonged enough to allow pain control during the entire postoperative period; pain relief also may be incomplete [13]. Weintraud et al. [14] showed that the landmark based IIN/IHN block results in intramuscular injection in > 80% of cases and with a failure rate of 40% whereas the ultrasound guided technique is associated with a success rate of >95% because of exact intermuscular administration of LA agent around the nerve structures. Due to these reasons we compared two ultrasound guided nerve block techniques for analgesia postoperatively in IHR surgeries. During the immediate postoperative period and upto 6 hours postoperatively the VAS at rest was comparable in both the groups. However after 6 hours of the block the VAS scores at rest were

significantly higher in the group T as compared to the group I ($p<0.001$). The VAS at rest scores at 12 hours and 24 hours postoperatively were higher in group T as compared to group I and this difference was statistically significant ($p<0.05$). A similar trend was observed in VAS on movement / coughing wherein the VAS scores were higher in the group T at 6, 12 and 24 hours postoperatively and this difference was statistically significant ($p<0.05$). These findings correlate with the study done by Kamal et al. [15] where the patients who received US guided TAP block had higher pain scores postoperatively as compared to those who received US guided IIN/IHN block. In the study by Aveline et al. [16] ultrasound guided TAP block was compared with blind IIN/IHN block for day care inguinal hernia repair. It was observed that VAS at rest was significantly lower in the TAP group at 4, 12 and 24 hours as compared to IIN/IHN group. This is in contrast to our study findings where ultrasound guided IIN/IHN block has proven to be superior as regards pain relief and can be explained by the fact that we used ultrasound guided technique which allows accurate visualisation of the nerves and deposition of the LA in the near vicinity of the nerves. The findings of our study correlate with those of Stav et al. [9] where the pain scores were lower in the ultrasound guided IIN/IHN group as compared to ultrasound guided TAP group for patients undergoing Lichtensteins patch tension free method of open inguinal hernia repair under general anaesthesia. In the study by Frassanito et al. [17] it was noted that a combination of US guided TAP and US guided IIN/IHN block provides adequate analgesia for inguinal herniorrhaphy surgeries postoperatively when compared to just US guided IIN/IHN block. Intravenous tramadol at a dose of 2mg/kg was administered to all patients who complained of pain or in those patients having a VAS>4. The time to this first request for analgesia was documented and compared in the two groups. It was noted that the patients in groupT (7.10±3.94 hours) demanded analgesia earlier as compared to the patients in group I (10.15 ± 4.44 hours). In group T 83.3% of the patients requested for analgesia within the first 12 hours postoperatively as compared to 53.3% of the patients in group T. These findings are contrasting to those of Sujatha et al. [4] who compared ultrasound guided TAP block to US guided ilioinguinal nerve block with wound infiltration after spinal anaesthesia. The time to first rescue for analgesia in their study was higher in the US guided TAP group as compared to the US guided IIN/IHN group. The concentration of the drug for US guided IIN/IHN block in our study was higher (i.e 10ml of 0.5% bupivacine for US guided IIN/IHN block as compared to 20 ml of 0.25% bupivacine for US guided TAP) as compared to the study by Sujatha et al[4] where similar concentrations were used in both groups, and this might explain the contrasting results. Since TAP block is a compartment block and is volume dependent we used 20 ml of 0.25% bupivacaine for US guided TAP block whereas the same dose of drug was injected, but at higher concentration and lower volume for US guided IIN/IHN block. There were no adverse effects noted in the first 24 hours postoperatively after the block. The haemodynamics in both the groups were within normal limits.

Conclusion

- Ultrasound guided ilioinguinal and iliohypogastric nerve block provides better postoperative analgesia than ultrasound guided transversua abdominis plane block for adult patients undergoing inguinal herniorrhaphy under spinal anaesthesia.
- Ultrasound guided ilioinguinal and iliohypogastric nerve block provides a longer duration of postoperative analgesia than ultrasound guided transversus abdominis plane block.

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Conflict of Interest: none

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