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A Prospective, Randomized Study Comparing Ultrasound Guided Transversus Abdominis Plane Block and Ultrasound Guided Ilioinguinal, Iliohypogastric Nerve Blocks in Patients Undergoing Open Inguinal Hernia Repair

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Abstract: ***Background: Transversus Abdominis Plane Block and Ilioinguinal Iliohypogastric nerve blocks have been documented to provide effective analgesia after lower abdominal surgeries. But there are limited studies comparing both techniques. Methods: Sixty patients undergoing unilateral open inguinal hernia repair were randomly assigned into two groups, either to receive ultrasound guided Transversus Abdominis Plane Block or ultrasound guided Ilioinguinal Iliohypogastric nerve blocks with 20 ml of 0.5% bupivacaine. All patients received general anaesthesia. The patients were monitored for intraoperative hemodynamics, intraoperative opioid requirement, and post operative visual analogue pain scale for 24 hours. Results: Intraoperative hemodynamics between two groups was considered to be not statistically significant (p> 0.05). The mean intraoperative fentanyl requirement in TAP group is 132 ± 17.49 microgram and in IIIH block group is 130.33 ± 14.49 microgram. The p value is 0.689. The mean post-operative vas score at 4, 6, 12, 24 hrs (TAP vs IIIH) are 3.23vs2.97; 2.97vs3.30; 2.53vs2.07; 1.37vs0.76, respectively. Thus the post-operative analgesia is considered to be statistically not significant between two groups, since p > 0.05. Conclusion: We concluded that the analgesic efficacy of ultrasound guided ilioinguinal, iliohypogastric nerve block is as effective as ultrasound guided transversus abdominis plane block in patients undergoing unilateral open inguinal hernia repair.***

Keywords: Transversus Abdominis Plane Block, Ilioinguinal Iliohypogastric nerve blocks, analgesia, bupivacaine, general anaesthesia, opioid, visual analogue pain scale.

1. Introduction

Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage. Postoperative pain is the main adverse outcome that distresses the patient, prolongs the hospital stay and increases the incidence of admission after surgery.

Inguinal hernia repair is one of the commonest surgeries performed. Provision of effective post operative pain control is the key to

- Improve patient comfort and satisfaction
- Facilitate early mobilization
- Reduce risk of deep vein thrombosis
- Facilitate faster recovery and less likelihood of the
- Development of neuropathic pain
- Reduce cost of care

Opioids and NSAIDS are commonly used for post – operative pain relief for inguinal hernia repair. Though opioids provide effective analgesia, they have side effects such as nausea, vomiting, urinary retention, pruritus and respiratory depression, hence require close monitoring.

Transversus abdominis plane block and Ilioinguinal, Iliohypogastric nerve blocks were performed successfully in the past with effective post-operative analgesia devoid of systemic side effects.

Rafi et al in the year of 2001 first described Transversus abdominis plane block. Transversus abdominis plane block provide analgesia to pain arising from skin, abdominal muscles of anterior abdominal wall, and parietal peritoneum.

Both Transversus abdominis plane block as well as Ilioinguinal, iliohypogastric nerve blocks were proven to reduce post-operative VAS score as well as opioid consumption devoid of significant systemic side effects. Performing these blocks under ultrasound guidance is absolutely safe. With these we conducted a prospective randomized study comparing analgesic efficacy of ultrasound guided Transversus abdominis plane block and ultrasound guided Ilioinguinal, Iliohypogastric nerve blocks in patients undergoing elective unilateral open inguinal hernia repair.

2. Materials and Methods

This study was conducted at Adhichuchunagiri institute of medical science, Bellore cross, on 60 patients undergoing elective unilateral open inguinal hernia repair. The study was conducted after obtaining Ethics committee approval. Informed written consent was obtained from the patients who were included in the study.

Study Design

The study was a Prospective, Randomized, comparative study. Sixty patients presenting for elective open inguinal hernia repair were randomly assigned to two groups. Only patients meeting the selection criteria were included in the study. Randomisation done by alternating patients to either Transversus abdominis plane block group (Group 1) or Ilioinguinal, Iliohypogastric nerve blocks group (Group 2)

Group 1 Pre operative ultrasound guided transversus abdominis plane block with 0.5% bupivacaine.
Group-2 Pre-operative ultrasound guided ilioinguinal, iliohypogastric nerve blocks with 0.5% bupivacaine.

Ultrasound guided transversus abdominis plane block

- Patient in supine position, the 6 – 13 MHz linear array probe5 is placed between iliac crest and costal margin on the lateral abdominal wall under strict aseptic precautions.
- Probe is aligned, rotated, and tilted in such a way to obtain clear optimized image of three muscle layers and TAP is identified.
- After skin infiltration with 2% lignocaine a 22 gauge 3.5 inch needle is inserted with in-plane technique.
- Needle shaft is identified and Saline is used to hydrodissect the transversus abdominis plane to visualise the needle tip easier.
- Sterile inj bupivacaine 0.5 % (20 ml) 6 is deposited in TAP.
- Correct placement of the drug is identified by a concave shaped echoluscent deposition of anaesthetic solution in the plane which pushes the transversus abdominis down.

Ultrasound guided ilioinguinal, iliohypogastric nerve blocks

- Patient in supine position. Skin is disinfected with povidine iodine.
- Under strict aseptic precautions the high frequency 6 – 13 MHz linear array probe5 is placed posterior and superior to the anterior superior iliac spine (ASIS) perpendicular to ilioinguinal, iliohypogastric nerve course.
- The probe is aligned, rotated, and tilted to optimise the needle image. Iliac crest is identified. Both nerves are located within 1.5 cm from iliac crest in the plane between internal oblique and transversus abdominis muscle.
- The deep circumflex iliac artery can be revealed with colour Doppler close proximity to these nerves.
- Then 22 gauge 3.5 inch needle is inserted with in-plane technique. Needle tip and shaft is visualised in the plane close to the nerves and 0.5 % bupivacaine solution (20 ml) is deposited after negative aspiration.
- All patients were given inj cefotaxim 1gm IV, inj. Glycopyrrolate 0.2 mg IV, inj. Fentanyl 2 microgram / kg IV and induced with inj. Propofol 1.5 – 2mg/kg IV. Airway maintained with appropriate size laryngeal mask airway.
- Anaesthesia maintained with sevoflurane 1-2%, 50% N2Os with O2.
- Intra-operative hemodynamics and fentanyl requirements were recorded. when mean arterial pressure exceeds 20% more than baseline inj. fentanyl 20 microgram is given.
- At the end of procedure patients were extubated, and post operatively received standard analgesic regime. (oral paracetamol 1 gm 6th hourly, oral diclofenac 50mg) 6
- Patients were monitored for Visual analogue pain scale (VAS) and incidence of side effects for 24 hours post–operatively. Inj tramadol 75 mg IV was used as rescue analgesic when VAS scores more than four.

Statistical Analysis

Descriptive statistics was done for all data and suitable statistical tests of comparison were done. Continuous variables were analysed with the T test and categorical variables were analysed with the Chi-Square Test and Fisher Exact Test. Statistical significance was taken as $P < 0.05$. The data was analysed using EpiInfo software (7.1.0.6 version; Center for disease control, USA) and Microsoft Excel 2010.

3. Observation and Results

Treatment Groups	Name of Group	Treatment	Number of Subjects
Group A	TAP	Ultrasound guided transversus abdominis plane block in patients undergoing open inguinal hernia repair	30
Group B	IIIH	Ultrasound guided ilioinguinal, iliohypogastric nerve blocks in patients undergoing open inguinal hernia repair	30

Statistics

Descriptive statistics was done for all data and suitable statistical tests of comparison were done. Continuous variables were analysed with the T test and categorical variables were analysed with the Chi-Square Test and Fisher Exact Test. Statistical significance was taken as $P < 0.05$. The data was analysed using EpiInfo software (7.1.0.6 version; Center for disease control, USA) and Microsoft Excel 2010.

Sample Size Calculation

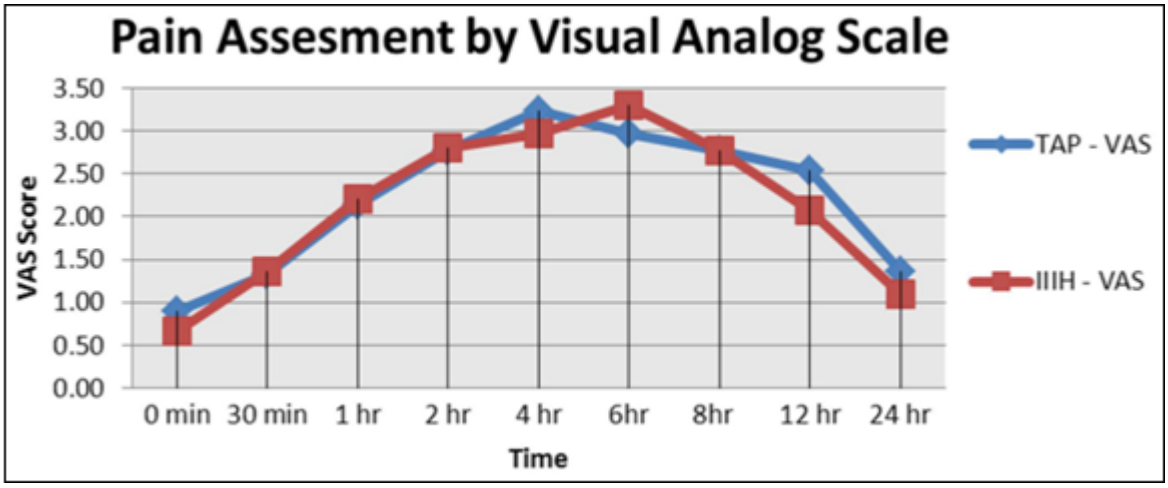
Sample size was determined on the basis of a pilot study in which the reduction in post-operative pain score (visual analogue scale) was measured as 15%. We calculated a minimum sample size of 24 patients was required in each group, assuming a type error (two-tailed) of 0.05 and a margin of error of 10%. Therefore, the final sample selected was n=30 in Group A and n=30 in Group B.

$n=t^2 \times p\ (1-p)\ m^2$
Description
n = required sample size
t = confidence level at 95% (standard value of 1.96)
p = estimated prevalence of malnutrition in the project area
m = margin of error at 10% (standard value of 0.05)
$n= (1.96)^2 \times 0.15\ (1-0.15)\ (0.1)^2$
$n=3.8146 \times 0.1275$
0.01
= 24 per group

4. Results

Intraoperative hemodynamics between two groups was considered to be not statistically significant ($p> 0.05$). The

mean intraoperative fentanyl requirement in TAP group is 132 ± 17.49 microgram and in IIIH block group is 130.33 ± 14.49 microgram. The p value is 0.689. The mean post-operative vas score at 4, 6, 12, 24 hrs (TAP vs IIIH) are 3.23vs2.97; 2.97vs3.30; 2.53vs2.07; 1.37vs0.76, respectively. Thus the post-operative analgesia is considered to be statistically not significant between two groups, since p > 0.05.



	VAS	0 min	30 min	1 hr	2 hr	4 hr	6hr	8hr	12 hr	24 hr
TAP	N	30	30	30	30	30	30	30	30	30
	Mean	0.90	1.33	2.13	2.77	3.23	2.97	2.77	2.53	1.37
	SD	0.80	0.71	0.68	0.90	0.97	1.10	0.82	0.68	0.56
II/IH	N	30	30	30	30	30	30	30	30	30
	Mean	0.67	1.37	2.20	2.80	2.97	3.30	2.77	2.07	1.10
	SD	0.66	0.81	0.76	0.76	0.93	1.06	0.77	0.58	0.76
	P value Unpaired t test	0.22427	0.865977	0.722086	0.877269	0.281423	0.235497	1.000	0.6094	0.126465

By conventional criteria the association between the treatment groups, The mean post-operative vas score at 4, 6, 12, 24 hrs (TAP vs IIIH) are 3.23vs2.97; 2.97vs3.30; 2.53vs2.07; 1.37vs0.76, respectively. The post operative analgesia is considered to be statistically not significant since p > 0.05.

5. Conclusion

In our study we concluded that the analgesic efficacy of ultrasound guided ilioinguinal iliohypogastric nerve block is as effective as ultrasound guided transversus abdominis plane block in patients undergoing unilateral open inguinal hernia rep

6. Summary

On comparing ultrasound guided transversus abdominis plane block with ultrasound guided ilioinguinal, iliohypogastric nerve blocks in patients undergoing unilateral open inguinal hernia repair, we found that, the intra operative hemodynamics are well maintained in both groups. The intraoperative fentanyl requirement is nearly equal and comparable between two groups. (TAP block 132 ± 17.49 microgram and IIIH block 130.33 ± 14.49 microgram) The post operative analgesia (24hr) in terms of visual analogue pain score is comparable between two groups. The first dose of rescue analgesia is given 4.86 ± 1.79 hours in TAP block group and 5.2 ± 1.86 hours in IIIH block group, which is nearly equal in two groups. The total 24 hours opioid consumption after surgery is nearly equal (TAP 82.5 ± 22.8 mg Vs IIIH 77.46 ± 13.7 mg) in two groups. There are no recorded complications due to two techniques. Thus in our study, the analgesic efficacy of ultrasound guided ilioinguinal, iliohypogastric nerve blocks in patients undergoing unilateral open inguinal hernia repair is comparable with ultrasound guided transversus abdominis plane block.

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