Section: Anaesthesiology

Original Research Article

COMPARISON BETWEEN ULTRASOUND-GUIDED TRANSVERSUS ABDOMINIS PLANE BLOCK AND CONVENTIONAL ILIOINGUINAL/ILIOHYPOGASTRIC BLOCK FOR OPEN INGUINAL HERNIA REPAIR

Daniel A[1], S.Balasubramaniam[2], E.Kathiravan[3], Sai Vishwanath G[4]

[1]Assistant Professor, Department of Anaesthesiology, Government Medical College & Hospital, Pudukkottai, Tamilnadu, India.
[2]Assistant Professor, Department of Anaesthesiology, Government Medical College & Hospital, Pudukkottai, Tamilnadu, India.
[3]Assistant Professor, Institute of Anaesthesiology & Critical Care, Madras Medical College, Tamilnadu, India.
[4]Assistant Professor, Department of Anaesthesiology, Government Medical College & Hospital, Pudukkottai, Tamilnadu, India.

Received : 28/04/2023
Received in revised form : 07/06/2023
Accepted : 20/06/2023

Keywords:
Ultrasound-guided Transversus, Abdominis plane block, Inguinal hernia repair, Conventional ilioinguinal, Iliohypogastric nerve block, Postoperative pain.

Corresponding Author:
Dr. Sai Vishwanath,
Email: saivish001@gmail.com

DOI: 10.47009/jamp.2023.5.4.83

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2023; 5 (4); 408-412

Abstract

Background: Regional anaesthesia and analgesia are essential for inguinal hernia repair, providing efficient pain relief, promoting faster recovery, reducing complications, and improving patient outcomes. This study aimed to compare Ultrasound-guided Transversus abdominis plane block and conventional ilioinguinal/iliohypogastric nerve block for postoperative pain relief in open inguinal hernia repair. **Materials and Methods:** This randomised prospective comparative study was conducted on 60 male patients with inguinal hernias at Rajiv Gandhi Government General Hospital attached to Madras Medical College, Chennai, after the Institution's Ethics Committee approval over three months during October-December 2017. Patients were divided into two groups of 30 each. Group 1 patients received ultrasound-guided Transversus abdominis plane block, and Group 2 patients received conventional Ilioinguinal/iliohypogastric nerve block. During the pre-anaesthetic assessment, detailed history was elicited, and a complete physical examination was performed. **Results:** There is no significant difference in age, weight, and ASA PS status between groups. Patients' mean weight in the ultrasound TAP group was 64.63 kg, and in the conventional IIN/IHN group was 63.67 kg. There is no significant difference in VAS score at 4 and 12 hours, but a significant difference at 24 hours between the groups (p=0.007). The Ultrasound group had a slightly higher mean time than the Conventional group and no significant difference in time of rescue analgesia between groups. There were no complications in any of the patients in both groups. **Conclusion:** USG-guided TAP block had better pain relief at 24 hours and prolonged time to rescue analgesia than conventional ilioinguinal/iliohypogastric nerve blocks, with no complications in both group.

INTRODUCTION

When performed under sedation or general anaesthesia, inguinal hernia repair is often combined with ilioinguinal/iliohypogastric nerve (IIN/IHN) block or surgical field infiltration with a long-acting local anaesthetic (LA) agent. Preoperative and immediate postoperative pain is associated with chronic pain, with reported frequency from 0% to 54%.[1,2] LA infiltration improves acute postoperative pain management and decreases postoperative visual analogue scale (VAS) scores, opioid demand, and time to first rescue analgesic administration. A blind injection of LA solution is usually performed after perceiving a loss of resistance between the external and internal oblique muscles fascia or between the internal oblique muscle and the transversus abdominis muscle.[3] The transversus abdominis plane (TAP) block has recently been described as an elective technique to reduce postoperative pain intensity and morphine consumption after lower abdominal surgery. The TAP block is easily performed under ultrasound guidance.[4]

Regional anaesthesia and analgesia are commonly used in inguinal hernia repair to control pain

ISSN (O): 2687-5365; ISSN (P): 2753-6556

effectively and offer several advantages over parenteral methods. Providing analgesia through regional techniques reduces the need for general anaesthetic drugs, leading to a faster recovery for the patient.[5,6] Additionally, these techniques decrease the postoperative requirement for opioids, which helps minimise the side effects associated with their use. Patients also experience an early return of appetite and a reduced incidence of postoperative nausea and vomiting (PONV). Regional anaesthesia allows for adequate muscle relaxation, eliminating the need for muscle relaxants and reducing the risk of respiratory insufficiency. Undesirable autonomic reflexes, such as laryngospasm and cardiac dysrhythmias, can be avoided with regional techniques. Moreover, these methods contribute to a decrease in intraoperative and postoperative bleeding and facilitate earlier ambulation. They provide greater cardiovascular stability and diminish the stress response to surgery, ultimately reducing the need for postoperative ventilatory support. Overall, regional anaesthesia and analgesia play a crucial role in inguinal hernia repair by providing efficient pain relief, promoting faster recovery, reducing complications, and improving patient outcomes.[5,7,8]

Peripheral nerve blocks are increasingly favoured over neuraxial blocks among the various regional anaesthetic techniques.[9] This is due to a lower reported incidence of complications associated with peripheral nerve blocks. Neuraxial blocks can lead to serious complications like total spinal or cauda equine syndrome. So, to avoid these complications, peripheral nerve blocks or infiltration blocks are preferred. In this scenario, ultrasonography is of immense value in regional anaesthesia and more so with peripheral nerve blocks as direct visualisation of the nerve/nerve bundles and vascular structures, tendons and bones, thereby allowing optimal placement of local anaesthetics. It reduces the risk of intravascular, intraneuronal and, more importantly, intraperitoneal injection. The location of the needle tip within the correct fascial plane and the spread of the local anaesthetic can be visualised accurately. In this way, larger local drugs can be avoided, and clinically effective blocks can be achieved. Therefore, the study aimed to compare Ultrasound-guided Transversus abdominis plane block and conventional ilioinguinal/iliohypogastric nerve block for postoperative pain relief in open inguinal hernia repair.

MATERIALS AND METHODS

This randomised prospective comparative study was conducted on 60 male patients with inguinal hernias at Rajiv Gandhi Government General Hospital attached to Madras Medical College, Chennai, after the institution's Ethics committee approval over three months during October-December 2017. After explaining the procedure in detail and informed written consent was obtained from patients.

Inclusion Criteria

Patients aged 18 -75 years with ASA PS I & II, undergoing elective surgery, and with valid informed consent were included.

Exclusion Criteria

Patients with advanced cardiac and respiratory insufficiency, skin infection at the puncture site, chronic hepatic or renal failure, lack of informed written consent, patient refusal, and patients with known hypersensitivity to local anaesthetics were excluded.

Methods

During the pre-anaesthetic assessment, detailed history was elicited, and a complete physical examination was performed. Total blood count, Liver function test, Renal function test, Blood grouping & typing, Random Blood sugar, ECG, and Chest x-ray were done. Equipment like anaesthesia workstation, multichannel monitor, AMBU bag, Bain circuit, laryngoscope with all sizes of blades, endotracheal tubes of size 6mm to 8.5mm ID, oropharyngeal airways, laryngeal mask airway size 3 & 4, ultrasound machine with high frequency (6-12 MHz) linear probe, oxygen source, suction apparatus, sevoflurane vaporiser, 18G and 22G IV cannula, syringes (2ml, 5ml, 10ml), sterile gauze pads, and sterile towel were kept ready to use when indicated.

Preoperatively, patients were given T. Alprazolam 0.5mg, T. Ranitidine 150mg and T. Perinorm 10mg per oral the night before surgery. Patients were kept nil per oral as per the standard guidelines. On the day of surgery, patients were shifted to the premedication room. IV line secured with 18G IV cannula, and Ringer Lactate was started at 2ml/kg/Hr. Patients were given premedication with Inj. Glycopyrrolate 0.2mg IM and Inj. Midazolam 1mg IM. On arrival of the patients in the operating room, NIBP, ECG, SpO_2, and temperature monitors were connected, and baseline values were recorded. The anaesthesia workstation was checked for proper functioning.

All patients in the study were given general anaesthesia as follows, Inj. Fentanyl 2mcg/kg IV, Inj. Propofol 2mg/kg IV, without neuromuscular block, and the patient's airway was maintained using a laryngeal mask. Anaesthesia was maintained with sevoflurane (0.8-1%) in a 50% mixture of O_2 and N_2O. Patients were divided into two groups of 30 each. Group 1 patients received ultrasound-guided Transversus abdominis plane block, and Group 2 patients received conventional Ilioinguinal/iliohypogastric nerve block.

Group 1 (USG guided TAP block): Immediately after induction of anaesthesia, patients were given transversus abdominis plane block under ultrasound guidance with a 6-12 MHz linear probe. The transducer was placed in a transverse plane above the iliac crest in the region of the anterior axillary line. After visualisation of the muscles and

ISSN (O): 2687-5365; ISSN (P): 2753-6556

intervening plane, 20 ml of 0.25% Bupivacaine was injected into the transversus abdominis plane and time was noted.

Group 2 (Conventional ilioinguinal/iliohypogastric nerve block): Immediately after induction of anaesthesia, patients were given ilioinguinal/iliohypogastric nerve block by a conventional method. The total volume of 20 ml of 0.25% Bupivacaine was divided into two equal doses. The first dose was injected with the needle entry point localised at one-third of a distance along a line from the anterior superior iliac spine to the umbilicus, after detection of the second entry point localised at one-third of a line joining the pubic tubercle and the anterior superior iliac spine and time noted.

Rescue analgesia was given as per the patient's requirement and on the patient's demand. Rescue analgesia was given if VAS scores were greater than or equal to 4. Injection. Ondansetron, 4mg IV, was given 20 minutes before administering the Injection of Tramadol 100mg IV. Postoperative pain assessments were scored at 4, 12 and 24 hours from the time of administration of the block using the Visual Analog Scale pain score.

Statistical Analysis

The collected data were analysed with IBM. SPSS statistics software 23.0 Version. Frequency analysis, percentage analysis, mean & S.D. were used to describe data, with frequency analysis for categorical variables and percentage analysis for continuous variables. The Unpaired sample t-test and Mann-Whitney U test were used to find the significant difference between bivariate samples in independent groups. The Chi-Square test was used to find the significance of categorical data. The probability value of 0.05 was considered significant.

RESULTS

All the sixty patients included in this study were males. Regarding age distribution, the Ultrasound Group had a higher proportion of participants up to 40 years old (53.3%) than the Conventional Group (33.3%).

Table 1: Age and ASA distribution between groups

		Ultrasound Group	Conventional Group	P-value
Age	Up to 40	16 (53.3%)	10 (33.3%)	0.165
	41-50	8 (26.7%)	15 (50%)	
	> 50	6 (20%)	5 (16.7%)	
ASA	I	19 (63.3%)	18 (60%)	0.5
	II	11 (36.7%)	12 (40%)	

Nineteen patients in the ultrasound TAP group and 18 in the conventional IIN/IHN group were of ASA physical status I. 11 patients in the ultrasound group and 12 in the conventional group were of ASA physical status II. No significant difference in age and ASA PS status between groups (Table 1).

Table 2: Weight, VAS score, and time of rescue analgesia between groups

		Ultrasound Group	Conventional Group	P-value
Weight		64.63 ± 3.801	63.67 ± 3.994	0.341
VAS	4 hrs	0.73 ± 1.112	1.07 ± 1.552	0.491
	12 hrs	1.20 ± 1.627	1.67 ± 2.171	0.488
	24 hrs	2.00 ± 1.819	3.87 ± 2.776	0.007
Time of rescue analgesia		17.67 ± 7.073	14.70 ± 7.086	0.11

Patients' mean weight in the ultrasound TAP group was 64.63 kg, and in the conventional IIN/IHN group was 63.67 kg. No significant difference in weight between groups (p=0.341). There is no significant difference in VAS score at 4 and 12 hours, but a significant difference at 24 hours between groups (p=0.007).

The mean time for rescue analgesia in the ultrasound TAP group was 17.67 hours, and 14.70 hours in the conventional IIN/IHN group. The Ultrasound Group had a slightly higher mean time than the Conventional Group and no significant difference in time of rescue analgesia between groups (p=0.11) (Table 2). There were no complications in any of the patients in both groups.

DISCUSSION

Postoperative pain is most often undertreated, with up to 70% of patients reporting moderate to severe pain following surgery[10]. Pain control is essential for improving the quality of patient care. Regional nerve block techniques offer better postoperative pain relief and facilitate early ambulation and discharge. A higher success rate can be achieved using ultrasound by placing local anaesthetic agents closer to the targeted nerves more accurately. Acute postoperative pain following open inguinal hernia repair is maximum during the first 24 hours.[11] Various modalities have been adopted to reduce this pain with parenteral opioids, NSAIDs, central neuraxial analgesia, TAP block, IIN/IHN blocks and wound infiltration with varying results. Among these techniques, TAP and IIN/IHN blocks are

ISSN (O): 2687-5365; ISSN (P): 2753-6556

effective and easy to perform with the least complications. While various studies are comparing ultrasound-guided TAP block with ultrasound-guided ilioinguinal/iliohypogastric nerve block for postoperative pain relief, there are only very few studies comparing ultrasound-guided TAP block with conventional ilioinguinal/iliohypogastric nerve block.

In our study, the mean VAS scores measured at 4 hours and 12 hours were comparable between both groups, which is statistically insignificant. But the mean VAS score at 24 hours (Group 1- 2.00 and Group 2- 3.87) with a p-value of 0.007 was statistically significant. Hence, USG-guided TAP block was comparable to conventional Ilioinguinal/Iliohypogastric nerve block for short-term analgesia and also provided better long-lasting analgesia, especially at 24 hours. Aveline C et al. found that VAS pain scores were lower in the ultrasound-guided TAP group at 4 hours, 12 hours, and 24 hours, while pain after the first 24 hours, 3 months, and 6 months was similar.[1]

Milone et al. found that a combined TAP block and local anaesthesia group reported significantly less pain (By VAS score). In contrast, a single conventional local anaesthesia group reported a higher need for rescue analgesia.[12] In a Sivapurapu V et al. study, a bilateral TAP block was performed on Group T with 0.25% bupivacaine 0.6ml/kg with half the volume on either side intraoperatively, whereas Group I received local infiltration. Time to rescue analgesic was found to be significantly more, and the VAS scores were lower in Group T.[13]

In our study, the mean time for rescue analgesia in group 1 (USG TAP) was 17.67 hours, and in group 2 (conventional IIN/IHN) was 14.70 hours with a p-value of 0.110 which was insignificant. Though the p-value was insignificant, the mean value between the two groups showed a difference of 3 hours which was clinically significant. Hence USG guided TAP block provides analgesia for a longer duration in the postoperative period. No complications were observed in both groups.

Sharma SK et al. ultrasound-guided transversus abdominis plane block (Group T) had a more significant time for first rescue analgesia. In contrast, unilateral spinal anaesthesia (Group S) had a better quality of block and no side effects. But, one patient had bradycardia, and two had hypotension in group S.[14] Sahin L et al. found that the time to rescue analgesia was significantly longer in the TAP group than in the control group. The cumulative number of analgesic doses was significantly lower. Pain scores significantly differed at all time points except 1, 20 and 24 hours.[15]

Our study observed that a USG-guided TAP block improved pain control at 24 hours. The time first to rescue analgesia was prolonged than the conventional Ilioinguinal/Iliohypogastric nerve block, which was similar to the Aveline C et al. study, which concluded that USG guided TAP block provided better pain control than 'blind' IHN block after inguinal hernia repair.[1] This was also similar to Sujatha C et al. study, which concluded that both TAP block and IIN/IHN nerve block with wound infiltration are effective regional blocks for open inguinal hernia procedures in adult patients. The time to first rescue analgesia was prolonged in the TAP group compared to IIN/IHN group.[16]

CONCLUSION

The study concluded that in the comparison between ultrasound-guided transversus abdominis plane and conventional ilioinguinal/iliohypogastric nerve blocks for open inguinal hernia repair, to assess the analgesic efficacy in the postoperative period, the pain relief at 4 and 12 hours were comparable in both groups, with better pain relief at 24 hours and prolonged time to first rescue analgesia with USG-guided TAP block, with no complications in both groups.

REFERENCES

1. Aveline C, Le Hetet H, Le Roux A, Vautier P, Cognet F, Vinet E, et al. Comparison between ultrasound-guided transversus abdominis plane and conventional ilioinguinal/iliohypogastric nerve blocks for day-case open inguinal hernia repair. Br J Anaesth 2011;106:380–6.
2. VanDenKerkhof EG, Hopman WM, Goldstein DH, Wilson RA, Towheed TE, Lam M, et al. Impact of perioperative pain intensity, pain qualities, and opioid use on chronic pain after surgery: a prospective cohort study: Prospective cohort study. Reg Anesth Pain Med 2012;37:19–27.
3. Idehen H, Imarengiaye C. Transversus abdominis plane block as an adjuvant in multimodal postoperative analgesia: Relevance and applicability in Nigeria. New Niger J Clin Res 2016;5:31.
4. Elamin G, Waters PS, Hamid H, O'Keeffe HM, Waldron RM, Duggan M, et al. Efficacy of a laparoscopically delivered transversus abdominis plane block technique during elective laparoscopic cholecystectomy: A prospective, double-blind, randomised trial. J Am Coll Surg 2015;221:335–44.
5. White PF, Kehlet H, Neal JM, Schricker T, Carr DB, Carli F, et al. The role of the anesthesiologist in fast-track surgery: from multimodal analgesia to perioperative medical care. Anesth Analg 2007;104:1380–96, table of contents.
6. Halaszynski TM. Pain management in the elderly and cognitively impaired patient: the role of regional anesthesia and analgesia. Curr Opin Anaesthesiol 2009;22:594–9.
7. Kehlet H, Dahl JB. Anaesthesia, surgery, and challenges in postoperative recovery. Lancet 2003;362:1921–8.
8. Bonnet F, Marret E. Influence of anaesthetic and analgesic techniques on outcome after surgery. Br J Anaesth 2005;95:52–8.
9. Cozowicz C, Poeran J, Memtsoudis SG. Epidemiology, trends, and disparities in regional anaesthesia for orthopaedic surgery. Br J Anaesth 2015;115:ii57–67.
10. Pyati S, Gan TJ. Perioperative pain management. CNS Drugs 2007;21:185–211.
11. Callesen T, Bech K, Nielsen R, Andersen J, Hesselfeldt P, Roikjaer O, et al. Pain after groin hernia repair. Br J Surg 1998;85:1412–4.
12. Milone M, Di Minno MND, Musella M, Maietta P, Salvatore G, Iacovazzo C, et al. Outpatient inguinal hernia repair under local anaesthesia: feasibility and efficacy of ultrasound-guided transversus abdominis plane block. Hernia 2013;17:749–55.
13. Sivapurapu V, Vasudevan A, Gupta S, Badhe AS. Comparison of analgesic efficacy of transversus abdominis

ISSN (O): 2687-5365; ISSN (P): 2753-6556

plane block with direct infiltration of local anesthetic into surgical incision in lower abdominal gynecological surgeries. J Anaesthesiol Clin Pharmacol 2013;29:71–5.
14. Sharma SK, Ahmad S, Kumar S, Khan AP, Dwivedi P, Rani R, Deo N. A comparative study of efficacy and safety of ultrasound-guided Transversus Abdominis plane (TAP) block with unilateral spinal Anaesthesia for inguinal hernia repair in geriatric patients. J Evolv Med Dent Sci. 2016;5:7356-60.
15. Sahin L, Sahin M, Gul R, Saricicek V, Isikay N. Ultrasound-guided transversus abdominis plane block in children: A randomised comparison with wound infiltration. Eur J Anaesthesiol 2013;30:409–14.
16. Sujatha C, Zachariah M, Ranjan RV, George SK, Ramachandran TR, Pillai AR. Transversus abdominis plane block versus ilioinguinal/iliohypogastric nerve block with wound infiltration for postoperative analgesia in inguinal hernia surgery: A randomised clinical trial. Anesth Essays Res 2017;11:976–80.

ISSN (O): 2687-5365; ISSN (P): 2753-6556