

A randomized clinical study to compare postoperative pain relief in ilioinguinal nerve block versus transversus abdominis plane block following inguinal hernia repair surgery



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ABSTRACT

Background: Inguinal hernia surgeries are associated with postoperative pain and discomfort. Transversus abdominis plane (TAP) block and Ilioinguinal/Iliohypogastric (IIIH) nerve blocks are widely used to control postoperative pain. In this study we have compared postoperative pain relief between TAP block and IIIH nerve block in the patients undergoing inguinal hernia surgery under spinal anesthesia. **Aims and Objectives:** The primary aim of this study was to compare postoperative pain relief of TAP block and IIIH block in patients undergoing inguinal hernia surgery. Secondary objectives were to observe hemodynamic parameters and to observe for postoperative side effects if any. **Materials and Methods:** Sixty patients of age group 18–65-year-old males, ASA grade I, II, were randomised into two groups TAP group (n = 30) and IIIH group (n = 30). TAP group received 30 mL of 0.25% ropivacaine TAP block and group IIIH received 20 mL, and wound infiltration with 10 mL of 0.25% ropivacaine. Duration of analgesia was recorded, visual analogue scale (VAS) score compared in first 24h postoperatively. Perioperative haemodynamic parameters were recorded. **Results:** VAS score was found significant at 1, 2, 3, 4, 5, 8, 10, 16 h (P<0.001). The mean duration of analgesia was found to be 4.64 ± 1.16 h and 6.3 ± 1.84 h for IIIH group and TAP group respectively which was statistically significant (P<0.001). Haemodynamic were stable and no complication was there in both the groups. **Conclusion:** As a part of multimodal analgesia regimen both TAP block and IIIH block provided good pain relief postoperatively in patients undergoing inguinal hernia. In this study TAP block provided prolonged pain relief than IIIH block after inguinal hernia repair.

Key words: Ilioinguinal/Iliohypogastric nerve block; Spinal anesthesia; Transversus abdominis plane nerve block; Postoperative analgesia; Multimodal analgesia; Inguinal hernioplasty

INTRODUCTION

Inguinal hernia surgery is one of the most common surgeries done by surgeons around the world; more than 20 million hernia patients are operated annually.¹ Recent studies show that up to one-third of all patients who operate for hernia repair surgery have painless outcomes and has no or little effects on their work and daily routine activities. In contrast to this 3–6% of patients are having severe pain, and more than 30% have mild pain even 1 year

after hernia repair. This pain remains for many years and can have a significant effect on their life, work, and daily routine activities.²

For effective pain control, multimodal analgesia is preferred. It is achieved by combining different analgesics having different mechanism (e.g., opioids, non-steroidal anti-inflammatory drugs [NSAIDs], and local anesthetics), which leads to additive and synergistic analgesia, lower the total dose of analgesics and has fewer side effects.

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Regional anesthesia has several benefits it reduces post-operative pain, decreases opioid and NSAIDs consumption and its related side effects such as nausea, vomiting, constipation sedation.³ These are well tolerated by patients and improves outcome by early ambulation and early discharge from the hospital and ultimately reduces the risk of chronic pain syndrome.

Transversus abdominis plane (TAP) block and ilioinguinal/iliohypogastric (IIIH) block are both the regional anesthetic technique that anesthetize the anterior abdominal wall and provide adequate postoperative pain relief after surgery.⁴ Various studies have been done on TAP block and IIIH block individually and comparison with different drugs in patients undergoing anterior abdominal wall and lower abdominal wall surgeries, but no studies have compared TAP with IIIH block using 0.25% ropivacaine in adults undergoing inguinal hernia surgeries.

Aims and objectives

1. To compare the postoperative pain relief of TAP block and IIIH block in patients undergoing open inguinal hernia surgery.
2. To observe hemodynamic parameters.
3. To observe post-operative side effects if any.

MATERIALS AND METHODS

After obtaining approval from the institutional ethics committee (approval no 56/IEC-GRMC/2020), the present study entitled “A randomized clinical study to compare postoperative pain relief in ilioinguinal nerve block versus TAP block following inguinal hernia repair surgery” was conducted in the department of Anesthesiology, J.A Group of Hospitals of G.R. Medical College, Gwalior (M.P.) from January 2020 to October 2022. Sixty male patients were randomized into two groups of thirty patients each, 18–65 years of ASA grade I or II, posted for unilateral open inguinal hernioplasty. Patients with any known drug allergy, any contraindications to spinal anesthesia, bilateral inguinal hernia/irreducible hernia, BMI >35 kg/m² were excluded.

A detailed preoperative assessment was done, and any present or past medical or surgical problems were ruled out. A routine physical examination and investigations were done. Informed consent was obtained for the procedure, the possible risks, benefits, and alternatives for pain management were explained. After shifting the patient to the operation theater, crystalloid fluids started @ 10–15 drops/min through IV line. Standard noninvasive monitors ECG, noninvasive blood pressure (BP), pulse oximeter, were connected. Subarachnoid block induced at the level L3–L4

space, after confirming free flow of CSF 3–3.2 mL of injection bupivacaine 0.5% heavy injected intrathecally.

After induction, block was given to patients according to their group, either TAP block or IIIH block. TAP group received TAP block with 30 mL of 0.25% Ropivacaine. IIIH group received IIIH block with 30 mL of 0.25% Ropivacaine.

Landmark guided TAP block

The landmark technique (double pop technique) described by McDonnell requires understanding of the triangle of petit, and internal anatomy. The triangle of Petit is identified by palpating the pelvic rim at the mid-axillary line. The iliac crest forms the inferior border of the triangle. The anterior border is formed by the lateral edge of the external oblique muscle. The posterior border is formed by the lateral edge of the latissimus dorsi muscle.

With the patient in a supine neutral position and appropriate identification of the borders and appropriate prep/drape, a 20 gauge needle is inserted perpendicularly to the skin in the triangle of petit. After piercing the skin, two pops are felt. The first is through the fascial extension of the external oblique; the second is through the fascial extension of the internal oblique. After negative aspiration, the study drug is injected.⁵

Landmark guided IIIH nerve block

IIIH is placed in a two-stage fashion; the first component was administered via 20G needle with injection at the point 2.5 cm medial to the anterior superior iliac spine (ASIS) and 1 cm cephalad toward a reference line connecting umbilicus and ASIS. The blunt portion of the needle permitted the identification of fascia and served to push away peripheral nerves present in the loose connective tissue between muscle layers. The needle was advanced until a loss of resistance was perceived upon piercing the external oblique fascia. After a negative aspiration test, an injection (10 mL) was carried out in a fanlike manner, interstitial to external and internal oblique muscle layers. This same technique was next used to deliver another 10 mL of solution between the internal oblique and transversus abdominis muscles.⁴ The second component of the IIIH was administered by injecting 10 mL of the same solution after skin closure at the suture line.⁶

Outcomes measured

- Duration of analgesia
- Postoperative visual analogue scale (VAS) pain score
- Intraoperative and postoperative hemodynamic parameters
- Side effects, if any.

Visual analog pain score

It is a printed horizontal card of 10 cm in length, with two verbal descriptors as “no pain” at one end and “worst possible pain” at other end. The patients are asked to mark on the line the point at which they feel, which represents their perception of their current pain state.⁷

- 0=No pain
- 1–3=Mild pain
- 4–6=Moderate pain
- 7–10=Severe pain.

The duration was noted, when VAS score >3 postoperatively, and it was managed with rescue analgesia with one dose of inj. tramadol 100 mg in 100 mL NS i.v. to relieve postoperative pain.

Side effects

Some patients had episodes of PONV, which was managed by injection Ondansetron 4 mg i.v. stat. and no other side effects were noticed in either group related to blocks.

Statistical analysis

Both groups of different regional blocks were compared. Quantitative continuous variables were compared by Independent t-test if normally distributed, if not, then by Mann–Whitney test. Chi-square test is done for qualitative data. Study data were taken statistically significant if ($P < 0.05$). Data are described in mean and standard deviation (Mean \pm SD).

RESULTS

Demographic parameters

The demographic parameters age, height, and weight were not statistically significant, it meant that there was no difference between the groups. In other words, the groups contained subjects with the same basic demographic characteristics.

Heamodynamics

The intraoperative and postoperative hemodynamic parameters, i.e., heart rate, systolic BP, diastolic BP was not found to be statistically significant.

Duration of analgesia

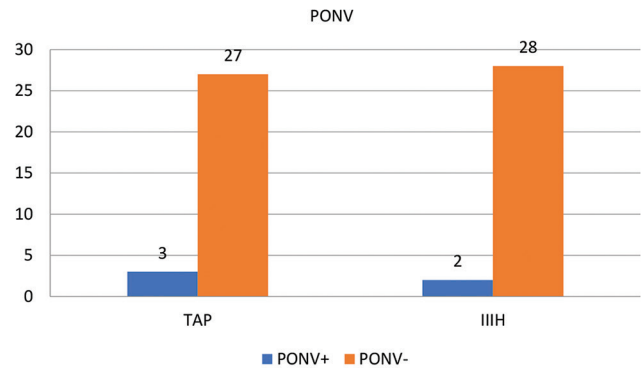
The mean time for the duration of analgesia for the TAP block was found to be 6.3 ± 1.84 h, and for the IIIH block 4.63 ± 1.16 h. On statistical comparison between the two groups, the duration of analgesia was found to be statistically significant.

VAS score

Mean VAS score for TAP block was 4 at 8 h and for IIIH block was 4.5 at 5 h. On statistical comparison between the

two groups, (TAP vs. IIIH) the effect on VAS score at 1 h (1.5 vs. 2.2), 2 h (1.9 vs. 2.8), 3 h (2.5 vs. 3.2), 4 h (2.7 vs. 3.8), 5 h (2.8 vs. 4.5), 8 h (4 vs. 3), 10 h (2.5 vs. 2.1) 16 h (2.1 vs. 1.6) was found to be statistically significant since $P < 0.01$.

PONV



Some Patients had postoperative nausea vomiting, 6.6% in the TAP group and 10% in the IIIH group, and no other side effects were found. On statistical comparison between the two groups, postoperative nausea vomiting was not found to be statistically significant ($P > 0.05$).

DISCUSSION

Inguinal hernia repair surgeries are one of the most commonly performed procedures. Although it is not a very extensive surgery, inguinal hernia repair is still associated with significant postoperative pain, which is maximum in the first 24 h.⁶ Conventionally, postoperative pain management mostly relies on opioids and NSAIDs, leading to significant side effects. In regional anesthesia techniques, TAP block and IIIH block are used for multimodal analgesia regimens to provide postoperative analgesia of the anterolateral abdominal wall.⁷ The benefits of good postoperative analgesia include a reduction in the postoperative stress response and morbidity, better patient satisfaction and improved outcome. IIIH block is routinely used as anesthetic technique for surgeries in inguinal hernia and lower abdominal surgeries.⁸ TAP block has gained acceptance in recent years after Rafi initially described it in 2001 using landmark-based techniques; the practitioner must identify the triangle of Petit. McDonnell describes “double pop” sensation as needle pierces the external oblique muscle and internal oblique muscle. At this point, drug is injected after negative aspiration of blood.

In this prospective randomized clinical trial, we compared the analgesic efficacy of TAP block and IIIH block by using VAS score, and duration of analgesia in patients undergoing inguinal hernia surgeries. All patients were assessed in our pre anesthetic assessment clinically. Sixty patients were randomly assigned into two groups of 30 each.

Patients were induced with subarachnoid block with 0.5% bupivacaine heavy intrathecally. Intraoperative hemodynamic were recorded. Postoperative hemodynamic, duration of analgesia, and VAS score were recorded. Injection tramadol 100 mg in 100 mL NS i.v. was given when patients complained for pain or VAS score of more than 3. Injection ondansetron 4 mg i.v. was given when patients complained for nausea and vomiting.

Intraoperative and postoperative systolic BP, diastolic BP, mean arterial BP, and heart rate in both groups were considered to be statistically not significant since P-value is more than 0.5. Sujatha et al.,⁶ did study and compared USG-guided TAP block and USG-guided IIIH block in which they found no adverse effects on the vital signs of the patients. Venkatraman et al.,⁹ observed USG-guided TAP block in inguinal hernia patients and found no significant variation in heart rate, BP, and SpO₂ in comparison to the placebo group.

TAP group and IIIH group were monitored for VAS score and their association at 1 h (1.5 vs. 2.2), 2 h (1.9 vs. 2.8), 3 h (2.5 vs. 3.2), 4 h (2.7 vs. 3.8), 5 h (2.8 vs. 4.5), 8 h (4 vs. 3), 10 h (2.5 vs. 2.1), 16 h (2.1 vs. 1.6) which came out to be statistically significant as $P < 0.01$. Aveline et al.,¹⁰ compared landmark-guided IIIH block and USG-guided TAP block in patients undergoing inguinal hernia surgery, and found lower VAS scores for TAP group at 4h (11 vs. 15, $P = 0.04$), at 12h (20 vs. 30, $P = 0.0014$) and at 24h (29 vs. 33 $P = 0.013$). Pratheeba et al.,¹¹ compared the analgesic efficacy undergoing lower abdominal surgeries, and found postoperative VAS score in group TAP were significantly reduced at 30 min 1 h, 2 h, 4 h, 6 h, 8 h, 10 h, 12 h, 18 h, 24 h, ($P < 0.001$) in comparison to WSI group. Mowar et al.,¹² compared USG-guided TAP block and subarachnoid block in patients undergoing elective inguinal hernia surgery. VAS score was found to be significantly reduced in group T at 3, 6, 12, 24, and 48 h compared to that of Group S ($P < 0.01$) and USG-guided TAP block provides better intraoperative and postoperative analgesia than subarachnoid block. Hosalli et al.,¹³ compared the efficacy of postoperative analgesia between ultrasound-guided dual TAP block and IIIH nerve block for open inguinal hernia repair. The VAS score at rest as well as in movement were significantly lower in the D-TAP group ($P < 0.001$) compared to the IIIH group. USG-guided D-TAP block provides more effective post-operative analgesia in open inguinal hernia surgery.

The mean duration of analgesia for TAP block was 6.3 ± 1.83 h and for IIIH block 4.63 ± 1.16 h since $P > 0.01$. hence statistically significant. McDonnell et al.,¹⁴ performed TAP block in patients undergoing cesarean delivery, and found median time to rescue analgesia 220 (150–190)

min in the TAP group and 90 (55–190)min in the control group. Harrison et al.,¹⁵ performed IIIH block in patients undergoing inguinal hernia repair surgery, and found median time to rescue analgesia 67.5 (15–226) min in the bupivacaine group and 26 (13–65) min in the saline group ($P < 0.001$), in comparison to our study which was longer duration of analgesia 4.6 ± 1.16 h maybe because we used 30 mL of 0.25% of ropivacaine. Oak et al.,¹⁶ compared post-operative analgesia between USG-guided TAP block and conventional landmark-guided block in patients undergoing gynecological abdominal surgeries. Mean duration of analgesia for Group U (18.88 ± 6.18) h and for Group A (8.38 ± 2.58) h. The reasons for the prolonged duration of the analgesic effect after TAP blockade may relate to the fact that under USG guidance, TAP can be clearly visualize and in addition TAP is relatively poorly vascularized, therefore drug clearance may be slowed. USG-guided TAP block provided a longer duration of analgesia in comparison to landmark-guided TAP block. Kumar et al.,¹⁷ compared analgesic efficacy between USG-guided TAP block and caudal block in children undergoing inguinal hernia surgery. The mean duration of analgesia was 523.44 ± 61.30 min in group T, whereas, in group C, it was 352.59 ± 32.54 min. TAP block was found to be superior as it provided a longer duration of analgesia and reduced rescue analgesic dose.

No adverse events occurred either from the TAP block or the IIIH block. Very few patients developed PONV, 6.6% in the TAP group and 10% in the IIIH group $P > 0.05$ hence statistically insignificant. Carney et al.,¹⁸ performed TAP block in patients undergoing appendectomy, found PONV as a main side effect (4%) in the TAP group, and after comparing it with the control group, it came out to be statistically insignificant $P > 0.05$. Similarly, Sakalli et al.,¹⁹ performed IIIH block in a patient undergoing cesarean section, They also found PONV as the main side effect (13.3%) and when compared with the control group, it came out to be statistically insignificant.

Limitations of the study

Only male patients of ASA I and II and with a BMI of less than 35 kg/m were studied. There were very few female patients operated for inguinal hernia, hence we eliminated female patients.

CONCLUSION

In our study we concluded that both TAP and IIIH block provide good postoperative analgesia in inguinal hernia repair surgeries. In our study we found that TAP block provides longer duration of analgesia and better patient satisfaction in comparison to IIIH block.

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JKK- Literature survey, prepared the first draft of manuscript, implementation of study protocol, data collection, data analysis, manuscript preparation and submission of article; **JA**- Concept, design, clinical protocol, manuscript preparation, editing, manuscript revision and supervision; **SS**- Design of study, statistical analysis and interpretation; **IJ**- Concept, coordination and preparation of manuscript; **PG**- Proofreading and revision of manuscript.

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