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ULTRASOUND GUIDED ILIOINGUINAL & ILIOHYPOGASTRIC NERVE BLOCK VERSUS TRANSVERSUS ABDOMINIS PLANE BLOCK FOR POSTOPERATIVE ANALGESIA IN PATIENTS UNDERGOING OPEN INGUINAL HERNIA REPAIR

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Abstract

Background and aim: Pain following surgery contributes to significant morbidity if not properly managed. The present study was aimed at comparing the efficacy of ultrasound guided ilioinguinal and iliohypogastric nerve (IIIHN) block versus transversus abdominis plane (TAP) block

Methodology: 60 male patients undergoing unilateral open inguinal hernia repair under spinal anaesthesia were randomized into two groups, IIIHN group (n=30) and TAP group (n=30). IIIHN block/TAP block was performed after completion of surgery with 25 ml of 0.375% ropivacaine and 4 mg dexamethasone as per the group allocation. Postoperative pain was assessed using visual analogue scale (VAS) score and haemodynamic parameters were recorded at 0,2,4,6,8,12,16,20 and 24 hours. Time for first rescue analgesia, doses of rescue analgesia (IV diclofenac aqueous) was noted.

Results: Patients in IIIHN group had lower VAS score at 6,8 and 12 hrs. Duration of analgesia was significantly prolonged in IIIHN group than TAP group. The number of rescue analgesia doses required was significantly less in IIIHN group.

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Conclusion: IIIHN block is superior to TAP block for postoperative analgesia in patients undergoing open inguinal hernia repair as it decreases VAS score, delays the need for first rescue analgesia and decreases the need for rescue analgesia.

Key words: Open inguinal hernia repair, ilioinguinal and iliohypogastric nerve block, transversus abdominis plane block, postoperative analgesia

Introduction

Patients undergoing open inguinal hernia repair experience moderate to severe pain and inadequate pain relief leads to delayed recovery, discharge and also escalates the cost of medical care. Pain incites neuroendocrine stress response which is characterised by increased levels of serum cortisol and catecholamines. NSAIDs and opioids are frequently used to control postoperative pain following hernia repair. However, they are associated with side effects like gastritis, respiratory depression, sedation, nausea and vomiting. Recently there is a surge in interest in transversus abdominis plane (TAP) block and ilioinguinal and iliohypogastric nerve (IIIHN) block for managing pain following open inguinal hernia repair. Conventional landmark and fascial pop guided technique for TAP/IIIHN block requires blunting of needle tip and relies on clinical expertise. Also, landmark guided technique has a significant failure rate due to false fascial pops and may result in accidental bowel injury.[1] The use of ultrasonography (USG) has revolutionized the practice of regional blocks for pain relief. Use of ultrasound allows real-time visualization of needle, improves the success rate and reduces complications. The ideal block amongst TAP block and IIIHN block for pain relief after open hernia surgery is a matter of debate as authors have reported conflicting results.[2,3,4] The present study was aimed at comparing USG guided IIIHN block and USG guided TAP block for postoperative analgesia in patients undergoing open inguinal hernia repair.

Methodology

After obtaining institutional ethical committee approval, the present prospective randomized double-blind study was carried in a tertiary care hospital. 60 male patients, belonging to American Society of Anaesthesiologists (ASA) grading I & II, aged between 18-65 years undergoing elective unilateral open inguinal hernia repair were included in the study. Patients with cardiorespiratory diseases, body mass index (BMI) ≥ 40 kg/m^2, history of allergy to study drugs, recurrent hernia and contraindications to spinal anaesthesia were excluded from the study.

Patients were randomized using block randomization method with blocks of 6 in 1:1 ratio. Patients were allotted to IIIHN group or TAP group using sequentially numbered opaque sealed envelopes. On the day of surgery, an anaesthesiologist who was not involved in assessment of postoperative analgesia opened the sealed, opaque envelope and administered IIIHN block or TAP block immediately after spinal anaesthesia. The patient, and the anaesthesiologist who was involved in assessment of postoperative analgesia was not aware of group allocation.

All patients received tab. Ranitidine 150 mg and tab. Alprazolam 0.5 mg at bed time the day before surgery. Preoperatively patients were educated about visual analogue scale (VAS) score and informed consent was taken. In VAS score, 0 indicates no pain and 10 indicates worst imaginable pain. On the day of surgery, after obtaining intravenous access

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patients were premedicated with inj. Pantoprazole 40 mg IV and inj. Ondansetron 0.08 mg/kg IV. Intraoperative monitoring included pulse oximetry (SpO2), non-invasive blood pressure (NIBP) and electrocardiogram (ECG). Inj. Bupivacaine 0.5% heavy 3.25 ml was administered intrathecally as per the institutional protocol. After completion of surgery, patients received TAP block or IIIHN block with 25 ml of 0.375% ropivacaine based on group allocation.

Sonosite ultrasound S II (Fujifilm Sonosite, USA) with high frequency linear probe 6-13 Mhz was utilised for giving blocks. To perform IIIHN block, the transducer was placed obliquely on a line joining anterior superior iliac spine (ASIS) and umbilicus. II & IH nerves appear as hypoechoic oval structures with hyperechoic covering between internal oblique (IOM) and transversus abdominis muscle (TAM) in close proximity to ASIS. A needle was inserted in an in-plane technique from medial to lateral direction to reach the II & IH nerves or alternatively the plane between IOM and TAM (if clear identification of nerves is not possible). After negative aspiration, 25 ml of 0.375% ropivacaine and 1 ml (4 mg) dexamethasone was injected. To perform TAP block, the transducer was placed between iliac crest and costal margin in the midaxillary line on the ipsilateral side and the three muscles of abdomen were identified. The needle was inserted medial to the medial aspect of the transducer in an in-plane technique. Once the needle reaches the TAP plane, after negative aspiration 25 ml of 0.375% ropivacaine was injected after visualizing the separation of IOM and TAM. In both blocks, before injection of drug, an initial test dose of 0.5 ml normal saline was injected confirming the position of needle in appropriate plane.

Monitoring of postoperative VAS score and haemodynamic parameters like heart rate (HR), mean arterial pressure (MAP) were recorded at 0, 2,4,6,8,12,16,20 and 24 hrs. When VAS score was 4 and above, inj. diclofenac aqueous solution 1.5 mg/kg IV suitably diluted was administered as rescue analgesia. Patients who had VAS score 4 and above despite diclofenac were administered inj. Ondansetron 0.08 mg/kg IV and inj. Tramadol 1.5 mg/kg IV. Duration of analgesia was defined as the time between administration of block and administration of rescue analgesia.

Statistical analysis: Sample size was calculated based on the results of our pilot study in which TAP group had a duration of analgesia of 5.8±2 hrs. To detect a 30% difference in the mean duration of analgesia with 95% confidence interval and 80% power of study, we needed 28 patients in each group. To compensate for loss to follow-up, we included 30 patients in each group. Data was analysed using Medcalc software version 22.018 (MedCalc Software Ltd, Belgium). Continuous data was expressed as mean±SD and analysed using Student's t test. Categorical data was analysed using Fisher's exact test. P value < 0.05 was considered as statistically significant.

Results: Patient characteristics such as age and BMI and duration of surgery was comparable in both the groups (table 1).

Table 1: Demographic data and duration of surgery:

Parameter	Mean ± SD		P value
	IIIHN group (n=30)	TAP group (n=30)	
Age (in years)	48.7±6.4	49.2±7.3	0.778
Sex (M/F)	30/0	30/0	1

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BMI (kg/m^2)	26.5±3.1	25.8±2.9	0.370
Duration of surgery (in minutes)	68.5±9.4	66.8±8.7	0.470

Postoperative VAS score was significantly less in IIIHN group at 6,8 and 12 hours in comparison to TAP group.

Table 2: Postoperative VAS score:

Time	IIIHN group	TAP group	P value
0	0	0	--
2	0.5±0.3	0.6±0.4	0.2778
4	1.3±0.4	1.4±0.5	0.3959
6	1.4±0.4	3.5±0.6	<0.0001
8	1.5±0.3	3.3±0.5	<0.0001
12	2.3±0.4	3.8±0.6	<0.0001
16	3.2±0.4	3.4±0.6	0.1342
20	3.5±0.6	3.8±0.7	0.0799
24	3.7±0.8	3.8±0.9	0.6509

Duration of analgesia was significantly prolonged in IIIHN group in comparison to TAP group (table 3). Patients in IIIHN group needed a smaller number of rescue analgesics.

Table 3: Duration of analgesia and rescue analgesia dose

Parameter	IIIHN group	TAP group	P value
Duration of analgesia	11.8±2.6	5.6±1.8	<0.0001
No.of doses of rescue analgesia required in 24 hours (Diclofenac)	1.2±0.3	2.1±0.5	<0.0001

Haemodynamic changes are shown in table 4. Patients in IIIHN group had lower HR and MAP at 6 and 8 hours.

Table 4: Haemodynamic changes

	Heart rate			Mean arterial pressure		
Time	IIIHN group	TAP group	P value	IIIHN group	TAP group	P value
0	68.6±7.4	67.9±7.1	0.7099	83.2±7.8	84.7±8.2	0.4708
2	69.4±8.2	70.2±7.8	0.7	86.6±8.4	86.4±8.8	0.9286
4	69.2±8.4	69.8±8.1	0.7792	84.8±8.2	86.4±7.8	0.4419

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6	70.4±9.2	80.6±9.6	<0.0001	84.6±7.6	92.4±9.6	0.0009
8	72.8±10.4	84.8±11.4	<0.0001	85.8±8.3	93.7±8.5	0.0005
12	80.8±10.8	84.2±11.2	0.2362	91.6±9.3	93.4±8.8	0.4444
16	82.6±11.4	85.1±10.8	0.3868	92.8±8.6	94.2±8.2	0.5213
20	81.9±10.8	83.2±10.4	0.6366	93.6±9.4	94.6±10.2	0.6944
24	84.4±9.8	85.8±10.2	0.5898	96.8±10.6	97.4±11.2	0.8320

Discussion:

Postoperative pain relief aids in early recovery of the patient and anaesthesiologists play a vital role in it. Regional nerve blocks offer better pain relief with less side effects in comparison to systemic NSAIDs and opioids. The use of ultrasound increases the success rate with less incidence of complications.

Postoperative VAS score was comparable in both the groups till 4 hours. VAS score was significantly less in IIIHN group in comparison to TAP group at 6,8 and 12 hrs. Kamal et al[5] and Faiz et al[6] also observed similar lower pain score in patients who received IIIHN block in comparison to TAP block.

In our study, the duration of analgesia was significantly prolonged in IIIHN group. Kamal et al[5] and Faiz et al[6] also observed that the time for first rescue analgesia was significantly delayed in patients who received IIIHN block.

In our study, the need for rescue analgesia (IV diclofenac) was significantly less in IIIHN group. Kamal et al[5] observed that the average dose of diclofenac tablet required was significantly less in IIIHN group in comparison to TAP group. Stav et al[7] also observed that 24 hr morphine consumption was significantly less in IIIHN block group in comparison to TAP block group.

Heart rate and MAP was significantly less at 6 and 8 hrs in IIIHN group than TAP group. This can be explained due to prolonged duration of analgesia with IIIHN block.

Carney et al[8] studied the spread of drug following TAP block in human volunteers. He observed that there is inconsistent spread of drug medial to ASIS and inguinal region following TAP block. This explains relatively less efficacy of TAP block in comparison to IIIHN block for pain relief following inguinal hernia repair.

Our study had few limitations. Only male subjects were studied since inguinal hernia is nearly 9-10 times more common in men than women. Postoperative pain score was assessed only rest. Assessment of pain during movement of hip may give more information about the efficacy of block.

To conclude, USG guided IIIHN block decreases postoperative VAS score, prolongs the duration of analgesia and decreases the need for rescue analgesia in comparison to TAP block in patients undergoing open inguinal hernia repair.

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