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COMPARISON OF ULTRASOUND-GUIDED TAP BLOCK VERSUS SAB USING HYPERBARIC ROPIVACAINE FOR THE EFFICACY OF SURGICAL ANAESTHESIA AND POSTOPERATIVE ANALGESIA IN OPEN INGUINAL HERNIOPLASTY.

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ABSTRACT

Background: Open inguinal hernioplasty is one of the commonest surgical procedures performed. Different types of anaesthesia techniques are used for painless inguinal hernioplasty comprising general anaesthesia and regional anaesthesia such as spinal, epidural, and nerve blocks. Regional anaesthetic techniques are most commonly used for uncomplicated open inguinal hernia repair. Ultrasound-guided peripheral nerve blocks are more used because of the reduced incidence of adverse events. **Aims:** To compare the efficacy of conventional regional anaesthesia technique with USG-guided peripheral nerve block to compare the adequacy of intraoperative surgical anaesthesia and postoperative analgesia with minimal adverse effects. **Study design:** This is a prospective, double-blinded, randomized, controlled, Helsinki protocol-compliant clinical study. The institutional review board has approved this study and written informed consent from all patients has been taken. **Methodology:** Sixty patients of the American Society of Anaesthesiologists physical status classes I/II, in the age group of 18-60 years male patients scheduled for elective open inguinal hernioplasty were enrolled into two groups of 30 patients each according to the anaesthetic technique used. Group A comprised patients receiving ultrasound-guided transversus abdominis plane block (TAP block) with 0.5 % Ropivacaine, whereas Group B comprised patients administered Subarachnoid block (SAB) with hyperbaric 0.5 % Ropivacaine for elective open inguinal hernioplsty. The primary endpoints of this study were to assess the adequacy of surgical anaesthesia and duration of postoperative analgesia, whereas the secondary endpoints included assessment of patients' hemodynamic profile post institution of the block and comparing the incidence of adverse events associated with the two techniques. **Results:** The VAS score was found significantly lower in Group A as compared to Group B, and the duration of postoperative analgesia was highly significant ($P < 0.001$) in Group A (724.00 ± 103.2914 min) as compared to Group B (256.643 ± 73.4218 min). The number of rescue analgesics administered over the first 24-48 h was significantly higher in the spinal group as compared to patients administered with the TAP block. The difference in perioperative haemodynamic stability was not significant ($p > 0.05$) in both groups, due to the use of Ropivacaine. **Conclusion:** Ultrasound-guided TAP block and SAB provides good intra-operative anaesthesia and analgesia. Also, perioperative haemodynamic stability for SAB using Ropivacaine is comparable with TAP block. But TAP block patients had good postoperative analgesia without any significant adverse events.

KEYWORDS : Transversus abdominis plane block; Inguinal hernioplasty, subarachnoid block, Ropivacaine.

INTRODUCTION:

Inguinal hernioplasty is the most commonly performed surgical procedure. Postoperative some patients may experience moderate pain, which delays return to routine day-to-day activities. It may persist as chronic postsurgical pain. [1,3]

Different anaesthetic techniques have been outlined for painless inguinal hernia repair, comprising general and regional anaesthesia (RA); RA is most commonly used for uncomplicated hernioplasty as it is safer, cheaper, and easy to administer under expert hands while providing better surgical conditions and improved intra/postoperative pain profile. Different types of regional anaesthesia techniques are available [2] including Subarachnoid block [SAB], and Transversus abdominal plane block (TAP). With experience hands, ultrasound-guided (US-guided) transversus abdominis plane block (TAP-block) has become popular because of the ease with which it can be performed under the direct visualization of a needle and spread of local anaesthetics (LA)[2] TAP-block involves depositing LA between the internal oblique and transversus abdominis muscles, the nerves in this plane[4]

The aim of the study is to compare the efficacy of two techniques to assess the adequacy of surgical anaesthesia and efficacy to ease postoperative pain with the least possible side effects.

METHODOLOGY:

This prospective, double-blind, randomized, parallel-group, Helsinki protocol-compliant clinical study was conducted after obtaining written informed consent from all patients and approval from the institutional review board. Sixty patients of American Society of Anaesthesiologists (ASA) physical status classes I/II, age group 18–60 years male patients, scheduled for elective open inguinal hernioplasty, were enrolled into two groups of 30 patients each according to the anaesthetic technique used.

Patients unwilling to participate, those who fall under ASA class III and above, obese patients with BMI ≥30 kg/m^2, patients with bleeding, patients with contraindications to RA, patients with irreducible/ strangulated/recurrent inguinal hernia, patients with preoperative chronic opioid use, and patients with hypersensitivity to LA were excluded from the study. Using computer-generated randomization techniques patients were randomized into two groups. Group A comprised patients receiving US-guided TAP-block, whereas Group B comprised patients who were administered SAB for elective open inguinal hernioplasty.

Patients were explained the visual analogue scale [VAS] before the scheduled elective surgery. Standard fasting guidelines were followed. monitors were applied and vascular access was secured. In Group A patients, US-guided TAP block was performed in the supine position. Under all aseptic precautions,

TAP-block was given with a portable ultrasound machine with a high-frequency, linear array probe by an experienced anaesthetist using an in-plane technique; 20 mL of 0.5% Ropivacaine was injected after negative aspiration for blood while ensuring safe dosage for Ropivacaine. To assess the level of the sensory block, the pin-prick method was used every 5 min for a total duration of 30 min. Achieving the T10-L1 level was considered to be a successful block.

In Group B patients, SAB was given under aseptic precautions using a 26 G Quincke spinal needle and 3 mL of Ropivacaine 0.5% was injected intrathecally after confirming the free flow of CSF. After achieving the block level assessed pin prick method of T8, surgery was commenced. Motor block at the beginning and end of surgery using the Modified Bromage scale was recorded. In both groups, inadequate block quality or levels were given general anaesthesia (GA) and were excluded from the study.

All patients were monitored for inadequacies in blocks performed or adverse events. For all patients electrocardiography, heart rate (HR), mean arterial pressure (MAP), respiratory rate and pulse oximetry were monitored. Data were recorded at 10-min intervals till the end of surgery. Postoperative pain was assessed immediately at the end of surgery and then till the first rescue analgesic (FRA) was administered. VAS score was monitored at 0, 3, 6, 12, 24, and 48 h post-procedure. Injection of paracetamol 15 $mg.kg^{-1}$ intravenously (i.v.) was administered 8th hourly following FRA. Inj. tramadol 1.5 $mg.kg^{-1}$ i.v. was given as a rescue analgesic whenever VAS was ≥4. The number of rescue analgesics required by participants of both groups was monitored in the first 24 h and 24–48 h. Intergroup total tramadol consumption as a rescue analgesic in the 48-h period was analysed.

Bradycardia, nausea and vomiting, hypotension, headache, urinary retention or other neurological sequelae were recorded. Sedation/analgesia supplemented If the patient is uncomfortable due to inadequate sensory level. The primary endpoints were adequate surgical anaesthesia and duration of postoperative analgesia, Secondary endpoints included comparing the incidence of adverse events and doses of rescue analgesics associated with the two techniques.

Statistical analysis

SPSS version 20.0 was used for analysis. Frequency, mean distribution, standard deviation, Chi-Square test and student t-Test were calculated to value. $P < 0.05$ was considered statistically significant. Categorical variables were expressed as absolute numbers and percentages. Intergroup data were compared by the Chi-square test. The sample size was decided as per the previous literature review. Patient information was collected through a structured proforma, tabulated in a master chart, and analysed using Statistical Package for the Social Sciences.

RESULT

The demographic parameters (age, BMI, and ASA-class), duration of surgery, and baseline hemodynamics were statistically comparable in both groups ($P = 0.244, 0.202, 0.578$, and 0.798) [Table 1].

Table 1 Demographic profile

Parameter	Group A	Group B	P
Age	35.75±6.286	38.54±10.098	0.244
BMI	22.68±3.305	23.54±1.819	0.202
ASA-I	14	13	0.798
ASA-II	11	12	
Duration of surgery	56.39±6.315	55.43±6.408	0.573

BMI=Body mass index, ASA=American Society of Anaesthesiologists

Table 2 Block profile and side effects

Parameter	Group A	Group B	P
Time to perform the block	11.83±3.423	6.22±0.676	0.000
Time for maximum sensory block	20.17±2.124	11.55±3.266	0.000
Modified bromage score	0	2.67±0.367	0.000
Side effect profile			
Bradycardia	0	2	0.491
Hypotension	0	0	0.890
PONV	0	1	0.491
Headache Urinary retention	0 0	2 0 0.890	0.236

PONV=Postoperative nausea and vomiting

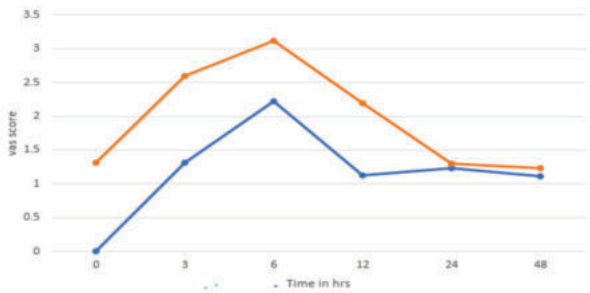

Figure 1.

VAS scores were significantly lower in Group A compared to that of Group B (fig 1), with the duration of postoperative analgesia being highly significant ($P < 0.000$) in Group A (724.00 ± 103.2914 min) compared to that of Group B (256.643 ± 73.4218 min) [Table 3]. Visual analogue scale score comparison

Table 3 Analgesic profile

Parameter	Group A	Group B	P
Duration of analgesia	690.00±123.20	200.2033±54.24	0.000
Number of rescue analgesics	0.171±0.3212	0.212±0.2456	0.128
Cumulative tramadol consumption	110.234±426	218.346±232.26	0.000

Difference in the number of rescue analgesics administered was significantly higher in Group B versus Group A. The number of rescue analgesics in two groups, Group A and Group B was 0.171 ± 0.3212 versus 0.212 ± 0.2456 ($P = 0.128$). The total tramadol consumption over the 48-h period was also significantly higher in the spinal group (218.246 ± 110.234 vs. 110.234 ± 426) ($P < 0.000$) [Table 3].

DISCUSSION

Many patients suffer from chronic pain after open inguinal hernioplasty which delays routine activities. Various RA techniques and analgesics like NSAIDs, Opioids are used as multimodal analgesia regimes which have their side effects. Although the time to perform USG-guided TAP-block was higher than conventional SAB block, TAP block provides good-quality analgesia of the anterior abdominal wall with duration and level of the block depending on the site of injection, drug type, and amount of LA administered [7] When the SAB is not possible or contraindicated TAP-block prove as an alternative. Jankovic [8] evaluated the efficacy of TAP-block in (lower) abdominal surgery and found that TAP-block was devoid of any motor/ sympathetic block [6].

Total postoperative analgesic duration in patients administered TAP-block was significantly higher than that in SAB. Cumulatively, 26 tramadol rescue doses were administered in 24 h postoperatively in the TAP group compared to almost double, 50 in the SAB group. The significant difference in pain scores and early requirement of rescue analgesics in Group B can be attributed to the regression of spinal Anaesthesia.

Sharma *et al* [4] reported similar results where the duration of analgesia (the time for FRA) was more in Group A (941 ± 235.68 min) as compared to that of Group B (240.75 ± 5.44 min). Group A did not require any rescue analgesia in the first 24 h. The total duration of analgesia for the TAP block was 390 min. Total analgesic consumptions were also significantly reduced in the TAP group. In our study. Group A patients showed hemodynamic stability throughout the procedure with no significant intragroup bradycardia or hypotension. Group B patients showed minimal fall in HR and MAP due to the use of Ropivacaine which is known for its haemodynamic stability compared to hyperbaric Bupivacaine. Sharma *et al* [4] study showed the HR was lower in the spinal group at all time intervals compared to those of the TAP group but returned to pre-procedure values at 20 min but in our study use of Ropivacaine maintained haemodynamic stability [5]. In terms of side effects, the TAP block displayed fewer adverse events compared to the central neuraxial blockade. The advantage of the TAP block is its safety profile. In our study, the requirement for rescue analgesics was greatly reduced in patients receiving TAP-block, which was consistent with Kahsay *et* [10].

US-guided TAP-block requires training, expensive equipment, and technical expertise which may not be available in peripheral health centres, especially in developing countries. With the availability of hyperbaric Ropivacaine, open inguinal hernioplasty can be safely performed under SAB where USG is not available in poor cardiovascular reserve patients with limitation of sufficient postoperative analgesia.

CONCLUSION

US-guided TAP-block provides better intraoperative/postoperative analgesia as compared to SAB in cardiovascular and respiratory cripples. The limitations experienced were the time for instituting the block, large volume of LA required, and absence of dense block. Training and regular use of USG can easily overcome this limitation. Furthermore, placing in-plane catheters shall make 24–48 h pain-free postoperative phase a realistic possibility. We recommend US-guided

TAP-block in conjunction with SAB for effective management of patients undergoing hernia/lower abdominal surgery for enhanced postoperative pain control with stable hemodynamic to achieve superadded cum synergistic advantages of both RA techniques.

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Conflicts of interest: There are no conflicts of interests.

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