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Research Article

Evaluation of Efficacy of Ultrasound Guided Ilioinguinal and Iliohypogastric Nerve Block for Post Operative Analgesia after Addition of Dexamethasone in Adult Patients Undergoing Unilateral Inguinal Hernioplasty under Subarachnoid Block

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ABSTRACT

Background: We assessed postoperative analgesic effect of ultrasound guided ilioinguinal and iliohypogastric nerve block, duration of action of the said block as well as the overall analgesic consumption in the first 24 hours of postoperative period after addition of dexamethasone.

Methods: After approval from the institutional ethics committee, hospital based randomized prospective study was carried out in patients of age group 40-60 years by dividing them into two groups A and B, posted for unilateral inguinal hernioplasty, comparing ilioinguinal and iliohypogastric block with ropivacaine 0.375% and ropivacaine 0.375% with dexamethasone 4mg respectively. The aim of the study was to assess the postoperative analgesia with visual analogue scale (VAS) and satisfactory score and total analgesic consumption and time till rescue analgesia.
Statistical Analysis: We used Chi-square test and paired t test and $P<0.05$ was considered statistically significant.

Results: Mean of duration of analgesia was significantly prolonged in group B (14.13±3.461 h) as compared to group A (5.77±2.161 h). Patients in group B had significantly lower VAS score and less number of rescue analgesic requirements in first 24 hours (h) postoperatively. No adverse effects recorded in any group.

Conclusion: Dexamethasone as an adjuvant with ropivacaine in ultrasound guided ilioinguinal and iliohypogastric block provided profound prolongation of duration of postoperative analgesia and reduces analgesic consumption of patients undergoing subarachnoid block for unilateral inguinal hernioplasty.

Inguinal hernioplasty is generally performed surgery which is associated with considerable postoperative pain. This surgery can be done under regional or general anaesthesia and postoperative analgesia is an important component of perioperative anaesthetic management [1-2]. These patients usually suffer from significant pain after inguinal hernioplasty [3] and require a multimodal postoperative treatment regimen that provides high quality analgesia that provides good analgesia with minimal side effect [1-4]. We demonstrated ilioinguinal and iliohypogastric (IIIH) nerve block in inguinal hernioplasty after subarachnoid block (SAB). The iliohypogastric nerve (L1) and ilioingunal nerve (L1) divides between the internal oblique and transverses abdominis near iliac crest supplying part of skin over inguinal region, hypogastric region, gluteal region and supplies part of skin covering genitalia, upper, medial part of thigh. IIIH nerve blockade is the regional anesthetic technique in which local anesthetics are deposited to block nerves supplying the anterior abdominal wall and designed to anesthetize the nerves provide sensory innervations to the skin of lower

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abdominal wall, upper hip, upper thigh and shown to reduce the need for postoperative opioid use, increase time interval for rescue analgesia and provide more effective pain relief. Various additives have been used to intensify the quality and prolong the duration of local anesthetic effect [5]. Previously dexamethasone added Ropivacaine in Transversus Abdominis Plane (TAP) Block for transabdominal hysterectomy under Subarachnoid Block [6]. Dexamethasone, through its anti-inflammatory and blocking effects on neural discharge, and nociceptor C fibers transmission could be used as a local anaesthetic adjuvant. Very few research demonstrated dexamethasone as an effective adjuvant for IIIH block. The aim of the present study is to assess the effect of dexamethasone as an adjunctive to ropivacaine in IIIH nerve block as a part of multimodal analgesia for inguinal hernioplasty. Objectives of our study-primary were 1) duration of analgesia 2) analgesic requirement in the postoperative period (first 24 hrs), secondary were 3) postoperative pain score (VISUAL ANALOG SCORE-VAS) at 0min,1,2,4,6,8,12,18 and 24hr 4) adverse effects if any.

Methods

After the institutional ethics committee approval and registration with clinical trial registry of India (REF/2022/07/056196), hospital based randomized prospective study was conducted in patients of age group 30-45 years of classes I or II of American Society of Anesthesiologists (ASA), by dividing them into two groups A and B posted for unilateral inguinal hernioplasty under spinal anaesthesia. Exclusion criteria included contraindications to spinal anaesthesia, infection at the site of injection, severe hypovolemia, ASA grade III and IV, lack of consent, local anesthetic sensitivity, allergy to study drug.

A standardized anaesthesia protocol was followed. Standard monitors such as pulse oximeter, electrocardiogram, and noninvasive blood pressure were connected. A peripheral venous cannula was secured, and patient was properly preloaded. Injection ondansetran 4mg given intravenously. Under all aseptic precautions, subarchanoid block was administered with Quinckes 26-gauge spinal needle [7], with 0.5% hyperbaric bupivacaine 15mg (3ml). Ultrasound (USG) guided Ilioinguinal and iliohypogastric (IIIH) nerve block (Figure 1). administered after completion of surgical procedure [8] Group B received IIIH nerve block with 0.375% ropivacaine (15ml) and injection dexmethasone 4 mg and Group A received IIIH nerve block with 0.375% ropivacaine (15 ml) on either side.

Experienced anesthetists who were blinded to the study drug performed IIIH nerve blocks. Ultrasound probe was placed on abdominal wall in such a way that inferior portion of probe over anterior superior iliac spine and superior margin of probe pointed towards umbilicus. The probe orientation was perpendicular to a line joining the anterior superior iliac spine and the inferior rib to obtain a transverse view of the abdominal layers. The probe was tilted, rotated, or both for better visualization of the three layers of the lateral abdominal wall, respectively, from superficial to the deep, external oblique, internal oblique and transversus abdominis. After identifying plane between internal oblique and transversus abdominis using in plane technique with ultrasound real time assessment, tip of needle was inserted, and the drug was administered [9]. When the tip of needle was correctly located in the targeted plane, ropivacaine 0.375% 15 ml was injected with intermittent aspiration and the correct placement of the needle was confirmed by expansion of the LA solution as a dark shadow between aponeurosis of the internal oblique (which moved anteriorly) and the transversus abdominis muscles pushing the muscle deeper.

After completion of the block, the patients were interviewed at 0, 1, 2, 4, 6, 8, 12, 18, 24 hr. Intravenous (IV) Tramadol (1mg/kg) administered as rescue analgesic. VAS score (VAS 0–10; 0 = no pain, 10 = max pain) [10], satisfaction grade, duration after which first analgesic was demanded by the patient, any adverse effects, total analgesic requirement in first 24 hours were observed.

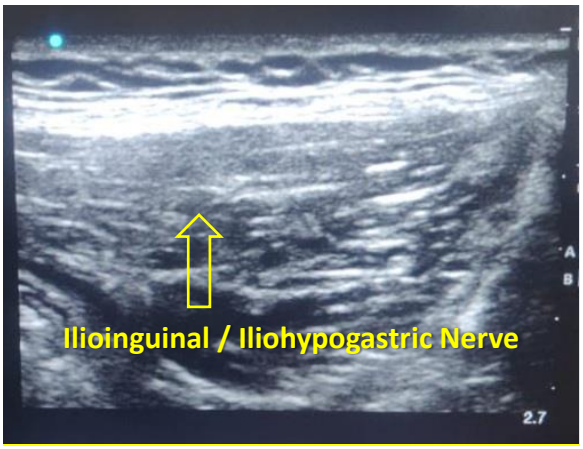

Figure 1- Image showing ultrasound guided IIIH nerve block

Statistical analysis

We assumed that there would be 25% absolute decrease in 24 h tramadol consumption due to dexamethasone-IIIH administration as a clinically significant end point for calculation of sample size. This was a conservative assumption based on our pilot study and previous studies. We calculated that 24 patients in each group would be enough to detect a 25% difference between the groups (α = 0.05 and β =0.2). To cover the dropouts, we selected thirty patients per group into the study. Statistical analysis was done using the computer statistical software system, SPSS version 18.0 (SPSS Inc., Chicago, IL, USA). Numerical data were analyzed using Student's T test and categorical data were analyzed by Chi-square test or fisher's exact test as appropriate. Results were

expressed as mean ± standard deviation, number or percentage (%). Results reported considered statistically significant if $P < 0.05$.

Results

The demographic data was comparable in both the groups of our study. The time to rescue analgesia was among the primary outcomes and was analyzed in the two groups. The mean time (in hours) to require rescue analgesia was found to be (14.13±3.461) versus (5.77±2.161), lesser tramadol requirement (in mg) (48.90±14.07) versus (87.43±10.331) during postoperative 24 hr for group B and group A, respectively. At 8 h, mean pain score was 4.50±1.796 in group A and 2.60±0.675 in group B. Pain score was highly significant ($P<0.001$) at 8h, significant ($p<0.05$) at 6h and 12h in group B in comparison with group A. Group B showed prolonged analgesic duration (14.13±3.461 versus 5.77±2.161) and lesser tramadol requirement (48.90±14.07 versus 87.43±10.331) as compared to Group A which was highly significant. Patients were hemodynamically stable in both groups. None of the patient developed any complications adverse effects related to procedure or drugs in either group.

Discussion

Acute postoperative pain following open inguinal hernioplasty is more severe for first 24 hrs period. Various techniques have been used to decrease postoperative pain which includes opioids, nonsteroidal anti-inflammatory drugs, central neuraxial analgesia, peripheral neuraxial blockade and local infiltration [11]. Bunting P Mc Conachie et al. showed significant reduction in complications and better pain relief with ilioinguinal and iliohypogastric (IIIH) nerve block rendering it an effective modality for postoperative pain management after caesarean section [12]. As per the study by khedkar SM et al., Ultrasound (USG) guided IIIH nerve block is finer in comparison with the conventional technique for surgeries in inguinal region as chances of complications with conventional technique like extension of the block to femoral nerve, urinary retention, trauma to blood vessels, puncture of intraperitoneal viscera are reduced with the use of ultrasound [13]. Also, USG gives real time image and lesser requirement of drugs, in addition to early onset of sensory and motor blockade. Hence, we decided to perform USG guided IIIH nerve block with ropivacaine in inguinal hernioplasty after subarachnoid block (SAB).

Multiple animal and clinical studies have revealed the efficacy and safety of dexamethasone as an adjunctive with different local anaesthetics in various kinds of nerve blocks [14]. Pehora, Carolyne et al. tested the comparative efficacy and safety of perineural against intravenous (IV) dexamethasone in peripheral nerve block and suggested that both IV and perineural dexamethasone prolongs the duration of sensory block and reduces opioid requirement in postoperative period [15]. Ammar AS et al study reported low VAS score and decreased opioid requirement in transverse abdominis plane (TAP) block with dexamethasone (4mg on either side) as an adjuvant to bupivacaine for abdominal hysterectomy [16]. A bulk of published data makes it a effective option as an adjunctive to ropivacaine or bupivacaine for peripheral nerve blocks. We studied analgesic effect of 4mg dexamethasone with 0.375% ropivacaine (15ml) in USG guided IIIH nerve block for inguinal hernioplasty under SAB and found that dexamethasone group had longer duration of action (14.13±3.461 h vs 5.77±2.161 h, $p<0.000$), lesser opioid consumption (48.90±14.07 mg vs 87.43±10.33 mg, $p<0.000$) as compared to control group. Effect of dexmedetomidine as an adjunctive to ropivacaine in ilioinguinal-iliohypogastric nerve blocks for paediatric patient posted for inguinal hernia repair was studied by Karan D et al., showed prolonged analgesia with few doses related side effects [17]. G.Ivani"s study compared analgesic effect of ropivacaine-clonidine mixture when administered as caudal or IIIH nerve blockade in children for inguinal surgery that did not require rescue analgesia in first 24 h after addition of adjunctive. There were no dose related side effects following IIIH blockade compared with caudal in inguinal hernia repair or orchidopexy [18]. These studies demonstrated analgesic efficacy of IIIH nerve block for inguinal hernia. Ammar AS et al found prolonged analgesia as well as decreased PONV when it was added to bupivacaine in TAP block in patients posted for abdominal hysterectomy [16]. None of the patient in either group developed PONV or any other complications related to technique or drugs.

Ropivacaine is a better local anaesthetic agent with reduced toxic potential for central nervous systems and cardiovascular system, a longer duration of block, lower propensity for motor block at a lower concentration with better sensorimotor differentiation [19]. Hence, we decided to study dexamethasone with 0.375% ropivacaine for IIIHN block.

Mechanism of analgesic effect of steroids is difficult to understand. Corticosteroids induces analgesia through their anti-inflammatory action or immunosuppressive actions, peripheral vasoconstriction by decreasing absorption rate of local anaesthetic, direct inhibition of ectopic neural discharge or by modulation of potassium channels as opined by Algren SC et al. [20]. Few authors also believe that the analgesic effect of corticosteroids is as a result of their systemic effects. A recent in vivo animal safety model study by Williams BA et al. showed antihyperalgesic effects and potential neuroprotection with clinically relevant dosing of perineural dexamethasone to bupivacaine associated with no side effects [21]. Irrespective of mechanism of action,

previous studies have put forward the dexamethasone as an adjunctive to potentiate analgesia and anaesthesia of local anaesthetic agents administered through different routes.

Limitations still exist in this study as the extent of blockade after spinal anaesthesia (as long as spinal action recede) as well as patient mobilization could not be assessed. In addition, recovery and discharge of patient were also not analysed which may be crucial in analysing a successful block. However, we have used 0.375% ropivacaine which has better sensorimotor differentiation producing only sensory blockade and dexamethasone prolongs analgesia. This ensured early mobilization and early hospital discharge similar to the prospective study of Santos Gde C et al. [22]. Also, we didn't measure serum dexamethasone level which could affect analgesic efficacy via systemic absorption. Therefore, we recommend larger sample size and randomized, multicentric, controlled clinical trials are still essential to investigate the optimal strategy of IIIH block with dexamethasone as an adjunctive for postoperative analgesia.

Table 1- Visual Analogue Scale (VAS)

VAS	Mean±SD Group A (n=30)	Group B (n=30)	P value
At 0 h	1.40±0.814	1.77±2.635	0.351
At 1 h	1.23±0.935	1.27±0.740	0.047
At 2 h	2.40±1.003	2.37±4.351	0.279
At 4 h	4.43±1.524	1.93±0.740	0.000
At 6 h	4.00±1.462	2.23±0.817	0.002
At 8 h	4.50±1.796	2.60±0.675	<0.000
At 12 h	3.60±1.476	3.10±1.32	0.002
At 18 h	2.87±0.860	3.0±0.788	0.198
At 24 h	3.0±0.788	2.70±0.837	00.193

Data represented in mean±Standard deviation (SD). p<0.05-significant. p<0.001-highly significant.

Table 2- Satisfaction

Grade	Group A	Group B
Good or very good	26%	87%
Poor or very poor	64%	13%

Table 3- Analgesic requirement

	Group A	Group B	P value
Duration of analgesia(h)	5.77±2.161	14.13±3.461	<0.000
Total tramadol required in first 24 hrs(mg)	87.43±10.331	48.90±14.07	<0.000

Data represented in mean±Standarad deviation (SD), p<0.05-significant, p<0.001-highly significant.

Conclusion

Our study demonstrates Ultrasound guided ilioinguinal and iliohypogastric nerve block using dexamethasone in addition to ropivacaine is a novel technique for postoperative pain relief without any adverse effects in inguinal hernia patients under subarachnoid block. So we recommend it for inguinal hernioplasty under subarachnoid block.

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