

Efficacy of Peripheral Nerve Stimulator Guided Ilioinguinal and Iliohypogastric Nerve Block for Post-Operative Analgesia in Inguinal Hernia Surgeries

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Abstract: *Background & Aims:* Ilioinguinal (IIN) and iliohypogastric nerve (IHN) blocks with landmark techniques have higher failure rates and need large drug volumes. The use of peripheral nerve stimulator may help in increasing the accuracy, require fewer amounts of drug volumes and hence less chances of drug toxicity. In this study, we compared the duration of post operative analgesia and total number of analgesics consumed within 24 hours between peripheral nerve stimulator guided nerve block & institutional protocol of administering analgesics. *Material and methods:* Fifty two male patients, aged 18-70years belonging to American Society of Anesthesiology grade I and II, posted for openinguinal hernia repair were enrolled in this prospective randomized, control trial and divided randomly into 2 groups of 26 each by sealed envelope method. Group B received peripheral nerve stimulator guided IIN and IHN block using injection ropivacaine 0.25% 20ml with 4mg injection dexamethasone & Group D received Inj diclofenac sodium 75mg in 100ml normal saline after wound closure. Paired and unpaired t tests were used for comparison between two groups. Chi square test was used for qualitative analysis and Mann Whitney test was used for assessing visual analogue scale. *Results:* The mean duration of post operative analgesia was 476.30 +24.4minutes in group B whereas it was 296.3+ 16.7 minutes in group D (p value of 0.000). There was statistically highly significant difference (p = 0.000) between total analgesics consumption between the two groups. *Conclusion:* Peripheral nerve stimulator guided IIN and IHN blocks are an effective technique for providing good postoperative analgesia in inguinal hernia surgeries.

Keywords: Diclofenac, iliohypogastric, ilioinguinal, nerve stimulator, ropivacaine

1. Introduction

Inguinal herniarepair is acommon surgical procedure with the incidence reported as 11/10, 000 in persons between 16 and 24 years of age, 200/10, 000 in persons more than 75 years of age. [1] Post-operative pain is an important concern associated with it which may persist for several weeks. This pain leads to neuroendocrine stress response which can result in delay in ambulation, return of gastrointestinal motility and increased stay at the hospital.

The under treatment of postoperative pain has been identified as one of the serious deficiencies in pain management today. In addition, some patients may develop chronic disabling pain which may occur in 5- 10% patients after the inguinal hernia repair that creates an important problem [1, 2] various methods and medications are used in postoperative pain management.

Newer modalities like nerve blocks play an important role in providing adequate analgesia with no or minimal side effects. IIN and IHN nerve blocks are considered as an effective regional anesthetic& analgesic technique for inguinal hernia, encysted hydrocele & lower abdominal

surgeries. [3] These blocks are easy to perform, inexpensive and safe. The approach to these blocks is by either landmark, peripheral nerve stimulator guided or by USG guided technique. The failure rate of landmark technique is as high as 45-72%. [4] USG guided blocks definitely increase the success rates but not many people have access to these machines. Peripheral nerve stimulators (PNS) on the other hand have an easy accessibility, are easy to use, inexpensive and can be used in peripheral centers where USG machines are not available. In this study, we hypothesize that PNS guided block & intravenous medications are equally effective in relieving postoperative pain. Our primary objective was to compare the efficacy of PNS guided IIN &IHN nerve block for hernia repair with our institutional protocol for relieving post operative pain.

2. Material and methods

After approval of the institutional Ethical Committee this randomized prospective study was conducted in 52 male patients. The study was registered with clinical trial registry (CTRI registration no 2020/05/025075). Written informed and valid consent were taken. The patients were allocated randomly by computerized method into two groups of 26

Volume 12 Issue 4, April 2023

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each.

Inclusion criteria were male patients aged between 18 and >70 years, American Society of Anesthesiology I-II, scheduled for elective uncomplicated unilateral inguinal hernia repair.

Exclusion criteria were, patients who did not consent to the study, age ≤ 18 years and ≥ 70 years, large and irreducible hernia, body mass index ≥ 40 kg/m², skin infection at the puncture site, allergy to local anesthetic agents, chronic hepatic or renal failure and preoperative opioid or nonsteroidal anti-inflammatory drug treatment for chronic pain. All routine investigations were carried out and fitness was confirmed. On the operative day, after confirming the nil by mouth status the patient was taken to operation theatre and intravenous fluid started. Necessary monitors were attached. All routine investigations were carried out, and fitness was confirmed. Informed consent was taken from all patients after explaining the procedure. Under all aseptic precautions, spinal anaesthesia was given to the patient in sitting position with 0.5% inj. bupivacaine, 3.5 ml using a 23G spinal needle. Intraoperative parameters such as pulse rate, mean blood pressure, spo2 and ECG were monitored every 10 minutes. No analgesic was given in the intra-operative period. After the wound closure, Group B received PNS guided IIN and IHN block with inj. ropivacaine 0.25% 20 ml and inj dexamethasone 4mg & Group D received inj diclofenac 75mg in 100ml normal saline intravenously.

PNS Technique

With the patient in supine position, inguinal region painted & draped. Peripheral nerve stimulator was then connected to a 50mm stimplex needle. The needle was inserted 5cm above and posterior to anterior superior iliac spine. Nervestimulator was set at 1mA and 2Hz current, once the needle is through the internal oblique fascia, twitches in lower abdominal wall and inguinal region were noted. Current was then reduced to 0.5mA and the desired local anesthetic was injected. (Figure1)

Pain was assessed at interval of 30 mins, 2hrs, 4hrs, 6hrs, 8hrs, 12hrs, 18hrs, and 24hrs. (Figure 2). Assessment of postoperative pain in both the groups was made by using the visual analogue scale (VAS). If VAS score was more than 4 at any given point of time post surgery, inj tramadol 50 mg in 100ml NS was given as a rescue analgesic. If pain did not subside by inj tramadol within 30 mins, alternative analgesia in the form of inj paracetamol 1 gm i.v. was given. The time of administration of first dose of rescue analgesic in the post-operative period was considered as the duration of postoperative analgesia. The surgeries requiring additional general anesthesia supplementation or requiring additional intra operative analgesia were excluded from the study. Total duration of postoperative analgesia and total amount of consumption of analgesics was noted in both the groups.

Statistical analysis

The study was conducted during August 2019 to October 2021. The population of surgery over this period was 150 patients. The sample size of the patients was calculated using population based formula. By exclusion and inclusion criteria and loss to follow-up, we divided the patients using

simple computerized randomization in two independent groups. Power of the test for post operative analgesia was 0.95

Quantitative data were expressed in form of Mean+ SD for statistical analysis. The unpaired t- test was used for comparison of mean between two groups. The paired t-test was used for intra-group comparison. The chi-square test was used for qualitative data. Mann- Whitney test was used for comparing VAS scores at various time intervals. All statistical analysis was made using SPSS 20 Windows (Statistical package for Social Science). A p value <0.05 was considered as statistically significant, p value < 0.001 was considered highly significant and p value >0.05 was considered as non-significant.

3. Results

The study was conducted in the age group from 18-70 years. Fifty two male patients were studied as two groups of 26 each. Group B was given PNS guided IIN & IHN nerve block & group D was given inj diclofenac in 100ml saline. The mean age of patients in group B was 49.50± 15.73 years and 55.77±14.41 years in Group D. Both the groups were comparable with no significant p value. The ASA grading in both the groups was comparable statistically (p =0.499). When the VAS score was more than 4, rescue analgesic in the form of inj. tramadol 50mg in 100ml NS was given in both the groups. Figure 3 depicts rescue analgesia was required at 8 hours in group B & it was required at 4 hours in Group D. Second dose of inj. tramadol was required about 10 hours after the first dose of rescue analgesic in Group B whereas it was administered 5 hours after 1st rescue analgesia in Group D. The VAS score when compared in both the groups, the 'p value' was highly significant (0.000) between 4- 10 hours. Figure 3 shows there was reduction in VAS score at 4, 6, 10 hours in group B when compared with Group D.

The mean duration of post operative analgesia was 476.30±24.4 min in group B & it was 296.3±16.7 min in group D. The difference was highly statistically significant with 'p value' of 0.000. (Figure 4). The total number of analgesics consumed includes both inj. Tramadol and inj. paracetamol & their consumption was more in Group D than in Group B with statistically highly significant difference of 'p value' 0.000 as shown in figure 5

4. Discussion

Post herniorrhaphy pain is a significant clinical problem that may have economic consequences because it can prolong convalescence. [2]

The nature of pain after hernia repair may be acute or chronic. Acute pain may be due to tissue injury, viscera distension or organ damage. [2] These patients may land up in chronic pain due to ill managed acute pain & other causes like nerve damage, mishmash where nerve may get trapped. [5] Various methods have been studied and applied for the management of post operative pain in hernia repair surgeries such as use of nonsteroidal anti inflammatory drugs, opioids,

incisional local anesthetic infiltration and inguinal field block. [2] Systemic analgesics possess various side effects like nausea, vomiting, respiratory depression and acute kidney injury. [6] IN & IH nerve blocks have been reported to produce excellent postoperative pain control in adults and children following hernia repair and groin surgery. [3]

There are various methods to administer IIN and IHN nerve blocks like landmark technique, use of Peripheral nerve stimulator or an ultrasound. In reality, the courses of both the IIN and IHN nerves are consistent with those described in anatomy texts in only 41.8% of patients. The absence of one or both is estimated as high as 12.5%, whereas the rate of occurrence of an accessory IIN or IHN nerve is approximately 5%. [7] Landmark technique can lead to side effects such as transient femoral nerve block [2-4] and rapid absorption of the local anesthetics, resulting in high plasma levels especially in young children & sometimes injury to the viscera [8].

IN & IH nerves along with their sensory supply have their motor supply to transverse abdominis and internal oblique muscle; hence PNS can be used to elicit motor responses where we can see twitches of abdominal muscles on stimulation even at low current. [4] Reduction in volume of local anesthetic can be considered as compared to landmark based technique. In most of the studies inj. bupivacaine was used for these nerve blocks but in our study, we used inj. ropivacaine due to its property of cardio stability as compared to bupivacaine. [9] There are various studies offascia iliac compartment block, femoral nerve block where dexamethasone was used as an additive to prolong the duration of postoperative analgesia, so we used inj. dexamethasone in our study. There is only one study in literature, done by Dr Surjit giri who had used peripheral nerve stimulator to evaluate the efficacy of IN & IH block for hernia surgeries so the purpose of this study was to evaluate the benefits of IN & IH nerve block for post herniorrhaphy pain and compared it to the routine protocol of our institute.

In our study the mean duration of analgesia in group B was significantly higher (476.30 ± 24.4 minutes) than in the group where inj. diclofenac 75mg was used (296.30 ± 16.7 minutes). The total consumption of analgesics were found to be less in Group B as compared to Group D where we concluded that the nerve block leads to reduced requirement of analgesics.

Htunetal [2] studied effectiveness of IIN and IHN nerve block and postoperative analgesic requirements in 50 patients. The block was given with 30ml Inj bupivacaine (0.25%) with adrenaline 1:200000 using the landmark technique. They observed that there was VAS score reduction at 8, 12, 24 hours postoperatively in nerve block group as compared to diclofenac group. There was no significant difference in the duration of first rescue analgesic requirement and total amount of analgesics consumed in both the groups but they observed better postoperative analgesia in nerve block group than inj. diclofenac.

Radhakrishnan et al [6] did a study on 72 patients where 36 patients received IIN and IHN nerve block with 10 ml of inj. ropivacaine (0.75%) while the rest did not receive any block.

They observed that the number of opioids consumed postoperatively and the duration of first analgesic requirement did not differ in both the groups significantly. But what they found that the nerve block was effective till 180 minutes postoperatively which was less as compared to our finding, addition of inj. dexamethasone might have contributed to the longer duration of action of the nerve block leading to reduced analgesic requirement.

SK Giri [4] did a study in 100 patients posted for inguinal hernia repair. It was not a comparative study and all the patients received IIN and IHN nerve block under PNS guidance with inj. levobupivacaine (0.5%) 20 ml with separate genitofemoral nerve block with 4ml of inj. lignocaine with adrenaline, 30 mins prior to the surgery. It was observed that adequate pain relief was there for 720 minutes postoperatively. They concluded that IIN & IHN nerve block could effectively be given using peripheral nerve stimulator.

The mean duration of analgesia in our study was 476 minutes whereas in their study it was 720 minutes. This difference might be due to the use of 0.5% levobupivacaine along with genitofemoral nerve block in their study.

The mean duration of analgesia found by Hosall et al [10] in patients who received IIN/IHN block was 190 ± 70 minutes, which is less when compared to our study. The reason might be due to addition of inj. dexamethasone to ropivacaine in our study & they had given nerve block just after spinal anesthesia prior to surgery.

5. Limitations of the Study

As there can be associated anatomical variations, more number of patients needed to be given PNS guided hernia blocks to get more appropriate results.

6. Conclusion

Peripheral Nerve stimulator guided IIN and IHN nerve blocks given for post operative analgesia in hernia repair surgeries significantly prolongs the duration of postoperative analgesia & also reduces consumption of analgesics as compared to our routine protocol of analgesic administration. We conclude that we can safely use IIN and IHN nerve blocks for postoperative analgesia in inguinal hernia surgeries.

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Figures



Figure 1: Anatomical landmark for PNS guided nerve block

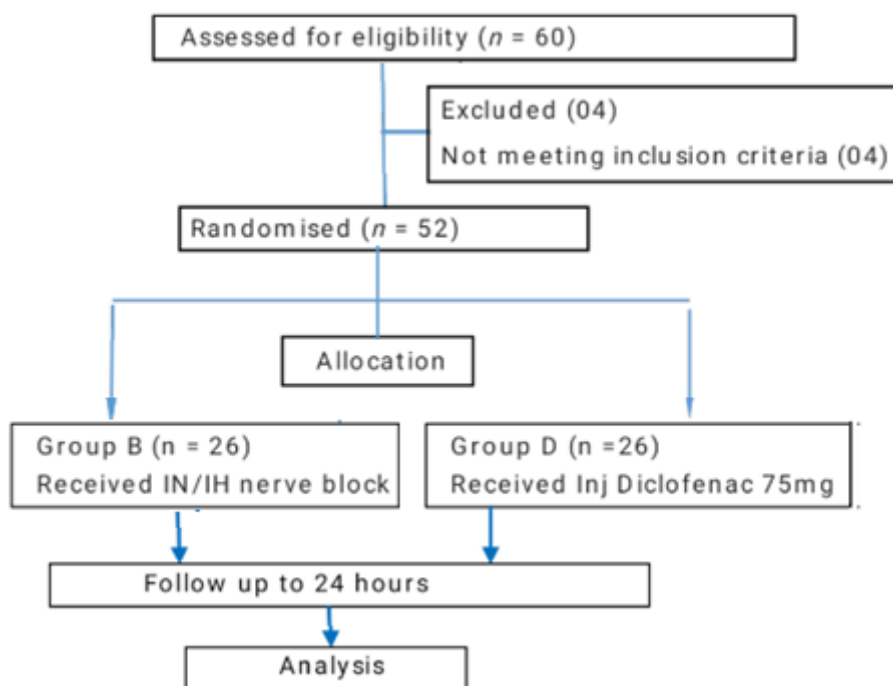


Figure 2: Consort Flow Diagram

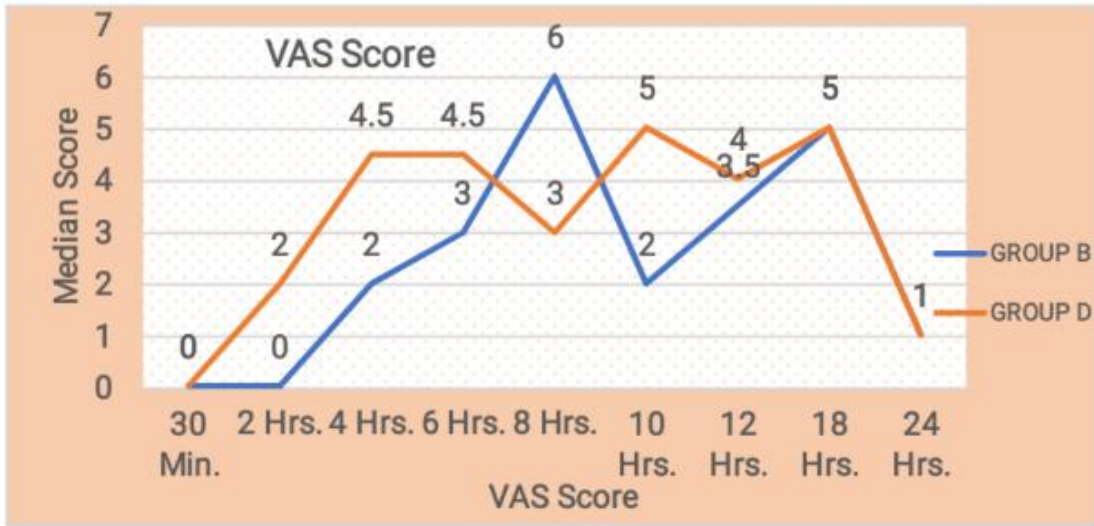


Figure 3: Comparisons of VAS score between two groups

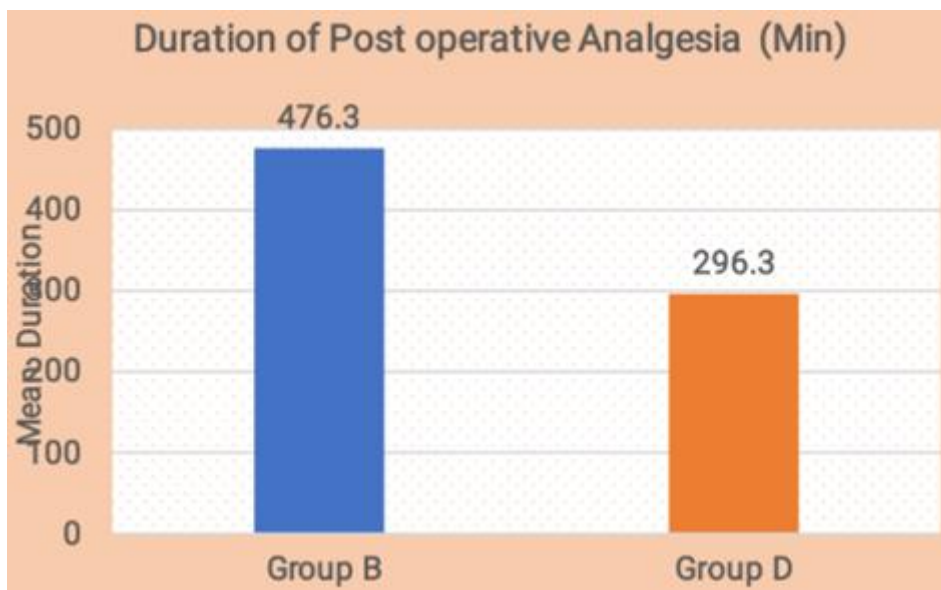


Figure 4: Comparison of duration of postoperative analgesia in both the groups

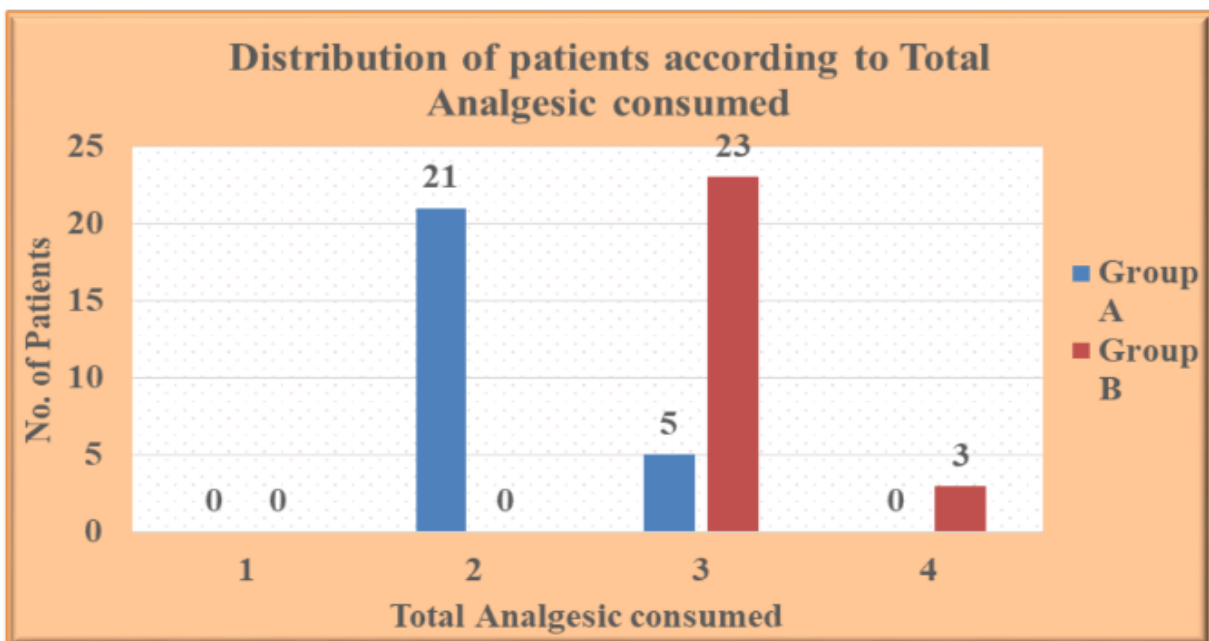


Figure 5: Total analgesics consumed in both the groups