

Comparative evaluation of postoperative analgesia after inguinal herniorrhaphy using lignocaine, adrenaline combination and bupivacaine by instillation and nerve block

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Abstract

Background: Inguinal herniorrhaphy in adults is considered a minor surgical procedure but can be associated with significant postoperative pain. This study was undertaken to evaluate and compare instillation and nerve block techniques using lignocaine, adrenaline combination and bupivacaine for postoperative analgesia after inguinal herniorrhaphy in adults. **Material and Methods:** In this study a total of 150 patients, above the age of 20 years, posted for elective inguinal herniotomy and herniorrhaphy were divided into five equal groups of 30 each. Group I received general anaesthesia, Group II and III received 2% lignocaine + adrenaline (1:80,000) combination by instillation and nerve block technique. Group IV and V received 0.5% bupivacaine instillation and nerve block technique. Pain scores, degree of pain and duration of satisfactory analgesia was determined for each patient in groups. **Results:** The mean pain scores in group IV and V when compared with control group and other group III and IV, the difference was found to be statistically significantly ($p < 0.05$). 0.5% bupivacaine to be effective in relieving immediate postoperative pain following inguinal herniorrhaphy. **Discussion:** The postoperative pain relief provided with 0.5% bupivacaine in conjunction with general anaesthesia gives good results after herniotomy and herniorrhaphy with instillation and nerve block techniques. This technique may prove a valuable weapon in the quest for optimal postoperative analgesia.


Keywords: Bupivacaine, lignocaine, Inguinal herniorrhaphy, instillation, nerve block, postoperative analgesia.

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INTRODUCTION

Post-operative pain not only has the potential for causing considerable distress to patient, but it also contributes to prolonged recovery time and may adversely affect patient outcome¹. Postoperative pain management has received increased attention in recent years because of the

increased understanding of the underlying pathophysiology of acute pain and development of more effective techniques and drugs for its treatment. Inguinal hernia repair is a common surgical procedure and one of the most painful ambulatory surgeries, with almost half of patients suffering moderate to severe pain after inguinal hernia repair². Pain after inguinal hernia repair is mainly due to activation of cutaneous and subcutaneous reception of afferent nerve fibres involved in the transmission of pain. Chronic pain occurs in 5-10% after the inguinal hernia repair that creates an important problem³. An ideal method of providing postoperative pain relief should be easy to administer and should not have adverse effects. Various methods and medications are used in postoperative pain management. Local anaesthetic-induced neural blockade is the most effective method of providing pain relief after a procedure and the analgesia from a single application of a local anaesthetic agent may

persist for longer than the pain itself. Nerve blocks of the ilio-inguinal nerve (IIN), ilio-hypogastric nerve (IHN) and/or genito-femoral nerve (GFN) have been used for both diagnostic and therapeutic purposes in the diagnosis and treatment of chronic post-herniorrhaphy inguinal pain (CPIP)^{4,5}. Topical analgesia with lignocaine or bupivacaine using the method of perfusion, instillation and nerve block etc. for relief of pain after inguinal hernia repair have been studied earlier. Bupivacaine is the classical long-acting local anesthetic that has been used successfully for local infiltration. It is more potent than lignocaine (3-4 times) and produces rapid and prolonged analgesia in the postoperative period when used for peripheral nerve blocks⁶. The present study was undertaken to evaluate and compare instillation and nerve block techniques using lignocaine and bupivacaine after inguinal herniorrhaphy in adults.

MATERIAL AND METHOD

In this study a total of 1500 patients, above the age of 20 years, posted for elective inguinal herniotomy and herniorrhaphy were divided into five equal groups of 30 each. All patients were evaluated preoperatively day before operation for any respiratory, cardiovascular, central nervous system disorders. Patients with restrictive and obstructive lung diseases, cerebrovascular accident, cardiac diseases such as ischemic heart diseases were excluded from the study. Informed consent was obtained from each patient. No premedication was given to any patient in any group. Height and weight of all patients was recorded preoperatively.

Group I: Served as control group in which 30 patients received general anaesthesia with intravenous thiopentone sodium in the dose of 5mg/kg body weight and suxamethonium 2mg/kg body weight, which was followed by endotracheal intubation. Anaesthesia was maintained with nitrous oxide and oxygen 50%; 50% and intravenous pancuronium bromide as muscle relaxant on controlled ventilation without any analgesics, on closed circuit with Boyle machine. Halothane in the concentration of 0.5% was administered with fluotec mark II vapourizer intermittently. Hernia repair was carried out in standard manner and at the end of operative procedure, neuromuscular block was reversed with neostigmine, atropine combination and patients shifted to recovery room. Remaining patients were divided into the following group for study purpose.

Group II: 30 patients received instillation block with 2% lignocaine + adrenaline (1:80,000) combination, dose 7mg/kg body weight.

Group III: 30 patients received nerve block (ilioinguinal, iliohypogastric and genitofemoral nerve) with 2%

lignocaine + adrenaline(1:80,000) combination. Dose 7mg/kg body weight.

Group IV: 30 patients received instillation block with bupivacaine 0.5%, dose 2mg/kg body weight.

GROUP V: 30 patients received nerve block(Ilioinguinal, iliohypogastric and genitofemoral nerve) with bupivacaine 0.5%, dose 2 mg/kg body weight. In group II and IV, the calculated dose of 2% lignocaine + adrenaline (1:80.000) combination and bupivacaine 0.5% was taken in a sterile syringe and it was instilled at the edges of the incision and on the cutaneous and sub-cutaneous surface of the surgical wound after carefully wiping the surface, and left for two minutes. This was repeated before skin closure. In group III and V, nerve block technique with 2% lignocaine + adrenaline (1:80,000) combination and bupivacaine 0.5% in calculated doses was carried out. Anterior superior iliac spine was palpated and a point 2.5 cm medial to it was taken and the needle was inserted through this point with a direction as downward and outwards until it strikes the inside ranging from 0 to 10. Pulse rate, blood pressure and respiratory rate was recorded. In all above groups, all patients received general anaesthesia as in group I. Hernia repair was carried out in usual manner, at the end of operation before skin closure local anaesthetic technique was applied. On the 7th postoperative day while dressings were changed patients were examined for wound infection, skin avulsion or any other problem. Pain score was determined in each patient by using linger analogue scale ranging from 0-10, postoperatively for first 24 hours. All these observations were statistically evaluated by students 't' test or chi-square test for statistical significance.

RESULTS

A total of 150 patients posted for elective herniotomy and herniorrhaphy were studied. The patients were equally distributed in five equal groups. All the groups under study were comparable as far as number of patients, age, height and weight is considered.

Table 1: Age distribution (n=150)

Age range (years)	Number of patients	Percentage
20-29	34	22.66
30-39	33	20.00
40-49	83	55.33
Total	150	100

Out of 150 patients, 83 (55.33%) of patients were in the age group of 40-49 years, 34 (22.66%) were in the age group of 20-29 years and 33 (22%) were in the age group of 30-39 years. Maximum number of patients, 74 (49.33%) were in the height range of 160-169 cms and 72 (48%) were in the height range of 150-159 cms. Considering weight, 77 (51.33%) of patients were in 50-54 kg range.

Table 2: Mean pain score in different groups

Group	Mean pain score (in 24 hours)	S.D	S.E
I	5.78	0.33	0.04
II	2.70	0.37	0.06
III	2.32	0.36	0.06
IV	3.40	0.30	0.06
V	1.99	0.29	0.04

In group I and II, mean pain scores were 5.78 and 2.70 respectively, when compared with control group the difference was found to be statistically significant. Similarly, in group III, IV and V, mean pain scores were 2.3, 3.4 and 1.99. When compared with control group the difference was found to be statistically significant (p < 0.05).

The percentage of patients showing degree of pain in first 24 hours was as shown in Table 3.

Table 3: Degree of pain in first 24 hours

Group	No pain	Mild pain	Moderate pain	Severe pain
I	00	00	21(70%)	9(30%)
II	10(33%)	12(40%)	8(27%)	00
III	14(46.6%)	11(36.4%)	5(17%)	00
IV	6(20.0%)	12(40.0%)	12(40%)	00
V	15(50.0%)	10(33.0%)	5(17%)	00

All the patients were observed for duration of satisfactory analgesia in each group. Patients with either 'no pain' or 'mild pain' were taken as having satisfactory analgesia.

Table 4: Duration of satisfactory analgesia

Duration of satisfactory analgesia in hours	Groups				
	I	II	III	IV	V
0-6	00	22(73%)	2(7%)	18(60%)	1(3%)
7-12	00	6(20%)	25(83%)	8(27%)	3(10%)
13-18	00	2(7%)	3(10%)	4(27%)	25(83%)
19-24	00	00	00	00	1(3%)
Total	00	30	30	30	30

It was observed that none of the patient from group I had satisfactory analgesia. In group II, 75% of patients had satisfactory analgesia for 0-6 hours, in group III, 83% of patients had satisfactory analgesia for 7-12 hours, in group IV, 60% patients have satisfactory analgesia for 0-6 hours and in group V, 83% patients had satisfactory analgesia for 13 to 18 hours. In our study we did not observe postoperative wound infection, wound irritation inflammatory reaction or delayed wound healing in any of the patients.

DISCUSSION

The goal of postoperative pain management is to reduce or eliminate pain and discomfort with least side effects and minimal cost^{7,8}. The long-acting local anaesthetic such as bupivacaine can provide sufficient duration of

analgesia on infiltration at the surgical site. This technique has an edge over other methods of analgesia in terms of lesser side-effects and is simple to perform⁹. In our study, the pain scores were significantly reduced in patients receiving postoperative analgesia as compared to control group. The mean pain scores in control group (group I), were significantly higher (p<0.05) postoperatively, as compared to the scores in group II, III, IV and group V, thus proving topical application of 2% lignocaine and adrenaline combination or 0.5% bupivacaine to be effective in relieving immediate postoperative pain following inguinal herniorrhaphy. Among lignocaine and bupivacaine groups, bupivacaine was more effective than lignocaine by instillation or nerve block method. The analgesia induced by topical bupivacaine was long lasting. This might be due to blockade of sodium channels by bupivacaine, however the lasting analgesic effect can be due to the effect of bupivacaine on membrane associated proteins and anti-inflammatory action alters the release and action of agents such as prostaglandins, lysosomal enzymes, sensitizing or stimulating the nocicepters and participating in inflammation. Trial by Spittal *et al*¹⁰ showed that the peroperative instillation of bupivacaine produced good postoperative analgesia, demonstrating evidence of a difference in effect of more than 20% when compared with an inguinal field block. Tsuchiya *et al*¹¹ confirmed that bupivacaine and ropivacaine are more effective than lidocaine in the prevention of postoperative pain after children's inguinal hernia repair. Bupivacaine instillation is more advantageous over a preoperative inguinal field block. It is done towards the end of the operation, so that the anaesthetist is not distracted from the care of the patient. A smaller dose of local anaesthetic is used to reduce the possibility of disturbing tissue planes, haemorrhage and infective sequelae. In the present study, 60% patients have satisfactory analgesia for 0-6 hours after instillation of 0.5% bupivacaine. Bugedo *et al*¹² studied the safety, effectiveness and duration of a percutaneous ilioinguinal-iliohypogastric nerve block with 10 ml 0.5% bupivacaine, as a method for postoperative analgesia and found this technique to be a simple and safe for providing effective and long-lasting postoperative analgesia. A study conducted by Sanjay and Woodward^[13] used combination of 0.5% bupivacaine and adrenaline and demonstrated that the use of local anaesthesia resulted in increased day-case rates, lower postoperative analgesic requirements and fewer micturition problems as compared to general anaesthesia. Peripheral nerve block of the ilioinguinal (IIN), iliohypogastric (IHN) and genito-femoral (GF) nerves is a relatively well known method for postoperative pain management. In our study, all patients received general

anesthesia and had peripheral nerve blocks administered with the combination of 2% lignocaine and adrenaline solution. Baerentzen *et al*¹⁴ found that ultrasound-guided blocks of the ilioinguinal and iliohypogastric nerves resulted in a statistically significant and clinically relevant reduction in postoperative pain. Kehlet and White¹⁵ have previously reported that the use of peripheral nerve block techniques promotes faster postoperative recovery compared with both general and spinal anesthesia. These previous studies report a reduction in postoperative pain and a reduction in the post operative consumption of analgesics. To conclude, the postoperative pain relief provided with 0.5% bupivacaine in conjunction with general anaesthesia gives good results after herniotomy and herniorrhaphy with instillation and nerve block techniques. Moreover, the technique of bupivacaine instillation is eminently suitable for use in day-case surgery because of its ease, efficacy and freedom from complications.

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