ORIGINAL ARTICLE

Effects of bupivacaine infiltration on postoperative tramadol consumption in elective day care unilateral inguinal hernia repair

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Abstract

Objective: To determine the difference in analgesic requirement in terms of mean postoperative narcotic consumption and mean postoperative pain score in patients undergoing unilateral inguinal hernia repair with or without bupivacaine infiltration as day-care patients.

Methods: The randomised controlled trial was conducted at Aga Khan University Hospital, Karachi, from June to December 2011, and comprised patients who were randomly divided into groups A and B. Tramadol 1.5 mgkg-1 was used as intraoperative analgesia. At the time of closure of surgical incision, 20ml of bupivacaine 0.25% plain was infiltrated in the subcutaneous tissue sub-facially and in the deeper layers along the incision line in patients of group A. In group B, which was the control group, the surgical wound was closed without infiltrating bupivacaine. On arrival in post-anaesthesia care unit, the patient's pain scores was assessed using Visual Analogue Scale every 15 minutes for the first hour, every 30 minutes for next one hour, and hourly for the next two hours by a blinded observer. Postoperative narcotic consumption was also noted.

Results: There were 80 patients in the study; 40(50%) in each of the two groups. Mean postoperative narcotic consumption and mean pain scores were high in group B in all follow-ups (up to 4 hours) compared to group A patients ($p<0.05$).

Conclusion: Wound infiltration with 0.25% bupivacaine diminished post-operative pain and decreased narcotic analgesic consumption for the first four hours after unilateral inguinal hernia repair.

Keywords: Inguinal hernia, Narcotic consumption, Local anaesthetic infiltration. (JPMA 66: 256; 2016)

Introduction

Opioid analgesics remain the primary treatment for patients experiencing moderate to severe post-operative pain, but are associated with adverse effects like respiratory depression, sedation nausea and vomiting.[1,2] Opioids analgesia also leads to delay in recovery and hospital discharge, especially in day-care anaesthesia.

Local infiltration anaesthesia in day-care settings has been associated with shorter hospital stay and less urinary retention, thus reducing costs.[2] It also reduces post-operative opioid requirements and allows patients to emerge from general anaesthesia with minimal side effects, thus enhancing patient's satisfaction and facilitating earlier mobilisation. The technique is attractive because of its ease of performance, safety, effectiveness and less incidence of post-operative nausea and vomiting.[3]

The current study was planned to determine the difference in analgesic requirement in terms of mean postoperative narcotic consumption in patients undergoing unilateral inguinal hernia repair with or without the use of 0.25% plain bupivacaine infiltration. Our secondary objective was to determine the difference in mean pain score using visual analogue scale (VAS) with or without the use of bupivacaine wound infiltration.

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Patients and Methods

The prospective randomised double-blind placebo controlled clinical trial was conducted at the Aga Khan University Hospital (AKUH), Karachi, from June 3 to December 3, 2011, and comprised patients of American Society of Anaesthesiologists (ASA) grade I-III, of either gender between 16 and 65 years of age who were scheduled for elective day-care inguinal hernia repair surgery. The study was approved by the institutional ethics committee and informed written consent was obtained from all the participants.

Those excluded were patients not willing to participate, undergoing emergency procedures, having known hypersensitivity to amide local anaesthetics and with history of liver disease.

The sample size was calculated on the basis of a study which evaluated the efficacy of pre-incisional bupivacaine infiltration on post-operative pain relief after appendectomy.[4] We took the standard deviation (SD) of mean post-operative narcotic consumption in the

intervention group as 8.80 and in the control group as 12.11mg. We took the difference in mean between the two groups as 6.08 at 0.05 level of significance and power of 80%. The calculated sample size was 80; with 40 in each group.

Look-alike opaque envelopes were prepared and numbered. Each treatment name was in the relevant envelope and sealed by a statistician of the institution and then handed over to the principal investigator. This procedure was done prior to the start of the study. Enrolled patients were divided into two groups. In group A, the study group, surgical wound was infiltrated with bupivacaine 0.25% plain at the time of wound closure, while in group B, the control group, the wound was closed without infiltrating bupivacaine. For every recruited patient, a sealed envelope was opened by an assistant anaesthetist, who was not involved in the study. Patients were instructed preoperatively about the usage of VAS. All patients were pre-medicated with tablet midazolam 7.5mg one hour prior to surgery.

On arrival in the operating room, monitoring was instituted that included heart rate (electrocardiogram [ECG]), blood pressure (non-invasive) and oxygen saturation (SPO2) (Datex Ohmeda, Helsinki, Finland). Afterwards, tramadol 1.5mg kg-1 was given intravenously (IV). Propofol 2-3 mg kg-1 was administered IV and laryngeal mask airway was inserted after loss of verbal contact with the patient. Anaesthesia was maintained with isoflurane in a mixture of oxygen and nitrous oxide (40:60). When surgical depth of anaesthesia was achieved, the surgeons were allowed to proceed with the incision. Haemodynamic parameters were recorded every five minutes and rescue analgesia with tramadol 5mg IV was administered if there was an increase in heart rate and blood pressure of more than 25% from the baseline after other causes of tachycardia and hypertension were ruled out. At the time of wound closure, 20ml of study drug was infiltrated in the subcutaneous tissues sub-facially and in the deeper layers along the incision line in group A patients.

Pain score was recorded on arrival in post-anaesthesia care unit (PACU) and after 15, 30, 45 and 60 minutes; thereafter at 90, 120, 180 and 240 minutes interval by a blind observer. Patient with VAS score 3 or more received tramadol 5mg IV. The study was terminated at four hours after surgery. There were no dropouts from the study.

Data was analysed using SPSS 16. Narcotic consumption, pain score, nausea, vomiting and sedation score were presented as mean and SD. Stratification was done with regards to age, gender, ASA status, height, duration of disease and type of hernia. Student's t test was used to compare the dose of narcotic analgesic between the two groups. Repeated measures analysis of variance (ANOVA) was used to compare different time point's readings for pain score. P<0.05 was considered statistically significant.

Results

There were 80 patients in the study; 40(50%) in each of the two groups. There was no statistical difference between the two groups (p>0.05) (Table-1).

Mean pain scores were significantly higher in group B in all follow-up checks (upto 4 hours) (p<0.0001) (Table2).

Mean post-operative narcotic (Tramadol) consumption was significantly higher in group B (p=0.04). The number of patients, who required rescue analgesia i.e. having VAS 3 or more, was higher in group B in all follow-ups. On arrival in recovery room, 11(27.5%) patients had VAS 3 or

Table-1: Demographic data (n= 80).

Variables	Group-A	Group-B	P-Value
Type of Hernia			
Direct	12 (30%)	11 (27.5%)	0.835
Indirect	28(70%)	29(72.5%)	0.895
Sites of Hernia			
Right	28(70%)	28(70%)	1
Left	12 (30%)	12 (30%)	1
ASA-Grades			
Grade-I	22(55%)	14(35%)	0.182
Grade-II	14(35%)	19(47.5%)	0.384
Grade-III	4(10%)	7(17.5%)	0.366
Mean age (years)	44.2±12.4	47.8±11.7	0.18
(Range)	20 - 63	27 - 65	
Mean weight (kgs)	70.3±8.1	67.5±8.4	0.14
(Range)	54 – 85	52-82	
Mean height (cm)	171.3±6.6	168.4±7.9	0.07
(Range)	155 - 180	154 - 180	
Mean duration of Surgery (Minutes)	65.9±12.7	64.9±13	0.72

Table-2: Comparison of mean pain scores between the two groups.

Time	Group-A	Group-B	95% CI	P value
On Arrival	1.7 (1.3)	4.5 (1.2)	-3.41 to-2.3	<0.0001*
15 min	1.7 (1.3)	4.3 (1.2)	-3.41 to -2.1	<0.0001*
30 min	1.7 (1.3)	3.6 (0.8)	-2.4 to -1.5	<0.0001*
45 min	1.8 (1.2)	3.1 (0.9)	-1.7 to -0.8	<0.0001*
60 min	1.8 (1.1)	2.5 (0.8)	-1.1 to -0.3	0.003*
90 min	1.5 (1)	2 (0.2)	-0.8 to -0.2	0.004*
120 min	1.5 (1.1)	2.2 (0.8)	-1.1 to -2.3	0.003*
180 min	1.3 (1)	2.2 (0.9)	-1.3 to -0.5	<0.0001*
240 min	1.2 (1)	2 (0.6)	-1.2 to -0.4	<0.0001*

*P value significant. SD in brackets.

Table-3: Mean postoperative narcotic consumption.

Time	Group-A		Group-B		95% CI	P value
	Number of patients requiring tramadol (%)	Mean (SD) dose in mgs	Number of patients requiring tramadol (%)	Mean (SD) dose in mgs		
On Arrival	11(27%)	5.5 (1.5)	36 (90%)	8.1 (2.5)	-3.86 to -1.3	<0.0001*
15 min	10(25%)	5.5 (1.6)	37(92%)	7.7 (2.5)	-3.6 to -0.86	0.003*
30 min	8(20%)	6.9(2.6)	35 (87%)	6.6 (2.4)	-15.9 - 2.2	0.748
45 min	12(30%)	5.4(1.4)	31 (77%)	6.1 (2.1)	-2.1 -0.6	0.217
60 min	12(30%)	5.8 (2)	14 (35%)	6.1 (2.1)	-1.9-1.4	0.77
90 min	4(10%)	6.3 (2.5)	2 (5%)	5 (0)	-7.65 -10.2	0.68
120 min	4(10%)	5 (0)	10 (25%)	6.8 (2.5)	-4.6-1	0.04*
180min	0	-	15 (37%)	5.7 (1.8)	NA	
240min	0	-	4	5 (0)	NA	

*P value significant, NA = Not Applicable.

more and received rescue analgesia in group A, while in group B, 36(90%) patients needed rescue analgesia. After 180 and 240 minutes, no rescue analgesia was needed in group A, while in group B, 15(37.5%) patients required rescue analgesia.

Mean post -operative narcotic consumption on arrival in recovery room was 5.5±1.5mg and 8.1±2.5mg in group A and B respectively ($p<0.0001$). No difference was observed between the groups at 30, 45, 60 and 90 minutes following surgery in the mean post-operative narcotic consumption ($p>0.05$). A difference between the two groups ($p=0.04$) was again seen at 120 minutes on arrival in recovery (Table-3).

Discussion

Ineffective post-operative pain control is the most common cause of delay in discharge from the recovery.[5,6] In addition, if post-operative pain is not controlled early, it may lead to increased risk of developing chronic pain in open herniorrhaphy.[7]

Inguinal hernia repair is a very commonly performed day-care procedure and is associated with moderate to severe post-operative pain. These patients require a post-operative analgesic technique that is effective, safe and has minimal side effects. This is more important in developing countries where health infrastructure lacks home follow-up of these patients in the initial 24 hours. Optimal analgesic technique for this surgery still remains controversial.[8]

Infiltration of local anaesthetics (LA) in the surgical wound is a safe, simple and low-cost method. It also prevents local inflammatory response to injury and hyperalgesia. The residual sensory block provided by the LA drug facilitates recovery, enables early ambulation and home discharge after inguinal hernia repair.[9] The main advantage of this technique is that systemic effects seen with central neural blockade, like motor block, delayed ambulation and urinary retention are avoided. Further, more potent opioid drugs are also avoided or their dose reduced in the immediate post-operative period, thus decreasing their systemic effects which can also delay recovery.

We used 20ml of 0.25% plain bupivacaine infiltration at the time of wound closure. Our results showed that this technique significantly reduced post-operative pain and diminished the use of rescue analgesia in the first four hours postoperatively. LA injections, whether administered before surgery or at the time of wound closure, have shown similar effects on pain scores and analgesic use post-operatively.[10-12]

Wound infiltration to decrease analgesic requirement has been studied by other authors. Derkering et al. investigated the effect of wound infiltration on morphine requirement in the first 24 hours and found reduction in morphine requirement.[13] We used tramadol, a mu agonist, which has been shown to be effective in management of moderate acute post-operative pain. Its advantages in comparison to stronger opioids is less sedation, minimal gastrointestinal (GI) dysfunction and lack of respiratory depression.[14] Published data in relation to use of infiltration analgesia and its effect on tramadol use in inguinal hernia surgery is insufficient. Our choice of drugs is also relevant for developing countries as short-acting narcotics, like fentanyl or remifentanil, used in day-care anaesthesia in more affluent countries are usually not available or their supply is short and erratic.[15]

Further studies are needed in our part of the world to gather more procedure-specific data using the above combination. Effect of combining wound infiltration technique with field block, or subcutaneous versus sub-

facial infiltration can also be researched further.

There are a few limitations to our study. We did not look at dynamic pain scores, time of discharge from the hospital, the effect of technique on side effects of tramadol, or patient satisfaction, which could have provided additional information.

Conclusion

Multi-layered wound infiltration with 0.25% plain bupivacaine in adult day-care patients undergoing open repair of inguinal hernia under general anaesthesia resulted in reduced post-operative pain in the first four hours as well as decrease in requirement of tramadol post-operatively.

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