



Original Research Article

COMPARISON OF 4 mg VERSUS 8mg OF DEXAMETHASONE AS AN ADJUVANT TO LEVOBUPIVACAINE IN ULTRASOUND-GUIDED FASCIA ILIACA BLOCK FOR PROXIMAL FEMORAL NAIL SURGERY UNDER SPINAL ANAESTHESIA: A RANDOMIZED DOUBLE-BLIND TRIAL

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ABSTRACT

Background: Fascia iliaca compartment nerve block (FICB) is a commonly preferred pain management technique in femoral fractures. The duration of analgesia is prolonged with the addition of an adjuvant to the Fascia iliaca compartment nerve block. **Aims and Objectives:** To compare the duration of analgesia and VAS scores between 4mg and 8mg of dexamethasone given as an adjuvant to Levobupivacaine in Fascia iliaca block.

Materials and Methods: 100 American Society of Anaesthesiologists (ASA) I and II patients of either sex, scheduled for proximal femoral nail surgery under spinal anaesthesia were randomly allocated to two groups. Group A (n=50) received ultrasonography (USG) guided fascia iliaca block with 28ml of 0.25% levobupivacaine combined with 1ml of 4mg dexamethasone and 1ml of normal saline. Group B (n=50) received USG guided fascia iliaca block with 28ml of 0.25% levobupivacaine combined with 2ml of 8mg dexamethasone. Following fascia iliaca block, spinal anaesthesia was administered in both the groups. Postoperative visual analogue scale (VAS) score, duration of analgesia and haemodynamic parameters were recorded.

Results: The duration of analgesia in Group A was 715.60 + 42.48 minutes and in Group B was 836 + 35.91 minutes (p <0.0001) and the VAS score was lower in the 8mg dexamethasone group than 4 mg dexamethasone at 12 hours postoperatively.

Conclusion: 8 mg dexamethasone, in comparison to 4 mg dexamethasone as an adjuvant to 0.25% levobupivacaine for FICB significantly prolongs postoperative analgesia and reduces need for rescue analgesia in patients undergoing proximal femoral nailing under spinal anaesthesia.

Keywords: Fascia iliaca block, Levobupivacaine, Dexamethasone, analgesia.

INTRODUCTION

Hip fractures are common both in the old, due to osteoporosis, and in young age due to road accidents.^[1] Proximal femoral nailing (PFN) is a minimally invasive procedure that facilitates the treatment of unstable inter-trochanteric fractures of

the hip. Fascia iliaca block given preoperatively is of immense benefit in patient positioning and provides effective postoperative analgesia.^[2] The accuracy of needle placement and success of the block with the traditional loss of resistance (LOR) technique is variable.^[3] Ultrasound-guided guidance for fascia

iliaca block improves success rate and minimises complications.^[4]

Levobupivacaine is a newer local anaesthetic that is less cardiovascular toxic than bupivacaine, with a better safety profile and prolonged duration of analgesia.^[5] Several adjuvants have been investigated over years like alpha 2 agonists (clonidine and dexmedetomidine), magnesium, midazolam, and tramadol for peripheral nerve blocks. Alpha 2 agonists produce bradycardia, hypotension and sedation, benzodiazepines and opioids depress respiration. Though magnesium is devoid of above side effects, it modestly prolongs the duration of analgesia. The ideal adjuvant which prolongs anaesthesia with minimal side effects remains elusive.^[6]

Dexamethasone as an additive to local anaesthetic is economical, easily available and prolongs the duration of analgesia. However, the dose of dexamethasone as an adjuvant to levobupivacaine remains unclear. Hence, we conducted this study to compare two different doses of dexamethasone to know the minimum dose required to produce the desirable effect.

MATERIAL AND METHODS

The study was conducted after the approval of the ethical committee of the institution. Written informed consent was obtained from all patients. Patients of either sex, aged between 18-65 years, belonging to American Society of Anaesthesiologists (ASA) physical status I or II, presenting for proximal femoral nail surgery under spinal anaesthesia were included in the study. Patients with hypersensitivity to study drugs, infection at the site of needle injection, previous history of inguinal hernia surgery and femoral bypass graft, coagulopathies and bleeding diathesis were excluded from the study.

Patients were randomly divided into two groups using computer generated numbers and opaque sealed envelope method, with a total number of 50 patients in each group

Group-A – 28 ml of 0.25% levobupivacaine and 4 mg dexamethasone

Group – B – 28 ml of 0.25% levobupivacaine and 8 mg dexamethasone

All the patients received oral Ranitidine 150mg and Alprazolam 0.25 mg on the night before surgery. After shifting the patients to the operative room, an 18 gauge intravenous line was secured and patients were preloaded with lactated Ringer's solution 10ml/kg. ASA standard monitors such as non-invasive blood pressure, ECG, and pulse-oximeter (SpO₂) were connected. After recording baseline vital parameters, midazolam 0.02 mg/kg was administered to all the patients intravenously.

The patients in both groups received Ultrasound-guided (Sonosite™ M Turbo machine, Bothell, WA U.S.A., linear high-frequency probe, 6–13 MHz) FICB. The block was performed with the patient in

the supine position, with a probe placed transversely and the femoral artery identified at the inguinal crease. Under aseptic and antiseptic precautions, a 22gauge 50 mm block needle was placed using an in-plane approach to place the needle tip beneath the fascia iliaca around the lateral third of a line between the ASIS and pubic tubercle. Following a negative aspiration, the correct needle placement was confirmed by hydro dissection using 2 ml of isotonic saline, which separates the fascia iliaca from the ilio-psoas muscle. After hydro dissection, the drug was injected. Group A - received 28ml of 0.25% Levobupivacaine combined with 1ml of 4mg Dexamethasone and 1ml of normal saline to a total of 30ml. Group B- received 28ml of 0.25% Levobupivacaine combined with 2ml of 8mg Dexamethasone to a total of 30ml. Both the groups received their respective drugs in FICB under ultrasound guidance before spinal anaesthesia. After 15-20 minutes of FICB administration, the degree of the block was assessed by determining pain at rest and pain during 15 degrees elevation of the limb. Spinal anaesthesia was administered in the L3-L4 space with 25G Quincke's spinal needle using 2.5 ml of 0.5% Bupivacaine HCL heavy (12.5 - 15mg) in sitting position.

The study was carried out in proximal femur nail (PFN) operations, which were done by surgeons with a similar level of expertise. Pulse rate, mean arterial pressure and SpO₂ were recorded every 10 minutes till the end of surgery. Hypotension (decrease in SBP by more than 20% from baseline or a fall below 90 mmHg) was treated with IV phenylephrine 50-100 mcg and bradycardia (HR<50 bpm) was treated with IV atropine 0.6 mg(0.01mg/kg). Tramadol 100mg iv was administered to the patients in whom postoperative VAS scores were more than 4, as rescue analgesia.

Pain was assessed using VAS score at arrival and then at 2, 4, 6, 12 and 24 hours (hr) in PACU postoperatively. Also, the need for rescue analgesia, hemodynamic variables and adverse effects were assessed postoperatively. Patients were monitored for any adverse effects such as complaints of increased sensitivity to temperature variations, numbness, tingling, or impaired fine-motor movements postoperatively.

Statistical Analysis

Demographic variables in categorical/dichotomous were given in frequencies with their percentages. The mean and standard deviation of the scores for quantitative variables were provided. The chi-square test was used to determine if Group A and Group B differed in terms of qualitative factors. Using a student-independent t-test, quantitative variables differences between Groups A and B were evaluated. The differences in postoperative pain score were assessed using a student-independent t-test. The differences in the hemodynamic parameters were assessed using a student-independent t-test.

A p-value of ≤ 0.05 was considered statistically significant, and two-tailed tests were used for testing

significance Statistical analysis was carried out using the Statistical Package for Social Sciences (SPSS, version 17).

RESULTS

The groups were comparable in age, gender, height, and weight. [Table 1]

There was no significant difference between the two groups concerning hemodynamic parameters (Heart rate, SpO₂, Mean Arterial Pressure) at any point of time during the intraoperative period. The duration of surgery between both groups was comparable and was not statistically significant. Post-operatively, hemodynamic parameters (Heart rate, MAP and SpO₂) were measured and compared at various intervals and there was no significant between the two groups. However, there was slight increase in blood pressure in Group A at 12 hours post operatively. (If pain scores are different then haemodynamics also should b different)

VAS Score

The mean values of the VAS score were significantly higher in group A when compared to group B at the 12th hour postoperatively. VAS scores were comparable at 2, 4,6 and 24 hours postoperatively between the two groups.

Data expressed as mean±SD * p<0.05 Statistically significant. An Independent t-test was used.

Duration of analgesia

The analgesia duration was considerably longer in Group B when compared to Group A. [Table 2]

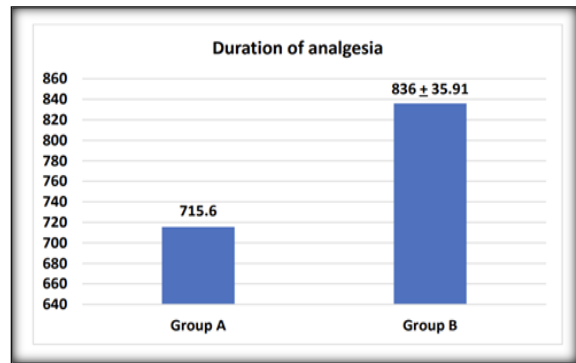


Figure 1: Distribution of Mean Duration of analgesia

First analgesic request time from block

The time for first analgesic request is significantly longer in group B than in group A.

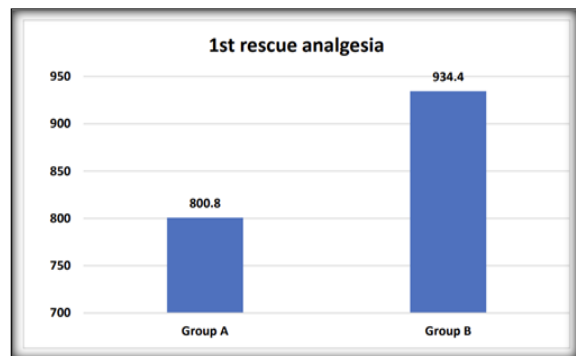


Figure 2: Distribution of Mean Duration of First Analgesic Request

Table 1: Demographic data

	Group A (n=50)	Group B (n=50)	P value
Age in yrs (Mean ± SD)	52.6± 6.7	51.8 ± 5.8	0.5247
Height in Cms (Mean ± SD)	158.74 ± 6.52	157.38 ± 7.60	0.339
Weight in Kgs (Mean ± SD)	61.90 + 6.70	61.76 ± 6.41	0.9152
Male	21 (58%)	20 (40%)	1
Female	29 (42%)	30 (60%)	

Table 2: Distribution of mean scores of VAS Score

VAS Score	Group A	Group B	P value
2nd hour	0.16 ± 0.37	0.18 ± 0.38	>0.05
4th hour	1.40 ± 0.5	1.34 ± 0.4	>0.05
6th hour	2.7 ± 0.77	2.66 ± 0.67	>0.05
12th hour	3.18 ± 0.91	2.28 ± 0.64	<0.0001
24th hour	5.24 ± 0.77	4.90 ± 0.73	0.8

Table 3: Comparison of analgesia duration in the study participants

	Duration in minutes (Mean±SD)	P-Value
Group A	715.60 ± 42.48	< 0.0001*
Group B	836 ± 35.91	

* p<0.05 Statistically significant. An Independent t-test was used

Table 4: Comparison of the first analgesic request from the block of the study participants

	Duration in minutes (Mean±SD)	p-value
Group A	800.80 ± 47.88	<0.0001

Group B	934.40 + 40.05	
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* $p < 0.05$ Statistically significant. An Independent t-test was used

DISCUSSION

Intertrochanteric fractures commonly result from falls in the elderly and can occasionally be linked to mishaps in the younger age range. After surgery, inadequate pain management increases mortality and morbidity. Alleviation from postoperative pain in proximal femoral nail operations requires multimodal analgesia, opioids, NSAIDs, and Dexamethasone. No single anaesthetic technique or agent appears to have a universal advantage for elderly surgical patients about survival. So, steps towards a multi-modal analgesia approach are being practised now a days for effective postoperative pain relief.^[7]

FICB is gaining popularity and is an attractive choice as it is easily administered in the preoperative period and has the added advantage of patient positioning during spinal anaesthesia, reduced opioid requirement, reduced hospital stays, delirium, and improved patient satisfaction and hospital stay.^[8] Ultrasound is the preferred method of localization because of the direct visualization of nearby anatomical structures. It allows visualization of the needle movement and direct spread of local anaesthetic, making the technique safer and more effective than the landmark-guided technique. US-guided block success rate is high because of accurate drug deposition near the target nerve, resulting in a faster and dense nerve blockade.

Dexamethasone is used as an adjuvant to local anaesthetic as it causes some degree of vasoconstriction and decreases local anaesthetic absorption there by increases local anaesthetic activity. It also acts on inhibitory k^+ channels on type c nerve fibres. The half-life is 36-54 hrs and maximum effects are observed within first 48 hrs.

We chose to study different doses of dexamethasone as an adjuvant as there are very few clinical studies conducted to know the optimal dose of dexamethasone as an adjuvant to local anaesthetic in FICB.

The duration of analgesia was significantly prolonged in group B when compared to group A. The results of our study were similar to Kumar N S et al,^[9] who found that the duration of block was prolonged with addition of 8mg dexamethasone to plain bupivacaine in FICB. Similar results were found in brachial plexus block in a meta-analysis conducted by Knezevic et al.^[10]

VAS score was significantly lower in group B (8mg dexamethasone) than in group A (4mg dexamethasone) and the duration of first rescue analgesia also prolonged in group B. These results were consistent with those of Muhammad Habib Khan et al,^[11] study which showed reduction of pain, and low VAS scores in FICB when compared to conventional painkillers.

Groot et al,^[12] (2015) in their study where a single fascia iliaca compartment block was given for emergency pain relief in hip fracture patients and it was noted that in two hours, 76% of patients experienced a clinically significant decrease in NRS, with 65% of them doing so without the use of opioids. Even eight hours later, 88% of patients had experienced this reduction, and 72% of those individuals did not require opioids.

Postoperative analgesic consumption was significantly lower in group B (8mg dexamethasone) than in group A (4mg dexamethasone) and the time for first rescue analgesia was prolonged in group B.

According to Raiger LK et al,^[13] the time to first analgesic request and cumulative analgesic consumption was significantly lower in two groups who received FICB with an amount of 30 ml amount of levobupivacaine 0.25% (75 mg) and bupivacaine 0.25% (75 mg) in comparison to another group where block was not administered.

Williams H et al,^[14] studied the use of FICB in patients with femoral neck fracture and observed reduced number of additional opioids required by 66% and eliminated opioid overdose. FICB also reduces the side effects of opioids (sedation, nausea, and vomiting) and provides longer-lasting analgesia. In the elderly with comorbidities such as renal dysfunction, reducing the number of opioids required preoperatively reduces the incidence of opioid overdose.

Limitations

The hip joint is supplied by the Femoral nerve, Obturator nerve, superior gluteal nerve, articular branches of the sciatic nerve, and nerves supplying the muscle quadratus femoris. With FICB all nerves are not blocked, so it is part of multimodal analgesia. Moreover we did not study the complications of dexamethasone like infection and nerve degeneration.

CONCLUSION

Ultrasound-guided administered Fascia iliaca compartment block with Dexamethasone 8mg as an adjuvant had a longer duration of postoperative analgesia compared with Dexamethasone 4mg as an adjuvant. The patients in the 8mg dexamethasone group B had reduced postoperative pain scores compared to the 4mg dexamethasone group A at the 12th hour which was statistically significant.

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