

Comparison of 0.2% Bupivacaine with 0.2% Ropivacaine in Femoral Nerve Block for Preoperative Positioning and Postoperative Analgesia in Femur Fractures

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Abstract

Introduction: Femur fractures are very painful. The peripheral nerve block provides good analgesia in these patients before performing regional anesthesia. This study aims to compare 2 local anesthetics in femoral nerve block for analgesia in preoperative positioning and postoperative analgesia of patients

Methods: Prospective, randomized study was conducted on 60 patients (18-60 years) of ASA I&II scheduled for femur surgery under combined spinal epidural. anaesthesia In group B (n=30), femoral nerve block(FNB) was performed with 0.2% bupivacaine (30ml) and in group R(n=30), 0.2% ropivacaine (30 ml) was used. Various parameters like numeric rating pain scale, time to spinal anaesthesia, sensory and motor block onset times and durations, time to first analgesic use, intraoperative & postoperative visual analog scale (VAS) data, post-operative epidural top ups, vitals and side effects were recorded for each patient.

Results: Pain assessed on visual analogue scale (VAS) during positioning was significantly less in FNB group using 0.2% bupivacaine at 5 minutes. Time to perform spinal block was significantly shorter in FNB group using 0.2% bupivacaine (8.30 min) versus ropivacaine group (17.30 min). But postoperative analgesic requirements were more in ropivacaine group and duration of analgesia was prolonged in bupivacaine group.

Conclusion: With bupivacaine time to perform spinal anesthesia was reduced and postoperative analgesia was better with bupivacaine group.

Keywords: Femoral nerve block, bupivacaine, ropivacaine.

1. Introduction

Fracture of femur is a very painful injury. Surgical repair most commonly involves either internal fixation of the fracture or replacement of the femoral head with arthroplasty. [1,2] In these surgeries regional anesthesia is preferred over general anesthesia (GA).[3] However, positioning of these patients is quite painful. Providing adequate pain relief not only increases comfort in these patients, but has also been shown to improve positioning for spinal block.[4] Before positioning femoral nerve block can be given to the patient which is a very good mode of pain relief [5-7]. This prospective study was performed to compare the analgesic effects of 2 local anesthetics

i.e. 0.2% bupivacaine and 0.2% ropivacaine in FNB prior to positioning for spinal block in patients with fractured femur and the analgesic requirements in both the groups in the post op period.

2. Materials and Methods

After obtaining institutional approval and written informed consent, we selected 60 patients with fracture femur for this prospective, randomized, controlled trial.

2.1 Inclusion criteria

Inclusion criteria were age 18–70 years, ASA physical status I–II, and being scheduled for surgery under spinal block.

2.2 Exclusion criteria

Exclusion criteria were multiple fractures, peripheral neuropathy, bleeding disorders, psychiatric disorders, allergy to local anesthetics, spinal deformities like kyphosis and scoliosis. We selected 30 patients in each group. The patients were randomly allocated to two groups of 30 patients each. In group B, femoral nerve block was given with 30 ml of 0.2% bupivacaine whereas in group R 30 ml of 0.2% ropivacaine was used.

On arrival all patients were monitored with electrocardiography, pulse oximeter, and non-invasive blood pressure measurement. An infusion of lactated Ringer's solution was started and all patients were supplied with oxygen via a face mask. Patients received FNB guided by a loss of resistance technique

2.3 Technique of femoral nerve block

The patient is placed supine, anterior superior iliac spine and pubic symphysis are identified and a line is drawn between these landmarks. This line represents the inguinal ligament. The femoral pulse is palpated and it is marked at the inguinal crease. The most successful point of needle entry is directly lateral (1–1.5 cm) to the artery in the inguinal crease. At this location the femoral nerve is wide and superficial. The needle is directed cephalad towards the center of the inguinal ligament line.

2.4 Stimulation

The needle is directed cephalad at approximately a 30° to 45° angle. A tingling sensation (paresthesia) is indicative of successful localization of the needle near the femoral nerve. The nerve is usually superficial, rarely beyond 3 cm from the skin and lateral to femoral artery. The local anaesthetic is then given. In our study we used 0.2% bupivacaine 30 ml in group B and 0.2% ropivacaine 30 ml in group R.

In the operating room and combined spinal epidural was performed in sitting/ lateral position after 15 minutes of giving preemptive analgesia. After injecting local anaesthesia (at lumbar interspace) with 2% xylocaine epidural 18G touhy's needle was inserted at appropriate interspace. Epidural space was identified by using loss of resistance technique and epidural catheter was inserted. With close monitoring of heart rate test dose of 3ml lignocaine with adrenaline was given. The subarachnoid block using 25G Quincke needle was performed and 3ml of 0.5% bupivacaine injected after obtaining free and clear flow of CSF one level below epidural catheter. The catheter was secured and patient made supine. In case of difficulty in performing epidural technique, spinal anaesthesia was performed. After performing femoral nerve block, quantitative relief of pain using VAS scale and satisfaction score was assessed after giving drugs at interval of 2 min, 5 min, 10min and 15 min

and during positioning. Time to perform spinal anesthesia was also recorded

Intraoperatively the time of onset, level and duration of sensory block were recorded. Motor bromage scale was used to assess motor block. No. of epidural top ups required were noted intra- operatively (given after 2 segment sensory regression). VAS was assessed postoperatively in ward till 24 hours and epidural top up with 0.2% bupivacaine 8ml was given when VAS \geq 4. On completion of the study, the results were compiled and statistically analyzed using Chi Square test for non-parametric data and ANOVA for parametric data. Students paired t test was applied whenever indicated P value of less than 0.05 was considered significant and less than 0.001 as highly significant.

3. Results

The demographic data was comparable in both groups [Table 1]. VAS at rest and movement for both groups was almost similar in both groups (bupivacaine / ropivacaine) at 2 minutes to 10 minutes (5.63 ± 1.273 versus 4.20 ± 1.157 at 2 minutes; 3.70 ± 1.149 versus 2.90 ± 1.296 at 10 minutes) though it was slightly in favor of group B. Time to perform spinal anesthesia was shorter in group B (8.30 ± 2.178 versus 17.80 ± 1.064) (Table 3) which was highly significant. The ropivacaine group (group R) had less duration of analgesia and required first top up at 4 hours after surgery whereas it was required at 6 hours in bupivacaine group (group I). The difference was statistically significant (Table 4). In group B no. of epidural top ups required were less as compared to group II (mean epidural doses 2.77 versus 3.70

Table 1: Demographic Data

	Group R	Group B	P Value
Age	51.70 \pm 15.02	48.20 \pm 15.18	0.373
Sex (M/F)	19/11	19/11	

Table 2a: Pre-emptive Analgesia

Time	Group R	Group B	P value
Baseline	8.60 \pm 1.22	8.83 \pm 1.07	0.450 ^{NS}
A0	7.57 \pm 1.478	8.43 \pm .971	0.009
2	5.63 \pm 1.273	4.20 \pm 1.157	0.009
5	4.20 \pm 1.157	3.70 \pm 1.149	0.009
10	3.70 \pm 1.149	2.90 \pm 1.296	0.009
15	2.90 \pm 1.296	1.47 \pm .937	0.009
P0	6.53 \pm 1.456	5.03 \pm .615	0.009

Data: Mean \pm SD, S: significant (p <0.05); p<0.001 =highly significant

Table 2b: Satisfaction Score

Time	Group R	Group B
VAS0	1.87±1.383	1.83±1.112
VAS15	1.97±1.351	1.60±1.062
VAS 30	2.07±1.230	2.03±1.165
VAS 45	2.07±1.230	2.03±1.165
VAS 60	2.50±1.137	2.07±0.999
VAS 75	2.63±1.189	2.00±0.952
VAS 90	2.73±1.112	2.00±0.898
VAS 105	2.97±1.189	2.00±0.900
VAS 120	3.07±1.258	2.00±0.932

Data: Mean ± SD, NS:

Table 3: Time to Perform Spinal Anaesthesia

Group	N	Spinal anaesthesia time (minutes)	P value	Analysis
Group R	30	17.80±1.064	<0.001**	HS
Group B	30	8.30± 2.178		

Data: Mean ± SD, S: significant (p <0.05); <0.001 =highly significant

Table 4: Comparing Vas in ward in 2 groups

Time	Group B	Group R	P value	Analysis
4	4.33±1.398	5.33±1.422	0.008	S
6	5.00±1.259	5.87±1.167	0.008	S
8	7.13±1.137	7.13±1.137	1.00	NS
16	8.03±0.320	8.03±0.320	1.00	NS
24	8.00±0.455	8.00±0.00	1.00	NS

4. Discussion

The choice of the anesthesia management in patients with a fracture of the femoral shaft is greatly affected by the surgical needs. [8] Therefore, a technique that allows the complete paralysis of all the muscles acting on the femur is mandatory to facilitate the intraoperative realignment of a femoral shaft fracture.

Urwin *et al* reported that there were significant advantages for regional anesthesia (RA) compared with GA in terms of one-month mortality and deep vein thrombosis.[2] Furthermore, time to ambulation was quicker in patients receiving RA. However, the choice of anesthetic technique depends on the anesthesiologist's preference and experience. The subsequent problem concerned was pain on positioning for spinal block. When considering the technique used to aid positioning patients for spinal block, Sandby-Thomas *et al* reported that the most frequently used agents were midazolam, ketamine and propofol.[9] Alternative agents were fentanyl, remifentanyl, morphine, nitrous oxide, and sevoflurane, whereas nerve blocks were used infrequently.

Schiferer *et al* demonstrated that FNB provided analgesia after femoral trauma which was a

better technique to reduce pain. [10] In our study same volumes of 2 local anesthetics i.e. bupivacaine and ropivacaine 30 ml were used, like those reported by Fanelli.[11] bupivacaine is a widely used local anesthetic for nerve block in outpatient surgeries.[12] Usually, bupivacaine 0.5% is used to block the femoral nerve.[13] In this study, combining a femoral nerve block with spinal anesthesia provided better pain free positioning for the spinal anesthesia procedure. Of the two used local anesthetics, bupivacaine showed a greater control of the pain in postoperative period. Our analysis showed that use of ropivacaine for FNB provided less duration of analgesia requiring first top up at 4 hours after surgery whereas it was required at 6 hours in bupivacaine group. The difference was significant statistically. At 6 hours there was no difference. In both groups, number of epidural top ups required was reduced thus showing femoral nerve block had prolonged duration of action for postoperative analgesia also as supported by Marino *et al* who reported that femoral block significantly reduced the need for opioids postoperatively.[15] In bupivacaine group, no. of epidural top ups required were less as compared to ropivacaine group (mean epidural doses 2.77 versus 3.70).

To conclude we can say that bupivacaine reduced the time to perform spinal anesthesia and post-operative duration of analgesia was prolonged with bupivacaine and thus had less analgesic requirements

References

- [1] Parker MJ, Handoll HHG, Griffiths R. Anaesthesia for hip fracture surgery in adults. *Cochrane Database Syst Rev*. 2004; 4:CD000521.
- [2] Urwin SC, Parker MJ, Griffiths R. General versus regional anesthesia for hip fracture surgery: a meta-analysis of randomized trials. *Br J Anaesth*. 2000; 84:450-455.
- [3] Wu CL, Seth R, Cohen BS. Efficacy of postoperative patient-controlled and continuous infusion epidural analgesia versus intravenous patient-controlled analgesia with opioids. *Anesthesiology*. 2005; 103:1079-88.
- [4] Ong CK, Lirk P, Seymour RA, Jenkins BJ. The efficacy of preemptive analgesia for acute postoperative pain management: A meta-analysis. *Anesth Analg*. 2005; 100:757-73.
- [5] Haddad FS, Williams RL: Femoral nerve block in extracapsular femoral neck fractures. *J Bone Joint Surg Br* 1995; 77-B: 922-23.
- [6] Hood G, Edbrook DL, Gerrish SP: Postoperative analgesia after triple nerve block for fractured neck of the femur. *Anaesthesia* 1991, 46:138-140.
- [7] Howard CB, Mackie IG, Austin TR: Femoral neck surgery using a local anesthetic technique.

- Anaesthesia 1983, 38:993–994. Advisory Committee on Genetic Modification: Annual Report. Lon
- [8] Starr AJ, Bucholz RW. Fractures of the shaft of the femur. In: Bucholz RW, Heckman JD, eds. Rockwood and Green's fractures in adults. 5th ed. Philadelphia, PA: Lippincott Williams & Wilkins, 2001:1683–1730.
- [9] Sandby-Thomas M, Sullivan G, Hall JE. A national survey into the peri-operative anesthetic management of patients presenting for surgical correction of a fractured neck of femur. *Anaesthesia*. 2008; 63:250–58.
- [10] Schiferer A, Gore C, Gorove L, et al. A randomized controlled trial of femoral nerve blockade administered preclinically for pain relief in femoral trauma. *Anesth Analg*. 2007; 105:1852–1854.
- [11] Fanelli G, Casati A, Beccaria P. A double blind comparison of ropivacaine, bupivacaine and mepivacaine during sciatic and femoral nerve blockade. *Anesth Analg* 1998; 87:597-600.
- [12] Punjasawadwong Y, Srisawasdi S, Werawatganon T, Taratarnkoolwatana K, Chauin W, Vasinanukorn M. The Thai anesthesia incidents study (THAI study) of ambulatory anesthesia: II. Anesthetic profiles and adverse events. *J Med Assoc Thai* 2008; 91: 188–95.
- [13] Singelyn FN. Femoral nerve block. In: Hadzic A, ed. Text Book of Regional Anesthesia and Acute Pain Management, 1st Edn. New York: McGraw-Hill Publishers, 2007; 499–507.