ORIGINAL ARTICLE

Pain Relief during Positioning for Spinal Anesthesia in patients with Femoral Fracture: A Comparison between Femoral Nerve Block and Intravenous Nalbuphine

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ABSTRACT

Aim: To enlighten better technique in terms of pain relief (on visual analogue scale) during positioning, time to perform spinal anesthesia, the quality of position and acceptance of patients.
Design: Interventional Quasi Experimental study
Place and duration of study: This study was conducted in Department of Anesthesia, ICU & Pain Management Sheikh Zayed Hospital Rahim Yar Khan from Jan 2013 to June 2013.
Methods: Eighty-four ASA I–II patients aged 18–80 years undergoing surgery for femur fracture under spinal block were selected and randomized into two groups (42 in each group). Fifteen minutes before positioning for spinal block, the FNB group received femoral nerve block with a mixture of 15 ml lignocaine with adrenaline and 5ml distilled water and the IVA group received 6mg intravenous nalbuphine. SPSS 16 was used for statistical analysis.
Results: Pain assessed on visual analogue scale (VAS) during positioning was significantly less in FNB group (1.40±0.66) versus IVN group (3.02±1.39), P=0.000. Time to perform spinal block was significantly shorter in FNB group (2.15±0.78min) versus IVN (3.50±1.46min), P=0.001. Quality of patient positioning during spinal was significantly better in FNB group (2.45±0.55) than IVN group (1.88±0.80), P=0.000. Acceptance of patient was very significantly higher among FNB group (40/42=95.24%) than IVN (28/42=66.67%) group, P=0.001
Conclusion: The results of this study reflected that femoral nerve block provides better analgesia resulting in adequate positioning, rapid performance of spinal and higher acceptance among patients with femoral fracture during positioning for administration of spinal anesthesia.
Keywords: Fracture femur, intravenous analgesia, spinal anesthesia, femoral nerve block

INTRODUCTION

The incidence of femoral fractures is reported as 1-1.33 fractures per 10,000 population per year (1 case per 10,000 population). In individuals younger than 25 year and those older than 65 years, the rate of femoral fractures is 3 fractures per 10,000 population annually[1,2]. 1756 patients with closed femur fracture were admitted in Benazeer Bhutto Hospital Rawalpindi[1] from Jan 2009 to April 2011 (approximately 753 per year). In our hospital, 323 patients were admitted during last year (2012) with femur fracture.

The majority of anesthetists used a spinal anesthetic for surgeries involving a fractured neck of femur despite a lack of clear-cut evidence of any superiority of this technique[3]. The patients with hip fracture may have greater number of co-morbidities and the potential for risk from severe cardiovascular changes during surgery, the combination of femoral nerve block and spinal anesthesia can be safely recommended for pain management in high risk patients[4]. SIA S[5] and Arissara Iamaroon[6] (only two relevant studies published up to now) stated that spinal anesthesia was preferred in their institutions for femoral fracture surgery. In our institution, spinal block is preferred anesthetic technique for these patients. In the absence of convincing differences in clinical outcomes between spinal and general anesthesia, we propose that cost should be one reasonable factor determining the ultimate choice in Pakistan. Chakladar[7] results suggested that spinal anesthesia offered a saving of approximately Pakistani RS. 13,500/- per case compared with general anesthesia for hip fracture surgery.

Fracture of femur is particularly a painful bone injury because the periosteum has the lowest pain threshold of the deep somatic structures[6] hence requiring adequate analgesia prior to definitive surgical management[8]. Pain is worsened by movement due to overriding of bone ends which offers great challenge for anesthesiologists[5] and their assistants. Delay in position further aggravates pain. Administration of epidural requires relatively longer time hence positioning for patients becomes more

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problematic. To reduce the pain and avoid further soft tissue trauma, we prefer to perform spinal anesthesia in sitting position while femoral traction is maintained. Despite this practice, patient feels agonizing pain which causes difficulty in positioning and greater time spent to perform spinal.

Analgesics or femoral nerve block (FNB) may be used to help the patient to tolerate positioning. There are a few data[5,6,9] to establish a benefit of one form of anesthetic over another in this situation. Up to now only two studies have been published to compare femoral nerve block with intravenous opioids (fentanyl) to prevent pain in patients and disturbance of anesthetist and his assistant while positioning for spinal anesthesia.

Administration of femoral nerve blocks familiarized the anesthetists and emergency doctors for its use to relive pain in such patients in emergency department. Although femoral nerve block is one of the easiest peripheral nerve blocks to perform because the landmarks are easy to identify and the nerve is usually superficial yet person administering must be aware of possible complication and ready to manage them. Possible complications specific to femoral nerve block include vascular puncture, hematoma, difficulty weight bearing/ mobilizing leading to falls and injuries (if administered to patients who are allowed to walk within 8 hours of block) specifically to femoral nerve block. Complications of other blocks may also encounter with this block like block failure, intravascular injection, local anesthetic toxicity, infection, allergy to local anesthetics and nerve damage[10].

MATERIALS & METHODS

This quasi experimental study was conducted to compare the analgesic effect of femoral nerve block and I/V Nalbuphine in patients having fracture of femur while making position for spinal anesthesia. After approval of ethical committee of the hospital and consent of patient, 84 patients requiring spinal anesthesia for correction of femur fracture were divided into two groups (42 in each), femoral nerve block (FNB) and intravenous nalbuphine (IVN). Statistical analysis was done using SPSS 16.0. Patients with age between18–80 years, ASA physical status I–II, and being scheduled for surgery under spinal block were included in study.

Patients with multiple fractures, peripheral neuropathy, bleeding disorders, mental disorders, communication failure, allergy to any study medicine, and use of analgesia up to 8 hour before surgery were excluded from study. Patients with local or systemic infection or patients with an abnormal neurological examination in that limb or perceived risk of compartment syndrome, which would require serial sensory examinations that would be impeded by the FNB were also excluded from study.

All patients were monitored with electrocardiography, pulse oximeter, and non-invasive blood pressure measurement. An infusion of lactated Ringer's solution was given and all patients were supplied with oxygen (5L/min) via a face mask. The patients were allocated by computer-generated random numbers into two groups of 42 patients each: a FNB group and an IVA group. The random allocation sequence was concealed in opaque, sealed envelopes until a group was assigned.

Data were analyzed using an SPSS 16.0 software package. Quantitative variables were described as mean ±SD; Qualitative variables were described as number (percentage). Student's t-test and Chi-square test were used as appropriate to compare the two groups. $P < 0.05$ was considered statistically significant. The sample size required for this study was estimated from the results of pioneer study of SIA S[5]. They reported V.A.S. during positioning for spinal 0.5±0.5 in femoral nerve group and 3.3±1.4 in intravenous fentanyl group; based on alpha error 5% and power 95%, our calculated sample size was at least 4 in each group.

RESULTS

During the study period there were about 178 patients presenting for surgical repair of femoral fracture but 84 patients were included in this study. 94 patients were excluded for reasons given in the exclusion criteria. No adverse systemic toxicity of lignocaine, such as seizure, arrhythmia, or cardiovascular collapse was noted in the FNB group. Neither vascular puncture nor paresthesia occurred. No patient in either group had hypoventilation (respiratory rate below10/min) or oxygen saturation below 95%.

Table 1: Demographics regarding ASA physical status, age, gender and time since trauma were not statistically significant between two groups.

	FNB (n=42)	IVN (n=42)	Total (n=84)	P-value
Age In Years (mean± S.D.)	40.79±16.91	44.12±17.85	42.45±17.36	0.901
Sex(male: female)	27:15	30:12	57:27	0.491
ASA 1/11/111	26/10/6	26/6/10	52/16/16	0.368
Time Since Trauma(Days) (mean± S.D.)	4.69±3.30	5.40±4.31	5.48±3.83	0.646
Site Of Femur Fracture (Proximal/shaft/distal)	22/16/04	25/12/05	47/28/09	0.646

Table 2: VAS Scores and Spinal Performance Time were significantly lesser in FNB group while Quality of Position and Patient Acceptance were significantly greater in FNB group.

	FNB (n=42)	IVN (n=42)	Total (n=84)	P-value
VAS at positioning for spinal anesthesia	1.40±0.66	3.02±1.39	2.21±1.35	0.000
Time to perform spinal anesthesia (min)	2.15±0.78	3.50±1.46	2.83±1.35	0.001
Quality of patient position (0 to3)	2.45±0.55	1.88±0.80	2.17±.74	0.000
Patient Acceptance (Yes/No) acceptance (% age)	40/2	28/14	68/16	0.001
	95.24%	66.67%	80.95%	

Fig. 1: Visual Analogue Score and time to perform spinal anesthesia significantly less in femoral nerve block (FNB) than intravenous nalbuphine (IVN).

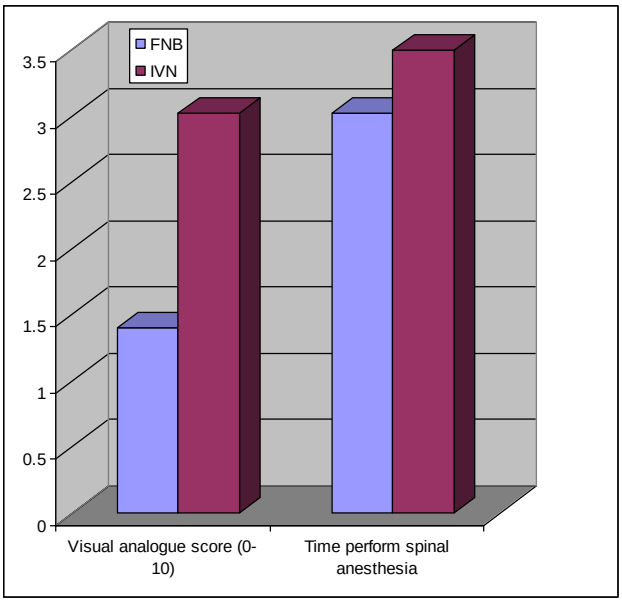
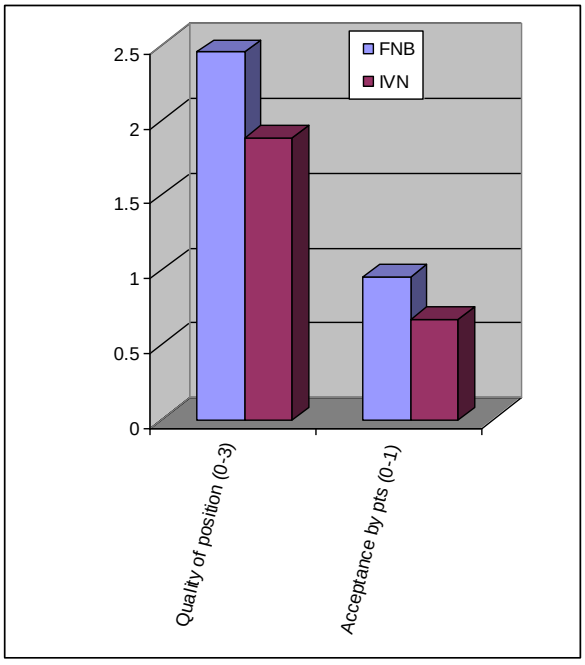


Fig. 2: Quality of Position and time to acceptance by patients significantly better in femoral nerve block (FNB) than intravenous nalbuphine (IVN).



DISCUSSION

The results of our study indicated that the femoral nerve block is more effective than intravenous nalbuphine to facilitate the positioning for spinal anesthesia in patients undergoing surgery for femoral fractures.

Ultrasound guided femoral nerve block is currently being practiced. Being expensive and requiring skill cannot be used as routine in our country. Nerve stimulated peripheral nerve block are considered gold standard. It is also much more expensive than loss of resistance technique. Geier KO[12] concluded that there were no significant differences regarding efficiency between loss of resistance and peripheral nerve stimulator methods. Time for peripheral nerve stimulator block was significantly longer ($p < 0.001$). Their study reflected that the loss of resistance technique is an effective and feasible alternative to peripheral nerve stimulator technique. We used Loss of resistance technique for blocking the femoral nerve using a single needle placement as described by Khoo ST[13].

Sia et al[5] were the pioneers who conducted a study for the very first time to compare the analgesic effects and feasibility of femoral nerve block and intravenous fentanyl for positioning for spinal anesthesia in patients with femoral shaft fractures. Visual analogue scores during said positioning was significantly less in FNB group (0.5±0.5) than I/V fentanyl group (3.3±1.4) P<0.001. Time to perform spinal anesthesia was significantly less in FNB group (1.8±0.7 min) compared with intravenous fentanyl group (3.0±1.1 min). P< 0.05. Adequacy of position was significantly better in FNB group (2.8±0.4) compared with I/V fentanyl group (1.6±0.7) P< 0.005. Acceptance of patient was significantly higher in FNB group (10/10=100%) than I/V fentnyl group (6/10=60%). Regarding all the four variables discussed above, our results were similar i.e., femoral nerve block was significantly better than intravenous nalbuphine. (P=0.000 or 0.001).

Other study was conducted by Arissera iamaroon[6]. They also included proximal femur fracture. Visual analogue score during positioning for spinal block did not significantly differ in both groups. It was 6.1±2.6 in FNB group and 5.9±3.4 in I/V fentanyl group. P=0.80. Quality of position did not

differ in both groups in their study. It was satisfactory in 28 out of 32 (87.5%) patients in FNB group and 26 out of 32(81.25%) patients in femoral nerve group. P=0.49. These results differ from our study due to several reasons. Firstly, time between trauma and surgery was much longer in their patients than in ours. Moreover in their study time between trauma and surgery was significantly longer in I/V fentanyl group (15.6±18.4 days) than FNB group (8.0±7.0 days). P=0.03. But in our patients time between trauma and surgery did not differ between two groups i.e. 5.40±4.31 days in I/V nalbuphine group and 4.69±3.30 days in FNB group. P= 0.646. They confessed that these facts might have influenced their results.

Secondly, it is hard for us to fully agree with them that in patients with proximal femoral fracture, femoral nerve block is only partly effective for pain relief. For surgical anesthesia, it is definitely true. Barry Nicholls[14] stated that hip joint is innervated by the femoral, sciatic and obturator nerves, with the skin and superficial tissues receiving branches from the lower thoracic nerves. Consequently no single peripheral nerve block is sufficient for hip surgery. But a large number of studies reflected that femoral nerve block is quite effective in providing pain relief in hip injuries in pre hospital settings, emergency department and post operatively[15-18]. McGLONE R[19] et al reported that femoral nerve block was found equally effective at all levels. Subsequently, they used femoral nerve blocks for inter-trochanteric fractured neck of femur with good results. They disagreed with suggestion of Tondare[20] that patients with high femoral fractures required supplementary opiate analgesia. Layzell M[21] outlined the development of a nurse-led service to provide preoperative femoral nerve blocks to provide good pain control for older patients with medical problems following fractured neck of femur.

Thirdly, Arissera Iamaroon[6] used bupivacaine for femoral nerve block and waited for only 15 minutes due to pressure of surgeons. They believed in Haddad et al that analgesic benefit of Femoral nerve block in extra capsular femoral neck fracture occurred at 15 minutes using 0.3ml /kg of 0.25% bupivacaine. They also noticed decrease in VAS after 15 minutes. But they omitted the fact that Haddad[22] et al did not produce movement for positioning for spinal. Several studies for three-in-one blocks (femoral, obturator and lateral cutaneous nerve blocks with single needle pierced just lateral to femoral artery and just below inguinal ligament with a pressure of thumb to prevent distal spread)) with 20 ml of bupivacaine 0.5% have reported sensory onset times of 27 ±7 minutes,[23] 32 ±10 minutes[24], and 27 ±16 minutes[25] . Arissera Iamaroon[6] admitted that real issue was pressure from surgeons concerning delay in surgery. They also confessed that to maximize the analgesic effect of bupivacaine, a time interval longer than 15 minutes would have been chosen. They very rightly pointed out that use of lignocaine instead of bupivacaine shortens the onset time. Sia et al[5] reported that a five-minute interval was adequate to establish the analgesic effect produced by femoral nerve block using 1.5% lidocaine. Gosavi et al[26] reported that onset time of femoral nerve block as 5 ±0.54 minutes by using the mixture of 10 ml of 2% lidocaine, 1 ml of sodium bicarbonate and 4 ml of normal saline. We used 20 ml of 1.5% lignocaine with adrenaline for femoral nerve block. We waited for 15 minutes. VAS was significantly lower in FNB group than IVN group. Adequacy of position was significantly better in FNB group than IVN group.

Mosaffa et al[9] compared IV fentanyl with fascia iliaca block (anesthetizes the femoral nerve in all cases and the lateral cutaneous nerve of the thigh and the obturator nerve in 75% of cases) using lignocaine. VAS values during placement in the lateral decubitus position were lower in the fascia iliaca block group [0.5 (0–1) versus 4 (2–6) for fascia iliaca block and IV fentanyl, respectively]. In our study, VAS values were similarly less in FNB group for sitting position for spinal block.

There are several limitations of our study that should be addressed. All patients were aware of their treatment group allocation. The rationale for lack of blinding was that we considered placebo injection in inguinal area unjustified. Although Assessors of position were blinded to the patient's allocated treatment group and remained outside the operating room during administration of femoral nerve block or intravenous nalbuphine yet the issue of blinding was problematic because the drug affecting the central nervous system was administered only in the patients of one of the groups. In fact, even if the anesthesiologist who performed the spinal block and judged the adequacy of position was blinded, the clinical effects of IV administration of nalbuphine were evident in some group IVA patients who complained of giddiness or a "strange feeling.

Although our results reflect that difference between two groups were highly significant statistically. But their clinical significance requires re-evaluation. E.g. VAS of FNB group (1.40±0.66) indicated mild pain and IVN group (3.02±1.39) reflected mild to moderate pain. Clinically, time to perform spinal in FNB group (2.15±0.78min) was not significantly shorter than IVN group (3.50±1.46 min). Quality of position was good to optimal in FNB group (2.45±0.55) while almost good in IVN group (1.88±0.80). However acceptance of patient was

higher in FNB group (95.42%) than IVN group (66.67%).

CONCLUSION

Both the techniques provided sufficient analgesia to perform spinal block in the sitting position. However pain relief provided by femoral block was significantly better than that provided by intravenous nalbuphnie. Pain relief and relaxation of quadriceps allowed better positioning, shorter spinal block performance time and more acceptances of patients in femoral nerve group. Although femoral nerve block is simple, effective and cheap method of analgesia in femur fracture yet we recommend large multicenter studies before including it in future A&E and orthopedic texts as suggested by McGLONE.R[19].

REFERENCES

1. Adnan R M, Khan R, Ahmed S, Zia M I, Amin J, Danish K F., "Frequency Of Femoral Fractures; Comparison Inpatients < 40 and >40 years of age". Professional Med J 2012;19(1): 011-014.
2. Aukerman D F, MD; Chief Editor: Sherwin SW Ho, "Femur Injuries and Fractures" Medscpae July 2013.
3. 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.
4. Amiri H R, Safari S, Makarem J, Rahimi M, Jahanshahi B. Comparison of Combined Femoral Nerve Block and Spinal Anesthesia With Lumbar Plexus Block for Postoperative Analgesia in Intertrochanteric Fracture Surgery. Anesth Pain. 2012;2(2):32-35. DOI: 10.5812/aapm.4526
5. Sia S, Pelusio F, Barbagli R, Rivituso C. Analgesia before performing a spinal block in the sitting position in patients with femoral shaft fracture: a comparison between femoral nerve block and intravenous fentanyl. Anesth Analg. 2004; 99:1221–1224.
6. Arissara Iamaroon,Manee Raksakietisak, Pathom Halilamien, Jitaporn Hongsawad, Kwankamol,. "Femoral nerve block versus fentanyl: Analgesia for positioning patients with fractured femur." Local and Regional Anesthesia 2010:3 21–26.
7. Chakladar A, White S. M. Cost estimates of spinal versus general anaesthesia for fractured neck of femur surgery. Anaesthesia. 65:8; 810–814, August 2010
8. Duc TA. Postoperative pain control. In: Conroy JM, Dorman BH, editors. Anesthesia for Orthopedic Surgery. New York, NY: Raven Press; 1994:355–365.
9. Mosaffa F, Esmaelijah A, Khoshnevis H. Analgesia before performing a spinal block in the lateral decubitus position in patients with femoral neck fracture: a comparison between fascia iliaca block and IV fentanyl. Reg Anesth Pain Med. 2005;30:61.
10. McEwen A, Anaesthesia Tutorial Of The Week 249, 6th February 2012**,** www.totw.anaesthesiologists.org www. davis drug .com
11. Karl Otto Geier Peripheral nerve stimulator for femoral nerve block. Is it really necessary?. Rev Bras Anestesiol. 2003 Jun;53(3):338-45.
12. Khoo S. T, Brown T. C. Femoral nerve block-the anatomical basis for a single injection technique. Anaesthesia and Intensive Care. 1983;11, 40-2.
13. Barry Nicholls is Consultant in Anaesthesia and Pain Management at Musgrove Hospital, Taunton, UK. Lower limb nerve blocks
14. Fletcher AK, Rigby AS, Hayes FL. Three-in-one femoral nerve block as analgesia for fractured neck of femur in the emergency department: a randomized, controlled trial. Annals of Emergency Medicine. 2003;41:227–233.
15. Gille J, Gille M, Gaur R, Weidman B.: [Acute pain management in proximal femoral fractures: femoral nerve block (catheter technique) vs. systemic pain therapy using a clinic internal organization model]. Anesthetist 55(4):414-22, 2006 Apr.
16. 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.
17. Beaudoin FL, Nagdev A, Merchant RC, Becker BM. Ultrasound-guided femoral nerve blocks in elderly patients with hip fractures. Am J Emerg Med. 2010 Jan; 28(1):76-81.
18. McGlone R, Sadhra K, Hamer DW, Pritty PE. Femoral nerve block in the initial management of femoral shaft fractures. Arch Emerg Med 1987; 4: 163–8.
19. Tondare A. S. & Nadkarni A. V. (1982) Femoral nerve block for fractured shaft of femur. Canadian Anaesthetists' Society
20. Layzell M Exploring pain management in older people with hip fracture.Nurs Times.2009 ;105(2): 20-3.
21. Haddad FS, Williams RL. Femoral nerve block in extracapsular femoral neck fractures. J Bone Joint Surg Br. 1995;77:922.
22. Urbanek B, Duma A, Kimberger O, et al. Onset time, quality of blockade, and duration of three-in-one blocks with levobupivacaine and bupivacaine. Anesth Analg. 2003;97:888–892.
23. Marhofer P, Oismuller C, Faryniak B, Sitzwohl C, Mayer N, Kapral S. Three-in-one blocks with ropivacaine: evaluation of sensory onset time and quality of sensory block. Anesth Analg. 2000;90:125.
24. Marhofer P, Schriigendorfer K, Koinig H, Kapral S, Weinstabl C, Mayer N. Ultrasonographic guidance improves sensory block and onset time of three-in-one blocks. Anesth Analg. 1997;85:854–857.
25. Gosavi CP, Chaudhari LS, Poddar R. Use of femoral nerve block to help positioning during conduct of regional anesthesia (Abstract). Available from: http://www.bhj.org/journal/2001_4304_oct/org_531. htm. Accessed December 29, 2008.