Original Research

USG Guided Femoral Nerve Block And Lateral Femoral Cutaneous Nerve Block To Provide Analgesia For Positioning Of Patients With Intertrochanteric Fracture Femur Before Subarachnoid Block:

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Abstract

Background: Femoral fractures are one of the most common fractures represented with an annual prevalence of around 2.9 million cases worldwide. Intertrochanteric fractures of femur subject the patients to lot of pain due to overriding of fracture ends especially during patient positioning for subarachnoid block. A central neuraxial block, mainly subarachnoid block is commonly used for surgery of Intertrochanteric fractures of femur.

Aim: Our aim was to assess the effectiveness of ultrasound (USG) guided femoral nerve block (FNB) and lateral femoral cutaneous nerve block (LFNB) before positioning for subarachnoid block for intertrochanteric fracture femur and to assess the VAS up to 24 hrs after surgery.

Methods: It was a prospective observational study conducted at Bone and Joint Hospital which is one of the associated hospitals of Government Medical College Srinagar in the department of anaesthesiology on 200 patients of ASA I and II class of age group (20 - 70 years) old, posted for intertrochanteric fracture femur surgeries under spinal anaesthesia. Patients were randomized into two groups Group A (N = 100) received USG guided femoral nerve block and lateral femoral cutaneous nerve block before positioning for spinal anaesthesia with 0.2 % ropivacaine and in control Group B (N = 100) didn’t receive any interventions preoperatively. Parameters recorded included VAS at baseline, 10 mins and during positioning, anaesthesiologist’s satisfaction (yes or no), total Tramadol consumption and patient’s satisfaction (Likert scale).

Results: Demographic variables were comparable in both groups. Mean pain intensity in the VAS score at the time of admission to the operating room was 6.9±0.9, which was reduced to 2.7±0.9 after blockade. In this study, 74 (74%) patients were very satisfied (Likert scale 5), 18 (18%) were satisfied (Likert scale 4), 4 (4%) had no opinion (Likert scale 3), 4 (4%) were not satisfied (Likert scale 2), and no one was dissatisfied (Likert scale 1). VAS in Group A 10 mins and during positioning was 2.5 ± 1.09 and 3.2 ± 0.31 in comparison to 6.56 ± 0.67 and 7.4 ± 0.82 in control group B respectively. Only 10 patients required injection tramadol and total consumption was 45±30 mg in group A, while all patients in control group required injection tramadol and total consumption was 170±70 mg. Anaesthesiologists and patient’s satisfaction were much higher in Group A.

Conclusion: USG - guided femoral nerve block (FNB) and lateral femoral cutaneous nerve block (LFNB) before positioning for spinal anaesthesia for intertrochanteric fracture femur is very effective in controlling pain during positioning for spinal anaesthesia. This analgesia block is a safe and effective to be used for positioning prior to spinal anesthesia and it prolongs postoperative analgesia.

Keywords: Ultrasound, Femoral Nerve Block, lateral femoral cutaneous nerve block, Spinal Anaesthesia, Ropivacaine, Intertrochanteric fracture femur

Introduction:

Intertrochanteric fracture (IF) is one of the most common injuries requiring surgical intervention. Anesthesia for repairing that kind of fracture is an especially challenging problem for anesthesiologists due to the advanced age of patients and their significant comorbidities . [1] Spinal anesthesia is commonly used in lower limb orthopedic surgeries and has many benefits including postoperative analgesia, ease of performance, effective analgesia, prevention of respiratory tract complications, Deep Vein Thrombosis (DVT) reduction, and decreased length of hospitalization and mortality . [2-5]

Regional anesthesia, including femoral nerve block (FNB) and lateral femoral cutaneous nerve block (LFCNB) is widely used for pain management among patients with hip fractures. [6,7] Among patients with hip fractures, in-hospital mortality varies from 1.6% to 9.7% . [8,9]
The most important issue to improve spinal anesthesia success rate is patient cooperation to get a proper position for spinal anesthesia. However, due to fracture, any change in position is very painful, which make spinal anaesthesia technique very difficult. Due to pain sympathetic nervous system gets activated causing further increase in heart rate and blood pressure, which may increase the risk of cardiovascular problem in affected patients. [10]

Various modalities of analgesia have been utilized for positioning which include opioids, midazolam, ketamine, nonsteroidal anti-inflammatory drugs and regional blocks such as fascia iliaca block and femoral nerve block (FNB).[11] The use of opioids and different sedative agents may cause severe respiratory depression, particularly in co-morbid conditions. Femoral nerve block and LFCNB features as a rescue analgesia so as to provide adequate analgesia for facilitation of satisfactory positioning for neuraxial block.[12] Femoral nerve block and LFCNB is an easy and safe block to perform owing to the easily identifiable landmarks and also because the nerve is usually superficial.
Ultrasonography (USG) using linear probe is a useful tool in identifying the femoral vessels and nerves which are closely related to each other and thus helps in avoiding inadvertent vessel puncture during femoral nerve block.
We conducted a prospective observational study to study the effects of supplementation of USG-guided nerve blocks (FNB and LFCNB) using 0.2% ropivacaine to SAB given prior to SAB, compared with SAB alone, in reducing the fracture pain, facilitating patient positioning for SAB, and postoperative analgesia in patients coming for intertrochanteric fracture femur surgery.

Methods:

This prospective observation study was conducted at Bone and Joint Hospital one of the associated hospitals of Government Medical College Srinagar in the department of anaesthesiology on 200 ASA I and II patients of 20 to 70 years of age group posted for intertrochanteric fracture femur surgeries under spinal anaesthesia, after getting approval from the institutional and ethical committee. It was prospective observational study conducted from April 2022 to August 2023**.** Patients satisfying the selection criteria and after having consented to participate in the study was enrolled.

Inclusion Criteria:

I. Age group between 20 & 70 years
II. Patients belonging to ASA I –II class were included.

Exclusion Criteria:

BMI > 35, Chronic opioid use, Neuropathic pain , contraindication to neuraxial block, contra indication to FNB , Allergic or contraindication to the drug to be used, severe psychiatric or mental disorder.

All patients were subjected to routine preoperative assessment and fasting protocols. All patients were visited in the night before surgery and explained about the anaesthetic procedure and the outcomes. Written and informed consents were taken.

All participants were explained about the visual analogue score (VAS) during the pre- anaesthetic visit. Patients were given a VAS scale containing a straight line with numbers from 0 to 10 equidistant to each other and asked to encircle the number according to their pains. 0 means no pain and a score of 10 means a worst possible pain.

The patients were randomized into two groups by computer generated random number table, Group-A (n = 100) patients received USG-guided FNB and LFCNB 10 min before SAB using 10mL of 0.2% ropivacaine for each nerve. Group-B patients (n = 100) received SAB only. In both the groups, SAB was given using 15mg of 0.5% heavy bupivacaine.

In the block room, intravenous infusion line was secured and standard monitoring devices measuring non- invasive blood pressure (NIBP), Pulse Rate (PR), percentage oxygen saturation (SPO2) and Continuous Electrocardiography (ECG) were attached and baseline recordings were taken. Baseline heart rate, mean blood pressure, spo2 were recorded and thereafter at every 3 minutes first, later every 5 minutes were recorded. All patients were preloaded with ringer lactate 10 ml / kg in the preoperative period.

The severity of pain was assessed with the help of VAS as a baseline pain score. A single experienced operator performed USG - guided FNB and LFCNB with 10 ml of 0.2 % ropivacaine in each nerve. Patients in the control group did not receive any interventions. The blocks were performed using in plane technique. The injection was carried out from the lateral to the medial side after visualizing the nerve just lateral to the femoral artery. Ultrasound machine used during the study was ECH0 - SON S.A.

Then, the patients of both the groups were made to sit and under aseptic precautions, SAB was performed using a 25-G Quincke-Babcock spinal needle with 15mg of 0.5% bupivacaine heavy at L3-L4 interspinous level by a senior anesthesiologist. The quality of patient positioning for administering SAB was recorded with scores of 0–3 (0-Not satisfactory, 1-Satisfactory, 2-Good, 3-Optimal).[13] Time to perform SAB was recorded (time from beginning of positioning to end of SAB procedure).The patients were monitored for heart rate (HR), noninvasive blood pressure (NIBP), saturation of oxygen (SpO2), respiratory rate (RR) before the block and at 5 min intervals throughout the procedure. Intraoperative analgesia was assessed by using VAS scores every 5 min after SAB up to 15 min, every one hour up to 6h, and thereafter every 2h up to 24h. Injection tramadal 50mg i.v was used as rescue analgesia at VAS score 4. Postoperatively, analgesic requests in the first 24 h were also assessed. Sensory blockage was assessed by loss of pain to pin prick with a blunt hypodermic needle. Motor blockage was assessed with modified Bromage scale. [Score 0-None (full flexion of knee and feet), 1-Partial (just able to move knees and feet), 2-Almost complete (just able to move feet only), 3-Complete (unable to move feet or knees).

Statistical analysis:

The statistical software namely IBM statistical package for social sciences (SPSS) version 16 was used for the analysis of the data. Microsoft word and Excel have been used to generate the graphs, tables, and charts. Descriptive statistics including proportions, measures of central tendency, and measures of dispersions were used to describe the data. Chi-square test has been used to test the significance of homogeneity of gender distribution. Furthermore, student's *t*-test have been used to find the significance of mean difference of analgesia (VAS scores), total consumption of analgesia, duration of postoperative analgesia, and motor blockade and also to test the homogeneity of samples on age, height, and weight. P value of < 0.05 was considered to be statistically significant.

Conflict of interest: Nil

Funding: Nil

Results:

A total of 200 patients were included in this study out of which 100 patients of (Group-A) were administered FNB and LFCNB before positioning, and remaining 100 patients of (Group-B) were administered spinal anaesthesia. Patients were comparable with regard to demographic profile of the study population [Table 1].

Table 1: Demographic profile of the study population

Variables	Group A n=100	Group B n=100	P value
Age (years)	56.78±9.28	57.89±8.23	>0.05
Sex M/F	76/24	72/28	>0.05
ASA I/II	68/32	66/34	>0.05
Weight (kg)	58.71±11.09	59.67±12.21	>0.05
Height (cm)	154±8.72	156±7.91	>0.05

Mean pre spinal values of VAS scores were compared, mean T1 (Baseline VAS score) was 6.9 ± 0.09 in Group-A and 6.23 ± 0.08 in Group-B, with P value >0.05, showing no statically significant difference. Mean T2 (VAS score just before SAB) was 3.04 ± 0.71 in Group-A and 6.25 ± 0.51 in Group-B, with P value < 0.05 showing statistically significant difference among the study population [Table 2].

Table 2: Comparison of pre spinal VAS scores among the study population:

Variables	Group A n=100	Group B n=100	P value
T1 (Base line)	6.9 ± 0.09	6.23 ± 0.08	>0.05
T2 (Just before SAB)	3.04 ± 0.71	6.25 ± 0.51	<0.05

The quality of patient positioning was good (score2) to optimal (score3) in Group-A compared to Group-B who had low scores (0 = not satisfactory, 1 = satisfactory) [Table 3].

Table 3: Comparison of quality of patient positioning among the study population:

Score	Group A n=100	Group B n=100	P value
3 (Optimal)	84	0	<0.05
2 (Good)	16	0	<0.05
1 (Satisfactory)	0	22	<0.05
0 (Not satisfactory)	0	78	<0.05

In general, 74 (74%) patients were very satisfied (Likert scale 5), 18 (18%) were satisfied (Likert scale 4), 4 (4%) had no opinion (Likert scale 3), 4 (4%) were not satisfied (Likert scale 2), and no one was dissatisfied (Likert scale 1) as compared to Group B patients in which majority of patients were not satisfied or dissatisfied [Table 4].

Table 4: Patient satisfaction (Likert scale) among the study population:

Scale	Group A n=100	Group B n=100	P value
(Likert scale 5)	74	0	<0.05
(Likert scale 4)	8	0	<0.05
(Likert scale 3)	4	36	<0.05
(Likert scale 2)	4	64	<0.05

The mean time to perform spinal anaesthesia was shorter in Group-A (4.05 ± 0.82 min) as compared to Group B (8.02 ± 2.89 min) with statistically significant difference *P* value < 0.0001. Time to first rescue analgesic was 902.87 ± 138.6 min in Group-A and was 201.47 ± 39.09 min in Group-B which was statistically significant with *P* value < 0.0001. The mean duration of analgesia in Group-A was 924 ± 118.38 min, which is statistically highly significant with *P* value < 0.0001 than Group-B in which it was 210 ±29.87 min. Total consumption of analgesia in 24h was 45±30 mg in Group-A and was 170±70mg Group-B, which was statistically significant with *P* value < 0.0001. The mean duration of motor block in Group-A was 458 ± 30.9 min with *P* value of < 0.0001 which is statistically highly significant when compared to Group-B in which it was 118.37 ± 13.28 min [Fig 1].

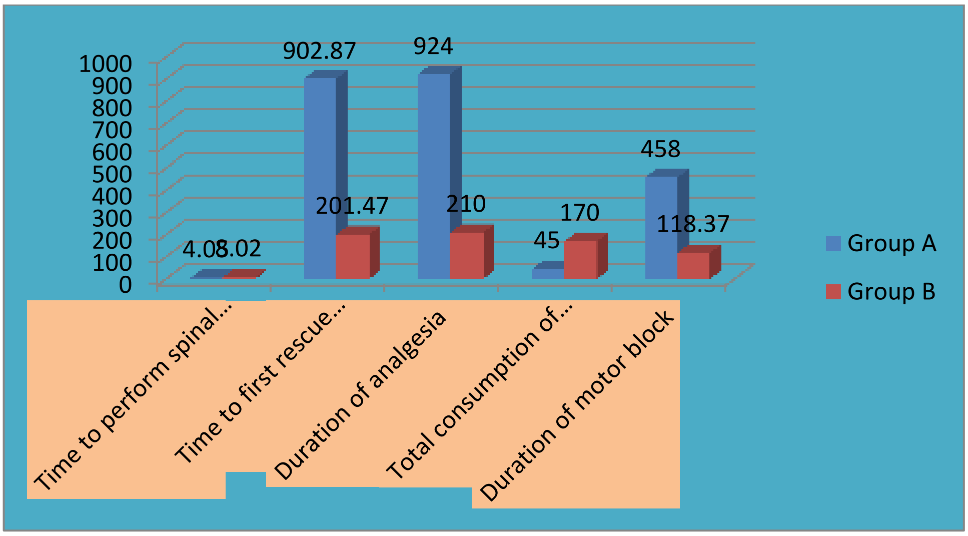

Fig 1

Visual analogue scale at different time intervals were statistically significantly lower at all times in Group A than Group B p-value (p<0.05) [Fig 2].

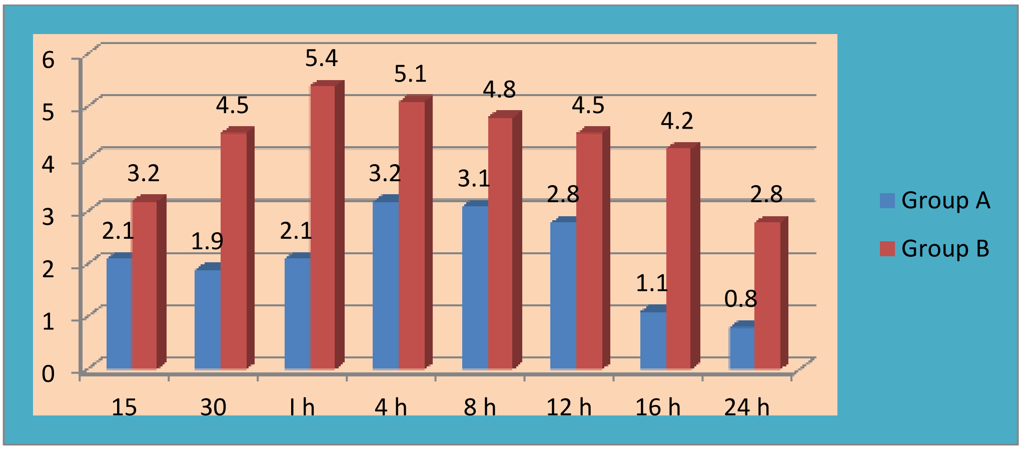

Fig 2

With regard to the post operative adverse effects observed among the two study groups. When compared statistically, the results were found not significant with a p value of >0.05 [Fig 3].

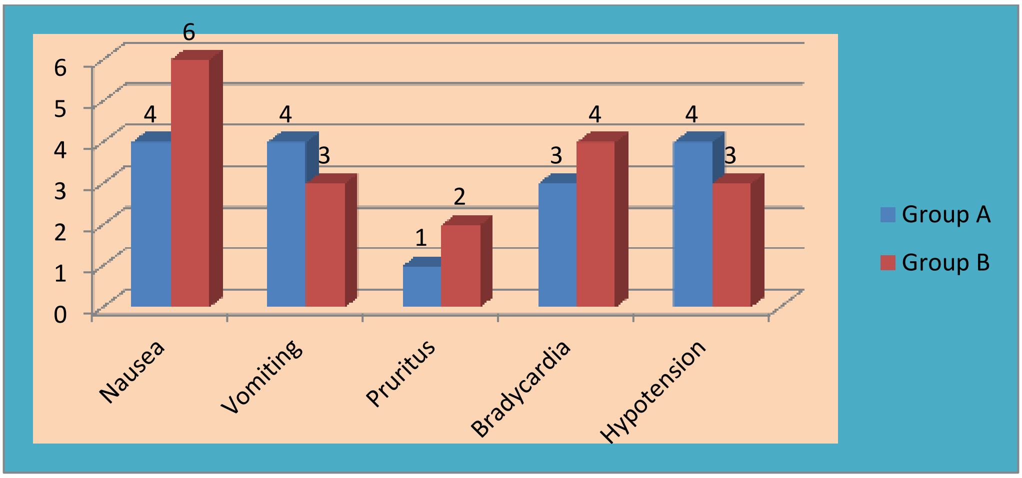

Fig 3

Discussion:

Spinal anesthesia have fewer side effects than general anesthesia and have many benefits such as effective analgesia, prevention of respiratory tract complications, reduction of DVT, and reduction in mortality and length of hospitalization and is the preferred method in lower limb orthopedic surgery. On the other hand, spinal anesthesia is difficult in patients with a femoral fracture due to severe pain in the fractured limb and difficulty in positioning themselves to perform the procedure. Many methods are recommended to increase patient's cooperation and satisfaction in order to facilitate the performance of spinal anesthesia such as administering intravenous/ intramuscular analgesics and different nerve blocks to induce analgesia in patients with femoral fractures. The analgesic effects of peripheral nerve blocks have been studied in many researches, particularly performing nerve blocks under ultrasound guidance was evaluated with benefits of greater precision and fewer side effects. [14]

Recently, USG guided femoral nerve block and LFCNB has become more popular and has been used with greater success. In the present study, there was a significant decrease in VAS score in Group A at 15 mins and during positioning. VAS score during positioning was 2.7 ± 0.9 in block group in comparison to 6.9 ± 0.9 in control group. In a study conducted by Ranjit et al. found similar results. [15] FNB was done with only nerve stimulator with 15 ml 0.2 % ropivacaine whereas in our study only USG were used.

In the present study, all patients had significant fracture pain indicated by comparable baseline VAS scores. Whereas just before SAB, VAS scores were lower in Group-A patients indicating significant reduction of fracture pain which can be attributed to the effect of USG guided blocks of femoral and LFCN. But in Group-B patients who did not receive nerve blocks, VAS scores just before SAB were same as baseline values. The quality of patient positioning was good to optimal in Group-A, but satisfactory to not satisfactory in Group-B, and the time to perform SAB was quicker in Group-A. This can be attributed to the effect of USG guided blocks of femoral and LFCN which provided effective analgesia and facilitated patient positioning, so that SAB can be performed easily and quickly. Our findings were supported by Guay J *et al*. who published their systematic review of usefulness of various nerve blocks for hip fractures.[16]

Before positioning for spinal anesthesia, we assessed VAS scores only 15 min after analgesic intervention, whereas other studies employed longer waiting times in similar experiments to ensure that the local anesthetic reached its peak analgesic effect. [17,18] Kumar and colleagues conducted a study with 30 mL of 0.5% ropivacaine and evaluated sensory blockade at 5, 10, and 20 min after performing FICB, and they concluded that sensory blockade at 20 min was the same as that at 10 min in all parts of the thigh.[19] Therefore, we chose 15 min for of final time point. Our findings of low VAS scores with nerve blocks were supported by Neena Jain *et al*. who compared FNB versus FICB in fracture femur surgery and found that reduction in VAS score by FNB is more effective than FICB.[20]

The time to first rescue analgesic was delayed in Group-A compared to Group-B and similarly total doses of rescue analgesics required during 24h postoperative period were less in Group-A compared to Group-B. This decreased requirement of rescue analgesic in Group-A is due to analgesia provided by nerve blocks. Similarly, the duration of analgesia and motor blockade were prolonged in Group-A compared to Group-B, which are attributed to nerve blocks. Prolonged motor blockade is supported by Kasper *et al*. who in their study have commented on the possible motor component with nerve blocks.[21] Therefore, nerve blocks help in improving pain free period and in turn prevention of postoperative morbidity.[22]

In our study, differences in hemodynamics (HR, NIBP) and other parameters such as RR and SpO2 were statistically not significant throughout the study period among the study population. This signifies that nerve blocks will not affect the hemodynamics independent of the SAB, and they can be useful in patients with cardiovascular impairment.

In the present study, Side effects such as nausea and headache were present in both groups which are statistically not significant. Incidentally, we found that backache was more in Group-B compared to Group-A (statistically significant), which can be assumed because of increased difficulty in performing the SAB in Group-B patients and probably soft tissue damage that might have occurred while performing spinal anesthesia, secondary to improper patient positioning due to persistent fracture site pain. Our finding is supported by Benzon HT *et al*. and Md K Rafique *et al*. who state that back pain after neuraxial blockade can occur when patient positioning for spinal anesthesia is not proper and soft tissue damage is a possibility.[23,24]

Conclusion:

USG - guided femoral nerve block (FNB) and lateral femoral cutaneous nerve block (LFCNB) before positioning for spinal anaesthesia for intertrochanteric fracture femur is very effective in controlling pain during positioning for spinal anaesthesia and it prolongs post operative analgesia. This method is a safe and effective to be used for positioning during spinal anesthesia procedure.

References:

1. Parker, M.; Johansen, A. Hip fracture. BMJ 2006, 333, 27–30.

2. Lončarić-Katušin M, Mišković P, Lavrnja-Skolan V, Katušin J, Bakota B, Žunić J. General versus spinal anaesthesia in proximal femoral fracture surgery–treatment outcomes. Injury 2017;48(suppl 5):S51-S5.

3. Pu X, Sun JM. General anesthesia vs spinal anesthesia for patients undergoing total-hip arthroplasty: A metaanalysis. Medicine (Baltimore) 2019;98(16):e14925.

4. Van Waesberghe J, Stevanovic A, Rossaint R, Coburn M. General vs. neuraxial anaesthesia in hip fracture patients: a systematic review and meta-analysis. BMC Anesthesiol 2017;17(1):87.

5. Jakobsson J, Johnson MZ. Perioperative regional anaesthesia and postoperative longer-term outcomes. F1000Res 2016 Oct 11;5:F1000 Faculty Rev-2501.

6. Li, J.; Dai, F.; Chang, D.; Harmon, E.; Ibe, I.; Sukumar, N.; Halaszynski, T.M.; Rubin, L.E.; O'Connor, M.I. A Practical Analgesia Approach to Fragility Hip Fracture: A Single-Center, Retrospective, Cohort Study on Femoral Nerve Block. J. Orthop. Trauma 2019, 33, 175–179.

7. Amin, N.H.; West, J.A.; Farmer, T.; Basmajian, H.G. Nerve Blocks in the Geriatric Patient With Hip Fracture: A Review of the Current Literature and Relevant Neuroanatomy. Geriatr. Orthop. Surg. Rehabil. 2017, 8, 268–275.

8. Hirose, J.; Mizuta, H.; Ide, J.; Nakamura, E.; Takada, K. E-PASS for predicting postoperative risk with hip fracture: A multicenter study. Clin. Orthop. Relat. Res. 2008, 466, 2833–2841.

9. Burgos, E.; Díez, R.; Muñoz, L.; Del Valle, S.G.; Gómez-Arnau, J.I.; Fernández-Guisasola, J. Predictive value of six risk scores for outcome after surgical repair of hip fracture in elderly patients. Acta Anaesthesiol. Scand. 2008, 52, 125–131.

10. Diakomi M, Papaioannou M, Mela A, Kouskouni E, Makris A. Preoperative fascia iliaca compartment block for positioning patients with hip fractures for central nervous blockade: a randomized trial. Reg Anesth Pain Med 2014;39(5):394-8.

11. Barker R, Schiferer A, Gore C, et al. Femoral nerve blockade administered preclinically for pain relief in severe knee trauma is more feasible and effective than intravenous metamizole: a randomized controlled trial. J Trauma 2008;64(6):1535-8.

12. Karmarkar AA, Bhatnagar V, Dwivedi D, et al. Evaluation of two different dosages of local anesthetic solution used for ultrasound-guided femoral nerve block for pain relief and positioning for central neuraxial block in patients of fracture neck of the femur. Indian Journal of Pain 2017;31(3):175-9.

13. Vats A, Gandhi M, Jain P, Arora KK. Comparative evaluation of femoral nerve block and intravenous fentanyl for positioning during spinal anaesthesia in surgeries of femur fracture. IntJContemp Med Res 2016;3:2298-301.

14. Kacha NJ, Jadeja CA, Patel PJ, Chaudhari HB, Jivani JR, Pithadia VS. Comparative study for evaluating efficacy of fascia iliaca compartment block for alleviating pain of positioning for spinal anesthesia in patients with hip and proximal femur fractures. Indian J Orthop 2018;52(2):147-53.

15. Ranjit S, Pradhan BB. Ultrasound guided femoral nerve block to provide analgesia for positioning patients with femur fracture before subarachnoid block: comparison with intravenous fentanyl. Kathmandu Univ Med J (KUMJ) 2016;14(54):125-9.

16. Guay J, Parker MJ, Griffiths R, Kopp S. Peripheral nerve blocks for hip fractures. Cochrane Database Syst Rev 2017;5:CD001159.

17. Yun MJ, Kim YH, Han MK, Kim JH, Hwang JW, Do SH. Analgesia before a spinal block for femoral neck fracture: fascia iliaca compartment block. Acta Anaesthesiol Scand. 2009;53:1282–1287.

18. Diakomi M, Papaioannou M, Mela A, Kouskouni E, Makris A. Preoperative fascia iliaca compartment block for positioning patients with hip fractures for central nervous blockade: a randomized trial. Reg Anesth Pain Med. 2014;39:394–398.

19. Kumar D, Hooda S, Kiran S, Devi J. Analgesic efficacy of ultrasound guided FICB in patients with hip fracture. J Clin Diagn Res. 2016;10: UC13–UC16.

20. Jain N, Mathur PR, Patodi V, Singh S. A comparative study of ultrasound-guided femoral nerve block versus fascia iliaca compartment block in patients with fracture femur for reducing pain associated with positioning for subarachnoid block. Indian J Pain 2018;32:150-4.

21. Thybo KH, Schmidt H, Hägi-Pedersen D. Effect of lateral femoral cutaneous nerve-block on pain after total hip arthroplasty: Arandomised, blinded, placebo-controlled trial. BMC Anesthesiol 2016;16:21.

22. Strike S, Sieber F, Gottschalk A, Mears SC. Role of fracture and repair type on pain and opioid use after hip fracture in the elderly. GeriatrOrthopSurgRehabil 2013;4:103-8.

23. Benzon HT, Asher YG, Hartrick CT. Backpain and neuraxial anaesthesia. Anaesth Analg 2016;122:2047-2058 .

24. Rafique MK, Taqi A. The causes, prevention and management of post spinal backache: An overview. Anaesth Pain Intensive Care 2011;15:65-9.