

## To study the efficacy of USG guided femoral nerve block as pre-operative analgesia for positioning of femur fracture patient for subarachnoid block

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### Abstract

**Background:** Femur fracture causes moderate to severe pain which requires effective analgesia both preoperatively and postoperatively. Multimodal analgesic regimens which includes non-steroidal anti-inflammatory drugs, opioids and regional analgesic techniques have been used in femur fracture patients so far. Peripheral blocks was initially done with either paresthesia technique or nerve stimulation-based technique. Ultrasound guided needle & catheter placement is observed to be technically superior, more accurate, being placed in peripheral location probably increases the safety of USG guided compared with other techniques.

### Aim & Objective:

1. To study USG guided femoral nerve block for positioning of femur fracture patient for subarachnoid block.
2. To evaluate the efficacy of ultrasonography guided femoral nerve block for pain relief in femur fracture patients.
3. To study VAS (visual analogue scale) before and after block.
4. Study of hemodynamic changes before and after block.

### Methods:

**Study design:** Prospective Observational Study.

**Study setting:** Anesthesia department of tertiary care centre.

**Study duration:** 2 years (from.... to....).

**Study population:** The study population included all the cases with Surgeries involving lower limbs admitted at a tertiary care center.

**Sample size:** 40.

**Results:** Our study was done on 40 patients which included 13 females and 27 male patients. There were 9 (22.5%) patients between age of 20-40 years, 13 (32.5%) patients between age

of 40-60 years and 18(45%) patients between 60-80 years. The youngest patient in our study was 22 years and oldest patient was 80 years. ASA distribution with 21 (52.5%) ASA 1 patients and 19 (47.5%) ASA 2 patients. there were 44% patients having intertrochanteric fracture of femur, 28% patients having femur shaft fractures and 28% patients having neck of femur fracture. VAS score 26 patients had no pain and 14 patients had mild pain. the FEMORAL block had a fall in systolic and diastolic bp up to 20 mins after the block, but there was no major hemodynamic change after the block. No patients during the study had hypotension or hypertension after the femoral block. Among the study population, 98% USG guided femoral nerve block were successful with 2% failure rate as in this study we calculated success rate from percent of successful blocks to supplemental analgesia for patient positioning.

**Conclusions:** USG guided femoral nerve block with 0.25% bupivacaine is a better choice for pre-operative pain relief of pain in femur fracture patients with high success rate and good post-operative analgesia with no complication.

**Keywords:** USG guided femoral nerve block, Hemodynamic changes, visual analogue score, ASA grading

## Introduction

Femur fracture causes moderate to severe pain which requires effective analgesia both preoperatively and postoperatively <sup>[1]</sup>. Multimodal analgesic regimens which includes non-steroidal anti-inflammatory drugs, opioids and regional analgesic techniques have been used in femur fracture patients so far. NSAIDS even in moderate doses causes adverse effects especially in elderly population <sup>[2]</sup>.

Although opioids are potent analgesics they are associated with adverse effects like drowsiness, nausea, respiratory depression, constipation etc. limiting their use <sup>[3]</sup>. Perineural analgesia is becoming popular as it provides comparable pain relief and decreases the side effects associated with central neuraxial blockade.

Peripheral blocks was initially done with either paresthesia technique or nerve stimulation-based technique. Ultrasound guided needle & catheter placement is observed to be technically superior, more accurate, being placed in peripheral location probably increases the safety of USG guided compared with other techniques. Peripheral nerve block in which local anesthetic is injected surrounding a peripheral nerve may provide superior pain relief when used as a part of a balanced analgesia <sup>[4, 5]</sup>.

Femoral nerve block is a basic nerve block technique that is easy to master, carries a low risk of complication and has a significant clinical applicability for pre-operative and post-operative analgesia and surgical anesthesia <sup>[6]</sup>. The block is well suited for preoperative pain management like analgesia before positioning of patient for subarachnoid block in femur fracture patient as well as for post-operative management after femur and knee surgery and surgical anesthesia for quadriceps muscle biopsy, knee arthroscopy, quadriceps tendon repair <sup>[7]</sup>.

When combined with the block of the sciatic nerve, anesthesia of the almost entire lower extremity from mid-thigh level can be achieved. The success rate of this block for surgery is very high, nearing 95% <sup>[8]</sup>.

## Aim and Objective

### Objective

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2. To evaluate the efficacy of ultrasonography guided femoral nerve block for pain relief in femur fracture patients.
3. To study VAS (visual analogue scale) before and after block.
4. Study of hemodynamic changes before and after block.

### **Material and Methods**

**Study design:** Prospective Observational Study.

**Study setting:** Anesthesia Department of tertiary care centre.

**Study duration:** 2 years (from .....to.....).

**Study population:** The study population included all the cases with lower limb surgeries admitted at a tertiary care center.

### **Inclusion criteria**

1. Patients of either sex, aged between 15-70 years.
2. Patients belonging to American Society of Anesthesiologists Grade 1, Grade 2 and Grade 3.
3. Surgeries involving lower limbs.

### **Exclusion criteria**

1. Patients with significant coagulopathies and other contra-indications for sciatic nerve block.
2. Patient allergic to amide local anaesthetics.
3. Patient belonging to ASA grade 4 & 5.

### **Approval for the study**

Written approval from Institutional Ethics committee was obtained beforehand. Written approval of Anesthesia and Related department was obtained. After obtaining informed verbal consent from all patients with the lower limb surgeries admitted to tertiary care centre such cases were included in the study.

**Sample size:** 40.

**Sampling technique:** Convenient sampling technique used for data collection. All patients admitted in the tertiary care center from... to... with lower limb surgeries were included in the study.

### **Methods of data collection and questionnaire**

Pre-designed and pre-tested questionnaire was used to record the necessary information. Questionnaires included general information, such as age, sex, religion, occupation of patients, residential address, and date of admission. Medical history- chief complaint, past history, general examination, systemic examination

Data on demographic profile, Radiological profile of COPD patient, investigation, personal history, medical past history, treatment modalities, and clinical outcome data collected from patients admitted in medicine ward. All the procedures and investigations conducted under direct guidance and supervision of PG guide.

## Technique

With the patient in the supine position, the skin is disinfected and the transducer positioned to identify the femoral nerve. If the nerve is not immediately apparent, sliding and tilting the transducer proximally or distally can be useful to improve the contrast and bring the nerve “out of the background” from the musculature. The needle is inserted in plane or out of plane, and advanced toward the femoral nerve. If nerve stimulation is used (1.0 mA, 0.1 msec), the contact of the needle tip with the sciatic nerve is usually associated with a motor response. Once the needle tip is in the proper position, 1-2 mL of local anesthetic is injected to confirm the adequate distribution of injectate. Such injection helps delineate the femoral nerve and it should displace the femoral nerve away from the needle. An improper spread of local anesthetic or nerve displacement may require an adjustment of the needle tip position.



**Fig 1:** Procedure of Femoral Nerve Block

## Procedure

Patient was shifted to a fully equipped operation theatre. i.v. line and i.v. fluid started. Monitors such as pulse oximeter, ECG, and noninvasive BP connected. Patient positioned according to the type of approach. Skin prepared with 5% Povidone Iodine paint followed by surgical spirit. Draping done with sterile linen. High frequency probe was placed in inguinal crease parallel to the inguinal ligament. femoral nerve was visualized as a hyperechoic triangular shaped structure immediately lateral to the femoral artery.

After identification of nerve, infiltration of the point of entry in the skin with 1% lidocaine 1 ml was done. The local anaesthetic used to perform the block is 10 ml of 0.25% bupivacaine was prepared. Needle is inserted at the lateral end of the ultrasound probe and advanced it parallel to the ultrasound beam until it reaches the femoral nerve. This approach is preferred as it allows the visualization of the entire needle.

Now local anesthetic 0.25% bupivacaine of 10 ml was injected. Vital signs recorded throughout the procedure. Discomfort of the injection technique assessed with visual analogue scale. The time of onset assessed by using pinprick test. Regarding pain relief after block data

collected after every 10 min from block until subarachnoid block is performed minutes.

Sensory block onset was defined as time from completion of block administration to loss of pin-prick sensation. Assessment of post procedure pain by Visual Analogue scale (VAS score).

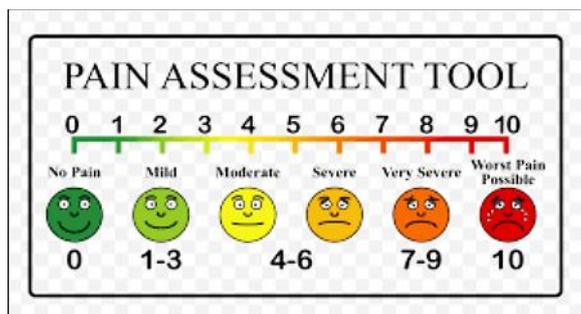


Fig 2: Visual Pain Analogue Scale

Hemodynamic assessment such as pulse rate, Blood pressure, SpO<sub>2</sub> were recorded.

**Data entry and analysis:** The data were entered in Microsoft Excel and data analysis was done by using SPSS demo version no 21 for windows. The analysis was performed by using percentages in frequency tables and correlation of COPD.  $p < 0.05$  was considered as level of significance using the Chi-square test.

**Results and Observations**

The prospective study was conducted in anaesthesia department on 40 pts aged between 18 to 80 years posted for femur surgeries to study ultrasound guided femoral nerve block in terms of pain relief for positioning of patient to perform subarachnoid block.

Table 1: Distribution of cases according to Age (N=40)

| Age in years | Frequency | Percentage |
|--------------|-----------|------------|
| 20-40        | 9         | 22.5%      |
| 40-60        | 13        | 32.5%      |
| 60-80        | 18        | 45%        |
| Total        | 40        | 40 (100%)  |

There were 9 (22.5%) patients between age of 20-40 years, 13 (32.5%) patients between age of 40-60 years and 18 (45%) patients between 60-80 years. The youngest patient in our study was 22 years and oldest patient was 80 years.

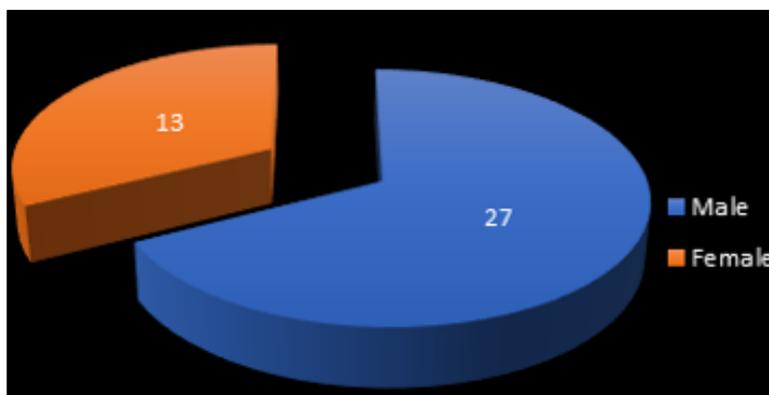


Fig 3: Distribution of cases as per gender

Our study was done on 40 patients which included 13 females and 27 male patients.

**Table 3:** Distribution of cases according to ASA Grading (N=40)

| ASA Grading | Frequency | Percentage |
|-------------|-----------|------------|
| ASA 1       | 21        | 52.5%      |
| ASA 2       | 19        | 47.5%      |
| Total       | 40        | 40 (100%)  |

Shows ASA distribution with 21 (52.5%) ASA 1 patients and 19 (47.5%) ASA 2 patients

**Table 4:** Distribution of cases according to type of Femur fracture (N=40)

| Type of femur fracture     | Frequency | Percentage |
|----------------------------|-----------|------------|
| Neck of femur fracture     | 14        | 28%        |
| Intertrochanteric fracture | 22        | 44%        |
| Femur shaft fracture       | 14        | 28%        |
| Total                      | 200       | 40 (100%)  |

There were 44% patients having intertrochanteric fracture of femur, 28% patients having femur shaft fractures and 28% patients having neck of femur fracture.

**Table 5:** Pain analogue scale

|                         |    |
|-------------------------|----|
| 0-2 (No pain)           | 26 |
| 2-4 (mild pain)         | 14 |
| 4-6 (moderate pain)     | -  |
| 6-8 (severe pain)       | -  |
| 8-10 (very severe pain) | -  |

Based on VAS score 26 patients had no pain and 14 patients had mild pain.

**Table 6:** Association of cases with age

| Timing       | Average Blood Pressure of patients (mean±2SD) |              |                        |
|--------------|---|--------------|------------------------|
|              | Systolic BP                                   | Diastolic BP | Mean arterial pressure |
| Before block | 128.72 ±2.427                                 | 84.24 ±1.265 | 99 ±1.18               |
| 5 min        | 128.96 ±1.827                                 | 81.44 ±0.894 | 97.28 ±0.97            |
| 10 min       | 120.56 ±2.149                                 | 83.16 ±1.34  | 95.62 ±1.47            |
| 15 min       | 120.44 ±1.865                                 | 84.28 ±0.784 | 96.33 ±0.84            |
| 20 min       | 124.76 ±1.645                                 | 83.44 ±0.954 | 97.21 ±0.94            |

All patients receiving the FEMORAL block had a fall in systolic and diastolic bp up to 20 mins after the block, but there was no major hemodynamic change after the block. No patients during the study had hypotension or hypertension after the femoral block.

**Table 7:** Success Rate of Block

| Success Rate of Block | Frequency |
|-----------------------|-----------|
| Success               | 30        |
| Failure               | 02        |
| Total                 | 40        |

Success was considered when patient able to give position solely on femoral nerve block without any supplemental analgesia. Among the study population,98% USG guided femoral nerve block were successful with 2% failure rate as in this study we calculated success rate from percent of successful blocks to supplemental analgesia for patient positioning.

## Discussion

Patients with femur fracture requires a continuum of pain management from the time of prehospital admission till final rehabilitation. Optimal preoperative analgesia is an issue to be addressed. A good preoperative analgesic regimen is critically important to attenuate stress response. Inadequate pain control may lead to serious medical issues such as tachycardia, myocardial ischemia, venous thromboembolism.

Regional anaesthesia technique provides anesthesia and analgesia in preoperative and postoperative patients and hence play a important role in pain management. 40 patients of ASA Class I and II of both sex with femur fracture posted for surgeries such as proximal femoral nailing, dynamic hip screw in patients with inter trochanteric fracture and interlocking nail in case of shaft of femur fracture between the ages of 22 and 80 years were randomly allocated.

All patients were given USG guided femoral nerve block in supine position depending upon the comfort of the patients. All patients were given 0.25% bupivacaine 10 ml through ultrasound guided femoral nerve block. Measure of pain relief is the, time taken for block, to proper positioning of patient for subarachnoid block using visual analogue scale as told by the patient was noted.

## Sex distribution

In my study of efficacy of ultrasound guided femoral nerve block. A show that there were 13 female patients and 27 male patients i.e., 34% females and 66% males. Patients were selected so both sexes would be equally represented in the study. There were no differences in my observations and results pertaining to sex of the patients.

Mohamed G Naeem *et al.* (2020) conducted a study on Comparative Study between Spinal Anesthesia and femoral nerve Block, also found no difference in femoral nerve block related to sex of the patient <sup>[8]</sup>.

## Age distribution

In my study show age distribution; there were 9 (22.5%) patients in the age group 20-40yrs, 13 (32.5%) patients in the age group 40-60 yrs., 18(45%) patients in the age group 60-80 yrs. Mean age was 54.2 years with standard deviation of 16.25 years in the study population. The youngest patient in our study was 22 years and oldest patient was 80 years.

## ASA grading

In my study shows ASA grading, there were 21 (52.5%) patients with ASA 1 and 19 (47.5%) patients with ASA 2.

## Type of femur fracture

In my study, shows type of femur fracture, 14 (28%) patients had femur neck fracture, 22 (44%) patients had intertrochanteric fracture, 14 (28%) patients had shaft of femur fracture.

## Hemodynamic changes

In my study, shows blood pressure changes, shows pulse rate changes. All patients receiving the FEMORAL block had a fall in systolic and diastolic BP up to 20 mins after the block, but there was no major hemodynamic change after the block. No patients during the study had

hypotension or hypertension after the femoral block. All patients receiving the FEMORAL nerve block had a fall in pulse up to 20 mins after the block, but there was no major hemodynamic change after the block. No patients during the study had bradycardia or tachycardia after the femoral nerve block. Similar study reported, Extended Femoral Nerve Sheath Block after Total Hip Arthroplasty showed no adverse hemodynamic changes<sup>[10]</sup>.

### Success rate

In my study, shows success rate of femoral nerve block. Success was considered when able to give position for subarachnoid block solely by ultrasound guided femoral nerve block or along with supplemental analgesia. Out of 40 patients 38 patient were able to give position for subarachnoid block without requirement of supplement analgesia and remaining 2 patients required supplement analgesia.

My study is comparable with this study Diakomion *et al.*<sup>[10]</sup> Following hip fractures, positioning the patient for spinal anesthesia is extremely painful. The Author has conducted a prospective randomized comparative study to evaluate the analgesic efficacy of fascia iliaca compartment block (FICB) versus Intra venous fentanyl consumption to position the patient with hip fractures for sub arachnoid block (SAB) 41 patients were included in this study, randomized into two groups. one group received iv fentanyl (1.5 mic/kg) 5 min before SAB, another group received FICB (40ml of 0.5% Ropivacaine) 20min before the procedure. Numerical rating pain score before and after placement of analgesia, time needed and quality of position to perform spinal anesthesia, post-operative analgesia in view of time to iv morphine requirement and total dose over 24 hrs and patient satisfaction were studied.

### Conclusion

USG guided femoral nerve block with 0.25% bupivacaine is a better choice for pre-operative pain relief of pain in femur fracture patients with high success rate and good post-operative analgesia with no complication. Because of Femoral nerve Block there was excellent analgesia in femur fracture patients. All the patients cooperated at the time of giving position for subarachnoid block and during block also. Because of pain there is always increase in pulse rate and blood pressure which came to normal after analgesia by femoral nerve block even though statistically it is not significant still it has importance in high-risk cardiac patients. So femoral block should be given in all types of femur fracture patients before shifting, positioning for anesthesia as under USG guided success rate is 100%. I conclude that USG guided nerve block is the best technique for fracture femur neck patients and should be given to all fracture femur neck patients before shifting and positioning.

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