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COMPARISON OF FEMORAL NERVE BLOCK AND SYSTEMIC INTRAVENOUS ANALGESIA FOR PAIN MANAGEMENT OF FEMORAL SHAFT FRACTURES.

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ABSTRACT
Background: Femoral nerve block is useful technique for acute pain relief in case of fracture shaft femur in comparison with systemic analgesia. (Randomised controlled study). **Aims and Objective:** a) To study and compare whether femoral nerve block is more efficacious in pain management of femoral shaft fractures than systemic intravenous analgesia. b) To study the duration of action of femoral nerve block for pain relief in femoral shaft fractures. c) To notify any complication. **Materials and Methods**: 50 patients of ASA I and II, aged 20-80 years, having fracture shaft femur at either level (mid, upper, lower) were studied after admission of patient in emergency ward. They were randomly allocated to group A (n-25, femoral nerve block using 20 ml 0.5% Bupivacaine) and group B (n-25, systemic analgesia using Inj. Diclofenac 100 mg). Each case was subsequently followed up for onset and total duration of analgesia till 8 hours. Efficacy in both groups was assessed by visual analogue score. **Results and Summary:** There is no significant difference in onset of action between both the groups. The duration of action in group A was more (5.16±1.63 hours) than group B (2.44±1.45hours). Visual analogue score showed significant pain reduction in group A after 15 minutes and also at 360 minutes (p=0.000) in comparison with group B. **Conclusion:** femoral nerve block is safe,simple, more efficacious procedure in comparison to systemic IV analgesia for acute pain management in patients with fracture shaft femur at all levels.

KEYWORDS: fracture shaft femur, femoral nerve block, pain relief, emergency and trauma ward.

INTRODUCTION
Fracture of femur is a particularly painful bone injury because the periosteum has the lowest pain threshold of the deep somatic structures. Surgical repair most commonly involves either internal fixation of the fracture or replacement of the femoral head with arthroplasty. However, any movement of the patient leads to severe pain. Providing adequate pain relief not only increases comfort in these patients, but has also been shown to improve positioning for spinal block. Analgesics or femoral nerve block (FNB) are often used to help the patient tolerate positioning. In the emergency or trauma ward, doctor should give prior attention towards pain relief with routine trauma check-up protocol. A femoral nerve block (FNB) provides better pain relief for prolonged duration in patients with femoral shaft fractures than currently used systemic drugs. [1]

As trauma ward has its own busy time tight schedule, femoral nerve block is not used to its full potential in accident and emergency. It gives prompt pain relief within 15 minutes. It is easy to administer and safe having fewer side effects. It is cost effective and no expertise required.[2]

Our aim is to study onset, duration, and efficacy of pain relief with femoral nerve in comparison to systemic intravenous analgesia for recent femoral shaft fractures and also to notify any complication.

MATERIALS AND METHODS
After taking approval from ethical committee and informed written consent, fifty patients were enrolled in the study from March 2013 to August 2015. Patients having fracture shaft femur at any level (mid, upper, lower) were initially assessed and resuscitated after admission in emergency ward for this comparative study.

They were randomly allocated to group A (n-25, femoral nerve block using 20 ml 0.5% Bupivacaine) and group B (n-25, systemic pain management alone(n=25, analgesia using Inj. Diclofenac 2mg/kg i.v.). At the time of taking consent, patients were explained about the study and the four point visual analogue scale and classifying the intensity of pain as none, mild, moderate and severe at timely intervals. Simple randomization table which was generated in excel was used for randomization.

In emergency situation it was difficult to obtain baseline score with 10 cm scale as a thorough understanding is required on part of the patient to mark on 10 cm scale.

Pain score	No pain	Mild pain	Moderate pain	Severe pain
In our study	0	1	2	3
corresponding to VAS score	0	0-3	4-7	>7

Each case was followed,15 min later, by application of a Hare splint. Pain score was assessed by visual analogue scale at the initial assessment, and at 15,30,60,90,120,240,360minutes interval and also about any complication. Data collecting junior resident and patient were blinded to study group. The study was double blinded, the saline injections were given to control group instead of femoral block and patients in test group received i.v. saline instead of Inj. Diclofenac. Rescue therapy was given if patient had vas score is >7 in either group during period of observation they were supplemented with Inj. Tramadol 1mg/kg i.v.

Inclusion criteria

1) Written and informed consent of patient
2) ASA (American Society of Anaesthesiologist) risk I and II
3) Age of patient (20-80yrs.) of either gender
4) Patients with recent femoral shaft fractures in emergency department

Exclusion criteria

1) Patient's refusal
2) Patients with known allergy to drug
3) Patients with neurologic deficit or psychological disorder
4) Patients with any cardiovascular or renal disorder
5) Patients with vascular or neurological problem in affected limb
6) Partial or no femoral nerve block effect
7) Patient with multiple trauma

Procedure

Equipment required

10 ml syringes, a 23 G needle, 20 ml 0.5% Inj. Bupivacaine and antiseptic for skin. [2]

Technique

After taking aseptic and antiseptic precaution, start the procedure. Stand on opposite side to fractured limb. Palpate the anterior superior iliac spine and pubic tubercle to visualize the inguinal ligament. Palpate the femoral artery just below the inguinal ligament.

Insert needle at a point 1-2 cm lateral to arterial pulsation. Insert needle vertically until either penetration of facia over the nerves occurs(often felt) or patient gets sharp pain down leg/thigh indicating that the needle is touching the nerve, in which case withdraw about1mm.

Finally, inject the local anaesthetic slowly and then laterally to the artery in the fan like distribution.[2](20 ml 0.5% bupivacaine).

Statistical analysis

Statistical analysis was done using the Epi-Info-7. To calculate the sample size, a power analysis of α=0.05 and α=0.90, showed that 25 patients per study group were needed. Data are expressed as either mean or standard deviation or numbers and percentages. Continuous covariates were compared using analysis of variance (ANOVA) Chi square test performed for the data evaluation., with the P value reported at the 95% confidence interval. P<0.05 was considered statistically significant. Unpaired student t test was used to analyse duration of analgegia and severity of pain.

OBSERVATION AND RESULTS

1. Demographic data like age and sex ratio was comparable in both groups. (Table no 1)
2. Comparison of severity of pain score at different time interval:

Pain relief at 15mins:

Pain significantly reduced within 15 minutes after block is performed in group A as compared to group B. (Table no 2). The result is statistically significant(X^2=40.9; p=0.001). The severity of pain is less in group A as compared to group B. (fig no 1)

Pain relief at 360 mins

In Group A at 360 minute, the pain score is significantly less than group B (X^2=27.1; p=0.001). (Fig no 2)

3. Comparison of duration of analgesia between two groups:

Duration of action is longer in femoral nerve block group than systemic analgesia group. Duration of action in Group A is 5.16±1.63 hours and in Group B is 2.44±1.45 hours. (Fig no 3).This difference is statistically significant (t=5.90; p=0.0001).

4. Comparision of severity of pain in two groups

There is better pain relief in Group A patients than Group B, this can be seen by greater pain score reduction at all time intervals, it is statistically significant. This suggests that FNB is more efficacious than systemic intravenous analgesia.)(Fig 3)

5. Comparison of number of patients with require rescue analgesia in two groups at different time point of observation

6. **Complication:** There were no major complications like infections, vascular injury, haematoma or nerve injury. 3 patients were excluded due to failure of block effect.

Table 1: Demographic profile

	Age (mean±SD)	Gender (male: female)	Fracture Level
Group A (n=22)	33.2±10.7	19:3	Upper-8 Mid-9 Lower -8
Group B(n=25)	30.20±9.98	24:1	Upper-7 Mid-8 Lower-10

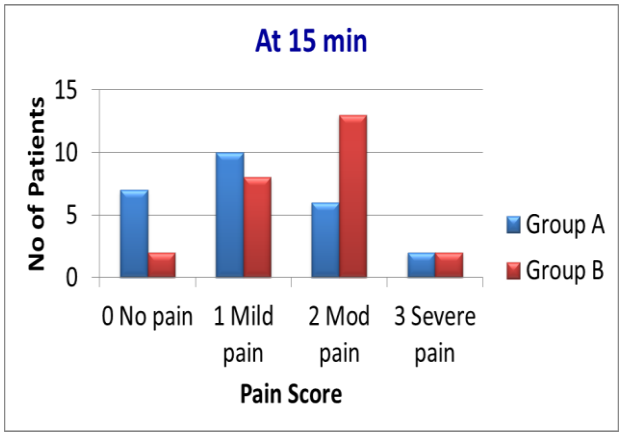

Figure 1Pain score at 15 minutes

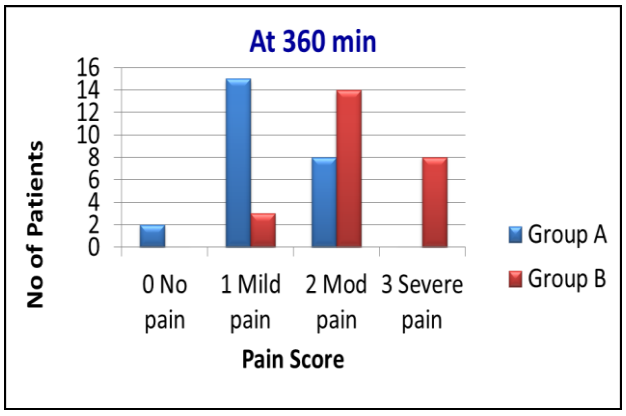

Figure -2 Pain score at 360 minutes

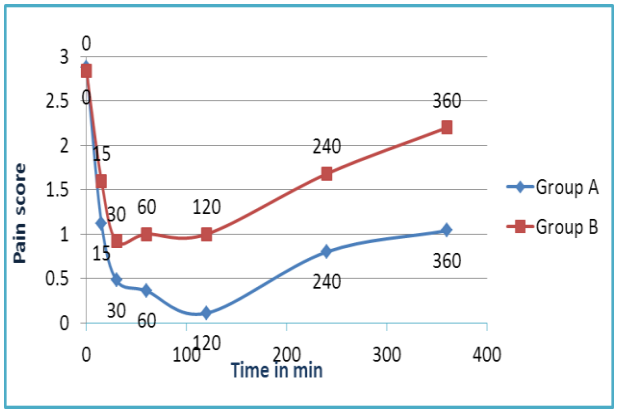

Figure -3 Degree of pain relief

DISCUSSION

Analgesic efficacy

The patients who received femoral nerve block had significantly lower pain score at various time intervals after obtaining a block effect at (15-20 min) than score on comparative group. The effect was for prolonged period and more efficient than systemic analgesic. Patient acceptance was good & the block enabled the movement of affected limb comfortably after 15 minutes of block particularly at the time of pin insertion and giving traction.

Rescue therapy

Safety

We did not face any major complication in our study except failure of block. Complication rate is low in this block. Likely complications of femoral nerve block are allergy, systemic toxicity, nerve injury, intravascular injection, haematoma, infection, limb injury. Any given complication can be prevented by using proper technique of block administration.[5]

Compared to previous study

Berry was first to publish use of femoral nerve block with 1% lignocaine with adrenaline in fracture shaft femur in 1977[6] But lignocaine has short duration of action so we used bupivacaine for longer pain relief. Another study suggested that patient with high femoral shaft fracture require supplementary opiate analgesia after FNB. But subsequently they also confirmed that femoral nerve block is also effective at all level of fracture femur even intertrochanteric fractured neck of femur with good results. [7]

R.C. McGloneetal studied femoral nerve block gave effective analgesia for varying duration by using both agents lignocaine and bupivacaine at all levels of femur fracture site when performed by junior staff. It had no side effects. [2]

In a case report published in 2005, they describe femoral nerve block for pain management of fracture femur in emergency department. They used lignocaine plus bupivacaine. They concluded that it gave complete pain relief and patient being more comfortable and

cooperative during subsequent assessment and complication rate is low if performed properly. [8]

Related Technique

There are two possible techniques described. Firstly simple femoral nerve block, and Secondly, three in one femoral nerve block.

Simple femoral nerve block is good for patient with fractured shaft femur. Three in one block is used for fracture neck femur. It is very similar procedure to above explained FNB with a same puncture site while it requires a larger amount of anaesthetic solution and slightly different angle of the injection of anaesthetic solution and requires compression distal to the injection site for five minutes after injection. It is believed that the anaesthetic ascends to the level of the lumber plexus. [9]

New techniques

It is a reasonable assumption to make that closer the anaesthetic agent to the nerve, shorter the delay before its onset of action. Use of Nerve locator or ultrasound can help in proximity of nerve location and require low dose of local anaesthetics,[10, 11]but in trauma or emergency ward it was not possible to manage or to use nerve locator / ultrasound. So in our study we used simple nerve block without using nerve locator or ultrasound which was a limitation in our study. But our results were satisfactory, except no block effect in two patients, partial in one patient observed after 15 minutes. These 3 cases were excluded from our study.

Addition of other drugs like adrenaline, fentanyl, clonidine, and dexmedetomidine with local anaesthetics or continuous block putting a catheter we can prolong the duration of block. [8]

(Use of continuous catheter technique can provide pain relief for prolonged duration, but in our study we have not used it because it may increase the risk of infection and also unavailability of adequate monitoring system in the ward.)

Benefits of block

It is recommended that ultrasound guided FNB be considered as an important standard of care for femur fractures at emergency departments and in the operating room, prior to operative intervention. FNB can also be considered as an option for out-of-hospital analgesia for purpose of transportation and immobilization, provided it is administered by trained healthcare providers.[10,11,13,14] It also use to provide analgesia for knee joint injuries and surgeries.[4,15]

Patients with fracture shaft femur are very uncomfortable during sitting position for giving spinal block,but patients are very cooperative if spinal anaesthesia is planned after femoral nerve block. [16]

If femoral nerve block used in protocol of acute fracture shaft femur patients than it can be very helpful in case of paediatric trauma case in I.C.U., during shifting and also at time of pin insertion or traction.[12, 17, 18, 19]

In a patient with multiple trauma plus fracture femur, the administration of narcotic analgesic has risk of dose dependent respiratory depression, which is undesirable. Femoral nerve block has a no such contra indication that can preclude the use of narcotics in multiple trauma or elderly patients. [5]

CONCLUSION

Femoral Nerve Block is superior in providing pain relief, its effect lasts for longer duration and free of any major complication in comparison with systemic intravenous analgesia. Routine use of femoral nerve block at emergency ward helps the patient with fracture shaft femur in acute pain relief during traction, shifting, at the time of pin insertion, during various positioning even it is given by trained healthcare provider or junior staff.

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