Original Article

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A Study to Compare the Analgesic Efficacy of IV Fentanyl, Versus Peripheral Nerve Stimulator Guided Femoral Nerve Block

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Abstract

Background: fractures occurring in elderly patients which require surgical intervention. Proximal femoral fractures are very common in patients older than 50 years which are mostly pathological. In younger patients, proximal femoral fractures are usually the result of high-energy physical trauma (eg. high speed motor vehicle accidents) and usually occur in the absence of disease. **Subjects and Methods:** A pre-anesthetic evaluation comprising of history of previous medical and surgical illnesses, previous anesthesia exposures, drug allergies and upper respiratory tract infection; clinical examination and baseline investigation of blood hemoglobin, radiograph of the chest and airway examination was done. **Results:** VAS score at rest and movement in femoral nerve block is less than Fentanyl after 25 minute. It shows that p value is significant ($p<0.001$) which indicates that VAS score at rest and movement after 25 minute is less in femoral nerve block than Fentanyl. **Conclusion:** Besides the excellent analgesic effect, the procedure used in group femoral nerve block showed a high feasibility. Femoral nerve block was easy to perform, even when patients' legs were placed in traction.

Keywords: Analgesic Efficacy, IV Fentanyl, Peripheral Nerve Stimulator Guided Femoral Nerve Block.

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Introduction

"Pain is what patient says, hurts". Thus the emphasis is on patients 'experience Pain is not just a physical sensation but also an emotional experience. Pain is derivedfrom Latin word Poena"means punishment. It has been described in terms of danger very aptly by the International Association for the Study of Pain (IASP) as" An unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage".[1]

Intertrochanteric and femoral neck fractures account for 90% of the proximal femoral fractures occurring in elderly patients which require surgical intervention. Proximal femoral fractures are very common in patients older than 50 years which are mostly pathological. In younger patients, proximal femoral fractures are usually the result of high-energy physical trauma (eg. high speed motor vehicle accidents) and usually occur in the absence of disease. Displaced fractures are very painful and don't allow the patient to move. Fracture of femur is a particularly painful bone injury because the periosteum has the lowest pain threshold of the deep somatic structures.[2] Surgical repair most commonly involves either internal fixation of the fracture or replacement of the femoral head with arthroplasty.[3,4] Patients with these fractures present special problems to the anaesthesiologist. These are subjected to major muscle forces that, especially in young patients, can deform the thigh and angulate the bone fragments, thus complicating the intraoperative reduction of the fracture. Therefore, complete paralysis of all the muscles acting on the femur is mandatory.

Neuraxial blockade is used more frequently than general anaesthesia (GA) for femoral fracture surgery. 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 are often used to help the patient to tolerate position. In analgesics NSAIDs, opioids etc. are generally used. The effects of narcotics drugs vary greatly among patients and thus individual response cannot be predicted. Side effects such as respiratory depression, vomiting, sedation and dependency are also associated with use of opioids.[5,6] Non-steroidal anti-inflammatory drugs (NSAIDs) are also commonly used because of their lack of sedative properties and their opioid sparing effects; but their efficacy is limited due to its side effects and relative contraindication like deranged renal function test ,known hypersensitivity to drugs, allergic asthma, single kidney, acid peptic disorder, post-nephrectomy status , elderly patient. Paracetamol is devoid of such side effects.

In this prospective randomized study, we compared the feasibility and analgesic effect of a femoral nerve block, and IV fentanyl when administered before neuroaxial blockade in patients undergoing surgery for fracture femur.

Fracture of the femur is a common orthopedic problem following trauma in patients of all ages and central neuraxial block such as spinal anesthesia is the preferred technique for providing anesthesia. [7]Correct positioning during central neuraxial block is the prerequisite for a successful procedure. However, limb immobility and extreme pain are the deterrents for an ideal positioning for this procedure. Various modalities like intravenous (IV) fentanyl (FENT), femoral nerve block (FNB) or fascia iliaca block with local anesthetic have been advocated to reduce the pain pre-operatively and improve the positioning of these patients.[8],[9] Previous studies have shown the superiority of the femoral nerve block as compared to the intravenous fentanyl. [10]However, recent studies have shown no benefit of femoral nerve block over intravenous fentanyl.We conducted this study with the aim to compare the analgesic effect provided by femoral nerve block and intravenous fentanyl prior to positioning for central neuraxial block in patients undergoing surgery for femur fracture.

Subjects and Methods

A pre-anesthetic evaluation comprising of history of previous medical and surgical illnesses, previous anesthesia exposures, drug allergies and upper respiratory tract infection; clinical examination and baseline investigation of blood hemoglobin, radiograph of the chest and airway examination was done.

- Informed written consent was taken from thepatient.
- Patient was kept nil by mouth for 10 hours prior to surgery.
- Preoperative vitals parameters in the form of baseline pulse and blood pressure were recorded.

Measure patients pain score (VAS score) before intervention at rest as well as atmovements. An 18-gauge intravenous cannula was inserted into forearm after applying standard monitoring (ECG, $Sp0_2$, and non-invasive arterial pressure, capnometer). The patients are randomly allocated to two groups using a computer randomization scheme using the website randomization.com.

Group A- 30 patients received 1microg/kg IV fentanyl before 30 minutes of planned anaesthesia.

Group B-30 patients received peripheral nerve stimulator guided femoral nerve block before 30 minutes of planned anaesthesia.

For administration of femoral nerve block, make the patient supine. With all sterile and aseptic precaution; painting and draping was done. All the procedure wasexplained to patient. After a thorough cleaning with an antiseptic solution, local anaesthetic was infiltrated subcutaneously at the estimated site of needle insertion. The injection for the skin anaesthesia is shallow and in a line extending laterally to allow for more lateral needle reinsertion when necessary.

The anaesthesiologist is standing on the side of the patient with the palpating hand on the femoral artery in inguinal crease. The needle is introduced 1cm lateral and 1cm inferior to it and advanced in the sagittal and slightly cephalad plane. The nerve stimulator is initially set to deliver 1.0 mA (2 Hz, 100 µsec). With proper needle position, advancement of the needle was not result in any local twitches; the first response is usually that of the femoral nerve. A visible or palpable twitch of the quadriceps muscle (patella twitch) at 0.2-0.5 mA current is the optimal response. 20 mlof 0.375%of bupivacaine would be administered. VAS score was assessed for every 5 minute up to 30 minute. A femoral block results in anaesthesia of the entire anterior thigh and most of the femur and knee joint. This technique is associated with minimal patient discomfort, because the needle passes only through the skin and adipose of the femoral inguinal region. After 30 minutes of giving femoral nerve block or the iv fentanyl the patients were given neuraxial blockade by a same experienced

Anesthesiologist to assess the time taken to give neuraxial block in the both the groups. Pain score was assessed after every 5 minutes of interval in all groups and compare it. If complication occurs in the form puncture of femoral artery; needle should be immediately withdrawn and redirect it. Side effects including nausea, retching, vomiting, respiratory depression, allergic reaction, hepatotoxicity etc. will be recorded. If indicated, side effects will be treated as required. If the patient's pain is greater than 4 according to VAS; rescue analgesic in the form of injection diclofenec sodium 75 mg IMor Injection Paracetamol 100ml IV was given.

Results

Table 1: Preintervention Vas Score at Rest and Movement

	Type	N	Mean Rank	Sum ff Ranks
Pre intervention VAS score at Rest	Femoral block	30	30.50	915.00
	Fentanyl	30	30.50	915.00
	Total	60		
Pre intervention VAS score on Movement	Femoral block	30	30.50	915.00
	Fentanyl	30	30.50	915.00
	Total	60		

The table below shows that there is no difference in pre-interventional VAS score in each group with p value >0.05 (p=1.00).Mann Whitney U test and Wilcoxon test was used to check for any statistical significance.

The table below shows mean heart rate, systolic and diastolic BP in each group at 5 minutes.

Table 2: Vas Score at Rest and Movement at 5th Minute

5th Minute Vas				Sum of Ranks
Score	Type	N	Mean Rank	
VAS score at Rest	Femoral block	30	30.00	900.00
	Fentanyl	30	31.00	930.00
	Total	60		
	Femoral block	30	30.00	900.00
	Fentanyl	30	31.00	930.00
	Total	60		

The table below shows that there is no significant difference

in VAS score in each group after 5 minute. Mann Whitney U and Wilcoxon test was applied which showed a p value of 1.00 thus proving that there is no difference.

Table 3: Vas Score at Rest and Movement at 10th Minute

10th Minute Vas Score	Type	N	Mean Rank	Sum Of Ranks
VAS score at Rest	Femoral block	30	15.50	465.00
	Fentanyl	30	45.50	1365.00
	Total	60		
VAS score on Movement	Femoral block	30	15.50	465.00
	Fentanyl	30	45.50	1365.00
	Total	60		

The above table shows that VAS score at rest and movement in femoral nerve block is less than IV fentanyl group after 10 minute.

Table 4: Vas Score at Rest and Movement at 15th Minute

15th Minute Vas Score	Type	N	Mean Rank	Sum Of Ranks
VAS score at Rest	Femoral block	30	15.50	465.00
	Fentanyl	30	45.50	1365.00
	Total	60		
	Fentanyl	30	45.50	1365.00

The above table shows that p value is extremely significant ($p<0.001$) which indicates that VAS score at rest and movement after 15 minute is less in femoral nerve block than iv fentanyl group.

Table 5: Vas Score at Rest and Movement at 20th Minute

20th Minute Vas Score	Type	N	Mean Rank	Sum Of Ranks
VAS score at	Femoral block	30	15.50	465.00
	Fentanyl	30	45.50	1365.00
	Total	60		
VAS score on	Femoral block	30	15.50	465.00
	Fentanyl	30	45.50	1365.00
	Total	60		

The above table shows that VAS score at rest and movement in femoral nerve block is less than Fentanyl group after 20 minutes.

This table shows that p value is significant ($p<0.001$) which indicates that vas score at rest and movement after 20 minute is less in femoral nerve block than iv fentanyl group.

VAS score at rest and movement in femoral nerve block is less than Fentanyl after 25 minute. This table shows that p value is significant ($p<0.001$) which indicates that VAS score at rest and movement after 25 minute is less in femoral nerve block than Fentanyl.

The above table shows that VAS score at rest and movement in femoral nerve block is less than Fentanyl after 30 minute. This table shows that p value is significant ($p<0.001$) which indicates that VAS score at rest and movement after 30 minute is less in femoral nerve block than Fentanyl.

Table 6: Vas Score at Rest and Movement at 30th Minute

30th Minute Vas Score	Type	N	Mean Rank	Sum Of Ranks
VAS score at	Femoral block	30	15.50	465.00
	Fentanyl	30	45.50	1365.00
	Total	60		

Discussion

Few studies have investigated femoral nerve block to facilitate positioning during conduct of regional anesthesia.

Gosavi[11] et al assessed pain during change of position from supine to sitting after FEMORAL NERVE BLOCK with lidocaine; VAS scores were 2.7 ± 1.1.Mosaffa[12]et al compared IV fentanyl with fascia iliaca block using lidocaine. 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.

Sia[9] et al compared IV fentanyl with Femoral nerve block using lidocaine. VAS values during placement in the sitting position were lower in the femoral nerve block group (0.5 ± 0.5 versus 3.3 ± 1.4 for femoral nerve block group and IV fentanyl, respectively).

Schiferer et al[13] demonstrated that FEMORAL NERVE BLOCK provided analgesia after femoral trauma which was adequate for patient transport.

Other studies have described the successful use of FEMORAL NERVE BLOCK as analgesia in the emergency department.

In our study Mann Whitney U is used for statistical analysis. Mean rank of VAS score in femoral nerve block after 10 minute is 15.50; and IV fentanyl is 45.50. This shows that onset of analgesia starts after 10 minute in case of femoral nerve block while peak of analgesia is found after 20 minute. In case of IV fentanyl no change is found in VAS score up to 20 minute. After 20 minute it starts decreasing with mean rank of 45.50. It is found that analgesic effect of femoral block was significantly better than that produced by IV fentanyl. The analgesic effect and the paralysis of the quadriceps allowed better patient positioning and a shorter neuroaxial blockade performance time in group femoral nerve block (4.3min 0.46) in comparison with (7.4 0.62) minutes in fentanyl group. same as that of study conducted by Sia[9] et al and haq dad durrai[14], Khalid javed butt.(time to perform spinal block was significantly shorter in FNB group ie2.15 0.78 min verses fentanyl (3.50 1.46 min) as in our study it was shorter in femoral nerve block group compared to fentanyl group. The administration of a femoral nerve block is also more useful when the anesthetic procedure is expected to be more complex than a simple spinal anesthesia (e.g., placement of an epidural or lumbar plexus catheter or spinal abnormalities), where the patient must stay in the sitting position for a longer time. Besides the excellent analgesic effect, the procedure used in group femoral nerve block group showed a high feasibility. Femoral nerve block was easy to perform, even when

patients' legs were placed in traction. The onset of the analgesic effect produced by the femoral nerve block was rapid as compared IV fentanyl. For very rapid action of femoral nerve block; 1.5% lignocaine can be added. The placement of spinal block was easier and faster in group femoral nerve block than in group IV fentanyl the only disadvantage noted in group Femoral nerve block was the additional cost for insulated needles and local anesthetic mixture.

Arissara Iamaroon[15] etalstudied femoral nerve block versus fentanyl: Analgesia for positioning patients with fractured femur. They found no difference between two groups and required rescue analgesic in the form of 0.5ug/kg IV fentanyl. They gave reason that they compared it for 15 minute which is very short time to compare.

In our study, we compare both the groups for 30 minutes. And at the end of 30 minute; if VAS score is more than 4 then rescue analgesia is given in the form of Injection dicofenac sodium 75mg IM or Injection paracetamol 100ml IV was given. It is found that in femoral nerve block group no rescue analgesia is required and in iv fentanyl 60% rescue analgesia is required with statistically significant p value(<0.001).

Two cases in FNB group encountered hematoma at the nerve block site as adverse effect which has subsided by compression over the site and three cases among fentanyl group had side effects as one case with bradycardia, one case with fall in SPO2 (respiratory depression) and another with purities which were treated symptomatically. Side effect was found in both the groups but significant difference in side effects between the groups were not found which suggested that one study group was not better than the other in terms of side effects produced.

In this study we found that femoral nerve block gives excellent analgesia for positioning to give neuroaxial blockade in fracture femur surgeries, than IV fentanyl group.

Conclusion

Thus it is found that analgesic effect of femoral block was significantly better than that produced by IV fentanyl. The analgesic effect and the paralysis of the quadriceps allowed better patient positioning and a shorter neuroaxial blockade performance time in group femoral nerve block. The administration of a femoral nerve block is more useful when the anesthetic procedure is expected to be more complex than a simple spinal anesthesia (e.g., placement of an epidural or lumbar plexus catheter or spinal abnormalities), where the patient must stay in the sitting position for a longer time.

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