

# Comparison Of Fentanyl With Sufentanil As An Additive To Hyperbaric Bupivacaine In Femur Fracture Surgery

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## Abstract

**Background:** subarachnoid block is widely used for lower limb orthopedic surgery. The most common drugs used in intrathecal route are local anesthetic and opioids. therefore we compared the effects of fentanyl 25mcg with sufentanil 7.5 mcg which were added to intrathecal hyperbaric bupivacaine.

**Methods.** =60 healthy patients were randomly divided into 3 groups.

Group 1= inj. Bupivacaine 7.5mg +nj. Sufentanil 7.5mcg

Group 2= inj bupivacaine 7.5mg + inj. Fentanyl 25mcg

Group 3= inj bupivacaine 7.5mg + normal saline 0.5 ml

We compared the maximum level of sensory block and motor block, the quality of intraoperative analgesia, the duration of effective analgesia.

**Result:** there were significant differences between control and fentanyl and sufentanil group for the quality of intraoperative analgesia, degree of muscle relaxation and duration of effective analgesia. the frequency of side effect such as nausea and pruritis in opioid group were higher than in control group.

**Conclusion:** the duration of analgesia was maximum in fentanyl group followed by normal saline, followed by sufentanil group. Addition of fentanyl 25mcg to bupivacaine 7.5mg for spinal blockade provides sensory and motor blockade better than provided by sufentanil plus 7.5mg bupivacaine .sufentanil used motor blockade of least duration.

**Keywords:** bupivacaine, fentanyl, sufentanil, subarachnoid block.

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## I. Introduction:

There are two types of regional anesthesia for lower limb orthopedic procedures, spinal and epidural. Pain is an unpleasant experience. The pain due to fracture of lower limb is one of the most severe forms of pain. Efforts have been made to manage such severe pain. Spinal anesthesia is one of the modalities used for lower limb orthopedic surgeries. It offers the advantage of fast onset and dense blockade of pain. The intrathecal route was found to provide excellent analgesia. The quest for ideal drug in subarachnoid block led to the discovery of drugs that are cost effective and easily available. Considering these facts we took to compare the analgesic characteristic of two opioids, Fentanyl and sufentanil.

Bupivacaine has been the most studied drug in subarachnoid block. However its prolonged duration of action in traditional dose has made it unsuitable choice for short outpatient surgeries.

Intrathecal opioids added to low dose local anesthetic produce a synergistic effect without increasing sympathetic block. Morphine as an aqueous opioids the most studied among the opioids . Drugs with higher lipid solubility (e.g. Fentanyl & sufentanil) have a faster onset, shorter duration and are associated with fewer late onset side effects. The risk of respiratory depression is predominantly limited to first 2 hrs after intrathecal injection.

Several reports have shown beneficial effects of adding various opioids to local anesthetic solution. So we compared sufentanil with Fentanyl in subarachnoid block , although cost of sufentanil is more than Fentanyl.

The purpose of this study was to compare as main end points the analgesic characteristic of 25mcg Fentanyl with 7.5 mcg Sufentanil for post operative pain relief after femur fracture surgery.

## II. Material And Methods:

The present study was carried out in department of anesthesia, Mata Chanandevi hospital, Janakpuri, Delhi. The hospital's ethical committee approved the study. Written and informed consent was taken from all the patients participating in the study. Patient with physical status ASA grade 1 & 2, aged 18 to 70 years for elective surgeries, which could be done under spinal anesthesia were enrolled for study. Patient unwilling for regional anesthesia were excluded. Patient with COPD and cardiovascular problem were excluded from study. All patients included in study underwent preanesthetic checkup and routine investigation. The patients enrolled for the study were randomly allocated into 3 groups of 20 each. The groups were,

Group 1: Bupivacaine 7.5mg + Sufentanil 7.5mcg.

Group 2: Bupivacaine 7.5mg + Fentanyl 25mcg

Group 3: Bupivacaine 7.5mg + Normal saline 0.5 ml.

Volume of solution given in all three groups was 2ml. A medical officer not involved in the study used to prepare the study solution. All the patients inside OT were monitored for heart rate, non-invasive blood pressure, ECG, SPO<sub>2</sub>, respiratory rate. All the subjects upon their arrival in OT received Ringer's Lactate solution @ 15 cc/kg via 18 gauge i/v cannula. Spinal anesthesia was performed in sitting position. The solution for intrathecal injection was prepared by consultant so that anesthetist performing the block did not know about the combination of drugs used. The same anesthetist performed all the blocks and subsequent assessment. Spinal anesthesia was instituted under complete asepsis at L2- L3 / L3 - L4 intervertebral level in sitting position with 26 gauge spinal needle Quincke type. Patients were monitored with ECG, Pulse oximetry, Heart rate, Non-invasive blood pressure. Oxygen was given through polymask. Respiratory depression was defined as a rate less than 8 breaths/minute or SPO<sub>2</sub> less than 85% on room air. We recorded the side effects that the patient complained of such as pruritis, nausea, vomiting, sedation, shivering, tightness in chest. Surgery was performed according to standard protocol. In the recovery room Pain was evaluated using standard 10cm linear Visual Analogue Scale with '0' corresponding to no pain and 10 to the worst pain. Duration of complete analgesia was defined as the time from intrathecal injection to visual analogue scale > 0 and duration of effective analgesia will be defined as time to VAS score > 4. The side effects and the time of requirement of first dose of analgesic in postoperative ward were recorded. The Patient were shifted to ward approximately 6hrs after surgery. Level of motor blockade was assessed using Bromage Scale every 3 minutes for 15 minutes. The movement were recorded on 4 point scale; 0= Able to raise extended Leg was no motor blockade.

1= Unable to raise extended Leg but able to flex the knee.

2= Unable to flex the knee but with free movement of ankle.

3= Unable to flex the ankle.

Figure 1. (bromage scale)

The time taken to achieve T6 sensory level was recorded bilaterally. The motor block and duration was assessed using Bromage criteria. The time taken for complete recovery of motor function was also noted. The time after subarachnoid block when patient first asked for pain relief was noted. Effects of drugs on hemodynamics were recorded. Statistical package for social science version 10 was used to analyse the collected data. All the parametric data like age, height, weight were analyzed using ANOVA. Non-parametric variables were analyzed using Kruskal-Wallis test and then Mann-Whitney's U test used to see any statistical difference between groups. A P-value of <0.05 was considered significant.

## III. Results:

There was no difference between three groups for age, height, weight and operation time while the mean volume of bupivacaine used in all the groups was 2ml. The infused amount of i.v fluid, the frequency of hypotension and dosage of ephedrine did not reveal any significant difference. The highest sensory level achieved was T6 in all patients. There was no significant difference between 3 groups. The time taken to achieve T6 dermatomal level was 8.85±2.739 min in group 1, 7.50±3.017 min in group 2, and 11.0±2.810 min in group 3. There was no statistically significant difference among any of the three groups concerning the motor blockade achieved. Figure 2.

Time taken for motor blockade in group 1 was 9.55±2.856 min, in group 2 = 8.74±2.557 min and in group 3 it was 14.65±4.209 min respectively. This difference in time taken for complete motor weakness of both lower limb was found to be statistically significant. Figure 3.

The time taken for return of complete motor power in lower limb in group 1 was 1.196 ± 0.302 hrs. Figure 4.

The time taken for return of complete motor power in group 2 was 3.25±0.6 hrs. Time taken for return of complete motor power in group 3 was 2.22±0.478 hrs.

Duration of analgesia was maximum in group 2 and minimum in group 1. Among the complications, there was no significant difference in incidence of hypotension among the three groups. Figure 5.

#### **IV. Discussion:**

We took 60 ASA 1 & 2 patients scheduled for Femur fracture surgery. We examined the efficacy in terms of onset, quality, and duration of analgesia of 2 opioids in femur fracture surgery.

Reuben et al reported that 40mcg of intrathecal fentanyl is an optimal dose for pain relief after lower extremity revascularization procedure in elderly patients. With its evolution into a safe, widely accepted technique, spinal anesthesia has become the mainstay as the method to provide anesthesia and analgesia for various lower limb surgeries. However Bupivacaine's prolonged duration of action in traditional doses precluded its use in gradually increasing scenario of day care surgery and the associated desired expedient discharge.

Subsequently the solution to this problem was found by using intrathecal adjuncts to small dose of Bupivacaine. Among these adjuncts, intrathecal opioids were found to have synergistic analgesic effect.

Hence this study was conceptualized to study the effects of coadministration of intrathecal Fentanyl to low dose hyperbaric Bupivacaine on the sensory and motor blocks in spinal anesthesia for femur fracture and compare the same with low dose intrathecal sufentanil in combination with Bupivacaine.

All three groups were comparable with respect to age, height, weight, M:F ratio, ASA 1:ASA 2

In extremes of age there can be small but significant increase in maximum spread of the solution used. It is often suggested that epidural fat compresses the dural sac, reduces csf volume and results in greater spread in obese patients. However such studies with hyperbaric solution have failed to show a significant relationship. No statistically significant difference were found in the level of sensory block achieved amongst male and female subjects in our study. With regard to solution used for subarachnoid block, patients in group 1 received a mixture of 1.5 cc 0.5% Bupivacaine added to 7.5 mcg of sufentanil; in group 2, a solution of 1.5cc 0.5% hyperbaric Bupivacaine with 25mcg Fentanyl, while in group 3, Patient received a solution of 1.5cc 0.5% hyperbaric Bupivacaine plus 0.5cc normal saline. In our study, the subarachnoid block was performed with the patient in sitting position and placed supine after 3 minutes. The bevel of spinal needle was directed laterally while injecting the solution. Method of monitoring sensory and motor blockade in our study was based upon the subjective response. Dermatomal level of sensory block in our study as determined by pin prick method was T6 in all groups.

Analysis of time taken to achieve the highest dermatomal level of sensory block revealed that it took lesser time in patients in group 2 to achieve a sensory level of T6. Most of the patients in all 3 groups demonstrated motor blockade of grade 3 intensity as per Bromage scale. The duration of analgesia was maximum in Fentanyl group, followed by normal saline group, followed by sufentanil group. The duration of surgery was comparable in all 3 groups.

The trend in fall of blood pressure in fentanyl and saline group was similar and gradual while in sufentanil group, the fall was steeper. The heart rate variation was within a narrow range in case of fentanyl and Sufentanil while patient in normal saline had a large variation in heart rate. Thus addition of 25mcg Fentanyl gives advantage of lowering the dose of bupivacaine for subarachnoid block. Our study demonstrated similar incidence of hypotension when Bupivacaine 7.5mcg is used with 25mcg Fentanyl or 7.5 mcg Sufentanil or with normal saline. Episode of Bradycardia occurred in one patient each in group 1 and group 2 and none in group 3.

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