



## COMPARATIVE STUDY OF EFFICACY OF LOW DOSE BUPIVACAINE AND FENTANYL WITH CONVENTIONAL DOSE OF BUPIVACAINE IN CESAREAN SECTION

### Anesthesiology

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### ABSTRACT

Spinal anaesthesia for cesarean section is the most preferred technique. Addition of opioids like fentanyl to low dose of hyperbaric bupivacaine, augments the analgesic effect of local anaesthetics, provides better hemodynamic stability and good anaesthetic status. Hence this study was planned to assess the duration of post operative analgesia in two groups of parturients, one group receiving inj 0.5% hyperbaric bupivacaine 10mg (2ml) and another group receiving inj 0.5% bupivacaine 7.5mg (1.5ml) + inj fentanyl 25micrograms (0.5ml) = 2ml intrathecaly. It was concluded that the total duration of analgesia was prolonged in the group receiving fentanyl with low dose of hyperbaric bupivacaine with a mean of 219.23±17.95 minutes as compared to the group receiving only conventional dose of hyperbaric bupivacaine with a mean duration of 156.27±13.69 minutes.

### KEYWORDS

bupivacaine, fentanyl, post-operative analgesia, cesarean section.

### INTRODUCTION:

Spinal anaesthesia is the most preferred regional anaesthetic technique in parturients undergoing Lower segment cesarean section, as it provides reliable intra-operative anaesthesia and good quality post operative analgesia. It is associated with less morbidity and mortality.<sup>[1,11]</sup>

Bupivacaine, an amide type of local anesthetic is the most commonly used in parturients undergoing cesarean section. It has a slow onset of action (5-8mins), long duration of action (1.5-2hours), has high potency and less postoperative complications.<sup>[5]</sup>

Many anatomical and physiological factors affect spinal anaesthesia, as well as hormonal and mechanical factors too. Hence pregnant women require less dosage of local anaesthetic when compared to non-pregnant women<sup>[2]</sup>. Despite achieving adequate dermatomal level for surgery, parturients may experience varying degrees of visceral discomfort, nausea and vomiting, particularly during exteriorization of the uterus and traction on the abdominal viscera. But any greater dose of the local anesthetic can cause toxicity, hemodynamic instability, maternal and neonatal morbidity and mortality.

With the discovery of opioid receptors in the brain and spinal cord, lipophilic as well as lipophobic opioids are used to potentiate the action of local anesthetic used in low doses. Opioids have an antinociceptive synergistic effect with the local anesthetic agent. Numerous studies shows that the opioids used intrathecaly either as a sole agent or in adjunct with low dose of local anesthetics provide adequate peri-operative anaesthesia and analgesia<sup>[3]</sup>, with lesser central and systemic side effects than opioids being administered systemically. They provide longer duration of post operative analgesia and faster recovery from spinal anaesthesia.

Lipophilic opioids like fentanyl are most commonly preferred than lipophobic morphine because they have a rapid onset of action (seconds to minutes), duration of analgesia is short (1-4hours) when compared to lipophobic opioids (12-18hours) and lesser chances of delayed respiratory depression when compared to lipophobic opioids.<sup>[4,5]</sup>

Fentanyl is a mu receptor antagonist with an analgesic potency greater than morphine. Analgesic effect is produced mainly by interaction with the mu receptors in the supraspinal site. To lesser degree it also binds to the kappa receptors and substantia gelatinosa of the spinal cord.

Hence this study was planned to assess the effect of fentanyl on low dose hyperbaric bupivacaine versus the conventional dose of hyperbaric bupivacaine on duration of post operative analgesia.

### MATERIALS AND METHODS:

The present study was conducted on 60 parturients belonging to 18-35

years of age. The patients were of either ASA1 or ASA2 grade. After institutional ethical committee clearance, a prospective double blinded randomized comparative study was planned. Informed valid written consent was taken. Parturients were randomly allocated into two groups:

- Group B (n=30) = parturients receiving injection 0.5% hyperbaric bupivacaine 10mg (2ml) intrathecaly (study group 1)
- Group BF (n=30) = parturients receiving injection 0.5% bupivacaine 7.5mg (1.5ml) + injection fentanyl 25mcg (0.5ml) intrathecaly (study group 2)=2ml

### INCLUSION CRITERIA:

- Parturients of 18-35 years of age group
- Parturients of ASA-1 and ASA-2
- Parturients undergoing elective/emergency cesarean section.

### EXCLUSION CRITERIA:

- Pre-existing diabetes, gestational diabetes, hypertension, pregnancy induced hypertension or eclampsia
- Placenta previa, Abruptio placenta, Twin pregnancy
- Presence of systemic disorders like cardiac, renal or neurological disorders
- Presence of bleeding disorders or coagulopathy
- Patient refusal
- Spinal deformity
- Allergic to local anesthetics or undue reactions to opioids
- BMI > 30kg/m<sup>2</sup>
- Extremes of height <140cms or >180 cms

### METHOD OF STUDY:

- A thorough pre-anaesthetic evaluation of all the parturients belonging to the inclusion criteria was done. Preliminary data were collected. Pre-operative investigations were noted down.
- Parturients were pre-loaded with adequate crystalloids, pre-medicated with inj. Metoclopramide 10mg and inj. Ranitidine 50mg 30 mins prior to surgery.
- On table essential monitors were connected and baseline vitals such as heart rate, blood pressure, ECG, oxygen saturation, respiratory rate and fetal heart rate were noted down.
- Under aseptic precautions, sub-arachnoid block was performed. The study drug was injected as per the group allocation. After the block the patient was laid supine immediately and a wedge was placed below the right hip.

### PARAMETERS OBSERVED:

- Cardiopulmonary and respiratory parameters were recorded throughout the surgery, such as heart rate, non invasive blood pressure, ECG, respiratory rate, oxygen saturation.

- The vitals were noted down every 2 minutes for the first 10 minutes, every five minutes for the next 20 minutes, every 15 minutes for the next 30 minutes. After 1 hour, the vitals were recorded for every 30 minutes upto 4hrs or regression of level to L1 whichever was earlier.
- Assessment of sensory and motor blockade were done. APGAR score at first minute and fifth minute after delivery were also noted down.
- As continuous monitoring were being done, any complications that occurred during the course were noted down and treated accordingly:
- Post operatively patients were assessed during 1st hour at 15 min ,30 min, 45 min and 60 minutes and thereafter every hour upto 8 hours and thereafter at 12th hour after operation regarding the pain at operative site.
- Pain assessment was done post operatively using VISUAL ANALOGUE SCALE  
0 =no pain  
10=unbearable pain
- Post operatively, when patients began to experience pain more than 4 on the VAS it was considered that the analgesic action of the drug has terminated and additional (rescue) analgesia with Inj.Tramadol (2mg/kg) or inj. Diclofenac sodium 75 mg were given slow IV.
- Time duration between the induction of anesthesia and requirement of the first rescue analgesic i.e. the total duration of post-operative analgesia were noted down.

#### STATISTICAL ANALYSIS:

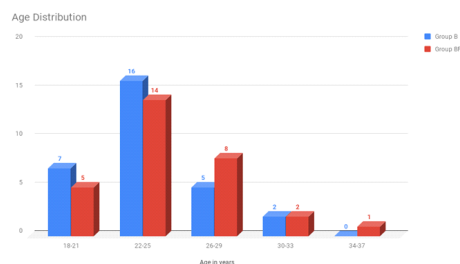
- Data were entered into Microsoft excel data sheet and were analyzed using SPSS 22 version software.
- Categorical data were represented in the form of Frequencies and proportions.
- Chi-square were the test of significance.
- Continuous data were represented as mean and standard deviation. p value <0.05 was considered as statistically significant.

#### RESULTS:

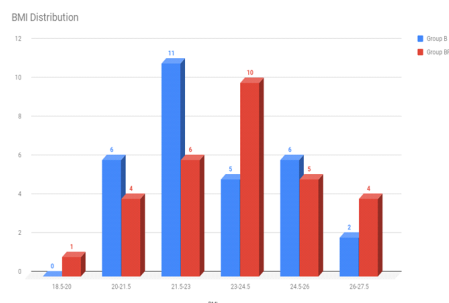
##### DEMOGRAPHIC PROFILE:

Demographic profile in terms of age and BMI were comparable in both the groups and statistically insignificant.

#### FIGURE 1 – AGE DISTRIBUTION



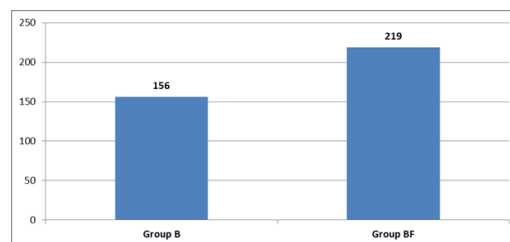
#### FIGURE 2 – BMI DISTRIBUTION



**Table 1: Total Duration Of Analgesia (vas Score >4)**

| GROUP B<br>MEAN ±SD | GROUP BF<br>MEAN±SD | MEAN<br>DIFFER<br>NCE | STUDENTS<br>UNPAIRED<br>T TEST<br>VALUE | 'P' VALUE   |
|---------------------|---------------------|-----------------------|-----------------------------------------|-------------|
| 156.27±13.69        | 219.23±17.9         | 62.96                 | 15.293                                  | 0.0001(sig) |

**Figure 3 – Total Duration Of Analgesia**

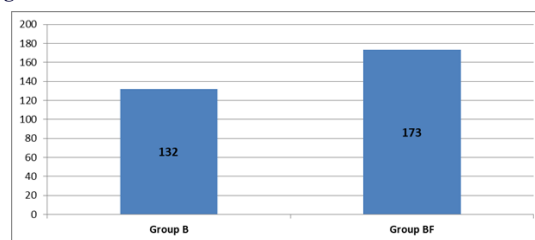


Total duration of analgesia i.e duration of post operative analgesia was significantly prolonged in group BF with a mean duration of 219.23±17.9 minutes when compared to group B with a mean duration of 156.27±13.69 minutes. This comparison was statistically significant as the p value was 0.0001. Hence the time for the first rescue analgesic was prolonged in group BF when compared to group B.

**Table 2: Total Duration Of Motor Blockade**

| GROUP B<br>MEAN ±SD | GROUP BF<br>MEAN ±SD | MEAN<br>DIFFER<br>CE | STUDENTS<br>UNPAIRED<br>T TEST<br>VALUE | 'P' VALUE  |
|---------------------|----------------------|----------------------|-----------------------------------------|------------|
| 132.73±16           | 173.73±9.9           | 41                   | 11.9                                    | 0.001(sig) |

**Figure 4 - Total Duration Of Motor Blockade**



The total duration of motor blockade was significantly longer in group BF with a mean duration of 173.73±9.9 minutes when compared to group B with a mean duration of 132.73±16 minutes with a p value of 0.001 which is statistically significant.

Time of onset of sensory analgesia at T10 was significantly shorter in group BF with a mean duration of 1.20±0.42 minutes when compared to group B with a mean duration of 2.61±0.87 minutes and p value of 0.001. Hence this is statistically significant.

Time required to achieve highest level of sensory analgesia, T4 dermatome in case of group BF was much shorter with a mean duration of 1.54±0.65 minutes when compared to T5 dermatome in case of group B with a mean duration of 3.55±1.08 minutes with a p value of 0.001. Hence this comparison was also statistically significant.

Time required for the onset of grade 3 motor blockade was much shorter in group BF with a mean duration of 1.28±0.44 minutes when compared to group B with a mean duration of 3.28±0.95 minutes and a p value of 0.001. This comparison was statistically significant.

Time required for sensory regression to L1 dermatome was longer in group BF with a mean duration of 196.3±12.9 minutes when compared to group B with a mean duration of 154.5±12.5 minutes and a p value of 0.001 which was statistically significant.

**Table 3: Complications**

| complications | GROUP B         |               | GROUP BF        |               |
|---------------|-----------------|---------------|-----------------|---------------|
|               | No. of patients | % of patients | No. of patients | % of patients |
| hypotension   | 16              | 53.33         | 8               | 26.67         |
| Nausea        | 2               | 6.67          | 2               | 6.67          |

|           |   |       |   |       |
|-----------|---|-------|---|-------|
| Vomiting  | 3 | 10    | 0 | 0     |
| Shivering | 7 | 23.33 | 4 | 13.33 |
| Pruritus  | 0 | 0     | 2 | 6.67  |

### DISCUSSIONS:

There is an increase in the incidence of cesarean sections in the past years. Spinal anaesthesia is the most preferred regional anaesthetic technique for parturients undergoing cesarean section. The most commonly used local anaesthetic for spinal anaesthesia is hyperbaric bupivacaine with a conventional dose of 10mg (2ml). But this is associated with side effects such as hemodynamic instability, lesser control of block height, reduced duration of post operative analgesia. Several adjuvants such as fentanyl are being added intrathecally along with local anaesthetics so as to reduce the volume of local anaesthetics being used and to minimize the adverse effects associated with it.<sup>[11]</sup> Fentanyl also prolongs the post operative duration of analgesia by acting on the mu receptors present in the substantia gelatinosa of spinal cord. Opioids inhibit the ascending transmission of nociceptive information from the spinal cord dorsal horn and activate the descending inhibitory pathway thus giving rise to the analgesic effects of opioids.<sup>[10]</sup>

Hence this randomized double blinded study was designed to compare the effect of intrathecal fentanyl to low dose of hyperbaric bupivacaine with that of conventional dose hyperbaric bupivacaine on the duration of post operative analgesia in cesarean section parturients.

The demographic profile of the present study was comparable to similar other studies in terms of age, BMI, ASA grading and does not show any statistical significance on comparison.

In our study we observed that the time required for the onset of sensory blockade at T4 dermatome was faster in group BF (1.54±0.65 minutes) as when compared to T5 of group B (3.55±1.08 minutes). This is statistically significant as p value is <0.001. This correlates with the observations made by venkata et al<sup>[5]</sup> and M Paul Wilson et al.<sup>[11]</sup>

Time required for sensory regression to L1 dermatome was prolonged in group BF with a mean duration of 196.3±12.9 minutes when compared to group B whose mean duration was 154.5±12.5 minutes with a p value of 0.001 which is statistically significant. This is similar to the findings of venkata et al study.<sup>[5]</sup>

The total duration of post operative analgesia was prolonged in group BF with a mean duration of 219.23±17.9 minutes when compared to group B with a mean duration of 156.27±13.69 minutes. p value was 0.0001 which is statistically significant. When VAS score > 4, the first rescue analgesic was given which was either inj. tramadol 100mg IV or inj. Diclofenac 75mg IV. These observations are similar to venkata et al<sup>[5]</sup>, M Paul Wilson et al<sup>[11]</sup> and Manoj Kumar et al<sup>[10]</sup> studies, thus proving that addition of fentanyl to local anaesthetics intrathecally prolongs the duration of post operative analgesia.

Intraoperative and post operative heart rate was comparable in both the groups.

In our study, we noted that the incidence of hypotension was more in group B with 53.33% of the patients experiencing it intraoperatively while only 26.66% patients experienced it in group BF. This observation concurs with the study conducted by Manoj Kumar et al.<sup>[10]</sup> Mild pruritus was seen in two patients amongst group BF and none in group B. This side effect might be due to fentanyl but etiology is uncertain. Similar results were seen in venkata et al study<sup>[5]</sup> and cowan et al study<sup>[15]</sup>.

Other complications such as nausea, vomiting, shivering were comparable in both the groups.

Neonatal outcome based on APGAR scoring was comparable in both the groups.

### CONCLUSION:

From the observations of our study, we conclude that the addition of fentanyl to low dose hyperbaric bupivacaine for spinal anaesthesia in cesarean section parturients results in the faster onset of sensory blockade, prolonged duration of post operative analgesia with better hemodynamic stability and minimal side effects than the conventional dose of hyperbaric bupivacaine given alone.

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