

## Original article

### Subarachnoid clonidine or fentanyl with low dose hyperbaric bupivacaine for elective caesarean section- A comparative study

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#### Abstract

**Background:** Preferred technique of anaesthesia for caesarean section is neuraxial block. Hyperbaric bupivacaine in adequate dose for subarachnoid block often causes complications like hypotension, shivering, nausea, vomiting, chest pain and epigastric pain.

**Objectives:** The aim of study is to reduce the complications of subarachnoid block, improve quality of block, quality of anaesthesia, prolong duration of post operative analgesia by reducing total dose of local anaesthetics with the use of adjuvant like fentanyl or clonidine.

**Methods:** Ninety parturients of ASA grade I & II for caesarean section under subarachnoid block were randomly allocated equally into three groups:

Group B: hyperbaric bupivacaine 0.5% of 2 ml+ 0.25ml normal saline regarded as control

Group BC: hyperbaric bupivacaine 0.5% of 1.75 ml + 0.5 ml clonidine (75 µg)

Group BF: hyperbaric bupivacaine 0.5% of 1.75 ml + 0.5 ml fentanyl (25 µg)

Parametric data like pulse, blood pressure among the groups were analyzed by ANOVA test & nonparametric data like chest discomfort, epigastric pain, nausea, vomiting were analyzed by chi-square test.

**Results:** The study revealed that subarachnoid clonidine or fentanyl as adjuvant with low dose hyperbaric bupivacaine provide better quality of block, better quality of anaesthesia, more haemodynamical stability and longer duration of post operative analgesia compared to bupivacaine alone. Clonidine is better alternative to fentanyl as adjuvant with bupivacaine in subarachnoid block.

**Conclusion:** Addition of clonidine as adjuvant can reduce total dose of bupivacaine in subarachnoid block to ensure better quality of block, better quality of anaesthesia by reducing complications and longer duration of post operative analgesia compared to fentanyl.

**Key words:** subarachnoid block, clonidine, fentanyl, hypotension.

#### Introduction

Caesarean section is one of the most common operations in the childbearing age of a woman<sup>1</sup>. Subarachnoid block for caesarean section is advantageous because of less neonatal exposure to depressant drugs, decreased risk of maternal pulmonary aspiration and an awoken mother at the birth of her child<sup>2</sup>. Hyperbaric bupivacaine is mostly used in subarachnoid block but effective calculated dose may be associated with high block and haemodynamic instability. Adding adjunct (opioid or nonopioid) allow reduction in dose of bupivacaine and provide cardiovascular stability<sup>3</sup>. Opioids and non opioids used as adjunct to subarachnoid block improve quality of block, quality of anaesthesia and prolongation of post operative analgesia<sup>4</sup>. Fentanyl following intrathecal administration does not tend to migrate to fourth ventricle in sufficient concentration to cause delayed respiratory depression<sup>5</sup>. So, fentanyl is suitable as

intrathecal drug for intraoperative analgesia and also prolongs analgesia in the early postoperative period<sup>6</sup>. But spinal opioids are associated with side effects like respiratory depression, itching, pruritus and activation of genital herpes. Recently, a non-opioid  $\alpha_2$  adrenergic agonist, clonidine was used as adjuvant in neuraxial block. Clonidine potentiates sensory and motor block of intrathecal local anaesthetic<sup>7</sup>.

So far literature reviewed several clinical studies have been conducted on intrathecal use of clonidine<sup>7-10</sup> in higher doses for pain relief. Clonidine in higher dose is associated with haemodynamic instability. Studies with lower dose intrathecal clonidine have not been undertaken so far in caesarean section. The purpose of this study was to compare the effects of intrathecal administration of low dose clonidine 75 µg with fentanyl 25µg on quality of block, quality of anaesthesia, duration of postoperative analgesia

induced by low dose hyperbaric bupivacaine in subarachnoid block.

**Materials and Methods**

After obtaining approval from ethical committee and written informed consent, 90 patients (ASA grade I and II, aged between 20 to 35 years) at term undergoing caesarean sections were enrolled for the study. The study was conducted in BSMMU (Bangabandhu Sheikh Mujib Medical University) during the period of 2004-2005. The patients were randomly divided into three equal groups as follows: Group B: hyperbaric bupivacaine 0.5% of 2 ml+ 0.25ml normal saline as control

Group BC: hyperbaric bupivacaine 0.5% of 1.75 ml + 0.5 ml clonidine ( 75µg)

Group BF: hyperbaric bupivacaine 0.5% of 1.75 ml + 0.5 ml fentanyl (25 µg)

All parturients were instructed for overnight fasting, prescribed injection metoclopramide 10 mg intravenously 1 hour before surgery. In the operation theatre, the parturient received 15mlkg<sup>-1</sup> Ringer's Lactate Solution as preload. Under full aseptic precaution lumbar puncture was performed with 25G Quincke's spinal needle in L<sub>3-4</sub> or L<sub>4-5</sub> interspace in sitting position and study drugs were injected as per groups of the parturient. After noting the time of injection, parturient was immediately placed in supine position. A wedge was placed under right hip. All parturients received O<sub>2</sub> 3L/min. via facemask. Immediate after administration of SAB pulse, blood pressure and rate of respiration was recorded. Then pulse, BP, respiratory rate recorded every 3min. for first 20 minutes, at 10 min. interval for remaining period of operation and thereafter at 30 min. interval. Occurrence of discomfort and side effects like sedation, pruritus, nausea, vomiting, shivering, chest pain and restlessness were recorded. Peroperative monitoring were ECG, SpO<sub>2</sub> and NIBP. SpO<sub>2</sub> was also monitored in postoperative period. Hypotension defined as a decrease in SBP to less than 20% from the base line was treated with bolus intravenous 5mg increments of ephedrine. Intensity of pruritus was assessed as mild, moderate and severe. Sedation was assessed by Ramsay sedation scale. Height of sensory block was assessed by pin prick method and motor block by Bromage scale. Quality of anaesthesia based on incidence of side effects was graded as excellent, good, fair and poor. Duration of effective analgesia and APGAR score was recorded.

All data were compiled and analyzed using ANOVA or chi-square tests as appropriate with the help of SPSS window version 11. The results were regarded as significant if p <0.05.

**Result**

Ninety term parturients undergoing elective caesarean section was included in this study. They were randomly allocated into 3 groups, 30 in each group (Gr-B, Gr-BF and Gr-BC)

**Table- I** Demographic profile of patients in different groups

Parameters	Gr-B	Gr-BF	Gr-BC	F value	P value
Age in year	25±4	25±3	25±3	0.054	0.947
Weight in kg	53±5	51±6	52±5	0.828	0.440
Height in cm	152±7	153±8	155±8	1.37	0.259
Duration of operation(min.)	45±3	45±3	44±3	1.82	0.167

Values are expressed as Mean ± SD, analysis among groups were done by ANOVA test. Values were regarded as significant if p<0.05.

There were no statistically significant difference in age (p=0.947), weight (p=0.440) and height (p=0.259) among groups. Therefore, patient in these groups were homogeneous regarding demographic character.

**Table- II** Level of sensory and motor block in different groups

Sensory block at 20 min.	Gr-B	Gr-BF	Gr-BC	χ <sup>2</sup>	P value	P value	χ <sup>2</sup>
T <sub>4</sub>	18(60%)	26(86.66%)	30(100%)	19.027	0.001	BF vs BC	BF vs BC
T <sub>6</sub>	8(26.66%)	4(13.33%)					
T <sub>8</sub>	4(13.33%)					0.038	4.286
Quality of motor block (Bromage Scale)	Gr-B	Gr-BF	Gr-BC	χ <sup>2</sup>	P value	P value	χ <sup>2</sup>
Grade 1	1(3.33%)						
Grade 2	4(13.33%)	4(13.33%)	2(6.66%)	2.977	0.562	0.389	0.741
Grade 3	25(83.33%)	26(86.66%)	28(93.33%)				

Table II shows level of sensory block and quality of motor block in three groups. On account of sensory block, all the patients of Gr-BC had up to the T<sub>4</sub> level(100%). The non-parametric test in groups for sensory block was highly significant (p=0.001).

Regarding quality of motor block, comparison among groups did not show any statistically significant difference (p=0.562). Level of sensory block in Gr BF& Gr BC were statistically significant (p=0.038)while comparison in the quality of motor block did not show any statistically significant difference (p=0.389).

**Table- III** Incidence of side effects in different groups.

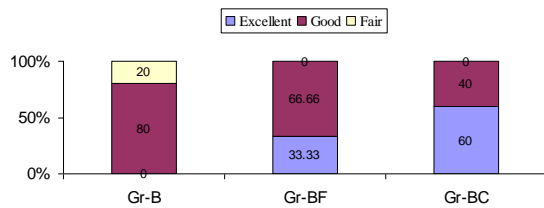
Parameters	Group-B	Group-BF	Group-BC	χ <sup>2</sup> value	P value
Sedation	8 (26.66%)	9(30%)	10(33.33%)	0.433	0.805
Pruritus	0	4(13.33%)	0	8.372	0.015
Nausea and vomiting	12(40%)	6(20%)	4(13.33%)	6.257	0.044
Chest pain	11(36.66%)	4(13.33%)	2(6.66%)	9.718	0.008
Restlessness	4(13.33%)	1(3.33%)	0	5.506	0.064
Shivering	7(23.33%)	4(13.33%)	2(6.66%)	3.417	0.181

Data are presented as frequencies and analyzed among groups with χ<sup>2</sup> test. Values are regarded significant if p<0.05.

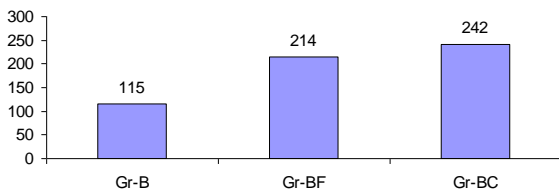
Incidence of side effects observed in three groups is given in table III. Sedation was observed in 33.33% of patients in group BC in comparison to 26.66% and 30% in groups B and BF respectively. Most of

pt. belonged to Ramsay sedation scale-2. Pruritus was only observed in patients of group - BF(13.33%). Only 6.66% patients in group BC complained of Chest pain in comparison to 36.66%, 13.33% in Group B and BF respectively. Incidence of nausea & vomiting in group BC was 13.33% as compared to 40% and 20% in Groups B and BF respectively.No

patient in group BC was found to be restless, whereas 13.33% in group B and 3.33% in group BF became restless. Shivering was observed in only 6.66% of patients in Gr BC compared to 23.33% and 13.33% in groups B and BF respectively.



**Fig-1:** Quality of anaesthesia in different groups  
Quality of anaesthesia is categorized as excellent, good, fair and poor (Fig. 1). In group-B ,80% were categorized as good and 20% as fair. In group BF quality of anaesthesia was to be 33.33% excellent and 66.66% good. In group BC 60% had an excellent quality and 40% good. Comparison among groups had a highly significant difference (p=0.000).Quality of anaesthesia among Gr BF & BC were statistically significant(p=0.038).



**Fig- 2:** Duration of analgesia in different groups (minutes)  
Duration of effective analgesia in Gr-B, Gr-BF & Gr-BC were 115±12, 214 ±20 & 242±20 minutes respectively. Data showed that duration of effective analgesia increased significantly in group BF & group BC compared to group B (p=0.000).

**Table-IV** Incidence of hypotension in different groups.

Group=B	Group-BF	Group-BC	χ <sup>2</sup> value	P value
8(26.67%)	2(6.66%)	2(6.66%)	6.923	0.031

Data are presented as frequencies and analyzed among groups with χ<sup>2</sup> test. Values are regarded significant if p<0.05..

Cardiovascular effect of spinal anaesthesia was measured in terms of hypotension (Table-IV). A fall in systolic blood pressure of more than 20% from base line was taken as hypotension. 6.66% patients in groups BF and BC required ephedrine to counter the hypotension compared to 26.67% in group B.

Comparison of the incidence among groups were statistically significant(p=0.031).

**Table-V** Apgar score in different groups.

Apgar score	Group-B	Group-BF	Group-BC	χ <sup>2</sup> value	P value
<b>At 1 minute</b>					
7	6(20%)	8(26.66%)	9(30%)		
8	14(46.66%)	13(43.33%)	14(46.66%)	1.196	0.879
9	10(33.33%)	9(30%)	7(23.33%)		
<b>At 5 minute</b>					
9	10(33.33%)	9(30%)	8(26.66%)	0.317	0.853
10	20(66.66%)	21(70%)	22(73.33%)		

Data were analyzed by χ<sup>2</sup> test. Values are as significant if p<0.05.

Table V shows Apgar score in different groups.Comparison among groups were not statistically significant.

**Discussion**

Neuraxial block for caesarean delivery has become increasingly popular, as data indicating increased maternal mortality with general anaesthesia have accumulated.<sup>11</sup> It is therefore standard practice to use spinal anaesthesia wherever possible. Patient undergoing caesarean section under spinal anaesthesia may get benefit from the co-administration of local anaesthetic and different adjuvants<sup>12</sup>.

In 'augmentation strategies' wide variety of opioids and nonopioids are used as an adjunct to subarachnoid block to improve quality of block, quality of anaesthesia and prolongation of analgesia in the postoperative period<sup>4</sup>. Experimental studies have shown that opioids and α<sub>2</sub> adrenergic agonist administered spinally are able to relieve visceral pain<sup>13-16</sup>. Clinical efficacy of intrathecal opioid to relieve visceral pain is well established<sup>17-18</sup>. Antinociceptive action of clonidine exist for both somatic and visceral pain<sup>13, 15, 16</sup>.

In the present study, patients were randomly allocated in three groups: B, BF & BC.

In BC group all the patients had sensory block at T<sub>4</sub> compared to 86.66% in BF group and 60% in B group (control). So, by addition of clonidine or fentanyl as adjuvant, a higher level sensory block was achieved, which was statistically significant (p=0.001). Again clonidine group had higher level sensory block than fentanyl group which was also statistically significant (p=0.038). There was no statistically significant difference (p=0.389) in motor block among three groups. This result is consistent in terms of level of sensory block with the study conducted by Benhamou et al<sup>9</sup> and Biswash et al<sup>6</sup>. Intraoperative nausea and vomiting occurs in as many as 66% of caesarean section mainly related to peritoneal traction<sup>19</sup>. In our study, nausea and vomiting was observed in 13.33% in group BC compared to 40% in group B and 20% in BF which was statistically significant (p=0.044). Pruritus was complained only by patients of group BF (13.33%)

which was shown in study by Hunt et al<sup>17</sup>. Incidence of shivering was more in control group B (23.33%) than group BF (13.33%) and group BC (6.66%). Complains of chest pain was more in group B (36.66%) compared to group BF (13.33%) and group BC (6.66%). Less incidence of chest pain in group BC and BF may be due to action of spinally administered clonidine and fentanyl to relieve visceral pain<sup>13-16</sup>.

Quality of anaesthesia was better in group BF and BC than control group B which was statistically significant ( $p=0.000$ ). On the other hand BC had better quality of anaesthesia than group BF which was also statistically significant ( $p=0.038$ ).

Duration of effective analgesia in group B, BF and BC were  $115\pm 12$ ,  $214\pm 20$  and  $242\pm 20$  min. respectively which was statistically significant ( $p=0.000$ ). On the other hand, group BC had prolonged duration of postoperative analgesia than group BF which was also statistically significant ( $p=0.000$ ). The result is similar with study conducted by Benhamou et al<sup>9</sup> and Biswash et al<sup>6</sup>. Incidence of hypotension among three groups was statistically significant ( $p=0.031$ ). In BC & BF dose of bupivacaine was reduced and provided cardiovascular stability. The result is similar with study conducted by Robert A et al<sup>3</sup>. Intrathecal clonidine does not induce respiratory depression even after massive dose<sup>20</sup>. In our study no patient in any group experienced respiratory depression. Neonatal Apgar score was similar in three groups which was not statistically significant.

Limitation to our study could be that we used only one dose of clonidine. We did not perform dose response study because previous study has already shown clonidine dose dependently potentiate the local anaesthetic effect.

### Conclusion

In patients undergoing caesarian sections with subarachnoid blocks, clonidine or fentanyl as adjuvant with low dose hyperbaric 0.5% bupivacaine provide better quality of block, better quality of anaesthesia, longer duration of postoperative analgesia, and more haemodynamical stability compared to bupivacaine alone (Control) without affecting neonatal outcome. On the other hand clonidine is better alternative to the fentanyl as adjuvant in subarachnoid block.

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