COMPARISON BETWEEN HYPERBARIC BUPIVACAINE PLUS FENTANYL AND HYPERBARIC BUPIVACAINE ALONE IN SPINAL ANESTHESIA FOR CAESAREAN SECTION

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ABSTRACT

Objective: To compare the result of the combination of hyperbaric bupivacaine plus fentanyl with hyperbaric bupivacaine alone in patients undergoing caesarean section in spinal anaesthesia.

Study Design: Comparative, cross-sectional study.

Place and Duration of Study: Department of Anesthesia, Fauji Foundation Hospital, Rawalpindi Pakistan, from Dec 2017 to Jun 2018.

Methodology: After consulting the institutional ethical review committees a total of 60 females between ages 18-40 years were enrolled for caesarean section delivery. They were divided into two groups. The study group (n=30) received a subarachnoid injection of 0.5% hyperbaric bupivacaine (10mg) 2ml with 25ug of fentanyl 0.5ml and control group (n=30) was injected 0.5% hyperbaric bupivacaine 12.5mg (2.5 ml) only. Pain experienced during the procedure was assessed by using 10-point visual analogue scoring method. The mean duration of analgesia, mean arterial blood pressure and heart rate after surgery were compared between two groups.

Results: The mean duration of analgesia was 206.5/min ± 6.4 in the study group and it was 163.6/min ± 7.2 in the control group (p=0.001). Mean arterial BP after surgery was 92.3mmHg ± 3.8 in the study group and 88.7mmHg ± 4.1 in the control group (p=0.001). The mean heart rate recorded after surgery was 75.2/min ± 5.2 in the study group and it was 70.4/min ± 6.1 in the control group (p=0.001).

Conclusions: The mean duration of analgesia was significantly longer in the study group when compared with the control group with better mean arterial blood pressure and heart rate response after Caesarean section.

Keywords: Bupivacaine, Caesarean Delivery, Fentanyl.

INTRODUCTION

Most caesarean sections are done under regional anesthesia which gives analgesia to the lower part of the body\(^1\). Spinal anesthesia is the most used method of the regional block in caesarean section, preferred for its rapid onset of action, effectiveness and protection against thromboembolic events\(^2\).

In caesarean section it is important to provide quality anesthesia that provides excellent analgesia to the mother. Local anesthetics, when used in moderate doses, cause vasodilatation which drops systemic vascular resistance resulting in hypotension along with motor and sensory blockade\(^3\). Maternal hypotension may have adverse effects on the fetus and is also associated with other symptoms such as nausea, vomiting, and dyspnea\(^4\).

Bupivacaine, an amide-type of a local anesthetic drug, is highly potent having slow onset (5-8 minutes) of action but lasts for a longer time (1.5-2 hours). For Caesarean section, intrathecal dose of hyperbaric bupivacaine is 12-15 mg and its hyperbaric form is made by adding 8.25% glucose in it\(^5\).

Since the discovery of opioid receptors in spinal cord, an alternate therapy of epidural and intrathecal administration of narcotics has been introduced. This technique helps to avoid producing sympathetic blockade\(^6\). Intrathecal short-acting lipophilic opioids given in combination with sub-therapeutic doses of local anesthetic, increase the level of analgesia because of synergistic effect\(^7\).

The most commonly used opioid is fentanyl which has high lipid solubility and more affinity for an opiate receptor following intrathecal administration\(^8\). Its onset of action takes around 5 minutes and the duration of analgesia is up to 30-40 minutes. Moreover, fentanyl provides effective analgesia and allows the intraoperative patient to experience no motor block, no sympatholytic effect and improves the anti-nociceptive effect of bupivacaine. It also prolongs postoperative analgesia with a lower occurrence of adverse drug reactions\(^9\).

The rationale of this study was to compare the effects of these drugs in pregnant patients in our demographic settings. If found to be effective, combination of intrathecal fentanyl with conventional hyperbaric
bupivacaine would allow a reduced dose of bupiva-
caine, improve the quality of block, and prolong the
duration of effective analgesia in patients undergoing
Caesarean section. The objective of this study was to
compare the results of intrathecal injection of combi-
nation of hyperbaric bupivacaine plus fentanyl with hyper-
baric bupivacaine alone in patients undergoing cae-
searean section in spinal anaesthesia.

METHODOLOGY

This comparative cross-sectional study was con-
ducted at department of Anesthesia, Fauji Foundation
Hospital, Rawalpindi from December 2017 to June
2018. Sample size was calculated by using WHO sam-
ple size calculator. After approval from institutional
Ethics Review Committee, a total of 60 patients were
included (30 patients in each group) with their infor-
med consent. Non-probability, consecutive sampling
technique was used. All patients with uncomplicated
pregnancy undergoing Cesarean section, in age group
18-40 years, with ASA status I and II and gestational
age of >37 weeks were included. Patients with history
of drug allergy, previous failed spinal anaesthesia or
in whom spinal anaesthesia was contra-indicated due to
other causes, were excluded. Patients with spinal de-
formity, BMI >30, fetal distress, or eclampsia (with fits,
platelet count <70000 and proteinuria >0.3 grams in a
24 hours urine specimen) were also excluded.

Patients were assigned to the two treatment
groups by lottery method. Study group received 0.5%
hyperbaric bupivacaine 10 mg (2.0ml) with 25 mg of
fentanyl (0.5ml). Control group received 0.5% hyper-
baric bupivacaine 12.5 mg (2.5 ml) only. Systemic exa-
mination of each patient was carried out along with
airway assessment and Mallampati score. Relevant
laboratory investigations were checked. The function
of anesthesia machine, endotracheal tube with a laryn-
goscope, and suction machine were checked. Avail-
ability of emergency drugs was confirmed. Intrave-
 nous access was secured with 18G cannula.

The patients received intravenous pre-hydration
with 15ml/kg of ringer’s lactate solution. Baseline
blood pressure, heart rate and oxygen saturation were
noted. After these measures, the patients were placed
in the sitting position and using aseptic precautions a
skin wheal was raised at the chosen inter-space with
2% lignocaine using a 25 gauge needle. A lumbar pun-
cure was then performed with a 25G pencil-point nee-
dle at the chosen space (preferably L3-L4). Access to
subarachnoid space was confirmed by the free flow of
CSF. The drug selected for each group was injected
over 20 seconds. Oxygen was supplemented by Hud-
son mask.

Heart rate and blood pressure were recorded after
every 5 minutes, 15 minutes, 30 minutes, 45 minutes,
60 minutes and then hourly till 6 hours. In case of
hypotension observed before the procedure (MAP 20%
or more reduction from baseline), fast infusion of IV
fluids was done along with phenylephrine in incre-
mental doses (5mcg/kg). Bradycardia (heart rate <60/
min) was treated with atropine injection 0.4-0.6mg.

Perioperative pain was assessed by using a 10-
point visual analogue scoring method (0-10cm where
0=no pain and 10=worst pain ever felt). Systemic anal-
gesic was not given until VAS was less than 4. Intra-
venous tramadol (50mg) was given in case of pain.
Duration between the time spinal block was adminis-
tered to the time patient electively demanded pain
relief was noted. This was considered as the duration
effective analgesia. All patients were observed for
24 hours readings of arterial blood pressure, heart
rate and duration of analgesia were observed. Data
was recorded on a proforma by two persons for every
patient.

Data was analyzed by IBM SPSS version 20. Mean
and standard deviation was computed for quantitative
variables. Frequency of percentage was calculated for
qualitative variables. Independent samples t-test was
used to compare the mean duration of postoperative
analgesia, heart rate and mean arterial pressure be-
tween groups.

RESULTS

A total of 60 females between age 18-40 years
who were planned for cesarean delivery were enrolled.
The mean duration of analgesia, mean arterial blood
pressure and heart rate after surgery was calculated
and compared in both the groups. Mean age, height,
weight and BMI of the study population were tabu-
lated (table-I).

The mean duration of analgesia was 206.5 min ±
6.4 in the study group and it was 163.6 min ± 7.2 in
control group. The mean duration of analgesia was
significantly longer in the study group when com-
pared with the control group (p=0.001, table-II). Mean
arterial BP after surgery was 92.3 mmHg ± 3.8 in
a study group and it was 88.7 mmHg ± 4.1 in the
control group (p= 0.001) (table-III). The mean heart rate
after surgery was 75.2/min ± 5.2 in the study group
and it was 70.4 min ± 6.1 in the control group (p=0.001)
table-IV).
DISCUSSION

The results of this study show that a combination of hyperbaric bupivacaine with fentanyl provides a longer analgesia as compared to hyperbaric bupivacaine alone in patients undergoing C-section in spinal anesthesia ($p=0.001$). The duration of postoperative analgesia was also notably longer in the group that received fentanyl and hyperbaric bupivacaine as compared to the group that received hyperbaric bupivacaine alone ($p=0.001$). This study also revealed that patients maintained a higher blood pressure with combination drugs as compared to local anesthetic alone ($p=0.001$). Mean heart rate in the study group was higher relative to the control group ($p=0.001$). These findings are in conformity with previous studies that compared these two methods of spinal anesthesia. A study conducted in India, reported a significant ($p=0.001$) fall of blood pressure (>25% fall from the baseline) with hyperbaric bupivacaine alone (98.76 ± 8.3) as compared to fentanyl and hyperbaric bupivacaine (117.32 ± 12.2). The study also reported a fall in heart rate in both groups (87.09 ± 9.36 vs 79.24 ± 11.63) but, unlike our study, the difference between the groups was not statistically significant ($p=0.001$).

Kashmiri et al., in a study conducted in 2015 at Karachi, compared the two methods in elective lower abdominal and lower limb orthopedic surgeries in a sample size of 60 patients. Their results are similar to our study in that duration of analgesia after the operation was reported to be significantly longer ($p=0.005$) in the group that received a combination of hyperbaric bupivacaine and fentanyl as compared to control group that received hyperbaric bupivacaine alone (249.87 ± 32.59 vs 161.97 ± 25.55).

Dosage of local anesthetic use in different studies varies between 7.5mg2 to 10mg12, when used in combination with adjuvant drugs. In this study we used 10 mg bupivacaine when used in combination with fentanyl.

Makwana et al12, conducted a study in 2014 to observe the effectiveness of spinal bupivacaine alone compared with a mixture of bupivacaine and fentanyl in major gynecological surgeries. The purpose of this study was to compare perioperative hemodynamic stability and postoperative analgesia using these two methods. Their findings are in concordance with our study as they reported a longer duration of sensory block and analgesia with combination of the two drugs as compared to Bupivacaine alone.

Hyperbaric bupivacaine has been used with several adjuvant agents to prolong the duration of spinal analgesia including combination with dexmedetomidine and ketamine. A study conducted in China in 2015 by Sun et al13, compared the effects of bupivacaine alone, bupivacaine plus fentanyl, and bupivacaine plus dexmedetomidine for postoperative pain management in patient planned for Cesarean section under intrathecal block. They did a trial on 90 patients who were randomly divided into 3 groups. Our study compares favorably with their results in that they reported sensory block to be significantly longer in bupivacaine plus fentanyl and bupivacaine plus dexmedetomidine as compared to bupivacaine alone. The occurrence of postoperative pain was also delayed in the groups having two drugs compared to Bupivacaine alone. A four group comparative study conducted on 84 patients in China (2015) by Li et al14, compared the effects of bupivacaine alone, bupivacaine plus fentanyl, bupivacaine with clonidine and bupivacaine plus dexmedetomidine on quality of spinal blockade for Cesarean section. The results of this study are similar to Sun et al12, and compare favorably with our results.

Hyperbaric bupivacaine alone was compared with combination of this drug with subarachnoid ketamine and subarachnoid fentanyl respectively in a study. In a study on 100 healthy females undergoing Cesarean section surgery by Bhattarai et al., at Kathmandu, Effectiveness and duration of analgesia was reported to be better with hyperbaric bupivacaine.
with fentanyl. Their results were similar to those of our study although the dose of bupivacaine in their study was 10 mg for both groups.

More studies are needed to compare the effects of lesser doses of bupivacaine in combination with fentanyl, to determine the minimum dose required to achieve effective analgesia without associated symptoms like nausea.

CONCLUSION

Hyperbaric bupivacaine combined with fentanyl provides longer analgesia and is safer in terms of hemodynamics, when used for spinal anesthesia, than hyperbaric bupivacaine alone.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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