Original Research Article

# Comparison of 2- chloroprocaine 1% vs 0.5% bupivacaine for subarachnoid block in elective caesarean section at a tertiary

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## Abstract

**Background:** In recent years, the frequency of caesarean delivery has increased markedly. An ideal spinal anaesthetic for short-duration surgeries should have rapid onset and faster offset, minimal side effects and adequate postoperative pain control. There is little information regarding bupivacaine compared with 2-chloroprocaine in patients undergoing LSCS. In present study we compared clinical characteristics of 0.5% hyperbaric bupivacaine and 1% 2-chloroprocaine in patients undergoing elective lower segment caesarean sections. **Material and Methods:** Present study was a prospective, randomized, clinical study conducted in pregnant women, 18-35 years of age, with ASA status ≤ 2, posted for elective lower segment caesarean surgery under subarachnoid block , willing to participate in study. Patients were randomly divided into two groups of 30 each. Bupivacaine group received subarachnoid block with 2ml of 0.5% hyperbaric bupivacaine while chloroprocaine group received subarachnoid block with 2.5 ml of 1% preservative free 2-chloroprocaine. **Results:** In present study 30 patients each were bupivacaine group and chloroprocaine group. We did not noted any statistically significant difference respect to age, weight, height and duration of procedure between groups. Duration of analgesia was more in bupivacaine group (168.41 ± *37*.94 min) as compared to chloroprocaine group (70.58 ± 31.15 min) and the difference was statistically significant. Common side effects such as hypotension, bradycardia, nausea, vomiting were noted in both groups and difference was statistically not significant. No transient neurological symptoms were noted till discharge. No morbidity or mortality noted in present study. No patient required conversion into general anaesthesia. **Conclusion:** Chloroprocaine appears as an alternative to bupivacaine for subarachnoid block in uncomplicated elective lower segment caesarean section patients.

**Key Words:** Subarachnoid block, 2-Chloroprocaine, bupivacaine, Lower segment caesarean section.

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Received Date: 05/04/2020 Revised Date: 12/06/2020 Accepted Date: 22/07/2020
DOI: https://doi.org/10.26611/101515311

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|---|---|
| Quick Response Code: | Website: www.medpulse.in |
| | Accessed Date: 27 September 2020 |

## INTRODUCTION

In recent years, the frequency of caesarean delivery has increased markedly. Due to increase in the percentage of all women having a first caesarean and a decline in the percentage of women delivering vaginally after a previous caesarean, steady rise is noted worldwide. Understanding of maternal and fetal physiology, pathophysiology of associated diseases, drug pharmacology and expert technical skills are essential for successful anaesthesia in caesarean delivery. Neuraxial anaesthesia is the preferred method in caesarean section as general anaesthesia is associated with airway related adverse outcome, aspiration

How to site this article: V Sathyanarayana, R Meenakumari. Comparison of 2- chloroprocaine 1% vs 0.5% bupivacaine for subarachnoid block in elective caesarean section at a tertiary. *MedPulse International Journal of Anesthesiology.* September 2020; 15(3): 131-134. http://medpulse.in/Anesthsiology/indp

risk, intraoperative awareness and increased uterine atony leading to higher blood loss.[1] An ideal spinal anaesthetic for short-duration surgeries should have rapid onset and faster offset, minimal side effects and adequate postoperative pain control.[2,3] Local anaesthetics such as bupivacaine, ropivacaine, levobupivacaine, chloroprocaine, lidocaine, and tetracaine have been used for caesarean operations, in combination usually with opioids such as fentanyl or its derivatives, or morphine.[4] Chloroprocaine is a short-acting amino-ester local anaesthetic with low incidences of side effects and a very short duration of action. [5] It was used widely for almost three decades (1952-82), after that reports of neurotoxicity were reported following the use of large doses of 2-chloroprocaine for epidural anaesthesia; subsequently, it was withdrawn from commercial use. [6,7] A preservative free formulation was reintroduced into clinical use in 2005 and has been safely used for spinal anaesthesia in healthy volunteers and in patients without complications.[8,9] Bupivacaine is popularly used due to a longer duration of action and good quality of motor block compared to tetracaine, and has been associated with dose-dependent cardiac toxicity.[10] There is little information regarding bupivacaine compared with 2-chloroprocaine in patients undergoing LSCS. In present study we compared clinical characteristics of 0.5% hyperbaric bupivacaine and 1% 2-chloroprocaine in patients undergoing elective lower segment caesarean sections.

## MATERIAL AND METHODS

Present study was a prospective, randomized, clinical study conducted in Department of Anaesthesiology, XXX Medical College and Hospital, XXXX, India. Study period was 6 months (September 2019 to March 2020). Ethical Committee approval was taken for present study.

### Inclusion criteria

Pregnant females, 18-35 years of age, with ASA status ≤ 2, posted for elective lower segment caesarean surgery under subarachnoid block , willing to participate in study.

### Exclusion criteria

- Requirement for emergency caesarean section for delivery
- Classification as ASA status ≥ III
- Unsuitable for regional anaesthesia, neurologic disease or spine deformities, infection at the site of needle insertion, drug allergy, etc.
- Pre-eclampsia
- Gestational diabetes mellitus
- Height less than 145 cm
- Body mass index (BMI) ≥ 30 kg/m$^2$
- Systemic illnesses such as goitre, diabetes mellitus or anaemia (Hemoglobin < 8 gm%)
- Multiple gestations,
- Polyhydramnios (defined as amniotic fluid index more than 25 cm), oligohydramnios (defined as amniotic fluid index less than 5 cm)
- Possibility of high risk of intraoperative hemorrhage, such as cases of placenta previa or coagulation defects
- Premature membrane rupture; preterm delivery (defined as before the 37th week of pregnancy); post-term delivery (defined as pregnancies exceeding the 40th gestational week)
- Pregnancies with obstetric problems such as fetal anomaly; intrauterine growth restriction (defined as birth weight two standard deviations below the population mean for gestational age and sex)

Procedure was explained to patients in local language and a written informed consent was taken. In all patients selected for the study, a detailed history was taken and a detailed general physical and systemic examination, including airway assessment, spine was done. Necessary laboratory investigations (CBC, BT, CT, LFT, RFT) were done as per necessity. Patients were kept nil per oral after 2 am. On arrival into operation theatre an intravenous access was secured and preloading done with 500 ml Ringer lactate solution over a period of 20 to 30 minutes. Basal vital parameters of the patients recorded. Patients were randomly divided into two groups of 30 each. Under aseptic precaution and subarachnoid block was performed using 25 G Quincke's spinal needle at L3 -L4 or L2 -L3 spinal inter space and after ensuring free flow of clear CSF, drug was injected intrathecally.

1. Bupivacaine group received 2ml of 0.5% hyperbaric bupivacaine
2. Chloroprocaine group received 2.5 ml of 1% preservative free 2-chloroprocaine.

Immediately patient was positioned supine. Pulse, NIBP, SpO2, and respiratory rate were recorded before the start of the procedure and then every 5 minutes till the patient is shifted out from the recovery room. Time of onset of sensory block was recorded as interval between the time of injection into the subarachnoid space and development of loss of sensation to pin prick while M\motor blockade was assessed using modified Bromage scale.

| Bromage scale | |
|---|---|
| 0 | no motor movement, complete motor block |
| 1 | unable to flex knee, able to flex ankle |
| 2 | unable to straight leg raise, able to flex knee |
| 3 | no block, full straight leg raise possible. |

Intra-operatively patients were carefully monitored for any untoward effects like, hypotension, bradycardia, respiratory distress, nausea, vomiting, shivering and

treated accordingly. All the patients were observed for up to 24 hours postoperatively to note any complications such as headache, backache, nausea, vomiting, retention of urine, any symptom or signs of TNS (TNS was defined as pain/dysaesthesia of light to severe intensity originating in the gluteal region and radiating to the lower extremity, commencing within 24 hours of spinal administration).

### Statistical analysis

For quantitative parameters percentage, mean and standard deviation were calculated as required. Student's t-tests and paired t-tests were used to compare results. All data was analysed using SPSS for Windows software version 24. P value of less than 0.05 was considered as statistically significant.

## RESULTS

In present study 30 patients each were bupivacaine group and chloroprocaine group. Though patients were randomly distributed, all patients belongs to low risk group posted for elective LSCS. We did not noted any statistically significant difference respect to age, weight, height and duration of procedure between groups. Duration of analgesia was more in bupivacaine group (168.41 ± *37*.94 min) as compared to chloroprocaine group (70.58 ± 31.15 min) and the difference was statistically significant.

**Table 1:** General characteristics

| Characteristic | Bupivacaine group | Chloroprocaine group | p Value |
|---|---|---|---|
| Age(in years) | 23.71 ± 2.58 | 24.11 ± 2.29 | 0.435 |
| Weight (in kgs) | 60.09 ± 7.25 | 58.91 ± *8*.11 | 0.716 |
| Height (in cms) | 149.92 ± 4.79 | 150.39 ± 4.91 | 0.581 |
| Duration of surgery (in minutes) | 34.23 ± 4.25 | 32.72 ± 5.82 | 0.711 |
| Duration of analgesia (in minutes) | 168.41 ± *37*.94 | 70.58 ± 31.15 | <0.001* |

(* significant p value)

Common side effects such as hypotension, bradycardia, nausea, vomiting were noted in both groups and difference was statistically not significant. No transient neurological symptoms were noted till discharge. No morbidity or mortality noted in present study. No patient required conversion into general anaesthesia.

**Table 2:** Side Effects

| Characteristic | Bupivacaine group (%) | Chloroprocaine group (%) | p Value |
|---|---|---|---|
| Hypotension | 11 (37%) | 8 (27%) | 0.614 |
| Bradycardia | 8 (27%) | 2 (7%) | 0.089 |
| Nausea | 1 (3%) | 2 (7%) | 0.522 |
| Vomiting | 1 (3%) | 3 (10%) | 0.486 |

## DISCUSSION

Spinal anaesthesia is still a mainstay in Caesarean Section as it avoids a general anaesthetic with concomitant risks of failed intubation especially in anatomical abnormalities, and risks of ventilation in respiratory diseases. The advantages of spinal anaesthesia for caesarean delivery are simple technique, speed of induction (in contrast to an epidural block), reliability, minimal fetal exposure to the drug(s), awake parturient and minimal hazards of aspiration. Disadvantages of spinal anaesthesia for caesarean delivery are hypotension, intraop nausea and vomiting, possibility of headaches after dural puncture and limited duration of action. Spinal anaesthesia is preferred over epidural anaesthesia for elective caesarean and emergency caesarean procedures, due to the relative ease of administration, reduced systemic toxicity, faster onset of action and start of the operation.[4] The choice of the correct local anaesthetic for spinal anaesthesia is crucial, the ideal anaesthetic should allow rapid onset and offset of its own effect with minimal side effects.[2] The choice of anaesthetic most appropriate for a caesarean depends on many factors, such as the urgency of the situation, maternal medical condition etc. The beneficial pharmacokinetic characteristics of chloroprocaine explain the renewed interest in its use in obstetric anaesthesia. Rapid hydrolysis by plasma cholinesterase guarantees a short half-life both in mother and fetus, with low risk of systemic side-effects.[11] Duration of analgesia was more in bupivacaine group (168.41 ± *37*.94 min) as compared to chloroprocaine group (70.58 ± 31.15 min) and the difference was statistically significant. Similar findings were noted by Ashwini S[12] and Satyendra Kumar[13]. In present study hypotension was noted as 37 % bupivacaine group and 27 % in chloroprocaine group. Hypotension was effectively managed with injection mephentermine along with fluid boluses. In a similar study by Ashwini S *et al.*[12], they noted higher incidence of hypotension as 53 % bupivacaine group and 30 % in chloroprocaine group. Dogan *et al.*.[14], compared maternal and fetal effects of intrathecal bupivacaine and levobupivacaine and concluded that in spinal anaesthesia undergoing caesarean section, levobupivacaine was less toxic than bupivacaine group and more potent anaesthetic and had no effects unwished for neonates. Venkata *et al.*.[15], concluded that the addition of

25 lg of fentanyl to 7.5 mg of hyperbaric bupivacaine in spinal anaesthesia for elective caesarean section shows faster onset of sensory block with better hemodynamic stability and significantly prolongs postoperative analgesia. Maes S *et al.*[16] noted that 2-Chloroprocaine can be used for low risk Caesarean section in healthy pregnant women. There is no difference in time to motor block resolution compared to bupivacaine. Motor recovery seems more predictable for 2-chloroprocaine and may be beneficial for the breastfeeding initiation. Lacasse *et al.*.[9] compared hyperbaric bupivacaine to 2 chloroprocaine in 106 patients. In comparison with bupivacaine, CP showed faster offset times to end of anaesthesia, unassisted ambulation, and quicker discharge from hospital, and these findings suggest that chloroprocaine may be a suitable alternative to low doses of long-acting local anaesthetics in ambulatory surgery. Present study was a small, institution-based study with limited follow up. Multicentric, large, blinded studies are required to document long term maternal and fetal side effects of chloroprocaine in comparison to bupivacaine.

## CONCLUSION

Chloroprocaine appears as an alternative to bupivacaine for subarachnoid block in uncomplicated elective lower segment caesarean section patients. Intravenous analgesics can complement to shorter analgesia duration of chloroprocaine.

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Source of Support: None Declared
Conflict of Interest: None Declared

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