ORIGINAL ARTICLE

MAXIMAL SENSORY BLOCK AND HAEMODYNAMICS AFTER SPINAL ANAESTHESIA IN WOMEN UNDERGOING ELECTIVE CAESAREAN SECTION

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Background: Spinal anaesthesia for caesarean section has gained popularity over epidural techniques because of its easy placement and rapid onset. In pregnant women, engorgement of epidural veins from aortocaval compression with displacement of cerebrospinal fluid (CSF) may contribute to unwanted cephalad extensions of the block. The aim of our study was to evaluate the interval of time required for the maximal sensory block along with haemodynamic variations of pulse and blood pressure after spinal anaesthesia among patients undergoing elective caesarean section. **Methods:** A prospective study was conducted at the Department of Anaesthesia, Holy Family Hospital, Rawalpindi Medical College, Rawalpindi, Pakistan over a period of 6 months. Spinal anaesthesia was given to 100 participants using 25 G, Quincke needle and 1.8 ml of 0.75% hyperbaric bupivacaine was injected. Patients were positioned supine immediately and 10° head down tilt and wedge was placed under right hip to prevent aorto-caval compression. Block level was assessed every 2 minutes with sensation to touch, pinprick, and cold ice saline for 30 minutes. Procedure was started as the maximal sensory T4 block confirmed. **Results:** The maximal sensory block achieved was up to the level of 3rd thoracic site (T3) with a range of T2-T7. The mean time for the block to reach maximal sensory level was 9.2±4.6 minutes. The maximal decrease in pulse, systolic BP and diastolic BP were 15.4±8.7/min, 33.6±11.3 mmHg and 18.2±7.8 mmHg respectively from the baseline. **Conclusions:** Injection bupivacaine 0.75%, 1.8 ml given via spinal needle in the subarachnoid space at the level of L3–L4 is sufficient to provide an adequate T4 sensory block in the desired time.

Keywords: Anaesthesia, Caesarean Section, Spinal, Sensory Block, Bupivacaine
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INTRODUCTION

Spinal anaesthesia has the advantage that profound nerve block can be produced in a large part of the body by the relatively simple injection of a small amount of local anaesthetic.[1] However, the greatest challenge in spinal anaesthesia is to control the spread of local anaesthetic through the cerebrospinal fluid (CSF) to provide a block which is adequate for the proposed surgery without unnecessary extensive spread, and increased risk of complications.

Studies of drug distribution usually involve measurements of concentration in a relevant body fluid compartment over time.[2] However, multiple sampling of CSF at one level, let alone at the several needed to build an image of drug distribution through the theca, is impractical. Indirect indicators of spread are used based on tests of neurological response.[3,4] Some indicator of the degree and extent of nerve block is needed before surgery can start.

During caesarean section (CS), although the skin cut usually occurs as a low midline incision (T12/L1), the structures underneath have spinal segmental innervations much higher.[5] The uterus is innervated by T10 and the peritoneum has innervations as high as T4. This is why a patient should ideally be numb up as far as her nipple line (T4–5) if she is not to feel pain during this operation. The same principle is true of other operations within the abdomen. Since peritoneal innervation may not be completely blocked in some patients, it is important to warn them that they will still feel something happening although it should not be painful. A gentle surgeon is able to help minimise this.

Spinal anaesthesia for CS has gained popularity over epidural techniques because of its easy placement and rapid onset.[6] However, careful prevention of potential complications must always be sought to maintain a high safety profile. In pregnant women, engorgement of epidural veins from aortocaval compression with displacement of CSF may contribute to unwanted cephalad extensions of the block.[7] Furthermore, caesarean section is a relatively short duration procedure that is often followed by early mobilisation of the patient, which increases the potential for late extension of the block. Spinal anaesthesia is one of the common techniques used in anaesthetic practice in CS nowadays. In the recent days anaesthesiologists are more concerned about providing qualitative service to the patients as well as getting used to new techniques, equipments, and drugs.[8,9]

The aim of our study was to evaluate the interval of time required for the maximal sensory block along with haemodynamic variations of pulse and BP after spinal anaesthesia among women undergoing elective CS.

METHODS

A prospective study was conducted at the Department of Anaesthesia, Holy family Hospital/Rawalpindi Medical College, Rawalpindi, Pakistan over a period of 6 months from October 2012 to March 2013.

After approval from Hospital Ethical Committee, a total of 100 parturients categorised in the American Society of Anaesthesia classification as ASA-I (normal healthy patient) and II (mild systemic disease with no functional limitation), aged in between 20–40 years presenting with single pregnancy for the elective caesarean section were recruited in the study. Patients with BMI >35, co-existing disease as diabetes mellitus, hypertension or contraindication to spinal block (coagulopathy, fixed cardiac output state) and refusal to conduct study were excluded from the study.

All patients were assessed a day before surgery and written informed consent will be taken. After arrival in operating theatre, electrocardiography, pulse oximetery, and non-invasive BP cuff were applied, and the baseline heart rate and blood pressure were measured. Intravascular access with two 18G cannulae was established. Each patient was preloaded with 500 ml Ringer lactate over 10 min. Patient were placed in sitting position, and after taking aseptic measures, local anaesthetic 2% plain Xylocaine 3 ml was infiltrated at Lumber Intervertebral space L3–4 level.

Spinal anaesthesia was given using 25 G, Quincke needle after ascertaining free clear flow of CSF(cerebrospinal Fluid), and 1.8 ml of 0.75% hyperbaric bupivacaine was injected. Patients were positioned supine immediately and 10° head down tilt and wedge was placed under right hip to prevent aorto-caval compression. Oxygen via mask at rate of 4 L/min was given to all the patients.

Block level was assessed every 2 minutes with sensation to touch, pinprick, and cold ice saline for 30 minutes. A standardised dermatome chart along with the study Performa was used to mark and label the dermatome level of sensory block achieved.

Monitoring of blood pressure, pulse and pulse oximeter were continuous at every two minutes interval. Procedure was started as the maximal sensory T4 block confirmed. Maternal hypotension during procedure was treated with a bolus of 50% of the initial dose of vasopressor. Heart rate <50 beats/min accompanied by hypotension was treated with 0.5 mg of Atropine.

Statistical analyses were performed using SPSS-15. Standard descriptive statistics were used to characterise sample mean and standard deviation. Student's *t*-test was used to test significant differences in ordinal and continuous variables. Range was calculated for continuous variables, and frequencies and percent for categorical variables. Chi-square test was carried out to compare proportions and $p<0.05$ was considered statistically significant.

RESULTS

The common baseline parameters of the study participants have been summarised in table 1.It is evident that all these parameters were almost within the normal range according to the study inclusion criteria.

Table-1: Baseline parameters of study participants

Parameter	Mean±SD
Age (Years)	29±3
Weight (Kg)	66.2±6.4
Height (Cm)	153.7±5.7
Body Mass Index(BMI) (Kg/Cm^2)	26.9±4.8
Baseline Pulse (Per Min)	90±18
Baseline Systolic Blood Pressure (mmHg)	131±23
Baseline Diastolic Blood Pressure (mmHg)	76±18

The maximal sensory block achieved was up to the level of 3rd thoracic site (T3) with a range of T2–T7. So our study clearly reflects that even a volume of 1.8 ml, 0.75 mg of bupivacaine is sufficient to achieve a reasonable sensory block level to conduct caesarean section.

The Mean time for the block to reach maximal sensory level was 9.2±4.6 min. The maximal decrease in pulse, systolic and diastolic BP were 15.4±8.7/min, 33.6±11.3 mmHg and 18.2±7.8 mmHg respectively from the baseline, keeping the study participants almost haemodynamically stable within the normal physiological range without making the attending anaesthetists to proceed emergency protocols for the management of adverse effects.

Table-2: Study parameters after spinal block

Parameter	Value
Maximal sensory block reached (Pin prick-level)	T3 (T2–T7)
Time to maximal sensory block (Min)	9.2±4.6
Maximal decrease in pulse from baseline (per min)	15.4±8.7
Maximal decrease in systolic BP from baseline (mmHg)	33.6±11.3
Maximal decrease in diastolic BP from baseline (mmHg)	18.2±7.8

DISCUSSION

Spinal anaesthesia is a popular technique employed by many anaesthesiologists nowadays in caesarean sections because of rapid onset, decreased exposure of parturient and foetus to unnecessary high dose local anaesthetics, inhalation agents and narcotics.[10,11]

Although hyperbaric local anaesthetic solutions have a remarkable record of safety, their use is not totally without risk: high spinals have been described with hyperbaric bupivacaine.[12]

Their successful use requires rapid movement of the patient from the lateral or sitting position to prevent unilateral or saddle blocks, and conversely extension or return of the block may develop after mobilisation.[13] Extension of the sympathetic block by

the same mechanism may play a role in sudden cardiac arrest after spinal anaesthesia with hyperbaric solution.

Again, the use of truly isobaric solutions may prove less sensitive to position issues. This is very useful in a short procedure such as caesarean section[14] where the hyperbaric local anaesthetic that has not fixed could migrate after early mobilisation and cause hypotension or bradycardia.

CONCLUSION

Injection bupivacaine 0.75%, 1.8 ml given via spinal needle in the subarachnoid space at the level of L3–L4 is sufficient to provide an adequate T4 sensory block in the desired time in Pakistani women undergoing elective caesarean section.

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