ORIGINAL RESEARCH PAPER
Volume - 10 | Issue - 05 | May - 2021 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

CAN WE PREDICT HYPOTENSION DURING CESAREAN SECTION BY MEASURING FUNDAL HEIGHT AND ABDOMINAL CIRCUMFRENCE – AN OBSERVATIONAL STUDY

Anaesthesiology

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KEYWORDS

INTRODUCTION:

Sub arachnoid block (SAB) is the most commonly employed technique for anaesthesia in parturient's scheduled for caesarean section (CS).[1] The ease of administration, effectiveness and minimal side effects to the newborn makes SAB a popular choice.[2]Even though safe procedure, SAB is accompanied by maternal hypotension, which can be as high as 70 to 80% if pharmacological prophylaxis is not administered.[3]This can lead to nausea or vomiting and may pose serious risks to the mother leading to unconsciousness, pulmonary aspiration and can also affect newborn causing hypoxia, acidosis, neurological injury. Aortocaval compression by the gravid uterus, low baseline vasomotor tone, and SAB related sympathetic blockade contribute to hypotension during CS.

Although various parameters have been proposed to predict the fall of blood pressure in parturients after administration of SAB, most of them are inconclusive. Hence we framed a study to find out correlation between the amount of fall in blood pressure with two variables which include maternal abdominal circumference(AC) and symphysis fundal height (SFH).

MATERIALS AND METHODS:

After obtaining institutional ethical committee clearance, a total of 185 parturient's who were belonging to American society of anaesthesiologist physical status 1 and 2 between 20 to 40 years of age group and scheduled for elective CS were included in the study. All the patients had a thorough pre-anaesthetic check-up done as per institutional protocol. Patients with history of pre-eclampsia, chronic hypertension, twin pregnancies, oligohydramnios, morbidly obese patients and emergency CS were excluded from the study. The height and weight of the patients were noted in the pre anaesthetic check-up, along with the abdominal circumference (AC) and symphysis fundal height (SFH). The measurement of AC is done at the level of umbilicus by using standard tape in supine position. The SFH is also measured in supine position with the same tape.

On the day of surgery, before administration of SAB all the patients received 15ml/kg of isotonic crystalloid solution as preloading through 18G cannula kept on the dorsum of the hand. The baseline vital parameters of the patient which includes heart rate, systolic diastolic and mean blood pressures were noted along with SP02 and temperature. SAB was administered in sitting position by using 26G Quinckes spinal needle at L3-L4 level, with bevel facing upwards. All patients received 2ml of 0.5% heavy Bupivacaine intrathecally (10mg). Immediately after SAB is administered patients were kept in supine position with a 15 degree wedge placed below the left lumbar region to prevent compression of gravid uterus on the great vessels. The position of the patient is not changed until the baby is delivered. The vital data of the patient is recorded at every 2nd minute interval by using multichannel monitor up to 10 minutes. The patients who refused to give consent for the study, and the patients where the effect of SAB is not adequate were excluded. The patients were the extraction of the baby took more than 10 minutes due to adhesions from the previous surgeries or any other reason were also not included in the study. The level of anaesthesia is checked by using pinprick sensation done in midline and on either side, and surgeon is allowed to operate only after adequate level of anaesthesia is achieved. The decrease in blood pressure more than 20% of baseline is treated with injection mephentramine 6mg intravenously. The heart rate decline more than 20% was treated with injection atropine intravenously. After the baby is extracted, APGAR score of the baby is noted and monitoring of the mother is continued till she has been shifted to post-operative ward.

RESULTS

Keeping confidence interval of 0.95 and probability 0.05 the estimated sample size came around 58.4. A total of 185 parturients, who were scheduled for elective CS between 38 to 42 weeks of gestation were included in the study. The data of patients which included age, height weight, of the patient along with MC and SFH and vital data which included pulse rate, systolic mean and diastolic blood pressures entered in to Microsoft excel sheet and analysed using SPSS software version 22.

The gestational details of the parturients enrolled in the study are included in table 1

The mean age of all parturients participated in the study is 25.37 years, the mean height is 154.8cms and the mean weight is around 62.22kg. The mean AC is 106.51cms and mean SFH is 37.59cms.

We analysed the percentage change in pulse rate, systolic, mean and diastolic blood pressure which were recorded every 2nd minute up to 10th minute and correlated each of them with the maternal AC, SFH, and the ratio of AC to SFH.

The mean fall in pulse rate when compared with base line of all patients in the first 10 minutes when compared to baseline is not significant statistically (P>0.05) and is not correlating with AC or SFH (P>0.05) The mean fall in all blood pressures (Systolic, Diastolic and Mean) of all patients during first 10 minutes is significant statistically (P<0.05) but when compared to abdominal circumference there is no correlation (P>0.05).

When the fall in blood pressures (systolic diastolic and mean) is compared with symphysis fundal height, during first 10 minutes, up to 5 minutes there is negative correlation but is not significant statistically (P>0.05)

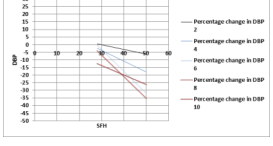
From 6th to 10th minute there correlation is a negative correlation between fall in blood pressures and SFH which is significant statistically (P <0.05), that implies the greater the SFH the lesser the fall in blood pressure. (Graph 1,2,3)

GRAPHS AND TABLES

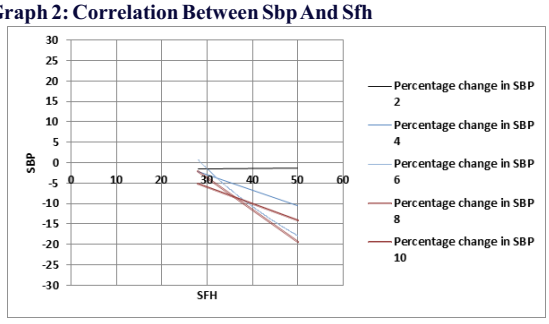
Table 1: Gestational details of the parturients enrolled in the study

TOTAL NUMBER OF PATIENTS	Frequency	Percentage
G2 (GRAVIDA 2)	89	48.11%
G3(GRAVIDA 3)	35	18.92%
G4 (GRAVIDA 4)	8	4.32%
G5(GRAVIDA 5)	5	2.70%
G6 (GRAVIDA 6)	1	0.54%
P (PRIMI GRAVIDA)	47	25.41%
Total	185	100.00%

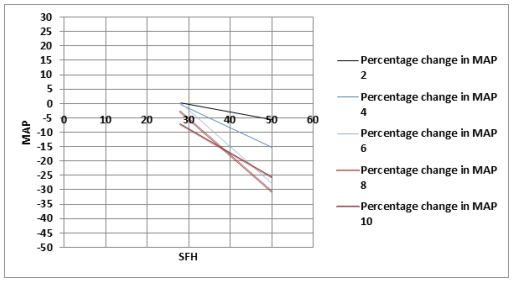
GRAPH 1: CORRELATION BETWEEN DBP AND SFH



Graph 2: Correlation Between Sbp And Sfh



Graph 3: Correlation Between Map And Sfh



DISCUSSION:

Hypotension is the most common side effect after spinal anaesthesia. The decrease in systemic vascular resistance due to sympathetic block is one of the major causes for this fall in blood pressure. [4] There are many guidelines suggested for the treatment of hypotension under spinal anesthesia during CS. [5,6] In addition, research has been carried out to predict the occurrence of hypotension after spinal anesthesia. [7,8,9,10,11] It is critically important to identify patients at risk of hypotension, as it would afford anaesthesiologists the opportunity to reduce this phenomenon by taking measures such as pre loading or prophylactic vasopressor administration. Hence we hypothesized that measurement of maternal AC and SFH can predict the degree of hypotension in parturients.

The details of 185 parturients were analyzed in Table 1 showing the gestational details of all included in the study.

All patients preoperative vital data was documented along with measurements. After administration of spinal anaesthesia the pulse rate systolic, diastolic and mean pressures were noted up to 10 minutes. The purpose of this study is to predict any correlation of AC and SFH with intra operative hypotension after administration of SAB in parturients undergoing elective CS.

Chi-Hang Kuok etal [12] has evaluated in 42 patients undergoing elective CS the effect of maternal AC and level of sensory blockade. The study concluded that greater AC tend to have higher sensory blockade at 5 minutes after administration of SAB. However the study did not show any correlation between AC and incidence of hypotension.

Our study is in coherence with the finding that though there is fall in blood pressure but it has no correlation with maternal AC. The most possible explanation for this could be, AC is majorly influenced by subcutaneous fat, which makes it a poor choice to predict the hemodynamic changes after SAB.

Additionally we also tried to correlate the incidence of hypotension with SFH. The SFH has negatively correlated with the fall in blood pressure and has statistical significance from 6^{th} to 10^{th} minute.

Sung Hee Chung etal [15] analyzed the correlation with SFH and ephedrine requirement to treat hypotension in 52 parturients posted for elective CS. Their study showed positive correlation between these two variables. This is not in coherence with our present study. The probable reasons might be

1) The demographic details like mean age, weight, and height of the patients are higher when compared to our study population, and more over the dose of bupivacaine was calculated by taking height and weight of the patient as suggested by Harten etal [16]. Where as in our present study we have fixed dosing in all of our patients. This might be reason for the incoherence
2) They have used Fentanyl along with Bupivacaine in their patients while administering SAB whereas in our study group we have used only 0.5% heavy Bupivacaine.

The incidence of hypotension in parturients after administration of SAB is influenced by many factors like preloading before block, venous capacitance, baseline peripheral vascular tone, blood volume, cardiac output, and the degree of aortocaval compression. [3,14] The complex interaction between all these factors will determine the fall in blood pressure.

Some authors, [12] also concluded that it is difficult to predict hypotension using these variables which is fully in coherence with our study.

Jawan et al [14] investigated the spread of spinal anesthesia in parturients with singleton and with twin pregnancies. They have noted that there is an increased cephalad spread of local anesthetics in twin pregnancies, but failed to find differences in the incidence of hypotension between the two groups.

In our study we have used both SFH and AC as surrogate markers for determining the uterine size, both of these measurements were taken by anaesthesiologist who is not administering SAB and the readings were not disclosed.

Of many factors contributing for hypotension during SAB, the compression of inferior venacava on gravid uterus is considered as major determinant. So we assumed that if we can measure the gravid uterus size we can predict the hypotension.

Although there are many indicators proposed to predict hypotension like finger perfusion index [17] measurement of thoracic electrical bioimpedance, [18] heart rate variability [19], and near infrared spectroscopy [20], all these require high end sophisticated monitors and cannot be applied on routine basis.

The most plausible explanation for negative correlation between SFH and hypotension is, SFH cannot exactly predict the size of uterus because at the term the due to engagement of head of the fetus the SFH will have a lower value which can preclude to predict hypotension. Sung Hee Chung etal [15] have also drawn conclusion that fetal weight has correlated with ephedrine requirement for treating hypotension after SAB, but the correct fetal weight can be estimated after the delivery, hence we have not taken this factor into consideration to predict hypotension. Further studies by using ultrasound to estimate the fetal weight before administering SAB can be done to predict the hypotension.

In conclusion, hypotension after SAB is influenced by many factors and predicting the incidence of hypotension by using maternal AC and SFH may not be the most appropriate method.

REFERENCES:

1) Carvalho B, Dyer RA. Norepinephrine for spinal hypotension during cesarean delivery: Another paradigm shift? Anesthesiology. 2015;122:728–30.
2) Flood P, Rollins MD. In: Anesthesia for obstetrics. 8th ed. Miller RD, editor. Philadelphia: Elsevier/Churchill Livingstone; 2015. pp. 2328–58.
3) Mercier FJ, Augè M, Hoffmann C, Fischer C, Le Gouez A. Maternal hypotension during spinal anesthesia for caesarean delivery. Minerva Anestesiol. 2013;79:62–73.
4) Hanss R, Ohnesorge H, Kaufmann M, Gaupp R, Ledowski T, Steinfath M, et al. Changes in heart rate variability may reflect sympatholysis during spinal anaesthesia. Acta Anaesthesiol Scand 2007; 51: 1297304.
5) Practice guidelines for obstetric anesthesia: An updated report by the American Society of Anesthesiologists Task Force on Obstetric Anesthesia and the Society for Obstetric Anesthesia and Perinatology. Anesthesiology. 2016;124:270–300.
6) Kinsella SM, Carvalho B, Dyer RA, Fernando R, McDonnell N, Mercier FJ, et al. International consensus statement on the management of hypotension with vasopressors during caesarean section under spinal anaesthesia. Anaesthesia. 2018;73:71–92.
7) Frolich MA, Caton D. Baseline heart rate may predict hypotension a.er spinal anesthesia in prehydrated obstetrical patients. Can J Anaesth 2002; 49: 1859.
8) Fujiwara Y, Sato Y, Shibata Y, Asakura Y, Nishiwaki K, Komatsu T. A greater decrease in blood pressure a.er spinal anaesthesia in patients with low entropy of the RR interval. Acta Anaesthesiol Scand 2007; 51: 11615.
9) Hanss R, Bein B, Francksen H, Scherkl W, Bauer M, Doerges V, et al. Heart rate variabilityguided prophylactic treatment of severe hypotension a.er subarachnoid block for elective cesarean delivery. Anesthesiology 2006; 104: 63543.
10) Hanss R, Bein B, Ledowski T, Lehmkuhl M, Ohnesorge H, Scherkl W, et al. Heart rate variability predicts severe hypotension a.er spinal anesthesia for elective cesarean delivery. Anesthesiology 2005; 102: 108693.
11) Hanss R, Bein B, Weseloh H, Bauer M, Cavus E, Steinfath M, et al. Heart rate variability predicts severe hypotension a.er spinal anesthesia. Anesthesiology 2006; 104: 53745.
12) Chung SH, Yang HJ, Lee JY, Chung KH, Chun DH, Kim BK, et al. The relationship between symphysis-fundal height and intravenous ephedrine dose in spinal anesthesia for elective cesarean section. Korean J Anesthesiol. 2010;59:173–8

13) Toyama S, Kakumoto M, Morioka M, Matsuoka K, Omatsu H, Tagaito Y, et al. Perfusion index derived from a pulse oximeter can predict the incidence of hypotension during spinal anaesthesia for Caesarean delivery. Br J Anaesth 2013;111:235 e41
14) Jawan B, Lee JH, Chong ZK, Chang CS. Spread of spinal anaesthesia for caesarean section in singleton and twin pregnancies. Br J Anaesth. 1993 Jun;70(6):639-41. doi: 10.1093/bja/70.6.639.
15) Chung SH, Yang HJ, Lee JY, Chung KH, Chun DH, Kim BK. The relationship between symphysis-fundal height and intravenous ephedrine dose in spinal anesthesia for elective cesarean section. Korean J Anesthesiol. 2010 Sep;59(3):173-8.
16) Harten JM, Boyne I, Hannah P, Varveris D, Brown A. Effects of a height and weight adjusted dose of local anaesthetic for spinal anaesthesia for elective Caesarean section. Anaesthesia 2005; 60: 348-53.
17) Toyama S, Kakumoto M, Morioka M, et al. Perfusion index derived from a pulse oximeter can predict the incidence of hypotension during spinal anaesthesia for Caesarean delivery. Br J Anaesth. 2013;111:235–241.
18) Ouzounian JG, Masaki DI, Abboud TK, Greenspoon JS. Systemic vascular resistance index determined by thoracic electrical bioimpedance predicts the risk for maternal hypotension during regional anesthesia for cesarean delivery. Am J Obstet Gynecol. 1996;174:1019–1025.
19) Hanss R, Bein B, Weseloh H, et al. Heart rate variability predicts severe hypotension after spinal anesthesia. Anesthesiology. 2006;104:537–545.
20) Berlac PA, Rasmussen YH. Per-operative cerebral near-infrared spectroscopy (NIRS) predicts maternal hypotension during elective caesarean delivery in spinal anaesthesia. Int J Obstet Anesth. 2005;14:26–31.