INTERNATIONAL JOURNAL OF CURRENT MEDICAL AND PHARMACEUTICAL RESEARCH
ISSN: 2395-6429, Impact Factor: 4.656
Available Online at www.journalcmpr.com
Volume 7; Issue 02(A); February 2021; Page No.5534-5537
DOI: http://dx.doi.org/10.24327/23956429.ijcmpr202102958

Research Article

HEMODYNAMIC CHANGES AFTER SUB ARACHNOID BLOCK IN FEMALES UNDERGOING CAESAREAN SECTION AND TO CORRELATE POST SPINAL HYPOTENSION WITH BASELINE HEART RATE

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ARTICLE INFO

Article History:
Received 12th November, 2020
Received in revised form 23rd December, 2020
Accepted 7th January, 2021
Published online 28th February, 2021

Key words:
LSCS, SAB, Hypotension, Bradycardia

ABSTRACT

Background: The study was aimed to study the hemodynamic changes after sub arachnoid block in females undergoing LSCS and co-relate post-spinal hypotension with baseline heart rate.
Methods: The study was done on 100 females. They were undergoing LSCS requiring sub-arachnoid block (SAB).Under all aseptic precautions SAB was given with Inj. Bupivacaine 0.5% (H) 2ml (10 mg) with 10mcg Fentanyl. Heart rate, systolic, diastolic, mean arterial pressure was recorded every 2 min for 10 min & thereafter every 10 min till the end of the surgery. Data was expressed as mean ± standard deviation. Demographic data like age, gestational age, gravida status and hemodynamic variables like heart rate, systolic blood pressure, diastolic blood pressure and mean arterial blood pressure were analysed statistically. Correlation between Baseline Heart Rate and post spinal hypotension was found by using the coefficient of correlation test.
Conclusion: Majority of patients develop hypotension after SAB and this hypotension was easily treated using fluids and vasopressors. Hypotension was not always accompanied with bradycardia but when it rarely does, aggressive resuscitation with vasopressors and atropine is necessary. As compared to post spinal hypotension, the incidence of bradycardia is very rare.

INTRODUCTION

Regional anaesthesia among parturient include spinal, epidural analgesia/anaesthesia or combined spinal epidural anaesthesia. Epidural or combined spinal epidural anaesthesia is time consuming and technical difficulties are noted with inexperienced hand. The major advantage of regional anaesthesia is avoidance of maternal morbidity with general anaesthesia. It avoidsneonatal depression associated with general anaesthesia. Physiological changes of full term pregnant women and dehydration lead to the highest incidence of hypotension after spinal anaesthesia.

Spinal anaesthesia is associated with higher incidence of hypotension but is easily treatable and short lived. Hypotension is common with significant maternal and foetal implications. The use of vasopressor is required with up to 80% of anaesthetics. Hypotension has been linked to maternal and foetal morbidity.

The ability to predict which patients are at risk of hypotension would enable anaesthesiologists to prepare and to individualise treatment. It would also enable adequate preparation inperioperative phase and could result in altered regimes like early initiation of vasopressor infusion. There are many predictors of post-spinal hypotension, non-modifiable and modifiable. Non-Modifiable risk factors include over-anxious patients, increased maternal age (>35 years), increased maternal BMI (>25 Kg/m^2), increased baseline heart rate (>100bpm). Modifiable risk factors include technique of giving spinal anaesthesia, amount of spinal drug given and the level of anaesthesia achieved.

The BezoldJarisch Reflex, a cardiac depressor reflex, involving bradycardiaand hypotension is one of the mechanisms responsible forhypotension under spinal anaesthesia. The circulatory response changes from the normal maintenance of arterial pressureto parasympathetic activation and sympathetic inhibition causing hypotension. This response may occur during regional anaesthesia, haemorrhage or supine inferior vena cava compression in pregnancy. The time has come to refer to perioperative bradycardia associated with hypotension. Its onset and incidence in obstetric population has not been studied much. So, the incidence of bradycardia will be found out in this study.

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METHODOLOGY

After approval from Institutional Ethics Committee, pregnant females coming for cesarean sections under sub-arachnoid block were included in study. Patients not giving consent, anaemic patients with Haemoglobin < 7gm%, patients with antepartum haemorrhage, pregnancy induced hypertension, cardiac diseases including pre-existing arrhythmias and chronic renal disease were excluded. Patients having standard contra-indications to regional anaesthesia (e.g. local infection, coagulopathy, some cardiac disease e.g. fixed output cardiac disease and foetal distress were also excluded. Patients who were started on oxytocin drip for induction were also excluded from the study as they might have a higher baseline heart rate because of oxytocin infusion.

Preoperative evaluation was done in all patients with clinical history, vital parameters, systemic examination, general and spine examination with airway examination. All routine investigations like CBC, LFT, RFT, serum electrolytes were checked. Patients were explained about the study and enrolled only after valid informed consent.

Statistical Analysis

Data was expressed as mean ± standard deviation. Demographic data like age, gestational age, gravida status and hemodynamic variables like heart rate, systolic, diastolicand mean arterial blood pressure were analysed. P value of <0.05 was taken to be significant. Correlation between baseline heart rate and post spinal hypotension will be found.

Observations

Mean age of females was 25.94±4.09 years and the mean gestational age was 37.03±1.27 weeks.

Out of the 100 patients 45% were gravida 2, 35% were primigravida, 12% were gravida 3, 5% were gravida 4 and only 3% were gravida 5. Most common indication was previous LSCS (23%) followed by meconium stained amniotic fluid.

Out of the 100 females, 19 had baseline Tachycardia (>100/min). Maximum heart rate recorded was 138/min which was seen after 4 minutes of administering SAB. Also after 4 minutes of administering SAB, 38 females showed Tachycardia. Only one patient had an episode of bradycardia which was seen after 8 minutes of administering SAB.

Table 1 Descriptive Statistics of Heart Rate

Heart Rate (/min)	N	Min	Max	Mean ± SD	Tachycardia >100 heart rate	Bradycardia <50 heart rate
Baseline	100	60	118	90.57±11.20	19	0
0 min	100	60	121	91.38±13.31	23	0
2 min	100	56	126	92.77±16.56	29	0
4 min	100	58	138	94.01±17.45	38	0
6 min	100	56	135	91.50±16.85	26	0
8 min	100	42	122	86.72±17.03	18	1
10 min	100	63	119	88.24±16.35	23	0
20 min	100	55	120	88.72±15.75	27	0
30 min	100	62	120	88.12±13.92	19	0
40 min	100	57	119	85.68±14.01	16	0
50 min	100	59	122	83.08±13.25	10	0
60 min	100	60	120	82.46±11.97	8	0
70 min	100	60	114	82.60±11.46	5	0
80 min	100	62	110	82.70±12.18	7	0
90 min	100	62	105	80.89±11.20	2	0
100 min	100	68	96	80.17±8.10	0	0

Table 2 Descriptive Statistics of Mean Arterial BP of Females

Mean Arterial BP (mm Hg)	N	Min	Max	Mean ± SD	Fall in Mean Arterial BP by > 20% of baseline
Baseline	100	74	103	88.64±5.83	-
0 min	100	69	105	86.50±8.81	3
2 min	100	53	103	79.94±11.87	24
4 min	100	50	105	75.41±12.39	36
6 min	100	57	103	75.89±11.39	37
8 min	100	56	103	76.44±11.24	36
10 min	100	63	94	77.69±7.68	18
20 min	100	64	93	78.09±6.37	23
30 min	100	65	99	81.43±9.50	20
40 min	100	65	100	81.95±7.05	8
50 min	100	63	103	81.32±6.04	8
60 min	99	65	104	81.01±6.19	3
70 min	99	70	103	82.61±5.61	3
80 min	97	72	105	82.71±5.53	2
90 min	63	72	108	83.83±6.07	1
100 min	18	76	94	85.00±5.18	1

Out of total 100 females, only 30 showed a fall in their systolic blood pressures to < 90mmHg and only 68 showed a fall in mean blood pressure by >20% of baseline. Out of those 68 females, 16 had a baseline Heart Rate of > 100/min

Table 3 Correlation between Baseline Heart Rate and Post Spinal Hypotension

MABP from baseline	Number of patients	Heart Rate more than 100	Mean ± SD	P- value	Significant at 5 % level
20% fall	68	16	92.43±11.27	0.015	Yes
Not 20% fall	32	3	86.63±10.14		
Total	100	19			

The minimum saturation found was 97% which was the baseline saturation of one female. All females maintained saturation of above 99% after administering SAB.

Out of the 100 females, 44 required Ephedrine to treat hypotension.

Out of the 100 females, only 1 required Atropine to treat Bradycardia.

Out of the 100 females, 19 of them were found to have baseline heart rate of > 100/min. Out of those 19, only 3had a fall in mean arterial blood pressure by > 20% of their baseline. Mean baseline heart rate of females showing a fall in mean arterial blood pressure to > 20% of their baseline was 92.43±11.27/min. Whereas the mean baseline heart rate of females not showing a fall in mean arterial blood pressure by > 20% of their baseline was86.63±10.14/min.

The difference in mean heart rate of females showing a fall in mean arterial blood pressure by > 20% of their baseline and those not showing a fall in mean arterial blood pressure by > 20% of their baseline was statistically significant.

Out of the 68 females showing a fall in mean arterial blood pressure to > 20%, 36 of them were gravida 2, i.e 52.9%.

Out of the 68 females showing a fall in mean arterial blood pressure by > 20% of baseline, 30 of them were in the age group of 25-29 years, i.e 44.1%.

Mean Age group of females showing a fall in mean arterial blood pressure by > 20% of baseline was found to be 25.65±4.07years. Whereas mean age group of females not showing a fall in mean arterial blood pressure by > 20% of

baseline was found to be 26.56±4.12 and the difference was not found to be statistically significant

DISCUSSION

Successful anaesthetic management of the pregnant woman is recognition of anatomic and physiologic changes and appropriate adaptation of our anaesthetic techniques to account for them, as there is marked anatomic and physiologic changes occur during pregnancy that allow the woman to adapt to developing foetus and its metabolic demands. Spinal is the preferred mode of anaesthesia in pregnant females undergoing cesarean section since it was first used in 1902 by Hopkins.

The advantages of spinal anaesthesia are simplicity, speed of induction, reliability, minimal foetal exposure to the drug(s), an awake parturient along with minimization of the hazards of aspiration. Disadvantages of spinal for cesarean delivery include high incidence of hypotension, intra-partum nausea and vomiting, possibility of headaches after dural puncture and limited duration of action.

Hypotension after spinal anaesthesia for caesarean section remains a common and potentially serious complication, despite the use of left uterine displacement, prophylactic ephedrine, and fluid loading. Hypotension also leads to maternal morbidity and foetal complications due to foetal academia.

The ability to predict which patients will develop severe hypotension would also enable adequate preparation in the peri-operative phase and may result in altered treatment regimes.

Out of the 100 females in our study, 19 had baseline tachycardia (>100/min). Maximum heart rate recorded was 138/min which was seen after 4 minutes of administering SAB. Only 1 patient had episode of bradycardia (<50/min) which was seen after 8 minutes of administering SAB when the heart rate dropped to 42/min. The bradycardia was associated with hypotension where the blood pressure had dropped to 72/42mmHg with mean arterial blood pressure of 56mmHg. The bradycardia responded to Inj. Atropine 0.6mg iv and the hypotension was treated with Inj. Ephedrine 12mg iv. Thus the incidence of bradycardia in our study was 1%. Our result was consistent with study performed by Somboonviboon W *et al*[1] where the the incidence of bradycardia 2.5%. Souvik Maitra *et al*[3] also reported a case of near fatal bradycardia in 31 yearold parturient undergoing cesarean section under spinal anaesthesia without a "high spinal" block. Theheart rate in their patient dropped to 29/min after 10 minutes of administering SAB and it too had responded to an iv bolus of Inj. Atropine 0.6mg.

Mean baseline systolic blood pressure was 114.83±7.40mmHg. Maximum lowest recorded systolic blood pressure was 72mmHg which was seen 8 minutes after administering SAB. Maximum highest recorded systolicpressure was 138mmHg which was seen 4 minutes after administering SAB. 17 Patients showed a fall of systolicpressure to less than 90mmHg, 6mins after administering SAB and the mean systolicpressure of all females at 6 mins being 101.09±12.81mmHg. This was found to be the lowest mean systolic blood pressure. Highest mean systolic pressure was 115.40±7.37mmHg which was seen 90 minutes after administering SAB. Although, not all surgeries took 90 minutes for completion. After 50 minutes of administering SAB, none had systolicpressure below 90mmHg. Out of100 females, only 30 females showed a fall in their systolic blood pressures to < 90mmHg.

Mean baseline diastolic blood pressure was 75.67±6.27mmHg. Maximum lowest recorded diastolic pressure was 36mmHg which was seen 4 minutes after administering SAB. Maximum highest recorded diastolic pressure was 95mmHg which was seen 90 minutes after administering SAB. Highest mean diastolic pressure was 75.67±6.27mmHg which was the mean baseline diastolic pressure. Highest mean diastolic pressure after administering SAB was 70.50±4.44mmHg which was seen 100 minutes after administering SAB although not all surgeries needed 100 minutes for completion. Lowest mean diastolic pressure after administering SAB was 61.91±12.09mmHg which was seen 4 minutes after administering SAB.

Mean of baseline mean arterial blood pressure was 88.64±5.83mmHg. Maximum lowest recorded mean arterial pressure was 50mmHg which was seen 4 minutes after administering SAB. Maximum highest recorded mean arterial pressure was 108mmHg which was seen 90 minutes after administering SAB. 37 females, showed a fall in their mean arterial blood pressure by >20% of baseline at 6 minutes after administering SAB. Out of total 100 females, 68 showed a fall in their mean arterial blood pressure by >20% of baseline.

In our study hypotension was defined as systolic blood pressures < 90mmHg or fall in their mean arterial blood pressure by >20% of baseline after administering spinal anaesthesia, whichever is higher. Thus incidence of hypotension in our study was 68%. Our result was like various studies done so far. Somboonviboon W *et al*[1] defined Hypotension as systolic blood pressure decrease of > 30% of baseline value and their incidence was 52.6% Dr. David M Kahoro[5]defined hypotension as systolic blood pressure equal to or below 90 mmHg and his incidence of hypotension was 64%.

Out of the 100 females, 19 had baseline tachycardia with heart rate of > 100/min. Out of19, 16had a fall in MABP by > 20% of their baseline whereas only 3had a fall in MABP by > 20% of their baseline. That is, 84.2% females having baseline tachycardia developed post spinal hypotension. Mean baseline heart rate of females showing a fall in MABP by > 20% of their baseline was found to be 92.43±11.27/min. Whereas the mean baseline heart rate of females not showing a fall in MABP by > 20% of their baseline was found to be 86.63±10.14/min. The difference in their mean baseline heart rates was found to be statistically significant. Chamchad *et al*[4] found that the mean baseline heart rate developing post spinal hypotension was 95 beats/min and those not developing hypotension was 81 beats/min and difference was significant. Hanss R *et al*[2] also found a higher sympathetic tone (higher baseline heart rate) and lower parasympathetic tone in females developing severe and moderate hypotension after SAB as compared to females developing mild hypotension. Hanss R *et al*[2] found that only 3 out of 17 control patients with low baseline heart rate demonstrated hypotension. In contrast 20 of 23 control patients with high baseline heart rate demonstrated hypotension after SAB. That is 86.9% with high baseline heart rate demonstrated hypotension. Their result closely resembles our result.

Out of 100 females 44 of them required Ephedrine to treat hypotension. Minimum amount used was 6mg. Maximum amount was 24mg. Mean amount of ephedrine required to treat hypotension was found to be 12.22±5.32mg.

Although, Hypotension was found in 68% females only 44% required Ephedrine. This might be because the rest of the females responded to fluid resuscitation and the ones who did not required Ephedrine to maintain normotension.

CONCLUSION

From our study, we conclude that majority of females develop hypotension after SAB and this hypotension is easily treated using fluids and vasopressors like Ephedrine. This hypotension is not always accompanied with bradycardia but when it rarely does, aggressive resuscitation with Ephedrine and Atropine is necessary. As compared to post spinal hypotension, the incidence of bradycardia is very rare. Amongst the various predictors of post spinal hypotension, a higher baseline heart rate is a promising predictor and will enable adequate preparation in the perioperative phase and could potentially result in altered treatment regimes. Sowhen properly administered, spinal anaesthesia is safe. Because of its simplicity, faster onset of action and relatively stable hemodynamics, it saves lot of time which is very much important in emergency situations and avoids the adverse effects of general anaesthesia.

Acknowledgements

We sincerely thank the Department of Anaesthesiology, LTMC Medical College, Mumbai, Maharashtra for permission to study and providing facility to carry out the work.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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How to cite this article:

Sayali Lalsare., Mohit Maurya and Nihar Sharma (2021) 'Hemodynamic Changes after Sub Arachnoid Block In Females Undergoing Caesarean Section and To Correlate Post Spinal Hypotension with Baseline Heart Rate', *International Journal of Current Medical and Pharmaceutical Research,* 07(02), pp 5534-5537

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