Original Research Paper

Volume-7 | Issue-12 | December-2017 | ISSN - 2249-555X | IF : 4.894 | IC Value : 86.18

Anesthesiology

"A PROSPECTIVE STUDY TO COMPARE TWO DIFFERENT SITTING POSITIONS FOR SPINAL ANAESTHESIA IN WOMEN UNDERGOING ELECTIVE CAESAREAN DELIVERY".

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ABSTRACT

Background: The most common complication of spinal anaesthesia in parturients is hypotension and subsequent risk of decreased uteroplacental perfusion. During caesarean delivery maternal position is particularly important as it can affect the spread of the block resulting in variable incidence of hypotension. The aim of the study was to assess the effect of parturient's position on quality of block during induction of spinal anaesthesia for caesarean delivery in traditional sitting and Hamstring stretch positions and their comparison with regards to differences in haemodynamic parameters, degree of hypotension, patient's comfort and number of needle-bone contacts.

Material & Methods: One hundred twenty ASA physical status I and II parturients undergoing elective caesarean delivery were randomised to receive spinal anaesthesia in traditional sitting position (Group S) or Hamstring stretch position (Group H). Using L_3-L_4 interspace, parturients received intrathecal 1.5ml (0.5%) hyperbaric bupivacaine with 25mcg fentanyl, after which they were immediately placed in supine position. Perioperatively heart rate, changes in blood pressure (systolic, diastolic & mean), onset of sensory and motor block, ephedrine & atropine requirement were recorded. Quality of parturient's anatomical landmarks was assessed by number of needle-bone contacts. Maternal hypotension was defined as systolic blood pressure <100mm Hg or decrease in systolic blood pressure by >30mm Hg or a fall in mean arterial pressure by >20% from baseline.

Results: Parturients in Group H experienced more fall in systolic blood pressure (Mean±SD) 113.90 ± 8.58 mmHg as compared to those in Group S (Mean±SD) 117.47 ± 10.3 mmHg for initial fifteen minutes after administration of spinal anaesthesia and this difference was statistically significant (p = 0.041). However, there was no significant fall in mean arterial pressure and diastolic blood pressure between the two groups. It was easy to administer spinal anaesthesia in traditional sitting position as compared to Hamstring stretch position. There were fewer needle-bone contacts in traditional sitting position than Hamstring stretch position and traditional sitting position was also more comfortable for the parturient.

Conclusion: Traditional sitting position offers greater haemodynamic stability in patients undergoing spinal anaesthesia for caesarean delivery and provides better patient comfort during the procedure with fewer number of needle-bone contacts.

KEYWORDS : Caesarean delivery; Spinal anaesthesia; Hypotension; Traditional sitting position; Hamstring stretch position

Introduction

Spinal anaesthesia is a well-established regional anaesthetic technique for caesarean delivery. The advantages are its simplicity, reliability, rapid onset, dense motor block and avoidance of potential airway complications associated with general anaesthesia.[1] Spinal anaesthesia offers significant advantages over epidural anaesthesia such as simple technique to perform, quick onset, which allows neuraxial anaesthesia in urgent caesarean deliveries and thus reducing the necessity for general anaesthesia. The small doses of local anaesthetics required to perform spinal anaesthesia also reduce the risks of systemic toxicity.[2]

Blockade to T_4 dermatome is necessary to perform caesarean delivery without maternal discomfort.[3]The most common complication of spinal anaesthesia is hypotension and the attendant risk of decreased uteroplacental perfusion. The incidence of hypotension during spinal anaesthesia for caesarean section is reported to be as high as 80% despite fluid overload, lateral uterine displacement and use of vasopressors. It may be due in part to cephalad spread of local anaesthetic in the subarachnoid space and also to aortocaval compression by gravid uterus. These factors are influenced by parturient's position during and immediately after subarachnoid injection including hypotension and its sequelae.[5] The severity of degree of hypotension depends on the height of the block, the position of the parturient and prophylactic measures taken to prevent hypotension.[6]By influencing spread of local anaesthetic, maternal position may affect the speed of onset of sensory block.[4]

Various positions such as lateral, sitting and Oxford have been described for conducting spinal anaesthesia for caesarean delivery.[8]Another position known as Hamstring stretch position has also been described for labour epidural analgesia and spinal anaesthesia for caesarean delivery. It includes patient sitting with lower extremities fully supported by OT table with maximum knee extension, hip adduction and forward lean of torso.[9] This study was undertaken to compare traditional sitting position or Hamstring stretch position for elective caesarean delivery.

Material & Methods:

After approval from hospital ethics committee, one hundred twenty healthy parturients aged between 18-45 years, belonging to American Society of Anesthesiologists (ASA) physical status I and II, scheduled for elective caesarean delivery under spinal anaesthesia were selected for participation in the study. Parturients in active labour, moderate to severe pregnancy induced hypertension, cardiopulmonary or cerebrovascular diseases, known foetal anomalies, diabetes, multiple pregnancy, intrauterine growth retardation, body weight<45kgs or > 100kgs, height <145 cm and >162.5 cm and any standard contraindication to regional anaesthesia were not included in the study. The parturients were randomly divided into two groups of 60 each. Group S comprised of sitting position with feet resting on stool (traditional sitting position) and Group H comprised of sitting position with knee extension, hip adduction and feet stretched in the axis of the operating table (Hamstring stretch position). Randomization was performed using sealed envelope containing code number. Baseline maternal heart rate (HR) and NIBP, was recorded as an average of 3 readings (T_B). The parturient was then positioned by a trained assistant into either sitting position or Hamstring stretch position and all haemodynamic parameters were recorded as T_P. Under all aseptic conditions, after identification of L_3 -L_4 intervertebral space and infiltration of skin and subcutaneous tissue with 2m1 of 2% lignocaine, spinal anaesthesia was administered through 25G Quincke's spinal needle using 1.5ml 0.5% hyperbaric bupivacaine and 25mcg fentanyl in all parturients. Parturient was then immediately placed in supine position with a 15-degree uterine tilt.

At this point, a second anaesthetist blinded to parturient's position recorded all parameters intraoperatively. Non-invasive blood pressure and heart rate were recorded at one-minute interval following

subarachnoid injection, for the first five minutes and at five minutes interval thereafter. Maternal hypotension was defined as systolic blood pressure <100mm Hg or decrease in systolic blood pressure by >30mm Hg or a fall in mean arterial pressure by >20% from baseline. This was managed by intermittent intravenous 3mg ephedrine boluses. Bradycardia was defined as HR <60 beats per min and was managed by intravenous atropine. Assessment of sensory block before surgery was carried out every 2 min using loss of cold sensation to cotton wool soaked in ethyl alcohol. Motor block was assessed using Bromage score (0 =no motor paralysis; 1=unable to raise extended legs but able to flex knee and ankles; 2=unable to raise extended legs and flex the knees but able to move feet; 3= not able to flex ankles and feet). Loss of cold sensation at and including the T_4 dermatomal level and a Bromage score of 3 was considered adequate for surgery. Oxygen saturation was monitored throughout the surgery.

Additional data collected included time duration from spinal anaesthesia to surgical incision, incision to delivery time and lowest measurements for BP and HR within 30 min of intrathecal injection**.** Patients comfort during administration of spinal anaesthesia was graded as: Grade I: no discomfort at all, Grade II: mild discomfort, Grade III: severe discomfort requiring change of position.

Ease of administration of spinal anaesthesia was assessed on quality of surface landmarks and number of needle -bone contacts by an anaesthesiologist having performed more than four hundred spinal anaesthetics. A spinal needle-bone contact was defined as spinal needle contact against bone preventing further advancement. The numbers of needle bone contacts were recorded. If more than five spinal needle-bone contacts occured, it was considered as failure and alternative method of anaesthesia was instituted.

Neonatal condition was assessed using Apgar score at 1min and 5min. Occurrence of intraoperative nausea, vomiting and pruritus was noted and managed accordingly.

Statistical analysis

Sample size was calculated based on reduction in systolic arterial pressure (SAP) after spinal anaesthesia for elective caesarean delivery. We chose a 40% baseline ratio of reduction in SAP from baseline, sample size of 60 patients per group was required to identify a 25% difference between the two groups for the change of SAP with respect to baseline, with a power of 90% and at alpha of 0.05.

Analysis of data collected was conducted with the statistical package for the social science system version SPSS 17.0. Continuous variables were presented as mean+/-SD or median if the data is unevenly distributed. Categorical variables were expressed as frequencies and percentages. The comparison of normally distributed continuous variables between the groups was performed using Student's t test. Nominal categorical data between the groups were compared using Chi-squared test or Fisher's exact test as appropriate. Non-normal distribution continuous variables were compared using Mann Whitney U test. For all statistical tests, p value less than 0.05 was taken to indicate a significant difference.

Results:

The demography of patients between the two groups was comparable and no statistically significant difference was observed in mean age, height, weight and body mass index between the two groups.

The incidence of maternal hypotension in our study was 22.7%. The results of our study show that the parturients who were given spinal anaesthesia in Hamstring stretch position experienced more fall in systolic blood pressure as compared to those in traditional sitting position for initial fifteen minutes. Statistically significant differences in systolic blood pressure at 4 minutes (p=0.001), 5 minutes (p=0.011), 10 minutes (p=0.012) and 15 minutes (p=0.037) after administration of spinal anaesthesia were observed between the two groups(fig 1).However there was no significant difference in diastolic blood pressures and mean arterial pressures. Sixteen (26.7%) parturients in Group H and eleven (18.4%) parturients in Group S developed hypotension and required additional ephedrine supplementation (Table 1). However, there was no statistically significant difference in total amount of ephedrine required between the two groups.

Time required to reach T_4 dermatome was faster in Group H (129.95±29.37sec) as compared to Group S (135.58±24.84sec), however it was not statistically significant. (p value=0.205).The time required to reach grade III motor block was comparable between the two groups with mean onset time of 91.17±19.36 seconds in Group S and 91.83±17.68 seconds in Group H, p=0.844.

There was difficulty in appreciating landmarks in three patients (5%) in Group S while in Group H, difficulty was encountered in four patients (6.7%). However, the difference in appreciating landmarks in two groups was comparable and was found to be statistically insignificant, (p=1.000).Needle-bone contacts was taken as indicator for ease of administration of spinal anaesthesia. In Group S nine patients (15%) required more than one attempt while in Group H twenty-five patients (41.7%) required more than one attempt. When compared statistically, the difference in number of attempts between the two groups was significant (p=0.004)(Table 2).

Incidence of intraoperative complications like nausea, vomiting and pruritus were comparable between the two groups. At birth neonates were evaluated by Apgar score at 1min and 5mins and no significant difference was found between the two groups.

Discussion

Neuraxial anaesthesia is the anaesthetic technique of choice for caesarean delivery and has resulted in a reduction in maternal mortality associated with general anaesthesia. Spinal anaesthesia helps to avoid the risk of tracheal intubation, facilitates early bonding between mother and baby and provides effective postoperative analgesia, enabling quicker maternal recovery.[10]Among parturients undergoing spinal anaesthesia for caesarean delivery haemodynamic changes can occur as a result of aortocaval compression, the effects of the spinal anaesthesia itself and the usual physiological changes associated with normal pregnancy. Therefore without adequate prophylaxis or treatment, spinal anaesthesia is associated with maternal hypotension in 80–83 % of parturients. Spinal hypotension is commonly associated with nausea and vomiting in the mother and in rare cases can result in cardiovascular collapse, loss of consciousness, or aspiration of gastric contents. Furthermore, sustained maternal hypotension reduces uteroplacental blood flow, which can cause foetal acidosis, particularly in situations in which there is already foetal compromise. Haemodynamic control during caesarean delivery under spinal anaesthesia is therefore very important for the well-being of both the mother and the fetus.[10]

The results of our study show that the parturients who were given spinal anaesthesia in Hamstring stretch position experienced more fall in systolic blood pressure as compared to those in sitting position for initial fifteen minutes. However there was no significant fall in mean arterial pressure between the two groups. It is uncertain why our study showed significant fall in systolic blood pressure whereas there was no difference in mean arterial pressures between the two positions. It is presumed that Hamstring stretch position is helpful in reducing lumbar lordosis as demonstrated by Tashayod et al, thereby making spine more straight.[11] Accentuation of the lordotic curvature (as in term pregnancy) may significantly affect uptake and distribution of spinal anesthetic solutions, the spread of which is governed by gravity. They do so because they either accentuate or eliminate the lower portion of the "S"-shaped curve of the subarachnoid space normally present when a patient lies in the supine position. Reduction of the lordotic curve increases the cephalad spread of hyperbaric solutions. Exaggeration of the lordotic curve may decrease the cephalad spread of hyperbaric solutions in the supine position by causing pooling of the anesthetic solution in the deepest part of the S shaped curve.[12] This could have accounted for more rapid spread of hyperbaric bupivacaine, hence accounting for more fall in systolic blood pressure in Hamstring stretch position. Maternal hypotension was defined as systolic blood pressure <100mm Hg or decrease in systolic blood pressure by >30mm Hg or a fall in mean arterial pressure by >20% from baseline. The incidence of maternal hypotension in our study was 22.7%. 16(26.7%) parturients in Group H and 11(18.4%) parturients in Group S developed hypotension and required additional ephedrine supplementation. We found differences in systolic blood pressure at 4(p=0.001), 5(p=0.011, 10(p=0.012) and 15(p=0.037) minutes after administration of spinal anaesthesia between the two groups. There was no significant difference in diastolic blood pressures and mean arterial pressures. However, there was no statistically significant difference in total amount of ephedrine required between the two groups.

Time required to reach T_4 dermatome was faster in Group H

(129.95±29.37sec) as compared to Group S (135.58±24.84sec), however it was not statistically significant. This can be attributed to the fact that Hamstring stretch position reduces lumbar lordosis and elimination of lordotic curve increases the cephalad spread of hyperbaric solutions. This could have accounted for more rapid spread of hyperbaric bupivacaine.[12] The time required to reach grade III motor block was comparable between the two groups with mean onset time of 91.17±19.36 seconds in Group S and 91.83±17.68 seconds in Group H, p=0.844.

The success of neuraxial block is influenced by the quality of patient's anatomical landmarks, the adequacy of patient positioning and the level of experience of anaesthesia provider. Appreciation of anatomical landmarks is particularly influenced by parturient's position. Incorrect posture resulting in multiple attempts causes discomfort to the parturient. It may also lead to post dural puncture headache and injury to neural structures. In our study, there was difficulty in appreciating landmarks in three patients (5%) in traditional sitting position while in Hamstring stretch position, difficulty was encountered in four patients (6.7%). However the difference in appreciating landmarks in two groups was comparable and was found to be statistically insignificant, (p=1.000).

In literature none of the studies conducted so far have assessed patient's level of comfort during administration of spinal anesthesia in cesarean delivery. Indeed, there are parturients who are unable to adapt to ideal posture. It may be uncomfortable for some patients to assume a flexed posture. In our study more number of parturients were comfortable in traditional sitting position as compared to Hamstring stretch position (1:5), however it was not statistically significant.

While performing spinal anaesthesia, identification of spinal space and reducing the number of needle-bone contacts is important so as to prevent patient's discomfort as well as minimizing chances of post dural puncture headache and injury to neural structures. Needle-bone contact was taken as indicator for ease of administration of spinal anaesthesia. In Group S nine patients (15%) required more than one attempt while in Group H twenty-five patients (41.7%) required more than one attempt. When compared statistically, the difference in number of attempts between the two groups was significant (p=0.004). Tashayod et al described Hamstring stretch position wherein passive extension of subject's knees producing increased hamstring tension, compensatory tilting of the pelvis and reduction of lumbar lordosis. Reduced lumbar lordosis may facilitate identification of intervertebral and epidural spaces and decreasing the number of needle-bone contacts.[11] Our results differ from study carried out by Fisher et al who compared traditional sitting position and Hamstring Stretch position for labour epidural needle placement and found equivalence regarding number of needle-bone contacts during administration of neuraxial anaesthesia.[9] This could be attributed to the fact that they provided neuraxial anaesthesia on bed with soft mattress while we administered spinal anaesthesia on OT table which is more firm and stable as compared to mattress which is much more pliable. However, the findings cannot be generalized to the non-pregnant population because hip flexion and forward lean components of hamstring stretch maneuver are limited by gravid uterus.

Incidence of intraoperative complications like nausea, vomiting and pruritus were comparable between the two groups. At birth neonates were evaluated by Apgar score at 1min and 5mins and no difference was found between the two groups. In studies in which haemodynamic effects of maternal position were compared, independent from the severity of hypotension, 1 and 5 minute Apgar scores were similar in lateral and sitting positions. With close blood pressure monitoring and an early diagnosis and treatment with vasopressor agents, long lasting hypotension is generally not seen in parturients. In various studies done to evaluate maternal hypotension during induction of spinal anaesthesia for caesarean delivery, no neonate was acidotic despite maternal hypotension. The reason can be that sustained maternal hypotension was never allowed to occur during caesarean delivery.

There are several factors that could influence the appropriate sensory nerve block and the incidence of hypotension in caesarean deliveries. The effect of the position on haemodynamics has been previously reported. However, differences in the study designs make it difficult to achieve a general conclusion to establish the best position. The preferred maternal posture for providing spinal anaesthesia varies among anaesthesiologists and lack of familiarity with certain maternal positions might influence their performance.

In the light of above observations, we conclude that traditional sitting position offers greater haemodynamic stability in patients undergoing spinal anaesthesia for caesarean delivery. Also, the traditional sitting position was easier for performing spinal anaesthesia with fewer needle-bone contacts and was more comfortable for the parturient as compared to Hamstring stretch position. However further studies involving larger number of patients should be undertaken to compare traditional sitting and Hamstring stretch position to assess their effect on haemodynamic stability of parturients during spinal anaesthesia for elective caesarean section.

Fig.1: Comparison of systolic and mean blood pressure between the two groups after administration of spinal anaesthesia.

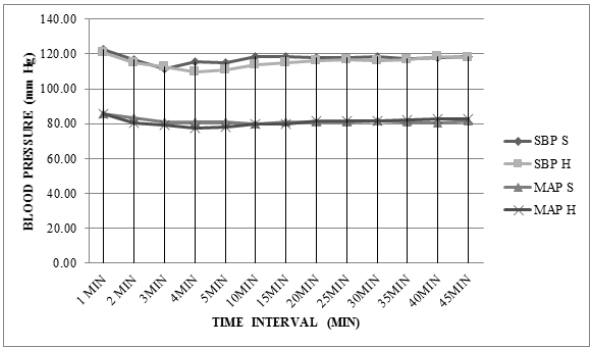

Table 1-Comparison of amount of ephedrine required between the two groups.

Amount of Ephedrine required (mg)	Group S		Group H		p Value
	Frequency	%	Frequency	%	
3	7	11.7%	12	20%	0.453
6	4	6.7%	4	6.7%	
None	49	81.7%	44	73.3%	
Total Patients	60	100%	60	100%	

Table 2- Comparison of needle –bone contacts and patient comfort between the two groups

Number of Needle Bone-Contacts	Group S		Group H		p Value
	Frequency	%	Frequency	%	
None	51	85.0	35	58.3	0.004
1	8	13.3	24	40.0	
2	1	1.7	1	1.7	
Patient Comfort Grade					
1	60	100	55	91.7	0.057
2	0	0	5	8.3	
Total patients	60	100	60	100	

REFERENCES

1. Akhtar F, Ashraf V, Pirzada A. Prevention of hypotension in caesarean delivery under spinal anaesthesia; the combination of modified supine wedged position, crystalloid co hydration and prophylactic atropine. Pakistan Armed Forces Medical Journal 2008;4.
2. Gogarten W. Spinal anaesthesia for obstetrics. Best Pract Res ClinAnaesthesiol. 2003 Sep;17(3):377-92.
3. Butterworth J, Mackey D, Wasnick J. Clinical Anaesthesiology. 5th ed. New Delhi: McGraw Hill Education Pvt Ltd; 2013:856.
4. Rucklidge M, Peach M J, Yentis S M. A comparison of the lateral, Oxford and sitting positions for performing combined spinal-epidural anaesthesia for elective caesarean section. Anaesthesia 2005;60:535-40.
5. Khaw KS, Ngan Kee, Lee WS. Hypotension during spinal anaesthesia for caesarean section: implications, detection, prevention and treatment. Fetal and Maternal Medicine Review 2006;17:2 1-27
6. Mitra JK. Prevention of hypotension following spinal anaesthesia in caesarean section - then and now. Kathmandu Univ Med J 2010;9(32):415-9.
7. Coppejans C, Hendrickx E, GoosensJ,Vercauteren P. The sitting versus right lateral position during combined spinal-epidural anaesthesia for caesarean delivery:block characteristics and severity of hypotension. AnesthAnalg2006;102:243-7.
8. Stoneham M D, Eldridge J, Popat M, Russel R. Oxford positioning technique improves haemodynamic stability and predictability of block height of spinal anaesthesia for elective caesarean section. Int J ObstetAnesth 1999 Oct;8(4):242-8.
9. Fisher S, Arnholt T, Douglas E, Vandiver L, Nguyen H. A randomized trial of the traditional sitting position versus the hamstring stretch position for labor epidural needle placement. AnesthAnalg2009;109:532-4.
10. Mavridou I, Stewart A, Fernando R. Maternal hypotension during spinal anesthesia for caesarean delivery. CurrAnesth Rep (2013) 3:282-91.
11. Tashayod ME, Tamadon S. Spinal block in sitting position without moving the legs. Middle East J Anesthesiol1980;5:529-33.
12. Greene NM. Distribution of local anesthetic solutions within the subarachnoid space. AnesthAnalg1985;64:715-30.