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Original Research

Effect of Supine versus Tilted Posture in Patients Undergoing Lower Segment Caesarean Section under Spinal Anaesthesia

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ABSTRACT:
The gravid uterus begins to compress the IVC in the supine position beginning at approximately the 20th week of pregnancy, with obstruction becoming virtually complete at term. Blood returns from the lower extremities through the collaterals which are developed during pregnancy, few examples are intraosseous, vertebral, paravertebral, and epidural veins. A prospective, randomized controlled study was done after obtaining the approval of institutional Ethics committee to compare the hemodynamic changes during lateral table tilt and supine position in women undergoing Caesarean section, in the Department of Anesthesiology. A total of 140 patients were enrolled for the study with the following inclusion and exclusion criteria. Mean time taken after spinal anesthesia to cause maximum fall in blood pressure before extraction in subjects in both group-L and group-S is 3.94±1.52 and 4.11±1.46 respectively. There was no statistically significant difference between the groups with a p value of .498and 95% confidence interval of -0.670 to 0.327.
Keywords: Tilted Posture, Lower Segment Caesarean Section, Spinal Anaesthesia

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INTRODUCTION

Mechanical pressure by the growing uterus in the 2nd and 3rd trimester causes aorta-caval compression in many pregnant women in supine posture, producing signs and symptoms of supine hypotension syndrome. The occurrence of supine hypotension syndrome is likely to be amplified by spinal anesthesia during LSCS (Lower Segment Cesarean Section), on account of peripheral venous pooling due to sympathetic paralysis. In severe cases it may jeopardize maternal and fetal hemodynamics. This is precluded by left uterine displacement by wedge under right hip or by table tilt of 15 degrees, because tipping point for IVC compression lies at 15 degrees, with an acceptable reduction if angle above this is achieved. Though these maneuvers are recommended theoretically, recent articles have suggested that aorta-caval compression may not be completely prevented by supine wedged or tilted position and only few obstetricians and anesthesiologists resort to them routinely.[1,2]

The gravid uterus begins to compress the IVC in the supine position beginning at approximately the 20th week of pregnancy, with obstruction becoming virtually complete at term. Blood returns from the lower extremities through the collaterals which are developed during pregnancy, few examples are intraosseous, vertebral, paravertebral, and epidural veins. But this collateral venous return is less than that would occur through the inferior vena cava (IVC). This leads to decrease in right atrial pressure. Inspite of it , 90% of women at term seem to be asymptomatic and hemodynamically stable in the supine position, due to the robustness of maternal intrinsic compensatory mechanisms like peripheral venoconstriction, which promotes venous return via collateral. This compensatory mechanism is blunted after administration of anesthesia, especially during subarachnoid block,which causes sympathectomy.[3,4]

In the supine position, the aorta is also compressed by the term gravid uterus,causing lower pressure in the femoral versus the brachial artery in the supine position.Lower extremity hypotension episodes were more frequent (25%–60%) than upper extremity hypotension (18%).These findings are consistent with angiographic studies in supine pregnant women, which show partial obstruction of the aorta at the level of the lumbar lordosis and enhanced compression during periods of maternal hypotension. But recent MRI findings do not suggest significant aortic compression by gravid uterus.[5]

At term, in the left lateral decubitus position there is less enhancement of cardiac sympathetic nervous system activity and less suppression of cardiac vagal activity than the supine or right lateral decubitus position. The supine position at term , leads to 10% to 20% decrease in stroke volume and cardiac output, which is consistent with the fall in right atrial filling pressure. Blood flow to upper extremities are normal,but uterine and lower extremity blood flow decreases by 20% and 50% respectively. The perfusion of the uterus is less affected than that of the lower extremities because compression of the vena cava does not obstruct venous outflow via the ovarian veins.[6]

Once the fetal head is engaged the adverse effects due to aortocaval compression is reduced. The sitting position can also cause aortocaval compression, with a decrease in cardiac output of 10%.Flexing the legs rotates the uterus to compress against the vena cava. Short intervals in the sitting position, such as occurs during epidural catheter placement, have no impact on uteroplacental blood flow.

The negative effect of aortocaval compression on uteroplacental perfusion is prevented by preferential perfusion of the placenta and by the venous drainage by ovarian veins.

METHODOLOGY

A prospective, randomized controlled study was done after obtaining the approval of institutional Ethics committee to compare the hemodynamic changes during lateral table tilt and supine position in women undergoing Caesarean section, in the Department of Anesthesiology. A total of 140 patients were enrolled for the study with the following inclusion and exclusion criteria.

INCLUSION CRITERIA

1. Singleton foetus (irrespective of parity)
2. Elective Caesarean section

EXCLUSION CRITERIA

1. Weight >90 kgs
2. Multiple pregnancy
3. Foetal distress
4. Diabetes (gestational diabetes / diabetes complicating pregnancy)
5. Hypertension (pregnancy induced hypertension/hypertension complicating pregnancy)
6. Hypotension
7. Heart disease

Informed consent was obtained from patients selected for the study. Patients are assured that, if hypotension is severe enough to jeopardize the well-being of mother /fetus, they will be promptly treated with suitable drugs and posture.

Detailed pre-anesthetic evaluation was done. Patient fulfilling the essential criteria are selected and are allocated to each of the 2 groups, Group S- supine position and Group L- Lateral table tilt, by computer generated random numbers. All patients are preloaded with Ringer's lactate solution (10 ml kg^{-1}) along with premedication of Metoclopramide (10 mg) i.v., Ranitidine (50) mg i.v., 15 minutes prior to surgery. Baseline blood pressure(BP) was measured in sitting position in right arm and then she is allowed to lie supine for 10 minutes and blood pressure was measured again in right arm. Any postural change in blood pressure is noted.

Subsequently, spinal anesthesia was given in sitting position at L3-L4 interspace with 26G Quinke’s spinal needle with 2ml inj. Bupivacaine heavy (0. 5%).Then according to allocated numbers, further study was conducted with standard ASA monitors with group S in supine position and group L in lateral table tilt of 15 degrees.

Sensory block was assessed at two minutes’ interval by using loss of sensation to touch using tooth pick. Time of onset of sensory blockade at T10 and maximum height of dermatomal block at 15 min was noted. Motor block was assessed by modified Bromate scale. APGAR score of newborn at one and five minutes after extraction was recorded.

RESULTS

The maximum fall in systolic and diastolic blood pressure from preoperative baseline figures in sitting posture, is calculated for the period before extraction. The corresponding value for the period after extraction is also calculated.

TABLE 1: Intraoperative maximum fall in blood pressure from baseline before and after extraction of baby

	MEAN MAXIMUM FALL IN INTRAOPERATIVE BLOOD PRESSURE					
	BEFORE EXTRACTION			AFTER EXTRACTION		
	Group-L	Group-S	P value	Group-L	Group-S	P value
SBP(in mmhg)	18.21 ± 12.69	20.61 ± 12.53	0.262	19.84 ± 13.01	23.60 ± 12.94	0.091
DBP(in mmhg)	14.49 ± 11.94	15.90 ± 13.36	0.510	14.49 ± 11.94	15.54 ± 14.07	0.478

Mean maximum fall in systolic pressure before extraction of baby in group-L and group-S was 18.21±12.69 and 20.61±12.53 respectively. There was no statistically significant difference between the groups with a p value of 0.262 and 95% confidence interval of -6.617 to 1.817.

Mean maximum fall in diastolic pressure before extraction of subjects in group-L and group-S was 14.49±11.94 and 15.90±13.36 respectively. There was no statistically significant difference between the groups with a p value of 0.510 and 95% confidence interval of -5.651 to 2.822.

Mean maximum fall in systolic pressure after extraction of subjects group-L and group-S was 19.84±13.01 and 23.60±12.94 respectively. There was no statistically significant difference between the groups with a p value of 0.091 and 95% confidence interval of -8.067 to 0.610.

Mean maximum fall in diastolic pressure after extraction of subjects in group-L and group-S was 14.49±11.94 and 15.54±14.07 respectively. There was no statistically significant difference between the groups with a p value of 0.478 and 95% confidence interval of -4.011 to 1.897.

In the subgroup of parturients who manifested supine hypotension syndrome perioperatively, there were no statistically significant changes in the mean maximum fall of systolic and diastolic blood pressure, before or after extraction of the baby in both the groups as shown in the following table.

TABLE 2: Intraoperative mean maximum fall in blood pressure from baseline before and after extraction of baby in supine hypotension subgroup

	MEAN MAXIMUM FALL IN INTRAOPERATIVE BLOOD PRESSURE (SUPINE HYPOTENSION SUBGROUP)					
	BEFORE EXTRACTION			AFTER EXTRACTION		
	Group-L	Group-S	P value	Group-L	Group-S	P value
SBP(in mmhg)	25.86 ± 7.64	23.00 ± 12.51	0.616	24.00 ± 9.12	28.71 ± 11.84	.420
DBP(in mmhg)	20.86 ± 12.06	17.14 ± 14.81	0.616	17.14 ± 12.03	26.43 ± 14.04	.209

TABLE 3: Mean time taken after spinal anesthesia to cause maximum fall in blood pressure before and after extraction

TIME TAKEN TO CAUSE MAX FALL IN BP	GROUP – L Mean ± SD	GROUP-S Mean ± SD	P Value
BEFORE EXTRACTION(in mts)	3.94±1.52	4.11±1.46	.498
AFTER EXTRACTION(in mts)	24.87±11.04	27.67±11.35	0.139

Mean time taken after spinal anesthesia to cause maximum fall in blood pressure before extraction in subjects in both group-L and group-S is 3.94±1.52 and 4.11±1.46 respectively. There was no statistically significant difference between the groups with a p value of .498and 95% confidence interval of -0.670 to 0.327.
Mean time taken after spinal anesthesia to cause maximum fall in blood pressure
after extraction in subjects in both group-L and group-S is 24.86±11.04 and 27.67±11.35 respectively. There was no statistically significant difference between the groups with a p value of .139 and 95% confidence interval of -6.558 to 0.930.
In the subgroup of parturients who manifested supine hypotension syndrome perioperatively, there were no statistically significant changes in the mean time taken after spinal anesthesia to cause maximum fall in blood pressure before and after extraction of the baby in both the groups as shown in the following table.

TABLE 4: Mean time taken after spinal anesthesia to cause maximum fall in blood pressure before and after extraction in supine hypotension subgroup

TIME TAKEN TO CAUSE MAX FALL IN BP	GROUP – L Mean ± SD	GROUP-S Mean ± SD	P Value
BEFORE EXTRACTION(in mts)	4.71±1.60	3.86±1.46	.317
AFTER EXTRACTION(in mts)	27.4±12.53	22.43 ± 7.06	0.403

TABLE 5: Hypotensive episodes

HYPOTENSIVE EPISODES	GROUP -L		GROUP - S	
	No. Of patients	Percentage	No. Of patients	Percentage
0	45	64.3%	50	71.4%
1	24	34.3%	18	25.7%
2	1	1.4%	2	2.9%

Hypotensive episodes were defined as fall in BP more than 20% from baseline . 45 patients in group-L and 50 patients in group-S didn't have hypotensive episodes.24 patients in group-L and 18 patients in group-S had 1 episode of hypotension.1 patient in group-L and 2 patients in group-S had 2 episodes of hypotension. There was no statistically significant difference between the groups with a p value of .517 and 95% confidence interval of -0.117 to 0.231.

TABLE 6: Hypotensive episodes before and after extraction

GROUP		**NO OF HYPOTENSIVE EPISODES**	**TOTAL**
L	BEFORE EXTRACTION	10 (38.46%)	26
	AFTER EXTRACTION	16 (61.53%)	
S	BEFORE EXTRACTION	8 (36.36%)	22
	AFTER EXTRACTION	14 (63.63%)	

The total number of hypotensive episodes in this series is 48, out of which 26 (54.16%) occurred in the group –L and 22 (45.83%) occurred in group –S.
In the group –L, out of 26 hypotensive episodes, 10 (38.46%) occurred before extraction of the baby and 16 (61.53%) occurred after extraction of the baby.
In the group –S, out of 22 hypotensive episodes, 8 (36.36%)occurred before extraction of the baby and 14 (63.63%) occurred after extraction of the baby.

TABLE 7: Hypotensive episodes in supine hypotension subgroup

HYPOTENSIVE EPISODES	GROUP -L		GROUP - S	
	No. Of patients	Percentage	No. Of patients	Percentage
0	3	42.85%	4	57.14%
1	3	42.85%	2	28.57%
2	1	14.28%	1	14.28`%

3 patients in group-L and 4 patients in group-S didn't have hypotensive episodes.3 patients in group-L and 2 patients in group-S had 1 episode of hypotension.1 patient in group-L and 1 patient in group-S had 2 episodes of hypotension.

TABLE 8: Hypotensive episodes before and after extraction of baby in supine hypotension subgroup

GROUP		NO OF HYPOTENSIVE EPISODES	TOTAL
L	BEFORE EXTRACTION	3 (60%)	5
	AFTER EXTRACTION	2 (40%)	
S	BEFORE EXTRACTION	1 (25%)	4
	AFTER EXTRACTION	3 (75%)	

The total number of hypotensive episodes in this subgroup is 9, out of which 5 (55.55%) occurred in the group – L and 4 (44.44%) occurred in group –S.
In the group –L, out of 5 hypotensive episodes, 3 (60%) occurred before extraction of the baby and 2 (40%) occurred after extraction of the baby.
In the group –S, out of 4 hypotensive episodes, 1 (25%) occurred before extraction of the baby and 3 (75%) occurred after extraction of the baby.

TABLE 9: Mean APGAR score at 1 and 5 minute

Variable	GROUP-L Mean ± SD	GROUP-S Mean ± SD	P Value
APGAR SCORE AT 1 MT	7.70±0.502	7.76±0.302	0.451.
APGAR SCORE AT 5 MT	9.00±0.000	9.00±0.00	

Mean APGAR score in 1 minute in subjects in both group-L and group-S is 7.70 ± 0.502 and 7.76 ± 0.302 respectively. There was no statistically significant difference between the groups with a p value of 0.451.
Mean APGAR score in 5 minute in subjects in both group-L and group-S is 9.00±0.00.
In 62(88.57%) cases surgeon's admitted that they were not uncomfortable with the left lateral table tilt position whereas in the rest (8- 11.42%), they found it uncomfortable.

DISCUSSION

Soft tissue anatomical studies in pregnant women conducted by Hirabayashi et al[7](1996) revealed that in the supine position, gravid uterus begins to compress IVC as early as 20th week of pregnancy, with almost complete obstruction at term. Angiographic studies done by Eckstein et al[8] showed that the term uterus also causes aortic compression. This aortocaval compression has been, for long, a topic of debate in uteroplacental perfusion.

It is believed that episodes of hypotension can be unpleasant for the mother and if prolonged, it can cause detrimental effect on the foetus. The dogma that LUD must be performed during caesarean delivery is codified in the 2016 Practice Guidelines for Obstetric Anaesthesia created by the American Society of Anaesthesiologists Task Force on Obstetric Anaesthesia and the Society for Obstetric Anaesthesia and Perinatology. Hence, it is a ubiquitous obstetric anaesthesia practice, to give left uterine displacement

to prevent aortocaval compression in parturients undergoing caesarean section. Various methods have been used to provide left uterine displacement, among which right lumbar wedge and left lateral tilt of operating table are commonly practised.

Newman et al[9] who observed 30 non-pregnant and 30 pregnant women, found that the left 15^0 tilted positions caused increase in cardiac output by 2.16% compared to the supine position (cardiac output was measured by transcutaneous aortovelography). Another study by Clark et al[10] (1991) in 10 normotensive primiparous patients between 36 and 38 weeks' gestation and between 11 and 13 weeks' post-partum showed that there was a mean 9% fall in cardiac output in the supine position and an 18% fall in standing posture, compared to left lateral tilted position. Hence they concluded that the cardiac output is better maintained in left lateral tilt position. Additional studies in early 1970-1990 corroborated with the above findings in parturients. They all attributed the increase in cardiac output to relief of aortocaval compression in left lateral position.

In the era of evidence based medicine, where clinical evidence seeks to question an established clinical practice, with patient concern as utmost importance, a fresh relook at postural intervention seems necessary. Bamber et al[11] in 2003, showed that there is no significant increase in CO from the supine position (mean 6.5 ±1.4 L/min) to left table tilt of 12.5° (mean 7.0 ± 1.6 L/min) and a more marked increase was noted in the full left lateral position (mean 7.7 ± 1.9 L/min). They derived this conclusion based on 33 pregnant women (at 38 to 40 weeks' gestational age), who were subjected to different degrees of right tilt, left tilt, and the supine position, in random order and their cardiac output was measured using thoracic bioimpedance. Hideyuki et al[12] in 2015 showed that aortic volume did not differ significantly between parturients and non-pregnant women in the supine position (12.7 ± 2.0 vs.12.6 ± 2.1ml; P = 0.95) but the Inferior vena cava volume in the supine position was significantly lower in parturients than in non-pregnant women (3.2 ± 3.4 vs.17.5 ± 7.8ml; P < 0.001). They also found that the aortic volume in parturients did not differ among left lateral tilt positions. Inferior vena cava volume in the parturients was not increased at 15° (3.0 ± 2.1 ml; P > 0.99), but was significantly increased at 30° (11.5 ± 8.6 ml; P = 0.009) and 45° (10.9 ± 6.8 ml; P = 0.015). They derived these results by their observation on magnetic resonance images of 10 singleton parturients at full term and 10 healthy non-pregnant women, in whom they measured the abdominal aorta and inferior vena cava volume between the L1–L2 disc and L3–L4 disc levels in both the supine and left-lateral tilt positions (15°, 30°, and 45°). The lateral tilt was maintained by insertion of a 1.5-m-long polyethylene foam placed under the right side of the parturients body.

CONCLUSION

- Magnitude of hemodynamic changes before and after extraction were similar in the two groups, even in parturients with known SHS.
- There was no difference in the newborn APGAR score.
- Technical preference of the operating team towards posture was equivocal.
- In view of these findings, ACOG practice guidelines recommending left lateral table tilt is debatable. The important rider for hemodynamic stability is optimum level of subarachnoid block with adequate dose of local anesthetic so as to curtail extensive sympathetic blockade.

REFERENCES

1. Lee A, Landau R. Aortocaval Compression Syndrome. Anesthesia & Analgesia. 2017;125(6):1975-1985.
2. Clark V, Velde M, Fernando R. Oxford textbook of obstetric anaesthesia. oxford university press; 2016.
3. Chestnut's Obstetric Anesthesia: Principles and Practice. 5th ed. Elsevier Health Sciences; 2014.
4. Robson SC, Hunter S, Boys RJ, Dunlop W. Serial study of factors influencing changes in cardiac output during human pregnancy. Am J Physiol 1989; 256:H1060.
5. Capeless EL, Clapp JF. Cardiovascular changes in early phase of pregnancy. Am J Obstet Gynecol 1989; 161:1449-53.
6. Laird-Meeter K, van de Ley G, Bom TH, et al. Cardiocirculatory adjustments during pregnancy—an echocardiographic study. Clin Cardiol 1979; 2:328-32.
7. Hirabayashi Y, Shimizu R, Fukuda H, et al. Soft tissue anatomy within the vertebral canal in pregnant women. Br J Anaesth 1996; 77:153-6.
8. Eckstein KL, Marx GF. Aortocaval compression and uterine displacement. Anesthesiology 1974; 40:92-6.
9. Newman B, Derrington C, Dore C. Cardiac output and the recumbent position in late pregnancy. Anaesthesia. 1983;38:332–335.
10. Clark SL, Cotton DB, Pivarnik JM, et al. Position change and central hemodynamic profile during normal third-trimester pregnancy and post partum. Am J Obstet Gynecol. 1991;164: 883–887.
11. Bamber JH, Dresner M. Aortocaval compression in pregnancy: the effect of changing the degree and direction of lateral tilt on maternal cardiac output. Anesth Analg. 2003;97:256–258.
12. 12.Higuchi H, Takagi S, Zhang K, Furui I, Ozaki M. Effect of lateral tilt angle on the volume of the abdominal aorta and inferior vena cava in pregnant and nonpregnant women determined by magnetic resonance imaging. Anesthesiology. 2015;122:286–293.