www.jmscr.igmpublication.org

Impact Factor 3.79
ISSN (e)-2347-176x

IGM Publication

Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

Comparison of Pelvic and Lumbar Wedges in Prevention of Hypotension in Patients Undergoing Caesarean Section Under Subarachnoid Block

Authors
Ashok Kulasekhar[1], Anand Subramaniam[2]
[1]Associate Professor, Department of Anesthesiology and Critical Care, CHRI
[2]Professor, Department of Anesthesiology and Critical Care, CHRI
Corresponding Author
Ashok Kulasekhar
Associate Professor, Department of Anesthesiology and Critical Care, CHRI
Email: *ashokk_dr@yahoo.com*

Abstract

A major cause of maternal hypotension during caesarean section is aorto caval compression.A randomised controlled trial was done to compare the effectiveness of tilt using wedges in the pelvic and lumbar regions for preventing hypotension following spinal anaesthesia for caesarean section. 60 parturients undergoing caesarean section were randomly assigned to 2 different wedged positions. After completion of the subarachnoid injecton, patient was placed with either a wedge under the right lumbar region [group 1, lumbar wedge], or under the right pelvis[group 2,pelvic wedge]. Systolic,diastolic and mean blood pressures and heart rate were recorded every 2 minutes after the subarachnoid block for the first 20 mts,thereafter15 mts till the end of surgery. Fall of Systolic blood pressure < 90 mm hg was treated with inj ephedrine 6 mg i.v. The obtained values were tested statistically using the students t test and chi square test. The incidence of hypotension was significantly higher in the pelvic group [25/30] than the lumbar group[6/30].Heart rate did not change significantly in either group.A lumbar wedge is more effective than a pelvic wedge in preventing hypotension following spinal anaesthesia for caesarean section.

Introduction

Caesarean section (cs) is a common surgical procedure done in women. The number of cs are increasing over the past years. In India it has risen from 3% in 1992-93 to 10% in 2005-06.[1]Both the techniques –subarachnoid block and general anesthesia are being used as anesthetic technique in cs ,However, regional is preferred because of the possibility of difficult airway, failed intubation and aspiration. Subarachnoid block is safe but is associated with its set of problems. Supine hypotension or aortocaval compression occurs because of the weight of the gravid uterus pressing on the inferior vena cava(IVC) .[2] Most pregnant women do not experience hypotension on assuming supine positons, However few women may experience hypotension, tachycardia, syncope, bradycardia and even arrest.[3]

Subarachnoid block with its associated sympathectomy will exacerbate the effects of supine hypotension.[4] This problem was countered by preloading with crystalloids, colloids, vasopressors and providing uterine displacement. Lateral tilt of the uterus was shown to decrease the IVC compression by the gravid uterus.[5] Lateral tilt was provided by giving table tilt[6,7],lumbar tilt by placing wedge under right lumbar region and pelvic tilt by placing wedge under the right gluteus maximus.[8,9]The effect of these maneuvers were variable. In this study we propose to compare the pelvic wedge with lumbar wedge in patients undergoing cs under subarachnoid block.

Aims and objectives of the study

To study and evaluate the haemodynamic effects and compare pelvic and lumbar wedge and its usefulness during caesarean section under spinal anesthesia

The parameters we observed in this study were

1. Maternal- Heart rate
   Systolic blood pressure
   Diastolic blood pressure
   Mean atrial pressure
2. Surgeon's comfort level during surgery

Materials & Methods

After receiving approval by the Institutional Ethical committee and written informed consent by the participants, 60 women scheduled for Elective and Emergency caesarean delivery were enrolled in this prospective computer generated randomized study into two groups.

Group 1: Lumbar wedge (n=30)

Group 2: Pelvic wedge (n=30)

Inclusion criteria:

ASA 1 and 2 patients

Exclusion Criteria

Patients not willing for spinal anesthesia

Patient with backache

Pregnancy induced hypertension

Diabetes complicating pregnancy.

Abruption placenta

Fetal distress

Monitoring

Electrocardiography and pulseoximetry will be monitored. The cuff of an automated noninvasive blood pressure (NIBP) device was attached to the right arm and monitored.

Methodology

Intravenous access will be secured with an 18-gauge cannula. Patients will be preloaded with 1 litre of ringer lactate.

60 patients undergoing caesarian section are randomly assigned in two groups of 30 each in group 1 & group 2.

Patient in lateral position, under strict aseptic precautions subarachanoid injection of bupivacaine 0.5% heavy 2ml given intrathecally with Quincke 27 gauge spinal needle using the midline technique at L2-L3 or L3-L4 level. Following which lumbar wedge is placed in 1 group and pelvic wedge is placed in 2 group respectively. The wedge dimension are 25 cm in length 10 cm height in the outer end 2 cm height in the inner end and angle of 20 degrees. It is made of firm rubber foam.

Heart rate, Systolic blood pressure& diastolic blood pressure are monitored for every 2 minutes for first 20 minutes from the time of subarachanoid injection thereafter every 15mins till the end of the surgery. When systolic blood pressure falls below 90mm hg inj.ephedrine 6mg iv is given.

The sensory block level was assessed separately on each side (right vs. left) using a pinprick test at 2-min intervals for 3min. The times from intrathecal injection to achieving the loss of sensory stimulation at the T6 level and to achieving the highest sensory level blocked were checked. BP and heart rate were evaluated every 2 min until delivery.

The incidence of nausea and vomiting during the intraoperative period was recorded. The time from completion of spinal induction to delivery and the time from skin incision to delivery were recorded.

The incidence of hypotension, ephedrine use,vomiting ,shivering and surgeon's comfort level during the procedure are recorded.

Statistical Analysis

The obtained values were analysed statistically using the independent sample t test and the chi square test with the spss(statistical package for social sciences) software

Observation

Table 1

Group Statisticspreoperative					
	Group	N	Mean	Std. Deviation	Std. Error Mean
Heart Rate	1	30	93.03	7.189	1.313
	2	30	91.40	4.868	.889
systolic	1	30	124.67	5.168	.944
	2	30	126.53	4.516	.825
diastolic	1	30	82.87	4.710	.860
	2	30	78.47	4.607	.841
mean	1	30	96.8000	4.57680	.83561
	2	30	94.0333	3.80698	.69506

Table 2

Independent Samples Test preoperative					
		Levene's Test for Equality of Variances		t-test for Equality of Means	
		F	Sig.	t	Df
Heart Rate	Equal variances assumed	6.476	.014	1.030	58
	Equal variances not assumed			1.030	50.972
systolic	Equal variances assumed	.710	.403	-1.490	58

	Equal variances not assumed			-1.490	56.975
diastolic	Equal variances assumed	.155	.696	3.658	58
	Equal variances not assumed			3.658	57.971
mean	Equal variances assumed	.175	.677	2.545	58
	Equal variances not assumed			2.545	56.138

When analysing the basal preoperative values between the two groups using the independent sample t test, we observed the following findings. The sig value of heart rate between the two groups were 0.014 which is greater than 0.05 and so not significant statistically.

The sig value of the systolic and diastolic blood pressure were 0.403 and 0.696 which again are greater than 0.005 and so statsistically not significant.

The sig value for the mean blood pressure between the two groups were 0.677 which is not statistically different.

Table 3

Group Statistics after loading					
	Group	N	Mean	Std. Deviation	Std. Error Mean
Heart Rate	1	30	93.30	7.415	1.354
	2	30	92.23	6.235	1.138
systolic	1	30	124.63	5.055	.923
	2	30	125.70	4.721	.862
diastolic	1	30	82.50	4.718	.861
	2	30	78.53	4.353	.795
mean	1	30	96.5444	4.56077	.83268
	2	30	94.2444	3.79345	.69259

Table 4

Independent Samples Testafterloading					
		Levene's Test for Equality of Variances		t-test for Equality of Means	
		F	Sig.	t	df
Heart Rate	Equal variances assumed	2.313	.134	.603	58
	Equal variances not assumed			.603	56.342
systolic	Equal variances assumed	.252	.617	-.845	58
	Equal variances not assumed			-.845	57.731
diastolic	Equal variances assumed	.002	.961	3.385	58
	Equal variances not assumed			3.385	57.628

mean	Equal variances assumed	.295	.589	2.124	58
	Equal variances not assumed			2.124	56.137

After preloading the sig value for heart rate between the two group is 0.134 which is below 0.05 and so statistically not significant.

After preloading the sig value for systolic, diastolic and mean pressure were 0.617,0.961 and 0.589. all three values are above 0.005 and hence not statistically significant.

Table 5

Group Statistics After sub arachnoid block					
	Group	N	Mean	Std. Deviation	Std. Error Mean
Heart Rate	1	30	95.03	7.659	1.398
	2	30	94.07	5.717	1.044
systolic	1	30	123.00	8.145	1.487
	2	30	124.40	6.484	1.184
diastolic	1	30	82.03	5.816	1.062
	2	30	77.97	5.007	.914
mean	1	30	95.6889	6.39440	1.16745
	2	30	93.4444	4.71919	.86160

Table 6

Independent Samples Test after sub arachnoid block					
		Levene's Test for Equality of Variances		t-test for Equality of Means	
		F	Sig.	t	Df
Heart Rate	Equal variances assumed	1.629	.207	.554	58
	Equal variances not assumed			.554	53.662
systolic	Equal variances assumed	.001	.977	-.737	58
	Equal variances not assumed			-.737	55.223
diastolic	Equal variances assumed	.652	.423	2.902	58
	Equal variances not assumed			2.902	56.745
mean	Equal variances assumed	.018	.894	1.547	58
	Equal variances not assumed			1.547	53.363

Immediately after subarachnoid block the sig value for the heart rate between the two groups was 0.207 and hence not statistically significant. The sig value for the systolic, diastolic and mean arterial pressure between the the two groups were 0.977, 0.423, and 0.894 which were not statistically significant.

Table 7

Group Statistics 2 mins					
	Group	N	Mean	Std. Deviation	Std. Error Mean
Heart Rate	1	30	93.73	8.839	1.614
	2	30	92.63	9.489	1.732
systolic	1	30	111.90	8.806	1.608
	2	30	113.67	10.094	1.843
diastolic	1	30	80.30	5.535	1.010
	2	30	74.17	6.849	1.250
mean	1	30	90.8333	5.55623	1.01442
	2	30	87.3333	7.34221	1.34050

Table 8

Independent Samples Test 2 mins					
		Levene's Test for Equality of Variances		t-test for Equality of Means	
		F	Sig.	t	Df
Heart Rate	Equal variances assumed	.119	.731	.465	58
	Equal variances not assumed			.465	57.711
systolic	Equal variances assumed	.884	.351	-.722	58
	Equal variances not assumed			-.722	56.952
diastolic	Equal variances assumed	3.962	.051	3.815	58
	Equal variances not assumed			3.815	55.553
mean	Equal variances assumed	5.284	.025	2.082	58
	Equal variances not assumed			2.082	54.012

2 minutes after the block the sig values between the lumbar wedge and the pelvic wedge group with respect to heart rate, systolic diastolic and mean arterial pressure were not significant.

Table 9

Group statistics 10 mins					
	Group	N	Mean	Std. Deviation	Std. Error Mean
Heart Rate	1	30	86.93	9.505	1.735
	2	30	97.50	9.145	1.670
systolic	1	30	96.73	4.961	.906
	2	30	97.30	8.945	1.633
diastolic	1	30	65.70	6.650	1.214
	2	30	67.43	5.575	1.018
mean	1	30	74.0111	7.98057	1.45705
	2	30	77.3889	5.95583	1.08738

Table 10

Independent Samples Test 10 minutes					
		Levene's Test for Equality of Variances		t-test for Equality of Means	
		F	Sig.	t	Df
Heart Rate	Equal variances assumed	.640	.427	-4.388	58
	Equal variances not assumed			-4.388	57.914
systolic	Equal variances assumed	1.340	.252	-.303	58
	Equal variances not assumed			-.303	45.301
diastolic	Equal variances assumed	.040	.841	-1.094	58
	Equal variances not assumed			-1.094	56.287
mean	Equal variances assumed	2.139	.149	-1.858	58
	Equal variances not assumed			-1.858	53.655

At 10 minutes the sig value for heart rate was 0.427 which is not significant. The sig value for the systolic diastolic and mean arterial pressure were 0.252, 0.841 and 0.149 and so statistically not significant.

Table 11

Group statistics 20 mins					
`	Group	N	Mean	Std. Deviation	Std. Error Mean
Heart Rate	1	30	87.50	6.761	1.234
	2	30	94.03	5.055	.923
systolic	1	30	110.37	6.105	1.115
	2	30	112.93	7.432	1.357
diastolic	1	30	74.07	4.748	.867
	2	30	74.13	4.855	.886
mean	1	30	86.1667	4.45045	.81254
	2	30	87.0667	5.32931	.97299

Table 12

Independent Samples Test 20 mins					
		Levene's Test for Equality of Variances		t-test for Equality of Means	
		F	Sig.	t	Df
Heart Rate	Equal variances assumed	.317	.576	-4.239	58
	Equal variances not assumed			-4.239	53.703
systolic	Equal variances assumed	.248	.620	-1.462	58
	Equal variances not assumed			-1.462	55.893
diastolic	Equal variances assumed	.054	.818	-.054	58

	Equal variances not assumed			-.054	57.972
mean	Equal variances assumed	2.155	.148	-.710	58
	Equal variances not assumed			-.710	56.213

at 20 minutes the sig value for the heart rate was 0.576 and the sig values for systolic diastolic and mean arterial pressure were 0.620,0.818 and 0.148 respectivelly which were above 0.005 and hence not significant.

Table 13

Independent Samples Test 50 mins					
		Levene's Test for Equality of Variances		t-test for Equality of Means	
		F	Sig.	t	Df
Heart Rate	Equal variances assumed	.186	.668	-3.305	58
	Equal variances not assumed			-3.305	57.539
systolic	Equal variances assumed	1.155	.287	-.858	58
	Equal variances not assumed			-.858	56.920
diastolic	Equal variances assumed	.084	.772	-1.040	58
	Equal variances not assumed			-1.040	57.857
mean	Equal variances assumed	.365	.548	-1.078	58
	Equal variances not assumed			-1.078	57.386

Table 14

Independent Samples Test 65 mins					
		Levene's Test for Equality of Variances		t-test for Equality of Means	
		F	Sig.	t	Df
Heart Rate	Equal variances assumed	.185	.669	-2.921	58
	Equal variances not assumed			-2.921	56.691
systolic	Equal variances assumed	1.099	.299	-2.080	58
	Equal variances not assumed			-2.080	54.350
diastolic	Equal variances assumed	1.340	.252	-.791	58
	Equal variances not assumed			-.791	57.551
mean	Equal variances assumed	.003	.954	-1.641	58
	Equal variances not assumed			-1.641	57.208

At 50 and 65 minutes also the sig values with respect to the heart rate, systolic, diastolic and mean arterial pressure between the two groups were not statistically significant

Table 15

Crosstab					
			Group		
			1	2	Total
hypotension	no	Count	24	5	29
		% within hypotension	82.8%	17.2%	100.0%
		% within Group	80.0%	16.7%	48.3%
		% of Total	40.0%	8.3%	48.3%
	yes	Count	6	25	31
		% within hypotension	19.4%	80.6%	100.0%
		% within Group	20.0%	83.3%	51.7%
		% of Total	10.0%	41.7%	51.7%
	Total	Count	30	30	60
		% within hypotension	50.0%	50.0%	100.0%
		% within Group	100.0%	100.0%	100.0%
		% of Total	50.0%	50.0%	100.0%

Table 16

Chi-Square Tests hypotension					
	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	24.093[a]	1	.000		
Continuity Correction[b]	21.624	1	.000		
Likelihood Ratio	26.053	1	.000		
Fisher's Exact Test				.000	.000
N of Valid Cases	60				
a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 14.50.					
b. Computed only for a 2x2 table					

In the lumbar wedge group 6 patients had hypotension requiring ephedrine top ups for increasing the blood pressure whereas 25 patients in the pelvic wedge group had hypotension requiring intervention. Analyzing the data using chi square test gives a p value of 0.00 which is less than 0.05 and so significant statistically. Patients in pelvic wedge group had statistically significant hypotension requiring intervention when compared to the lumbar group.

Figure 1

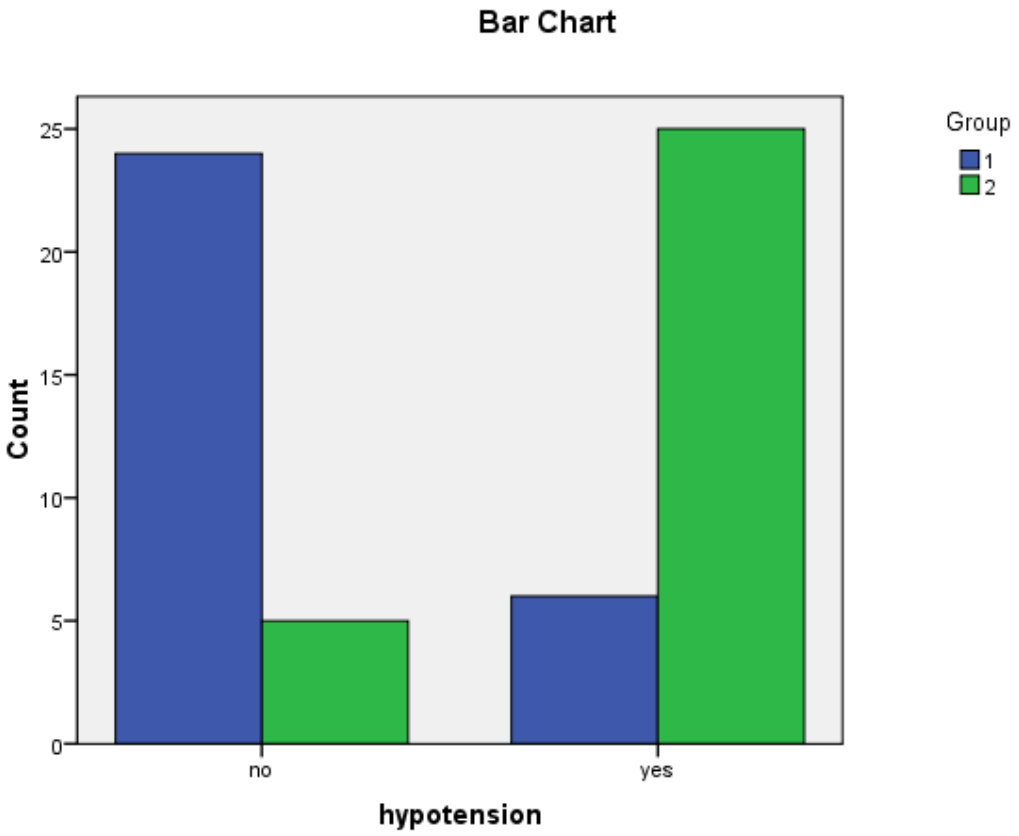


Table 17

Crosstab vomiting					
			Group		
			1	2	Total
vomiting	no	Count	28	20	48
		% within vomiting	58.3%	41.7%	100.0%
		% within Group	93.3%	66.7%	80.0%
		% of Total	46.7%	33.3%	80.0%
	yes	Count	2	10	12
		% within vomiting	16.7%	83.3%	100.0%
		% within Group	6.7%	33.3%	20.0%
		% of Total	3.3%	16.7%	20.0%
	Total	Count	30	30	60
		% within vomiting	50.0%	50.0%	100.0%
		% within Group	100.0%	100.0%	100.0%
		% of Total	50.0%	50.0%	100.0%

Table 18

Chi-Square Tests vomiting					
	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	6.667[a]	1	.010		
Continuity Correction[b]	5.104	1	.024		
Likelihood Ratio	7.162	1	.007		
Fisher's Exact Test				.021	.011
N of Valid Cases	60				
a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.00.					
b. Computed only for a 2x2 table					

2 patients in the lumbar wedge group had vomiting which is 16.7% compared to 10 patients in the pelvic wedge group which is 33.3%. the p value using the pearson chi-square test is 0.010 Which is above 0.05 and so not statistically significant.

Figure 2

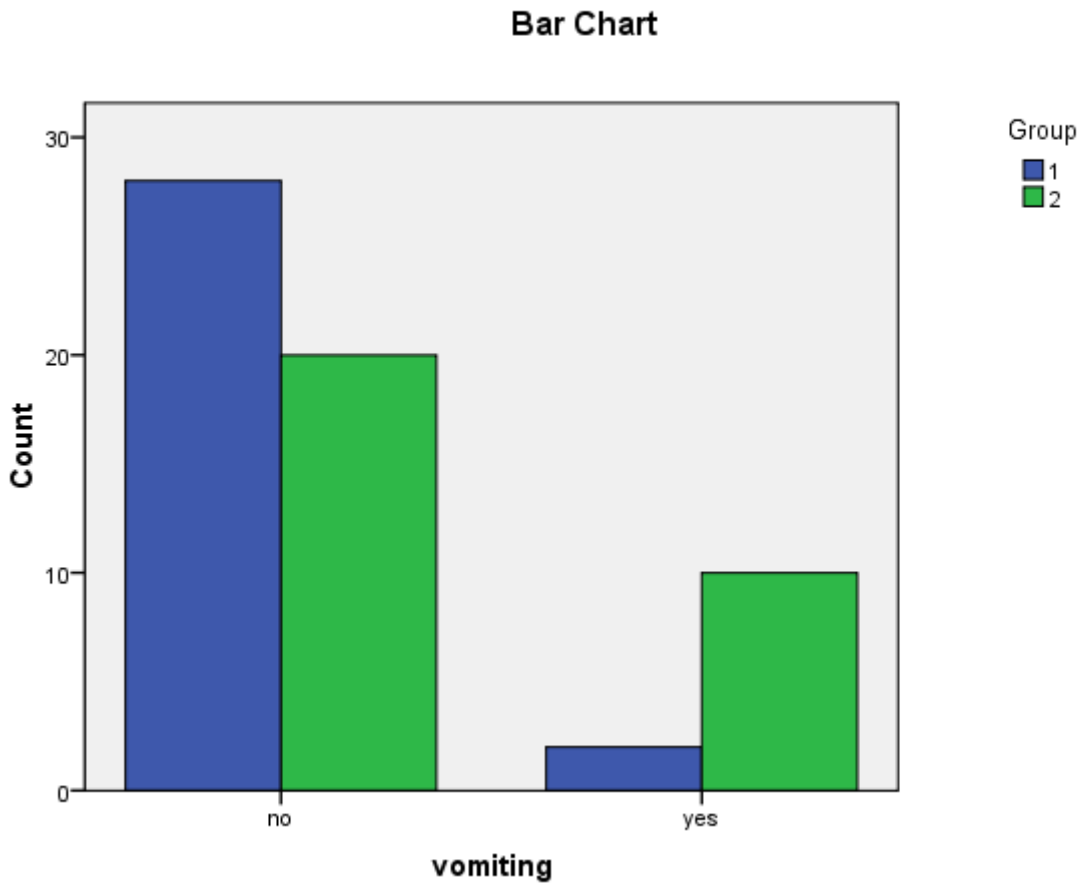


Table 19

Crosstab shivering					
			Group		
			1	2	Total
shivering	no	Count	20	13	33
		% within shivering	60.6%	39.4%	100.0%
		% within Group	66.7%	43.3%	55.0%
		% of Total	33.3%	21.7%	55.0%
	yes	Count	10	17	27
		% within shivering	37.0%	63.0%	100.0%
		% within Group	33.3%	56.7%	45.0%
		% of Total	16.7%	28.3%	45.0%
	Total	Count	30	30	60
		% within shivering	50.0%	50.0%	100.0%
		% within Group	100.0%	100.0%	100.0%
		% of Total	50.0%	50.0%	100.0%

Table 20

Chi-Square Tests shivering					
	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3.300[a]	1	.069		
Continuity Correction[b]	2.424	1	.119		
Likelihood Ratio	3.332	1	.068		
Fisher's Exact Test				.119	.059
N of Valid Cases	60				
a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 13.50.					
b. Computed only for a 2x2 table					

10 patient in the lumbar wedge group had shivering compared to 17 patient in the pelvic wedge group. The pearsons chi square test value is 0.069 which is not statistically significant.

Figure 3

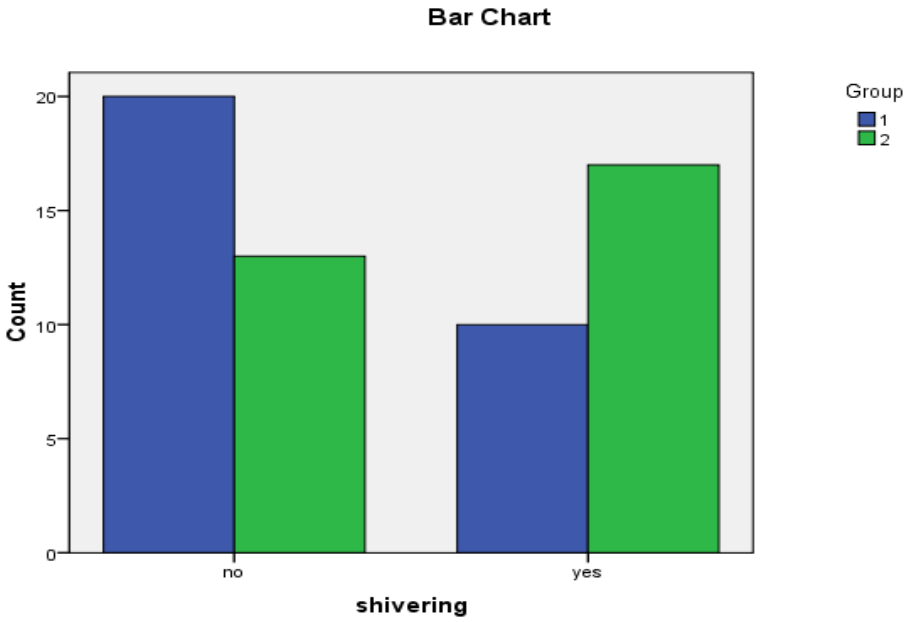


Table 21

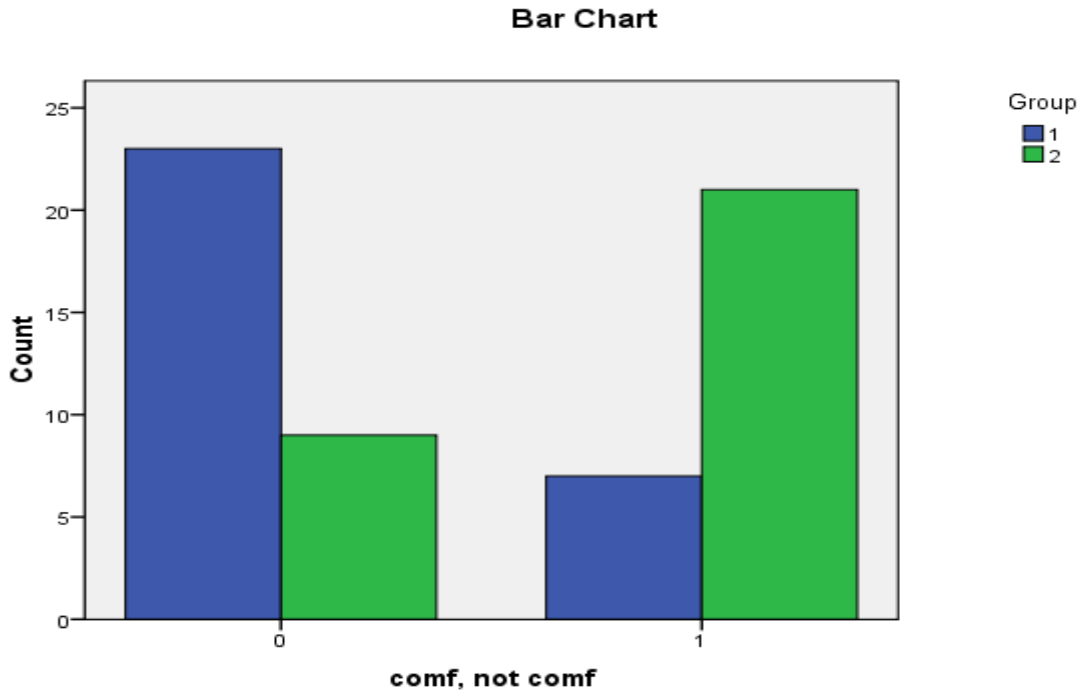
Crosstab surgeon comfort					
			Group		
			1	2	Total
comf, not comf	0	Count	23	9	32
		% within comf, not comf	71.9%	28.1%	100.0%
		% within Group	76.7%	30.0%	53.3%
		% of Total	38.3%	15.0%	53.3%
	1	Count	7	21	28
		% within comf, not comf	25.0%	75.0%	100.0%
		% within Group	23.3%	70.0%	46.7%
		% of Total	11.7%	35.0%	46.7%
	Total	Count	30	30	60
		% within comf, not comf	50.0%	50.0%	100.0%
		% within Group	100.0%	100.0%	100.0%
		% of Total	50.0%	50.0%	100.0%

Table 22

Chi-Square Tests surgeon comfort					
	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	13.125[a]	1	.000		
Continuity Correction[b]	11.317	1	.001		
Likelihood Ratio	13.663	1	.000		
Fisher's Exact Test				.001	.000
Linear-by-Linear Association	12.906	1	.000		
N of Valid Cases	60				
a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 14.00.					
b. Computed only for a 2x2 table					

With respect to the comfort level of the surgeon, 23 surgeons in the lumbar wedge group were comfortable with the wedge in position during the surgery, where as 21 surgeons in the pelvic wedge group were uncomfortable with the pelvic wedge in position during the surgery.

Figure 4



Discussion

Cochrane collaboration review suggests that there is limited evidence to support or clearly disprove the value of tilting the table, the use of wedges and mechanical displacers, and that larger studies are needed.[10] In our study, we found that placing a lumbar wedge produced fewer chances of hypotension, whereas patients with pelvic wedge had more hypotension requiring more ephedrine injection for increasing the blood pressure. Zhou ZQ et al in there randomized controlled clinical trial of 60 patients undergoing elective caesarean found that pelvic wedge produced more hypotension and requiring more ephedrine when compared to the lumbar group.[8]

J.A. Calvache et al studied 80 elective patient undergoing caesarean surgery under spinal anesthesia using either a lumbar-pelvic wedge or supine position. they found that lumbar-pelvic wedge was not effective in reducing the incidence of hypotension compared to the supine group however the chance of nausea was significantly reduced. Our study showed that the chance of nausea and vomiting was not significantly different between the lumbar and pelvic wedge group. When comparing the surgeon's comfort with respect to the wedge in position, they were more comfortable with the lumbar wedge and did find it difficult with patient position for surgery in the pelvic wedge group.

The drawback with our study was that the observer was not blinded to the study and we did not compare the supine position with the lumbar and pelvic wedge tilt.

Conclusion

In our study population we observed that lumbar wedge was better than pelvic wedge in preventing hypotension after sub arachnoid block in caesarean section and that surgeon's comfort was better with lumbar wedge..

Acknowledgments

Prof. Dr. Lailu Mathew. HOD, Dept. of Anesthesiology and critical care, Chettinad Hospital and Research Institute.

Prof Dr. K. R. Shivashankar. Senior professor, Dept. of Anesthesiology and Critical care, Chettinad Hospital and Research Institute.

Dr.Mohamed Arif .Post Graduate. Dept .of Anesthesiology and Critical Care, Chettinad Hospital and Research Institute.

References

1. IIPS and Macro International (2007): National Family Health Survey (NFHS-3),2005- 06, India, Vol. I andVol. II, International Institute for Population Sciences, Mumbai.
2. Holmes F .Spinal analgesia and caesarean section; maternal mortality. J ObstetGynaecol Br Emp *1957;64:229-32.*
3. Marx GF. Aortocaval compression syndrome: its 50 years history. IJOA. 1992;1:60–4.
4. Birnbach David J, Browne Ingrid M. Miller Ronald D, Eriksson Lars I, Fleisher Lee A, Wiener-Kronish Jeanine P, Young William L., editors. Anesthesia for Obstetrics, Miller's Anesthesia. 2009:1–64.

5. Ueland K, Novy MJ, Peterson EN, et al. Maternal cardiovascular dynamics. Part IV. The influence of gestational age on the maternal cardiovascular response to posture and exercise. Am J Obstet Gynecol. 1969;104:856.
6. Sprague DH. Effects of position and uterine displacement on spinal anaesthesia for caesarean section. Anesthesiology. 1976;44:164
7. Russel IF. Effect of posture during the induction of spinal anesthesia for caesarean section. Right vs left lateral. Br J Anaesth. 1987;59:342–6.
8. Zhou, Z.Q., Shao, Q., Zeng, Q., Song, J., Yang, J.J. Lumbar wedge versus pelvic wedge in preventing hypotension following combined spinal epidural anaesthesia for caesarean delivery. Anaesth Intensive Care.2008;36:835–839.
9. Calvache JA et al. Hemodynamic effects of a right lumbar–pelvic wedge during spinal anesthesia for cesareansection. Int J ObstetAnesthOctober 2011 Volume 20, Issue 4, Pages 307–311 .
10. Cluver C, Novikova N, Hofmeyr GJ, Hall DR. Maternal position during caesarean section for preventing maternal and neonatal complications. Cochrane Database Syst Rev 2010: