Original Article

# Comparison of induction of spinal anesthesia in sitting position with legs parallel and crossed for cesarean section: A randomized controlled trial

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## Abstract

**Background and Aims:** The position of the patient during subarachnoid block has a role in its success. Landmarks of the spine can be easily identified in sitting position. Sitting position with legs parallel (LPSP) produces a reversal of lumbar lordosis. The crossed-leg sitting position (CLSP) is an alternative position. In this study, we compared the ease of performing subarachnoid blocks in these two positions. The objectives were to compare the attempts at subarachnoid placement, patient comfort, ease of landmark palpation, level of block, hypotension, and neonatal outcomes.

**Material and Methods:** This randomized trial was performed in 80 parturients posted for elective cesarean section. Parturients were assigned randomly to two groups. In group LPSP, the subarachnoid block was performed in sitting position with legs parallel and in group CLSP in the CLSP with knees and hips flexed.

**Results:** The percentage of parturients with a successful subarachnoid block in the first attempt was higher in the CLSP than in LPSP group (87.5% versus 55%). The remaining 12.5% parturients in the CLSP group had successful block in the second attempt. In the LPSP group, 32.5% required two attempts and 12.5% required more than two attempts. This difference was statistically significant (*P*-value of 0.003). The landmark was easily palpable in 92.5 versus 67.5% of parturients in CLSP and LPSP, respectively, with a *P*-value of 0.014.

**Conclusion:** CLSP is better than a sitting position with legs parallel for reducing the number of attempts and improving the ease of performing the subarachnoid block.

**Keywords:** Caesarean, Pregnancy, sitting position, subarachnoid

## Introduction

The position of the patient during subarachnoid block has a major role in its success. Sitting or lateral positions are the standard positions used in parturients for subarachnoid blocks.[1,2] The landmarks of the spine can be easily identified in sitting positions and hence preferred in obese parturients.[3,4] Sitting position will reduce the lordosis of the spine seen in pregnancy and make spinal puncture easier. The crossed-leg sitting position (CLSP) is a recently recognized alternative position recommended for positioning during regional anesthesia.[5] The CLSP is a comfortable position, particularly during pregnancy. The CLSP is associated with

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hip and knee flexion, causing an increase in the degree of lumbar flexion making it easier to perform spinal anesthesia. In our study, we compared the ease of performing subarachnoid block with parturients sitting with the legs parallel (LPSP) on the table and sitting with legs crossed on the table. The hypothesis of this study is that CLSP would be a better position for subarachnoid block. The primary objective is the comparison of the number of attempts at subarachnoid placement in LPSP and CLSP. Secondary objectives are to compare the patient comfort in positioning, ease of landmark palpation, level of block, hypotension, the compared requirement of vasopressors, and neonatal outcomes in both groups.

## Material and Methods

This prospective randomized controlled trial was done in a tertiary care teaching hospital with approval from the institutional ethical committee [IEC-AIMS-2019-ANES-251 dated02-12-2019], Clinical Trial Registry of India registration[ CTRI/2020/01/022734, registered on 13-01-2020] and after attaining consent from parturients from March to December 2020. Term parturients with a singleton pregnancy between 18 and 40 years of age belonging to American Society of Anesthesiologists (ASA) physical classes II and III scheduled for elective cesarean section planned under subarachnoid block were recruited in this study. Parturients having an extreme height (<150 or >170cm), spinal deformity, difficulty in flexing knees, obesity with body mass index >30 kg/m$^2$, hypertensive disorders of pregnancy, diabetes mellitus, fetal abnormalities, and having any contraindication to spinal anesthesia were excluded from the study.

All parturients were premedicated with oral metoclopramide 10 mg and ranitidine 150mg on the night prior and the morning of surgery. In the operating room, an 18 gauge IV cannula was inserted and monitoring with noninvasive blood pressure, saturation and electrocardiography were established. Patients were coloaded with ringer lactate (10 mL/kg).Patients were randomly allotted to two groups, by a computer-generated random sequence of numbers, and concealment was achieved with sequentially numbered, sealed, opaque envelopes. Blinding was not done as it was not possible to blind the patient and anesthetist of the position taken to perform spinal anesthesia. Group LPSP patients were positioned in a sitting position with the legs parallel on the operating table and Group CLSP patients were in the CLSP with knees and hips flexed and legs under the contralateral thigh for subarachnoid block. The parturients were asked to arch their back and bend forward by hugging a pillow. Subarachnoid block was performed in the L3-4/L4-5 space by a single consultant anesthesiologist using a land mark technique, and hyperbaric bupivacaine (0.5%) 1.8mLwith 10μg of fentanyl was given intrathecally over 20s using 25guage Whitacre spinal needle. The number of attempts required to perform subarachnoid block was assessed and was graded as 1, 2, or >3. Redirecting the needle was considered a separate attempt. The difficulty of landmark palpation was classified to: easily palpable (lower border of the superior spinous process and the upper border of the inferior spinous process clearly palpable) –1, hardly palpable (lower border of the superior spinous process and the upper border of the inferior spinous process not palpable) –2, and impalpable (the spinous process could not be palpated) – 3. After injecting the spinal drug, parturients were placed in a supine wedged position. Pulse rate and blood pressure were monitored every 5 min for 15 min and then every 15 min up to 60 min. The level of sensory block achieved at 5 min, and the maximum level achieved was noted by loss of sensation to pinprick in the midline. Bradycardia (HR <50 bpm) was treated with intravenous 0.6 mg of atropine sulfate. Tachycardia was defined as HR >100bpm and hypotension as a decrease in systolic blood pressure greater than 20% from baseline. Intravenous phenylephrine 50μg was used to treat hypotension. Total fluid administered and total dose of phenylephrine used intraoperatively were noted. If the block up to T5 was not achieved in 20 min, general anesthesia was administered. Patient satisfaction was graded as 0–2 (0–not comfortable, 1– comfortable, and 2– very comfortable). The neonatal assessment was done by a pediatrician by Apgar scores at 1 and 5 min and by umbilical venous gas sampling.

### Statistical analysis

Based on the mean and standard deviation of the number of successful first attempts between CLSP (1.2 ± 0.4216) and LPSP (1.6 ± 0.6990) obtained from a pilot trial conducted with 10 samples in each group, with a 95% confidence interval and 80% power, the minimum sample size was 33 in each group. We enrolled 40 parturients in each group. Statistical analysis was done using IBM SPSS Statistics 20.0 Windows (SPSS Inc, Chicago, USA). Continuous variables were represented as mean and standard deviation and categorical as a percentage. The Pearson Chi-square test was used for finding associations between categorical variables. To test the statistically significant difference in the mean parameters between groups, an independent sample *t*-test was applied. All tests of statistical significance were two-tailed. A $P$-value < 0.05 was considered to be statistically significant.

## Results

Eighty parturients were recruited in this study [Figure 1]. The parturients in both the groups were comparable with

respect to the distribution of age, height, weight, and ASA physical status. All patients in both groups had a successful subarachnoid block, and there was no conversion to general anesthesia. The intravenous fluid and phenylephrine consumption intraoperatively were comparable between the groups [Table 1]. Heart rate and systolic blood pressure were comparable between the groups at all time points. There were no incidences of bradycardia requiring treatment in both groups. The percentage of parturients with the successful subarachnoid block in the first attempt was more in the CLSP than the LPSP group (87.5% versus 55%). The remaining 12.5% parturients in the CLSP group had a successful subarachnoid block in the second attempt. In the LPSP group, 32.5% required two attempts and 12.5% of parturients required more than two attempts. This difference was found to be statistically significant (*P*-value of 0.003). The landmark was easily palpable in 92.5% of parturients in the CLSP group and 67.5% in the LPSP group and this difference was statistically significant (*P*-value of 0.014). Positioning was not comfortable in 2.5 vs. 0%, comfortable in 92.5 vs. 85% and very comfortable in 5 vs. 15% in CLSP and LPSP groups, respectively, which was not statistically significant [Table 2]. The level of block achieved at 5 min, and the maximum level achieved was comparable between the groups [Table 3]. Intraoperative, postoperative side effects, fetal Apgar, and blood gases were comparable between the two groups [Table 4].

## Discussion

The subarachnoid block was successfully given to all the patients in both groups with no failure or conversion to general anesthesia. The CLSP was found to be an efficient and comfortable position for performing subarachnoid block in

**Table 1: Demographic data**

| Variables | CLSP (*n*=40) | LPSP (*n*=40) | *P* |
|---|---|---|---|
| Age in years (mean±SD) | 26.30±4.60 | 27.58±4.36 | 0.208 |
| Height in cm (mean±SD) | 155±5.38 | 155.33±6.15 | 0.852 |
| Weight in kg (mean±SD) | 69.7±5.74 | 68.68±7.56 | 0.908 |
| ASA *n* (%) | | | |
| 2 | 34 (85) | 33 (82.5) | 1.000 |
| 3 | 6 (15) | 7 (17.5) | |
| IVF *n* (%) | | | |
| 3 | 8 (20) | 11 (27.5) | 0.599 |
| 4 | 32 (80) | 29 (72.5) | |
| Phenyl ephrine *n* (%) | | | |
| 0 | 33 (82.5) | 31 (77.5) | 0.820 |
| 1 | 5 (12.5) | 7 (17.5) | |
| 2 | 2 (5) | 2 (5) | |

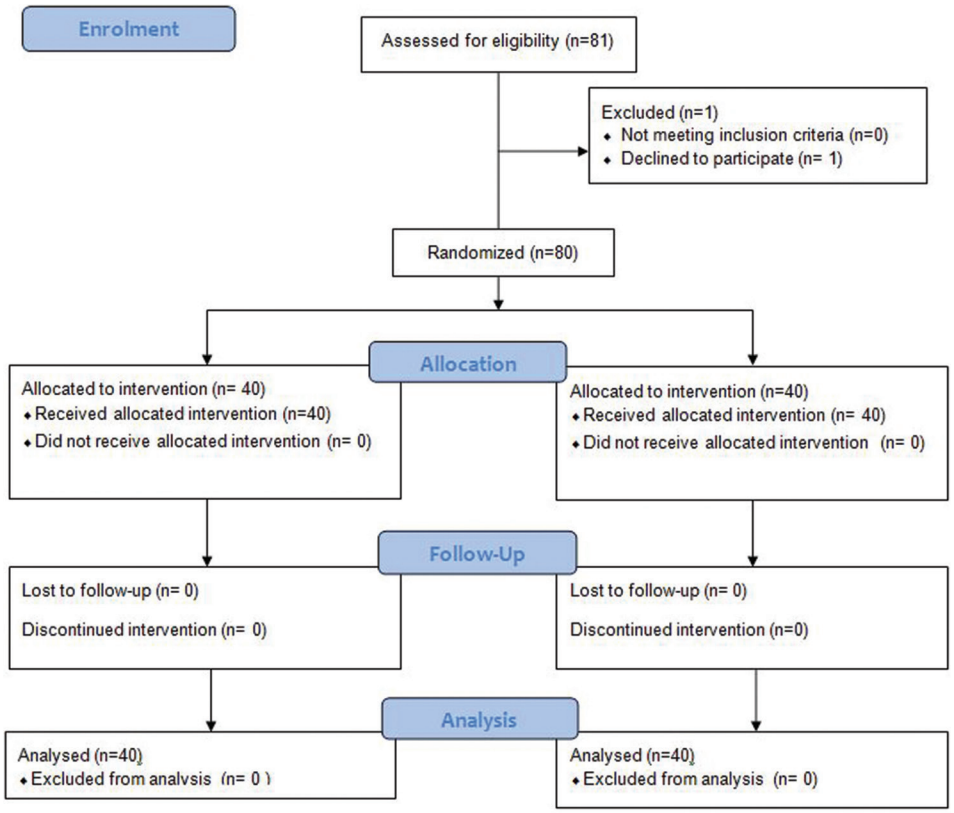


**Figure 1:** Consort flow diagram

parturients posted for cesarean section. CLSP made palpation of interspinous space easier, and the subarachnoid block was better achieved in the first attempt. Difficulty in performing the subarachnoid block increases as the depth of the subarachnoid space from the skin increases.[6,7] CLSP is found to produce an additional 10–15° of lumbar flexion than the other sitting positions [Figure 2].[8] This helps to move the spinal cord more superficially toward the midline, making it easier to perform the subarachnoid block.[9] The successful performance of the block in the first attempt is influenced by the ability to identify the landmarks and the provider's experience. Hence, all the subarachnoid blocks were performed by a single consultant anesthesiologist with adequate experience in performing subarachnoid blocks in parturients. In a study to find the best position for performing lumbar subarachnoid puncture by measuring the interspinous space by ultrasonography, it was observed that the space was more in sitting position than in lateral position.[10] On comparing the ease of performing subarachnoid block in sitting with the legs placed parallel on the operating table with the traditional sitting position with legs placed on a stool, it was observed that patients found legs placed on the operating table more comfortable.[11]

**Table 2: Block characteristics**

| Variables | CLSP *n*=40 | LPSP *n*=40 | *P* |
|---|---|---|---|
| Number of attempts *n* (%) | | | |
| 1 | 35 (87.5) | 22 (55) | 0.003 |
| 2 | 5 (12.5) | 13 (32.5) | |
| >3 | 0 (0) | 5 (12.5) | |
| Ease of insertion *n* (%) | | | |
| 1 | 37 (92.5) | 27 (67.5) | 0.014 |
| 2 | 3 (7.5) | 9 (22.5) | |
| 3 | 0 (0) | 4 (10) | |
| Satisfaction *n* (%) | | | |
| 0 | 1 (2.5) | 0 (0) | 0.209 |
| 1 | 37 (92.5) | 34 (85) | |
| 2 | 2 (5) | 6 (15) | |

**Table 3: Level of Block**

| Variables | CLSP *n*=40 | LPSP *n*=40 | *P* |
|---|---|---|---|
| Level achieved at 5 min *n* (%) | | | |
| 3 | 1 (2.5) | 3 (7.5) | 0.368 |
| 4 | 34 (85) | 33 (82.5) | |
| 5 | 2 (5) | 0 (0) | |
| 6 | 3 (7.5) | 4 (10) | |
| Maximum level achieved *n* (%) | | | |
| 3 | 3 (7.5) | 7 (17.5) | 0.310 |
| 4 | 37 (92.5) | 33 (82.5) | |

**Table 4: Foetal parameters**

| Variable | CLSP *n*=40 | LPSP *n*=40 | *P* |
|---|---|---|---|
| Apgar 1 | 8.10±0.304 | 8.05±0.221 | 0.402 |
| Apgar 5 | 9.00±0.000 | 9.00±0.000 | |
| Umbilical artery pH | 7.315±0.021 | 7.315±0.024 | 0.940 |

In a study comparing the number of attempts required to perform subarachnoid block between sitting straight and sitting flexed, it was observed that lesser attempts were required with flexed position. This difference was attributed to the difficulty in palpating the spinous process with a straight back.[12,13] Enlarged uterus and hyperlordosis of the lumbar spine make it difficult to position parturients for subarachnoid block. Suboptimal positioning can lead to multiple attempts to achieve successful subarachnoid block causing inconvenience and pain to already distressed parturients. Hence, various studies have been conducted to find out the optimal positioning technique which is comfortable to the parturient and increases the first attempt success. Compared to lateral position, parturients prefer sitting position and this was found to improve the success of performing the subarachnoid block.[3] There was no difference in the hemodynamic parameters with the use of two positions, and the vasopressor consumption was comparable between the groups. There were also no incidences of bradycardia requiring treatment in both groups. The crossed-leg position for performing the subarachnoid block in urology patients was associated with better first time needle placement, ease of landmark palpation and lesser needle bone contact than traditional sitting position.[6] In a previous study for performing labor epidural anesthesia, it was observed that the crossed-leg position was better than the traditional sitting position.[14] Both studies compared the crossed-leg position with legs on a stool. In this study, a comparison between CLSP and sitting with legs parallel on the operating table was performed because in both these positions the parturient could be made to lie supine immediately without much effort after the block. Moreover, in a study comparing traditional sitting positions with legs on a stool and legs parallel on the table, it was observed that patients found legs parallel positions more comfortable.[11]

Several studies have compared different modifications of sitting positions for ease of performing subarachnoid blocks. Modified sitting positions with knees flexed completely were found to be better than the traditional sitting position for performing the

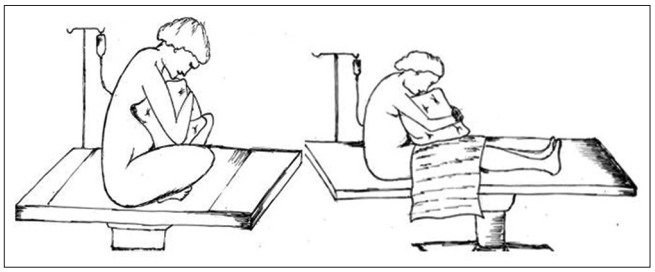

**Figure 2:** Crossed-leg sitting and traditional sitting position

subarachnoid block.[15] The squatting position was compared with the traditional sitting position and was found to produce less needle bone contact.[16] Pendant position with patient's underarms propped with a cantilever was compared with the traditional sitting position and was found to be better.[17] A 45° head-up tilt was found to make the performance of spinal anesthesia easier and comfortable in elderly patients.[18] In CLSP, there is the abduction of the thigh and crossing of legs with feet under the contralateral thigh leading to a larger surface area of contact with the theatre table making it a more stable position for parturients. It also provides additional space for the distended abdomen.

This study is limited by the fact that it is a nonblinded study and a single consultant anesthesiologist performed all the subarachnoid blocks. This could have resulted in bias. We suggest further studies with anesthesiologists with varying experience of performing the block and including obese parturients in whom positioning and performance of the subarachnoid block would be difficult.

## Conclusion

A CLSP is better than a sitting position with legs parallel for reducing the number of attempts and improving the ease of performing the subarachnoid block.

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Nil.

### Conflicts of interest
There are no conflicts of interest.

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