

# Comparison of cross-legged sitting position with the traditional sitting position for the ease of insertion of an epidural catheter in parturient for providing labour analgesia: A randomised control trial

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## ABSTRACT

**Background and Aims:** The patient's position during the insertion of the epidural catheter plays a major role in the success of labour analgesia. In our study, we compared the ease of insertion of the epidural catheter in either traditional sitting position (TSP) or crossed-legged sitting position (CLSP). The primary objective was to compare the number of successful first attempts at epidural placement between the groups. Secondary objective included patient comfort, ease of landmark palpation and the number of needle-bone contacts. **Methods:** The prospective non-blinded randomised control study was conducted on 50 parturient with uncomplicated pregnancy during active labour. Patients were randomly assigned into two groups using a computer-generated random sequence of numbers by closed envelope technique. Group TSP received epidural in a traditional sitting position and group CLSP received an epidural in a crossed-legged sitting position with knee and hip flexed. **Results:** The parturient in both groups were comparable with respect to the distribution of age, height, weight and parity. The baseline visual analogue score (VAS) and VAS scores at 15 min were comparable between groups. Percentage of a parturient with successful epidural placement in the first attempt was higher in CLSP group than in TSP group (88% versus 44%,  $P = 0.004$ ). The landmark, needle-bone contact and comfort during positioning were comparable between the two groups. **Conclusion:** Cross-legged sitting position is a better position than the traditional sitting position for the ease of insertion of labour epidural catheter.

**Key words:** Analgesia, epidural catheter, labour, pregnancy, sitting position

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## INTRODUCTION

The patient's position during the insertion of the epidural catheter plays a major role in the success of labour epidural analgesia.<sup>[1]</sup> The traditional sitting position (TSP) or lateral position is the standard position used for placing the epidural catheter for labour analgesia.<sup>[2,3]</sup> The crossed-legged sitting position (CLSP) is one of the alternative positions recommended for the administration of regional anaesthesia.<sup>[4,5]</sup> This position is easy and comfortable for Asian patients. The CLSP causes knee and hip flexion, resulting in an increase in the degree of lumbar flexion making it easier to perform spinal or epidural anaesthesia. In our study, we tried to compare the ease of insertion of the epidural catheter for providing

labour analgesia by placing parturient in either TSP or CLSP. The primary objective of our study was to compare the number of successful first attempts at labour epidural placement in TSP and CLSP position for providing labour analgesia. Secondary objectives included patient comfort in positioning, ease of

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landmark palpation and the number of needle-bone contacts in both groups.

## METHODS

This prospective randomised control open-label trial was conducted in a tertiary care teaching hospital from March-August 2019, after approval from the hospital ethics committee and obtaining written informed consent from 50 parturient with uncomplicated pregnancy in active labour. The study was registered with clinical trial registry-India (CTRI/2019/03/018062). ASA 2 parturient in active labour requesting labour epidural analgesia were included in this study. Uncooperative patients, a significant anatomical disorder of the spine and hip, wound/scar in the lumbar area and subjects with a body mass index (BMI)  $>35$  kg/m<sup>2</sup> were excluded from the study. The study was performed in accordance with the principles of the Declaration of Helsinki.

After attaching monitors (electrocardiogram, non-invasive blood pressure, saturation probe) and securing intravenous access, baseline visual analogue score (VAS) and vitals were noted. All patients were preloaded with 500 mL of ringer lactate. Patients were randomly assigned to two equal groups, using a computer-generated randomisation programme (<http://www.randomiser.org>) and allocation was performed by sequentially numbered envelopes that were handed over to the consultant anaesthetist. Parturient and the anaesthetist placing the epidural were not blinded to the group allocation as blinding was not possible. All procedures were performed by the same consultant anaesthetist. Group TSP patients received conventional labour epidural using an epidural kit (Portex, Smiths Medical, Czech Republic) in the traditional sitting position wherein the patient sat on the side of the bed with his or her feet propped up on a chair and hugging a pillow. Group CLSP patients received an epidural in a cross-legged sitting position with knee and hip flexed and hugging a pillow [Figure 1]. The epidural catheter was placed in L3-4 or L4-5 space using the loss of resistance technique and the catheter was threaded cephalad 5 cm into the epidural space. After negative aspiration of blood and CSF, as per our hospital protocol, 20 mL dose of the study medication (20 mL of 0.1% ropivacaine with 30 mcg of fentanyl) was administered in small aliquots. If analgesia was inadequate (VAS  $>4$ ) epidural was considered as a failure and catheter was recited/reinserted/rescue analgesia was provided. VAS score was assessed on a scale of zero (no pain) to ten (the worst imaginable pain). The successful first



**Figure 1:** Diagrammatic representation of traditional sitting and cross-legged sitting position

attempts at labour epidural placement, the proportion of successful epidural catheter placement, ease of landmark palpation and the number of needle-bone contacts in both groups were assessed. Withdrawing the needle up to the skin to change the direction of needle entry was also considered as an attempt. Difficulty of landmark palpation was classified as 1-easily palpable (the lower border of the superior spinal process and the upper border of the inferior spinal process clearly palpable), 2- hardly palpable (the lower border of the superior spinal process and the upper border of the inferior spinal process not palpable) and 3- impalpable (the spinal process could not be palpated). Patient comfort with positioning was assessed using score 0 and 1. A score of 0 was given if the patient was comfortable with the positioning and score 1 if any discomfort was experienced.

Based on the results of pilot study conducted with 10 patients in each group, to compare the percentages of attempts to achieve spinal between sitting (50%) and cross-legged sitting position (90%) for patients undergoing labour epidural, with 80% power and 95% confidence interval, the minimum sample size came to 38 (19 in each group). However, we enrolled 25 patients in each group to take care of any dropouts. Statistical analysis was performed using IBM SPSS 20.0 (SPSS Inc, Chicago, USA). Categorical variables were expressed using frequency and percentage and numerical variables expressed as mean and standard deviation. To obtain the association between categorical variables Chi-square test was applied. Independent sample *t*-test was used to compare the continuous variables. A *P* value  $<0.05$  was considered to be statistically significant.

## RESULTS

A total of 50 parturient were recruited in this study [Figure 2]. The parturient in both groups was comparable with respect to the distribution of age, height, weight and parity. The baseline VAS scores and VAS scores at 15 min were comparable between the two groups [Table 1]. Percentage of a parturient with the successful placement of epidural in the first attempt was higher in CLSP group than in TSP group (88% versus 44%). Remaining 12% parturient in CLSP group had a successful epidural placement in the second attempt. In TSP group 44% parturient required 2 attempts and 3% parturient required 3 attempts. This difference was statistically significant with a *P* value of 0.004 [Table 2]. About 84% of parturient did not have any needle bone contact in CLSP group whereas only 14% of parturient had no needle bone contact in TSP group. This difference was not statistically significant. The landmark was easily palpable in 84% of parturient in CLSP group and 68% in TSP group but this difference was not statistically significant. Around 92% of parturient in CLSP group found positioning during epidural very comfortable and 76% in group TSP found the positioning for epidural comfortable. This was also not found to be statistically significant [Table 3].

## DISCUSSION

The study is the first to use CLSP in the parturient. There was a 100% successful placement of epidural in both groups of patients. Among these, CLSP parturient had a significantly higher first-attempt success rate. Assessment of difficulty in performing neuraxial block

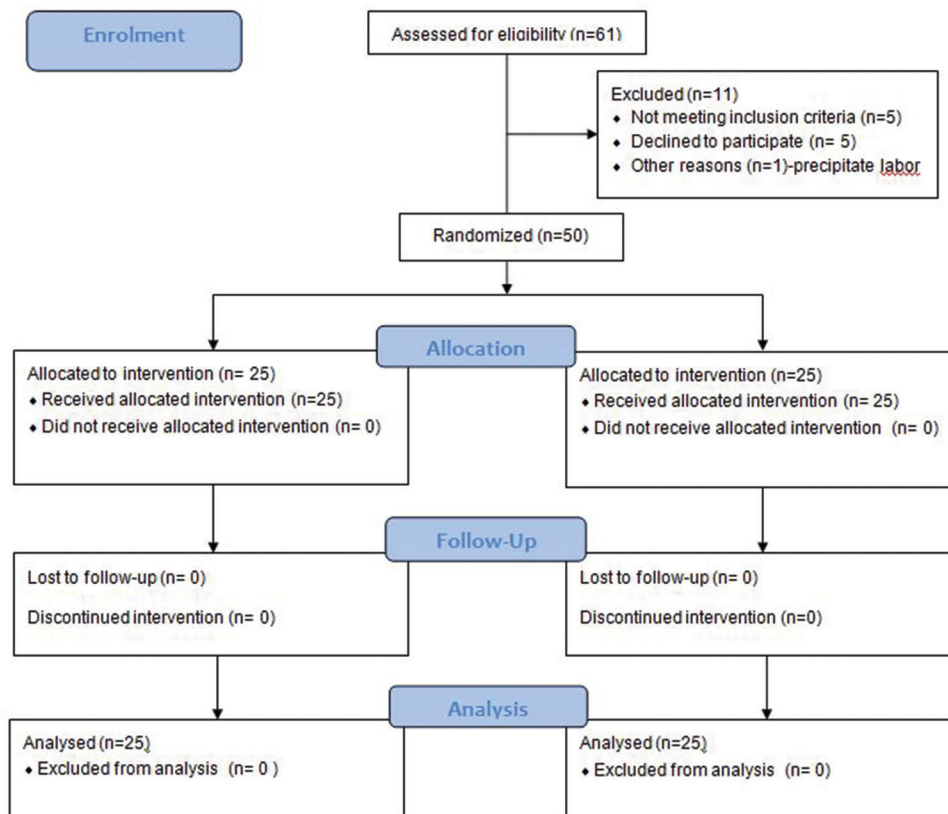
**Table 1: Demographic variables and pain score (VAS)**

Variable	Group CLSP (n=25) Mean±SD	Group TSP (n=25) Mean±SD	<i>P</i>
Age	26.88±3.972	27.48±4.312	0.611
Height	157.76±6.300	159.20±4.203	0.347
Weight	66.52±9.566	66.56±6.971	0.987
	Median (IQR)	Median (IQR)	
VAS0	9 (2)	9 (1)	0.760
VAS15	2 (2)	2 (1)	0.304

SD – Standard deviation, VAS 0 – Visual analogue score before epidural insertion, VAS 15 – Visual analogue score 1 min after epidural insertion. IQR – Inter quartile range

**Table 2: Comparison of the number of attempts required for successful epidural placement**

Number of attempts	Group		<i>P</i>
	CLSP (n=25)	TSP (n=25)	
1	22 (88%)	11 (44%)	0.004
2	3 (12%)	11 (44%)	
3	0	3 (12%)	



**Figure 2:** Consort flow diagram

**Table 3: Comparison of the number of needle bone contact, ease of landmark palpation and patient comfort with positioning**

Variable	Group CLSP		Group TSP		P
Needle bone contact	0	1	0	1	0.064
	21 (84%)	4 (16%)	14 (56%)	11 (44%)	
Land mark	1	2	1	2	0.321
	21 (84%)	4 (16%)	17 (68%)	8 (32%)	
Comfort	0	1	0	1	0.247
	23 (92%)	2 (8%)	19 (76%)	6 (24%)	

was found to be directly related to the distance from the skin to the subarachnoid or epidural space.<sup>[6]</sup> The CLSP was found to be associated with an additional 10–15° of lumbar flexion.<sup>[7]</sup> An optimal lumbar flexion will provide access to the inter-spinous gap by moving medulla spinalis to a more superficial position towards the midline.<sup>[4]</sup> On comparing the number of attempts required in placing a spinal block between sitting straight and sitting flexed, attempts required were less with a flexed position as an assessment of spinous process was difficult with straight back posture.<sup>[8]</sup>

In lateral position, parturient is expected to curve their backs without twisting and maintain this position even during a painful uterine contraction. Flexion of the back is often associated with discomfort to neck and pain over the abdomen as well as in knee joints.<sup>[9]</sup> Suboptimal positioning can cause multiple insertion attempts and painful bone contacts causing inconvenience and pain to the parturient.<sup>[10]</sup> Hence, placing an epidural catheter in a parturient in active labour is a challenge to the anaesthetist. Tan *et al.* compared the ease of insertion of combined spinal-epidural in sitting versus lateral position and found that first attempt success rate was better with sitting than lateral position.<sup>[11]</sup>

The sitting position is considered a comfortable position in the parturient. Even in sitting position adequate positioning of the patient is not possible because of an enlarged uterus and lumbar hyperlordosis.<sup>[12]</sup> Parturient finds CLSP more comfortable and stable as the larger surface area is in contact with the bed.<sup>[4]</sup> Moreover, our study was conducted among Indian population where cross-legged sitting position was traditionally followed for religious purposes such as offering prayers. Some of the parturients even insisted to continue sitting in this position even after the procedure. Landmark identification was easier and needle bone contact was less in CLSP than in TSP. Withdrawing the needle up to the skin to change the direction of needle entry was considered an additional attempt. This could have

resulted in a higher number of attempts noted in the conventional group. The successful location of the subarachnoid or the epidural space at the first attempt was influenced by the quality of patients' anatomical landmarks, the adequacy of patient positioning and the provider's level of experience.<sup>[13]</sup> In a study by Manggala *et al.*<sup>[4]</sup> on urology patients, first-time needle placement, ease of landmark palpation and needle bone contact were all slightly better with cross-legged than traditional sitting position but this difference was not found to be statistically significant. On the contrary, we could demonstrate a significant difference between the two groups. This could be because our patients were pregnant and cross-legged position allowed the patients to flex their back more effectively as the fetus was likely to descend more in this position.

TSP is associated with thigh adduction and hanging of the foot whereas in CLSP there is the abduction of the thigh and crossing of legs with feet under the contralateral thigh.<sup>[4]</sup> Several modified sitting positions were also tried for regional techniques. Pendant position (patients underarms propped up by a cantilever) was found to be better than traditional sitting position.<sup>[10]</sup> Modified sitting positions with knees flexed completely and each foot under the ipsilateral buttock, which was useful in painful perineal conditions was compared with TSP and was found to be better.<sup>[11]</sup> Squatting position (sits with their lower extremity fully flexed at hip and knee joint while hugging their knees and both buttocks) has been compared with TSP for ease of placement of spinal anaesthetic and was found to have less spinal needle bone contact.<sup>[8]</sup> Other positions tried for regional techniques with better success rate were modified 45° head-up tilt for lumbar puncture in elderly.<sup>[14]</sup>

The epidural pressure is more negative in the sitting position than in lateral position.<sup>[15]</sup> Hence sitting position is better in the detection of epidural space especially when hanging drop technique is used. In our study, we used the loss of resistance to air technique. Studies have shown controversial results regarding the incidence of PDPH following spinal anaesthesia in lateral and sitting positions.<sup>[16,17]</sup> However, we did not encounter any accidental dural tap or PDPH in both groups of patients. There were no complications reported in any of our patients related to the procedure. Neonatal monitoring was done by cardiotocography.

Sandovel *et al.* tried to determine the best position by assessing the width of the chosen interspace



by ultrasonography. The lateral position and two variations of sitting position with either foot supported or unsupported were studied. The authors concluded that sitting with feet supported provided the widest interspinous space which may favour more success rate for lumbar puncture.<sup>[18]</sup> On comparing sitting position with legs parallel versus sitting position with legs on a stool, Afolayan *et al.* found that patients were more comfortable in the leg parallel position but successful spinal needle placement in the first attempt was better with legs placed on a stool.<sup>[19]</sup> The cross-legged position allows sufficient space for the distended abdomen making the labouring mother more comfortable in this position and it does not hinder the progress of labour. Even during labour pains, patients are stable because of the larger surface area in contact with the bed. But precautions have to be taken and a person has to be entrusted the duty of positioning the patient. Epidural analgesia is given in the active phase of labour, so the risk of cord prolapse is minimised by the engaging head. There was no change in haemodynamics in this position.

This study has certain limitations as a single consultant anaesthetist performed all labour epidurals. Blinding and concealment were also not possible. All these could have resulted in bias. The success rates and comfort levels of different anaesthetists with varying experience were not studied. We suggest further studies on larger populations with varied ethnicities and obese patients.

## CONCLUSION

The cross-legged sitting position is a better position than the traditional sitting position for the ease of insertion of an epidural catheter in parturient demanding labour epidural analgesia.

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## Conflicts of interest

There are no conflicts of interest.

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