

A study of comparison between pre procedural ultrasound and real time ultrasound for spinal spaces

Raghu K C¹, Nagesh R^{2*}, Viswash G K³

¹Assistant Professor, Department of Anaesthesia, Akash Institute of Medical Sciences and Research Centre, Devanahalli, Bangalore, Karnataka- 562110, INDA.

²Consultant Anaesthesiologist, Kaveri Hospital, Bangalore, Karnataka, INDIA.

³Associate Professor, Department of Anaesthesia, SSIMSRC, Davanagere, INDIA.

Email: drnagesh.r17@gmail.com

Abstract

Background: Use of thoracic epidurals for intra- and post-operative analgesia for open abdominal surgeries has exponentially increased over the last decade. Spinal anaesthesia is used a landmark – guided midline approach, in these absent, indistinct or distorted in the presence of obesity, previous spinal surgeries, deformities, or degenerative changes associated with ageing. In the present study evaluates the efficacy of real-time ultrasound (RUS)-guided paramedian approach, and pre-procedure ultrasound (PUS) landmark-guided paramedian approach in obese persons. **Methods:** This is a Prospective Randomized Double-Blind Study conducted in Akash Institute of Medical Sciences and Research centre. Total 50 subjects (Group A – 25, Group B – 25). All the subjects included after informed consent, Along with Chest X-ray and ECG-for patients over 40 years of age. The primary end point was to attain a successful lumbar puncture. Variables like the number of attempts, the number of passes, the time taken for identifying landmark(s), and time for a successful lumbar puncture(s) were secondary end points and were recorded in both the groups. **Results:** This study was evaluated in real-time ultrasound (RUS)-guided paramedian approach, and pre-procedure ultrasound (PUS) landmark-guided paramedian approach in obese patients. There is a statistically high significant difference in PUS group than RUS Group. A P value < 0.002 is the statistically in between 2 groups. **Conclusion:** the space identification and number of attempts, passes and time consuming in pre procedure ultrasound when compared to real time ultrasound. This study suggest real time ultrasound is good for identification of space. **Key Words:** Real-Time Ultrasound (RUS), Pre-Procedure Ultrasound (PUS), ECG.

*Address for Correspondence:

Dr Nagesh R, Consultant Anaesthesiologist, Kaveri Hospital, Bangalore, Karnataka, INDIA.

Email: drnagesh.r17@gmail.com

Received Date: 05/04/2021 Revised Date: 12/05/2021 Accepted Date: 22/06/2021

DOI: <https://doi.org/10.26611/10151921>

This work is licensed under a [Creative Commons Attribution-NonCommercial 4.0 International License](https://creativecommons.org/licenses/by-nc/4.0/). 

Access this article online

| | |
|---|--|
| Quick Response Code: | Website: www.medpulse.in |
|  | Accessed Date: 02 August 2021 |

INTRODUCTION

The evaluating subarchanoid space achieved by particular anatomical landmarks and surrogate markers are important for particularly in obese patients as well as edema.¹ Landmark-based approaches do not take into account all anatomical variations or abnormalities, and frequently lead to incorrect identification of a given lumbar interspace.² Accurate identification of the subarachnoid space is paramount as multiple attempts at needle placement may cause patient discomfort, higher incidence of spinal hematoma postdural puncture headache and trauma to neural structures.³ Having alternative approaches may help improve success and mitigate the limitations of the current techniques. a real-time ultrasound guided approach may

further improve on the limitations of the ultrasound-assisted pre-puncture techniques⁴. In particular this technique avoids the potential for error in the process of having to “remember” the degree of cephalad to caudad and lateral to medial angulation required pre-puncture skin marking⁵. Although ultrasound (US)-guided regional anesthesia is well established, ultrasonography has been relatively underutilized in neuraxial anesthesia. This may be due in part to the fact that the vast majority of anesthesiologists master the conventional surface landmark-based techniques for spinal anesthesia with success rates approaching 96%. Information on the use of real-time ultrasound (RUS) guided spinal anaesthesia has, to date, been limited to case series and case reports and few prospective observational studies⁶⁻⁷. The RUS permits more accurate estimation of the appropriate needle insertion site and trajectory. There has been no study done to compare the efficacy of RUS-guided spinal⁸. This study evaluates the for identification of spaces in obese patients by using pre procedure ultrasound and real time ultrasound.

MATERIALS AND METHODS

This is a Prospective Study conducted in Akash Institute of Medical Sciences and Research centre. A total 70 subjects are included in this study and All the subjects were recruited in the study after obtaining their informed consent after obtaining of ethical clearance from the institute. Obese Patients with different disease and age more than 30 years were included in the present study. The inclusion criteria for the study were a diagnosis of according to the modified New York criteria and age ≥ 18 years. The exclusion criteria were difficulties in understanding the Swedish language, dementia and pregnancy. Patients with psoriasis or inflammatory bowel

disease (IBD) were also excluded in order to create a more homogenous cohort of patients with typical AS The following cardiovascular parameters were recorded in all patients “Heart rate [HR] in beats per minute, Systolic blood pressure [SBP] in mm of Hg , Diastolic blood pressure [DBP] in mm of Hg, Mean blood pressure[MBP] in mm of Hg”. By using pre procedure ultra sound and real time ultra sound also we compared in both the groups of the subjects. With this view it is possible to visualize the lamina, the intervertebral space, and the posterior longitudinal ligament vertebral body complex (seen as a white line deep in the intervertebral space). Unlike previous descriptions of real-time techniques, this maneuver provides an ergonomic advantage for simultaneous needle handling specifically because more room is created between the needle entry point and the bed surface. It also allows for a needle approach that more closely approximates the traditional paramedian technique as well as all the other advantages that a paramedian approach has been shown to afford when using neuraxial ultrasound. As anal maneuver the probe is moved towards the patient’s midline (craniomedial) in the same axis already established. The distance between skin and posterior complex and the angulation of the probe were noted in transverse view. Ultrasound depth (UD), i.e., the distance between skin and the ventral border of posterior complex was measured.

Statistical Analysis

The normal distribution of data checked by using Kolmogorov Smirnov test. All the characters descriptively summarized. The mean and standard deviation about the arithmetic mean were used. Dependent variables should be normally distributed . The Data was compiled in Microsoft excel spread sheets and analyzed using SPSS for windows version 16.0. A p value <0.05 was considered statistically significant.

RESULTS

Table 1: shows the data distribution all the parameters studied had at least one group with not normally distributed data. Hence, data was logarithmically transformed before applying parametric statistical tools.

Table 1: Showed a demographic characteristic’s of two groups of study subjects

| Parameter | Group 1 (n=25) | Group 2 (n=25) | Mean |
|-------------|-------------------|-------------------|--------|
| AGE | 34.32±3.43 | 42.64 ±3.01 | 0.643 |
| Height (cm) | 152.30±3.84 | 159.54±2.60 | 0.052* |
| Weight (kg) | 62.74±11.90 | 64.86±11.02 | 0.020* |
| BMI | 32.42 ±4.20 | 37.85 ±3.81 | 0.200* |

Table 2: shows the demographic and clinical characteristics of the subjects

| Parameter | Group 1 (n=25) | Group 2 (n=25) | Mean |
|---|-------------------|-------------------|-----------|
| Space identification time | 57.10±10.45 | 56.70±13.08 | <0.0001* |
| Total Number of passes of needle | 3.90±0.51 | 4.26±0.44 | <0.0001 * |
| Total time for successful lumbar puncture | 44.80±9.28 | 27.90±5.30 | <0.0001* |

DISCUSSION

Correct identification of the interspinous space is one of the important steps for successful spinal anaesthesia as it minimises the number of attempts, which in turn reduces the risk of spinal haematoma, post-dural puncture headache, trauma-to-neural structures and patient discomfort⁹⁻¹⁰. In our study, the success rate of correct identification of the subarachnoid space in parturients using ultrasound guidance on the first attempt was 96% which was similar to various other patient populations¹¹. Furthermore, the mean total number of attempts was significantly less in ultrasound group as compared to conventional group. This is in contrary to study done by which showed no significant difference in the total number of attempts. Grau *et al.* have also shown that use of real-time ultrasound guidance for combined spinal-epidural insertion in a younger obstetric population significantly reduced the number of needle passes required when compared to a traditional landmark-based approach¹². In our study, we found that the time taken for identification of the L3-L4 interspinous space was less in landmark-based technique as compared to ultrasound-guided identification of the interspinous space¹³⁻¹⁴. This may be due to difficulty in identifying a satisfactory acoustic window in ultrasound technique. Although the identification time was long in ultrasound group, the procedural time was significantly less in ultrasound group. Sahin *et al.* also showed that the total duration of the spinal procedure was shorter in the ultrasound group. In patients undergoing elective hip or knee joint replacements, routine use of pre-procedure ultrasound-guided paramedian spinal performed at the L5-S1 level did not reduce the number of passes or attempts required to achieve a successful spinal anaesthetic when compared to a conventional landmark-guided midline approach¹⁵⁻¹⁶. Third, as discussed earlier, neuraxial ultrasound has its own limitations in correctly identifying the L5-S1 interspinous space. However, all three anaesthesiologist performing the procedure were experienced in neuraxial ultrasound, having performed more than 100 neuraxial scans in this patient population before the study¹⁷. Finally, this study suggest that compared to using pre procedural ultrasound real time ultrasound is good approach for spinal spaces.

CONCLUSION

On the basis of the present observation it can be concluded that the space identification and number of attempts, passes and time consuming in pre procedure ultrasound when compared to real time ultrasound. This study suggest real time ultrasound is good for identification of space.

Acknowledgement

It is purely being done with the idea of research and all the cost of the study will be borne by the investigator.

REFERENCES

1. Chin KJ, Perlas A, Chan V, Brown-Shreves D, Koshkin A, Vaishnav V. Ultrasound imaging facilitates spinal anesthesia in adults with difficult surface anatomic landmarks. *Anesthesiology* 2011;115:94-101.
2. Conroy PH, Luyet C, McCartney CJ, McHardy PG. Real-time ultrasound-guided spinal anaesthesia: A prospective observational study of a new approach. *Anesthesiol Res Pract* 2013;2013:525818.
3. Lim YC, Choo CY, Tan KT. A randomised controlled trial of ultrasound-assisted spinal anaesthesia. *Anaesth Intensive Care* 2014;42:191-8.
4. Tan Y, Aghdasi BG, Montgomery SR, Inoue H, Lu C, Wang JC. Kinetic magnetic resonance imaging analysis of lumbar segmental mobility in patients without significant spondylosis. *Eur Spine J* 2012;21:2673-9.
5. Lee SH, Daffner SD, Wang JC. Does lumbar disk degeneration increase segmental mobility in vivo? Segmental motion analysis of the whole lumbar spine using kinetic MRI. *J Spinal Disord Tech* 2014;27:111-6.
6. Patil AD, Bapat M, Patil SA, Gogna RL. Spinal anesthesia using Taylor's approach helps avoid general anesthesia in short stature asthmatic patient. *Saudi J Anaesth* 2015;9:474-6.
7. Lim YC, Choo CY, Tan KT. A randomised controlled trial of ultrasound-assisted spinal anaesthesia. *Anaesth Intensive Care* 2014;42:191-8.
8. Sahin T, Balaban O, Sahin L, Solak M, Toker K. A randomized controlled trial of preinsertion ultrasound guidance for spinal anaesthesia in pregnancy: Outcomes among obese and lean parturients: Ultrasound for spinal anesthesia in pregnancy. *J Anesth* 2014;28:413-9.
9. Srinivasan KK, Leo AM, Iohom G, Loughnane F, Lee PJ. Pre-procedure ultrasound-guided paramedian spinal anaesthesia at L5-S1: Is this better than landmark-guided midline approach? A randomised controlled trial. *Indian J Anaesth* 2018;62:53-60.
10. Khemka R, Rastogi S, Desai N, Chakraborty A, Sinha S. Comparison of ultrasound imaging in transverse median and parasagittal oblique planes for thoracic epidurals: A pilot study. *Indian J Anaesth* 2016;60:377-81.
11. Chin KJ, Perlas A. Ultrasonography of the lumbar spine for neuraxial and lumbar plexus blocks. *Curr Opin Anaesthesiol* 2011; 24: 567-72.
12. Chin KJ, Perlas A, Chan V, Brown-Shreves D, Koshkin A, Vaishnav V. Ultrasound imaging facilitates spinal anesthesia in adults with difficult surface anatomic landmarks. *Anesthesiology* 2011; 115: 94-101.
13. Brinkmann S, Tang R, Vaghadia H, Sawka A. Assessment of a real-time ultrasound-guided spinal technique using SonixGPSTM in human cadavers. *Can J Anesth* 2012; 59: 1156-7.
14. Wong SW, Niazi AU, Chin KJ, Chan VW. Real time ultrasound guided spinal anesthesia using the SonixGPS—needle tracking system: a case report. *Can J Anesth* 2013; 60: 50-3.

15. Margarido CB, Arzola C, Balki M, Carvalho JC. Anesthesiologists' learning curves for ultrasound assessment of the lumbar spine. *Can J Anesth* 2010; 57: 120-6.
16. Salman A, Arzola C, Tharmaratnam U, Balki M. Ultrasound imaging of the thoracic spine in paramedian sagittal oblique plane: The correlation between estimated and actual depth to the epidural space. *Reg Anesth Pain Med* 2011;36:542-7.
17. Sahota JS, Carvalho JC, Balki M, Fanning N, Arzola C. Ultrasound estimates for midline epidural punctures in the obese parturient: Paramedian sagittal oblique is comparable to transverse median plane. *Anesth Analg* 2013;116:829-35.

Source of Support: None Declared
Conflict of Interest: None Declared

