Editorial

Ultrasound-guided central neuraxial block: Practice to curriculum?

Srinivasan Parthasarathy, Nishant Kumar[1], Indubala Maurya[2], J. Edward Johnson[3]

Department of Anaesthesiology, Mahatma Gandhi Medical College and Research Institute, Pondicherry, [1]Department of Anaesthesiology and Critical Care, Lady Hardinge Medical College and Associated Hospitals, New Delhi, [2]Department of Anaesthesiology, Kalyan Singh Super Speciality Cancer Institute, Lucknow, Uttar Pradesh, [3]Department of Anaesthesiology, Kanyakumari Government Medical College, Nagercoil, Tamil Nadu, India

Address for correspondence: Dr. Nishant Kumar, A 103, Urja Towers, Sector 47, Gurgaon, Haryana, India. E-mail: kumarnishant@yahoo.co.uk

Submitted: 27-Jul-2024
Accepted: 19-Aug-2024
Published: 14-Sep-2024

Access this article online

Website: https://journals.lww.com/ijaweb

DOI: 10.4103/ija.ija_777_24

Quick response code

Central neuraxial blockade (CNB) has been widely used as a single anaesthetic technique for perioperative surgical anaesthesia and pain management. Landmark-based CNB administration is the traditional method with surrogate endpoints, that is, free cerebrospinal fluid flow and loss of resistance for subarachnoid block and epidural space identification, respectively.

Previous studies have shown that ultrasound (USG)-guided CNB has higher success rates and fewer complications than the traditional landmark-based technique.[1,2] A meta-analysis of 16 randomised controlled trials found that USG-guided spinal anaesthesia resulted in a higher success rate for first-attempt needle insertion, lower incidence of postdural puncture headache and shorter procedure time than the landmark technique.[1] USG guidance during lumbar epidural anaesthesia reduced the number of attempts for successful placement, decreased the incidence of failed blocks and increased the quality of analgesia.[2]

USG for CNB allows better visualisation of vertebral anatomy and identification of anatomical landmarks, particularly in obese or pregnant patients where the traditional palpation approach can be challenging. USG can accurately identify the level of the epidural space and assess the thickness of the ligamentum flavum, which influences the depth and angle of needle insertion.[3] National Institute for Health and Care Excellence guidelines published in 2008 recommended the routine use of USG-guided administration of lumbar epidural labour analgesia in obese parturients. Moreover, USG can visualise the spread of local anaesthetic drugs in real time and allow for early detection of intravascular injection or accidental dural puncture.[4] Therefore, success rates and safety issues can be improved by adopting USG-guided techniques, which offer enhanced visualisation and real-time monitoring.

USG-guided CNB has been associated with reduced costs compared to the traditional technique. A study in Australia found that introducing USG-guided epidural anaesthesia in obstetric patients significantly reduced the total cost per procedure, including a decrease in the number of failed attempts, a reduction in the length of hospital stays and lower medication costs.[5] Economic savings might be alluring, but the requirement for equipment and training costs must be considered. Despite these, USG-guided CNB could potentially lead to cost savings for healthcare systems in terms of decreased complications and loss of person-hours.

Like the traditional landmark technique, USG-guided CNB is an art to master. Before one can embark on the journey to USG-guided CNB, one must be proficient

with the machine and the basics of ultrasonography. USG can only guide or locate the landmarks and confirm the position of the needle and/or catheter. The real-time visualisation of the needle *per se* is elusive for routine practice and remains for research purposes as of now.

The minimum knowledge that the students should possess includes understanding different views and the sono-anatomical knowledge of the spine and structures around it. The lamina, interlaminar space and possible path of spinal needles should be well defined. Students should also have sufficient manipulative skills to perform other blocks before performing neuraxial blocks. Furthermore, one needs to understand the sono-anatomy of the thoracic interspinous space and how to visualise the interlaminar space in the challenging spines for scoliosis. While it may seem attractive in developing countries like ours to learn in real-time practice rather than from manikins, simulation plays an important role. Simulation-based medical education increases knowledge, shortens the learning curve and gives teaching opportunities. The impact of online videos/tutorials, textbook material and academic lectures on achieving competency in the technical performance of a central neuraxial block is unknown. Simulation and USG manikins would undoubtedly add financial burden. As patient safety is paramount, skill labs are being made mandatory for medical colleges.[6-8] Students' performance in the USG simulation lab can be compared with real-time performance in the theatres, providing avenues for high-quality research in this field.

Incorporating USG training for CNB into the postgraduate medical curriculum will improve the competencies and skill sets of future anaesthesia professionals. With USG becoming increasingly popular across different specialities, teaching postgraduate students the fundamentals of USG could enhance their understanding of anatomy and their ability to use it in clinical practice. Moreover, training postgraduate students in USG for CNB could facilitate students' promotion of evidence-based, safe techniques.

Teaching USG-guided CNB to postgraduate students involves various obstacles. For novices, perfecting the technique necessitates extensive hands-on experience and expertise with ultrasonographic anatomy, which can be time-consuming. It has a high learning curve and necessitates intensive supervision by competent instructors, which might strain institutional resources. Variations in patient anatomy and placement may impede the learning process. Providing consistent, high-quality USG machines and teaching aids is also important, but funding constraints may limit options. Besides the above, integrating theoretical knowledge with practical skill development in an otherwise demanding postgraduate programme can be challenging. The number of CNBs performed primarily in obstetrics in countries like India poses a direct challenge to the regular usage of USG. A study by Rebel *et al*.[9] showed that a formal curriculum as part of anaesthesia training is required to achieve competency in USG-guided procedures. Thus, we must formulate a base standardised curriculum consisting of written material, teaching videos and simulation-based teaching to achieve CNB using the USG approach.

To conclude, USG-guided CNB has demonstrated benefits in terms of safety, success rates, patient outcomes and cost savings. Incorporating training in the postgraduate curriculum could significantly improve the standard of care for patients receiving CNB. However, the financial implications and training of trainers still pose an ardent threat to immediate universal inclusion despite the need. As USG becomes an increasingly valuable tool in clinical practice, early stepwise adoption of this technique in the postgraduate curriculum, fuelled by good-quality research, will enhance future anaesthesiologists' competency.

ORCID

Srinivasan Parthasarathy: https://orcid.org/0000-0002-3808-6722

Nishant Kumar: https://orcid.org/0000-0002-6064-3580

Indubala Maurya: https://orcid.org/0000-0002-3593-2313

J. Edward Johnson: https://orcid.org/0000-0002-9493-6330

REFERENCES

1. Guay J, Kopp S. Ultrasonography for central neuraxial blocks: A systematic review and meta-analysis. Anesth Analg 2015;120:868-83.
2. Coviello A, Iacovazzo C, Piccione I, Posillipo C, Barone MS, Ianniello M, *et al*. Impact of ultrasound-assisted method on success rate of spinal anesthesia performed by novice trainees: A retrospective comparative study. J Pers Med 2023;13:1515. doi: 10.3390/jpm13101515.
3. Chin KJ, Perlas A, Chan V, Brull R. Needle visualisation in ultrasound-guided regional anesthesia: Challenges and solutions. Reg Anesth Pain Med 2008;33:532-44.
4. Yoo S, Kim Y, Park SK, Ji SH, Kim JT. Ultrasonography for the lumbar neuraxial block. Anesth Pain Med (Seoul) 2020;15:397-408.

5. Tilleul P, Aissou M, Bocquet F, Thiriat N, le Grelle O, Burke MJ, *et al*. Cost-effectiveness analysis of the introduction of ultrasound-guided epidural anesthesia using likelihood ratios. Br J Anaesth 2013;110:259-67.
6. Niazi AU, Tait G, Carvalho JC, Chan VW. The use of an online three-dimensional model improves performance in ultrasound scanning of the spine: A randomised trial. Can J Anaesth 2013;60:458-64.
7. Hewson DW, Knudsen R, Shanmuganathan S, Ferguson E, Hardman JG, Bedforth NM, *et al*. Effect of mental rotation skills training on ultrasound-guided regional anaesthesia task performance by novice operators: A rater-blinded, randomised, controlled study. Br J Anaesth 2020;125:168-74.
8. Udani AD, Kim TE, Howard SK, Mariano ER. Simulation in teaching regional anesthesia: Current perspectives. Local Reg Anesth 2015;8:33-43.
9. Rebel A, Srour H, DiLorenzo A, Nguyen D, Ferrell S, Dwarakanatli S, *et al*. Ultrasound skill and application of knowledge assessment using an innovative OSCE competition-based simulation approach. J Educ Perioper Med 2016;18:E404.

How to cite this article: Parthasarathy S, Kumar N, Maurya I, Johnson JE. Ultrasound-guided central neuraxial block: Practice to curriculum? Indian J Anaesth 2024;68:849-51.