Commentary

Enhancing the safety of thoracic segmental spinal anaesthesia: Do's and don'ts

Submitted: 06-Feb-2025
Revised: 13-Mar-2025
Accepted: 19-Mar-2025
Published: 16-Apr-2025

Access this article online

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

DOI: 10.4103/ija.ija_157_25

Quick response code

Naresh W. Paliwal, Imran A. Khan[1]

Department of Anaesthesiology, Dr. Panjabrao Deshmukh Memorial Medical College, Amravati, Maharashtra, [1]KMC Medical College and Hospital, Maharajganj, Uttar Pradesh, India

Address for correspondence: Dr. Imran A. Khan,
Department of Community Medicine, KMC Medical College and Hospital, Maharajganj, Uttar Pradesh, India.
E-mail: ikhan0046@gmail.com

Since Dr. Andre van Zundert *et al.*[1] published his report on the successful use of thoracic segmental spinal anaesthesia (TSSA) in a patient with severe obstructive lung disease in 2006, there has been an increasing trend in its use for various types of surgical procedures in high-risk patients. TSSA gained significant attention as more evidence appeared in the literature encouraging the use of neuraxial techniques, including TSSA, over general anaesthesia for high-risk patients and procedures, especially during the coronavirus disease 2019 pandemic.[2,3] Since then, there have been vast numbers of publications and case reports documenting successful implementation in various types of abdominal, breast, thoracic and even upper extremity surgeries.[4,5] Its benefits over traditional lumbar spinal anaesthesia (LSA) include surgeries out of the domain of LSA, like upper abdominal, thoracic and breast surgeries, which can be done with just half the dose that is required at lumbar levels.[6] Because of lower doses of local anaesthetic (LA) and segmental block achieved, there are minimal haemodynamic fluctuations, early recovery, voiding and mobilisation.[7,8] TSSA is particularly valuable in high-risk patients with multiple comorbidities and pulmonary issues, and can prevent postoperative pulmonary complications and patients going on ventilatory support.[9] However, because of the unique anatomical and physiological considerations involved in TSSA, some precision and adherence to safety measures are required while performing TSSA [Table 1].

DO'S

Before proceeding, a thorough knowledge of the technique of TSSA is essential as to the technical difficulties, drug doses and sites of injection for various types of surgical procedures. Careful patient selection is a must; the indication of TSSA should match the surgical needs of the patient.[10] A thorough preoperative evaluation of comorbidities, drugs being taken, airway assessment or any previous neurological disorders is essential. Appropriate informed consent must be obtained beforehand. Interaction with the surgical team regarding the extent, duration, and mode of surgery is mandatory to choose the proper drug, dose, additive, and mode of TSSA. Because of the technical difficulties involved in TSSA, especially at mid-thoracic levels, in obese patients, patients with spine deformities or previous spine surgery, pre-procedural ultrasound scans or fluoroscopic guidance can be helpful for the safe performance of TSSA.[11] Always use the position to give the spinal position to which you are accustomed, including sitting or lateral positions. The choice of spinal needle depends on availability and expertise. Both pencil points and cutting needles can be used successfully

Table 1: Do's and don'ts of thoracic segmental spinal anaesthesia

Do's	Don'ts
Gain a thorough knowledge of TSSA technique, drug doses and complications	Do not use TSSA in the absence of a valid clinical indication
Carefully select patients according to surgical needs and valid indications	Do not be rough; advance the spinal needle gently and slowly
Conduct standard preoperative evaluation as done in any anaesthetic	Do not continue advancing if paraesthesia is observed; withdraw and redirect
Obtain informed consent after explaining the full details of TSSA	Do not exceed recommended LA doses to avoid complications
Use imaging guidance (ultrasound/fluoroscopy) in difficult cases	Do not use multiple or inappropriate additives
Choose an appropriate position for the successful conduct of the procedure (sitting/lateral)	Do not over-sedate, especially when using high thoracic blocks without an airway plan
Choose a suitable needle type based on expertise and availability	Do not use TSSA for superficial neck/upper limb surgeries
Consider combined spinal–epidural technique in expected prolonged procedures	Do not attempt TSSA in difficult airway patients without a backup airway plan
Use multimodal analgesia to provide adequate postoperative pain relief	Do not use paediatric TSSA unless experienced with paediatric regional anaesthesia

LA=local anaesthetic, TSSA=thoracic segmental spinal anaesthesia

for TSSA.[12] When combining TSSA with an epidural, a combined spinal epidural kit can be a safer option.[13] Intensive monitoring according to the needs of the patient and surgical procedure is vital for the safe conduct of TSSA. Facilities for invasive monitoring, high-flow nasal cannula, and difficult airway handling should be available as needed. The use of multimodal analgesia that will not cause postoperative nausea, vomiting, respiratory depression or urinary retention is valuable for the success of TSSA. Always prepare and keep your backup plan ready.

DON'TS

Unless there is a strong indication in favour of TSSA as the technique of choice in a particular patient, it should not be recommended as the primary mode of anaesthesia to the surgical team. While performing spinal anaesthesia at thoracic levels, exercise meticulous care and gentle technique, advancing the spinal needle millimetre by millimetre to ensure precision and minimise the risk of injury to the spinal cord. Do not proceed if the patient experiences the slightest of paraesthesia while advancing the spinal needle; withdraw the needle and change the direction while advancing slowly. Do not use higher than recommended doses of LA agents at higher thoracic levels to avoid undue respiratory and cardiac issues.[14] A high degree of precision is required in the selection of proper additives for LA agents; excessive doses and multiple additives may cause unnecessary complications and should be avoided. Excessive sedation with higher levels of blocks after TSSA should be avoided unless there is a plan to secure the airway with a supraglottic device or by other appropriate airway devices. Though it is possible to do superficial neck surgeries like thyroid surgery and upper extremity surgeries under TSSA, it is not recommended as there are safer and less invasive regional anaesthesia blocks available for such procedures.[15] In patients with an anticipated difficult airway, TSSA should not be used unless a definite plan and equipment are readily available to deal with difficult airways.

CONCLUSIONS

TSSA is emerging as a safe and effective alternative anaesthesia technique, particularly for high-risk patients. Its advantages, including effective analgesia, reduced motor impairment and better haemodynamic stability, make it a valuable anaesthetic modality in the anaesthesia armamentarium. However, it demands technical precision and has a steep learning curve. Failing to observe fine details may lead to inadvertent high spinal block, and technical difficulty in obese or anatomically challenging patients may arise. The scarcity of large-scale randomised clinical trials and systematic reviews limits the generalisability of available evidence. Hence, cautious adoption with adequate training and backup preparedness is essential. Adherence to best practices, including low-dose LA use, imaging guidance and continuous haemodynamic monitoring, minimises risks and enhances patient outcomes. With further research and clinical refinement, TSSA holds promise for broader application in diverse surgical settings.

Financial support and sponsorship
Nil.

Conflicts of interest

There are no conflicts of interest.

ORCID

Naresh Wamanrao Paliwal: https://orcid.org/0000-0001-7179-9196

Imran Ahmed Khan: https://orcid.org/0000-0002-0460-0754

REFERENCES

1. van Zundert AA, Stultiens G, Jakimowicz JJ, van den Borne BE, van der Ham WG, Wildsmith JA. Segmental spinal anaesthesia for cholecystectomy in a patient with severe lung disease. Br J Anaesth 2006;96:464-6.
2. Uppal V, Sondekoppam RV, Landau R, El-Boghdadly K, Narouze S, Kalagara HKP. Neuraxial anaesthesia and peripheral nerve blocks during the COVID-19 pandemic: A literature review and practice recommendations. Anaesthesia 2020;75:1350-63.
3. Khattab MFM, Sykes DAW, Abd-El-Barr MM, Waguia R, Montaser A, Ghamry SE, *et al*. Spine surgery under awake spinal anaesthesia: An Egyptian experience during the COVID-19 pandemic. Neurosurg Focus 2021;51:E6. doi: 10.3171/2021.9.FOCUS21456
4. Gautam SN, Yadav R, Khanal A, Dangol S. The safety and feasibility of segmental thoracic spinal anesthesia above the umbilicus and breast surgery. Nepal Med Coll J 2024;26:104-11.
5. Sertcakacilar G, Tire Y, Kelava M, Nair HK, Lawin-O'Brien ROC, Turan A, *et al*. Regional anesthesia for thoracic surgery: A narrative review of indications and clinical considerations. J Thorac Dis 2022;14:5012-28.
6. Kour L, Wani MA. Comparison of thoracic vs lumbar spinal anaesthesia for orthopaedic surgeries. Int J Res Med Sci 2019;7:2323-27.
7. Nagar S, Lohia R, Saluja V, Gupta S. Segmental spinal anaesthesia for routine surgeries: Efficacy and safety in ASA 1 and 2 patients-A case series study. Eur J Cardiovasc Med 2023;13:1736.
8. Singhal G, Kaur P. Comparison of hemodynamic changes in thoracic segmental spinal anaesthesia and general anaesthesia for laparoscopic cholecystectomy. Indian J Clin Anaesth 2024;11:125-31.
9. Aljuba YM, Alkadi AT, Hamamdh MG. Segmental thoracic spinal anesthesia for critical patients undergoing abdominal surgeries: A case series and literature review. Cureus 2024;16:e74348. doi: 10.7759/cureus.74348
10. Haloi P. Thoracic segmental spinal anesthesia for cesarean section in a parturient with atrial septal defect-A case report.: TSSA in ASD patient for LSCS. J Port Soc Anesthesiol 2024;33. doi: 10.25751/rspa.35006.
11. Elzohry AAM, Hegab AS, Khalifa OYA, Elhossieny KM, Abdel Hameed FAZH. Safety and efficacy of ultrasound-guided combined segmental thoracic spinal epidural anesthesia in abdominal surgeries and laparoscopic procedures: A prospective randomized clinical study. Anesth Pain Med 2024;13:e138825. doi: 10.5812/aapm-138825
12. Massoud TF, Lanzman BA. Alternative percutaneous dural puncture routes: Cervical, thoracic, lumbar, and sacral. Neuroimaging Clin N Am 2025;35:41-52.
13. Imbelloni LE, Gouveia MA, Ghorayeb NM, Neto SV. Spinal anesthesia: Much more than single shot of hyperbaric bupivacaine. Int J Anesthetic Anesthesiol 2021;8:122.
14. Khan IA, Ansari MA: Thoracic segmental anesthesia: A new paradigm in anesthesiology practice. Arch Anesth Crit Care 2023;10:203-4.
15. Singh AK, Khan IA. Thoracic segmental spinal anaesthesia for upper extremity surgery: A critical evaluation. Ain-Shams J Anesthesiol 2024;16:1-2.

How to cite this article: Paliwal NW, Khan IA. Enhancing the safety of thoracic segmental spinal anaesthesia: Do's and don'ts. Indian J Anaesth 2025;69:509-11.