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Review Article

The Difficult Neuraxial Block: When Should We Change Strategy? A Narrative Review of Recognition, Optimisation and Escalation

Dr. Sathya Narayan R [1*], Dr. Tripti Gautam [2]

[1] Senior Resident, Department of Cardiac Anaesthesia and Critical Care, All India Institute of Medical Sciences (AIIMS), Bhubaneswar, Odisha, India

[2] Junior Resident, Department of Anaesthesiology, All India Institute of Medical Sciences, Raipur, Chhattisgarh, India

Corresponding Author: * Dr. Sathya Narayan R

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Abstract

Background: Central neuraxial blockade is widely used for surgical anaesthesia and perioperative analgesia. However, anatomical variations, obesity, previous spinal surgery and operator-related factors can make neuraxial procedures technically challenging. Repeated needle insertions may increase patient discomfort and procedural difficulty, while delaying the establishment of an alternative anaesthetic plan.

Objective: This narrative review examines the recognition and management of difficult neuraxial procedures, with particular emphasis on when to stop repeated attempts and change strategy.

Methods: Relevant literature was reviewed using PubMed/MEDLINE and published reviews, systematic reviews, clinical studies and educational articles. Particular attention was given to the role of preprocedural ultrasound, alternative needle approaches, operator experience and the management of unsuccessful neuraxial procedures.

Discussion: Difficult neuraxial access should prompt early reassessment of patient positioning, anatomical landmarks and needle trajectory. Changing the interspace, adopting a paramedian approach, using preprocedural ultrasound and seeking assistance from an experienced anaesthesiologist are potential strategies. Evidence suggests that ultrasound improves first-attempt success and reduces the number of needle attempts, particularly in patients with anticipated difficult anatomy. However, there is no universally established maximum number of attempts applicable to every patient or neuraxial technique.

Conclusion: The decision to continue or abandon a difficult neuraxial procedure should be individualised. Repeated attempts without a meaningful change in strategy should be avoided. A structured escalation approach may improve procedural success, patient comfort and overall safety.

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KEYWORDS: Difficult neuraxial block; spinal anaesthesia; epidural anaesthesia; ultrasound; paramedian approach; failed neuraxial block; procedural escalation.

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1. INTRODUCTION

Central neuraxial blockade, including spinal, epidural and combined spinal–epidural techniques, remains an essential component of modern anaesthetic practice. These techniques provide effective surgical anaesthesia and perioperative analgesia across obstetric, orthopaedic, urological and general surgical procedures.

Traditionally, neuraxial procedures are performed using surface anatomical landmarks, tactile feedback and the identification of the epidural or subarachnoid space. Although this approach is effective in most patients, technical difficulty may arise when anatomical landmarks are poorly palpable or the normal spinal anatomy is altered.

Obesity, spinal deformity, previous spinal surgery, degenerative spinal changes and inadequate patient positioning can make needle insertion challenging. In addition, operator experience and the choice of approach may influence procedural success.

Repeated needle insertions may increase patient discomfort, procedural time and tissue trauma. They may also make subsequent attempts more difficult because of local tissue changes, bleeding or loss of clear anatomical orientation.

The increasing availability of neuraxial ultrasound has introduced an additional method for identifying the midline, intervertebral space, needle insertion point and estimated depth of the neuraxial space.

Although several techniques are available to overcome difficult neuraxial access, an important practical question remains: when should the anaesthesiologist stop repeating needle attempts and change strategy?

This review discusses the recognition, optimisation and escalation of difficult neuraxial procedures, with emphasis on a structured approach to avoiding repeated unsuccessful attempts.

2. METHODS OF LITERATURE SEARCH

A narrative literature search was conducted using PubMed/MEDLINE and relevant published journal articles. Search terms included combinations of "difficult neuraxial block", "difficult spinal anaesthesia", "difficult epidural placement", "ultrasound-guided neuraxial blockade", "preprocedural ultrasound", "paramedian approach", "multiple needle attempts" and "failed spinal anaesthesia".

Relevant systematic reviews, meta-analyses, randomised controlled trials, observational studies and narrative reviews were considered. Particular attention was given to studies evaluating ultrasound-assisted neuraxial techniques, procedural success, needle passes, patient discomfort and the management of technically difficult procedures.

This was a narrative review and not a formal systematic review. No formal PRISMA selection process, independent duplicate screening or quantitative meta-analysis was undertaken.

3. UNDERSTANDING DIFFICULT NEURAXIAL ACCESS

A difficult neuraxial procedure may be characterised by difficulty identifying the appropriate intervertebral space, repeated bone contact, inability to advance the needle through the intended trajectory, difficulty identifying the epidural or subarachnoid space, or failure to obtain the desired block despite apparently successful needle placement.

It is important to distinguish between:

- Difficult access: Difficulty reaching the intended neuraxial space.
- **Failed access:** Inability to obtain successful needle placement despite appropriate attempts.
- **Failed block:** Inadequate sensory or motor blockade despite apparently successful drug administration.
- **Inadequate duration or spread:** A block that is initially successful but does not provide sufficient anaesthesia for the intended procedure.

These situations require different responses. A technically difficult spinal puncture should not be confused with pharmacological failure of an established neuraxial block.

3.1. Anatomical factors

Several anatomical factors can contribute to difficult neuraxial access:

- Obesity and increased soft-tissue depth.
- Poorly palpable spinous processes and iliac crests.
- Scoliosis and spinal rotation.
- Degenerative spinal disease.
- Narrowed interspinous spaces.
- Previous spinal surgery and altered anatomy.
- Ossification or calcification of spinal ligaments.

In patients with altered anatomy, the assumed location of the midline and intervertebral space based on surface palpation may not correspond accurately to the actual anatomical position.

3.2. Patient positioning

Appropriate positioning is essential for successful neuraxial access. Inadequate lumbar flexion, inability to maintain the sitting or lateral position and patient discomfort may reduce the available interspinous space.

Positioning should therefore be reassessed before repeating needle insertion.

3.3. Operator-related factors

Experience influences the ability to interpret anatomical landmarks, recognise the direction of needle deviation and select an alternative approach.

A less experienced operator may repeatedly direct the needle along an unsuccessful trajectory, whereas an experienced operator may identify the reason for failure and modify the approach.

4. WHY SHOULD REPEATED ATTEMPTS BE AVOIDED?

The objective of neuraxial anaesthesia should not simply be successful needle placement but successful placement with minimal patient discomfort and unnecessary tissue trauma.

Repeated skin punctures and needle redirections may increase:

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- Patient discomfort and anxiety.
- Local tissue trauma.
- Procedural time.
- The possibility of vascular puncture.
- The likelihood of eliciting paraesthesia or radicular symptoms.
- Difficulty maintaining an appropriate patient position.

Multiple needle passes have also been associated with increased procedural discomfort. Ultrasound-assisted techniques may reduce the number of attempts required to achieve successful placement.

However, it is important not to assume that every additional attempt inevitably produces a complication. The risk depends on patient anatomy, needle trajectory, operator experience, the type of neuraxial procedure and the nature of the symptoms encountered.

The practical concern is repeated failure without meaningful reassessment or modification.

5. RECOGNISING WHEN THE CURRENT APPROACH IS FAILING

An unsuccessful needle insertion should prompt reassessment rather than immediate repetition.

5.1. Repeated contact with bone

Repeated contact with bone may indicate an inappropriate needle trajectory, incorrect identification of the interspace or anatomical rotation.

Instead of repeatedly redirecting the needle along the same path, the operator should withdraw to an appropriate depth, reassess the direction and consider a different approach.

5.2. Inability to identify the midline

Poorly palpable landmarks may make the conventional midline approach unreliable.

In such patients, preprocedural ultrasound can help identify the midline, intervertebral space and an appropriate needle insertion point.

5.3. Persistent inability to access the neuraxial space

If the needle repeatedly fails to enter the intended space despite appropriate positioning and correction of the trajectory, changing the interspace or adopting a paramedian approach should be considered.

5.4. Patient discomfort or paraesthesia

Patient-reported pain and paraesthesia should never be ignored.

If paraesthesia or radiating pain occurs during needle advancement, further advancement should be stopped and the needle reassessed or withdrawn. Persistent or concerning neurological symptoms require appropriate evaluation.

5.5. Loss of procedural orientation

Repeated attempts may make it increasingly difficult to maintain a clear understanding of the needle trajectory and the anatomical landmarks.

At this stage, seeking assistance from a more experienced anaesthesiologist may be safer than continuing independently.

6. WHAT SHOULD CHANGE AFTER AN UNSUCCESSFUL ATTEMPT?

The central principle should be that something should change before another attempt is made.

6.1. Reassess patient positioning

The sitting and lateral positions should be evaluated for their suitability.

Adequate lumbar flexion, stable positioning and appropriate assistance may improve the accessibility of the interspinous spaces.

In patients unable to maintain the sitting position, the lateral approach may be considered if clinically appropriate.

6.2. Change the interspace

Repeated attempts at the same interspace may be unproductive, particularly when the space is narrowed or anatomically distorted.

An alternative interspace should be considered after reassessment of the anatomy and procedural requirements.

6.3. Change the needle approach

The conventional midline approach may be difficult in patients with scoliosis, degenerative spinal changes or poorly palpable landmarks.

A paramedian approach may be useful because it avoids some of the midline ligamentous structures and may provide access through a more favourable interlaminar window.

The Taylor approach, targeting the L5–S1 interspace, may be considered in selected patients when conventional lumbar access is difficult. The choice should depend on the patient's anatomy and the intended neuraxial technique.

6.4. Use preprocedural ultrasound

Preprocedural ultrasound can help identify:

- The spinal midline.
- The appropriate intervertebral level.
- The interlaminar window.
- The optimal needle insertion point.
- The estimated depth of the epidural or intrathecal space.
- The direction and angle of needle insertion.

Ultrasound is particularly useful when surface landmarks are poorly palpable or spinal anatomy is altered.

It is important to distinguish preprocedural ultrasound-assisted techniques from real-time ultrasound-guided needle insertion. Preprocedural scanning and skin marking are more widely established, whereas real-time ultrasound-guided neuraxial procedures require additional technical expertise.

6.5. Change the operator

A change in operator may be beneficial when the initial clinician has difficulty identifying the appropriate anatomical trajectory.

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An experienced anaesthesiologist may recognise an alternative interspace or approach and may improve the likelihood of successful placement.

6.6. Reconsider the equipment

The choice of needle, its length and design may influence procedural success.

In patients with increased tissue depth, an appropriately sized longer needle may be required. A pencil-point spinal needle may be preferred for spinal anaesthesia when appropriate.

Equipment selection should be guided by the intended technique and the patient's anatomy.

7. ROLE OF ULTRASOUND IN DIFFICULT NEURAXIAL PROCEDURES

Ultrasound has become an important adjunct in the management of difficult neuraxial access.

Parthasarathy and colleagues highlighted the potential role of ultrasound-guided central neuraxial block and its incorporation into anaesthesia training.[1]

A systematic review and meta-analysis by Guay and Kopp evaluated the role of ultrasound for central neuraxial blocks and supported its use in improving technical performance, particularly in patients with anticipated difficulty.[2]

Coviello and colleagues evaluated ultrasound-assisted spinal anaesthesia performed by novice trainees. Their retrospective comparative study reported fewer attempts, reduced procedural time and lower patient discomfort in the ultrasound-assisted group.[3]

A subsequent Cochrane review comparing ultrasound guidance with anatomical landmarks in adults found that ultrasound probably improves first-attempt success and reduces the number of attempts required for successful neuraxial placement. The review also found reduced needling time, although the evidence for some patient-centred outcomes and adverse events remained uncertain.[4]

7.1. When should ultrasound be considered?

Ultrasound may be particularly useful in:

- Patients with obesity.
- Patients with poorly palpable anatomical landmarks.
- Patients with scoliosis.
- Patients with previous spinal surgery.
- Patients with degenerative spinal changes.
- Patients with a history of difficult neuraxial access.
- Procedures performed by trainees in patients with anticipated difficult anatomy.

7.2. Is ultrasound necessary for every patient?

The evidence does not establish that every neuraxial procedure requires ultrasound.

In patients with easily palpable landmarks and straightforward anatomy, conventional landmark-guided techniques remain effective.

The greatest benefit of ultrasound appears to be in patients with anticipated technical difficulty. It should therefore be regarded as an important adjunct rather than a universal replacement for anatomical landmark techniques.

8. THE QUESTION OF A FIXED NUMBER OF ATTEMPTS

One of the most important practical questions is whether a maximum number of needle attempts should be recommended.

Unlike some difficult-airway algorithms, there is no universally established evidence-based maximum number of neuraxial attempts that can be applied to every patient and every clinical situation.

A fixed number may provide a useful reminder to reassess, but it cannot account for differences in patient anatomy, operator experience, urgency and the consequences of abandoning neuraxial anaesthesia.

For example, a patient with easily identifiable landmarks may require a minor change in needle direction before successful placement. In contrast, a patient with severe scoliosis and previous spinal surgery may require ultrasound assistance and an experienced operator before another attempt is made.

The decision should therefore be based on the clinical circumstances rather than an arbitrary numerical threshold.

Repeated attempts without a change in technique should be discouraged, while a carefully planned attempt following reassessment may still be reasonable.

9. WHEN SHOULD THE ANAESTHESIOLOGIST ABANDON NEUROAXIAL ANAESTHESIA?

The decision to abandon a neuraxial technique should be individualised.

Several factors should be considered:

9.1. Patient-related factors

The patient's anatomy, comfort, cooperation, preferences and physiological condition should influence the decision.

A patient who is increasingly distressed or unable to maintain the required position may not benefit from further attempts.

9.2. Urgency of surgery

The urgency of the procedure is particularly important.

In elective surgery, there may be time to use ultrasound, change operators or reconsider the anaesthetic plan.

In an emergency, prolonged attempts may delay definitive surgical management and increase risk.

9.3. Anticipated difficulty with general anaesthesia

The potential risks of general anaesthesia should be considered before abandoning a neuraxial technique.

This is particularly relevant in obstetric anaesthesia, where airway-related risks during conversion to general anaesthesia may influence the overall decision.

However, concern about general anaesthesia should not justify indefinite or traumatic attempts at neuraxial access.

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9.4. Operator experience and available resources

The availability of an experienced anaesthesiologist, ultrasound equipment and alternative anaesthetic techniques may influence the next step.

Early assistance should be sought rather than waiting until repeated attempts have failed.

9.5. Patient preference

The patient's willingness to continue with neuraxial attempts should be respected.

Clear communication regarding the difficulty encountered, available alternatives and potential risks is essential.

10. SPECIAL CONSIDERATIONS IN OBSTETRIC ANAESTHESIA

Obstetric anaesthesia presents a particularly important setting for difficult neuraxial procedures.

Neuraxial anaesthesia is commonly preferred for caesarean delivery because it avoids many of the risks associated with general anaesthesia in pregnancy.

However, difficult neuraxial access may occur in patients with obesity, poorly palpable landmarks, scoliosis or previous spinal procedures.

In addition, the urgency of delivery may limit the time available for repeated attempts.

The potential consequences of conversion to general anaesthesia should be considered alongside the risks of continued neuraxial attempts.

The objective should be to establish an effective and safe anaesthetic plan within an appropriate time frame, rather than persisting with a technically unsuccessful procedure.

It is also important to distinguish difficult needle access from failure of an established spinal or epidural block. An inadequate block after successful drug administration requires assessment of block height, density, symmetry and duration, followed by an appropriate supplementation or conversion strategy.

11. A PROPOSED ESCALATION FRAMEWORK FOR DIFFICULT NEURAXIAL ACCESS

Based on the available literature and clinical principles, we propose a structured approach to difficult neuraxial procedures.

Table 1. Recognition and response to difficult neuraxial access

Clinical finding	Suggested response
Poorly palpable landmarks	Reassess positioning and consider preprocedural ultrasound
Repeated contact with bone	Reassess needle trajectory and interspace
Persistent difficulty with midline approach	Consider a paramedian approach
Narrowed or distorted interspace	Consider an alternative interspace
Increased tissue depth	Consider ultrasound and appropriate needle length
Repeated unsuccessful attempts	Seek assistance from an experienced operator
Paraesthesia or radiating pain	Stop needle advancement and reassess
Persistent difficulty despite optimisation	Reconsider the neuraxial technique and alternative anaesthetic plan
Increasing patient distress or procedural urgency	Avoid further unnecessary attempts and change strategy

Proposed practical decision pathway

Step 1: Recognise difficulty.

Identify poor landmarks, repeated bone contact, inability to advance the needle or failure to access the intended neuraxial space.

Step 2: Stop and reassess.

Reassess patient positioning, spinal anatomy, interspace selection and needle trajectory before another puncture.

Step 3: Modify the approach.

Change the interspace, adopt a paramedian approach or use preprocedural ultrasound where appropriate.

Step 4: Escalate expertise.

Seek assistance from an experienced anaesthesiologist rather than continuing repeated unsuccessful attempts.

Step 5: Reassess the benefit of further attempts.

Consider patient comfort, procedural urgency, available resources, operator experience and the anticipated risks of alternative anaesthetic techniques.

Step 6: Change the anaesthetic plan when appropriate.

If neuraxial access remains unsuccessful or further attempts are unlikely to provide meaningful benefit, proceed with an alternative anaesthetic strategy.

This proposed framework is intended to support clinical decision-making and does not replace established institutional protocols or individual clinical judgement.

12. FUTURE DIRECTIONS

Further research is required to establish objective criteria for identifying when a difficult neuraxial procedure should be abandoned.

Future studies could evaluate the relationship between the number of needle passes, patient discomfort, procedural complications and successful neuraxial placement.

Standardised definitions of skin puncture, needle insertion, needle redirection and successful access would improve comparison between studies.

The incorporation of neuraxial ultrasound into anaesthesia training may also improve procedural confidence and reduce unnecessary attempts, particularly among novice operators.

Simulation-based training may provide an additional opportunity to develop skills in identifying difficult anatomy, changing needle approaches and recognising when to seek assistance.

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13. CONCLUSION

Difficult neuraxial access should prompt early recognition, reassessment and modification of technique rather than repeated needle insertions along an unsuccessful trajectory.

Preprocedural ultrasound, alternative interspace selection, paramedian approaches and early involvement of experienced anaesthesiologists provide useful strategies for overcoming technical difficulty.

Although a fixed maximum number of attempts may appear attractive, there is insufficient evidence to support a universal numerical threshold applicable to all patients and neuraxial techniques.

The decision to continue or abandon a difficult neuraxial procedure should be individualised according to patient anatomy, procedural urgency, operator experience, patient comfort and the anticipated risks of alternative anaesthetic techniques.

The important question is not simply how many attempts have been made, but whether the next attempt is likely to be meaningfully different from the previous one.

A structured escalation strategy may improve procedural success, reduce unnecessary needle trauma and enhance patient comfort and safety.

REFERENCES

1. Parthasarathy S, Kumar N, Maurya I, Johnson JE. Ultrasound-guided central neuraxial block: practice to curriculum? Indian J Anaesth. 2024;68(10):849-51. doi: 10.4103/ija.ija_777_24.
2. Guay J, Kopp S. Ultrasonography for central neuraxial blocks: a systematic review and meta-analysis. Anesth Analg. 2015;120(4):868-83.
3. 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(10):1515. doi:10.3390/jpm13101515.
4. Makino Y, Miyake K, Roche D, Yoshimura S, Nahara I, Sahker E, et al. Ultrasound guidance versus anatomical landmarks for neuraxial anaesthesia in adults. Cochrane Database Syst Rev. 2025;5(5). doi: 10.1002/14651858.CD014964.pub2.
5. Chin KJ. Recent developments in ultrasound imaging for neuraxial blockade. Curr Opin Anaesthesiol. 2018;31(5):608-13. doi:10.1097/ACO.0000000000000634.
6. Chin KJ, Perlas A, Chan V, Brull R. Needle visualization in ultrasound-guided regional anesthesia: challenges and solutions. Reg Anesth Pain Med. 2008;33(6):532-44.
7. Poots C, Chin KJ. Strategies for successful lumbar neuraxial anaesthesia and analgesia in patients with challenging anatomy. BJA Educ. 2024;24(2):46-56. doi: 10.1016/j.bjae.2023.10.006.
8. Eley VA, et al. Does preprocedural ultrasound prior to lumbar neuraxial anesthesia or analgesia increase first-pass success in adults with obesity? A systematic review. Health Sci Rep. 2024;7(11). doi:10.1002/hsr2.70039.
9. Fettes PDW, Jansson JR, Wildsmith JAW. Failed spinal anaesthesia: mechanisms, management, and prevention. Br J Anaesth. 2009;102(6):739-48.

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About the Author

Dr. Sathya Narayan R. is a Senior Resident in the Department of Cardiac Anaesthesia and Critical Care at the All-India Institute of Medical Sciences (AIIMS), Bhubaneswar, Odisha, India. His academic and clinical interests include cardiac anaesthesia, perioperative patient management, critical care, and advancing evidence-based practices in cardiovascular healthcare.

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