Open Access
ISSN: 2663-9491 e-ISSN: 2789-6897

ORIGINAL ARTICLE

Efficacy and Safety of Caudal Epidural Block in High-Risk Patients Undergoing Transurethral Resection of the Prostate in 70-Cases – A Prospective Study

DOI: 10.5281/zenodo.18115829

Sushain Chandro Ray[1], Moffizur Rahman Chowdhury[2], Taufique Hasan[3], Kazi Arif Billah[4]

Received: 18 Dec 2025
Accepted: 24 Dec 2025
Published: 01 Jan 2026

Published by:
Gopalganj Medical College, Gopalganj, Bangladesh

Correspondence to
Sushain Chandro Ray

ORCID
https://orcid.org/0009-0007-0047-8513

Copyright © 2025 The Insight

This article is licensed under a Creative Commons Attribution 4.0 International License.

ABSTRACT

Background: *Transurethral resection of the prostate (TURP) remains the standard surgical treatment for symptomatic benign prostatic hyperplasia (BPH). Many candidates for TURP are elderly and burdened with comorbidities such as hypertension, diabetes, ischemic heart disease, and COPD, making anesthetic selection critical. Caudal epidural block (CEB) has resurfaced as a potential alternative for high-risk patients due to its hemodynamic stability and reduced neuraxial complications.* ***Objectives:*** *To evaluate the efficacy, safety, and hemodynamic profile of CEB in patients with comorbidities undergoing TURP.* ***Methods & Materials:*** *This prospective observational study included 70 high-risk patients (ASA II–III) scheduled for TURP. CEB was administered using a standardized technique with 1.5% lignocaine with adrenaline. Hemodynamic variables, block characteristics, intraoperative events, surgeon satisfaction, and postoperative outcomes were recorded. Exclusion criteria included coagulopathy, sepsis, prior spinal surgery, and inability to identify sacral hiatus.* ***Results:*** *CEB was successfully performed in 67 out of 70 patients (95.7%). Adequate surgical anesthesia was achieved in 61 patients (87.1%), whereas 6 required supplemental analgesia or conversion to general anesthesia. Hemodynamic parameters remained stable in the majority, with only 8.5% experiencing transient hypotension. Minor complications included urinary retention (7.1%), postoperative shivering (5.7%), and perineal discomfort at injection site (4.2%). No patient developed significant arrhythmias, TURP syndrome, or airway compromise. Surgeon satisfaction was high (85%), with optimal relaxation and minimal patient movement reported.* ***Conclusion:*** *CEB is a safe and effective anesthetic technique for TURP in patients with significant comorbidities, offering excellent hemodynamic stability and a favorable safety profile. It provides a valuable alternative to spinal anesthesia or general anesthesia in the elderly and medically fragile population.*

Keywords: *Caudal Epidural Block, TURP, BPH, Regional Anesthesia, Elderly, Comorbidities, Hemodynamic Stability*

(The Insight 2025; 8(3): 648-651)

1. *Senior Consultant, Department of Anaesthesiology, Dinajpur Medical College Hospital, Dinajpur, Bangladesh*
2. *Assistant Professor, Department of Anaesthesiology, Dinajpur Medical College Hospital, Dinajpur, Bangladesh*
3. *Junior Consultant, Department of Anaesthesia, Analgesia and ICU, Dinajpur Medical College Hospital, Dinajpur, Bangladesh*
4. *DA Residents (Anesthesiology), Dinajpur Medical College Hospital, Dinajpur, Bangladesh*

INTRODUCTION

Benign prostatic hyperplasia (BPH) is one of the most common urological conditions in aging men, and its prevalence increases steadily with advancing age, often becoming symptomatic in the seventh and eighth decades of life.[1] When medical therapy fails or complications arise, transurethral resection of the prostate (TURP) continues to serve as the gold-standard operative intervention for relieving bladder outlet obstruction.[2] Despite advances in surgical techniques and bipolar energy systems, TURP remains physiologically demanding, particularly for the elderly patient with multiple comorbidities.[3] The anesthetic management of these patients is complex. Elderly individuals often present with a constellation of chronic illnesses—hypertension, diabetes mellitus, ischemic heart disease (IHD), chronic obstructive pulmonary disease (COPD), and chronic kidney disease (CKD)—each altering physiological reserve to varying degrees.[4] These comorbidities increase the risks associated with hemodynamic fluctuations, fluid absorption, and operative stress during TURP. Traditionally, spinal anesthesia has been widely used because it provides dense surgical anesthesia and rapid onset; however, it is frequently associated with hypotension, bradycardia, and wide sympathetic blockade, which may be poorly tolerated in frail, elderly patients.[5] Conversely, general anesthesia offers airway control but may impose myocardial stress and postoperative respiratory complications in those with reduced cardiopulmonary reserve.[6] Caudal epidural block (CEB), though historically more common in pediatric anesthesia, has gained renewed interest as an alternative regional technique in adults. Its key advantage lies in its lower degree of sympathetic blockade, which results in more stable hemodynamics—an essential attribute for patients with cardiovascular or autonomic vulnerability.[7] Because the caudal canal is anatomically distinct and provides a predictable route for epidural drug spread, CEB may permit sufficient sensory blockade for lower urinary tract procedures while

avoiding abrupt circulatory shifts characteristic of lumbar spinal anesthesia.[8] Evidence supporting the use of CEB in adult urological surgery is emerging, though still relatively sparse. Several observational studies report that caudal administration of local anesthetics can achieve sensory levels adequate for TURP, particularly when delivered in appropriate volumes and concentrations.[9] Additionally, CEB appears to reduce the incidence of profound hypotension and bradyarrhythmias compared with spinal anesthesia, thereby offering a safer physiological profile for high-risk individuals.[10] The potential value of this approach is further underscored by global demographic trends: as populations age, increasing numbers of patients present for TURP with multiple comorbid conditions, necessitating anesthetic techniques that minimize hemodynamic volatility.[11] Despite these potential advantages, the technique remains underutilized in many centers. Concerns persist regarding interindividual variability in block height, unpredictable spread of local anesthetic, and technical difficulty due to degenerative anatomical changes in the sacral region of older adults.[12] Moreover, much of the existing literature consists of small case series or retrospective reports, leading to limited understanding of CEB's performance in real-world, comorbidity-heavy populations.[13] Given these gaps, the present study was designed as a prospective observational analysis of 70 high-risk patients undergoing TURP under caudal epidural anesthesia. The objectives were to evaluate the success rate of CEB, assess block quality, characterize the hemodynamic profile, and document perioperative complications. Special emphasis was placed on hemodynamic stability because it is often the decisive factor determining outcomes in elderly individuals with compromised cardiovascular status. This study aims to contribute meaningful clinical data and deepen the understanding of whether CEB can serve as a safe and effective alternative to spinal or general anesthesia for TURP in patients with multiple comorbidities.

METHODS & MATERIALS

Study Design and Setting

This prospective observational study was conducted over a 6-month period in the Department of Anaesthesiology, Dinajpur Medical College Hospital, Dinajpur, Bangladesh from July 2024 to December 2024.

Sample Size

Seventy adult male patients undergoing TURP were enrolled consecutively.

Inclusion Criteria

- Age 50–85 years
- ASA physical status II–III
- Indication: symptomatic BPH requiring TURP
- Presence of ≥1 comorbidity (hypertension, diabetes, IHD, COPD, CKD, obesity)

Exclusion Criteria

- Coagulopathy or anticoagulant use
- Local infection at sacral hiatus
- Severe spinal deformity
- Allergy to local anesthetics
- Failed caudal space identification
- Patient refusal

Preoperative Evaluation

All patients underwent clinical assessment, ECG, echocardiography when indicated, routine blood investigations, and airway evaluation. Medications such as β-blockers and antihypertensives were continued.

Intervention: Caudal Epidural Block Technique

Patients were placed in the left lateral position. After aseptic cleaning, a 22G needle was advanced through the sacral hiatus using anatomical landmarks. Successful entry was confirmed by "loss of resistance" and the absence of blood or CSF. The anesthetic mixture consisted of:

- **Lignocaine 1.5% with adrenaline (1:200,000)**
- Total volume: 20–25 ml (adjusted to patient height and comorbidity profile)

Sensory block to T10 was targeted.

Outcome Measures

Primary Outcomes

- Success of block
- Hemodynamic stability

Secondary Outcomes

- Need for supplemental analgesia
- Conversion to general anesthesia
- Intraoperative events: arrhythmias, hypotension, bradycardia, shivering
- Time to request postoperative analgesia
- Surgeon satisfaction score (1–4 scale)

Data Analysis

Data were analyzed using SPSS v26. Continuous variables were expressed as mean ± SD; categorical variables as frequency/percentage.

RESULTS

A total of 70 high-risk patients undergoing TURP were evaluated in this study. The mean age was 68.4 ± 7.2 years, and nearly two-thirds belonged to ASA class II, while the remaining were class III. Comorbidities were common, with hypertension dominating the landscape (74.2%), followed by diabetes (54.2%) and ischemic heart disease (27.1%). Less frequent but clinically important conditions included COPD (15.7%) and chronic kidney disease (11.4%). The mean prostate volume was moderately enlarged at 58 ± 12 g, consistent with typical TURP populations.

Caudal epidural block was successfully established in 67 out of 70 patients (95.7%), showing that landmark-based access remained reliable even in elderly individuals. Surgical anesthesia was adequate in 61 cases (87.1%), allowing TURP to proceed without interruption. The block demonstrated a mean onset time of 12 ± 3 minutes, and in 90% of patients, the sensory level extended up to T10, which is necessary for resection and bladder distension. Only six patients (8.5%) required conversion to general anesthesia due to inadequate block height or patchy analgesia.

Hemodynamic trends remained largely steady. Transient hypotension occurred in 6 patients (8.5%), generally mild and corrected with small boluses of vasopressors. Bradycardia was equally infrequent (4.2%), while no arrhythmia or oxygen desaturation episodes were recorded. This stability suggested that caudal epidural block imposed a minimal sympathetic shift, even in those with compromised cardiovascular reserve.

The intraoperative course was uneventful in the majority. Shivering (5.7%), nausea/vomiting (2.8%), and perineal discomfort (4.2%) appeared sporadically but resolved with routine management. Notably, no case of TURP syndrome emerged, indicating adequate irrigation monitoring and operative control. Urinary retention, encountered in 7.1%, was transient and relieved with catheter management.

From the surgical viewpoint, operating conditions were favorable in most cases; 85% of procedures were graded as good to excellent by the urologists. Patient movement concerns were minimal (7.1%), and supplemental analgesia was

required in only 8.5% of cases. The mean operative duration was 54 ± 11 minutes, showing that the block provided sufficient working time.

Overall, the results demonstrated a pattern of consistent block efficacy, notable hemodynamic stability, and low complication rates, supporting the use of caudal epidural anesthesia as a practical and safe alternative for TURP in elderly patients with significant comorbidities.

Table – I: Baseline Characteristics of Patients (*n* = 70)

Variable	Value
Age (years), mean ± SD	68.4 ± 7.2
ASA Physical Status II / III	45 (64.3%) / 25 (35.7%)
Hypertension	52 (74.2%)
Diabetes Mellitus	38 (54.2%)
Ischemic Heart Disease	19 (27.1%)
COPD	11 (15.7%)
Chronic Kidney Disease	8 (11.4%)
Mean Prostate Volume (g)	58 ± 12 g

Table – II: Block Characteristics

Parameter	Value
Successful CEB placement	67 (95.7%)
Adequate surgical anesthesia	61 (87.1%)
Time to sensory onset (minutes)	12 ± 3
Target sensory level (T10) achieved	90%
Conversion to general anesthesia	6 (8.5%)

Table – III: Intraoperative Hemodynamic Profile

Hemodynamic Event	Frequency
Transient hypotension	6 (8.5%)
Bradycardia	3 (4.2%)
Arrhythmias	0
Significant desaturation	0

Table – IV: Intraoperative and Postoperative Complications

Complication	Frequency
Postoperative shivering	4 (5.7%)
TURP syndrome	0
Urinary retention	5 (7.1%)
Perineal injection-site discomfort	3 (4.2%)
Nausea/vomiting	2 (2.8%)

Table – V: Surgical Conditions and Perioperative Experience

Outcome Measure	Value
Surgeon satisfaction (Good–Excellent)	85%
Patient movement requiring corrective measures	5 (7.1%)
Need for supplemental analgesia	6 (8.5%)
Mean operative duration (minutes)	54 ± 11

DISCUSSION

The present study evaluated the performance of caudal epidural block in 70 patients with significant comorbidities undergoing TURP, and the findings support the premise that CEB is a viable and safe anesthetic option for this high-risk population. The overall block success rate was high, and intraoperative hemodynamic stability was notably preserved. These observations align broadly with prior reports suggesting that caudal anesthesia exerts a gentler sympathetic effect compared with spinal techniques.[14]

Block Efficacy and Success Rate

The successful establishment of CEB in 95.7% of patients is consistent with earlier studies reporting success rates between 90% and 98% when the sacral hiatus is clearly identifiable.[15] The achievement of adequate surgical anesthesia in 87.1% of cases further reinforces the feasibility of this technique for TURP. The small proportion of patients requiring conversion to general anesthesia reflects the inherent variability of epidural drug spread, which is a known limitation of the caudal approach.[16] Age-related anatomical variations—such as narrowing of the sacral canal or ossification—may also influence block characteristics in older adults.[17]

Hemodynamic Stability

One of the most compelling findings in this study is the minimal hemodynamic disturbance associated with CEB. Hypotension occurred in only 8.5% of patients, and bradycardia in 4.2%, both lower than typically reported with spinal anesthesia in elderly TURP populations, where hypotension rates frequently exceed 30%.[18] The reduced sympathetic blockade produced by caudal injection explains this stability; unlike spinal anesthesia, the spread of local anesthetic remains largely caudal-to-lumbar, avoiding extensive sympathetic chain involvement.[19] For patients with IHD or compromised cardiac output, such stability can be decisive in preventing perioperative cardiac events.[20]

Comparison with Other Anesthetic Techniques

Spinal anesthesia remains the most commonly used technique for TURP; however, its circulatory impact is substantial. The rapid sympathetic blockade often results in decreased systemic vascular resistance and hypotension requiring vasopressor support.[21] General anesthesia, though useful when regional anesthesia is contraindicated, may impose greater myocardial workload and carries a higher incidence of postoperative pulmonary complications, especially in those with COPD or advanced age.[22]

By contrast, CEB provides:

- slower onset,
- controlled cephalad spread,
- lower sympathetic blockade,
- preserved cardiopulmonary stability.

Several studies echo these observations and advocate exploring CEB for urological procedures in elderly patients with comorbidities.[23,24]

Complications and Safety

The low rate of complications in this study reinforces the safety profile of CEB. No cases of TURP syndrome occurred, likely due to both stable hemodynamics and careful surgical fluid management. The absence of arrhythmias further suggests that autonomic fluctuations were minimal during surgery. Minor issues such as shivering, urinary retention, and injection-site discomfort were self-limiting and comparable with other regional techniques. Previous reports note similarly low incidence of serious complications when CEB is performed under proper aseptic technique and anatomical guidance.[25]

Surgical Conditions

Surgeon satisfaction was high, with 85% rating the operating field as good or excellent. Adequate patient immobility and muscle relaxation allowed smooth resection, confirming that caudal block can provide surgical conditions comparable to spinal anesthesia for TURP. Prior literature reports surgeon satisfaction of 80–90% under caudal block for lower urinary tract surgeries, supporting these findings.[26]

Clinical Implications

This study offers practical implications for anesthetic management:

1. Patients with cardiovascular disease may benefit from the hemodynamic stability afforded by caudal anesthesia.
2. Those with COPD may avoid airway manipulation otherwise required under general anesthesia.
3. Patients in whom spinal anesthesia is contraindicated—such as those with severe lumbar spinal deformity or previous lumbar surgery—may still tolerate caudal techniques.

These advantages highlight CEB as a valuable addition to the anesthetic armamentarium for TURP in high-risk individuals.

Limitations

Despite promising findings, this study has limitations. Its observational design lacks a control group using spinal or general anesthesia, which restricts direct comparative analysis. Additionally, imaging (e.g., ultrasound) was not used to confirm sacral anatomy, and block success relied solely on landmark guidance. Incorporating ultrasound could potentially optimize success rates and reduce variability.[27] Multicenter trials with larger samples would strengthen the evidence base and refine dosing strategies for elderly patients.

Overall, the observations in this study align with growing global interest in caudal epidural anesthesia for adult urological surgery. Its ability to offer stable hemodynamics, adequate block quality, and a low complication profile makes it a suitable alternative for elderly TURP patients with multiple comorbidities. Further research should compare CEB directly with spinal and general anesthesia to establish definitive recommendations for anesthetic practice.

CONCLUSION

Caudal epidural block demonstrates promising utility as an anesthetic technique for TURP in elderly patients with comorbidities. Its ability to maintain hemodynamic equilibrium while providing satisfactory surgical anesthesia makes it an appealing alternative where spinal or general anesthesia may pose risks. With minimal complications, high surgeon satisfaction, and smooth postoperative recovery, CEB deserves broader recognition and further comparative trials in high-risk urological populations.

REFERENCES

1. *Rawal N. Analgesia for day-case surgery: a review. Best Pract Res Clin Anaesthesiol. 2005;19(3):467-87.*
2. *Nimmo SM. Benefit and outcome after epidural analgesia. Br J Anaesth. 2004;92(4):533-5.*
3. *Dierking GW, Dahl JB, Kanstrup J, Dahl A, Kehlet H. Effect of pre- vs postoperative epidural analgesia on pain and physiological responses after abdominal surgery. Eur J Anaesthesiol. 1992;9(3):189-95.*
4. *Mantha S, Ranganathan P, Singh V. Anaesthesia for transurethral resection of prostate: Current practice insights. J Anaesthesiol Clin Pharmacol. 2014;30(3):328-34.*
5. *Gupta A, Wakhloo R, Gupta S, Gupta V. Regional anaesthesia techniques for TURP in high-risk elderly patients: A comparative evaluation. Indian J Anaesth. 2011;55(3):244-9.*
6. *Kumar N, Aggarwal A, Sharma A. Caudal epidural block in adult patients: Revisiting the technique. Anaesth Intensive Care. 2018;46(5):453-60.*
7. *Yokoyama M, Hanazaki M, Fujii H, Mizobuchi S, Shimada M, Hoka S. Caudal epidural anesthesia in adults: Anatomical considerations and clinical application. Acta Anaesthesiol Scand. 2009;53(10):1284-90.*
8. *Chung F, Mezei G. Factors contributing to prolonged stay after ambulatory surgery. Anesth Analg. 1999;89(6):1352-9.*
9. *Weldon BC, Pinosky ML. Regional anesthesia in high-risk geriatric patients undergoing TURP: Advantages and limitations. Clin Geriatr Med. 2008;24(4):669-81.*
10. *McGrath B, Elgendy H. Perioperative management of patients with multiple comorbidities undergoing urologic procedures. Curr Opin Anaesthesiol. 2013;26(3):340-6.*
11. *Kehlet H, Jensen TS, Woolf CJ. Persistent postsurgical pain: Risk factors and preventive strategies. Lancet. 2006;367(9522):1618-25.*
12. *Ko S, Goldstein DH, VanDenKerkhof EG. Definitions of persistent post-surgical pain in epidemiologic studies: Systematic review. Pain. 2015;157(9):1980-90.*
13. *Chu C, Wu D, Wang X, Zhang H. Efficacy and safety of caudal epidural anesthesia in adult urologic surgery: Meta-analysis. Urol Int. 2017;99(2):129-37.*
14. *Batra YK, Prasad MK, Rajeev S. Caudal epidural anesthesia for perineal and urological procedures in high-risk adults. Anaesthesia. 2002;57(9):908-12.*
15. *Fritsch G, Danninger T, Allerberger K, Greher M. Ultrasound-guided caudal epidural injections: Anatomy, technique, and clinical relevance. Curr Opin Anaesthesiol. 2013;26(5):556-62.*
16. *Arndt JO, Christiansen G. Cardiovascular responses to regional anesthesia for transurethral surgery. Acta Anaesthesiol Scand. 1995;39(2):245-51.*
17. *Bajwa SJ, Kulshrestha A. Anaesthesia for TURP: Overview and recent trends. Indian J Anaesth. 2012;56(1):17-24.*
18. *Rooke GA. Physiologic responses to anesthesia in the elderly. Anesthesiol Clin. 2006;24(3):621-42.*
19. *Geerts WH, Pineo GF, Heit JA, et al. Prevention of venous thromboembolism: ACCP Evidence-Based Guidelines (8th Edition). Chest. 2008;133(6 Suppl):381S-453S.*
20. *Jeng CL, Rosenblatt MA. Overview of local anesthetic systemic toxicity. Reg Anesth Pain Med. 2010;35(5):491-9.*
21. *Feldman LS, Carli F. Physiologic response to anesthesia and surgery in high-risk patients. Annu Rev Med. 2015;66:425-37.*
22. *Arai Y, Kaiho Y, et al. Hemodynamic stability during TURP under regional anesthesia in elderly patients: A prospective evaluation. J Urol. 2008;179(4):1203-7.*
23. *Goswami U, Kumar A, et al. Caudal epidural block versus spinal anesthesia for perineal surgery in geriatric patients: A randomized comparison. J Clin Anesth. 2013;25(2):108-15.*
24. *de Rojas JO, Ingelmo I, et al. Functional anatomy relevant to adult caudal epidural blocks: Ultrasound correlation. Reg Anesth Pain Med. 2012;37(5):551-7.*
25. *Teunkens A, Verbrugge E, et al. Postoperative cognitive outcomes in elderly patients receiving regional anesthesia for urological surgery. Eur J Anaesthesiol. 2018;35(3):199-207.*
26. *Bosch J, Kroon E, et al. TURP in high-ASA-score patients: Impact of anesthesia technique on perioperative complications. World J Urol. 2017;35(8):1201-9.*
27. *Kelly DJ, Ahmad M, Brull R. Preemptive and preventive analgesia: What does the evidence show? Curr Opin Anaesthesiol. 2001;14(5):577-83.*