Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/z6c07s77

COMPARISON OF HEMODYNAMIC STABILITY AND ANESTHETIC EFFICACY BETWEEN SUBARACHNOID BLOCK VERSUS SADDLE BLOCK IN PATIENTS UNDERGOING TRANSURETHRAL RESECTION OF THE PROSTATE

Syed Wahaj Uddin[1*], Syed Saqib Ali[2], Shakil Malik[3], Sagar Khurana[4], Syed Muhammad Abbas[5], Qamar Abbas[6], Zamir Ahmed[7], Aimal Abbasi[8]

[1*,2]Senior Lecturer, Department of Anesthesia, Sindh Institute of Urology and Transplantation (SIUT), Karachi, Pakistan
[3,4]Assistant Professor, Department of Anesthesia, Sindh Institute of Urology and Transplantation (SIUT), Karachi, Pakistan
[5,6,7]Professor, Department of Anesthesia, Sindh Institute of Urology and Transplantation (SIUT), Karachi, Pakistan
[8]BS Anesthesia, Department of Anesthesia, Sindh Institute of Urology and Transplantation (SIUT), Karachi, Pakistan

***Corresponding author:** Syed Wahaj Uddin
*Email: splashinaday@yahoo.com

ABSTRACT

Objective: To compare the efficacy and hemodynamic stability of saddle block (SA) versus conventional subarachnoid block (SAB) anesthesia in patients undergoing transurethral resection of the prostate (TURP).

Study Design: A prospective, randomized, comparative study.

Place of Study: Sindh Institute of Urology and Transplantation (SIUT), Karachi, Pakistan

Methodology: Two equal groups of 70 male patients undergoing elective TURP (n = 35 each) were randomly assigned. Group Saddle underwent a saddle block with 0.5% hyperbaric bupivacaine, whereas Group SAB received standard spinal anesthesia. Postoperative results, sensory and motor block features, and intraoperative hemodynamic parameters were all noted and contrasted. SPSS version 26 was used for statistical analysis. $p \leq 0.05$ was considered significant.

Results: Baseline characteristics were comparable between groups ($p > 0.05$). Saddle block maintained higher intraoperative systolic and diastolic blood pressures ($p = 0.000$) and lower heart rates ($p = 0.012$*). Hypotension ($p = 0.009$) and vasopressor requirements were significantly lower in the saddle group. Although sensory block onset was faster in saddle anesthesia ($p = 0.001$*), motor block and analgesia duration were longer in SAB ($p < 0.01$*). Intraoperative adverse events were fewer with saddle anesthesia ($p = 0.041$*).

Conclusion: Saddle block anesthesia provides adequate surgical anesthesia for TURP with superior hemodynamic stability, fewer adverse events, and faster recovery compared to conventional spinal anesthesia. It represents a safer and more controlled alternative for elderly or high-risk patients.

Key Words: Saddle block, Subarachnoid block, TURP, Hemodynamic stability, Regional, Bupivacaine.

INTRODUCTION

Transurethral resection of the prostate (TURP) remains one of the common urological procedures performed for symptomatic benign prostatic hyperplasia in older men and is frequently performed under regional (neuraxial) anesthesia because it provides good intraoperative analgesia, allows intraoperative neurologic monitoring, and reduces pulmonary complications compared with general anesthesia in high-risk patients.[1] Neuraxial techniques are associated with favorable short-term outcomes after TURP, including lower 30-day mortality and fewer systemic complications in large database analyses when compared with general anesthesia.[2]

Conventional subarachnoid (spinal) block is the most widely used neuraxial technique for TURP.[3] However, spinal anesthesia in elderly patients carries a well-recognized risk of sympathetic blockade that can cause hypotension and bradycardia, effects that are particularly important in the typical TURP demographic (elderly men with cardiovascular comorbidity).[4] Several trials and observational studies have therefore examined strategies to limit the cephalad spread and sympathetic impact of spinal anesthetics to preserve hemodynamic stability, including dose reduction, use of additives, patient positioning, and alternative block distributions.[5, 6]

The saddle block, a limited spinal technique designed to confine the block to the sacral and lower lumbar dermatomes by using small drug volumes and sitting positioning, theoretically produces adequate perineal and lower-limb anesthesia for endoscopic prostatic surgery while minimizing cephalad sympathetic spread.[7] Multiple randomized controlled trials and single-center RCTs in reported that saddle or modified-saddle blocks are associated with smaller falls in mean arterial pressure and heart rate, lower vasopressor requirements, and comparable surgical conditions when compared with conventional subarachnoid block in patients undergoing TURP.[8-10]

Despite the accumulating single-centre evidence favoring a reduced hemodynamic impact with saddle-type blocks, published studies vary in patient selection (cardiac risk, age), local anesthetic type and dose, exact block technique (classic vs modified saddle), monitoring strategies, and outcome definitions (absolute MAP drop vs incidence of clinically significant hypotension, vasopressor use, or need to convert anesthesia).[8] In addition, adjuncts such as low-dose intrathecal opioids or systemic sedative agents (e.g., remimazolam) have been evaluated for their effects on intraoperative comfort and hemodynamics during neuraxial anesthesia for TURP, adding further heterogeneity to the literature.[6, 11]

Given the high prevalence of cardiovascular comorbidity among TURP patients and the potentially serious consequences of intraoperative hypotension in this group, there is a clear clinical need for comparative, standardized data assessing whether saddle (or modified saddle) block provides superior hemodynamic stability without compromising surgical anesthesia or postoperative analgesia when contrasted with conventional subarachnoid block. Existing trials show promising signals but differ in design and endpoints; therefore, a rigorously designed comparison using contemporary monitoring and consistent definitions of hemodynamic events will help to guide anesthesia choice for TURP, especially in elderly or cardiac-risk cohorts. The current study compared the anesthetic effectiveness and hemodynamic stability of saddle block with subarachnoid block in patients having transurethral resection of the prostate.

METHODOLOGY

This study was designed as a prospective, randomized controlled trial. It was conducted at the Sindh Institute of Urology and Transplantation (SIUT), Karachi, Pakistan after approval from SIUT Research Ethics Committee (Approval No: **SIUT-ERC-2025/A-583**.

The study included 70 male patients aged between 50 and 80 years with an American Society of Anesthesiologists (ASA) physical status classification of I–III who were scheduled for elective transurethral resection of the prostate (TURP).[12] Sample-size calculation was performed using OpenEpi (Open Source Epidemiologic Statistics for Public Health). Using a two-sided $\alpha = 0.05$ and 80% power and assuming a clinically meaningful between-group difference in mean arterial pressure of ~6.7 mmHg with an assumed standard deviation of 10 mmHg, the required sample size was 35

patients per group (70 total).[8, 9] A simple random sampling technique was employed using a computer-generated randomization list, and allocation concealment was maintained with sealed opaque envelopes. Patients with known allergies to local anesthetics, psychiatric or neurological disorders, morbid obesity (BMI > 35 kg/m²), coagulation abnormalities, or those unwilling to participate were excluded from the study.
Before surgery, each patient received a thorough pre-anesthetic evaluation. Each participant was fully briefed about the study's procedures and goal before providing written informed consent. Baseline vital parameters, such as heart rate (HR), oxygen saturation (SpO_2), systolic blood pressure (SBP), diastolic blood pressure (DBP), and mean arterial pressure (MAP), were taken when the patient arrived in the operating room. Patients were preloaded with 0.9% normal saline at a rate of 10 ml/kg over 20 minutes using an 18-G intravenous cannula. One of two groups was randomly assigned to each participant.

In Group SA (Subarachnoid Block), a 25G Quincke needle was used to deliver 2.5 ml of 0.5% hyperbaric bupivacaine via the midline approach to the L3–L4 or L4–L5 intervertebral space. Individuals were then left in a supine position for 10 minutes following the injection. In Group SB (Saddle Block), the patient was sat for ten minutes before being put in a supine posture after receiving an injection of two milliliters of 0.5% hyperbaric bupivacaine. Continuous intraoperative monitoring was performed according to the Association of Anaesthetists of Great Britain and Ireland (AAGBI) guidelines, including electrocardiography, non-invasive blood pressure measurement, and pulse oximetry.[13] Hemodynamic parameters were recorded every five minutes for the first thirty minutes and then every ten minutes until the end of the surgery. Hypotension, defined as a decrease of more than 20% in MAP from baseline, was managed with phenylephrine boluses.

Motor blockade was assessed using the modified Bromage scale, while sensory blockade levels were evaluated bilaterally using a wet swab test at fixed intervals.[14] Additional intraoperative data, such as time to maximum sensory and motor blockade, duration of surgery, irrigation fluid volume, and perioperative complications, were documented. The primary outcome variables included anesthetic efficacy in terms of sensory and motor blockade, while secondary outcome variables included hemodynamic stability, vasopressor requirements, and anesthesia-related adverse events.

The data was entered and examined using the Statistical Package for the Social Sciences (SPSS) software, version 26. "Continuous variables with a normal distribution, represented as mean ± standard deviation (SD), were compared using the independent samples t-test." Non-normally distributed variables were shown as medians (interquartile ranges) and compared using the Mann-Whitney U test. Frequencies and percentages representing categorical data were examined using the chi-square test and Fisher's exact test. P-values were considered statistically significant if they were less than 0.05.

RESULTS

Both groups were comparable with respect to demographic and baseline clinical parameters. There were no statistically significant differences between patients receiving subarachnoid block (SAB) and those receiving saddle block in terms of age, weight, height, or body mass index (BMI), indicating successful randomization and homogeneity between the groups. Similarly, prior to the application of anesthesia, baseline hemodynamic parameters such as heart rate, systolic blood pressure (SBP), diastolic blood pressure (DBP), and mean arterial pressure (MAP) were similar in both groups. This ensured that any observed intraoperative variations in hemodynamic stability or anesthetic efficacy could be attributed to the type of block rather than pre-existing physiological differences between the study participants. (Table 1)

Table 1. Baseline Demographic and Clinical Characteristics of Patients (n = 70)

Variable	SAB (n = 35) (Mean ± SD)	Saddle (n = 35) (Mean ± SD)	p-value
Age (years)	68.7 ± 6.8	69.5 ± 6.5	0.642
Weight (kg)	78.2 ± 11.5	78.1 ± 11.0	0.961
Height (cm)	168.3 ± 6.8	166.7 ± 6.2	0.312
BMI (kg/m²)	27.7 ± 4.3	28.2 ± 4.6	0.667
Baseline Heart Rate (beats/min)	78.1 ± 8.1	77.2 ± 9.0	0.685
Baseline SBP (mmHg)	138.1 ± 14.6	140.7 ± 17.1	0.482
Baseline DBP (mmHg)	83.0 ± 11.1	82.0 ± 8.0	0.697
Baseline MAP (mmHg)	101.4 ± 9.8	101.6 ± 9.5	0.892

'An independent samples t-test was applied to compare continuous variables between the two groups'.
Abbreviations: *SAB: Subarachnoid Block; SB: Saddle Block; SBP: Systolic Blood Pressure; DBP: Diastolic Blood Pressure;MAP: Mean Arterial Pressure; bpm: Beats per Minute.*

During the intraoperative period, statistically significant differences were noted between the two groups with respect to hemodynamic stability. Patients in the saddle block group maintained higher and more consistent blood pressures compared to those in the subarachnoid block group. Mean systolic and diastolic blood pressures were 'significantly higher in the saddle block' group (p = 0.001 and p = 0.004, respectively), indicating better circulatory control.

The mean heart rate during surgery was also lower and more stable among saddle block patients (p = 0.012). Episodes of hypotension occurred less frequently in the saddle block group (p = 0.009), and their total vasopressor requirement was markedly reduced compared to the subarachnoid group (p < 0.001). (Table 2)

Table 2. Intraoperative Hemodynamic Parameters (n=70)

Parameter	SAB (Mean ± SD)/n(%)	Saddle (Mean ± SD)/n(%)	p-value
SBP at 5 min (mmHg)	108.5 ± 15.2	125.2 ± 17.6	0.000*
SBP at 15 min (mmHg)	116.5 ± 14.6	128.1 ± 18.8	0.005*
Mean HR during surgery (beats/min)	82.3 ± 8.9	76.1 ± 7.4	0.012*
Mean SBP during surgery (mmHg)	112.7 ± 13.4	124.8 ± 11.7	0.001*
Mean DBP during surgery (mmHg)	70.5 ± 9.2	79.3 ± 8.4	0.004*
Hypotension episodes (n, %)	12 (34.3%)	3 (8.6%)	0.009*
Total vasopressor dose (mg)	2.4 ± 0.6	0.3 ± 0.9	<0.001*

'Independent Samples t-test was used for continuous variables; a Fisher's Exact test was used for categorical data'. ***Abbreviations:*** *SAB – Subarachnoid Block; SB – Saddle Block; SBP – Systolic Blood Pressure; DBP – Diastolic Blood Pressure; HR – Heart Rate*

Significant variations were found in a number of factors when the block characteristics of the two groups were compared. While the percentage of patients who experienced sufficient sensory block was similar in the saddle block and subarachnoid block groups (p = 0.337), the saddle block group saw a considerably faster start of sensory block (p = 0.001).

The duration of analgesia was also shorter with saddle block (p = 0.010), suggesting quicker recovery. In terms of motor block, patients receiving saddle anesthesia achieved a lower maximum Bromage score (p = 0.024) and exhibited a significantly 'shorter duration of motor blockade' (p < 0.001), indicating earlier mobility and reduced motor impairment. (Table 3)

Table 3. Comparison of Block Characteristics between Groups (n = 70)

Parameter	SAB (n = 35) (Mean ± SD)/n(%)	Saddle (n = 35) (Mean ± SD)/n(%)	p-value
Adequate Sensory Block	33 (94.3%)	31 (88.6%)	0.337
Time to Maximum Sensory Block (min)	6.8 ± 1.9	4.5 ± 1.3	0.001*
Duration of Analgesia (min),	239.9 ± 10.1	203.6 ± 8.6	0.010*
Maximum Bromage Score Achieved (Median, IQR)	3 (3–3)	2 (2–3)	0.024*
Duration of Motor Block (min),	202.7 ± 16.2	148.9 ± 14.8	<0.001*

*'An independent samples t-test was used for continuous variables, and the Mann–Whitney U test was used for non-parametric data (Bromage score)'. *Statistically significant (p ≤0.05)*
***Abbreviations:** SAB – Subarachnoid Block;*

Intraoperative and postoperative outcomes showed a clear advantage of saddle block over subarachnoid block in terms of overall patient stability and safety. Although the mean duration of surgery was comparable between the two groups (p = 0.472), patients in the saddle block group required significantly less irrigation fluid during transurethral resection of the prostate (p = 0.048), indicating improved hemodynamic control and reduced bleeding tendency. The incidence of intraoperative adverse events was also significantly lower in the saddle block group compared to the subarachnoid block group (p = 0.041). Postoperative nausea and vomiting, as well as conversion to general anesthesia, were less frequent in the saddle block group, though the differences were not statistically significant (p = 0.132 and p = 0.151, respectively). (Table 4)

Table 4. Intraoperative and Postoperative Outcomes (n = 70)

Variable	SAB (n = 35) (Mean ± SD)/n(%)	Saddle (n = 35) (Mean ± SD)/n(%)	p-value
Duration of Surgery (min)	68.4 ± 10.9	66.7 ± 9.5	0.472
Irrigation Fluid Volume (mL)	1850 ± 320	1720 ± 290	0.048*
Intraoperative Adverse Events	9 (25.7%)	3 (8.6%)	0.041*
Postoperative Nausea/Vomiting	6 (17.1%)	2 (5.7%)	0.132
Conversion to General Anesthesia	2 (5.7%)	0 (0.0%)	0.151

*Independent Samples t-test was applied for continuous variables; Chi-square test was used for categorical data.*Statistically significant (p ≤ 0.05)* ***Abbreviations:** SAB – Subarachnoid Block*

DISCUSSION

In this randomized trial comparing subarachnoid block (SAB) and saddle block for TURP, we observed markedly better intraoperative hemodynamic stability with saddle block: higher intraoperative SBP/DBP, fewer hypotensive episodes, and substantially lower vasopressor requirements despite comparable baseline characteristics. These findings are concordant with a series of recent randomized and comparative studies that reported less hypotension and lower vasopressor consumption with saddle or modified-saddle techniques compared with conventional spinal anesthesia for TURP.[11, 15]

Our finding of fewer hypotension episodes and lower vasopressor dose with saddle block mirrors the results reported by Anjum et al. (modified saddle block) and other single-center randomized trials that documented significantly smaller falls in MAP and HR in saddle groups. These investigators attributed the advantage to the limited cephalad spread of local anesthetic with a low/sitting technique, which minimizes sympathetic blockade.[9, 10]

An open-label randomized trial from Karachi similarly reported lower vasopressor needs and better hemodynamic profiles with saddle block, while still achieving acceptable surgical conditions, a result that supports the external validity of our observations in a similar patient population. That study also noted no increase in major complications with the saddle block.[8] Several authors have emphasized trade-offs between the two techniques. Consistent with our data, prior trials and comparative reports have found that conventional SAB may provide a longer duration of analgesia and a more intense motor block, while saddle block tends to have a faster sensory onset and earlier motor recovery, advantages that facilitate earlier ambulation and shorter motor impairment.[16-18] This pattern was visible in our data, where SAB produced longer analgesia but saddle block had a faster onset and shorter motor block.[19, 20]

Several quasi-experimental and prospective series also reported that saddle block produced smaller MAP changes and lower cumulative vasopressor/ephedrine consumption than spinal anesthesia, reinforcing the idea that the haemodynamic benefit is reproducible across centers and different saddle-block modifications. While many of these were single-center with modest sample sizes, the direction and magnitude of effect are consistent with our trial.[9] Regarding surgical conditions and sensory adequacy, most recent studies found both techniques acceptable for TURP when carefully performed and dosed; in our cohort, the proportion achieving adequate sensory block did not differ significantly between groups, which aligns with other RCTs reporting comparable surgical adequacy despite differing hemodynamic profiles. Thus, the saddle block's hemodynamic advantage does not appear to come at the expense of surgical conditions in contemporary series.[10, 15]

Some authors have documented a slightly higher requirement for supplemental analgesia or lower patient satisfaction with saddle block (presumably related to its more limited dermatomal spread and shorter analgesic duration), while others reported no meaningful differences in satisfaction when intraoperative sedation/analgesic plans were optimized. These nuances explain why technique selection may be individualized, balancing the need for hemodynamic stability (favoring saddle block) versus longer postoperative analgesia or patient comfort preferences (sometimes favoring SAB).[8, 19]

Safety signals in the recent literature are reassuring and consistent with our observations: saddle block was associated with fewer intraoperative adverse events and no increase in serious complications such as TURP syndrome, major bleeding, or need for conversion in most studies that reported such endpoints. A few cardiac-risk–focused studies even suggested that saddle block may be preferable in frail or ischemic heart disease patients undergoing TURP because it limits the extent.[8, 21]

Based on the findings of this study, it is clinically recommended that saddle block anesthesia be considered the technique of choice for patients undergoing transurethral resection of the prostate, particularly in elderly individuals or those with cardiovascular risk factors. Its ability to provide adequate sensory blockade with minimal hemodynamic fluctuations, reduced vasopressor requirements, and quicker postoperative recovery makes it a superior alternative to conventional subarachnoid block. Anesthesiologists should, however, carefully select the dose and positioning time to ensure optimal saddle block spread while avoiding higher levels of anesthesia. Incorporating the saddle block into routine anesthetic practice for TURP can enhance patient safety, improve perioperative outcomes, and reduce postoperative complications.

It is important to recognize the current study's limitations. The kind and dosage of local anesthetics, the precise sitting times for the saddle technique, the use of intrathecal adjuncts, and the definitions of hypotension or vasopressor protocols vary, and many comparison studies are single-center and rather small. Effect sizes and subgroup effects could be more accurately estimated by a meta-analysis with harmonized endpoints or a standardized multicenter RCT.

CONCLUSION:

Saddle block anesthesia offers a safer, more hemodynamically stable, and equally effective alternative to conventional subarachnoid block for patients undergoing TURP. By confining the anesthetic effect to the sacral and lower lumbar dermatomes, saddle anesthesia effectively minimizes sympathetic blockade and the resultant hypotension, thereby enhancing cardiovascular stability, an especially valuable advantage in elderly patients with comorbidities. Furthermore, the technique provides a rapid onset of adequate sensory blockade with faster postoperative recovery and fewer adverse events. These findings underscore the clinical utility of saddle block as a preferred anesthetic technique for short-duration urological procedures, offering both patient safety and procedural efficiency without compromising analgesic quality.

ETHICAL APPROVAL: SIUT-ERC-2025/A-583
PATIENT CONSENT: Informed consent as given by participants.

CONFLICT OF INTEREST: None

AUTHOR CONTRIBUTIONS:

REFERENCES:
1. Ottaiano N, Shelton T, Sanekommu G, Benson CR. Surgical Complications in the Management of Benign Prostatic Hyperplasia Treatment. Curr Urol Rep. 2022 May;23(5):83-92. doi: 10.1007/s11934-022-01091-z.
2. Darwish OM, Lutnick E, Dalimov Z, Waisanen KM, Wang D, Houjaij A, Jung I, Nader ND. Neuraxial vs General Anesthesia: 30-Day Mortality Outcomes Following Transurethral Resection of Prostate. Urology. 2021 Nov;157:274-279. doi: 10.1016/j.urology.2021.06.034.
3. Kamal H, Mohanty Y, Kamal K, Arora V, Bala R, Ahlawat G. Comparative evaluation of spinal anaesthesia and transrectal ultrasound guided peri-prostatic block for patients undergoing transurethral resection of prostate. Sri Lanka Journal of Surgery. 2025;42(3).DOI: 10.4038/sljs.v42i3.9111
4. Mehta A, Mahajan N. Hemodynamic Responses to Spinal Anesthesia in Hypertensive Patients Receiving Angiotensin Receptor Blockers: A Comparative Analysis. Journal of Contemporary Clinical Practice. 2025 May;11(5):184-188. DOI : 10.61336/jccp/25-05-26
5. Elkady OMF, Mohamed NK, Salim AEE, Eldaba AA. Hemodynamic Changes During Spinal Anesthesia with Different Bupivacaine Concentrations in Elderly Cardiac Patients Undergoing Transurethral Resection of Prostate. Journal of Advances in Medicine and Medical Research. 2021;33(7):99-108.
6. Zhao TY, Chen D, Sun H, Xu ZX, Lyu S, Wang T, Liu LL. Moderate sedation with single-dose remimazolam tosilate in elderly male patients undergoing transurethral resection of the prostate with spinal anesthesia: a prospective, single-arm, single-centre clinical trial. BMC Anesthesiol. 2022 Aug 4;22(1):247. doi: 10.1186/s12871-022-01788-1.
7. Karunarathna I, Gunathilake S, Kap De Alvis P, Jayawardana A, Fernando C, Vidanagama U. Saddle Block Anesthesia: A Focused Neuraxial Approach for Perineal and Anorectal Surgical Procedures.
8. Shahid N, Iqbal MW, Haque SN, Rashid AM, Shaukat S. Effectiveness Of Saddle Block Vs Spinal Anaesthesia In Turp: An Open Label Randomized Control Trial. J Ayub Med Coll Abbottabad. 2023 Feb-Mar;35(1):127-132. doi: 10.55519/JAMC-01-11451.
9. Anjum W, Zareen A, Siddique F, Anwar MH, Rehman A. Hemodynamic Comparison between modified saddle block and subarachnoid block for Transurethral Resection of Prostate. Journal of Rawalpindi Medical College. 2022;26(4).
10. Mahmoud AO, Raswal WFA, Ahmed AA, Hasan MAM. Comparison of Saddle Block and Subarachnoid Block for Transurethral Resection of The Prostate in Elderly Cardiac Patients: A Randomized Clinical Trial. The Egyptian Journal of Hospital Medicine (July 2025).100:3308-15.
11. Afsar MI, Shahzad S, Tariq M. Change in Hemodynamics with Saddle versus Spinal Block in Patients Undergoing Elective Transurethral Resection of Prostate for Benign Prostate Hyperplasia. Age (years).56(12.01):62.35-10.96.
12. Porcaro AB, Rizzetto R, Bianchi A, Gallina S, Serafin E, Panunzio A, Tafuri A, Cerrato C, Migliorini F, Zecchini Antoniolli S, Novella G, De Marco V, Brunelli M, Siracusano S, Cerruto MA, Polati E, Antonelli A. American Society of Anesthesiologists (ASA) physical status system

predicts the risk of postoperative Clavien-Dindo complications greater than one at 90 days after robot-assisted radical prostatectomy: final results of a tertiary referral center. J Robot Surg. 2023 Jun;17(3):987-993. doi: 10.1007/s11701-022-01505-7.

13. Jessica L, Wraight E. P291 Documentation of consent and risk for anaesthetic procedures: a single site audit in comparison with national guidelines. BMJ Publishing Group Ltd; 2025.
14. Cetgen N, Ener D, Dogukan M, Duran M, Uludag O. Perfusion Index Value in Determining the Success of Axillary Block. J Coll Physicians Surg Pak. 2022 Sep;32(9):1105-1109. doi: 10.29271/jcpsp.2022.09.1105.
15. Bejoy R, Thomas D, Beevi S. Saddle block versus subarachnoid block for transurethral resection of prostate surgery: A randomized comparative study. Bali Journal of Anesthesiology. 2020;4(4):178-82.
16. Yung EM, Abdallah FW, Todaro C, Spence E, Grant A, Brull R. Optimal local anesthetic regimen for saddle block in ambulatory anorectal surgery: an evidence-based systematic review. Reg Anesth Pain Med. 2020 Sep;45(9):733-739. doi: 10.1136/rapm-2020-101603.
17. Kiprop KB. Effectiveness of Isobaric Bupivacaine Saddle Blocks in Pelvic Surgery: University of Nairobi; 2022.
18. Peterson KJ, Dyrud P, Johnson C, Blank JJ, Eastwood DC, Butterfield GE, Stekiel TA, Peterson CY, Ludwig KA, Ridolfi TJ. Saddle block anesthetic technique for benign outpatient anorectal surgery. Surgery. 2022 Mar;171(3):615-620. doi: 10.1016/j.surg.2021.08.066.
19. Kshetrapal K, Mishra P, Kamal H, Bansal P. Is Saddle block superior to spinal anaesthesia for patients undergoing transurethral resection of prostate-a comparative evaluation. Asian Journal of Medical Sciences. 2021;12(10):105-10.
20. Kim YH, Kwon SY, Jun EH, Choi ST, Park SJ, Kim Y. Comparison of epidural, spinal, and saddle block for holmium laser enucleation of prostate (HoLEP): A prospective randomized, comparative study. Medicine (Baltimore). 2021 Oct 22;100(42):e27534. doi: 10.1097/MD.0000000000027534.
21. Mehmood Z, Abdullah MA, Sanan M, Fayyaz H, Ahmad U, Iftikhar A, Aslam F, Pervaiz Khanday S. Outcomes of Transurethral Resection of the Prostate (TURP) in High-Risk Cardiac Patients Under Spinal Anesthesia. Cureus. 2025 Aug 15;17(8):e90137. doi: 10.7759/cureus.90137.