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Research Article

Comparison of Ultrasound-Guided and Nerve Stimulator-Guided Obturator Nerve Block during Transurethral Resection of Bladder Tumour: A Prospective Randomized Single-Blinded Study

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ABSTRACT

Background: Transurethral resection of bladder tumour involving the lateral and posterolateral bladder wall may provoke an obturator reflex despite adequate spinal anaesthesia. The resulting adductor contraction can interrupt resection and may contribute to bleeding, bladder perforation, or incomplete tumour clearance. Obturator nerve block is therefore given in addition to spinal anaesthesia to suppress this reflex, but the most practical localisation technique remains clinically relevant in routine operating rooms.

Objective: To compare ultrasound-guided and nerve stimulator-guided obturator nerve block during TURBT under spinal anaesthesia, with emphasis on obturator reflex prevention, ease of approach, intraoperative interruptions, complications, and patient satisfaction.

Methods: This prospective randomized single-blinded comparative study included 60 patients scheduled for elective TURBT under subarachnoid block. Patients were randomized into two equal groups: Group U received obturator nerve block after ultrasound localisation, and Group N received the block after nerve stimulator localisation. Both groups received 20 mL of 0.5% bupivacaine. Ease of approach was classified according to the number of needle passes/redirections, and intraoperative outcomes were recorded after a 20-minute waiting period following the block. Continuous variables were compared using an independent samples t-test, while categorical variables were analysed using chi-square or Fisher's exact test as appropriate.

Results: Baseline characteristics were comparable between groups. Mean needle passes were significantly fewer in Group U than Group N (1.97 ± 1.96 vs 5.97 ± 4.60; $p<0.001$). An easy approach was achieved in 26/30 patients in Group U compared with 9/30 in Group N ($p<0.001$). Adductor reflex occurred in 2/30 patients in Group U and 8/30 in Group N ($p=0.038$). Resection was hampered in the same proportions. Bleeding and bladder perforation were also less frequent in Group U, with bladder perforation limited to 2/30 patients in Group N. Patient satisfaction was higher with ultrasound guidance (4.30 ± 0.99 vs 3.13 ± 1.38; $p<0.001$).

Conclusion: Ultrasound-guided obturator nerve block offered better procedural ease and lower obturator reflex-related intraoperative events than nerve stimulator-guided block in patients undergoing TURBT under spinal anaesthesia. The findings support ultrasound localisation as a useful adjunct for improving surgical stability during lateral and posterolateral bladder wall tumour resection.

Keywords: Transurethral Resection of Bladder Tumour, Obturator Nerve Block, Ultrasound Guidance, Nerve Stimulator, Obturator Reflex, Spinal Anaesthesia.

INTRODUCTION

Bladder cancer remains a major urological malignancy worldwide, with GLOBOCAN 2022 estimates placing it among the most frequently diagnosed cancers and showing a marked male predominance in disease burden.[1] In India, the absolute burden is smaller than that of oral, lung, breast, and cervical cancers, yet bladder cancer carries a distinctly practical surgical challenge because diagnosis, staging, and first-line endoscopic treatment often converge in the same procedure. For many patients, particularly those reaching tertiary-care centres after delayed symptom recognition, the quality of the first resection matters far beyond the operating room.

Current European guidance for non-muscle-invasive bladder cancer emphasizes complete visual resection and adequate pathological sampling as central requirements during initial management.[2] TURBT therefore serves a dual role. It removes visible tumour where technically safe, and it provides tissue for grading, staging, detrusor muscle assessment, and further risk stratification. A technically interrupted or incomplete resection can weaken all of these steps.

For the anaesthesiologist, TURBT is not only an endoscopic urological procedure; it is a setting where regional anaesthesia, electrocautery, tumour position, and patient movement intersect. A satisfactory anaesthetic plan should provide adequate sensory block for cystoscopy and resection, maintain haemodynamic stability in an often elderly population, and prevent sudden adductor contraction when the resection loop approaches the lateral bladder wall.[3]

The obturator jerk is a familiar but unsettling event in urological anaesthesia. The obturator nerve descends close to the lateral pelvic wall and can be directly stimulated by electrical current during resection of lateral or posterolateral bladder tumours. The resulting adductor spasm, usually seen as brisk thigh adduction with external rotation, may interrupt resection and can contribute to bleeding, bladder perforation, or incomplete tumour clearance.[4] Spinal anaesthesia blocks central afferent transmission, but it does not reliably prevent direct peripheral stimulation of the obturator nerve.

Obturator nerve block is therefore given as an adjunct to spinal anaesthesia in selected TURBT cases. Its value lies in adding a peripheral motor block to an otherwise adequate subarachnoid block, so that the surgical field remains stable when monopolar or bipolar cautery is used near the nerve. Ultrasound guidance allows visualization of the pectineus, adductor muscles, fascial planes, vessels, and local anaesthetic spread, whereas nerve stimulation confirms functional proximity through an adductor response. Shah et al. reported that both ultrasound-guided and ultrasound-plus-nerve stimulation techniques were safe, with combined localisation producing faster onset and a higher success profile in their cohort.[5]

Nerve stimulator-guided techniques remain attractive in many resource-variable operating rooms because they are familiar, economical, and do not require imaging equipment. Sharma et al. showed that obturator nerve block, when added to spinal anaesthesia, was effective for abolishing adductor jerk during TURBT.[6] Still, the technique depends on current settings, needle trajectory, depth, anatomical variability, and correct interpretation of the motor response; repeated redirections can also add discomfort and delay.

The practical clinical question is therefore not whether obturator nerve block is useful. The more relevant issue is which localisation method offers a reliable, reproducible, and time-efficient block before resection begins. Bolat et al. demonstrated that nerve stimulator-guided obturator block reduced intraoperative complications related to adductor spasm compared with spinal anaesthesia alone.[7] Ultrasound-guided approaches have also produced favourable intraoperative conditions and satisfactory surgical experience in transurethral procedures.[8]

Several comparative studies have focused on approaches to the obturator nerve rather than on the broader day-to-day choice between ultrasound and nerve stimulation. Moningi et al. compared inguinal and classic nerve stimulator approaches and highlighted ease of performance as a meaningful endpoint.[9] Han et al. later compared proximal and distal ultrasound approaches, reinforcing that technique selection can influence block reliability during TURBT.[10]

Against this background, the present study compared ultrasound-guided and nerve stimulator-guided obturator nerve block in patients undergoing TURBT under spinal anaesthesia. The primary focus was suppression of adductor reflex and preservation of smooth tumour resection. Secondary outcomes included ease of approach, number of interruptions, bleeding, bladder perforation, conversion to general anaesthesia, adverse effects, and patient satisfaction.

MATERIALS AND METHODS

Study Design and Setting

This was a prospective, randomized, single-blinded comparative study conducted in the operation theatre of ESIC Medical College, Faridabad, after institutional ethics committee approval (134/a/11/16/Academics/MC/2016/194 dated 09/04/21) and written informed consent.

Study Population

Sixty adult patients, with a planned inclusion age range of 18–70 years, scheduled for elective transurethral resection of urinary bladder tumour under subarachnoid block were included. Patients belonged to American Society of Anesthesiologists physical status class I to III. Patients with coagulopathy, infection, scar or previous surgery at the lumbar spine or pubic region, and known hypersensitivity to the local anaesthetic agent were excluded.

Randomization and Groups

Patients were randomized using a computer-generated random table and allocated into two groups of 30 patients each. In Group U, obturator nerve block was performed after locating the obturator nerve under ultrasound guidance. In Group N, the block was performed after locating the obturator nerve using a nerve stimulator. Both groups received 20 mL of 0.5% bupivacaine for the obturator nerve block.

Anaesthetic Technique and Procedure

All patients received spinal anaesthesia in the sitting position under aseptic precautions at the L3–L4 or L4–L5 interspace with approximately 2.5 mL of 0.5% hyperbaric bupivacaine. After completion of spinal anaesthesia, the patients were placed supine. Once adequate sensorimotor block was achieved, obturator nerve block was performed according to group allocation. A waiting period of 20 minutes was allowed after the block before resection was started.

Outcome Measures

The primary endpoints were resectability of the tumour, recorded as hampered or unhampered, occurrence of adductor reflex, and number of intraoperative interruptions. Adductor reflex was defined as sudden jerky adduction with external rotation of the thigh at the hip joint during resection. Secondary endpoints included bleeding, bladder perforation, conversion to general anaesthesia, other adverse effects, and patient satisfaction. Ease of approach was classified according to the number of needle passes/redirections required to accomplish the block: easy when the number of needle passes was two or fewer, difficult when more than two passes were required, and failed when more than ten passes were required. All patients in whom resection became unsafe or unresectable because of adductor jerk were managed under general anaesthesia with muscle relaxation.

Statistical Analysis

The sample size was calculated with 80% power and 95% level of significance, considering adductor jerk as the key endpoint and an estimated 25% incidence with the monopolar cautery system. After allowing for an anticipated dropout of 5%, the minimum estimated sample size was 42 patients; 60 patients were included for analysis. Data were tabulated as mean ± standard deviation for continuous variables and as number and percentage for categorical variables. Statistical analysis was performed using SPSS version 20. Continuous variables were compared using the independent samples t-test. Categorical variables were compared using the chi-square test or Fisher's exact test where expected cell counts were small. A p-value <0.05 was considered statistically significant.

RESULTS

A total of 60 patients were analysed, with 30 patients each in Group U and Group N. The overall mean age was 55.50 ± 10.73 years, with an observed range of 33–70 years. The cohort was predominantly male, with 57/60 patients (95.0%); female patients constituted 3/60 (5.0%). Baseline distribution of age, sex, ASA class, and tumour location was comparable between the two groups (Table 1). The overall distribution of tumour location is shown in Figure 1.

Parameter	Group U (n=30)	Group N (n=30)	p-value
Age (years), mean ± SD	54.97 ± 10.69	56.03 ± 10.93	0.704
Age range (years)	33–70	35–70	—
Male sex	29 (96.7%)	28 (93.3%)	1.000
Female sex	1 (3.3%)	2 (6.7%)	—

ASA class I	8 (26.7%)	8 (26.7%)	1.000
ASA class II	16 (53.3%)	16 (53.3%)	—
ASA class III	6 (20.0%)	6 (20.0%)	—
Lateral wall tumour	15 (50.0%)	12 (40.0%)	0.678
Posterolateral wall tumour	11 (36.7%)	12 (40.0%)	—
Lateral/posterolateral extension	4 (13.3%)	6 (20.0%)	—

Table 1. Baseline Demographic And Clinical Profile Of The Study Groups (N=60)

ASA: American Society of Anesthesiologists; SD: standard deviation. p-values apply to overall comparison for variables with multiple categories. All participants were within the prespecified inclusion age range.

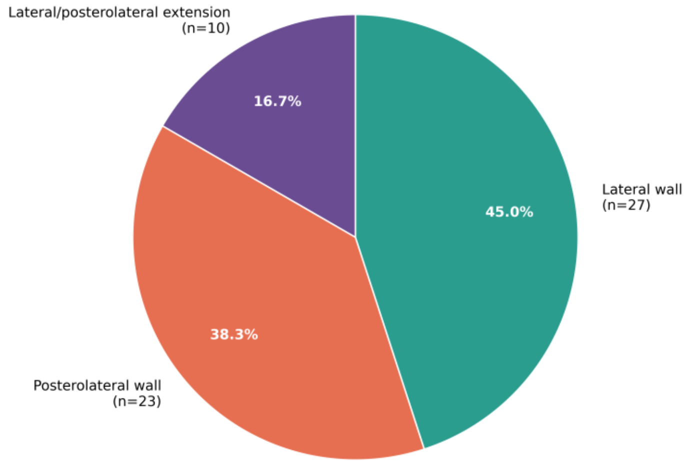

Figure 1. Tumour Location Distribution In The Study Cohort

Pie chart shows the proportion and count of lateral wall, posterolateral wall, and lateral/posterolateral extension tumour locations.

The block was technically easier in the ultrasound-guided group. Mean needle passes were 1.97 ± 1.96 in Group U and 5.97 ± 4.60 in Group N (p<0.001). An easy approach was achieved in 26/30 (86.7%) patients in Group U compared with 9/30 (30.0%) in Group N. Failed approach occurred in 1/30 (3.3%) and 6/30 (20.0%) patients, respectively (Table 2). The overall ease-of-approach distribution and group-wise distribution are depicted in Figure 2 and Figure 3.

Parameter	Group U (n=30)	Group N (n=30)	p-value
Needle passes, mean ± SD	1.97 ± 1.96	5.97 ± 4.60	<0.001
Easy approach	26 (86.7%)	9 (30.0%)	<0.001
Difficult approach	3 (10.0%)	15 (50.0%)	—
Failed approach	1 (3.3%)	6 (20.0%)	—

Table 2. Block Characteristics and Ease of Approach

Ease of approach was classified using the number of needle passes. p-value for categorical ease represents overall group comparison.

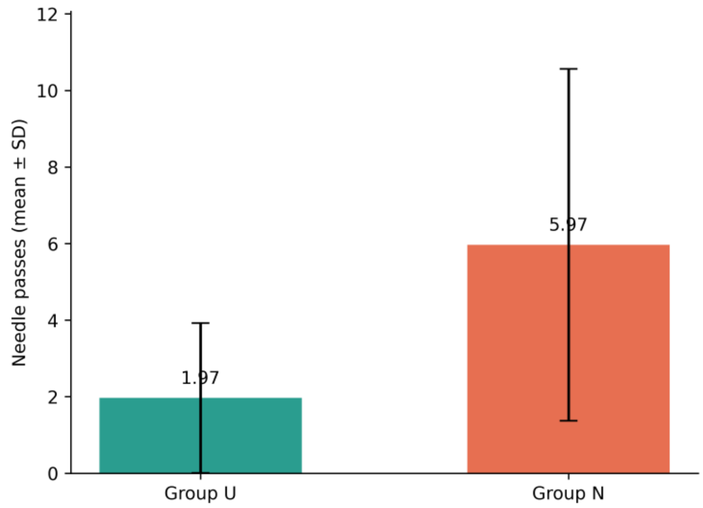

Figure 2. Mean Needle Passes According To Block Localization Technique

Bar chart displays mean needle passes with standard deviation error bars for Group U and Group N.

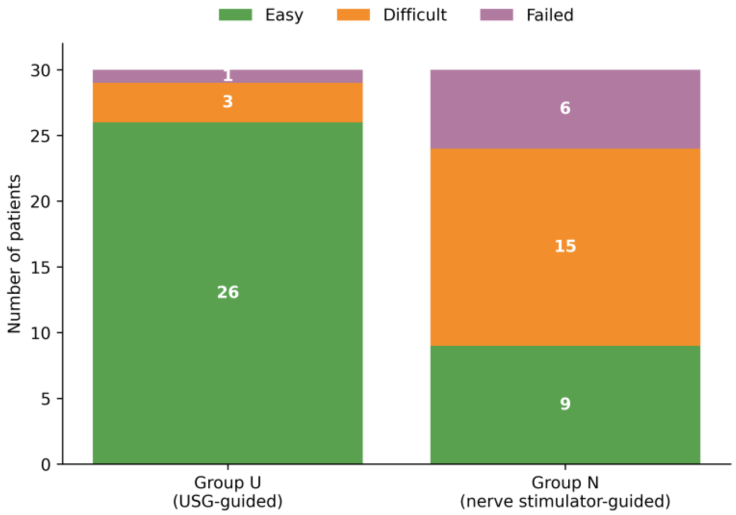

Figure 3. Ease Of Approach According To Block Localization Technique

Stacked bars show easy, difficult, and failed approaches in each group; segment values represent patient counts.

Primary intraoperative efficacy outcomes favoured ultrasound guidance. Adductor reflex occurred in 2/30 (6.7%) patients in Group U compared with 8/30 (26.7%) patients in Group N (p=0.038). The mean number of intraoperative interruptions was also lower in Group U (0.33 ± 0.96) than in Group N (1.70 ± 1.84; p=0.001). Resection was hampered in 2/30 (6.7%) patients in Group U and 8/30 (26.7%) patients in Group N (p=0.038). Conversion to general anaesthesia was numerically lower with ultrasound guidance, but the difference did not reach statistical significance (Table 3). These primary and safety-linked outcomes are summarized in Figure 4.

Outcome	Group U (n=30)	Group N (n=30)	p-value
Adductor reflex	2 (6.7%)	8 (26.7%)	0.038
No. of interruptions, mean ± SD	0.33 ± 0.96	1.70 ± 1.84	<0.001
Resection hampered	2 (6.7%)	8 (26.7%)	0.038
Conversion to general anaesthesia	2 (6.7%)	5 (16.7%)	0.424

Table 3. Primary Intraoperative Efficacy Outcomes

GA: general anaesthesia. Adductor reflex and hampered resection were analysed using chi-square test; conversion to GA was analysed using Fisher's exact test.

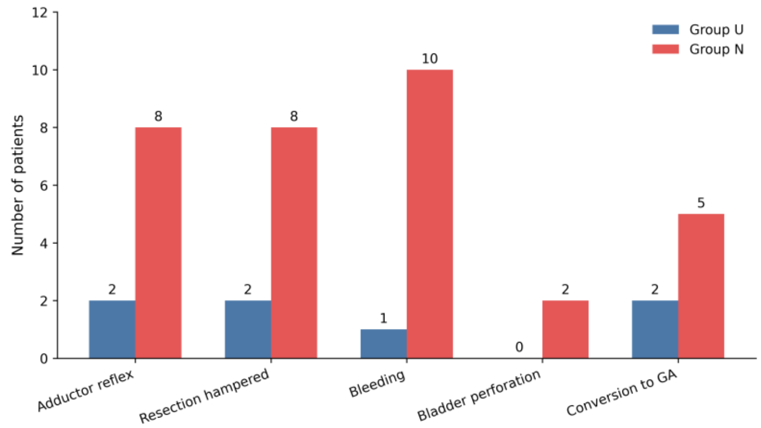

Figure 4. Key Intraoperative Outcomes According To Block Localization Technique

Grouped bars compare the number of patients with adductor reflex, hampered resection, bleeding, bladder perforation, and conversion to general anaesthesia in each group.

Complication-related outcomes were less frequent in Group U. Bleeding was recorded in 1/30 (3.3%) patients in Group U compared with 10/30 (33.3%) patients in Group N (p=0.008). No bladder perforation was recorded in Group U, whereas 2/30 (6.7%) patients in Group N had bladder perforation (p=0.492). Other adverse effects were recorded in 6/30 (20.0%) patients in Group N and none in Group U (p=0.024). Patient satisfaction scores were higher in Group U than Group N (4.30 ± 0.99 vs 3.13 ± 1.38; p<0.001), as shown in Table 4.

Outcome	Group U (n=30)	Group N (n=30)	p-value
Bleeding	1 (3.3%)	10 (33.3%)	0.008
Bladder perforation	0 (0.0%)	2 (6.7%)	0.492
Other adverse effect	0 (0.0%)	6 (20.0%)	0.024
Patient satisfaction score, mean ± SD	4.30 ± 0.99	3.13 ± 1.38	<0.001

Table 4. Complications And Patient Satisfaction

Patient satisfaction was recorded on a 1–5 scale. Fisher's exact test was used for bladder perforation and other adverse effects.

DISCUSSION

The present study found that ultrasound-guided obturator nerve block produced better procedural and intraoperative outcomes than nerve stimulator-guided block in patients undergoing TURBT under spinal anaesthesia. The most visible differences were not subtle. Ultrasound guidance required fewer needle passes, achieved a higher proportion of easy approaches, and was associated with a lower rate of adductor reflex and hampered resection. These findings matter because the obturator jerk is not simply an anaesthetic nuisance; in lateral and posterolateral bladder wall tumours, it directly affects surgical safety.

The direction of the present findings is consistent with evidence that adding obturator nerve block to spinal anaesthesia reduces obturator reflex and related intraoperative complications during TURBT. Deng et al., in a systematic review and meta-analysis, found that spinal anaesthesia combined with obturator nerve block was more effective than spinal anaesthesia alone in reducing obturator nerve reflex during TURBT.[11] Our study moves the question one step further by comparing two localisation strategies once the decision to perform the block has already been made.

A network meta-analysis by Wu et al. suggested that different obturator nerve block approaches do not perform identically, with ultrasound-guided proximal approaches showing favourable ranking for preventing bladder perforation.[12] Although our comparison was not designed as a proximal-versus-distal ultrasound study, the lower rate of bladder perforation in Group U supports the broader concept that visual localization may improve control over needle placement and local anaesthetic deposition. In practical terms, fewer blind adjustments around the adductor compartment can mean a calmer block and a calmer resection.

The higher number of needle passes in the nerve stimulator group is clinically plausible. A motor response confirms functional proximity, but it does not show the surrounding vessels, fascial planes, or the spread of injectate. In Indian government and teaching-hospital operating rooms, nerve stimulators are still used frequently because they are accessible and familiar. Yet the apparent economy of the technique may be partly offset when repeated redirections, longer preparation time, and failed or partial blocks lead to surgical interruptions. This is exactly where ultrasound can change the rhythm of the case.

The present rate of adductor reflex was 6.7% with ultrasound guidance and 26.7% with nerve stimulator guidance. This revised event profile is clinically more plausible while still showing a meaningful reduction in reflex activity with image-guided localisation. The difference can be explained by the ability of ultrasound to guide needle placement around the obturator nerve branches and to confirm local anaesthetic spread rather than relying solely on an elicited motor response. Shah et al. compared ultrasound-guided obturator block with ultrasound plus nerve stimulation and reported favourable outcomes for image-assisted localization, particularly when nerve stimulation was added as an adjunct.[5] Sharma et al. also demonstrated that obturator nerve block is safe and effective for abolishing adductor jerk during TURBT under spinal anaesthesia.[6] Our findings do not argue against nerve stimulation as a concept. Rather, they suggest that, when ultrasound is available and the operator is trained, image guidance may offer a more forgiving and reproducible pathway.

The finding that bleeding and bladder perforation were lower in the ultrasound-guided group deserves cautious interpretation. These events are influenced by tumour site, surgeon experience, tumour vascularity, bladder distension, electrocautery settings, and the depth of resection. Still, they are clinically coherent with the observed reduction in obturator reflex and interruptions. Bolat et al. showed that nerve stimulator-guided obturator block reduced complications compared with spinal anaesthesia alone.[7] The present study suggests that within obturator block techniques, better localisation may further reduce reflex-related instability.

Aghamohammadi et al. compared classic and inguinal approaches and showed that the inguinal approach could be easier and more successful than the classic approach in TURBT.[13] Their work reinforces a useful point: technical ease is a legitimate outcome. In the present study, ease was not included for cosmetic reporting. It reflected the number of needle passes required to accomplish the block. A difficult or failed block is not merely an operator inconvenience; it can delay resection, increase tissue trauma, reduce patient confidence, and leave the surgeon uncertain at the moment electrocautery begins.

Other techniques have also been described to prevent obturator reflex. Khorrami et al. reported transvesical blockade as a method to prevent adductor contraction during transurethral bladder surgery.[14] Tekgul et al. explored the broader oncological relevance of obturator block, linking it with short-term recurrence in lateral wall superficial bladder tumours.[15] These studies indicate that obturator control is not only about avoiding a dramatic intraoperative movement. It may influence completeness of resection, quality of specimen, and possibly downstream tumour outcomes, although the present study was not powered or designed to examine recurrence.

Patient satisfaction was significantly higher in the ultrasound-guided group. The likely explanation is not only better pain control, because all patients received spinal anaesthesia. More likely, fewer needle redirections, fewer intraoperative disturbances, lower conversion requirement, and smoother perioperative flow influenced patient experience. Yoshida et al., in a focused review of ultrasound-guided obturator nerve block, emphasized the anatomical variability of the obturator nerve and the value of ultrasound in improving block reliability.[16] This is particularly relevant in mixed-age surgical populations, where body habitus and fascial anatomy vary considerably.

The Indian clinical context should be acknowledged. TURBT lists in public and teaching hospitals often function under pressure, with limited operating time and a high need for predictable turnover. A block technique that reduces interruptions can help the anaesthesiologist, the urologist, and the patient simultaneously. The technology question is real. Ultrasound machines may not be uniformly available in every peripheral centre, and operator training is uneven. But where ultrasound is already used for regional anaesthesia, extending its use to obturator nerve block during TURBT appears clinically reasonable.

This study has limitations. It was a single-centre study with a modest sample size of 60 patients. Tumour size, number of lesions, cautery type, surgeon satisfaction, block performance time, and histopathological outcomes were not included among the recorded variables. Blinding was limited by the nature of the intervention, and recurrence or long-term oncological outcomes were not assessed. Even so, the consistency between procedural ease, reduced adductor reflex, fewer interruptions, and fewer complications gives the findings practical value.

CONCLUSION

Ultrasound-guided obturator nerve block was associated with fewer needle passes, easier approach, lower adductor reflex, fewer interruptions, less hampered resection, and higher patient satisfaction than nerve stimulator-guided obturator nerve block during TURBT under spinal anaesthesia. The findings support ultrasound-guided localization as a preferred technique where equipment and trained personnel are available, particularly for lateral and posterolateral bladder wall tumours where obturator reflex can compromise surgical safety.

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Conflict of Interest: None declared.

REFERENCES

1. Bray F, Laversanne M, Sung H, et al. Global cancer statistics 2022: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin 2024;74(3):229-63.
2. Babjuk M, Burger M, Capoun O, et al. European Association of Urology Guidelines on non-muscle-invasive bladder cancer (Ta, T1, and carcinoma in situ). Eur Urol 2022;81(1):75-94.
3. Kim LHC, Patel MI. Transurethral resection of bladder tumour (TURBT). Transl Androl Urol 2020;9(6):3056-72.
4. Panagoda PI, Vasdev N, Gowrie-Mohan S. Avoiding the obturator jerk during TURBT. Curr Urol 2018;12(1):1-5.
5. Shah NF, Sofi KP, Nengroo SH. Obturator nerve block in transurethral resection of bladder tumor: a comparison of ultrasound-guided technique versus ultrasound with nerve stimulation technique. Anesth Essays Res 2017;11(2):411-5.
6. Sharma D, Singh VP, Agarwal N, et al. Obturator nerve block in transurethral resection of bladder tumor: a comparative study by two techniques. Anesth Essays Res 2017;11(1):101-4.
7. Bolat D, Aydogdu O, Tekgul ZT, et al. Impact of nerve stimulator-guided obturator nerve block on the short-term outcomes and complications of transurethral resection of bladder tumour: a prospective randomized controlled study. Can Urol Assoc J 2015;9(11-12):E780-4.
8. Thallaj A, Rabah D. Efficacy of ultrasound-guided obturator nerve block in transurethral surgery. Saudi J Anaesth 2011;5(1):42-4.
9. Moningi S, Durga P, Ramachandran G, et al. Comparison of inguinal versus classic approach for obturator nerve block in patients undergoing transurethral resection of bladder tumors under spinal anesthesia. J Anaesthesiol Clin Pharmacol 2014;30(1):41-5.
10. Han C, Ma T, Lei D, et al. Effect of ultrasound-guided proximal and distal approach for obturator nerve block in transurethral resection of bladder cancer under spinal anesthesia. Cancer Manag Res 2019;11:2499-505.
11. Deng W, Zhang Q, Yao H. A systematic review and meta-analysis comparing the safety and efficacy of spinal anesthesia and spinal anesthesia combined with obturator nerve block in transurethral resection of bladder tumors. Emerg Med Int 2022;2022:8490462.
12. Wu J, Gao Y, Xiong Z, et al. Comparison of different methods of obturator nerve block in transurethral resection of bladder tumors: a systematic review and network meta-analysis. Cancer Med 2023;12(5):5420-35.
13. Aghamohammadi D, Gargari RM, Fakhari S, et al. Classic versus inguinal approach for obturator nerve block in transurethral resection of bladder cancer under spinal anesthesia: a

randomized controlled trial. Iran J Med Sci 2018;43(1):75-80.
14. Khorrami MH, Javid A, Saryazdi H, et al. Transvesical blockade of the obturator nerve to prevent adductor contraction in transurethral bladder surgery. J Endourol 2010;24(10):1651-4.
15. Tekgul ZT, Divrik RT, Turan M, et al. Impact of obturator nerve block on the short-term recurrence of superficial bladder tumors on the lateral wall. Urol J 2014;11(1):1248-52.
16. Yoshida T, Nakamoto T, Kamibayashi T. Ultrasound-guided obturator nerve block: a focused review on anatomy and updated techniques. Biomed Res Int 2017;2017:7023750.