

Re-TURBT Redefined: How Repeat Transurethral Resection Optimizes Management of High-Grade Non-Muscle-Invasive Bladder Cancer

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Abstract

Background: High-grade non-muscle-invasive bladder cancer (HG-NMIBC) has a strong tendency to recur early, often because some tumor is left behind after the first resection rather than because a new tumor has formed. Systematic reviews report residual disease in 33–53% of patients after an initial transurethral resection of bladder tumor (TURBT). This prospective study evaluated how useful a repeat TURBT (reTURBT) is in high-grade T1 NMIBC — how often it finds residual tumor, how often it changes the stage, and which factors predict this. **Material and Methods:** This prospective study was done at the NCR Institute of Medical Sciences, Meerut (May 2025–May 2026). Thirty adults with confirmed high-grade T1 NMIBC underwent reTURBT 4–6 weeks after their first resection. Group comparisons used the chi-square test. Because some subgroups were small, we also calculated exact 95% confidence intervals (Clopper-Pearson method) so small-sample estimates are not over-interpreted. **Results:** Residual or recurrent tumor was found in 56.7% of patients (17/30; 95% CI 37.4–74.5%). Rates were highest in anterior wall tumors (100%, 3/3), tumors ≥ 3 cm (80%, 4/5), and multiple tumors (63.6%, 7/11) — though the anterior wall and size subgroups had very few patients, so their confidence intervals are wide (29.2–100% and 28.4–99.5%) and should be read with caution. Upstaging from T1 to T2 occurred in 6.6% of cases (2/30; 95% CI 0.8–22.1%). Whether or not detrusor muscle was present in the first specimen made no clear difference to recurrence (58.3% vs. 55.6%). **Conclusion:** ReTURBT identifies clinically significant residual disease and staging changes in high-grade T1 NMIBC and supports the EAU/AUA recommendation for routine re-resection in high-risk cases. Some of our subgroup findings are based on very small numbers and need confirmation in larger studies. A selective approach may be reasonable for lower-risk patients.

Keywords: Urinary Bladder Neoplasms, Neoplasm Staging, Reoperation, Cystoscopy.

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INTRODUCTION

Bladder cancer is the 10th most common cancer worldwide, with an estimated 573,000 new cases and over 210,000 deaths annually.^[1] In India, it accounts for roughly 3–4% of cancers in men, with population-based data suggesting a rising incidence linked to tobacco use and industrial exposure. It is one of the more common cancers in older adults and a significant cause of illness in this age group.^[2] Bladder cancer is broadly divided into muscle-invasive bladder cancer (MIBC) and non-muscle-invasive bladder cancer (NMIBC), with NMIBC making up most new cases.^[3] High-grade NMIBC recurs often and carries a real risk of progressing into the muscle layer, which is why close follow-up and timely re-treatment are considered essential.^[3,4] TURBT serves a dual purpose: it removes the visible tumor and provides tissue for accurate staging. Even when the surgery goes well, residual tumor is found in more than a third of patients when they are re-checked, and about one in ten patients turns out to have been understaged the first time.^[5] Whether the first specimen contains detrusor muscle is a useful clue to how thorough the resection was - its absence is linked to a higher chance of residual disease and later progression.^[5] However, our own findings suggest this link is not strong enough to reliably predict outcomes in an

individual patient.

An early second resection (reTURBT) helps close this gap: it improves staging accuracy, removes residual disease more completely, and lowers the risk of progression. Because of this, both the European Association of Urology (EAU) and the American Urological Association (AUA) recommend reTURBT for nearly all high-grade T1 NMIBC cases, especially when the first specimen lacked detrusor muscle.^[3,4] In everyday practice, however, this is not always followed — a second surgery adds cost, risk, and logistical burden, particularly where resources are limited, which is why some clinicians favour a more selective approach. This study evaluates how reTURBT performs in high-grade NMIBC patients treated at our centre — specifically its effect on staging accuracy and on finding residual or recurrent

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disease — and weighs its benefits against the burden it adds, with a focus on which patient and tumor factors might help identify who truly needs a second resection.

MATERIALS AND METHODS

Study design and setting: This prospective study was conducted at the Department of Surgery, NCR Institute of Medical Sciences, Meerut, from May 1, 2025 to May 1, 2026. Ethical approval was obtained from the Institutional Review Board, and written informed consent was obtained from all participants prior to enrolment.

Patient selection: Thirty adult patients with histopathologically confirmed high-grade T1 NMIBC following initial TURBT were included. Exclusion criteria comprised muscle-invasive bladder cancer (T2 or higher), prior history of bladder cancer, uncorrected coagulopathy, and significant comorbidities precluding repeat surgery.

Surgical technique: TURBT was performed under general or regional anesthesia using a 26 Fr resectoscope. All visible tumor was completely resected, and deeper tissue including detrusor muscle was systematically sampled. All eligible patients underwent reTURBT within 4–6 weeks via systematic re-resection of the previous tumor bed.

Outcome definitions: For the primary outcome, "residual/recurrent tumor" refers to any tumor identified at reTURBT, whether at the original resection site or elsewhere in the bladder. Given the short 4–6 week interval between the two procedures, these findings are presumed to represent residual disease from the initial resection rather than genuinely new (recurrent) tumor formation; this distinction is discussed further below.

Statistical analysis: Data were analyzed using SPSS version 21.0 (IBM Corp., Armonk, NY). Categorical variables were compared using the chi-square test, with $p < 0.05$ considered statistically significant. Because several subgroups were small and multiple comparisons were made without adjustment, formal p -values are not reported; instead, exact 95% confidence intervals (Clopper-Pearson method) are presented alongside all proportions to convey the precision of each estimate.

RESULTS

Patient and tumor characteristics: Thirty patients were included; demographic and tumor characteristics are summarised in [Table 1]. Mean age was 65.5 years (range 40–78), and 70% of patients were older than 60 years. There was a strong male predominance (96.7%), and 40% had a smoking history.

Most tumors (83.3%) were smaller than 3 cm, and multiple lesions were present in 36.7% of patients (11/30). The lateral wall was the most common tumor location (56.7%), followed by the posterior wall (33.3%) and anterior wall (10.0%).

Residual and recurrent tumor rates: The overall residual/recurrent tumor rate on reTURBT was 56.7% (17/30). Recurrence was highest in anterior wall tumors (100%, 3/3), tumors ≥ 3 cm (80%, 4/5), posterior wall tumors (80%, 8/10), and multiple lesions (63.6%, 7/11). Detrusor muscle presence in the primary specimen was not significantly protective: recurrence occurred in 58.3% (7/12) of patients with muscle present versus 55.6% (10/18) without [Table 2].

Re-staging after reTURBT: Upstaging from T1 to T2 was observed in 6.6% of cases (2/30); the majority of patients (93.4%, 28/30) remained at the same pathological stage after reTURBT [Figure 1].

Table 1: Demographic and tumor characteristics of the study population (n = 30).

Characteristic	n	%	95% CI
Age (years)			
40–50	2	6.7	0.8–22.1
51–60	7	23.3	9.9–42.3
>60	21	70.0	50.6–85.3
Sex			
Male	29	96.7	82.8–99.9
Female	1	3.3	0.1–17.2
Smoking history			
Current/ex-smoker	12	40.0	22.7–59.4
Non-smoker	18	60.0	40.6–77.3
Number of lesions			
Single	19	63.3	43.9–80.1
Multiple	11	36.7	19.9–56.1
Tumor size			
<3 cm	25	83.3	65.3–94.4
≥ 3 cm	5	16.7	5.6–34.7
Tumor location			
Anterior wall	3	10.0	2.1–26.5
Posterior wall	10	33.3	17.3–52.8
Lateral wall	17	56.7	37.4–74.5
Outcome on reTURBT			
No residual tumor	13	43.3	25.5–62.6
Residual/recurrent tumor	17	56.7	37.4–74.5

Table 2: Residual/recurrent tumor on reTURBT according to tumor characteristics.

Characteristic	Residual tumor present, n (%)	Residual tumor absent, n (%)	Total	95% CI (residual)
Detrusor muscle in primary TURBT				
Present	7 (58.3)	5 (41.7)	12	27.7–84.8

Absent	10 (55.6)	8 (44.4)	18	30.8–78.5
Tumor size				
<3 cm	13 (52.0)	12 (48.0)	25	31.3–72.2
≥3 cm	4 (80.0)	1 (20.0)	5	28.4–99.5
Number of lesions				
Single	10 (52.6)	9 (47.4)	19	28.9–75.6
Multiple	7 (63.6)	4 (36.4)	11	30.8–89.1
Tumor location				
Anterior wall	3 (100.0)	0 (0.0)	3	29.2–100.0
Posterior wall	8 (80.0)	2 (20.0)	10	44.4–97.5
Lateral wall	6 (35.3)	11 (64.7)	17	14.2–61.7

Residual tumor rates were similar among patients with detrusor muscle present (58.3%) and absent (55.6%) in the primary TURBT specimen. Tumor size showed a higher residual rate in lesions ≥3 cm (80.0%) compared with those <3 cm (52.0%). Similarly, residual tumor was more frequent in patients with multiple lesions (63.6%) than in those with a single lesion (52.6%). [Table 2]

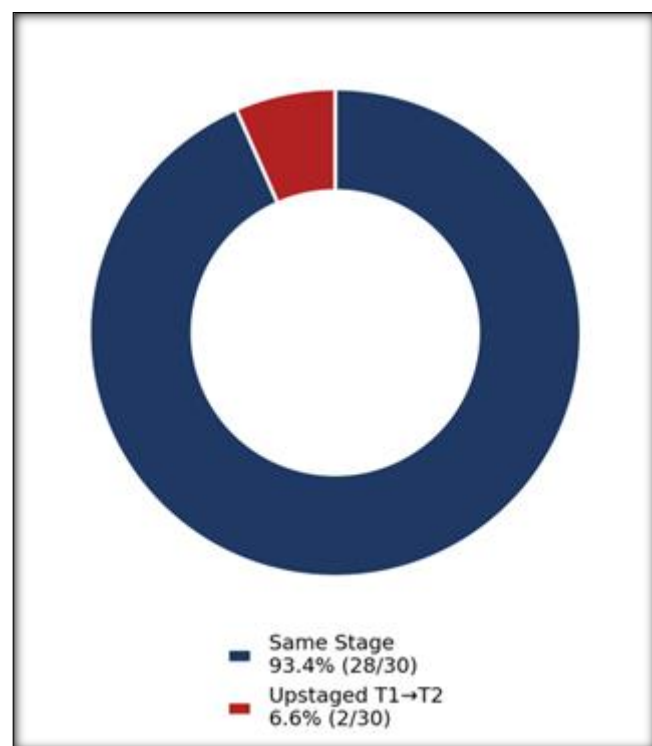


Figure 1: Re-staging distribution following reTURBT.

The donut chart illustrates the proportion of patients upstaged from T1 to T2 (6.6%, n = 2) versus those remaining at the same pathological stage (93.4%, n = 28). Abbreviation: reTURBT, repeat transurethral resection of bladder tumor.

DISCUSSION

In this study, 56.7% of patients had residual or recurrent tumor found at reTURBT (17/30; 95% CI 37.4–74.5%), and 6.6% were upstaged from T1 to T2 (2/30; 95% CI 0.8–22.1%). Both figures are consistent with the range reported by other studies, where residual disease at second resection has been found in 33% to 76% of cases⁵. Notably, reTURBT is done only 4–6 weeks after the first surgery — too soon for a genuinely new tumor to grow. So most of what is labelled

"residual/recurrent" disease in this kind of study is really tumor that was simply missed the first time, not a new cancer forming. Grouping these together, as most studies do, can make the disease sound more aggressive than it really is, when the bigger issue is that the first resection was incomplete.

The groups with the highest residual disease rates in our study were anterior wall tumors (100%, 3/3), tumors 3 cm or larger (80%, 4/5), and tumors with multiple lesions (63.6%, 7/11). These match the risk factors that guidelines already flag as needing re-resection. The anterior wall finding is also clinically plausible on technical grounds: anterior wall lesions are harder to resect completely because of the limited working angle and reduced visibility with a standard resectoscope, which may explain why residual disease was more common there. However, the anterior wall and size groups had only 3 and 5 patients respectively, so their confidence intervals are wide (29.2–100% and 28.4–99.5%). These findings are hypothesis-generating and require validation in larger studies.

Both EAU and AUA guidelines recommend reTURBT for high-grade T1 disease, especially when the first specimen lacked detrusor muscle, for exactly the reasons above^{3,4}. Our results support this and, with the caution noted above, also point to anterior wall location, larger tumor size, and multiple tumors as useful markers for deciding who most needs a second resection. One finding contrasted with the existing literature, which identifies absence of detrusor muscle in the index specimen as a predictor of residual disease⁵: in our cohort, whether or not detrusor muscle was present made no clear difference to recurrence (58.3%, 7/12 vs. 55.6%, 10/18; confidence intervals 27.7–84.8% and 30.8–78.5%, which overlap almost completely). This overlap tells us our study is simply too small to detect a real difference if one exists — it does not prove that detrusor muscle sampling doesn't matter, and this finding should not be read as evidence against the importance of adequate muscle sampling. Larger studies, ideally across multiple centres with a standard resection technique, are needed to clarify this question in contemporary practice.

Rationale for reporting confidence intervals: A few points about our statistical approach are worth explaining plainly. First, we looked at four separate tumor features (detrusor muscle status, size, number of tumors, and location) against the same outcome. When you test several factors like this without adjustment, a striking-looking result in one subgroup — like the 100% recurrence in anterior wall tumors — is more likely to be due to chance than if it had been the single question we set out to test. Second, several of our subgroups are too small for the chi-square test to be reliable (it needs at least 5 expected cases per group). This is why we chose not to report formal p-values, and instead

used exact confidence intervals, which are more honest about how uncertain small-sample estimates really are. Third, because every patient in this study had a reTURBT, we can only describe what reTURBT finds — we cannot directly compare it to skipping the second surgery. That comparison

has to come from the randomised trials discussed below.

Comparison with other studies: [Table 3] compares our findings with the key studies that have shaped current reTURBT practice, from the earliest second-look series to the largest modern systematic review.

Table 3: Comparison of residual/recurrent tumor and upstaging rates with key published studies on reTURBT in high-grade NMIBC.

Study	Design	n	Residual/recurrent rate	Upstaging rate	Key finding
Present study (Chauhan & Kumar, 2026)	Prospective, single-centre	30	56.7%	6.6%	Anterior wall, size ≥ 3 cm, multifocality carried highest burden; detrusor status not distinguishably protective
Cumberbatch et al, ^[5] 2018	Systematic review (31 studies)	8,409	33–78% (T1)	0–32%	Largest pooled evidence base; wide heterogeneity across included studies
Divrik et al, ^[6] 2006	Randomised controlled trial	—	Not individually reported	—	Second resection + intravesical mitomycin significantly reduced recurrence, greatest benefit in high-grade tumors
Divrik et al, ^[7] 2010	RCT, long-term follow-up	—	—	—	Routine second resection improved long-term recurrence-free and progression-free survival
Herr, ^[8] 1999	Second-look series	—	Substantial (not individually quantified)	—	Among the earliest studies establishing the rationale for reTURBT
Klan et al, ^[9] 1991	Second-look series	—	Substantial	—	Early foundational evidence of residual disease at second resection
Dalbagni et al, ^[10] 2002	Retrospective staging study	—	—	Meaningful proportion	Second resection altered staging/management in a meaningful proportion of patients
Zapała et al, ^[11] 2018	Retrospective, single-centre	132	40.2% (51.4% in T1-HG subset)	6.8%	Closest comparator to the present study in both residual and upstaging rates
Sfakianos et al, ^[12] 2014	Retrospective, BCG-treated cohort	—	—	—	Restaging findings carried independent prognostic value for recurrence and progression

Overall, our residual/recurrent rate sits in the upper-middle of the range seen across these studies, while our upstaging rate is on the lower side — in keeping with the idea that most of what reTURBT finds is residual disease rather than aggressive new-stage tumor. The closest match to our study, Zapała et al,^[11] used a similar single-centre retrospective design and found similar numbers, which gives our results some outside support despite our small sample. One thing our study adds that isn't clearly called out in the others is the anterior wall finding — none of the comparison studies highlight this location specifically as a risk factor.

Reserving reTURBT for genuinely low-risk patients — small, single, laterally located tumors with good muscle sampling the first time — may be reasonable and would spare them a second surgery without compromising safety.^[3] Adding biomarker testing, such as urinary FGFR3 status, along with a formal cost analysis, could help sharpen these decisions further, though any such approach would need to be tested properly in larger studies before being used in practice.

Clinical Implications: These findings support the routine use of reTURBT in high-grade T1 NMIBC, particularly for tumors with high-risk features. The 6.6% upstaging rate to T2 is clinically important, since muscle-invasive disease requires a very different treatment path, including radical cystectomy or trimodality therapy. In resource-limited settings, a risk-stratified approach may be worth considering: patients with small (<3 cm), solitary, laterally located tumors with documented detrusor muscle in the first specimen could reasonably be considered for observation instead of mandatory reTURBT, provided close surveillance is feasible.

Strengths and Limitations: This study's main strengths are

its prospective design, careful data collection, and detailed recording of tumor features relevant to clinical decisions. It also reports exact confidence intervals rather than relying on statistical tests that don't work well with small subgroups. Coming from a tertiary-care centre, it reflects real-world practice and supports current guidelines while pointing toward more targeted risk assessment.

The limitations are equally important to state clearly: this is a single-centre study of only 30 patients, with a short follow-up period that doesn't capture long-term progression or survival, and no comparison group that skipped reTURBT. Several subgroup results are based on very small numbers. The finding that detrusor muscle presence made no difference to recurrence should be read as "our study was too small to tell," not as proof that it truly doesn't matter — this needs to be checked in a larger dataset. Additionally, this study did not capture data on intravesical therapy (e.g., BCG or chemotherapy) administered between the initial and repeat resections, which may have influenced residual tumor rates.

CONCLUSION

ReTURBT plays a genuine role in accurately staging and clearing residual disease in high-grade NMIBC. Our findings are consistent with routine re-resection as recommended by EAU and AUA guidelines, especially for patients with large, multiple, or anteriorly located tumors — though our small sample means these findings support rather than prove that recommendation. For lower-risk patients, a selective approach to reTURBT may reasonably save resources without compromising safety, pending confirmation in larger studies. What's needed next is a larger, multicentre study — ideally with a comparison group that skips reTURBT and with biomarker testing included — to confirm

these findings with greater certainty.

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Conflicts of interest

There are no conflicts of interest.

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