RESEARCH ARTICLE

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The Effect of Surgeon Experience on the Recurrence of Non-Muscle Invasive Bladder Cancer (NMIBC), Following Transurethral Resection of the Bladder Tumor (TURBT): A double Blinded Prospective Randomized Study

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Abstract

Background: Transurethral resection of the bladder tumor (TURBT) followed by intravesical instillation therapy is the standard treatment for non-muscle invasive bladder cancer (NMIBC). One of the factors that may affect the risk of recurrence after TURBT is the quality of surgery that may vary between individual surgeons. While there has been a large number of studies demonstrating the ability to reduce the risk of recurrence of NMIBC with different types of the intravesical therapy, less attention was paid to the quality of TURBT in improving long-term treatment results. The aim of the study is to evaluate the effect of the quality of TURBT on the recurrence rate of NMIBC based on surgeon experience. **Methods:** The study is a double blinded prospective randomized study conducted on 50 patients with NMIBC. who underwent 126 procedures (50 primary cystoscopies ,26 restaging cystoscopies and 50 check cystoscopies at three months). All Treatment-naive patients with NMIBC candidate for TURBT were included, with exclusion of patients with previous history of TURBT, previous open bladder surgery, patients with urethral stricture, patients with muscle invasive bladder cancer. And patients who lost follow up. Patients were randomized by closed envelope into two groups; Group A included 25 patients who underwent TURBT by a senior surgeon (more than 5 years' experience), and Group B included 25 patients underwent TURBT by a qualified junior surgeon (less than 5 years' experience). Restaging cystoscopy at 2-6 weeks (if indicated) and follow up cystoscopy at three months were performed by another senior surgeon (who was blinded to the name of the first surgeon). **Results:** No statistically significant difference was found between both groups regarding the incidence of complications (urethral injury, bladder perforation, ureteric injury, obturator reflex), Group B showed a statistically significant longer operative time, postoperative irrigation time, more hemoglobin loss, longer hospital stay, and higher 3 months' recurrence rates. Moreover, senior surgeons' specimens were more likely to include detrusor muscles. **Conclusion:** surgeon's experience has significant impact on the quality of TURBT and risk of recurrence of NMIBC. With less operative time, less hemoglobin drop, and less hospital stay.

Keywords: bladder cancer- TURBT- NMIBC, double blinded study.

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Introduction

The goal of Transurethral resection of bladder tumor (TURBT) in Non muscle invasive bladder cancer (NMIBC) is to ensure the accurate diagnosis as well as completely remove all visible lesions [1]. The main challenge in management of NMIBC is to reduce recurrence and progression as recurrence is associated with need for multiple procedure with its financial burden and progression which may diminish patient survival and quality of life. The risk of recurrence and progression of NMIBC, as stratified by European association of urology (EAU) guideline, is based on tumor number, size, grade, stage (Ta/T1), and presence of carcinoma in situ (CIS).

However, a little is known about the impact of surgical experience or surgical volume on recurrence and progression rates after TURBT in NMIBC [2]. Recurrence after TURBT is significantly related to operative experience and should be considered in training programs. one of the factors responsible for the risk of recurrence after complete transurethral resection of the bladder tumor (TURBT) in patients with non-muscle invasive bladder cancer (NMIBC) is the quality of surgery that may vary between individual surgeons [3].

A surgeon experience has a significant impact on the risk of recurrence after endoscopic resection of NMIBC. This effect is observed despite the relatively extensive experience in bladder endoscopic surgery of all of the

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surgeons practicing in a setting of one specialized center [4].

A number of studies have shown that limited surgical experience, which is generally defined as being a non-senior staff member, is associated with an increased risk of disease recurrence as compared to the senior staff members [5]. In brief, the outcome of TURBT with regard to recurrence was influenced by the operative experience of the surgeon (specialist vs resident). To eliminate this effect, it may be necessary to implement dedicated teaching programs, standardized checklists for the procedure and better supervision. Moreover, assigning TURBTs to a limited number of surgeons at each hospital should result in very-high-volume surgeons, which may improve the outcome of TURBT in Ta/T1 bladder cancer [6].

Therefore, this study investigated the impact of surgical experience (senior vs junior) in TURBT on perioperative complications and early recurrence of NMIC.

Materials and Methods

This is a prospective randomized double-blinded study conducted between October 2023 till June 2024 and included 50 patients. The study was approved by the local committee of ethics (code:MS-288-2023), sample size was calculated by statistician based on the presence of detrusor muscle in the specimens retrieved by senior and junior surgeon.

All patients signed an informed written consent after explaining the nature of the procedure, risks, and potential benefits of the treatment. All treatment-naive patients with NMIBC (no previous history of TURBT) who are candidates for Cystoscopy and TURBT were included, with exclusion of patients with previous history of TURBT, previous open bladder surgery, patients with urethral stricture, Patients with muscle invasive bladder cancer (solid tumor).and patients who lost follow up.

Preoperative assessment included, detailed history, physical examination, complete blood count, Coagulation profile, kidney function tests, urinalysis, and urine culture. Imaging study included, (ultrasound scan, computed tomography, or magnetic Resonance imaging). Patients were divided into two groups; Group A included 25 patients who underwent TURBT by a senior surgeon (more than 5 years' experience), and Group B included 25 patients underwent TURBT by a qualified junior surgeon (less than 5 years' experience).

After induction of anaesthesia, a thorough cystoscopic examination of the bladder to evaluate site, size, number, and appearance of the bladder mass (Villous or solid), then resection of the tumor (TURBT) was then done using a monopolar current, with tumor and tumor base were sent separately for histopathological examination. At the end of the procedure, a three-way 24 Fr catheter was inserted, and bladder irrigation is initiated if needed. Postoperative Intravesical instillation of mitomycin C is delivered if no contraindications.

Intra operative events (urethral injury, ureteric orifice injury, bladder perforation and obturator reflex) were recorded if any. Postoperative parameters (duration and volume of bladder irrigation, post-operative hemoglobin, catheterization time, and hospital stay) were recorded.

After obtaining the pathology results, document presence or absence of detrusal muscle in the specimen and patients were stratified in to low, intermediate, and high-risk group according to European association of urology guidelines and hence the need for adjuvant therapy, restaging cystoscopy, and timing of follow up cystoscopy.

Patients were assessed after one week for any complications. Restaging cystoscopy (second look cystoscopy) in case of T1, high grade tumor or absence of detrusal muscle in the specimen was performed at 2-6 weeks postoperatively by another senior surgeon who was blinded to the operator of the previous procedure and the results were recorded.

Adjuvant chemotherapy was given for intermediate risk patients and BCG for high-risk patients. A follow up cystoscopy was done to all patients after 3 months by another senior surgeon (who was blinded to the operator of the previous procedure) and the results were recorded.

Results

A total of 50 patients diagnosed with NMIBC underwent TURBT. Patients were divided into two groups by closed envelope: Group (A) included 25 patients underwent TURBT by a senior surgeon and Group (B) included 25 patients underwent TURBT by a qualified junior surgeon. The mean age of group A was 53.7 years while in group B, the mean age was 50.9 years, with 76% and 72% male patients in group A and group B respectively. No statistically significant difference was elicited between both groups regarding tumor characteristics (number, size, grade, stage, and presence of CIS) as shown in Table 1.

there was no statistically significant difference between both groups regarding intraoperative complications (urethral injury, bladder perforation, ureteric injury, obturator reflex), the operative time was longer in group B. (p value <0.001) Moreover, more patients in group B needed postoperative bladder irrigation as shown in Table 2.

Regarding postoperative data there were statistically significant differences between both groups with more hemoglobin drop and longer hospital stay in group B (p value<0.001) as shown in Table 3. Histopathological examination of specimens showed that Detrusor muscle was detected in 74% of specimens retrieved by senior surgeon in comparison to only 64% with junior surgeon. (p value 0.354). Restaging cystoscopy was performed by another senior surgeon after 2-6 weeks if (T1, high grade, CIS, or absence of detrusor muscle in specimen on primary cystoscopy) as recommended by EAU guidelines. Restaging cystoscopy was indicated in 14 (54%) patients in group A and 12 (46%) patients in group B. Five patients in each group showed residual tumor as shown in Table 4.

Follow up cystoscopy was performed at 3 months by another senior surgeon and The 3-month recurrence rate was 36% and 56% in groups A and B, respectively (p value 0.026). One patient in group A and three patients in group B were upstaged to T2 and underwent radical cystectomy as shown in Table 5.

Another senior surgeon perfomed second look

Table 1. Tumor Characteristics (N = 50)

		Group A (N = 25)	Group B (N = 25)	
Histological Grade No. (%)	Low Grade	11 (44%)	13 (52%)	
	High Grade	14 (56%)	12 (48%)	0.571*
T Stage No. (%)	Ta	13 (52%)	14 (56%)	
	T1	12 (48%)	11 (44%)	0.775*
	Concomitant CIS	4 (16%)	5 (20%)	
Number of masses Mean ± SD (Range)		1.7 ± 1 (1 – 4)	1.8 ± 1 (1 – 5)	0.725**
Tumor Size (cm) Mean ± SD (Range)		2.5 ± 1.3 (0.7 – 5)	2.6 ± 1.3 (1 – 5)	0.786**
Tumor Morphology No. (%)	Papillary	22 (88%)	21 (84%)	
	Non-papillary (flat sessile)	3 (12%)	4 (16%)	0.683*
Intra-vesical Therapy (Adjuvant) No. (%)	None	11 (44%)	9 (36%)	
	BCG	10 (40%)	11 (44%)	0.835*
	Chemotherapy	4 (16%)	5 (20%)	
AUA Risk No. (%)	Low	4 (16%)	5 (20%)	
	Intermediate	7 (28%)	5 (20%)	0.787*
	High	14 (56%)	15 (60%)	
Detrusor muscles in specimens No. (%)		19 (76%)	16 (64%)	0.354*

Table 2. Intraoperative Data (N = 50)

	Group A (N = 25) No. (%)	Group B (N = 25) No. (%)	p value
Urethral Injury	0	1 (4%)	0.312**
Bladder Perforation	1 (4%) Intraperitoneal	3 (12%)	0.297**
		2 Intraperitoneal	
		1 Extraperitoneal	
Ureteric Orifice Injury	0	0	-
Obturator Reflex	1 (4%)	4 (16%)	0.157**
Significant Bleeding	2 (8%)	4 (16%)	0.001**
Operative Time (min)	43.2 ± 8.8 (30 – 58)	58 ± 11.8 (43 – 79)	< 0.001*

*, Independent sample t test; **, Chi-square test.

cystoscopy and follow up cystoscopy at 3 months and was blinded to the operator of the first cystoscopy. Data collected by a person who also did not know the operator of each arm.

Discussion

The main challenge in management of NMIBC is to reduce the rate of recurrence and progression. The well-known risk factors for recurrence and progression of NMIBC include clinical (frequency of recurrence, number, and size of the tumor) and pathological (category pT, Tumor grade, CIS) characteristics of the disease [2]. Although intravesical therapy, as proved by large number of studies, reduces the risk of recurrence of NMIBC, less attention was paid to the quality of TURBT [3].

Our study aimed at assessment of the quality of TURBT (perioperative complications, and risk of recurrence at three months). based on surgeon experience as the only variant. No statistically significant difference between both groups was found regarding intraoperative complications. As regard post-operative parameters, there were significant difference in irrigation rate, catheterization time and hospital stay between both groups

Table 3. Postoperative Data (N = 50)

Irrigation needed No. (%)	Group A (N = 25)		Group B (N = 25)		P value*
	6 (32%)		13 (68%)		0.001
	Mean ± SD	Range	Mean ± SD	Range	
Irrigation Time (hours)	15 ± 20	5 – 30	30 ± 20	10–50	0.01
Catheterization Time, (days)	2 ± 1	1 – 7	3 ± 2	2 – 10	0.17
Haemoglobin Loss, gm/dl	0.3 ± 0.1	0.1 – 0.5	0.6 ± 0.2	0.3 – 1	0.001
Hospital Stay, (days)	2 ± 0.8	1 – 3	3 ± 0.8	2 – 4	0.001

* Independent sample t test

Table 4. Restaging Cystoscopy (N = 26)

	Group A N = 14 (54%)	Group B N = 12 (46%)	P value*
Ta high grade	2/14 (14%)	1/12 (8%)	
T1	3/14 (22%)	4/12 (34%)	
Negative cystoscopy	9/14 (64%)	7/12 (58%)	0.749

*, Chi-square test.

Table 5. Recurrence/Progression Rates (N = 50)

		Group A (N = 25)	Group B (N= 25)	P value*
Restaging cystoscopy (residual Tumor)		5/14 (36%)	5/12 (42%)	0.047
Recurrence at three months		9/25 (36%)	14/25 (56%)	0.026
Progression at three months	Ta to T1	2/25 (8%)	4/25 (16%)	0.034
	T1 to T2	1/25 (4%)	3/25 (12%)	

*, Chi-square test.

with shorter catheterization time and hospital stay in group performed by senior surgeon.

Specimen retrieved by junior surgeon contained less detrusor muscles, this may be attributed to the more conservative approach adopted by the junior surgeon to avoid complications or may be due to the small cohort study. Recurrence in 3 months was higher in junior surgeon's cohort (56%) in comparison to (36%) in senior surgeon's cohort. This may be related to the quality of the first TURBT as there were no differences in the primary tumor characteristics between both groups.

Brausi et al. assessed the recurrence rate at first follow-up cystoscopy 3 months after the TURBT between different urological clinics in EORTC phase III trials (2,410 patients with NMIBC). A significant variability was detected in the early recurrence rate (3% to 21% for patients with a single tumor and from 7% to 46% for multiple tumors). It was stated that those differences could only be explained by the variability in the quality of the TURBT, and high early recurrence rates are explained by the high rate of residual tumor after poor quality TURBT which is matched with our conclusion. Brausi et al. concluded that the reduction in the recurrence rate was associated with being a staff urologist rather than a resident [4].

Jancke et al. evaluated the impact of surgical experience on the recurrence and progression rates in 768 patients with primary NMIBC in a retrospective study. They found a substantial decrease in the recurrence rate after TURBTs performed by specialized urologists as compared to residents, but the risk of progression was basically the same [7]. Zingaro et al. evaluated 209 Patients with intermediate and high risk NMIBC. The study found high surgical volume (defined as experience in more than 100 TURBTs) to be Predictive for recurrence and progression [8].

In our study detrusor muscle was detected in 74% of specimens retrieved by senior surgeon in comparison to only 64% with junior surgeon. Despite being statistically insignificant difference, this may be linked to the quality of TURBT. Also, despite the percentage of detrusal muscle in specimen retrieved by senior surgeon is relatively low (76%) but it didn't affect the management because most of these lesions were Ta tumor and the lamina properia were included in the specimen and was free of tumor so no need for restaging cystoscopy due to absence of detrusal muscle in the specimen.

We think absence of detrusor muscle (DM) is associated with high rate of residual tumor and improper staging. This may be translated into a higher rate of recurrence at 3 months in TURBT performed by junior surgeon. Our finding is compatible with Rouprêt et al. who found a significant difference in the rate of muscle tissue detection in the specimen between junior and senior surgeons (61.3% vs. 73.8%; p = 0.02) [9]. in contrast to Del Giudice et al who found that: Surgeon's experience in the case of adequate perioperative surgical checklist implementation was inversely associated with the presence of DM in the specimen but directly linked to higher probability of persistent disease at re-TURBT, although no 5-year RFS differences were noted [10].

Mariappan et al. assessed the prognostic value of the presence of muscle tissue in the specimen after TURBT as a surrogate marker for the quality of the TURBT in 356 patients with NMIBC and found that the early recurrence rate correlated with the absence of muscle in the specimen and a junior surgeon which is matched with our study [11].

Also, Huang et al. [12] found that the absence of muscle in the specimen after TURBT was more often observed with large tumors, tumors with difficult location and "young" surgeons (≤10 years of Training). These factors, together with the absence of muscle in the specimen and T1 staging, were associated with the presence of residual tumor on repeat TURBT [12].

In our study, we did not analyze the patients with absent detrusor in the specimen because of the small sample size but our conclusion is in agree with Huang et al. [12]. Although our study is a small cohort (50 patients with 126 procedures) with limited follow up but to our knowledge there is paucity of such prospective randomized double blinded study and much of the published articles are retrospective non-randomized studies.

In our study restaging cystoscopy and three months' cystoscopy were performed by another senior surgeon who was blinded about the operator of previous cystoscopy to eliminate the bias. Moreover, Data collectors and

statisticians were blinded to the surgeons who performed any of the procedures. Despite limited follow up but we think that the presence of detrusor muscle and three months' recurrence rate are good surrogate for the quality of TURBT and hence the role of surgical experience.as the later recurrene or progression are attributed mainly to tumor characteristics (grade, stage and presence of CIS mainly) not to quality of primary TURBT.

In conclusion, surgeon experience has a significant impact on the risk of recurrence after TURBT in patients with NMIBC. Early recurrence rate may be used as a criterion of the quality of the TURBT. We recommend a larger sample size study with long term follow up to evaluate the role of surgeon experience in delayed recurrence, tumor progression and impact on survival.

Author Contribution Statement

All authors contributed equally in this study.

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Declarations and conflict of interest

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Ethics approval and consent to participate

The study was approved by the research ethical committee of faculty of medicine, Kasr- Alainy Hospital, Cairo university (code:MS-288-2023). All patients signed informed consent.

Consent for publication

All patients signed informed consent for use of their data in publication.

Availability of data and material

All Data are available upon request from the corresponding author.

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