



# Contemporary surgical and technical aspects of transurethral resection of bladder tumor

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**Abstract:** To date, transurethral resection of bladder tumor (TURBT) remains the gold standard of staging urothelial cancer of the bladder and treating non-muscle invasive bladder cancer (NMIBC). The primary goal of the procedure includes a proper diagnosis, correct staging, and removal all lesions. Herein, we discuss major contemporary surgical and technical aspects of including *en bloc* resection, bipolar and laser resection as well as quality control of TURBT.

**Keywords:** Non-muscle invasive bladder cancer (NMIBC); transurethral resection of bladder tumor (TURBT); treatment; surgery; endoscopy

Submitted Oct 09, 2018. Accepted for publication Dec 05, 2018.

doi: 10.21037/tau.2019.01.04

**View this article at:** <http://dx.doi.org/10.21037/tau.2019.01.04>

## Introduction

Transurethral resection of bladder tumor (TURBT) remains the gold standard of staging urothelial cancer of the bladder and treating non-muscle invasive bladder cancer (NMIBC) (1). TURBT aims proper diagnosis, correct staging, and remove of all lesions. Indeed, residual tumor after initial TURBT is associated with a higher risk of disease recurrence (2). Therefore, complete and optimal TURBT is crucial to achieve good oncological outcomes. Given this cornerstone role, achieving a high-quality resection should be the first step of the primary management of NMIBC. This resection requires best of care in terms of diagnosis, visualization, disease burden assessment, resection and optimal specimen analysis.

Herein, we discuss the major contemporary surgical and technical aspects including *en bloc* resection, bipolar and laser resection as well as best standards for TURBT. New visualization and detection techniques and re-TURBT are not discussed in the current article.

## Surgical and technical aspect of TURBT

### *Cystoscopy and mapping*

The first step of the TURBT includes a thorough cystoscopy. During this step, fresh urine can be collected for urine cytology if not performed earlier. The cystoscopy assesses the number, the location, and the aspects of all suspicious lesions. Specifically, the distance to the ureteral orifices, the trigonal lesions, bladder neck, and prostatic urethra invasion. The EAU guidelines recommend a standardized mapping (1). The mapping may be useful when a distinct pathology reports is warranted in some clinical scenarios.

### *Resection type: conventional vs. en bloc resection*

TURBT using a wire loop is considered the gold standard for staging and treating NMIBC. However, the piecemeal resection, the potential scattering of tumor cells, the

absence of detrusor muscle (DM) in the resected specimen are thought to be drawbacks of the conventional resection. Thus, in order to improve the quality of the resection and, ultimately decreasing the recurrence rate, the en bloc resection was introduced (3). Different options, including loop modifications, laser techniques and water-jet based enucleation, have been reported (3-6). The “*en bloc*” technique include the incision of the surrounding mucosa with a safety margin to detach the tumor in one piece. Care should be taken to get deep enough in the bladder wall to remove DM (7). Studies could demonstrate DM in all cases and the resection of tumor up to 7.5 cm (4,8). However, this approach failed to demonstrate any improvements of oncological outcomes.

### **Energy**

Modifications, such as bipolar TURBT have several advantages such as reduction of the obturator nerve injury. In fact, stimulation of the nerve may lead to the patient motion that can cause bladder perforation (7). In addition, bipolar vaporization allows, enucleation and debulking techniques and subsequent resection of the tumor base (7). However, bipolar TRUBT doesn't preclude resection requirements including complete tumor removal and muscle sampling. A recent systematic review and meta-analysis that compared bipolar and monopolar TURBT did not report any statistically significant differences between bipolar TURBT and monopolar TURBT for rates of obturator nerve reflex, bladder perforation, and transfusion. Cautery artifacts were similar in both procedures. There was no significant difference in disease recurrence rates when comparing the two types of procedures (9).

### **Bladder neck and prostate biopsy**

The biopsy of the bladder neck and the prostatic urethra with there is an evidence of disease is not questioned. However, in some cases, the involvement is not visible. The risk of involvement is higher in case of carcinoma in situ (CIS), high-grade tumor, and positive cytology without evidence of the disease in the bladder (10).

When indicated, the biopsy from abnormal areas in the prostatic urethra and from the precollicular area (between the 5 and 7 o'clock position) are performed using a resection loop or cold-cup biopsy when stromal invasion is not suspected (1).

### **Quality control**

The aims of TURBT include the resection of all macroscopic lesions, establish pathological stage and grade and identify significant prognostic factors (2). These being of the utmost importance for patient management, quality control of the procedure is mandatory. Pathologists and urologists have both a major play role in achieving a gold standard procedure.

According, to the International Society of Urological pathology (ISUP) recommendations, pathology reports should be standardized and should at least mention tumor stage and grade, the presence of DM in the resected specimens, the present of any histological variants, and concomitant CIS (11). A permanent dialogue between urologists and pathologists should be established to review cases and confront pathological findings with clinical findings.

From a surgical perspective, a good-quality TURBT is not always achieved because of poor cystoscopic view, tumor size, multifocality of the disease, difficult location, an inexperienced surgeon or complications such as bleeding or bladder perforation. Inadequate tumor clearance results in early recurrence and inaccurate staging of the cancer. After reviewing published controlled studies, the recurrence rate at the first follow-up cystoscopy (RRFFC) was introduced by the European Organization for Research and Treatment of Cancer (EORTC) (12). It was concluded that this discrepancy was a result of variability in the quality of the resections. A low RRFFC was reported to be associated with the presence of DM on the specimen which is significantly more achieved when the procedure was performed by a senior surgeon (13). DM in the specimen is easy to identify allowing an immediate quality control of TURBT.

Another way of improving the quality of TURBT is the implementation of a check-list in order to standardize the surgical procedure and therefore enhance its performance and improve surgical and oncological outcomes. As such, an eight-item check-list was reported to improve disease-free survival after TURBT but failed to improve the rate of DM in the resected specimens (14).

Finally, the best TURBT is achieved when the procedure is performed in standardized fashion (*Table 1*). This standardization should be part of the training process of junior urologists.

### **Conclusions**

TURBT is a cornerstone of the primary management of

**Table 1** Checklist for a good TURBT

Preoperative
Sterile urinalysis
Urine cytology
Imaging reviewing
Upper tract clearance if high-grade
Procedure modality
White light ± (blue light or narrow band imaging or other)
Operative
Urethral assessment
Bladder assessment
Macroscopic appearance
Number of lesions
Mapping of lesions
Involvement of the trigone and/or bladder neck
Proximity to/involvement the ureteral orifices
Macroscopic clearance after resection
Surgical complications
Perforation
The need of specific specimen to be sent separately
Postoperative
Pathology report review
Histology type
Stage, grade, concomitant CIS
ISUP/WHO classification
Presence of DM (detrusor muscle)
EORTC risk assessment
The need of second look/complimentary TURBT

CIS, carcinoma in situ; DM, detrusor muscle; TURBT, transurethral resection of bladder tumor; ISUP, International Society Of Urological Pathology; WHO, World Health Organization.

bladder tumors. Achieving a high-quality resection allows a correct treatment, staging and classification of the tumor. Because of the jeopardized prognosis of a bad TURBT, the procedure should be performed by experienced surgeons or strictly supervised when performed by trainees. Ideally, procedure should be standardized according to best practice recommendations.

## Acknowledgements

None.

## Footnote

*Conflicts of Interest:* The authors have no conflicts of interest to declare.

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**Cite this article as:** Ouzaid I, Panthier F, Hermieu JF, Xylinas E; on behalf of the EAU Young Academic Urologists—Urothelial Cancer Working party. Contemporary surgical and technical aspects of transurethral resection of bladder tumor. *Transl Androl Urol* 2019;8(1):21-24. doi: 10.21037/tau.2019.01.04