SCANDINAVIAN JOURNAL OF UROLOGY
2021, VOL. 55, NO. 5, 366–371
https://doi.org/10.1080/21681805.2021.1954686

ARTICLE

Potential candidates for en bloc resection among patients with primary and recurrent bladder tumours

Ninna Kjaer Nielsen, Jakob Kristian Jakobsen, Pernille Skjold Kingo and Jørgen Bjerggaard Jensen

Department of Urology, Aarhus University Hospital, Aarhus, Denmark

ABSTRACT

Introduction: Transurethral resection (TURB) is the gold standard treatment for non-muscle invasive bladder cancer (NMIBC). However, conventional TURB is possibly part of the mechanism leading to the high recurrence rate in NMIBC and the need for repeated procedures, as the method with piecemeal resection of the tumour violates basic oncological principles and compromises pathological examination. En bloc resection (EBR) could potentially overcome these flaws by improving pathological quality and thereby reducing the need for re-resections and could potentially also lower the risk of tumour seeding leading to early recurrences. With this study, we aimed to evaluate tumour characteristics in a consecutive cohort of patients undergoing conventional TURB in order to estimate the proportion of procedures eligible for EBR, findings at re-resection, and early recurrence rate.

Methods: All TURBs performed at a single large University Hospital in a 12 month period were manually reviewed. Based on tumour size and appearance, patients were registered as candidates or non-candidate for EBR.

Results: A total of 600 TURBs were reviewed. Overall, 25% of procedures were found to be eligible for EBR. The most frequent reason for not being a candidate was tumour diameter <1 cm. Re-resections were done after 10.5% of the procedures, where the residual tumour was found in 28.6% of these. Within 6 months, 21.2% had a recurrence.

Conclusion: We found approximately 25% of all TURBs to be eligible for EBR. Based on a relatively low recurrence rate, we conclude that future studies on EBR with recurrence rate as the primary endpoint will require large patient cohorts.

ARTICLE HISTORY
Received 13 January 2021
Revised 6 July 2021
Accepted 8 July 2021

KEYWORDS
En bloc resection; TURB; non-muscle invasive bladder cancer

Introduction

Urothelial carcinoma of the bladder is the tenth most common cancer in the world and approximately 75% of patients present with non-muscle invasive bladder cancer (NMIBC) [1,2]. The gold standard for resection and essential for pathological staging of bladder tumours is transurethral resection (TURB). In conventional TURB, the tumour is typically dissected piecemeal. In addition to compromising pathological examination of the specimen, this method violates basic oncological surgical principles as tumours are fragmented and not safely removed with the certainty of free tumour margins. This could potentially lead to tumour cell scattering and implantation with tumour recurrence as a consequence [3]. These main flaws of conventional TURB are thought to be one of the important mechanisms responsible for the high recurrence rate of NMIBC. Moreover, the high prevalence of residual tumour tissue following initial resection has led to the recommendation of re-resection of T1-tumours (tumours with invasion into suburothelial tissue) and most high-grade Ta-tumours [4,5].

Because of these limitations of conventional TURB, the method with en bloc resection (EBR) has gained increasing interest. In EBR, the tumour is dissected and removed from the bladder wall in one piece. Several studies have demonstrated the safety and feasibility of EBR [6–8]. The major advantage of EBR has been shown to be the high prevalence of detrusor muscle in the specimens, which is considered a surrogate to high specimen quality [9]. This could potentially reduce the need for re-resections or even make it superfluous. Better pathological quality and thereby more accurate determination of correct stage combined with low risk of remnant tumour tissue could be an argument for this. A recent study has proven EBR to be an independent predictor of T0 at second resection [10]. Moreover, this study found that patients with residual disease at second resection had significantly worse recurrence-free and progression-free survival rates compared to patients with T0 at reTURB. Thus, the removal of the whole tumour in one piece with free margins suggests the theoretical effect of reduced recurrence rates. However, large randomized trials investigating these theoretical benefits are still needed.

Tumours have to meet certain criteria to be eligible for EBR. Tumours should be papillary in appearance, as solid tumours suspected to be muscle-invasive or flat tumorous areas should not be dissected en bloc [11,12]. Small tumours with a diameter <1 cm, which can be removed in whole

CONTACT Ninna Kjaer Nielsen ninna@clin.au.dk Department of Urology, Aarhus University Hospital, Palle Juul-Jensens Boulevard 99, DK-8200 Aarhus N, Denmark

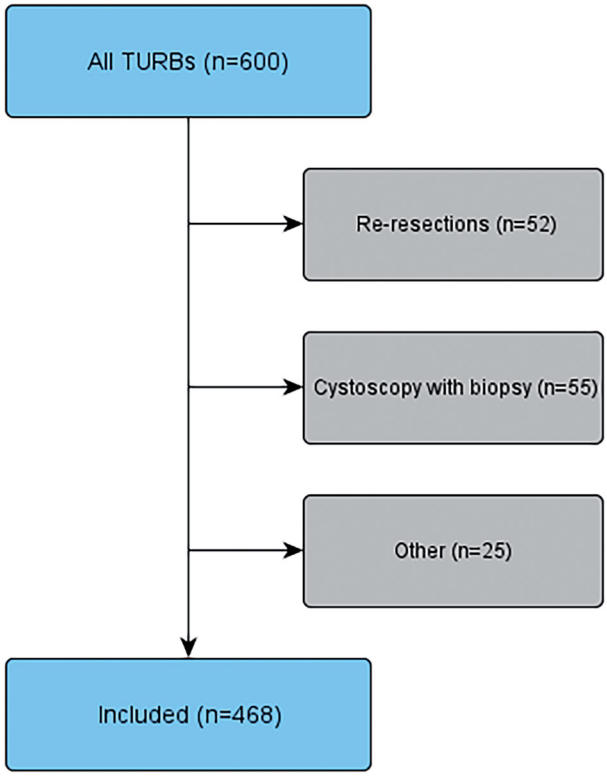

Figure 1. Flowchart illustrating patients with relevant exclusion criteria. Other reasons for exclusion were surgeries inaccurately coded as TURB, for example, evacuation of blood clot or removal of bladder stone, palliative/haemostatic TURB, or surgeries where a TURB was planned but the surgeon did not find suspect tissue and resection was not performed.

within the range of the resection loop or as cold cup biopsies, are not relevant for EBR either.

To be able to power future RCTs, it is necessary to know which proportion of bladder tumours are candidates for EBR, based on the above-mentioned criteria.

Several previous studies have reported tumour characteristics such as size, multiplicity, localization, T-stage, and grade, but often limited to primary tumours or Ta/T1 tumours, or not reporting tumour appearance [13–15]. We have only been able to identify one study reporting both appearance of tumour (papillary/solid) and size, and this study was limited to T1HG tumours [10].

With the current study, we aimed to characterize all tumours referred to TURB with the aim to evaluate tumour characteristics relevant for EBR. Based on these characteristics, we assessed which proportion of future TURB procedures could be relevant for EBR.

Methods

The study was a retrospective, descriptive study. Data were collected from electronic patient records and registered in a REDCap database created for the purpose. We included all procedures with transurethral resection of pathologic tissue in the urinary bladder (TURB) performed at a single large University Hospital in the period 1st January 2019 until 31st December 2019. The hospital is not a referral centre for TURB, but performs procedures on all patients from its own catchment area. Hence, patients were not referred from other institutions, but were either referred directly from the general practitioner with haematuria (primary tumours) or tumours were found at standard follow-up cystoscopy in previous bladder tumour patients (recurrent tumours). As all TURB procedures within 1 year were included, some patients could potentially be included more than once. In total, 600 unique TURBs in 495 patients were reviewed. Both tumours resected with bipolar wire loop and as cold cup biopsies were included.

Cases were excluded as illustrated in Figure 1. Pre-defined exclusion criteria for this study were if the TURB was a re-resection, if the procedure was a cystoscopy with biopsy, that is, performed by flexible cystoscopy in the outpatient clinic (patient not in general anaesthesia), or cystoscopy with biopsy after intravesical instillation therapy.

Tumour was registered as recurrence if the patient had previously been diagnosed with urothelial carcinoma, also if the primary tumour was located in the ureter or the renal pelvis.

Tumour appearance was based on the surgeon's description of the tumour and registered as papillary, solid, or flat. In cases with discrepancies between the description by flexible cystoscopy and by TURB, the tumour appearance was registered as described by TURB. This was based on potentially better vision with a rigid resectoscope, and because a TURB is most often performed by a more senior urologist than the one performing the diagnostic flexible cystoscopy.

Tumour diameter was based on estimate during the TURB procedure or estimated size on diagnostic CT scan in patients undergoing haematuria workup. Where no metric size was mentioned and no CT scan was available, an estimate from the surgeon's description was made if possible. If no mentioning of the extensiveness of tumour tissue, the diameter was registered as 'Undefined'.

Tumour location was based on description at TURB.

Tumour stage, grade, and presence of detrusor muscle were based on the routine pathology description. T-stage (UICC 2016 TNM classification) and grade (WHO 2004 grading version) were registered as the highest T-stage and grade found in any biopsy from the procedure. If detrusor muscle was not present in any of the biopsies or only in biopsies without pathology, it was registered as no detrusor muscle in the specimen.

Recurrences were registered by the date they were first seen, most often by flexible cystoscopy in the outpatient clinic. Only true recurrences with positive pathology were registered. Thus, suspected recurrences where biopsies showed no malignancy, were not included. Visually diagnosed recurrences coagulated in the outpatient clinic without biopsy were considered true recurrences, although no pathological description was available.

All patients alive were followed up for a minimum of 8 months.

Based on relevant tumour characteristics, the tumours were registered as candidate vs. non-candidate for EBR. Predefined reasons for not being a candidate were tumour appearance solid or flat, or tumour diameter <1 cm. Other

reasons were undefined size of tumour, or if the tumour was not resectable. Tumours could be registered for more than one reason, most often being both flat appearance and diameter <1 cm.

Statistics and ethics

Statistical analysis was performed using Stata software version 16.1. The Chi-square test was used to evaluate significant differences between relevant parameters in patient and tumour groups. A two-sample *t*-test was used to compare the mean age of patients with primary and recurrent tumours.

The collection of data from patient records was approved by the Danish Patient Safety Authority, and the project was registered on the internal list of research projects on the Central Denmark Region's website. The Danish Patient Safety Authority waived the requirement for patient consent.

Results

Patient demographics and tumour characteristics are shown in Table 1. Patient demographics were as expected; approximately 75% males and mean age at TURB of 72 years. All tumour characteristics were significantly different when comparing primary and recurrent tumours.

We found 85.4% of the tumours with urothelial carcinoma to be NMIBC (77.4% in primary and 96.4% in recurrent) and detrusor muscle was represented in 65.8% of specimens (71.7% in primary and 58.5% in recurrent).

Candidate for EBR

Overall, 25.0% of tumours were found to be eligible for EBR based on our criteria. Primary tumours were more often candidate (34.5%) compared to recurrences (13.0%) ($p < 0.001$) (Table 2).

The most frequent reason for not being a candidate was tumour diameter <1 cm, both overall (49.0%) and for recurrences (67.8%). However, for primary tumours, the most frequent reason was solid appearance (49.7%). Of all cases described as solid tumours at TURB ($n = 93$), 11 tumours (11.8%) proved to be Ta and 28 (30.1%) proved to be T1, and could therefore have been a candidate for EBR, in spite of the appearance at TURB, but were not registered as such in this material.

Findings at reTURB

A total of 49 patients (10.5%) underwent a re-resection (reTURB) (Table 3). In 30 patients (61.2%), no residual tumour was found (T0). In two (4.1%) and three (6.1%) patients, the pathology at reTURB was Tx and CIS, respectively. A residual tumour (Ta, T1, or T2) was found in 14 (28.6%) patients. In four patients (8.2%), progression in T-stage at reTURB compared to initial T-stage was identified.

Recurrences

Within 6 months, 99 patients (21.2%) had a recurrence. This was similar for both tumours candidate for EBR (21.4%) and non-candidates (21.1%). However, when stratifying for primary tumours vs recurrent tumours, we found that the recurrence rate in primary tumours was markedly higher for tumours candidate for EBR vs non-candidate, whereas it was the other way around in recurrent tumours (Table 4).

Recurrence within 6 months was significantly more common in recurrent tumours (33.3%) compared to primary tumours (11.5%) ($p < 0.001$).

Discussion

The method of EBR was first described by Kawada et al. in 1997 [16]. Since then, several studies on the method have been published. Most studies have been prospective, non-randomized trials demonstrating the safety and the feasibility of the method in small patient cohorts [6,8,17–19]. In recent years, several RCTs have also been published using different energy sources and different methods for extracting the tumours [20–23].

Importantly, bladder tumours have to meet certain criteria to be candidates for EBR. Most previous studies on EBR have excluded tumours with a diameter larger than 2–3 cm, and many studies have considered certain locations in the bladder as not eligible for EBR, for example, tumours located in the bladder dome, the bladder neck, or involving the ureteric orifice.

In April 2020, an international collaborative consensus statement on EBR was published [12]. Through a Delphi survey followed by an expert panel meeting, health care professionals with experience in EBR discussed a series of criteria to consider when assessing if a bladder tumour could be eligible for EBR or not.

Regarding tumour size, the panel members agreed that for tumours larger than 3 cm it might be difficult to extract the tumour in one piece, but the resection procedure is still possible. Thus, EBR should still be considered for tumours larger than 3 cm, as the benefits in regards to complete resection and proper staging can still be preserved.

Regarding the location of the tumour, an agreement was reached that EBR is feasible for all locations in the bladder. For tumours located at the bladder dome, an agreement was not reached in the Delphi survey, but at the panel meeting, there was a 100% agreement on the feasibility of EBR for this tumour location as well.

Therefore, we decided the criteria for not being a candidate for EBR to only include solid and flat tumours (muscle-invasive and CIS in the consensus statement) and tumours smaller than 1 cm. Previous studies on EBR have stated inclusion and exclusion criteria, but not how large a proportion of bladder tumours can be expected to be candidate. We aimed to estimate this proportion with this study.

Based on a consensus agreement, we registered all tumours larger than 3 cm to be a candidate for EBR. Thus, it should be emphasized that this study focused on the

Table 1. Patient demographics and tumour characteristics.

Patient demographics	Primary tumour	Recurrent tumour	Total	*p*-Value*
Gender, *n* (%)				
Male	210 (80.5)	146 (70.5)	356 (76.1)	0.012
Female	51 (19.5)	61 (29.5)	112 (23.9)	
Total	261	207	468	
Age, years (SD)				0.268
Mean age	71.9 (9.7)	72.8 (9.1)	72.5 (9.5)	
Tumour characteristics				
Tumour appearance				<0.001
Papillary	132 (50.6)	131 (63.3)	263 (56.2)	
Solid	86 (33.0)	7 (3.4)	93 (19.9)	
Flat	43 (16.5)	69 (33.3)	112 (23.9)	
Number of tumours				<0.001
1	158 (60.5)	58 (28.0)	216 (46.2)	
2–7	94 (36.0)	117 (56.5)	211 (45.1)	
>7	9 (3.5)	32 (15.5)	41 (8.8)	
Diameter of largest tumour				<0.001
<1 cm	50 (19.2)	121 (58.5)	171 (36.5)	
1–2 cm	85 (32.6)	42 (20.3)	127 (27.1)	
2–4 cm	70 (26.8)	13 (6.3)	83 (17.7)	
4–6 cm	27 (10.3)	2 (1.0)	29 (6.2)	
>6 cm	12 (4.6)	4 (1.9)	16 (3.4)	
Undefined	17 (6.5)	25 (12.1)	42 (9.0)	
Location of largest tumour				<0.001
Anterior wall	10 (3.8)	16 (7.7)	26 (5.6)	
Posterior wall	28 (10.7)	47 (23.7)	75 (16.0)	
Lateral wall	137 (52.5)	59 (28.5)	196 (41.9)	
Dome	13 (5.0)	21 (10.1)	34 (7.3)	
Trigone	26 (10.0)	18 (8.7)	44 (9.4)	
Neck	21 (8.0)	31 (15.0)	52 (11.1)	
Involving an orifice	25 (9.6)	14 (6.8)	39 (8.3)	
Majority of bladder surface	1 (0.4)	1 (0.5)	2 (0.4)	
T-stage				<0.001
Ta/Dysplasia	113 (43.3)	134 (64.7)	247 (52.8)	
T1a[a]	31 (11.9)	10 (4.8)	41 (8.8)	
T1b	24 (9.2)	2 (1.0)	26 (5.6)	
≥T2	52 (19.9)	6 (2.9)	58 (12.4)	
CIS	10 (3.8)	16 (7.7)	26 (5.6)	
No malignancy	25 (9.6)	37 (17.9)	62 (13.3)	
Other pathology[b]	6 (2.3)	1 (0.5)	7 (1.5)	
Missing[c]	0	1 (0.5)	1 (0.2)	
Tumour grade				<0.001
Low grade	88 (33.7)	93 (44.9)	181 (38.7)	
High grade	117 (44.8)	51 (24.6)	168 (35.9)	
Undefined	56 (21.5)	62 (30.0)	118 (25.2)	
Missing[c]	0	1 (0.5)	1 (0.2)	
Detrusor muscle in specimen				0.007
Yes	187 (71.7)	121 (58.5)	308 (65.8)	
No	74 (28.4)	85 (41.1)	159 (34.0)	
Missing[b]	0	1 (0.5)	1 (0.2)	
Re-resection				<0.001
Yes	42 (16.1)	11 (5.3)	53 (11.4)	
No	219 (83.9)	196 (94.7)	415 (88.7)	

*p-Value comparing primary tumours vs. recurrences.
[a]Including 7 patients where subclassification into pT1a or pT1b was not possible. [b]Other pathology, for example, urothelial papilloma, prostate cancer. [c]Missing data: pathology specimen gone missing.

Table 2. Proportion of TURBs candidate for en bloc resection (EBR) and reasons for not candidate.

	Primary tumour, *n* (%)	Recurrent tumour, *n* (%)	Total, *n* (%)	*p*-Value*
Candidate for EBR				<0.001
Yes	90 (34.5)	27 (13.0)	117 (25.0)	
No	171 (65.5)	180 (87.0)	351 (75.0)	
Total	261	207	468	
Reason for not candidate[a]				<0.001
Appearance, solid	85 (49.7)	7 (3.9)	92 (26.2)	
Appearance, flat	43 (25.1)	67 (37.2)	110 (31.3)	
Tumour diameter <1 cm	50 (29.2)	122 (67.8)	172 (49.0)	
Tumour not resectable[b]	2 (1.2)	1 (0.6)	3 (0.9)	
Size undefined	1 (0.6)	1 (0.6)	2 (0.6)	

*p-Value comparing primary tumours vs. recurrences.
[a]Tumours can be registered with more than one reason. [b]Tumours not possible to resect completely, for example, described as 'covering the majority of the bladder surface' or similarly.

Table 3. Initial T-stage vs. T-stage at reTURB.

	T-stage at second resection							
Initial T-stage	T0	Ta	T1a	T1b	T2	Tx	CIS	Total
Ta	9	4	1[a]	0	0	0	0	14
T1a[b]	15	3	1	0	1[a]	2	3	25
T1b	5	1	0	1	2[a]	0	0	9
CIS	1	0	0	0	0	0	0	1
Total	30	8	2	1	3	2	3	49

[a]Progression in T-stage. [b]Including 7 patients where subclassification into pT1a or pT1b at initial resection was not possible.

Table 4. Recurrences within 6 months for primary and recurrent tumours stratified for candidate versus non-candidate for en bloc resection (EBR).

	Recurrences within 6 months, *n* (%)
Primary tumours ($n = 261$)	
Candidate for EBR ($n = 90$)	18 (20.0)
Non-candidate ($n = 171$)	12 (7.0)
Recurrent tumours ($n = 207$)	
Candidate for EBR ($n = 27$)	7 (25.9)
Non-candidate ($n = 180$)	62 (34.4)
Total ($n = 468$)	99 (21.2)

resection technique alone and not retrieval, as not all large tumours are necessarily possible to remove from the bladder en bloc. However, with the proper device available even very large tumours can be removed in one piece [24,25].

One limitation of the study is the retrospective design. A prospective design would be more beneficial, as the tumour description and measurements could be standardised and systematically reported. However, all patient records were reviewed and data registered manually, which strengthens the study compared to an automatized data collection.

In a standardised description, a general description of the bladder appearance could be included, which would be desirable, as a heavily trabeculated bladder is a considerable limitation for EBR to be done.

As patients with tumours small enough to be resected in the outpatient clinic are excluded from the study, the estimated proportion of tumours eligible for EBR will be slightly overestimated compared to institutions where all tumours are handled in general anaesthesia. However, this will only apply to recurrence tumours, as primary tumours are recommended to always be resected by TURB.

Recurrences small enough to be coagulated in the clinic are considered true recurrences, although no pathological description is available. This could potentially lead to an overestimation of the number of recurrences. However, this will probably not have a substantial effect on this dataset, as the issue is limited to very few patients and more importantly, it is expected to be similar in all patient groups.

As described, we found approximately 25% of patients undergoing TURB to be a candidate for EBR based on the aforementioned criteria. There is a theoretical benefit of EBR regarding reduced recurrence rates, especially early recurrences that can be the consequence of remnant tumour tissue or implantation metastases. Therefore, we reviewed how large a proportion of the patient candidates for EBR, who had a recurrence within 6 months. This was registered in 21.2% of patients. Based on these results, we would expect one-fifth of the TURB patients who had an early recurrence to potentially have benefited from EBR.

Based on this rather small proportion of all TURBs, it would be challenging to conduct the highly requested RCT with recurrence rate or recurrence-free survival as the primary endpoint, as it would require a very large study population to gain sufficient power for these endpoints.

However, if EBR potentially could be a method to remove tumours more safely with free margins, and make it easier for the pathologist to assess the tumour margins, it could lower both the number of patients with residual tumour at reTURB and the need for re-resections overall.

Conclusion

In this retrospective, descriptive study, we found approximately 25% of all TURBs to be eligible for EBR. Our findings suggest that only a minority of all TURB patients would potentially benefit from EBR regarding recurrence rate. These findings demonstrate that future studies on EBR with recurrence rate as a primary endpoint will require large patient cohorts. Pathological quality and the need for re-resections is therefore a more clinically relevant outcome.

Disclosure statement

The authors declare no conflicts of interest relevant for the present study. JB Jensen reports grants and personal fees from Photocure ASA, Olympus, Ferring, Cephaid, Medac, Pfizer, MSD, Astra-Zenica, Ambu, and Intuitive Surgery, and non-financial support from Roche outside the submitted work.

Funding

The study was completed as part of a Ph.D. study where funding was sponsored by the Novo Nordisk Foundation with a Project Grant in Surgical Research. Award reference [NNF19OC005834].

ORCID

Jørgen Bjerggaard Jensen http://orcid.org/0000-0002-4347-739X

References

[1] Globocan [Internet]. Bladder cancer fact sheet. Lyon (France): International Agency for Research on Cancer; 2019. Available from: http://gco.iarc.fr/today/data/factsheets/cancers/30-Bladder-fact-sheet.pdf

[2] Burger M, Catto JW, Dalbagni G, et al. Epidemiology and risk factors of urothelial bladder cancer. Eur Urol. 2013;63(2):234–241.

[3] Engilbertsson H, Aaltonen KE, Bjornsson S, et al. Transurethral bladder tumor resection can cause seeding of cancer cells into the bloodstream. J Urol. 2015;193(1):53–57.

[4] Babjuk M, Burger M, Comperat EM, et al. European Association of Urology Guidelines on non-muscle-invasive bladder cancer (TaT1 and carcinoma in situ) - 2019 update. Eur Urol. 2019;76(5):639–657.

[5] Herr HW, Donat SM. A re-staging transurethral resection predicts early progression of superficial bladder cancer. BJU Int. 2006;97(6):1194–1198.

[6] Kramer MW, Rassweiler JJ, Klein J, et al. En bloc resection of urothelium carcinoma of the bladder (EBRUC): a European multicenter study to compare safety, efficacy, and outcome of laser and

electrical en bloc transurethral resection of bladder tumor. World J Urol. 2015;33(12):1937–1943.
[7] Zhang D, Yao L, Yu S, et al. Safety and efficacy of en bloc transurethral resection versus conventional transurethral resection for primary nonmuscle-invasive bladder cancer: a meta-analysis. World J Surg Oncol. 2020;18(1):4.
[8] Hurle R, Lazzeri M, Colombo P, et al. "En bloc" resection of nonmuscle invasive bladder cancer: a prospective single-center study. Urology. 2016;90:126–130.
[9] Kramer MW, Altieri V, Hurle R, et al. Current evidence of transurethral en-bloc resection of nonmuscle invasive bladder cancer. Eur Urol Focus. 2017;3(6):567–576.
[10] Soria F, D'Andrea D, Moschini M, et al. Predictive factors of the absence of residual disease at repeated transurethral resection of the bladder. Is there a possibility to avoid it in well-selected patients? Urol Oncol. 2020;38(3):e1–e7.
[11] Kramer MW, Abdelkawi IF, Wolters M, et al. Current evidence for transurethral en bloc resection of non-muscle-invasive bladder cancer. Minim Invasive Ther Allied Technol. 2014;23(4):206–213.
[12] Teoh JY, MacLennan S, Chan VW, et al. An international collaborative consensus statement on en bloc resection of bladder tumour incorporating two systematic reviews, a two-round Delphi survey, and a consensus meeting. Eur Urol. 2020;78(4):546–569.
[13] Collado A, Chechile GE, Salvador J, et al. Early complications of endoscopic treatment for superficial bladder tumors. J Urol. 2000;164(5):1529–1532.
[14] Jancke G, Rosell J, Jahnson S. Impact of tumour size on recurrence and progression in Ta/T1 carcinoma of the urinary bladder. Scand J Urol Nephrol. 2011;45(6):388–392.
[15] Ströck V, Holmäng S. A prospective study of the size, number and histopathology of new and recurrent bladder tumors. Urol Pract. 2015;2(5):260–264.
[16] Kawada T, Ebihara K, Suzuki T, et al. A new technique for transurethral resection of bladder tumors: rotational tumor resection using a new arched electrode. J Urol. 1997;157(6):2225–2226.
[17] Lodde M, Lusuardi L, Palermo S, et al. En bloc transurethral resection of bladder tumors: use and limits. Urology. 2003;62(6):1089–1091.
[18] Sureka SK, Agarwal V, Agnihotri S, et al. Is en-bloc transurethral resection of bladder tumor for non-muscle invasive bladder carcinoma better than conventional technique in terms of recurrence and progression?: a prospective study. Indian J Urol. 2014;30(2):144–149.
[19] Ukai R, Kawashita E, Ikeda H. A new technique for transurethral resection of superficial bladder tumor in 1 piece. J Urol. 2000;163(3):878–879.
[20] Liu H, Wu J, Xue S, et al. Comparison of the safety and efficacy of conventional monopolar and 2-micron laser transurethral resection in the management of multiple nonmuscle-invasive bladder cancer. J Int Med Res. 2013;41(4):984–992.
[21] Zhang XR, Feng C, Zhu WD, et al. Two micrometer continuous-wave thulium laser treating primary non-muscle-invasive bladder cancer: is it feasible? a randomized prospective study. Photomed Laser Surg. 2015;33(10):517–523.
[22] Chen X, Liao J, Chen L, et al. En bloc transurethral resection with 2-micron continuous-wave laser for primary non-muscle-invasive bladder cancer: a randomized controlled trial. World J Urol. 2015;33(7):989–995.
[23] Gakis G, Karl A, Bertz S, et al. Transurethral en bloc submucosal hydrodissection vs conventional resection for resection of non-muscle-invasive bladder cancer (HYBRIDBLUE): a randomised, multicentre trial. BJU Int. 2020;126(4):509–519.
[24] Naselli A, Introini C, Germinale F, et al. En bloc transurethral resection of bladder lesions: a trick to retrieve specimens up to 4.5 cm. BJU Int. 2012;109(6):960–963.
[25] Maurice MJ, Vricella GJ, MacLennan G, et al. Endoscopic snare resection of bladder tumors: evaluation of an alternative technique for bladder tumor resection. J Endourol. 2012;26(6):614–617.