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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

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Abstract

Background: There has been increasing interest in en bloc resection of bladder tumour (ERBT) as an oncologically noninferior alternative to transurethral resection of bladder tumour (TURBT) with fewer complications and better histology specimens. However, there is a lack of robust randomised controlled trial (RCT) data for making recommendations.

Objective: We aimed to develop a consensus statement to standardise various aspects of ERBT for clinical practice and to guide future research.

Design, setting, and participants: We developed the consensus statement on ERBT using a modified Delphi method. First, two systematic reviews were performed to investigate the clinical effectiveness of ERBT versus TURBT (effectiveness review) and to identify areas of uncertainty in ERBT (uncertainties review). Next, 200 health care professionals (urologists, oncologists, and pathologists) with experience in ERBT were invited to complete a two-round Delphi survey. Finally, a 16-member consensus panel meeting was held to review, discuss, and re-vote on the statements as appropriate.

Outcome measurements and statistical analysis: Meta-analyses were performed for RCT data in the effectiveness review. Consensus statements were developed from the

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uncertainties review. Consensus was defined as follows: (1) ≥70% scoring a statement 7–9 and ≤15% scoring the statement 1–3 (consensus agree), or (2) ≥70% scoring a statement 1–3 and ≤15% scoring the statement 7–9 (consensus disagree).

Results and limitations: A total of 10 RCTs were identified upon systematic review. ERBT had a shorter irrigation time (mean difference −7.24 h, 95% confidence interval [CI] −9.29 to −5.20, $I^2 = 85\%$, $p < 0.001$) and a lower rate of bladder perforation (risk ratio 0.30, 95% CI 0.11–0.83, $I^2 = 1\%$, $p = 0.02$) than TURBT, both with moderate certainty of evidence. There were no significant differences in recurrences at 0–12, 13–24, or 25–36 mo (all very low certainty of evidence). A total of 103 statements were developed, of which 99 reached a consensus. A summary of statements is as follows: ERBT should always be considered for treating non–muscle-invasive bladder cancer; ERBT should be considered feasible even for bladder tumours larger than 3 cm; number and location of bladder tumours are not major limitations in performing ERBT; the planned circumferential margin should be at least 5 mm from any visible bladder tumour; after ERBT, additional biopsy of the tumour edge or tumour base should not be performed routinely; for the ERBT specimen, T1 substage, and circumferential and deep resection margins must be assessed; it is safe to give a single dose of immediate intravesical chemotherapy, perform second-look transurethral resection, and give intravesical bacillus Calmette-Guérin (BCG) therapy after ERBT; and in studies of ERBT, both per-patient and -tumour analysis should be performed for different outcomes as appropriate. Important outcomes for future ERBT studies were also identified. A limitation is that as consensus statements are brief, concise and binary in nature, areas of uncertainty that are complex in nature may not be addressed adequately.

Conclusions: We have provided the most comprehensive review of the evidence base to date using a meta-analysis where appropriate and applying the Grading of Recommendations Assessment, Development and Evaluation (GRADE) methodology, and mobilised the international urology community to develop a consensus statement on ERBT using transparent and robust methods. The consensus statement will provide interim guidance for health care professionals who practice ERBT and inform researchers regarding ERBT-related studies in the future.

Patient summary: En bloc resection of bladder tumour (ERBT) is a surgical technique aiming to resect a bladder tumour in one piece. We included an international panel of experts to agree on the best practice of ERBT, and this will provide guidance to clinicians and researchers in the future.

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1. Introduction

En bloc resection of bladder tumour (ERBT) was first described by Kitamura et al [1] in 1980. ERBT has three potential benefits in treating non–muscle-invasive bladder cancer (NMIBC) when compared with conventional transurethral resection of bladder tumour (TURBT). First, bladder tumour is resected in one piece and the tumour specimen remains intact for a proper histological assessment. Whether a complete resection has been achieved can be ascertained by histological means rather than the surgeon's judgement alone. Second, the resection process is more precise and controlled; thus, the complication profile, in particular the risk of bladder perforation, may be reduced. Third, ERBT can avoid tumour fragmentation as in the case of conventional piecemeal resection. It can potentially minimise the amount of floating tumour cells and reduce the risk of tumour reimplantation.

ERBT upholds the basic principles in cancer surgery, and it has gained increasing interests globally in the past decade. However, high-quality data are limited to make robust recommendations. There is a lack of standardisation leading to heterogeneity in the clinical and technical aspects of ERBT. It is important to develop a consensus statement on ERBT that can serve as a standard reference for health care professionals in the future. It will have important implications in our clinical practice as well as future studies of ERBT.

2. Patients and methods

We developed the consensus statement on ERBT using a modified Delphi method. The development process included two systematic reviews, a two-round Delphi survey, and a face-to-face consensus meeting (Fig. 1).

2.1. Systematic reviews

Two systematic reviews were performed according to the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines [2], and the study protocol was registered on PROSPERO [3]. The "effectiveness" review assessed the benefits and harms of ERBT compared with conventional TURBT and provided certainty of evidence ratings using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) methodology [4,5]. The "uncertainties" review identified clinical and technical uncertainties in the area of ERBT. The findings of the systematic reviews provided the basis for the statements developed for voting in the Delphi survey and consensus meeting.

2.1.1. Search strategy

A comprehensive literature search to encompass the reviews of effectiveness and uncertainties was performed using a combination of

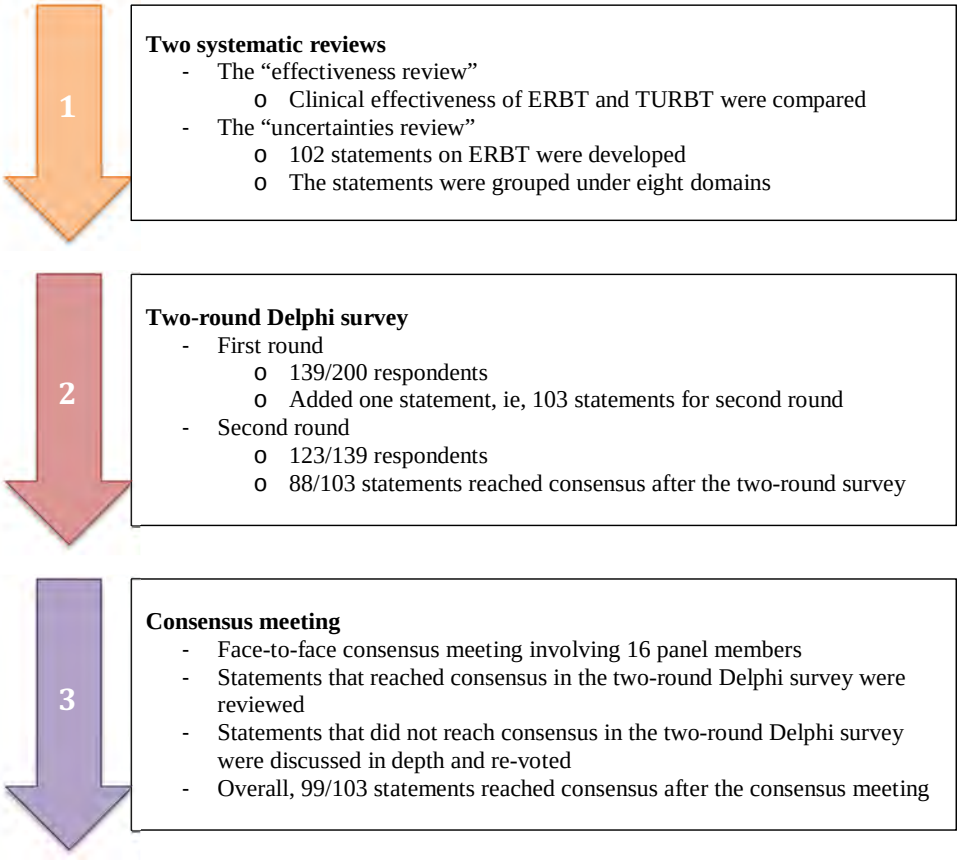

Fig. 1 – Overview of the development of the consensus statement.
ERBT = en bloc resection of bladder tumour; TURBT = transurethral resection of bladder tumour.

keywords (MeSH terms and free text words) related to "bladder tumour", and "'en bloc resection"/"ERBT". MEDLINE, EMBASE, and Cochrane library (CENTRAL and CDSR) were searched. The search strategy is presented in the Supplementary material. Additional references were sought from the reference lists of the included studies.

2.1.2. *Types of studies included*

All randomised and nonrandomised comparative studies, reported in journals or conference proceedings, were included in the effectiveness review. Single-arm case series or case reports were excluded from the effectiveness review but were retained for the uncertainties review. There was no cut-off date for the literature search. Only English-language articles were included. Conference proceedings, letters to editors, commentaries, and international guidelines were included in the uncertainties review.

2.1.3. *Assessment of risk of bias*

For the effectiveness review, the risk of bias in randomised controlled trials (RCTs) was assessed by using the recommended tool in the Cochrane Handbook for Systematic Reviews of Intervention [6]. The risk of bias in nonrandomised comparative studies was assessed with the same tool, with an extra item to assess the risk of findings being explained by confounding. This is a pragmatic approach informed by methodological literature pertaining to assessing the risk of bias in nonrandomised studies, and it is the approach adopted in systematic reviews commissioned by the European Association of Urology (EAU) guidelines office to inform their guidelines [7].

2.1.4. *Data synthesis and statistical analysis*

For the effectiveness review, a meta-analysis was performed if there were two or more RCTs reporting on the same outcome. Data from RCT conference proceedings were included to reduce the risk of publication bias [6]. Reports of the same studies were linked together, where the reports containing the most complete data and longest follow-up were used. Relative risk (RR) and its 95% confidence interval (CI) were used to summarise statistic dichotomous data. Mean differences were used to summarise continuous data. Some clinical and methodological heterogeneity across the studies was suspected, and therefore a random effect model was used. Narrative synthesis, using the methods outlined in the Centre for Reviews and Dissemination handbook, were used to synthesise the results from nonrandomised studies [8]. Results from nonrandomised studies were not included in the quantitative analysis, as there may be significant selection bias, especially in the context of ERBT. Application of GRADE certainty of evidence was done in accordance with the GRADE handbook [9].

For the uncertainties review, areas of uncertainties in ERBT were extracted verbatim from any of the studies or sources meeting the inclusion criteria. The extracted data were categorised with reference to the usual management pathway and grouped under domains such as case selection, surgical procedure, postoperative management, and follow-up schedule. To reduce the data further, statements relating to the same concept were subsumed within one statement, resulting in a conceptual map of uncertainties identified in the ERBT literature. These statements were then used to create positively worded statements that can be agreed or disagreed with, for inclusion in the Delphi survey. The

statements were discussed within the steering group (J.Y.C.T., S.M., H.M., T.H., and M.B.) and finalised before proceeding to the Delphi survey.

2.2. Two-round Delphi survey

Delphi survey methods were used to promote anonymity and to control for the influence of dominant voices or perceived authoritative voices, yet still provided controlled feedback to participants [10].

2.2.1. Conduct of the two-round Delphi survey

The two-round Delphi survey was conducted using DelphiManager [11]. A total of 200 urologists, oncologists, and pathologists involved in the field of ERBT were purposively sampled for expertise and geographical location, to ensure that we covered an adequate breadth of international experience. The steering group provided the names of known experts in the field. This was supplemented by inviting the authors of studies included in the systematic reviews. Finally, in order to gather opinion from a more general perspective, a Twitter advert was promoted using the hashtags #ERBT and #UroSoMe [12]. Interested individuals were verified to have personal experience in ERBT before they were invited to participate in the online Delphi survey via an e-mail providing a link to the study. The link took them to a webpage providing information about the aims and objectives of the study, with a further link to a registration page. Informed consent was implied if the participant registered to take part.

As ERBT is heavily surgery oriented, a single heterogeneous panel model was used, as we did not think it is necessary to look for differences across stakeholder groups (ie, urologists, pathologists, and oncologists) [10,13]. Participants were asked to state their strength of agreement on a scale of 1 (strongly disagree) to 9 (strongly agree). There was also an "unable to score" option. Participants were instructed to choose "unable to score", rather than "5" (neither agree nor disagree) if they felt they did not have enough knowledge or expertise on a particular statement, because these two concepts are qualitatively different. We made this explicit because this phenomenon has been noted as a limitation in other consensus projects [14,15]. During the first round, participants could suggest additional items to be incorporated into the second round of survey (subjected to review by the steering group). Only those who had completed the first-round survey could participate in the second-round survey. In the second round, they were reminded of their own round 1 score and were shown a distribution of the group scores across the 1–9 scale for each statement. They were allowed to use this information to consider retaining their previous scores or changing their scores relative to the field. All voting results were anonymous to minimise bias and influence regarding agreeing with dominant or authoritative voices.

2.2.2. Definition of consensus and analysis plan

Consensus is defined as follows: (1) $\geq$70% scoring a statement 7–9 and $\leq$15% scoring the statement 1–3 (consensus agree), or (2) $\geq$70% scoring a statement 1–3 and $\leq$15% scoring the statement 7–9 (consensus disagree). This definition has been used in other urology consensus meetings [14–16] and achieves a balance between being overinclusive and -exclusive whilst still allowing a consideration of variance (ie, spread or divergent opinions) [17].

2.3. Consensus meeting

A consensus meeting was held to review the statements that reached consensus in the Delphi survey, and to discuss in-depth and re-vote on those statements upon which there was no consensus. The consensus panel consisted of 16 members, including 12 urologists, one oncologist, one pathologist, one methodologist (nonvoting member), and one patient representative. The meeting was chaired by the methodologist with experience in chairing consensus meetings and no conflicts of interest regarding ERBT. First, the results of the effectiveness review were presented and discussed. Next, the two-round Delphi survey results were discussed. Panel members were provided with a hard-copy overview of the Delphi voting results for both rounds, along with a reminder of their own votes in both rounds. Statements where there was a clear consensus were reviewed to ensure that the results were sensible. Then statements in which more than five participants had chosen "unable to score" were reviewed to explore reasons for this. Finally, statements not reaching a consensus in the Delphi survey were discussed in depth before anonymous voting using their own smart devices and the Poll Everywhere software [18]. The same consensus definitions were used.

3. Results

3.1. Systematic review and meta-analysis

The PRISMA flow diagram is shown in Figure 2. The initial search yielded 669 records. After removing duplicates, 430 articles were screened based on title and abstract. For the effectiveness review, 44 articles were reviewed in full text. At the end of the process, 32 studies (with 39 reports) were included in qualitative synthesis. Among them, 10 were RCTs (with 13 reports) [19–31], and these were included in a quantitative analysis. For the uncertainties review, 151 articles were reviewed in full text and included for generation of consensus statements. The studies included in the uncertainties review are listed in the Supplementary material.

Table 1 summarises the study characteristics of the RCTs. Only data from RCTs were extracted for subsequent meta-analysis. Risk of bias assessment of the RCTs is presented in Figure 3. Study characteristics and risk of bias assessment of the nonrandomised studies and the GRADE summary of finding profiles are included in the Supplementary material.

3.1.1. Effectiveness review—outcome measures from RCTs

ERBT had a longer operative time than TURBT (mean difference 9.07 min, 95% CI 3.36–14.79, $I^2 = 86\%$, $p = 0.002$; very low certainty evidence). ERBT had a shorter irrigation time than TURBT (mean difference −7.24 h, 95% CI −9.29 to −5.20, $I^2 = 85\%$, $p < 0.001$; moderate certainty evidence), but there were no significant differences in the catheterisation time (mean difference −0.90 d, 95% CI −2.21 to 0.41, $I^2 = 97\%$, $p = 0.18$; low certainty evidence) and hospital stay (mean difference −1.32 d, 95% CI −2.71 to 0.06, $I^2 = 97\%$, $p = 0.06$; low certainty evidence). Although there was no significant difference in the occurrence of obturator nerve reflex (RR 0.19, 95% CI 0.03–1.22, $I^2 = 79\%$, $p = 0.08$; very low certainty evidence), ERBT had a lower rate of bladder perforation than TURBT (RR 0.30, 95% CI 0.11–0.83, $I^2 = 1\%$, $p = 0.02$; moderate certainty evidence). Presence of detrusor muscle in specimen was similar between ERBT and TURBT (RR 1.11, 95% CI 0.40–3.11, $I^2 = 77\%$, $p = 0.84$; very low certainty evidence). There were no significant differences in 0–12 mo (RR 0.82, 95% CI 0.56–1.19, $I^2 = 12\%$, $p = 0.29$), 13–24 mo (RR 0.79, 95% CI 0.44–1.42, $I^2 = 0\%$, $p = 0.43$), and 25–36 mo (RR 0.89, 95% CI 0.65–1.22, $I^2 = 47\%$, $p = 0.47$) recurrence rates (all very low certainty evidence). Data were too limited for the subgroup

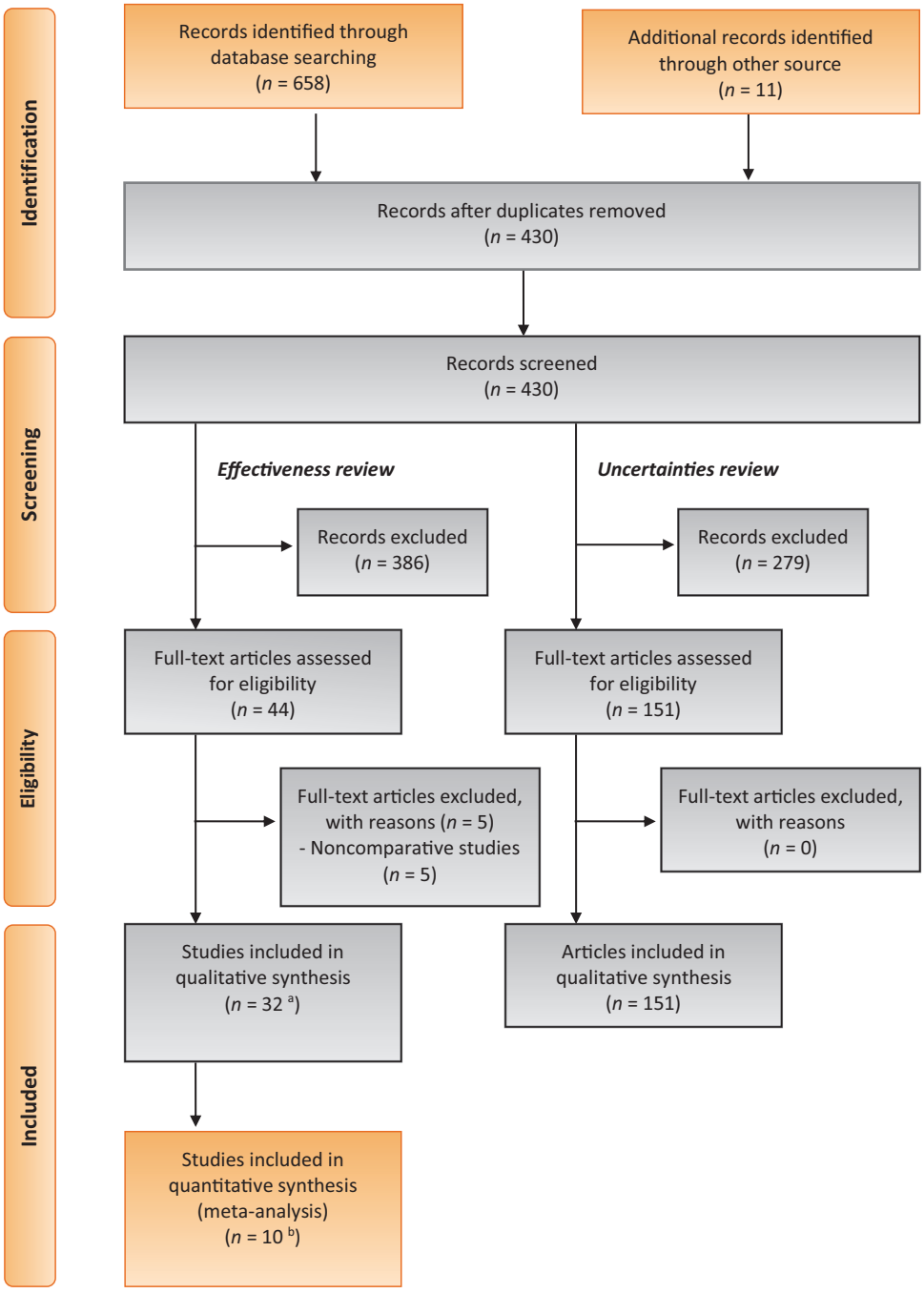

Fig. 2 – PRISMA flow diagram.
PRISMA = Preferred Reporting Items for Systematic Reviews and Meta-analyses.
[a]Thirty-two studies with 39 reports.
[b]Ten studies with 13 reports.

comparisons between different modalities of ERBT and TURBT. The key findings of the meta-analysis are summarised in Figure 4, and other results are summarised in the Supplementary material.

3.1.2. Effectiveness review—outcome measures from nonrandomised studies

Most studies showed that ERBT had a shorter irrigation time and a lower rate of bladder perforation than TURBT, and this is in line with the RCT data. However, the results on the operative time were controversial. Most studies showed that ERBT had a shorter catheterisation time, shorter hospital stay, lower rate of obturator nerve reflex, and higher rate of detrusor muscle than TURBT. Most studies also showed lower 0–12, 13–24, and 25–36 mo recurrence rates in favour of ERBT. All outcomes were judged to be at low or very low certainty of evidence. The results are summarised in the Supplementary material.

3.2. Uncertainties review—generation of consensus statements

Based on the results of the systematic review, 102 statements were generated for the first-round survey. After the first-round survey, one additional statement was added, resulting in 103 statements in total for the second-round survey.

The statements were grouped under eight domains as follows.

1 Definitions and objectives of ERBT.
2 Case selection.
3 Surgical procedure.
4 Different modalities of ERBT.
5 Reporting of intraoperative findings.
6 Specimen preparation and reporting of histological findings.
7 Postoperative management and follow-up schedule.
8 Data reporting and outcome measures.

3.3. Two-round Delphi survey

In the first-round survey, there were 139 respondents out of 200 invitations (69.5%). Among the first-round survey respondents, 123 completed the second-round survey (88.5%). There was a wide coverage of respondents globally, with the majority practising in Europe and Asia. The majority had >10 yr of clinical practice; 90.2% were urologists, 6.5% were pathologists, and 3.3% were oncologists. This is reflective of the situation that NMIBC is

Table 1 – Study characteristics of included randomised controlled trials.

Study	Country	Eligibility criteria	Comparison	Total (*n*)	ERBT arm (*n*)	Control arm (*n*)
Balan et al (2018) [19], Geavlete et al (2018) [20], and Geavlete et al (2019) [21] [a]	Romania	NMIBC 1–3 cm in diameter No solid sessile tumours Not located at bladder neck or involving the ureteral orifice	Bipolar ERBT vs monopolar TURBT	90	45	45
Chen et al (2015) [22]	China	Primary NMIBC No suspicion of MIBC No serious heart, lung, or brain conditions	Thulium laser ERBT vs TURBT[b]	142	71	71
Cheng et al (2016) [23]	China	NMIBC	HybridKnife ERBT vs TURBT[b]	75	38	37
Gakis et al (2017) [24]	Germany	NMIBC Tumour size >5 mm	HybridKnife ERBT vs TURBT[b]	115	56	59
Hu et al (2017) [25] and Hu et al (2018) [26][a]	China	Primary NMIBC Not CIS Not >3 cm and not <1 cm in diameter Not more than 5 tumours	HybridKnife ERBT vs TURBT[b]	93	46	47
Kufner et al (2014) [27]	Germany	Superficial papillary bladder tumour	HybridKnife ERBT vs TURBT[b]	16	7	9
Li et al (2014) [28]	China	NMIBC	ERBT[b] vs TURBT[b]	158	80	78
Liu et al (2013) [29]	China	Newly diagnosed NMIBC Not urothelial papillomas Not MIBC or CIS No upper urinary tract tumours No extravesical extension, lymphatic metastasis, or invasion of adjacent organs	Thulium laser ERBT vs monopolar TURBT	120	64	56
Ruffo et al (2017) [30]	Italy	Newly diagnosed NMIBC	Thulium laser ERBT vs monopolar TURBT	54	30	24
Zhang et al (2015) [31]	China	Primary NMIBC Not inverted papilloma No extravesical extension, lymph node metastasis, or adjacent organ invasion No upper urinary tract tumours Excluded patients who could not tolerate general anaesthesia No severe cardiovascular or pulmonary disease, or disturbance of blood coagulation contradicting operation	Thulium laser ERBT vs bipolar TURBT	292	149	143

CIS = **c**arcinoma in situ; ERBT = **e**n bloc resection of bladder tumour; MIBC = muscle-invasive bladder cancer; NMIBC = non–muscle-invasive bladder cancer; TURBT = **t**ransurethral resection of bladder tumour.
[a] Same study with numerous reports; report with the most complete data and longest follow-up was presented.
[b] Unknown energy source.

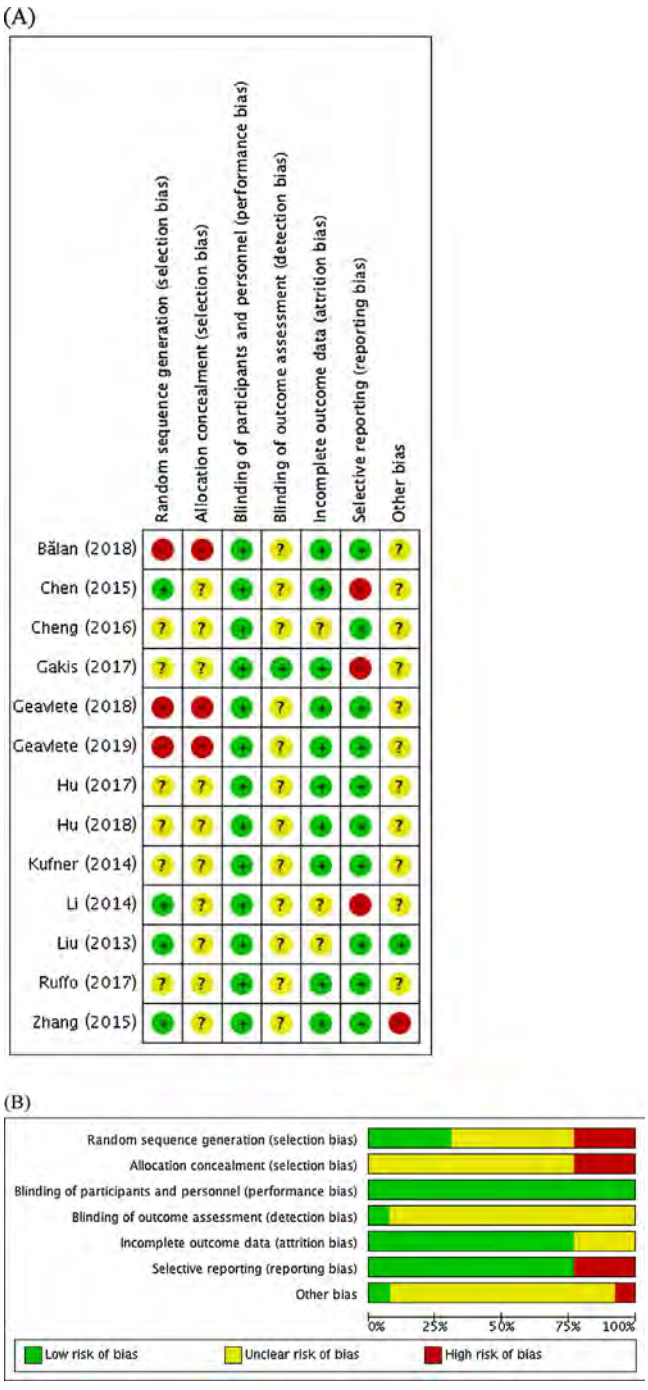

Fig. 3 – Risk of bias assessment of the randomised controlled trials.

managed mostly by urological surgeons. Table 2 summarises the characteristics of the Delphi participants completing both rounds of survey. After the two-round Delphi survey, a consensus was reached in 88 out of 103 statements (85.4%).

3.4. Consensus panel meeting

Table 3 lists the characteristics of the panel members. After the discussion and re-voting processes, the consensus panel

Table 2 – Characteristics of the Delphi participants who completed both rounds of survey.

		Round 1 *N* (%)	Round 2 *N* (%)
Region			
	Africa	4 (2.9)	2 (1.6)
	Asia	70 (50.4)	62 (50.4)
	Australia/New Zealand	2 (1.4)	2 (1.6)
	Europe	53 (38.1)	48 (39.0)
	North America	3 (2.2)	2 (1.6)
	South America	7 (5.0)	7 (5.7)
Years of practice			
	1–5	15 (10.8)	14 (11.4)
	6–10	37 (26.6)	33 (26.8)
	11–15	41 (29.5)	36 (29.3)
	16–20	26 (18.7)	23 (18.7)
	21–25	12 (8.6)	9 (7.3)
	26–30	5 (3.6)	5 (4.1)
	>30	3 (2.2)	3 (2.4)
Speciality			
	Oncologist	6 (4.3)	4 (3.3)
	Pathologist	8 (5.8)	8 (6.5)
	Urologist	125 (89.9)	111 (90.2)
Total		139 (100)	123 (100)

was able to reach a consensus in 11 out of 15 statements. Overall, 99 out of 103 statements (96.1%) reached a consensus after the whole development process.

3.5. Principal findings of the consensus statement

Table 4 summarises the results of all statements and consensus status after two rounds of survey. Table 5 summarises the statements that were discussed and re-voted, and their consensus status after the voting session. The final results of the consensus statements on ERBT are summarised in Table 6.

3.5.1. Definitions and objectives of ERBT

Removal of bladder tumour in one piece [32] is the most appropriate definition for ERBT. The main goals of ERBT are to ensure complete local resection of bladder tumour, ensure proper local staging of the disease, and reduce the risk of tumour reimplantation. Upon ERBT, we must aim to include the detrusor muscle layer in the specimen. ERBT should always be considered for treating NMIBC [19,22–26,28–30]. However, in cases of muscle-invasive bladder cancer (MIBC) and carcinoma in situ (CIS) of the bladder, ERBT should not be considered [22,25,26,29].

3.5.2. Case selection

3.5.2.1. Size of bladder tumour. Size of bladder tumour is a major limitation in performing ERBT. Most studies used bladder tumour size of 3 cm as a cut-off in performing ERBT [19,25,26,33,34]. In the Delphi survey, it was agreed that ERBT is feasible for bladder tumour size of ≤3 cm. For bladder tumour size of >3 cm, no consensus was reached in the Delphi survey. The panel members agreed that, in such situation, it might be difficult to extract the specimen in one piece. However, the resection procedure itself is still

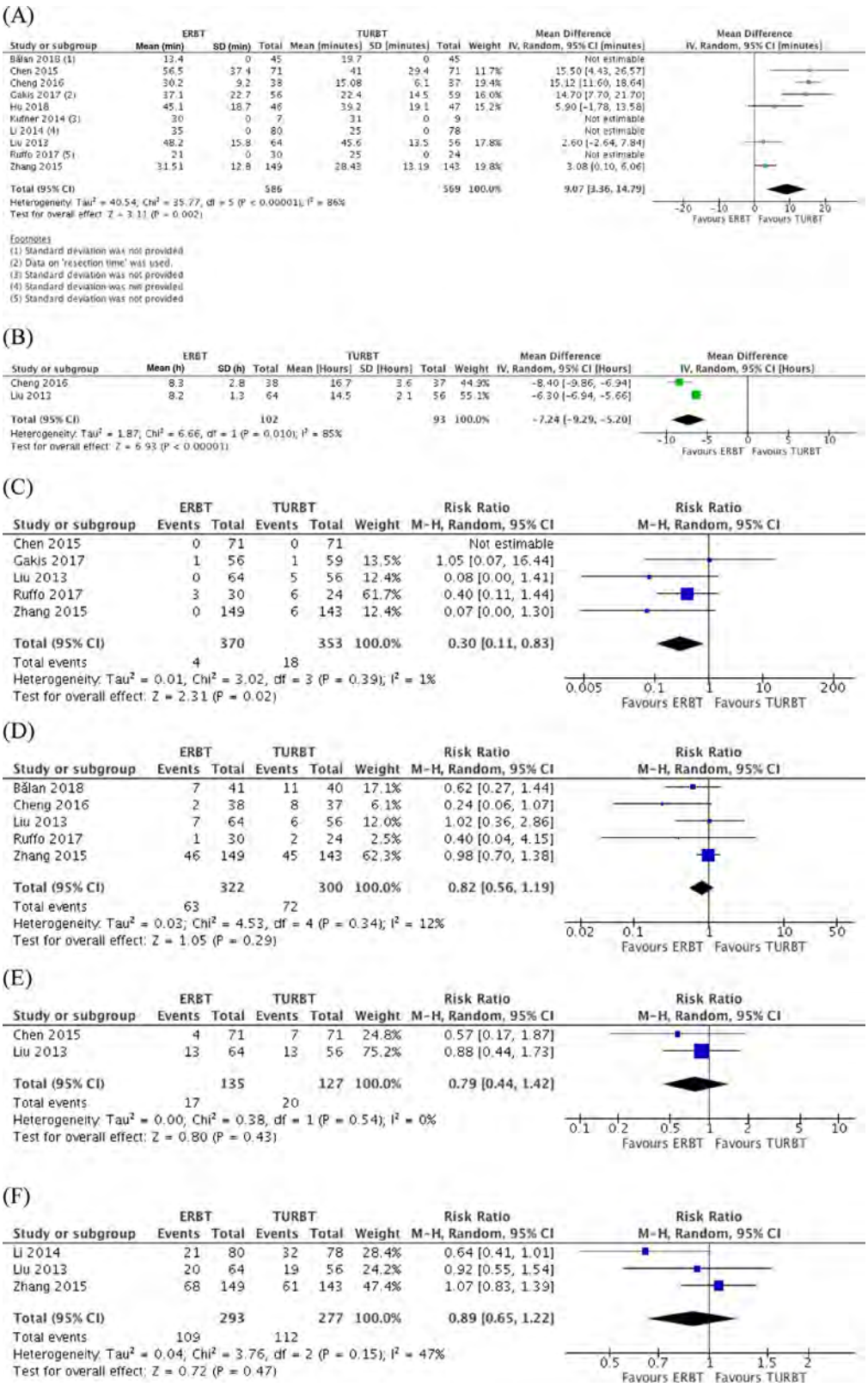

Fig. 4 – Key findings of the meta-analysis results from randomised controlled trials: (A) operative time (minutes), (B) irrigation time (hours), (C) bladder perforation, (D) recurrence at 0–12 mo, (E) recurrence at 13–24 mo, and (F) recurrence at 25–36 mo.
CI = confidence interval; ERBT = en bloc resection of bladder tumour; IV = inverse variance; M-H = Mantel-Haenszel; SD = standard deviation; TURBT = transurethral resection of bladder tumour.

Table 3 – Panel members of the consensus meeting.

Name	Role	Representing body/institution
Steven MacLennan	Chair (methodologist)	University of Aberdeen, UK
Darren Poon	Oncologist	The Chinese University of Hong Kong, Hong Kong, China
Fernand Lai	Pathologist	The Chinese University of Hong Kong, Hong Kong, China
Chow Wing-Kie	Patient	New Territories East Cluster Bladder Cancer Support Group, Hong Kong, China
Alberto Breda	Urologist	Fundacion Puigvert, Universitat Autonoma de Barcelona, Spain
Bernard Malavaud	Urologist	Institut Universitaire du Cancer, France
Edmund Chiong	Urologist	National University Hospital, National University Health System, Singapore
Hugh Mostafid	Urologist	Royal Surrey County Hospital, UK
Jeremy Teoh	Urologist	The Chinese University of Hong Kong, Hong Kong, China
Jun Miki	Urologist	Jikei University School of Medicine, Japan
Lee Hsiang-Ying	Urologist	Kaohsiung Municipal Ta-Tung Hospital, Taiwan
Lee Lui-Shiong	Urologist	Sengkang General Hospital, Singapore General Hospital, Singapore
Marek Babjuk	Urologist	Hospital Motol, Charles University, Czech Republic; Medical University of Vienna, Austria
Mario Kramer	Urologist	University Clinic of Schleswig-Holstein, Campus Luebeck, Germany
Thomas Herrmann	Urologist	Spital Thurgau AG, Switzerland; Hanover Medical School (MHH), Germany
Wei Yong	Urologist	First Affiliated Hospital of Fujian Medical University, China

technically possible [22,29,35–38], and the potential benefits of ensuring proper staging and complete resection of NMIBC can still be preserved. Therefore, the panel members concluded that ERBT should be regarded as a feasible surgical approach even for bladder tumours larger than 3 cm.

3.5.2.2. Number of bladder tumours. The number of bladder tumours is not a major limitation in performing ERBT. Most studies used four bladder tumours as a cut-off in performing ERBT [39–43]. In the Delphi survey, it was agreed that ERBT is feasible for patients with fewer than four bladder tumours. For patients with more than four bladder tumours, no consensus was reached in the Delphi survey. The panel members agreed that, in such situation, it might take more time and effort to perform ERBT. However, ERBT is still feasible in most of the patients within a reasonable operative time [29,33]. Therefore, the panel members concluded that ERBT should be regarded as a feasible surgical approach even for patients with more than four bladder tumours.

3.5.2.3. Tumour location. Tumour location is not a major limitation in performing ERBT. In the Delphi survey, it was agreed that ERBT is feasible for bladder tumours located at the posterior wall, anterior wall, right lateral wall, left lateral wall, trigone, bladder neck, and near the ureteric orifice areas. Although no consensus was reached for bladder tumours located at the bladder dome in the Delphi survey, there was a 100% consensus in the panel meeting that ERBT is feasible in such tumour location. The panel members concluded that, although bladder dome tumours might be more technically difficult to resect, by allowing more time for resection and with relevant experience [38,44], ERBT is still a feasible approach in such situations.

3.5.3. Surgical procedure

As bladder cancer changes can be subtle, a thorough cystoscopic examination must be performed before any ERBT [22,34,36,45]. However, the evidence on the use of enhanced imaging (narrow-band imaging, Image 1S, or photodynamic diagnosis) is limited, especially in the context of ERBT, and no consensus was reached in this aspect. The bladder should be distended enough, but not overdistended [29,37], to facilitate ERBT while avoiding bladder perforation during the procedure. The planned circumferential margin should be marked first to facilitate subsequent ERBT [35,37,44,45], and it should be at least 5 mm from any visible bladder tumour [34,36,37]. The depth of incision should be made at the detrusor muscle layer [19,22,34,36,37,44,45]. As ERBT specimens can provide comprehensive information regarding the depth of tumour invasion and resection margins [33,35,46–48], additional biopsy of the tumour base and tumour edge should not be performed routinely after ERBT. If bladder tumours are adjacent to each other, en bloc resection of the cluster of bladder tumours as a whole can be considered. If the bladder tumour is too large, after ERBT, dividing the specimen into two to three pieces for retrieval [45,49] can be considered. If any technical difficulty is encountered upon ERBT, conversion to conventional TURBT should be considered. Special extraction methods can be considered in retrieving large ERBT specimens [35,49,50].

3.5.4. Different modalities of ERBT

It is technically feasible to use monopolar energy [37,48,49], bipolar energy [19–21,46–48,51], holmium laser [33,48,52], thulium laser [22,29,30,48], and HybridKnife (hydrodissection) [24–27,35] to perform ERBT. Monopolar and bipolar ERBT techniques allow conversion to piecemeal resection readily when technical difficulty arises. Holmium and thulium laser ERBT techniques eliminate the risk of obturator nerve reflex during the procedure [22,29,33,44]. There is however a risk of residual disease and understaging when we use HybridKnife (hydrodissection) for ERBT due to its nature of submucosal elevation [35,53].

3.5.5. Reporting of intraoperative findings

The EAU guidelines stated that the operative record of conventional TURBT must describe tumour location, ap-

Table 4 – Summary of statements and consensus status after two rounds of Delphi survey.

Domains and statements		Round 1[a]						Round 2[a]					
		% Disagree (1–3)	% Equivocal (4–6)	% Agree (7–9)	Total *N*	Unable to score *N*	Consensus status	% Disagree (1–3)	% Equivocal (4–6)	% Agree (7–9)	Total *N*	Unable to score *N*	Consensus status
Definitions and objectives of ERBT													
1	Removal of bladder tumour in one piece is the most appropriate definition for ERBT	3.6	9.4	87.0	139	1	Agree	0.8	6.5	92.7	123	0	Agree
2	The depth of ERBT must include the detrusor muscle layer in the specimen	5.8	9.4	84.8	139	1	Agree	4.1	7.3	88.6	123	0	Agree
3	One of the main goals of ERBT is to ensure complete local resection of bladder tumour	0.7	3.6	95.7	139	1	Agree	0.8	0.8	98.4	123	0	Agree
4	One of the main goals of ERBT is to ensure proper local staging of the disease	0.7	0	99.3	139	2	Agree	1.6	0	98.4	123	1	Agree
5	One of the main goals of ERBT is to reduce the risk of tumour reimplantation	8.8	14.6	76.6	139	2	Agree	4.1	15.7	80.2	123	2	Agree
6	ERBT should always be considered for treatment of non–muscle-invasive bladder cancer	8.8	24.8	66.4	139	2	Not reached	4.9	17.2	77.9	123	1	Agree
7	ERBT should be considered for treatment of muscle-invasive bladder cancer	53.7	26.5	19.9	139	3	Not reached	63.9	19.7	16.4	123	1	Not reached
8	ERBT should be considered to treat carcinoma in situ of the bladder to optimise subsequent treatment	48.1	31.1	20.7	139	4	Not reached	56.3	26.1	17.6	123	4	Not reached
Case selection													
9	Size of bladder tumour is a major limitation in performing ERBT	8.8	6.6	84.6	139	3	Agree	9.2	3.3	87.5	122	2	Agree
10	ERBT is feasible for patients with bladder tumour size of <3 cm	2.2	4.4	93.3	139	4	Agree	1.7	1.7	96.6	122	3	Agree
11	ERBT is feasible for patients with bladder tumour size of more than 3cm	21.1	41.4	37.6	139	6	Not reached	15.3	37.3	47.5	122	4	Not reached
12	Number of bladder tumours is a major limitation in performing ERBT	36.5	29.9	33.6	139	2	Not reached	38.3	17.5	44.2	122	2	Not reached
13	If tumour size is not an issue, ERBT is feasible for patients with <4 bladder tumours	7.4	13.3	79.3	139	4	Agree	5.0	5.0	89.9	122	3	Agree
14	If tumour size is not an issue, ERBT is feasible for patients with >4 bladder tumours	18.8	34.6	46.6	139	6	Not reached	15.1	21.8	63.0	122	3	Not reached
15	Tumour location is a major limitation in performing ERBT	20.9	23.1	56.0	139	5	Not reached	16.1[b]	12.7	71.2	122	4	Not reached
16	ERBT is feasible for bladder tumour located at the posterior wall	3.0	5.9	91.1	139	4	Agree	1.7	0.8	97.5	122	4	Agree
17	ERBT is feasible for bladder tumour located at the anterior wall	14.9	26.9	58.2	139	5	Not reached	12.8	14.5	72.6	122	5	Agree
18	ERBT is feasible for bladder tumour located at the right lateral wall	0.7	5.9	93.3	139	4	Agree	0	3.4	96.6	122	4	Agree

Table 4 (*Continued*)

Domains and statements		Round 1[a]						Round 2[a]					
		% Disagree (1–3)	% Equivocal (4–6)	% Agree (7–9)	Total *N*	Unable to score *N*	Consensus status	% Disagree (1–3)	% Equivocal (4–6)	% Agree (7–9)	Total *N*	Unable to score *N*	Consensus status
19	ERBT is feasible for bladder tumour located at the left lateral wall	1.5	5.9	92.6	139	4	Agree	0	3.4	96.6	122	4	Agree
20	ERBT is feasible for bladder tumour located at the trigone	2.2	8.1	89.6	139	4	Agree	0.8	2.5	96.6	122	4	Agree
21	ERBT is feasible for bladder tumour located at the bladder dome	17.8	30.4	51.9	139	4	Not reached	16.9	22.0	61.0	122	4	Not reached
22	ERBT is feasible for bladder tumour located at the bladder neck	13.4	15.7	70.9	139	5	Agree	10.3	7.7	82.1	122	5	Agree
23	ERBT is feasible for bladder tumour located near the ureteric orifice	11.2	17.2	71.6	139	5	Agree	7.6	9.3	83.1	122	4	Agree
Surgical procedure													
24	A thorough cystoscopic examination must be performed before any ERBT	3.0	3.8	93.2	137	4	Agree	0.8	0	99.2	122	3	Agree
25	Narrow-band imaging, Image 1S, or photodynamic diagnosis must be considered to enhance bladder cancer detection before ERBT	19.5	30.9	49.6	137	14	Not reached	14.4	26.1	59.5	122	11	Not reached
26	The bladder should be distended enough to facilitate ERBT	12.7	22.4	64.9	137	3	Not reached	9.2	11.8	79.0	122	3	Agree
27	The bladder should not be overdistended to avoid bladder perforation upon ERBT	4.6	10.7	84.7	137	6	Agree	4.3	5.1	90.6	122	5	Agree
28	The planned circumferential margin should be marked first to facilitate subsequent ERBT	4.5	14.4	81.1	137	5	Agree	1.7	6.8	91.5	122	4	Agree
29	Upon ERBT, the planned circumferential margin should be at least 5 mm from any visible bladder tumour	7.6	18.2	74.2	137	5	Agree	3.4	11.0	85.6	122	4	Agree
30	Upon ERBT, the incision should be made deep into the detrusor muscle layer	12.9	12.1	75.0	137	5	Agree	11.1	6.8	82.1	122	5	Agree
31	After ERBT, additional biopsy of the tumour base should be performed routinely	39.8	24.1	36.1	137	4	Not reached	45.8	17.8	36.4	122	4	Not reached
32	After ERBT, additional biopsy of the tumour edge should be performed routinely	47.3	27.5%	25.2%	137	6	Not reached	62.4%	21.4%	16.2	122	5	Not reached
33	If bladder tumours are adjacent to each other, en bloc resection of the cluster of bladder tumours as a whole can be considered	3.0	8.3	88.6	137	5	Agree	1.7	3.4	94.9	122	4	Agree
34	If the size of bladder tumour is too big, after ERBT, dividing the specimen into 2–3 pieces for retrieval can be considered	12.2	22.1	65.6	137	6	Not reached	8.5	12.8	78.6	122	5	Agree

Table 4 (*Continued*)

Domains and statements		Round 1[a]						Round 2[a]					
		% Disagree (1–3)	% Equivocal (4–6)	% Agree (7–9)	Total *N*	Unable to score *N*	Consensus status	% Disagree (1–3)	% Equivocal (4–6)	% Agree (7–9)	Total *N*	Unable to score *N*	Consensus status
35	If any technical difficulty is encountered upon ERBT, conversion to conventional TURBT should be considered	1.5	3.0	95.5	137	3	Agree	0.8	0.8	98.3	122	3	Agree
36	Special extraction methods (Endobag, laparoscopic instrument through nephroscope, etc.) can be considered in retrieving large ERBT specimens	12.2	11.4	76.4	137	14	Agree	8.1	7.2	84.7	122	11	Agree
Different modalities of ERBT													
37	It is technically feasible to use monopolar energy for ERBT	7.5	20.8	71.7	135	15	Agree	5.5	11.0	83.5	122	13	Agree
38	It is technically feasible to use bipolar energy for ERBT	0.8	3.2	96.0	135	10	Agree	0	0.9	99.1	122	9	Agree
39	It is technically feasible to use holmium laser for ERBT	1.8	19.6	78.6	135	23	Agree	2.0	12.9	85.1	122	21	Agree
40	It is technically feasible to use thulium laser for ERBT	2.1	20.0	77.9	135	40	Agree	1.1	11.1	87.8	122	32	Agree
41	It is technically feasible to use HybridKnife (hydrodissection) for ERBT	3.4	26.1	70.5	135	47	Agree	0	18.1	81.9	122	39	Agree
42	ERBT using monopolar energy allows conversion to piecemeal resection readily when technical difficulty arises	6.7	12.6	80.7	135	16	Agree	4.5	6.4	89.1	122	12	Agree
43	ERBT using bipolar energy allows conversion to piecemeal resection readily when technical difficulty arises	0.8	9.0	90.2	135	13	Agree	0	5.3	94.7	122	9	Agree
44	Holmium laser eliminates the risk of obturator nerve reflex during ERBT	1.0	20.4	78.6	135	32	Agree	0	8.1	91.9	122	23	Agree
45	Thulium laser eliminates the risk of obturator nerve reflex during ERBT	1.1	24.7	74.2	135	42	Agree	0	8.9	91.1	122	32	Agree
46	HybridKnife (hydrodissection) is the safest modality for performing ERBT	18.1	50.6%	31.3%	135	52	Not reached	18.2	57.1	24.7	122	45	Not reached
47	There is a risk of residual disease and understaging when we use HybridKnife (hydrodissection) for ERBT due to its nature of submucosal elevation	11.3	47.5	41.3	135	55	Not reached	7.7	52.6	39.7	122	44	Not reached
Reporting of intraoperative findings for patients undergoing ERBT													
48	The modality used for ERBT must be documented	0	3.0	97.0	135	1	Agree	0	0.8	99.2	122	1	Agree
49	Whether ERBT has been successfully performed or any need of conversion to conventional TURBT must be documented	0	1.5	98.5	135	1	Agree	0	0.8	99.2	122	1	Agree
50	Whether additional biopsy of the tumour base has been performed must be documented	0	3.7	96.3	135	1	Agree	0	0.8	99.2	122	1	Agree

Table 4 (*Continued*)

Domains and statements		Round 1[a]						Round 2[a]					
		% Disagree (1–3)	% Equivocal (4–6)	% Agree (7–9)	Total *N*	Unable to score *N*	Consensus status	% Disagree (1–3)	% Equivocal (4–6)	% Agree (7–9)	Total *N*	Unable to score *N*	Consensus status
51	Whether additional biopsy of the tumour edge has been performed must be documented	2.2	4.5	93.3	135	1	Agree	0.8	0.8	98.3	122	1	Agree
52	The EAU guidelines stated that the operative record of TURBT must describe tumour location, appearance, size and multifocality, all steps of the procedure, as well as extent and completeness of resection	0	0	100.0	135	1	Agree	0	0	100.0	122	1	Agree
53	Any occurrence of obturator nerve reflex and the laterality of obturator nerve reflex being encountered during ERBT must be documented	2.3	18.8	78.9	135	2	Agree	0	9.9	90.1	122	1	Agree
54	Any occurrence of extra- or intraperitoneal bladder perforation during ERBT must be documented	0.7	1.5	97.8	135	1	Agree	0.8	0	99.2	122	1	Agree
55	The method of tumour extraction must be documented	1.5	4.5	94.0	135	1	Agree	0	0	100.0	122	1	Agree
56	Any difficulty in tumour extraction must be documented	1.5	6.7	91.8	135	1	Agree	0	4.1	95.9	122	1	Agree
57	Whether the ERBT specimen has been divided for extraction must be documented	0.7	5.2	94.0	135	1	Agree	0	0.8	99.2	122	1	Agree
Specimen preparation and reporting of histological findings													
58	Every ERBT specimen must be prepared and sent for histological assessment separately	1.5	6.0	92.5	135	2	Agree	0.8	3.3	95.8	121	1	Agree
59	For the ERBT specimen, the circumferential mucosal edge must be pinned for better orientation and better histological assessment of the bladder tumour	7.9	31.0	61.1	135	9	Not reached	5.2	30.4	64.3	121	6	Not reached
60	For the ERBT specimen, the circumferential and deep resection margins must be inked to facilitate subsequent histological assessment	14.3	32.5	53.2	135	9	Not reached	8.0	31.0	61.1	121	8	Not reached
61	For the ERBT specimen, it should be serially sectioned at 2 mm intervals	3.1	38.1	58.8	135	38	Not reached	0	29.2	70.8	121	32	Agree
62	The EAU guidelines stated that the pathological report of TURBT specimen should specify tumour location, tumour grade and stage, lymphovascular invasion, unusual (variant) histology, and presence of carcinoma in situ and detrusor muscle	0	3.0	97.0	135	1	Agree	0	2.5	97.5	121	1	Agree

Table 4 (*Continued*)

Domains and statements		Round 1[a]						Round 2[a]					
		% Disagree (1–3)	% Equivocal (4–6)	% Agree (7–9)	Total *N*	Unable to score *N*	Consensus status	% Disagree (1–3)	% Equivocal (4–6)	% Agree (7–9)	Total *N*	Unable to score *N*	Consensus status
63	Upon histological assessment of the ERBT specimen, the maximal dimension of bladder tumour must be documented	5.8	22.3	71.9	135	14	Agree	2.7	12.7	84.5	121	11	Agree
64	Upon histological assessment of the ERBT specimen, T1 substage must be assessed	1.5	10.4	88.1	135	1	Agree	0.8	8.3	90.8	121	1	Agree
65	Upon histological assessment of the ERBT specimen, circumferential resection margin must be assessed	3.0	6.7	90.3	135	1	Agree	4.2	2.5	93.3	121	1	Agree
66	Upon histological assessment of the ERBT specimen, deep resection margin must be assessed	0.7	3.0	96.3	135	1	Agree	0	1.7	98.3	121	1	Agree
Postoperative management and follow-up schedule													
67	It is safe to give a single dose of intravesical chemotherapy immediately after ERBT	4.7	14.2	81.1	135	8	Agree	1.7	6.1	92.2	121	6	Agree
68	The indications of a single dose of intravesical chemotherapy immediately after ERBT should follow the EAU guidelines recommendation as in the case of conventional TURBT	2.3	9.9	87.8	135	4	Agree	1.7	4.3	94.0	121	4	Agree
69	It is safe to perform second-look TURBT after the first ERBT	3.9	11.6	84.5	135	6	Agree	2.5	6.8	90.7	121	3	Agree
70	Indications of second-look TURBT after ERBT should follow the EAU guidelines recommendation as in the case of conventional TURBT	10.0	14.6	75.4	135	5	Agree	7.0	10.4	82.6	121	6	Agree
71	It is safe to give intravesical BCG therapy after ERBT	3.9	7.0	89.1	135	6	Agree	1.7	5.1	93.2	121	4	Agree
72	Indications of intravesical BCG therapy after ERBT should follow the EAU guidelines recommendation as in the case of conventional TURBT	1.5	3.8	94.7	135	4	Agree	0	3.4	96.6	121	3	Agree
73	The flexible cystoscopy surveillance protocol after ERBT should follow the EAU guidelines recommendation as in the case of conventional TURBT	0	4.5	95.5	135	2	Agree	0	3.4	96.6	121	2	Agree
74 [c]	Upon flexible cystoscopy, the location of tumour recurrence must be documented to help differentiate between in-field and out-of-field recurrence	–	–	–	–	–	–	0.9	2.6	96.5	121	7	Agree
Data reporting and outcome measures													
75	In studies of ERBT, both per-patient and per-tumour analyses should be performed for different outcomes	3.8	10.6	85.6	135	3	Agree	1.7	5.0	93.3	121	1	Agree

Table 4 (*Continued*)

Domains and statements		Round 1[a]						Round 2[a]					
		% Disagree (1–3)	% Equivocal (4–6)	% Agree (7–9)	Total *N*	Unable to score *N*	Consensus status	% Disagree (1–3)	% Equivocal (4–6)	% Agree (7–9)	Total *N*	Unable to score *N*	Consensus status
76	In studies of ERBT, the operative time is an important outcome to measure	10.7	26.0	63.4	135	4	Not reached	8.5	19.5	72.0	121	3	Agree
77	In studies of ERBT, the presence of obturator nerve reflex is an important outcome to measure	4.7	25.0	70.3	135	7	Agree	1.8	16.7	81.6	121	7	Agree
78	In studies of ERBT, the need for bladder irrigation is an important outcome to measure	12.2	25.2	62.6	135	4	Not reached	6.0	17.9	76.1	121	4	Agree
79	In studies of ERBT, the duration of urethral catheterisation is an important outcome to measure	11.5	20.8	67.7	135	5	Not reached	8.5	12.0	79.5	121	4	Agree
80	In studies of ERBT, hospital stay is an important outcome to measure	10.5	21.1	68.4	135	2	Not reached	7.6	10.9	81.5	121	2	Agree
81	In studies of ERBT, the complication rate is an important outcome to measure	0	1.5	98.5	135	1	Agree	0	0.8	99.2	121	1	Agree
82	In studies of ERBT, the Clavien-Dindo grading system is the preferred system to measure the severity of complication	2.3	9.4	88.3	135	7	Agree	1.7	5.2	93.0	121	6	Agree
83	In studies of ERBT, the need for blood transfusion is an important outcome to measure	9.8	16.7	73.5	135	3	Agree	5.9	12.6	81.5	121	2	Agree
84	In studies of ERBT, the occurrence of urethral stricture is an important outcome to measure	11.2	22.4	66.4	135	1	Not reached	6.7	15.8	77.5	121	1	Agree
85	In studies of ERBT, the occurrence of bladder perforation is an important outcome to measure	0	2.3	97.7	135	2	Agree	0	1.7	98.3	121	1	Agree
86	In studies of ERBT, the occurrence of urinary tract infection is an important outcome to measure	12.7	27.6	59.7	135	1	Not reached	6.7	20.8	72.5	121	1	Agree
87	In studies of ERBT, the occurrence of transurethral resection syndrome is an important outcome to measure	14.9	23.1	61.9	135	1	Not reached	12.5	15.0	72.5	121	1	Agree
88	In studies of ERBT, the occurrence of urinary retention is an important outcome to measure	18.7	29.1	52.2	135	1	Not reached	10.0	28.3	61.7	121	1	Not reached
89	In studies of ERBT, the occurrence of ureteric stricture is an important outcome to measure	11.2	21.6	67.2	135	1	Not reached	5.8	13.3	80.8	121	1	Agree
90	In studies of ERBT, the successful en bloc resection rate (ie, removal of bladder tumour in one piece) is an important outcome to measure	0.7	3.0	96.3	135	1	Agree	0	0.8	99.2	121	1	Agree
91	In studies of ERBT, presence of detrusor muscle in the ERBT specimen is an important outcome to measure	0.7	2.2	97.0	135	1	Agree	0	2.5	97.5	121	1	Agree

Table 4 (*Continued*)

Domains and statements		Round 1[a]						Round 2[a]					
		% Disagree (1–3)	% Equivocal (4–6)	% Agree (7–9)	Total *N*	Unable to score *N*	Consensus status	% Disagree (1–3)	% Equivocal (4–6)	% Agree (7–9)	Total *N*	Unable to score *N*	Consensus status
92	In studies of ERBT, presence of clear circumferential resection margin in the ERBT specimen is an important outcome to measure	2.3	5.3	92.5	135	2	Agree	3.3	2.5	94.2	121	1	Agree
93	In studies of ERBT, presence of clear deep resection margin in the ERBT specimen is an important outcome to measure	0	3.7	96.3	135	1	Agree	0	0.8	99.2	121	1	Agree
94	In studies of ERBT, whether postoperative intravesical instillation of chemotherapy is given is an important outcome to report	0.8	15.9	83.3	135	3	Agree	0.8	10.9	88.2	121	2	Agree
95	In studies of ERBT, whether second-look transurethral resection is performed is an important outcome to report	3.0	9.0	88.0	135	2	Agree	1.7	6.7	91.6	121	2	Agree
96	In studies of ERBT, whether any residual disease is detected upon second-look transurethral resection is an important outcome to report	1.5	3.8	94.7	135	2	Agree	0	2.5	97.5	121	2	Agree
97	In studies of ERBT, whether any upstaging of disease is detected upon second-look transurethral resection is an important outcome to report	1.5	4.5	94.0	135	2	Agree	0	3.4	96.6	121	2	Agree
98	In studies of ERBT, whether intravesical BCG therapy is given is an important outcome to report	3.8	18.0	78.2	135	2	Agree	1.7	9.2	89.1	121	2	Agree
99	In studies of ERBT, 3-mo recurrence rate is an important outcome to measure	0.7	4.5	94.8	135	1	Agree	0	1.7	98.3	121	1	Agree
100	In studies of ERBT, 1-yr recurrence rate is an important outcome to measure	0	2.3	97.7	135	2	Agree	0	0.8	99.2	121	1	Agree
101	In studies of ERBT, 1-yr progression rate is an important outcome to measure	0	1.5	98.5	135	1	Agree	0	0.8	99.2	121	1	Agree
102	In studies of ERBT, 5-yr recurrence rate is an important outcome to measure	1.5	6.7	91.8	135	1	Agree	0	2.5	97.5	121	1	Agree
103	In studies of ERBT, 5-year progression rate is an important outcome to measure	1.5	6.0	92.5	135	1	Agree	0	2.5	97.5	121	1	Agree

BCG = bacillus Calmette-Guérin; EAU = European Association of Urology; ERBT = En bloc resection of bladder tumour; TURBT = Transurethral resection of bladder tumour.

[a] In columns showing percentages agree/equivocal/disagree, red shaded cells indicate ≥70%.

[b] Green shaded cell indicate ≥15% of disagree despite ≥70% of agree in the same statement.

[c] This statement was added after first round of Delphi survey.

Table 5 – Summary of the statements that were discussed and re-voted, and their consensus status after the voting session.

Domains and statements		Voting session[a]					
		% Disagree (1–3)	% Equivocal (4–6)	% Agree (7–9)	Total *N*	Unable to score *N*	Consensus status
Definitions and objectives of ERBT							
7	ERBT should be considered for treatment of muscle-invasive bladder cancer	80.0	6.7	13.3	15	0	Disagree
8	ERBT should be considered to treat carcinoma in situ of the bladder to optimise subsequent treatment	73.3	13.3	13.3	15	0	Disagree
Case selection							
11	ERBT is feasible for patients with bladder tumour size of >3 cm	0.0	6.7	93.3	15	0	Agree
12	Number of bladder tumours is a major limitation in performing ERBT	86.7	6.7	6.7	15	0	Disagree
14	If tumour size is not an issue, ERBT is feasible for patients with >4 bladder tumours	0.0	0.0	100.0	15	0	Agree
15	Tumour location is a major limitation in performing ERBT	73.3	20.0	6.7	15	0	Disagree
21	ERBT is feasible for bladder tumour located at the bladder dome	0.0	0.0	100.0	15	0	Agree
Surgical procedure							
25	Narrow-band imaging, Image 1S, or photodynamic diagnosis must be considered to enhance bladder cancer detection before ERBT	20.0	33.3	46.7	15	0	Not reached
31	After ERBT, additional biopsy of the tumour base should be performed routinely	86.7	6.7	6.7	15	0	Disagree
32	After ERBT, additional biopsy of the tumour edge should be performed routinely	100.0	0.0	0.0	15	0	Disagree
Different modalities of ERBT							
46	HybridKnife (hydrodissection) is the safest modality for performing ERBT	86.7	6.7	6.7	15	0	Disagree
47	There is a risk of residual disease and understaging when we use HybridKnife (hydrodissection) for ERBT due to its nature of submucosal elevation	0.0	21.4	78.6	14	1	Agree
Specimen preparation and reporting of histological findings							
59	For the ERBT specimen, the circumferential mucosal edge must be pinned for better orientation and better histological assessment of the bladder tumour	40.0	33.3	26.7	15	0	Not reached
60	For the ERBT specimen, the circumferential and deep resection margins must be inked to facilitate subsequent histological assessment	20.0	26.7	53.3	15	0	Not reached
Data reporting and outcome measures							
88	In studies of ERBT, the occurrence of urinary retention is an important outcome to measure	13.3	46.7	40.0	15	0	Not reached

ERBT = en bloc resection of bladder tumour.
[a] In columns showing percentages agree/equivocal/disagree, red shaded cells indicate ≥70%.

pearance, size and multifocality, all steps of the procedure, as well as the extent and completeness of resection [54], and these also apply to ERBT. In addition, the modality used for ERBT, success of ERBT, the need of conversion to conventional TURBT, method of tumour extraction, and any additional biopsy of the tumour base and tumour edge must be documented. Any problems encountered during the ERBT procedure, including the occurrence of obturator reflex, bladder perforation, and any difficulty in tumour extraction, must be documented.

3.5.6. *Specimen preparation and reporting of histological findings*

Every ERBT specimen must be prepared and sent for histological assessment separately. The EAU guidelines stated that the pathological report of TURBT specimen should specify tumour location, tumour grade and stage, lymphovascular invasion, unusual (variant) histology, and presence of CIS and detrusor muscle [54], and these also apply to ERBT specimens. In addition, the maximal dimension of the bladder tumour [36], T1 substage [55–57], and circumferential and deep resection margins [33,35,46–48] must be assessed.

3.5.7. *Postoperative management and follow-up schedule*

It is safe to give a single dose of immediate intravesical chemotherapy [19,22,29,33,36,37,44,45], to perform second-look TURBT [39,44], and to give intravesical bacillus Calmette-Guérin (BCG) therapy after ERBT [19,33,49]. The indications should follow the EAU guidelines recommendation as in the case of conventional TURBT [54]. The

Table 6 – Final consensus statements on en bloc resection of bladder tumour.

Domains and statements		Consensus stage (Delphi/meeting)	Direction of consensus (agree/disagree)
Definitions and objectives of ERBT			
1	Removal of bladder tumour in one piece is the most appropriate definition for ERBT	Delphi	Agree
2	The depth of ERBT must include the detrusor muscle layer in the specimen	Delphi	Agree
3	One of the main goals of ERBT is to ensure complete local resection of bladder tumour	Delphi	Agree
4	One of the main goals of ERBT is to ensure proper local staging of the disease	Delphi	Agree
5	One of the main goals of ERBT is to reduce the risk of tumour reimplantation	Delphi	Agree
6	ERBT should always be considered for the treatment of non–muscle-invasive bladder cancer	Delphi	Agree
7	ERBT should be considered for the treatment of muscle-invasive bladder cancer	Meeting	Disagree
8	ERBT should be considered for the treatment of carcinoma in situ of the bladder to optimise subsequent treatment	Meeting	Disagree
Case selection			
9	Size of bladder tumour is a major limitation in performing ERBT	Delphi	Agree
10	ERBT is feasible for patients with bladder tumour size of $\leq$3 cm	Delphi	Agree
11	ERBT is feasible for patients with bladder tumour size of $>$3 cm	Meeting	Agree
12	The number of bladder tumours is a major limitation in performing ERBT	Meeting	Disagree
13	If tumour size is not an issue, ERBT is feasible for patients with $\leq$4 bladder tumours	Delphi	Agree
14	If tumour size is not an issue, ERBT is feasible for patients with $>$4 bladder tumours	Meeting	Agree
15	Tumour location is a major limitation in performing ERBT	Meeting	Disagree
16	ERBT is feasible for bladder tumour located at the posterior wall	Delphi	Agree
17	ERBT is feasible for bladder tumour located at the anterior wall	Delphi	Agree
18	ERBT is feasible for bladder tumour located at the right lateral wall	Delphi	Agree
19	ERBT is feasible for bladder tumour located at the left lateral wall	Delphi	Agree
20	ERBT is feasible for bladder tumour located at the trigone	Delphi	Agree
21	ERBT is feasible for bladder tumour located at the bladder dome	Meeting	Agree
22	ERBT is feasible for bladder tumour located at the bladder neck	Delphi	Agree
23	ERBT is feasible for bladder tumour located near the ureteric orifice	Delphi	Agree
Surgical procedure			
24	A thorough cystoscopic examination must be performed before any ERBT	Delphi	Agree
25	Narrow-band imaging, Image 1S, or photodynamic diagnosis must be considered to enhance bladder cancer detection before ERBT	Meeting	Not reached
26	The bladder should be distended enough to facilitate ERBT	Delphi	Agree
27	The bladder should not be overdistended to avoid bladder perforation upon ERBT	Delphi	Agree
28	The planned circumferential margin should be marked first to facilitate subsequent ERBT	Delphi	Agree
29	Upon ERBT, the planned circumferential margin should be at least 5 mm from any visible bladder tumour	Delphi	Agree
30	Upon ERBT, the depth of incision should be made at the detrusor muscle layer	Delphi	Agree
31	After ERBT, additional biopsy of the tumour base should be performed routinely	Meeting	Disagree
32	After ERBT, additional biopsy of the tumour edge should be performed routinely	Meeting	Disagree
33	If bladder tumours are adjacent to each other, en bloc resection of the cluster of bladder tumours as a whole can be considered	Delphi	Agree
34	If the size of bladder tumour is too big, after ERBT, dividing the specimen into 2–3 pieces for retrieval can be considered	Delphi	Agree
35	If any technical difficulty is encountered upon ERBT, conversion to conventional TURBT should be considered	Delphi	Agree
36	Special extraction methods (Endobag, laparoscopic instrument through nephroscope, etc.) can be considered in retrieving large ERBT specimens	Delphi	Agree
Different modalities of ERBT			
37	It is technically feasible to use monopolar energy for ERBT	Delphi	Agree
38	It is technically feasible to use bipolar energy for ERBT	Delphi	Agree
39	It is technically feasible to use holmium laser for ERBT	Delphi	Agree
40	It is technically feasible to use thulium laser for ERBT	Delphi	Agree
41	It is technically feasible to use HybridKnife (hydrodissection) for ERBT	Delphi	Agree
42	ERBT using monopolar energy allows conversion to piecemeal resection readily when technical difficulty arises	Delphi	Agree
43	ERBT using bipolar energy allows conversion to piecemeal resection readily when technical difficulty arises	Delphi	Agree
44	Holmium laser eliminates the risk of obturator nerve reflex during ERBT	Delphi	Agree
45	Thulium laser eliminates the risk of obturator nerve reflex during ERBT	Delphi	Agree
46	HybridKnife (hydrodissection) is the safest modality for performing ERBT	Meeting	Disagree

Table 6 (*Continued*)

Domains and statements		Consensus stage (Delphi/meeting)	Direction of consensus (agree/disagree)
47	There is a risk of residual disease and understaging when we use HybridKnife (hydrodissection) for ERBT due to its nature of submucosal elevation	Meeting	Agree
Reporting of intraoperative findings for patients undergoing ERBT			
48	The modality used for ERBT must be documented	Delphi	Agree
49	Whether ERBT has been successfully performed, or any need of conversion to conventional TURBT, must be documented	Delphi	Agree
50	Whether additional biopsy of the tumour base has been performed must be documented	Delphi	Agree
51	Whether additional biopsy of the tumour edge has been performed must be documented	Delphi	Agree
52	The EAU guidelines stated that the operative record of TURBT must describe tumour location, appearance, size and multifocality, all steps of the procedure, as well as extent and completeness of resection. This recommendation should also be applied to ERBT	Delphi	Agree
53	Any occurrence of obturator nerve reflex and the laterality of obturator nerve reflex being encountered during ERBT must be documented	Delphi	Agree
54	Any occurrence of extraperitoneal or intraperitoneal bladder perforation during ERBT must be documented	Delphi	Agree
55	The method of tumour extraction must be documented	Delphi	Agree
56	Any difficulty in tumour extraction must be documented	Delphi	Agree
57	Whether the ERBT specimen has been divided for extraction must be documented	Delphi	Agree
Specimen preparation and reporting of histological findings			
58	Every ERBT specimen must be prepared and sent for histological assessment separately	Delphi	Agree
59	For the ERBT specimen, the circumferential mucosal edge must be pinned for better orientation and better histological assessment of the bladder tumour	Meeting	Not reached
60	For the ERBT specimen, the circumferential and deep resection margins must be inked to facilitate subsequent histological assessment	Meeting	Not reached
61	For the ERBT specimen, it should be serially sectioned at 2 mm intervals	Delphi	Agree
62	The EAU guidelines stated that the pathological report of TURBT specimen should specify tumour location, tumour grade and stage, lymphovascular invasion, unusual (variant) histology, and presence of carcinoma in situ and detrusor muscle. This recommendation should also apply to ERBT specimen	Delphi	Agree
63	Upon histological assessment of the ERBT specimen, the maximal dimension of bladder tumour must be documented	Delphi	Agree
64	Upon histological assessment of the ERBT specimen, T1 substage must be assessed	Delphi	Agree
65	Upon histological assessment of the ERBT specimen, circumferential resection margin must be assessed	Delphi	Agree
66	Upon histological assessment of the ERBT specimen, deep resection margin must be assessed	Delphi	Agree
Postoperative management and follow-up schedule			
67	It is safe to give a single dose of intravesical chemotherapy immediately after ERBT	Delphi	Agree
68	Indications of a single dose of intravesical chemotherapy immediately after ERBT should follow the EAU guidelines recommendation as in the case of conventional TURBT	Delphi	Agree
69	It is safe to perform second-look TURBT after the first ERBT	Delphi	Agree
70	The indications of second-look TURBT after ERBT should follow the EAU guidelines recommendation as in the case of conventional TURBT	Delphi	Agree
71	It is safe to give intravesical BCG therapy after ERBT	Delphi	Agree
72	Indications of intravesical BCG therapy after ERBT should follow the EAU guidelines recommendation as in the case of conventional TURBT	Delphi	Agree
73	The flexible cystoscopy surveillance protocol after ERBT should follow the EAU guidelines recommendation as in the case of conventional TURBT	Delphi	Agree
74[a]	Upon flexible cystoscopy, the location of tumour recurrence must be documented to help differentiate between in-field and out-of-field recurrence	Delphi	Agree
Data reporting and outcome measures			
75	In studies of ERBT, both per-patient and per-tumour analyses should be performed for different outcomes	Delphi	Agree
76	In studies of ERBT, the operative time is an important outcome to measure	Delphi	Agree
77	In studies of ERBT, the presence of obturator nerve reflex is an important outcome to measure	Delphi	Agree
78	In studies of ERBT, the need for bladder irrigation is an important outcome to measure	Delphi	Agree
79	In studies of ERBT, the duration of urethral catheterisation is an important outcome to measure	Delphi	Agree
80	In studies of ERBT, hospital stay is an important outcome to measure	Delphi	Agree
81	In studies of ERBT, the complication rate is an important outcome to measure	Delphi	Agree

Table 6 (*Continued*)

Domains and statements		Consensus stage (Delphi/meeting)	Direction of consensus (agree/disagree)
82	In studies of ERBT, the Clavien-Dindo grading system is the preferred system to measure the severity of complication	Delphi	Agree
83	In studies of ERBT, the need for blood transfusion is an important outcome to measure	Delphi	Agree
84	In studies of ERBT, the occurrence of urethral stricture is an important outcome to measure	Delphi	Agree
85	In studies of ERBT, the occurrence of bladder perforation is an important outcome to measure	Delphi	Agree
86	In studies of ERBT, the occurrence of urinary tract infection is an important outcome to measure	Delphi	Agree
87	In studies of ERBT, the occurrence of transurethral resection syndrome is an important outcome to measure	Delphi	Agree
88	In studies of ERBT, the occurrence of urinary retention is an important outcome to measure	Meeting	Not reached
89	In studies of ERBT, the occurrence of ureteric stricture is an important outcome to measure	Delphi	Agree
90	In studies of ERBT, the successful en bloc resection rate (ie, removal of bladder tumour in one piece) is an important outcome to measure	Delphi	Agree
91	In studies of ERBT, presence of detrusor muscle in the ERBT specimen is an important outcome to measure	Delphi	Agree
92	In studies of ERBT, presence of clear circumferential resection margin in the ERBT specimen is an important outcome to measure	Delphi	Agree
93	In studies of ERBT, presence of clear deep resection margin in the ERBT specimen is an important outcome to measure	Delphi	Agree
94	In studies of ERBT, whether postoperative intravesical instillation of chemotherapy is given is an important outcome to report	Delphi	Agree
95	In studies of ERBT, whether second-look transurethral resection is performed is an important outcome to report	Delphi	Agree
96	In studies of ERBT, whether any residual disease is detected upon second-look transurethral resection is an important outcome to report	Delphi	Agree
97	In studies of ERBT, whether any upstaging of disease is detected upon second-look transurethral resection is an important outcome to report	Delphi	Agree
98	In studies of ERBT, whether intravesical BCG therapy is given is an important outcome to report	Delphi	Agree
99	In studies of ERBT, 3-mo recurrence rate is an important outcome to measure	Delphi	Agree
100	In studies of ERBT, 1-yr recurrence rate is an important outcome to measure	Delphi	Agree
101	In studies of ERBT, 1-yr progression rate is an important outcome to measure	Delphi	Agree
102	In studies of ERBT, 5-yr recurrence rate is an important outcome to measure	Delphi	Agree
103	In studies of ERBT, 5-yr progression rate is an important outcome to measure	Delphi	Agree

BCG = bacillus Calmette-Guérin; EAU = European Association of Urology; ERBT = en bloc resection of bladder tumour; TURBT = transurethral resection of bladder tumour.
[a] This statement was added after first round of Delphi survey.

flexible cystoscopy surveillance protocol after ERBT should also follow the EAU guidelines recommendation as in the case of conventional TURBT [54]. In addition, upon flexible cystoscopy, the location of tumour recurrence must be documented to help differentiate between in- and out-of-field recurrence [19,34,37].

3.5.8. *Data reporting and outcome measures*

In studies of ERBT, both per-patient and -tumour analyses should be performed for different outcomes as appropriate [46,47]. Perioperative outcomes, including operative time, obturator nerve reflex, successful en bloc resection rate, need of bladder irrigation, duration of urethral catheterisation, and hospital stay, should be documented. Severity of complications should be measured using the Clavien-Dindo grading system [58]. Complications including bladder perforation, need of blood transfusion, ureteric stricture, urethral stricture, urinary tract infection, and transurethral resection syndrome should be documented. For the histological assessment, presence of detrusor muscle, and circumferential and deep resection margins are important outcomes to measure. Whether adjunct treatments, including postoperative intravesical instillation of chemotherapy, second-look TURBT, and intravesical BCG therapy, have been given or performed should be reported. For those with second-look TURBT performed, any residual disease or upstaging of disease should be reported. For the oncological outcomes, 3-mo recurrence rate, 1-yr recurrence and progression rates, and 5-yr recurrence and progression rates are important outcomes to measure.

4. Discussion

In our effectiveness review, which is the most comprehensive and methodologically robust systematic review of the ERBT evidence base to date, we identified 10 RCTs comparing ERBT and TURBT; however, only four of them [19,22,29,31] were published as full-text articles. High-

quality data are limited for making robust recommendations in ERBT, and this explains why it is important to develop a consensus statement to provide the highest level of evidence that we can achieve so far, which can serve as a standard reference for health care professionals in the future. This consensus statement is the first attempt in trying to standardise the management of bladder cancer patients with special focus on ERBT. We mobilised the international community and used transparent and robust methods to review the evidence, identify current uncertainties, and survey expert opinion in an unbiased way, in order to provide recommendations for interim practice guidance and a basis to inform the research agenda. Health care professionals from different specialities (ie, urologists, oncologists, and pathologists) were involved to ensure that we had a comprehensive collection of opinions across different fields.

4.1. Relevance and impact of study findings on clinical practice and research

There are several important messages that may impact our clinical practice. Although tumour size has long been recognised as a major limitation, we must emphasise that ERBT is a treatment intended for patients with NMIBC. In patients with bladder tumours larger than 3 cm, there is a reasonable chance of MIBC, and ERBT should not be considered a definitive treatment when there is a suspicion of MIBC. Moreover, it is recognised that the major benefit of ERBT is the ability to ensure a complete local resection, and this holds true even when the specimen cannot be retrieved in one piece. Therefore, we should still consider ERBT in patients with large bladder tumours where NMIBC is considered a possibility. We also offered practical solutions on how we can extend the indication of ERBT to patients with large bladder tumours. Modified ERBT, for example, en bloc resection followed by division of specimen into two to three pieces for retrieval, is considered acceptable [45,49]. The use of special tumour extraction methods may also facilitate tumour extraction [50], but we need to be aware that the devices being used implied additional costs and were not formally approved for such indication, and whether they would lead to increased risk of complications such as urethral stricture is unknown. There is an urgent need for innovative methods of tumour extraction so as to achieve a true ERBT even for large bladder tumours.

ERBT is a surgical approach that aims to uphold the basic oncological principles in bladder cancer resection. Although there are different modalities of ERBT, they are all technically feasible and there are no data showing superiority of one over the other. In ERBT, surgical technique is primary and tools are secondary. Of note, bipolar ERBT appears to be the most acceptable modality based on the percentage of agreement. This might be explained by its widespread availability, ease and precision of resection, as well as the allowance of instant conversion to conventional TURBT. Although there is a risk of residual disease and understaging when using HybridKnife (hydrodissection) for ERBT, this is only theoretical based on its nature of submucosal elevation and whether this is genuinely true is unknown.

As ERBT specimens allow assessment of the depth of invasion as well as the resection margins, routine additional biopsy of tumour base and tumour edge after ERBT is considered unnecessary. If there is any doubt regarding the completeness of resection, additional resection of tumour base and edge can be considered, and they should be sent for histological assessment separately. Although pinning of circumferential mucosal margin and inking of resection margins in ERBT specimens are commonly performed (and possibly a good practice), it is not considered mandatory for a proper histological assessment. ERBT specimens also allow more precise assessment of the T1 substage. World Health Organization's classification of T1a–c disease is considered acceptable [57], but more research work will be needed to see whether they carry any important prognostic implications in NMIBC after ERBT.

We noticed a significant variation in the reporting of outcome measures across nonrandomised studies and RCTs. Data on important outcomes such as the presence of detrusor muscle were not readily reported in RCTs. There is also a wide variation in the study quality, as reflected by our risk of bias assessment. Standardisation on data reporting and outcome measures is important to move ERBT forward. Future studies on ERBT should consider incorporating the important outcome measures as identified by our consensus statement.

4.2. Strengths and limitations

This consensus statement was developed using a robust and reproducible method [10,14–16]. Our systematic reviews were conducted according to the PRISMA guidelines [2]. When compared with previous meta-analyses in the literature [59–62], our search strategy was most comprehensive, and we included only RCTs with a proper risk of bias assessment in our meta-analysis. The GRADE method was used for assessing certainty of evidence [9], and this is useful for decision making at many levels, including for the development of clinical practice guidelines. Our uncertainties review also provided a solid basis for the survey items being developed. Invitations were sent to a large panel of health care professionals purposively sampled from across the world. The consensus building process was based on a two-round Delphi survey, followed by a consensus panel meeting, where anonymous voting techniques were used. All these improved the internal and external validity of the study results. The definition of a consensus was also based on previously described methodology.

There are several limitations in this study. First, we recognise the lack of high-quality studies in ERBT. We were also not able to stratify the results according to patient and disease factors. Therefore, some results of the effectiveness review (eg, recurrence rates) have to be interpreted with caution. Second, statements generated were brief, concise, and binary in nature. Areas of uncertainty that are complex in nature may not be addressed adequately. Some terminologies (eg, degree of bladder distension) were also

difficult to define. Third, most of the participants involved were urologists, and they might lack knowledge regarding certain aspects of ERBT such as reporting of histological findings. The statements generated had an extensive coverage of every surgical aspect of ERBT. Even urologists may not have sufficient personal experience to vote in every statement (eg, different modalities of ERBT). Fourth, we recognised that there was strong representation from Europe and Asia in the Delphi survey. This may represent a selection bias from purposive sampling, and the results may not be applicable to regions outside Europe and Asia. On the contrary, it may reflect a genuine situation that ERBT is much more commonly practised in Europe and Asia.

4.3. Future directions of ERBT

To determine whether ERBT should replace conventional TURBT as the standard of care will require more results from high-quality RCTs. In our systematic review, we noticed that a number of RCTs have been presented but not fully published. Proper reporting according to the CONSORT statement is strongly encouraged [63]. There are also a number of on-going RCTs with clinically important primary outcomes. The EB-StaR study is a multicentre study comparing the 1-yr recurrence rates between bipolar ERBT and bipolar conventional TURBT for patients with bladder tumour size of $\leq$3 cm [64]. There are two RCTs comparing between laser ERBT and conventional TURBT with the primary outcome of residual tumour upon second TURBT [65,66]. There is another RCT investigating the presence of detrusor muscle in the specimen, which may serve as a surrogate marker for the quality of resection [67].

One of the major criticisms of ERBT is the inability to retrieve large bladder tumours in one piece. Acknowledging the benefit of ensuring a complete resection, we should accept modified approaches of ERBT (eg, ERBT followed by retrieval of bladder tumour in several pieces [45,49], piecemeal resection of the exophytic part of bladder tumour followed by en bloc resection of the tumour base [68], etc.). Moreover, ERBT is focused on patients with NMIBC (presumably smaller in size in most cases), so a true ERBT is still feasible for the majority of the patients. An exploratory study investigating the role of modified ERBT for patients with bladder tumour size of $\geq$3 cm is currently under way [69].

Although ERBT is a promising surgical technique for NMIBC, the learning curve of ERBT and whether it can easily be generalised is an important issue to address. More effort will be needed for proper education and training globally. With the foundation of the consensus statement, a prospective international registry study on ERBT is planned. This will provide us with more insights into the generalisability and practicality of implementing ERBT in our clinical practice. Long-term real-world data will also be useful in determining the true value of ERBT. We believe that oncological principles exist for good reasons, and our group will continue to work together and contribute to the development of ERBT in a collaborative manner.

5. Conclusions

A consensus statement for ERBT has been developed, and it has a comprehensive coverage regarding every aspect of ERBT. The findings will guide and inform health care professionals about the routine clinical practice of ERBT, and has important implications regarding future studies of ERBT. The consensus statement will serve as a standard of reference until higher level of evidence from prospective RCTs is available.

Author contributions: Marek Babjuk had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.
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Appendix A. Supplementary data

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