

Cold en bloc excision (CEBE) of bladder tumours using Zedd excision scissors: a prospective, pilot, safety and feasibility study

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Abstract

Background: Transurethral resection of bladder tumour (TURBT) is the traditional technique of choice for endoscopically suspected bladder tumours. Cold En Bloc Excision (CEBE) using novel Zedd scissors is proposed for endoscopic treatment of patients with non-muscle invasive bladder cancer (NMIBC). The aim of this study was to evaluate feasibility and safety of CEBE of bladder tumours using Zedd scissors.

Methods: A pilot prospective study of patients who underwent a CEBE of suspicious bladder tumours using Zedd scissors was conducted. A total of 23 patients underwent CEBE for suspected bladder tumours using Zedd scissors. New and recurrent tumours <3 cm were included in the study. The outcome measures were the presence of detrusor muscle (DM) and obturator nerve reflex (ONR), bladder perforation rates, specimen cautery artefacts, recurrence rates and complication rates. The mean age was 64 years \pm 10.41 (range: 49–83 years). The median follow up was 4 months (range 1–9 months). The mean tumour size was 1.8 cm \pm 0.40 (range: 0.8–2.6 cm). Tumours were located in the lateral wall ($n=11$), dome ($n=2$), posterior wall ($n=6$), trigone ($n=2$), anterior wall ($n=4$) and the junction of lateral and posterior wall ($n=4$).

Results: There was no ONR or bladder perforation and none of the patients had any complications. DM was present in 21 patients (91%). There was no tumour identified at the circumferential margins. There was no cautery artefact reported in any case. No patients had a recurrence at first follow up cystoscopy and two patients had out of field recurrence at subsequent cystoscopies.

Conclusion: CEBE with Zedd scissors is a promising en bloc excision technique for bladder tumour. It is a safe and feasible for excision of tumours less than 3 cm. The early oncological outcomes are comparable with existing en bloc resection techniques (ERBT) for NMIBC.

Keywords: bladder cancer, bladder tumours, cold en bloc excision, non-muscle-invasive bladder cancer, urothelial cancer, Zedd scissors

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Introduction

Transurethral resection of bladder tumour (TURBT) has been the traditional technique of choice for endoscopically suspected bladder tumours.^{1,2} The technique has diagnostic, staging, prognostic and therapeutic intentions.^{1,2} A good quality TURBT must ensure complete resection of tumour including the detrusor muscle (DM).^{2,3} The presence of

DM in the specimen is a surrogate marker of resection quality and is essential for local staging with prognostic and therapeutic implications.^{1–3} Tumours at the dome and lateral wall can be technically challenging using TURBT.¹ The resected specimens may, therefore, not be of the desired quality in a proportion of cases.^{1–3} Furthermore, the application of conventional electrical energy

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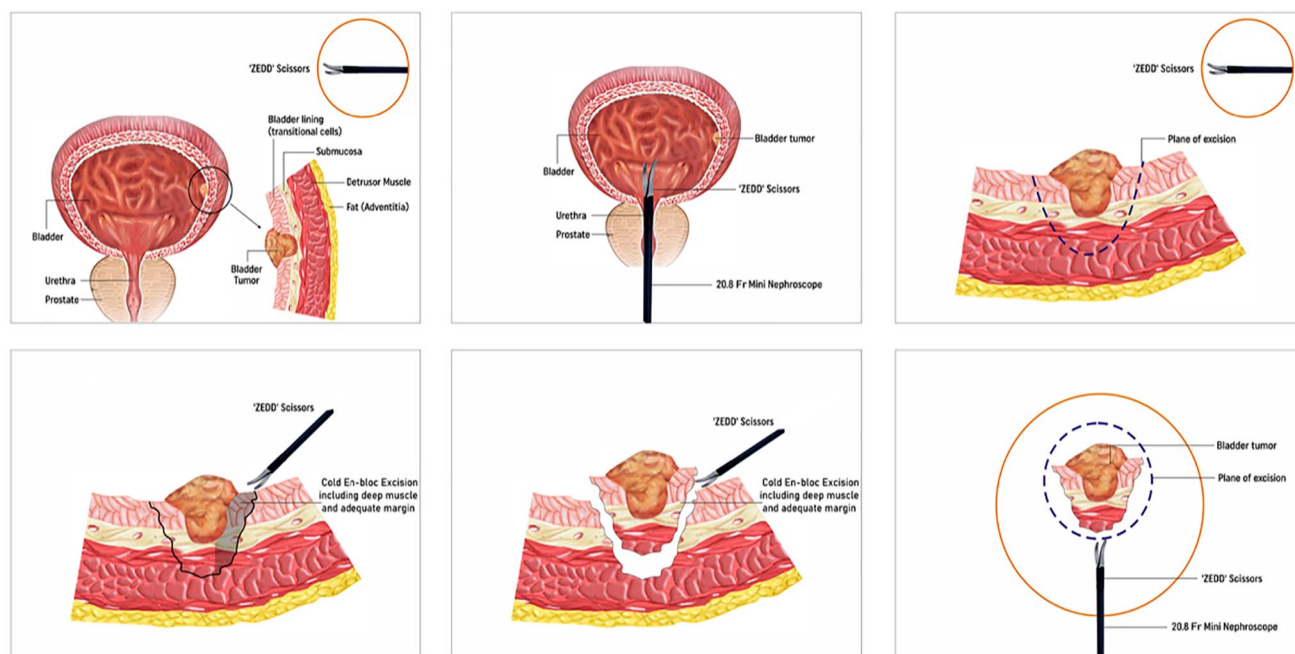


Figure 1. Illustration of different steps of CEBE with the depiction of the excisional plane with regard to the DM and the mucosal margin around the tumour.

CEBE, cold en bloc excision; DM, detrusor muscle.

can compromise histological evaluation due to a charring effect.^{4,5} In addition piecemeal resection of the bladder tumour does not conform to conventional oncological principles, raising concerns of tumour scattering.^{2,6}

In recent years, en bloc resection of bladder tumour (ERBT) has gained popularity, with the potential to mitigate some of the limitations associated with the traditional TURBT.^{2,7-9} With the ERBT approach, the bladder tumour is excised 'en-bloc' with the deep DM layer and a mucosal margin of around 1 cm.⁶ The purported benefits of ERBT include complete tumour resection, superior specimen quality, reduction of inadvertent obturator nerve jerk with consequent bladder perforation risks and ERBT helps facilitate accessibility to challenging areas in the bladder such as the dome and anterior wall.^{8,10-14} DM has been reported to be present in 97–100% of ERBT specimens, with consequently lower recurrence rates.⁷ ERBT can be performed using a wide variety of energy sources such as electrocautery (monopolar/bipolar), laser (KTP, Holmium, Thulium) and a hybrid approach using a waterjet with monopolar current.^{8,10-15}

In this series, we describe a novel 'Cold en bloc excision' (CEBE) of bladder tumour, using Zedd

excision scissors, which are modified endoscopic scissors. The technique sparingly uses electrocautery during excision of the bladder tumour. Our purpose of this pilot study was to report the feasibility and safety of the CEBE technique. In addition, we also report short-term oncological outcomes with this approach.

Materials and methods

Study design and data collection

A pilot study was conducted after obtaining ethical clearance from Kasturba Medical College and Kasturba Hospital Institutional Ethics Committee (IEC 493/2019). All the patients provided informed written consent. Demographic data was collected prospectively from July 2019 to March 2020 for all suspected bladder tumours undergoing a CEBE using endoscopic Zedd scissors. The following data were collected: age, gender, tumour size, tumour location, multiplicity, previous history of TURBT, history of smoking, completion of resection, presence of obturator jerk and perforation. Informed consent was taken from the patients after explaining the procedure. Patients were diagnosed with bladder tumour based on imaging [ultrasound scan (USS)/contrast enhanced

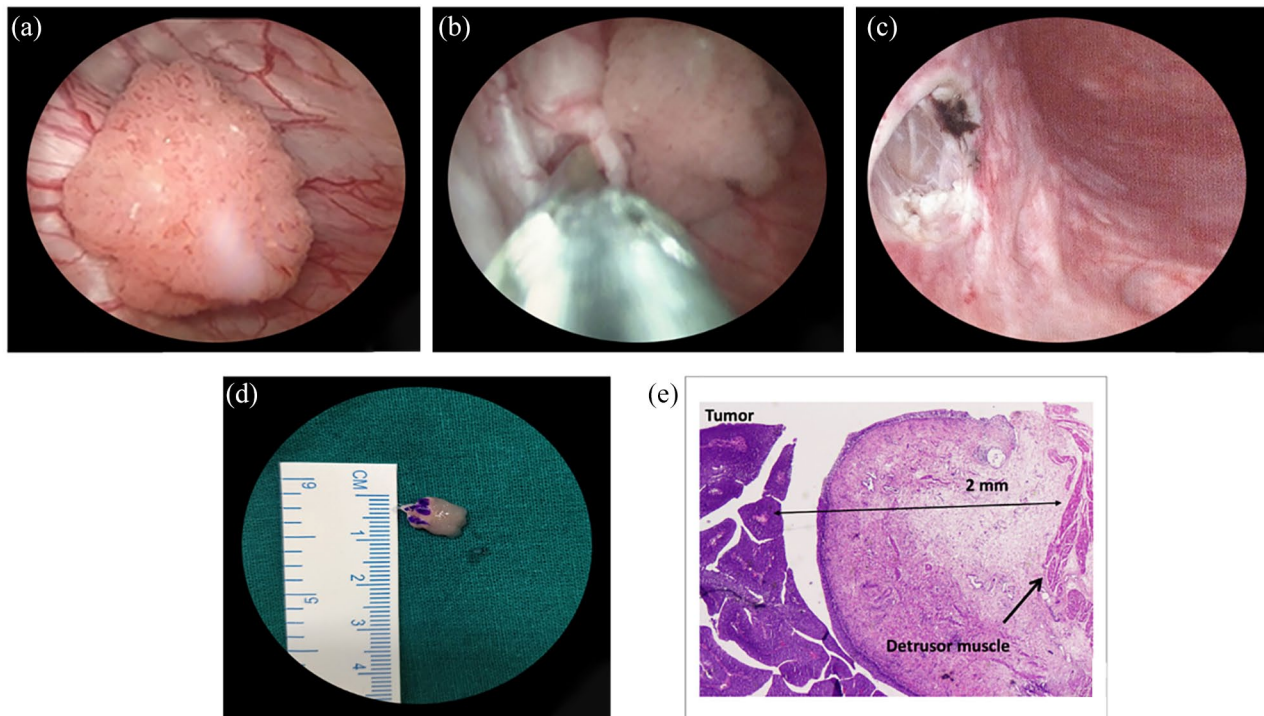


Figure 2. Intra-operative images of right lateral wall tumour (A), with Zedd scissors dissection (B), and post excision (C). Specimen of CEBE with DM (D) Photomicrograph section shows no cautery artefact (E).
CEBE, cold en bloc excision; DM, detrusor muscle.

computed tomography] or prior cystoscopic findings of a tumour.

The inclusion criteria were new or recurrent tumour where the individual tumour size was <3 cm and pedunculated tumours. The arbitrary size of 3 cm was chosen following a consensus opinion amongst three authors (BMZH, MS, JT). The authors had concerns that larger tumours may pose a retrieval challenge. Exclusion criteria were the presence of tumours at the ureteric orifice, concurrent upper tract urothelial tumours and endoscopic suspicion or previous history of carcinoma *in situ* (CIS).

Zedd scissors

The innovative Zedd scissors are modified endoscopic excision scissors that have been designed specifically to excise bladder tumours. There are two types of Zedd scissors: rigid scissors with curved blades and semi-rigid with straight blades (Supplemental video). The scissors are customised to be inserted *via* the 3.5 mm working channel of a 20.8F Nephroscope (Richard Wolf GmbH, Knittlingen, Germany). The shaft of the

scissors is 42 cm and the diameter is 3 mm. The shaft can be connected to an electrocautery, which can then be used to coagulate the bleeding vessels selectively. The blades of the scissor have rotational capabilities. A single procurement cost of Zedd scissors is an estimated US\$100. The scissors are reusable after sterilisation. The estimated life of the scissors is 10–12 cases.

CEBE technique using Zedd scissors

CEBE of a suspicious bladder tumour is done in the lithotomy position (Figure 1). A systematic urethroscopy is performed. Tumour location, size, multiplicity and morphological appearance were documented using a bladder diagram. Using a 20.8F nephroscope, Zedd scissors were connected with the bladder kept half-filled, using glycine for irrigation.

There is an outer sheath in the nephroscope with a built-in channel for the outflow of irrigation fluid, which maintains a constant bladder distension and provides clear vision during excision. The mucosa around the tumour was excised circumferentially, leaving a margin of about 1 cm around it (Figure

2). The blades of the scissors could be rotated, allowing accessibility to all tumour locations within the bladder. Deep to the submucosa, the DM was identified by the presence of whitish interlacing muscle fibres. The deep muscle plane was created using the blades of the scissors and small cuts were made; simultaneously the margin around the tumour was cut. The entire procedure was performed under vision and the irrigation fluid helped in maintaining a clear plane of excision. Care was taken to stay in the DM plane and avoid the use of cautery. The monopolar electrocautery connected to the Zedd scissors was used sparingly if excessive bleeding was obscuring vision. Pin-point coagulation of the bleeder at the bladder base was done using the closed tip of the scissors, thereby avoiding charring of the specimen. Upon successful excision of tumours, a three-pronged grasper could be introduced into the working channel to retrieve a large specimen. If the specimen was small, it could be removed *via* the cystoscope and Toomey syringe or Ellik evacuator.

The DM in the specimen was marked (Figure 2) and sent for histopathological examination (HPE). All specimens were evaluated by a board certified uropathologist. The staging and grading were done in accordance with the 2019 Tumour, Node, Metastasis Classification (TNM) and 1973 World Health Organisation (WHO) classifications systems. Patients with non-muscle invasive bladder cancer (NMIBC) had cystoscopic surveillance at 3, 6 and 9 months, respectively.

Outcome measures

Presence of obturator nerve reflex (ONR), bladder perforation rates, complications, presence of DM, electrocautery artefact rates, recurrence and complication rates were recorded.

Results

A total of 23 patients underwent CEBE for suspected bladder tumours using Zedd scissors (Table 1). All procedures were performed by a single surgeon (BMZH). The mean (SD) age was 64 years \pm 10.41 (range: 49–83 years). The male:female ratio was 16:7. Of the 17 (74%) patients who presented with visible haematuria, 14 (61%) had a history of smoking; urine cytology was positive in 5 (22%) patients. Six (26%) patients had a previous history of TURBT, one of whom had a repeat resection due to absence of DM at the initial resection. A total of 19 (83%) tumours were

identified on USS and the remaining 4 (17%) patients had tumour seen on cystoscopy. The median follow up was 4 months (range: 1–9 months). A total of 18 (78%) patients had a solitary tumour and 5 (22%) patients had multifocal tumours. All tumours were pedunculated with a classic papillary pattern. There was no endoscopic suspicion of CIS in any of the cases. The mean [standard deviation (SD)] tumour size was 1.8 cm \pm 0.40 (range: 0.8–2.6 cm). The tumour location was in the lateral wall ($n=11$), dome ($n=2$), posterior wall ($n=6$), anterior wall ($n=4$), trigone ($n=2$) and the junction of lateral and posterior wall ($n=4$). The mean (SD) operative time was 28 min \pm 8.0 (range: 17–41 min). (Table 1).

A single dose of intravesical mitomycin C (MMC) was instilled post-operatively in 12 (52%) patients with a solitary lesion. No ONR was encountered while excising the lateral wall tumours. Bladder perforation was not encountered in any case, and no intra or post-operative complication was noted (Table 1). There were no cases of urethral stricture on follow up, which may be attributed to the use of smaller instrument (20.8F). None of the patients required readmission.

The histological variant in all patients was transitional cell carcinoma (TCC). DM was present in 21 patients (91%). In cases with absent DM, the tumours were located at the anterior and posterior wall. There was no tumour identified at the circumferential margins and none of the specimens had any electrocautery artefact (Table 1).

On a 3-month check cystoscopy, none of the 21 patients with NMIBC had a recurrence. One patient had a recurrent tumour at 6 months and another at 9 months, both of which were low grade NMIBC, and the recurrence was not at the site of the primary excised tumour (Table 1).

Discussion

The preliminary data from our study suggest that the novel CEBE technique using the Zedd scissors is a feasible, safe and effective ERBT approach for tumours less than 3 cm. The largest tumour excised in this series was 2.6 cm. We did not encounter any ONR or bladder perforation during the procedure. DM was absent in two patients. None of the patients had any complications or required re-admission. The histological evaluation was not compromised in any specimen due to energy artefact, and no tumours were identified at

Table 1. Demographic data, tumour characteristics, perioperative data, histopathological findings, follow up and recurrence.

Demographic details	
Total no of patients (n)	23
Age (years)-mean (SD)	64 years (± 10.41)
Male: female	16:7
Previous history of TURBT-n (%)	6 (26%)
History of smoking-n (%)	14 (61%)
Multiplicity-n (%)	<ul style="list-style-type: none"> • Solitary-18 (78%) • Multiple-5 (22%) • Two lesions-4 (17%) • Three lesions-1 (4%)
Size of tumour- mean (SD) (Range)	1.8 cm (± 0.40) (Range 0.8–2.6 cm)
Site of tumour-n (%)	<ul style="list-style-type: none"> • Lateral walls-11 (38%) • Posterior wall-6 (21%) • Dome-2 (7%) • Anterior Wall-4 (14%) • Trigone-2 (7%) • Lateral wall/posterior wall-4 (14%)
Procedural details	
Operating time mean (SD)	28 minutes (± 8.0)
Number of cases with ONR	None
Hospital stay-mean (SD)	2 days
Number of cases with bladder perforation	None
Complications	Nil
Haemoglobin-mean (SD)	Pre-op 11.47 g/dl (± 0.87) Post-op 11.13 g /dl (± 0.89) Drop in Hb 0.34 g/dl (± 0.15)
Histopathology findings-n (%)	Tumour type <ul style="list-style-type: none"> • TCC-23 (100%) Tumour classification <ul style="list-style-type: none"> • Ta-8 (35%) • T1-13 (57%) • T2-2 (9%) Grade <ul style="list-style-type: none"> • G1-9 (39%) • G2-8 (35%) • G3-6 (26%) Pathological staging <ul style="list-style-type: none"> • TaG1-8 (35%) • T1G1-1 (4%) • T1G2-8 (35%) • T1G3-4 (17%) • T2G3-2 (9%) DM <ul style="list-style-type: none"> • Present-21 (91%) • Absent-2 (9%)
Follow up and recurrence	3 months In Field: nil Out of Field: nil 6 months In Field: nil Out of Field: 1 9 months In Field: nil Out of Field: 1
Hb, haemoglobin; DM, detrusor muscle; ONR, obturator nerve reflex; SD, standard deviation; TCC, transitional cell carcinoma, TURBT, transurethral resection of bladder tumour.	

the excised margins. None of the patients had a recurrence at first follow-up cystoscopy, although two patients had a recurrence distant from the primary excision site on subsequent follow up.

In our series, the novel Zedd scissors enabled us to perform a safe CEBE. This technique has minimal reliance on electrocautery, and monopolar electrocautery for coagulation of bleeders was used sparingly. Cold excision therefore avoided charring of the tissue, obturator jerk and bladder perforation. The Zedd scissor has relatively long (42 cm), rigid and semi-rigid shafts with additional rotational capabilities of the blades. The design of the Zedd scissors therefore allows accessibility and safe excision of tumours from difficult sites such as the dome. Interestingly, in a prospective single centre series of 87 patients who underwent an en-bloc excision using the Collins loop, Hurle *et al.* excluded patients with lesions located in the anterior and posterior wall.⁶ In this series, we safely excised tumours from the dome, anterior and posterior wall. Tumour location is not a contraindication to this technique. It is also the authors' view that the rigid and semi-rigid nature of the shaft is likely to facilitate excision of tumours in the dome, particularly in large capacious bladders.

Maintaining histological integrity is vital for accurate histological evaluation. In a parallel arm, randomised controlled trial, Venkatramani *et al.* reported severe cautery artefact in 25% and 46.7% of bipolar and monopolar TURBT, respectively.⁴ In the present series, none of the histopathology specimens had cautery artefacts. Furthermore, presence of DM is essential for prognostication and also has an impact on timely decision-making in bladder cancer management.^{2,3} We had two patients (9%) in whom the DM was not present. The tumours were located at the anterior and posterior walls, respectively. In a series of 356 patients undergoing TURBT, Mariappan *et al.* reported DM to be absent in over 30% of specimens.³ Early results of CEBE with Zedd scissors suggest higher DM presence compared with TURBT. However comparison with contemporaneous series of other en bloc techniques would suggest that CEBE with Zedd scissors has marginally inferior DM presence rates.^{7,9} In a multicentric European study, Kramer *et al.* reported DM presence rates of 97–100% regardless of energy source used.⁹ A number of reasons can be attributed to this observation. The current series is a pilot study with a small cohort. It is plausible that the current series may not

appropriately balance with other series with potential confounders such as tumour location influencing outcomes. CEBE with Zedd scissors is also an evolving technique and is currently in its infancy.¹⁶ Further refinement of the technique and maturity of learning curves is therefore likely to improve DM presence rates.

Our study has some limitations. It is small pilot study and the objective was to confirm safety and feasibility. The authors plan to evaluate the technique as part of a non-inferiority randomised control trial, comparing it with TURBT and other ERBT techniques. The series is a single surgeon series and requires further validation to ensure widespread applicability. The largest tumour in this series was 2.6 cm and the performance of CEBE in larger tumours is unknown. The pathological evaluation was performed by a single pathologist and therefore inter-observer variability could not be evaluated. The follow up is relatively short and therefore the authors can only comment on short-term oncological outcomes, which appear to have been comparable with those of other ERBT techniques.¹⁷

Conclusion

CEBE with Zedd scissors is a promising novel en bloc excision technique for bladder tumour. It is a safe and feasible procedure for excision of tumours smaller than 3 cm with consistent presence of deep muscle layer without artefacts, absence of obturator nerve reflex, negligible complications and decreased rate of recurrence. Early oncological outcomes are comparable with those of other ERBT techniques.

Conflict of interest statement

The authors declare that there is no conflict of interest.

Ethics statement

All procedures performed were in accordance with the 1964 Helsinki declaration and its later amendments. The study was conducted after obtaining ethical clearance from Kasturba Medical College and Kasturba Hospital Institutional Ethics Committee (IEC 493/2019). All the patients provided informed written consent.

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Supplemental material

Supplemental material for this article is available online.

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