

# A novel transurethral resection technique for superficial flat bladder tumor: Grasp and bite technique

Kyung Jin Oh, Yoo-Duk Choi<sup>1</sup>, Ho Suck Chung, Eu Chang Hwang, Seung Il Jung, Dong Deuk Kwon, Kwangsung Park, Taek Won Kang

Departments of Urology and <sup>1</sup>Pathology, Chonnam National University School of Medicine, Gwangju, Korea

**Purpose:** Transurethral resection of bladder tumor (TURBT) can be a challenging procedure for an inexperienced surgeon. We suggest an easy technique for TURBT, which we have named the “grasp and bite” technique. We describe this technique and compare its effectiveness and safety with that of conventional TURBT.

**Materials and Methods:** Monopolar TURBT (24-Fr Karl Storz) was performed in 35 patients who had superficial bladder tumors. After defining the tumor margin, the tumor and surrounding mucosa were grasped by use of a loop electrode and resectoscope sheath. With tight grasping, linear moving resection was performed. The patients’ demographic, intraoperative, and postoperative data were analyzed between the conventional and grasp and bite TURBT groups.

**Results:** Of 35 patients, 16 patients underwent conventional TURBT (group 1), and the other 19 patients underwent grasp and bite TURBT (group 2). Both groups were similar in age, tumor multiplicity, size, anesthesia method, and location. Grasp and bite TURBT could be performed as safely and effectively as conventional TURBT. There were no significant differences in irrigation duration, urethral catheterization, postoperative hemoglobin drop, or length of hospital stay. No significant side effects such as bladder perforation, severe obturator reflex, or persistent bleeding occurred. There were no significant pathological differences between specimens according to the type of resection technique.

**Conclusions:** The grasp and bite TURBT technique was feasible for superficial bladder tumors. It may be a good tool for inexperienced surgeons owing to its convenient and easy manner.

**Keywords:** Transurethral resection; Urinary bladder neoplasms; Urologic surgical procedures

This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/3.0>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

## INTRODUCTION

Transurethral resection of bladder tumor (TURBT) is well-established modality for treating non-muscle-invasive bladder cancer. Furthermore, it is essential for

evaluating the pathological depth of bladder tumors in resected specimens. Despite improvements in endoscopic instruments and imaging systems, however, TURBT remains a challenging technique for unskilled surgeons to master.

**Received:** 1 October, 2014 • **Accepted:** 14 January, 2015

**Corresponding Author:** Taek Won Kang

Department of Urology, Chonnam National University Hospital, Chonnam National University School of Medicine, 42 Jebong-ro, Dong-gu, Gwangju 501-757, Korea  
TEL: +82-62-220-6703, FAX: +82-62-227-1643, E-mail: sydad@hanmail.net

There are well-recognized complications associated with TURBT, such as bladder perforation, irrigation fluid absorption, bleeding, infection, damage to the ureteric orifices, obturator nerve stimulation, and tumor cell implantation [1]. Among these, bladder perforation is one of the most frequent complications of TURBT and is sometimes associated with obturator reflex. Several researchers have reported that the risk of obturator nerve stimulation is from 10.6% to 11% [2,3].

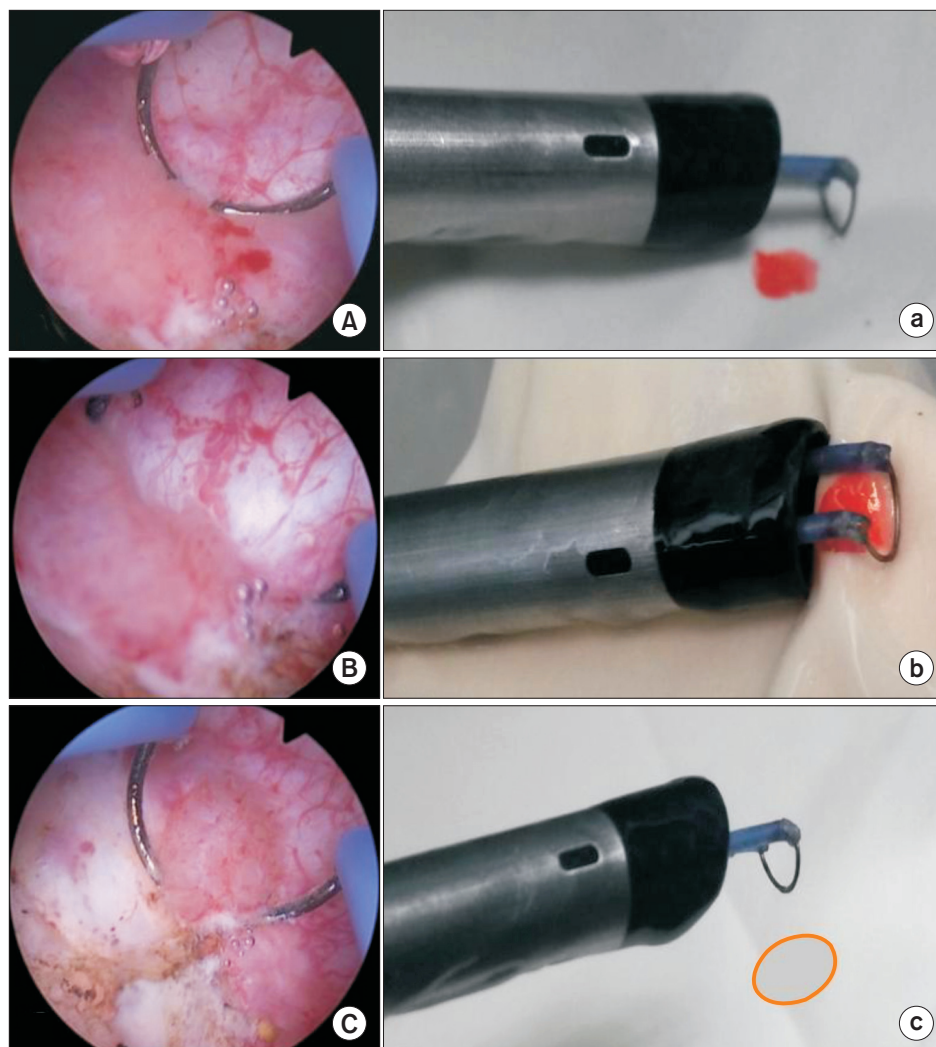
Several advances in instruments and techniques, including modifications of resectoscope design and snare resection, have been proposed to remove pedunculated bladder tumors [4,5]. However, difficulties remain in safely collecting adequate specimens for flat tumors. We introduce an easy technique for superficial bladder cancer that uses a standard monopolar resectoscope loop.

In this study, we demonstrate the easy resection technique for superficial bladder tumors that we have termed the “grasp and bite” TURBT technique and compare it with conventional TURBT.

## MATERIALS AND METHODS

### 1. Patients

This was a retrospective study in the Department of Urology of Chonnam National University Hospital (Gwangju, Korea) between January 2012 and April 2013. This study included a total of 29 men and 6 women who had bladder tumors with superficial lesions and who underwent TURBT. Patients with a huge unresectable mass, an invasive tumor shown during preoperative imaging, or an irradiated bladder were excluded. Bladder tumors were diagnosed



**Fig. 1.** Grasp and bite technique. Define the tumor margin and grasp the tumor with the loop and end portion of the resectoscope sheath. The photos and illustrations demonstrate the technique schematically: (A, a) defining tumor, (B, b) “grasp” step, and (C, c) after “bite” step. Scan this QR code to see the accompanying video, or visit [www.kjuurology.org](http://www.kjuurology.org) or <http://youtu.be/2xJDgSpZY4>.

preoperatively with cystoscopy under local anesthesia. Group 1 patients were treated by use of the conventional TURBT technique, and group 2 patients underwent the grasp and bite technique. We applied each technique during a distinct time period. Conventional TURBT was performed in 2012 and grasp and bite TURBT was performed in 2013. All procedures were performed by a single experienced operator. This study was approved by the Institutional Review Board of Chonnam National University Hospital (IRB No. CNUH-2014-025).

## 2. TURBT technique

Transurethral resection was performed with a monopolar resectoscope system (24-Fr Karl Storz, Tuttlingen, Germany). For the grasp and bite technique, the operator initially defined the tumor morphology and safe margin. In small and flat lesions, the tumor and surrounding mucosal lesions were positioned between the resection loop and the end portion of the resectoscope sheath. The resectoscope sheath was then moved backward carefully. The tumor could be held tightly with the loop electrode

and sheath. We call this the “grasp” step (Fig. 1; Video clip, Supplementary material). Using the grasping technique, the tumor lesions were lifted up. In the “bite” step, the surgeon maintained a tight hold and resected the tumor while grasping. A cystoscopic view and schematic illustrations are shown in Fig. 1. For resection during the bite step, the movement of the electrode loop was straight backward in a linear direction. Resection was performed carefully so as not to cause bladder perforation without excessive bladder wall distention. Poorly located tumors were accessed by suprapubic pressure and nearly emptying the bladder. When necessary, cold cup biopsy was done at the tumor base and edges. The resection site was carefully inspected for bleeding and coagulation. In bulky or pedunculated tumors, the protruding mass was resected rapidly with the grasp and bite technique. After removal of the bulging mass, the base lesion and surrounding mucosa were resected carefully by using grasp and bite TURBT as mentioned earlier. Also, the tumor margin could be resected in the same manner repeatedly.

Resected specimens were reviewed by a pathologist to

**Table 1.** Demographic and intraoperative data of groups 1 and 2

Variable	Group 1 (n=16)	Group 2 (n=19)	p-value
Age (y), mean±SD	70.69±7.62	67.63±9.32	0.302
Size (cm), median (range)	1.25 (0.5–5.0)	1.0 (0.5–5.0)	0.806
Gender			0.817
Male	13 (81.3)	16 (84.2)	
Female	3 (18.7)	3 (15.8)	
Tumor multiplicity			0.316
1	9 (56.3)	6 (31.6)	
2	3 (18.7)	5 (26.3)	
≥3	4 (25.0)	8 (42.1)	
Tumor morphology			0.600
Pedunculated	9 (56.3)	9 (47.4)	
Flat	7 (43.7)	10 (52.6)	
Anesthesia			0.138
General	13 (81.3)	11 (57.9)	
Spinal	3 (18.7)	8 (42.1)	
Tumor location			0.321
Lateral	3 (18.8)	7 (36.8)	
Anterior	0 (0)	2 (10.5)	
Ureteral orifice	2 (12.5)	0 (0)	
Posterior	1 (6.3)	2 (10.5)	
Posterolateral	5 (31.3)	4 (21.1)	
Anterolateral	1 (6.3)	0 (0)	
Dome	1 (6.3)	3 (15.8)	
Whole bladder	3 (18.8)	1 (5.3)	

Values are presented as number (%) unless otherwise indicated.

TURBT, transurethral resection of bladder tumor; group 1, conventional TURBT; group 2, grasp and bite TURBT; SD, standard deviation.

evaluate the depth of resection. Specimens were measured by hematoxylin and eosin (H&E) staining and immunohistochemical smoothelin stain to determine the muscularis mucosae.

### 3. Statistical analysis

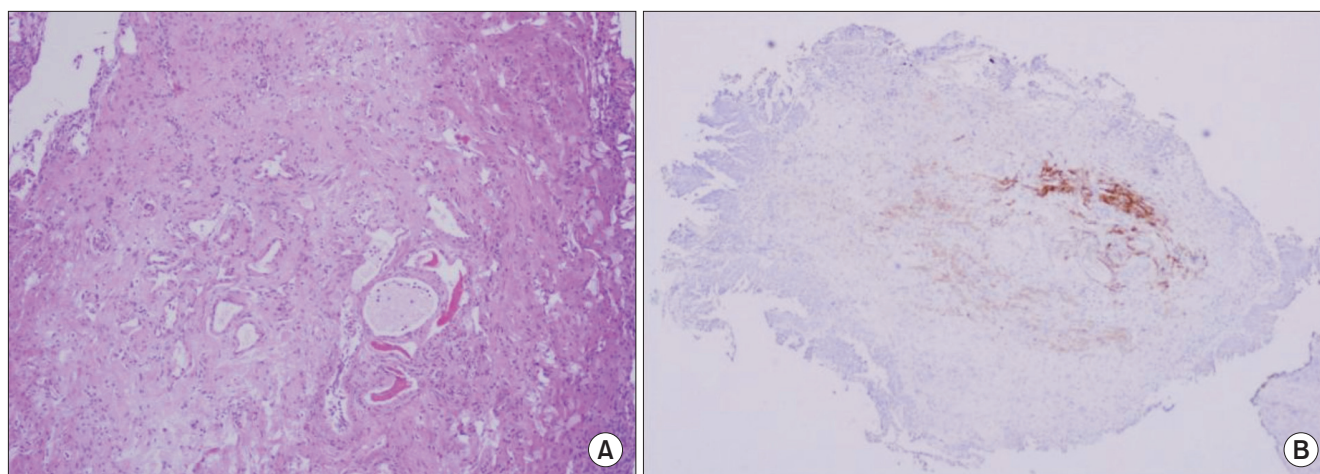
Independent t-tests were used to compare the mean values of two independent parametric continuous variables. The Mann-Whitney test was used to compare the median values of two nonparametric continuous variables. Categorical variables were verified by Pearson chi-square or Fisher exact test.  $p < 0.05$  was considered to indicate statistical significance. Statistical analyses were performed with IBM SPSS Statistics ver. 20.0 (IBM Co, Armonk, NY,

USA).

## RESULTS

From January to April 2012, 16 patients were enrolled who had undergone conventional TURBT. From January to April 2013, the grasp and bite technique was applied to 19 patients with superficial bladder tumors. Tumors ranged in size from 0.5 to 5 cm. The two groups had comparable demographic and intraoperative data, including patient age, tumor size, patient gender, multiplicity, tumor morphology, and tumor location (Table 1).

The mean operative time was similar in the conventional and grasp and bite groups (35 minutes vs. 35 minutes,



**Fig. 2.** Histologic findings of resected tumors in the grasp and bite group. (A) H&E stain shows papillary urothelial carcinoma containing muscularis mucosae ( $\times 100$ ). (B) Muscularis mucosae bundles stained intensely with smoothelin ( $\times 40$ ).

**Table 2.** Postoperative data of groups 1 and 2

Variable	Group 1 (n=16)	Group 2 (n=19)	p-value
Operative time (min)	35 (10–100)	35 (10–115)	0.683
Hemoglobin drop (g/dL)	0.4 (0.1–1.2)	0.5 (0.1–2.8)	0.659
Irrigation (d)	1.0 (1–2)	1.0 (1–2)	0.961
Catheterization (d)	2.0 (1–3)	2.0 (1–3)	0.781
Hospital stay (d)	2.0 (1–3)	2.0 (1–3)	0.707
Stage			0.285
Ta	13 (81.3)	12 (63.2)	
T1	3 (18.7)	7 (36.8)	
Grade			0.557
G2	10 (62.5)	10 (52.6)	
G3	6 (37.5)	9 (47.4)	
Recurrence			0.458
Yes	7 (43.7)	6 (31.6)	
No	9 (56.3)	13 (68.4)	

Values are presented as median (range) or number (%).

TURBT, transurethral resection of bladder tumor; group 1, conventional TURBT; group 2, grasp and bite TURBT.

respectively). The mean duration of irrigation, duration of catheterization, and hospital stay were not significantly different between the groups. Hemoglobin change and complication rates were also comparable between the two groups. There were no cases of bladder perforation, excessive obturator reflex, or persistent hematuria in either group. The tumor stages and grades were similar in the two groups. Specimens were adequate for accurate pathological staging of the muscularis mucosae. H&E staining and smoothelin immunohistochemistry positivity identified the muscularis mucosae in the grasp and bite group (Fig. 2). There was no significant difference in recurrence rates between the conventional and grasp and bite TURBT groups during the 14-month follow-up (43.8% vs. 31.6%,  $p=0.458$ ). The detailed postoperative outcomes are given in Table 2.

## DISCUSSION

The purpose of TURBT is complete removal of all visible tumors for curative intent and acquisition of adequate tissue for pathologic evaluation. Achievement of the above purposes is not so easy for an inexperienced surgeon. Also, tumor recurrence after TURBT is relatively high. For non-muscle-invasive bladder cancer, the probability of recurrence after 1 year ranges from 15% to 70% [6,7]. Many obstacles can arise during the procedure, such as bladder perforation, bleeding, obturator reflex, and damage to the ureteral orifices. To overcome these difficulties, many surgical techniques and innovative devices have been developed. For example, endoscopic snare resection of a bladder tumor can be used to remove pedunculated tumors [5]. Although the snare method offers the advantage of en block resection, smaller and sessile tumors are not suitable for this technique. New devices such as water jet hydrodissection and the thulium:yttrium aluminium garnet laser may be applicable for en block resection of superficial tumors [8,9]. However, further studies and development of these techniques are necessary to determine efficacy and oncologic outcomes.

Variable methods of tumor resection have been developed and used in association with tumor size and location. These also are determined by a surgeon's preference and surgical experience. Modifications of TURBT equipment and techniques also have the possibility of improving surgical outcomes. Accurate surgical technique is mandatory for dealing with safety and efficacy issues. Innovative resectoscope modifications have also been developed. The side-to-side bidirectional lateral rotating handgrip and loop

allows excellent precision and control over the loop under direct vision [4]. Loop modification, the so-called "runner," can push the bladder wall away during resection, thereby widening the view and decreasing the risk of perforation [10]. We developed an easy and safe technique for an inexperienced operator. We wanted a technique in which we could use a conventional resectoscope and loop without accessory equipment.

When using a wire-loop resectoscope, the tumor must be resected thoroughly to obtain adequate muscle tissue. The movement of the loop is somewhat fast and deep to avoid charring of the surrounding mucosa and bladder perforation [11]. These are key technique of TURBT, but not so easy to perform. Our technique has the merit of acquiring adequate tissue. Direct pressure to the bladder wall may allow deeper tissue to protrude into the bladder wall and then be easily removed by use of the resectoscope. Instead of the curvilinear movement of the resectoscope end according to the curved bladder surface, the easy linear motion can make a curved resection with grasping. Using our "grasp and bite" technique, beginners can easily perform TURBT safely. Often, small and sessile tumors are missed and severely damaged during resection and cauterization. The grasp and bite technique can effectively be applied to small, flat, sessile lesions. For larger tumors, the protruding tumor can be removed first by the conventional method, and then the stalk and base lesion can be removed by the grasp and bite technique. Poorly accessible tumors are difficult for complete resection. In theory, the grasp and bite technique could have difficulties in a posterior or posterolateral located tumor because of its moving mechanism. In our series, two posterior and four posterolateral tumors were successfully accessed by use of suprapubic pressure and nearly emptying the bladder. Similar to conventional TURBT, it was also difficult to access posterior tumors with the grasp and bite method.

In our consecutive cases, obturator reflex was not problematic. There were no cases of excessive obturator reflex or bladder perforation in either group. General anesthesia was preferred in the conventional and grasp and bite groups (81.3% vs 57.3%,  $p=0.138$ ). Also, tumor locations did not differ significantly between the two groups ( $p=0.253$ ). We postulated that the grasping method, which lifts the tissue away from the obturator nerve and tightly holds the grasped tissue, may eventually weaken the reflex. Considering this small population, however, we cannot make conclusions and need to further study a larger population.

This study had some limitations that may have limited

the conclusions. First, the two groups were classified by the date of operation. Thus, there could have been a selection bias. Also, the study population was small, and thus we were unable to perform statistical analysis of the oncologic outcome as recurrence-free survival. This was a preliminary study to develop a surgical technique performed by an experienced surgeon. Larger prospective studies with a long follow-up period will be necessary to show the oncologic advantage of this technique. To determine the feasibility of the technique for inexperienced surgeons, future study will address a teaching protocol comparing the conventional and grasp and bite methods. Owing to the nature of retrospective research, histologic information was not fully acquired. Investigation of tissue adequacy of proper muscle and effect of coagulation will be our next subject of study.

## CONCLUSIONS

Our study demonstrated that grasp and bite TURBT is a safe and effective method for removing superficial bladder tumors. This technique has merit for flat tumors and can also be used for pedunculated and poorly accessible tumors. The grasp and bite method may be a shortcut for overcoming the difficulties of TURBT.

## CONFLICTS OF INTEREST

The authors have nothing to disclose.

## ACKNOWLEDGMENTS

This study was financially supported by Chonnam National University, 2009 and Basic Research Program, through the National Research Foundation of Korea (NRF) funded by the Ministry of Education, Science and Technology (2012-0002947). This research received a 2014 academic award by The Korean Endourological Society.

## SUPPLEMENTARY MATERIALS

An accompanying video can be found in the 'urology in motion' section of the journal homepage ([www.kjurology.org](http://www.kjurology.org)). The supplementary data can also be accessed by scanning a QR code located on the Fig. 1 of this article, or

be available on YouTube (<http://youtu.be/2xJDgSpZvY4>).

## REFERENCES

1. Traxer O, Pasqui F, Gattegno B, Pearle MS. Technique and complications of transurethral surgery for bladder tumours. *BJU Int* 2004;94:492-6.
2. McKiernan JM, Kaplan SA, Santarosa RP, Te AE, Sawczuk IS. Transurethral electrovaporization of bladder cancer. *Urology* 1996;48:207-10.
3. Kihl B, Nilson AE, Pettersson S. Thigh adductor contraction during transurethral resection of bladder tumours: evaluation of inactive electrode placement and obturator nerve topography. *Scand J Urol Nephrol* 1981;15:121-5.
4. Pantuck AJ, Baniel J, Kirkali Z, Klatte T, Zomorodian N, Yossepowitch O, et al. A novel resectoscope for transurethral resection of bladder tumors and the prostate. *J Urol* 2007;178:2331-6.
5. Maurice MJ, Vricella GJ, MacLennan G, Buehner P, Ponsky LE. Endoscopic snare resection of bladder tumors: evaluation of an alternative technique for bladder tumor resection. *J Endourol* 2012;26:614-7.
6. Legrand G, Soliman H, Dubosq F, Verine J, Desgrandchamps F, de The H, et al. Prevalence and spectrum of microsatellite alterations in nonmuscle invasive bladder cancers. *Am J Cancer Res* 2011;1:595-603.
7. Kurth KH, Denis L, Bouffieux C, Sylvester R, Debruyne FM, Pavone-Macaluso M, et al. Factors affecting recurrence and progression in superficial bladder tumours. *Eur J Cancer* 1995; 31A:1840-6.
8. Wolters M, Kramer MW, Becker JU, Christgen M, Nagele U, Imkamp F, et al. Tm:YAG laser en bloc mucosectomy for accurate staging of primary bladder cancer: early experience. *World J Urol* 2011;29:429-32.
9. Nagele U, Kugler M, Nicklas A, Merseburger AS, Walcher U, Mikuz G, et al. Waterjet hydrodissection: first experiences and short-term outcomes of a novel approach to bladder tumor resection. *World J Urol* 2011;29:423-7.
10. Herr HW, Reuter VE. Evaluation of new resectoscope loop for transurethral resection of bladder tumors. *J Urol* 1998;159: 2067-8.
11. Thomas K, O'Brien T. Improving transurethral resection of bladder tumour: the gold standard for diagnosis and treatment of bladder tumours. *Eur Urol Suppl* 2008;7:524-8.