

# Histomorphological features of resected bladder tumors: Do energy source makes any difference

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## Abstract

**Context:** The recent advent of bipolar energy in bladder tumor resection has raised many questions regarding density of current and its effect on histopathology of the resected transurethral resection of bladder tumor (TURBT) chips.

**Aims:** The aim of this study is to evaluate the histomorphological features in resected bladder tumors comparing bipolar versus conventional (monopolar) energy.

**Settings and Design:** Inclusion criteria were patients with primary presentation of carcinoma urinary bladder undergoing TURBT. The patients with prior resections were excluded as these could jeopardize the results of cautery artifacts.

**Materials and Methods:** From February 2010 to December 2011, 61 patients with primary carcinoma bladder and meeting our inclusion criteria were compared. Group 1 ( $n = 31$ ) underwent bipolar-TURBT (B-TURBT) and Group 2 ( $n = 30$ ) monopolar-TURBT (M-TURBT). Two pathologists, who were blinded to the form of electrocautery used, examined the resected tissue. The degree of cautery artifact in each specimen was recorded. The severity of the cautery artifact was graded as absent, mild, moderate, or severe. The mean age, tumor size, and resection time were recorded in both groups.

**Statistical Analysis Used:** Data were analyzed using SPSS 16. Data were compared in between groups using paired *t*-test and Pearson's Chi-square test. The significance level was set at 0.05.

**Results:** The mean age, tumor size, and resection time were similar in between the two groups. The pathologists had no obscurity in reaching a correct diagnosis in all cases. The cautery artifacts were graded as absent in 10 (32.2%) and 8 (26.67%), mild in 12 (38.7%) and 11 (36.67%), moderate in 5 (16.1%) and 7 (23.33%) and severe in 4 (12.9%) and 5 (16.66%) cases, respectively in Group 1 and 2. There was no statistically significant histomorphological dissimilarity between specimens according to the type of cautery used.

**Conclusions:** Bladder tissue obtained from B-TURBT is of equivalent histomorphological feature as that of standard M-TURBT.

**Key Words:** Bipolar resection, bladder tumor, cautery artifact

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## INTRODUCTION

Transurethral resection of bladder tumor (TURBT) pioneered by Edwin Beer in 1910, is the basis of initial diagnosis and therapy of bladder cancer.<sup>[1]</sup> The proper pathologic diagnosis, which consists of staging and grading, is essential in determining whether conservative treatment is sufficient or if more radical treatment is necessary.<sup>[2]</sup> The ability to correctly assign stage

and grade to tumors depends on transurethral resection (TUR) technique.<sup>[2-4]</sup> Thus, the endoscopic removal of bladder tissue must be performed in a meticulous approach that ensures that the tumor is safely and completely removed, without needless destruction of the tumor tissue. Excessive cautery artifacts can make pathologic interpretation tricky and less edifying.<sup>[5-9]</sup> We have found bipolar electrocautery to be effective in bladder tumor resection in our recent study as have been found by others investigators.<sup>[9-12]</sup> In our previous study, we demonstrated that the energy level used in bipolar are high and undesirable causing obturator jerks and perforation.<sup>[10]</sup> The amount of energy delivered to the bipolar loop is high to generate plasma vapor bubble and therefore these loops are sturdier (tungsten) to withstand heat.<sup>[13]</sup> Whether this high energy in bipolar-TURBT (B-TURBT) can lead to cautery artifacts and cause pathological misinterpretation is a matter of concern.<sup>[6]</sup> There are few studies reporting on the pathological characteristics of bladder tumor tissue following B-TURBT. Therefore, we aim to study the effect of cautery artifacts on histomorphological characteristics of bladder tumor tissues resected using bipolar energy at low power settings and compare them with monopolar energy.

## MATERIALS AND METHODS

From February 2010 to December 2011, 61 patients, undergoing TUR for the 1<sup>st</sup> time were included in the study. The groups were selected randomly on the basis of tumor characteristics from a prospective cohort of 100 consecutive patients undergoing TURBT. The groups were matched for tumor size and resection time. Recurrent tumors, incompletely resected tumors and those undergoing fulguration only were excluded. Group 1 consists of 31 patients undergoing B-TURBT. Group 2 consists of 30 patients undergoing monopolar-TURBT (M-TURBT). All procedures were performed by senior urologists with the patient under spinal anesthesia. All patients received preoperative antibiotics. B-TURBT was performed using bipolar electrocautery system (Gyrus Medical Inc., Cardiff, UK) and Karl storz® 27F continuous-flow resectoscope with normal saline irrigant. Power settings on the machine were lower; 50 W for cutting and 40 W for coagulation as described by us previously.<sup>[10]</sup> M-TURBT was performed using monopolar electrocautery (ERBE, Tubingen, Germany) and Karl storz® 27F continuous-flow resectoscope with glycine as the irrigation fluid. Power settings on the machine were 50-70 W for cutting and 60-80 W for coagulation. All the specimens were spot checked and then fixed in formalin. The specimens were subjected to standard paraffin embedding and Hematoxylin and Eosin staining. Two pathologists who were blinded to the form of energy used, examined all the resected tissues. The detailed histomorphological examination included tumor grade, presence of muscularis propria, presence of lamina propria and muscle invasion, and the degree of cautery artifact

in each specimen. The pathologists were asked to quantify the degree of cautery artifact in each specimen. The artifactual pathological archetypes that were specially looked for included spindling, stromal coagulation, crushing, atypical morphological changes and abnormal cellular orientation. In each specimen, at least 20 fields were examined ( $\times 200$ ), and grading was done. The severity of the cautery artifact was graded as absent, mild, moderate or severe if none;  $<25\%$ ,  $25-50\%$  and  $>50\%$  of the resected specimen was involved, respectively. The pathologists were further queried on any possible misinterpretation or difficulty in reaching a final diagnosis from the tissue available in B-TURBT. Data were analyzed using Statistical Package for the Social Sciences SPSS 16, Chicago, IL. Data were compared in between groups using paired *t*-test and Pearson's Chi-square test.

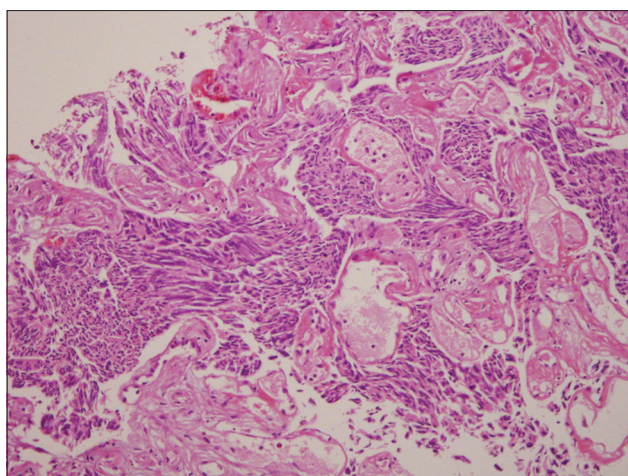
## RESULTS

The pathologist had no difficulty in reaching a precise diagnosis in all of cases involving bipolar cautery. There was no significant histomorphological dissimilarity in between specimens, according to the type of cautery used. The tumor chips obtained with B-TURBT were smaller in size due to the small size of the bipolar loop. The median age, stage, grade, and operative time were comparable in both groups [Table 1]. Artifactual pathological archetypes that were identified in both groups included: Spindling, stromal coagulation [Figures 1 and 2] crushing and abnormal cellular orientation. There was no difference in the effect of energy in between the two groups with respect to the size of the tumors. The cellular spindling artifact was found in 9 (29%) and 10 (33.33%) of Group 1 and 2 patients, respectively. Group 1 (B-TURBT) the cautery artifacts were graded as absent in 10 (32.2%), mild in 12 (38.7%), moderate in 5 (16.1%), and severe in 4 (12.9%). In Group 2 (M-TURBT), the cautery artifacts were graded absent in 8 (26.67%), mild in 11 (36.67%), moderate in 7 (23.33%), and severe in 5 (16.66%) cases [Table 2].

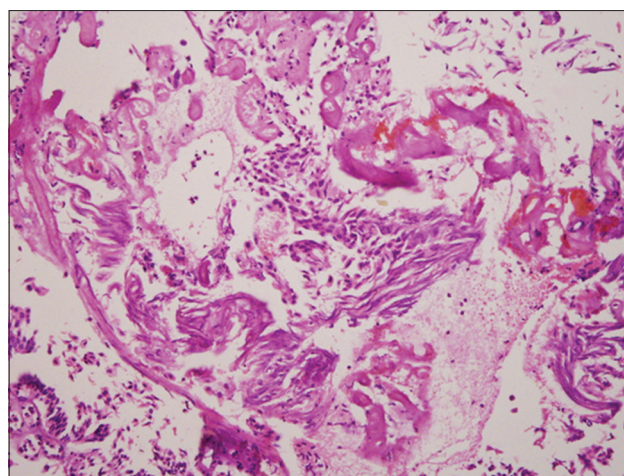
**Table 1: Clinical and histopathomorphological features of the two groups**

Parameters	Group 1 (B-TURBT) <i>n</i> =31	Group 2 (M-TURBT) <i>n</i> =30	<i>P</i> value
Age (years)	58.3±11.61	56.68±12.51	0.852
Sex	Male=26 Female=05	Male=28 Female=02	0.952
Size (cm)	3±1.68 (1-6)	3±1.447 (1-6)	0.969
Operative time (min)	27.90±18.8	24.68±15.37	0.724
Stage (%)			
Ta	16 (51.6)	15 (50)	
T1	11 (35.4)	12 (40)	
T2	4 (12.9)	3 (10)	
Grade (%)			
PUNLMP	18 (58.1)	16 (53.3)	
Low grade	07 (22.58)	08 (26.6)	
High grade	06 (19.35)	06 (20)	

B-TURBT: Bipolar-transurethral resection of bladder tumor,  
M-TURBT: Monopolar-transurethral resection of bladder tumor,  
PUNLMP: Papillary urothelial neoplasm of low malignant potential



**Figure 1:** A case of a monopolar transurethral resection of bladder tumor showing spindling of the tumor cells (H and E,  $\times 200$ )



**Figure 2:** A case of a bipolar transurethral resection of bladder tumor showing stromal coagulation and spindling artifacts (H and E,  $\times 200$ )

**Table 2: The grade and types of cautery artifact in the two groups**

Parameters	Group 1 (B-TURBT) (%) <i>n</i> =31	Group 2 (M-TURBT) (%) <i>n</i> =30	<i>P</i> value
Cautery artifacts			
Absent	10 (32.2)	08 (26.67)	0.768
Mild	12 (38.7)	11 (36.67)	0.824
Moderate	05 (16.13)	07 (23.33)	0.682
Severe	04 (12.9)	05 (16.66)	0.954
Cellular spindling	09 (29)	10 (33.33)	0.923
Crushing	06 (19.35)	05 (16.66)	0.756

B-TURBT: Bipolar-transurethral resection of bladder tumor;  
M-TURBT: Monopolar-transurethral resection of bladder tumor

## DISCUSSION

The feasibility and efficacy of B-TURBT is now been recognized in bladder tumor resection with results comparable to M-TURBT.<sup>[9,10,14-16]</sup> Despite the evident benefits, conventional monopolar electrocautery is still the most frequently used.<sup>[1,2]</sup> In B-TURBT, the loop used for resection is smaller than a standard M-TURBT loop; therefore, the tumor chips obtained are smaller, but this does not seem to cause any increase in artifact on pathologic assessment.<sup>[9,16]</sup> The foremost advantage of bipolar over monopolar is the ability to resect in saline thus circumventing TUR syndrome.<sup>[9-11,13,16]</sup> Thermal artifacts, due to cautery, have been observed in TUR of prostate/TURBT chips and other tissues after resection and these artifacts are formed because of high temperature.<sup>[6,17-19]</sup> It has been stated that a variety of problems can arise during histopathological evaluation of specimens that have undergone thermal changes and that this can be lead to confounding results by pathologists.<sup>[5,6]</sup> A validated artifact grading system is lacking in the literature to quantify and compare findings.<sup>[5]</sup> In this study, we compared the pathologic specimens of bladder tumors resected with bipolar and monopolar electrocautery. Our pathologists, who were blinded

to the form of electrocautery used, examined the tumor tissue to determine grade, depth of invasion and the degree of cautery artifact present. In our study, pathologic specimens obtained by B-TURBT were adequate for making the proper diagnosis in all cases. The pathologic feature of the specimens obtained using B-TURBT and M-TURBT were similar. The pathologists had no obscurity in correctly assigning grade and stage in all the tumors. Cautery artifacts were present in 21 and 23 patients in Groups I and 2, respectively. Of these significant spindling and crushing artifact was present in 15 patients of each group, rest showed coagulation of cells and stroma, focal hemorrhage and rupture of tissue, which were not studied in details in these groups. Our results suggest that though cautery artifacts do occur following B-TURBT, they are similar to M-TURBT. The statistical difference was not significant in comparison of all the artifacts. We noted that in both groups, the severity of the cautery artifact was independent of the size of tumors. However, there was a comparable degree of cautery artifact in the two groups: The specimens obtained by B-TURBT did not exhibit any more cautery artifact than those obtained by monopolar electrocautery. The limitations of our study is that the same surgeon did not perform all of the TURBT, thus raising the possibility that surgical technique may have played a role in the cases of severe cautery artifact. The size difference between the bipolar resection loop and the monopolar resection loop used in this study may be considered a limitation of this study. The energy which is the basis of artifacts to form is not equal in the two procedures. Despite doing B-TURBT at low power setting the amount of cautery artifacts were similar to M-TURBT thus signifying the fact that there would indeed be more thermal damage with the conventional high settings. Despite these limitations, our study demonstrates that the use of B-TURBT does not appear to cause unwarranted destruction of tissue due to thermal cautery artifact that would preclude a definitive diagnosis if used at a low power setting.



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