Original Article

A Prospective Study on Safety and Efficacy of Bipolar Energy for Transuretheral Resection of Bladder Tumor

Nisar Ahmad, Majed Saeed, Saqlain Amjad, Ajmal Rasheed, Ussama Iftikhar and Moed Ahmad

ABSTRACT

Objective: Bladder tumor's treatment with bipolar transurethral resection have been considered as better alternative due to lesser complications and better quality of specimen. The present study aimed to assess the safety and efficacy of bipolar energy for transurethral resection of bladder tumor.

Study Design: A prospective study

Place and Duration of Study: This study was conducted at the department of Urology in Sahiwal Teaching Hospital, Sahiwal during the period from April 2022 to March 2023.

Materials and Methods: This study was conducted on 90 patients underwent transureththeral resection of bladder tumor. All the patients underwent surgery under general anesthesia and were categorized into two groups: Group-I (Mono-polar TURBT) and Group-II (Bipolar TURBT). The demographic details, tumor characteristics, and procedure's complications such as bladder perforation, transurethral resection syndrome, obturator jerk, blood loss, and need for re-surgery were recorded. The specimens of tumor were analyzed for deep muscle invasion, stage, thermal artifact's quality and quantity, and grade.

Results: Each group had 45 patients. The overall mean age of group-I and group-II patients was 56.48 ± 11.84 years and 55.68 ± 16.92 years. There were 74 (82.2%) male and 16 (17.8%) females. The baseline characteristics and tumor features were comparable in both groups. The prevalence of bladder perforation and variation in hemoglobin levels were comparable. The major complication obturator jerk was found in 26.7% patients as compared to 13.3% in mono-polar group. There were no thermal artifacts in 28.8% patients of group-II as compared to 6.7% in group-I.

Conclusion: Bipolar TURBT has the same operating risks as mono-polar TURBT, including as bladder perforation, blood loss, and obturator jerk. However, fewer thermal artefacts in tissue samples obtained via bipolar resection may aid pathologists in interpreting histopathological findings.

Key Words: Bladder tumor, bipolar energy, transurethral resection, efficacy, safety

Citation of article: Ahmad N, Saeed M, Amjad S, Rasheed A, Iftikhar U, Ahmad M. A Prospective Study on Safety and Efficacy of Bipolar Energy for Transuretheral Resection of Bladder Tumor. Med Forum 2023;34(5):79-83.

INTRODUCTION

Transurethral resection of bladder tumors (TURBT) has been the frequently used treatment and primary diagnostic technique for bladder tumors.[1] With technical advancement and the development of bipolar electro-surgery, it is now possible to employ physiologic solutions such as saline during resection. Bipolar resection has been developed to provide better specimens and lower the risk of complications when compared to traditional monopolar resection.

Department of Urology, Sahiwal Teaching Hospital, Sahiwal.

Correspondence: Nisar Ahmad, Associate Professor Sahiwal Teaching Hospital/ Sahiwal Medical College, Sahiwal.
Contact No: 03234292578
Email: nisarahmad741@gmail.com

Received: April, 2023
Accepted: April, 2023
Printed: May, 2023

The findings are still being debated.[2-7] For TURBT, mono-polar cautery is commonly used. Activated current during mono-polar resection may generate obturator nerve stimulation, resulting in bladder perforation and adductor muscle spasm.[8] Furthermore, the systemic circulation absorbed an irrigation fluid, increased irrigation fluid uptake can result in over hydration, which can lead to transurethral resection (TUR) syndrome.[9] The current flow variation in bipolar energy and normal saline irrigation minimizes the occurrence of TUR syndrome.[10] The patient's impedance is greater than that of the irrigation fluid during bipolar resection.[11]

The longer operative duration comes from thinner and smaller resection loops causing the bipolar system issues.[12] Bipolar TURBT has decreases the hospital stay, TUR syndrome, and improved hemostasis.[13] Latest research, however, has revealed that bipolar transurethral resection of bladder tumours is no better than monopolar resection in terms of obturator reflex and bladder perforation.[14,15] There were less thermal

artifacts in bipolar energy than mono-polar energy during TURBT. The present study aimed to assess the safety and efficacy of bipolar energy for transurethral resection of bladder tumors..

MATERIALS AND METHODS

A total of 90 patients underwent transureththeral resection of bladder tumor in the department of Urology in Sahiwal Teaching Hospital, Sahiwal during the period from April 2022 to March 2023. All the patients underwent surgery and were categorized into two groups: Group-I (Mono-polar TURBT) and Group-II (Bipolar TURBT). The sample size was calculated using an 80% power and a 95% confidence level. The sample size of each group was 45. In a standard literature study, the incidence rate of obturator jerk was estimated to be roughly 25% in MTURBT and 5% in BTURBT. The demographic details, tumor characteristics, and procedure's complications such as bladder perforation, transurethral resection syndrome, and obturator jerk, blood loss, and need for re-surgery were recorded. The tumor's specimens were assessed for stage, thermal artifact's quality and quantity, and grade. Bipolar electrocautery was used to conduct bipolar TURBT. For bipolar resection, a 26 Fr resectoscope and an angled loop wire were utilised. The cutting power was adjusted between 160 and 200 watts, and the coagulation power was set between 100 and 120 watts, with automated adjustment based on tissue thickness. As an irrigant, glycine was utilised. A 22 Fr three-way Foley catheter was inserted at the conclusion of the surgeries, and saline irrigation was maintained as needed. After the urine had been clear for 24 hours, the catheter was removed.

The primary research outcomes were the occurrence of bladder perforation and obturator jerk. When perivesical fat was observed during TURBT, the surgeon subjectively determined bladder perforation. Changes in hemoglobin and salt levels, clot retention, blood transfusion requirements, TUR syndrome, and resection time were also compared. The incidence of obturator jerk was calculated using bladder tumours placed in the lateral wall. The secondary end objectives in both groups were the amount and quality of cautery artefacts in tissue specimens. SPSS version 27 was used for data analysis.

RESULTS

Each group had 45 patients. The overall mean age of group-I and group-II patients was 56.48 ± 11.84 years and 55.68 ± 16.92 years. There were 74 (82.2%) male and 16 (16.8%) females. The baseline characteristics and tumor features were comparable in both groups. The prevalence of bladder perforation and variation in hemoglobin levels were comparable. The major complication obturator jerk was found in 26.7% patients as compared to 13.3% in mono-polar group. There were no thermal artifacts in 28.8% patients of group-II as compared to 6.7% in group-I. Demographic details of patients from both groups are compared in Table 1. Tumor's characteristics in both groups are shown in Table 2. Table 3 represents the comparison of complications and hospital stay.

Table No. 1: Comparison of Demographic details of patients from both groups

Variables	Group-I (N=45)	Group-II (N=45)	P-value
Age (years)	56.48 ± 11.84	55.68 ± 16.92	0.836
Gender N (%)			
Male	36 (80)	38 (84.4)	0.0924
Female	9 (20)	7 (15.6)	
Recurrent tumor	8 (17.8)	8 (17.8)	1.000
Smoker	18 (40)	28 (35.6)	0.592
Co-morbidities	25 (55.6)	29 (64.4)	0.152
ASA			
SA1	33 (73.3)	32 (71.1)	0.627
ASA2	12 (26.7)	13 (28.9)	

Table No. 2: Tumor's characteristics

Characteristics	Group-I (N=45)	Group-II (N=45)	P-value
Tumor's location			
Right lateral	12 (26.7)	12 (26.7)	
Left lateral	20 (44.4)	18 (40)	
Posterior wall	8 (17.8)	9 (20)	0.909
Anterior wall	3 (6.7)	3 (6.7)	
Bladder neck	1 (2.2)	2 (4.4)	
Dome	1 (2.2)	1 (2.2)	
Frequency of Tumor			
Single	38 (84.4)	29 (64.4)	0.329
Multiple	7 (15.6)	16 (35.6)	
Tumor's size (cm)	2.4±0.923	2.6±0.967	0.413
Grade			
Low	27 (60)	28 (62.2)	0.729
High	18 (40)	17 (37.8)	
Stage			
Ta	7 (15.6)	10 (22.2)	0.343
T1	26 (57.8)	20 (44.4)	
T2	12 (26.7)	15 (33.4)	

Table No. 3: Comparison of complications and hospital stay

Characteristics	Group-I (N=45)	Group-II (N=45)	P-value
Obturator jerk	13.3%	26.7%	0.239
Bladder perforation	5%	2.2%	0.372
Clot retention	2.2%	0%	1.000
Re-surgery	2.2%	0%	1.000
Operative time(min)	40.64±12.68	40.52±9.78	0.997
Hospital stay	1.84±0.72	1.82±0.65	0.967

DISCUSSION

The current investigation mainly focused on the safety and efficacy of bipolar energy for transurethral resection of blood tumors and found that bipolar energy technique has lately gained popularity as a transurethral bladder tumor removal treatment alternative. The bipolar electrocautery primary benefits with usage of normal saline with ability of less tissue charring and clean cutting ability. According to numerous studies no TUR syndrome was found in bipolar TURBT.[16,17] TUR syndrome was not seen in any of the participants in our research. The improved hemostasis causing lower loss of bleeding is another bipolar resection advantage.[18, 19] Similarly to prior research, no blood transfusion was required among both group patients. In a study on endoscopic removal of bladder tumours employing monopolar energy, Venkatramani et al.[20] first reported TUR syndrome in few patients. As a result, there is limited research on the syndrome, which has a 2% incidence in monopolar TURBT.

Comparing the mono-polar resections, the bipolar resections had lower obturator jerks incidence. Yang et al.[21] reported that 10.6% patients had obturator jerks in mono-polar energy while investigating the 160 cases of resections. Mashni et al[22] reported that mono-polar radiation group patients had 11% obturator reflex. Liem et al.[23] conducted their study on 121 patients and reported that 13.2% patients developed complication rate using 160 watts power using bipolar TURBT including the blood transfusion required for hematuria in 2.5% patients, 1.7% required bladder perforation, and 4.9% patients had obturator jerks. Obturator jerk, which can induce bladder perforation, is a serious issue during bladder tumor removal. Obturator jerk occurs in 1.7 to 11% of monopolar TURBTs.[24,25] In the current study, the obturator jerk was found 13.3% and 26.7% in group-I and group-II. Similarly, another study by Gupta et al[26] reported 49% and 60% in mono-polar and bipolar group. These variation was statistically insignificant.

Wang et al.[27] reported that mono-polar and bipolar group had bladder perforation in 23% and 8% patients. According to Truong et al[28] tissue recued charring and clean cutting during bipolar TURBT leads to thermal artifact's lower prevalence. Fewer investigation compared the mono-polar and bipolar resection regarding the thermal artifact's degree.[29, 30]

The present study discovered that the monopolar group had considerably greater thermal artefacts. Other studies have yielded conflicting results when it comes to the presence of thermal artefacts in deep muscle biopsy.[31] Hashad et al[32] found no statistically significant difference in deep muscle biopsy thermal damage grades between the mono-polar and bipolar groups.

CONCLUSION

Bipolar TURBT has the same operating risks as mono-polar TURBT, including as bladder perforation, blood loss, and obturator jerk. However, fewer thermal artefacts in tissue samples obtained via bipolar resection may aid pathologists in interpreting histopathological findings**..**

Author's Contribution:

Concept & Design of Study:	Nisar Ahmad
Drafting:	Majed Saeed, Saqlain Amjad
Data Analysis:	Ajmal Rasheed, Ussama Iftikhar, Moed Ahmad
Revisiting Critically:	Nisar Ahmad, Majed Saeed
Final Approval of version:	Nisar Ahmad

Conflict of Interest: The study has no conflict of interest to declare by any author.

REFERENCES

1. Murugavaithianathan P, Devana SK, Mavuduru R, Kumar S, Singh SK, Mandal AK, et al. Bipolar transurethral resection of bladder tumor provides better tissue for histopathology but has no superior efficacy and safety: a randomized controlled trial. J Endourol 2018;32(12):1125-30.
2. Ma Y, Sun L, Lin X, Zhang W, Wang D. Efficacy and safety of bipolar versus monopolar transurethral resection of bladder tumors: A meta-analysis of randomized controlled trials. J Can Res Ther 2020;16:1588-95.
3. Alame WF, Raad N, Ibrahim S. Did the Scientific Innovations in the Management of Non-Muscle Invasive Bladder Cancer Patients Improve the Outcome during the Last 2 Decades? Open J Urol 2022;12(11):563-87.
4. Elgharbawy MS, Elaskary FA, Abdallah MM, Samaka RM, Abdelgawad OA, Elmahdy AE. Is bipolar superior to monopolar energy for transurethral resection of bladder tumors?. Menoufia Med J 2022;35(2):938.
5. Gu J, He Z, Chen Z, Wu H, Ding M. Efficacy and safety of 2-micron laser versus conventional trans-urethral resection of bladder tumor for non-muscle-invasive bladder tumor: A systematic review and meta-analysis. J Cancer Res Therapeutics 2022; 18(7):1894-902.
6. Saini VK, Ahuja A, Seth A, Dogra PN, Kumar R, Singh P, et al. Histomorphological features of resected bladder tumors: Do energy source makes any difference. Urol Ann 2015;7(4): 466–469.
7. Mashni J, Godoy G, Haarer C, Dalbagni V, Reuter VE, Ahmadie HA, et al. Prospective evaluation of

plasma kinetic bipolar resection of bladder cancer: comparison to mono-polar resection and pathologic findings. Int Urol Nephrol 2014;46:1699–1705.

8. Teoh JY, Chan ES, Yip SY, Tam HM, Chiu PK, Yee CH, et al. Comparison of detrusor muscle sampling rate in monopolar and bipolar transurethral resection of bladder tumor: A randomized trial. Ann Surg Oncol 2017;24: 1428‑34.
9. Ozer K, Horsanali MO, Gorgel SN, Ozbek E. Bladder injury secondary to obturator reflex is more common with plasmakinetic transurethral resection than monopolar transurethral resection of bladder cancer. Cent European J Urol 2015;68: 284-288.
10. Del Rosso A, Pace G, Masciovecchio S, Saldutto P, Galatioto GP, Vicentini C. Plasmakinetic bipolar versus monopolar transurethral resection of non-muscle invasive bladder cancer: a single center randomized controlled trial. Int J Urol 2013; 20(4):399–403.
11. Ozer K, Horsanali MO, Gorgel SN, Ozbek E. Bladder injury secondary to obturator reflex is more common with plasmakinetic transurethral resection than monopolar transurethral resection of bladder cancer. Cent European J Urol 2015; 68:284–288.
12. Bostrom PJ, van Rhijn BWG, Fleshner N, Finelli A, Jewett M, Thoms J, et al. Staging and staging errors in bladder cancer. Euro Urol Suppl 2010; 9:2–9.
13. Xie K, Cao D, Wei Q, Ren Z, Fu M, Li J, et al. Bipolar versus monopolar transurethral resection of non-muscle-invasive bladder cancer: a systematic review and meta-analysis of randomized controlled trials. World J Urol 2021;39:1177–1186.
14. Das Gupta RPA. Electrosurgery of the prostate: improvements in electrosurgical unit, transurethral vaporization of the prostate, and bipolar resection. In: Smith Arthur GHB, Preminger GM, Kavoussi LR. editors. Smith's textbook of endourology. 3rd ed. Oxford: Blackwell;2012.p.1592–1601.
15. Sugihara T, Kattan MW, Nishimatsu H, Nakagawa T, Homma Y, Yasunaga H, et al. Comparison of perioperative outcomes including severe bladder injury between monopolar and bipolar transurethral resection of bladder tumors: A population based comparison. J Urol 2014;192:1355–1359.
16. Zhao C, Tang K, Yang H, Xia D, Chen Z. Bipolar versus monopolar transurethral resection of nonmuscle-invasive bladder cancer: a meta-analysis. J Endourol 2016;30:5–12.
17. Mahmoud MA, Tawfick A, Mostafa DE, Elawady H, Abuelnaga M, Omar K, et al. Can bipolar energy serve as an alternative to monopolar energy in the management of large bladder tumours>3 cm? A prospective randomised study. Arab J Urol 2019; 17:125–131.
18. Osman Y, Harraz AM. A review comparing experience and results with bipolar versus monopolar resection for treatment of bladder tumors. Curr Urol Rep 2016; 17:21.
19. Xishuang S, Deyong Y, Xiangyu C, Tao J, Quanlin L, Jibin Y, et al. Comparing the safety and efficiency of conventional monopolar, plasmakinetic, and holmium laser transurethral resection of primary non-muscle invasive bladder cancer. J Endourol 2010; 24:69–73.
20. Venkatramani V, Panda A, Manojkumar R, Kekre NS. Monopolar versus bipolar transurethral resection of bladder tumors: a single center, parallel arm, randomized, controlled trial. J Urol 2014;191:1703–1707.
21. Yang SJ, Song PH, Kim HT. Comparison of deep biopsy tissue damage from transurethral resection of bladder tumors between bipolar and monopolar devices. Korean J Urol 2011; 52:379–383.
22. Mashni J, Godoy G, Haarer C, Dalbagni G, Reuter VE, Al-Ahmadie H, et al. Prospective evaluation of plasma kinetic bipolar resection of bladder cancer: comparison to monopolar resection and pathologic findings. Int Urol Nephrol 2014; 46:1699–1705.
23. Liem E, McCormack M, Chan ESY, Matsui Y, Geavlete P, Choi YD, et al. Monopolar vs. bipolar transurethral resection for non-muscle invasive bladder carcinoma: a post-hoc analysis from a randomized controlled trial. Urol Oncol 2018; 36:338.
24. Cui Y, Chen H, Liu L, Chen J, Qi L, Zu X. Comparing the efficiency and safety of bipolar and monopolar transurethral resection for non-muscle invasive bladder tumors: a systematic review and meta-analysis. J Laparoendosc Adv Surg Techniq 2016; 26:196–202.
25. Cheng YY, Sun Y, Li J, Liang L, Zou TJ, Qu WX, et al. Transurethral endoscopic submucosal en bloc dissection for nonmuscle invasive bladder cancer: A comparison study of hybrid knife‑assisted versus conventional dissection technique. J Cancer Res Ther 2018;14:1606‑12.
26. Gupta NP, Saini AK, Dogra PN, Seth A, Kumar R. Bipolar energy for transurethral resection of bladder tumours at low-power settings: initial experience bipolar TURBT. BJU Int 2011; 108:553–556.
27. Wang DS, Bird VG, Leonard VY, Plumb SJ, Konety B, Williams RD, et al. Use of bipolar energy for transurethral resection of bladder

tumors: pathologic considerations. J Endourol 2004;18:578–582.

28. Truong M, Liang L, Kukreja J, Brien JO, Jean-Gilles J, Messing E. Cautery artifact understages urothelial cancer at initial transurethral resection of large bladder tumours. Can Urol Assoc J 2017; 11:E203.
29. Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin 2018;68:394‑424.
30. Burger M, Catto JW, Dalbagni G, Grossman HB, Herr H, Karakiewicz P, et al. Epidemiology and risk factors of urothelial bladder cancer. Eur Urol 2013;63:234‑41.
31. Bolat D, Gunlusoy B, Degirmenci T, Ceylan Y, Polat S, Aydin E, et al. Comparing the short‑term outcomes and complications of monopolar and bipolar transurethral resection of non‑muscle invasive bladder cancers: A prospective, randomized, controlled study. Arch Esp Urol 2016; 69:225−33.
32. Hashad MM, Abdeldaeim HM, Moussa A, Assem A, Youssif TM. Bipolar vs monopolar resection of bladder tumours of >3 cm in patients maintained on low‑dose aspirin: A randomised clinical trial. Arab J Urol 2017;15:223‑7.

.