COMPARISON OF PERIOPERATIVE OUTCOMES BETWEEN MONOPOLAR AND BIPOLAR TRANSURETHRAL RESECTION OF BLADDER TUMORS

Thesis
Submitted for the partial Fulfillment of the MD Degree in Urology

By

Ahmed Mohamed Kassem
M.B., B. Ch., M. Sc.

Supervised by

Prof. Dr. Ahmed Salah Hegazy
Professor of Urology
Faculty of Medicine
Ain Shams University

Assistant Prof. Dr. Youssef Mahmoud Kotb
Assistant professor of Urology
Faculty of Medicine
Ain Shams University

Dr. Mahmoud Ahmed Mahmoud
Lecturer of Urology
Faculty of Medicine
Ain Shams University

Faculty of Medicine
Ain Shams University
2018

مقارنة النتائج المحيطة بالجراحة بين إستخدام المنظار أحادي القطب وثنائي القطبين فى إستئصال أورام المثانة بالمنظار

رسالة توطئة
للحصول على درجة الدكتوراه فى
جراحة المسالك البولية و التناسلية

مقدمة من
الطبيب/ أحمد محمد قاسم

تحت اشراف

أ.د/ أحمد صلاح حجازى
أستاذ جراحة المسالك البولية
كلية الطب ـ جامعة عين شمس

أ.د.م/ يوسف محمود قطب
أستاذ مساعد جراحة المسالك البولية
كلية الطب ـ جامعة عين شمس

د/ محمود أحمد محمود
مدرس جراحة المسالك البولية
كلية الطب ـ جامعة عين شمس

كلية الطب
جامعة عين شمس
٢٠١٨

ACKNOWLEDGEMENT

First of All thanks to **ALLAH**

I would like to express my deepest gratefulness to my supervisor; ***Prof. Dr. Ahmed Salah Hegazy****, for his support, guidance and continuous advice.*

Also, I would like to express my thanks to ***Assistant Prof. Dr. Youssef Mahmoud Kotb*** *and* ***Dr. Mahmoud Ahmed Mahmoud,*** *for their help through this work.*

I appreciate the indispensable comments, encouragement and generous cooperation offered by all the staff members of urology department in Ain Shams University Hospital to bring this work foreword.

LIST OF CONTENTS

Chapter **Page**

LIST OF ABBREVIATIONS

AJCC	**:**	American Joint Committee on Cancer
ALA	**:**	Aminolevulinic acid
AUA	**:**	American Urological Association
BTA	**:**	Bladder tumor antigen
BLC	**:**	Blue light cystoscopy
bTURBT	**:**	bipolar Transurethral resection of bladder tumor
CBC	**:**	Complete blood count
CIS	**:**	Carcinoma in situ
CT	**:**	Computed Tomography
DM	**:**	Diabetes mellitus
DRE	**:**	Digital rectal examination
FISH	**:**	Fluorescence in situ hybridization
HAL	**:**	Hexaminolevulinic acid
HB	**:**	Hemoglobin
HPV	**:**	Human papilloma virus
HTN	**:**	Hypertension
ICD	**:**	Implanted cardioverter defibrillator
IHD	**:**	Ischemic heart disease
IVU	**:**	Intra venous urography
LN	**:**	Lymph node
MRI	**:**	Magnetic resonance imaging
mTURBT	**:**	Monopolar Transurethral resection of bladder tumor
NBI	**:**	Narrow band imaging
NCI	**:**	National Cancer Institute

NMIBC	**:**	Non Muscle Invasive Bladder Cancer
NMP 22	**:**	Nuclear Matrix Proteins 22
PDD	**:**	Photodynamic diagnosis
PK	**:**	PlasmaKinetic
PUNLMP	**:**	Papillary urothelial neoplasm of low malignant potential
SCC	**:**	Squamous cell carcinoma
SD	**:**	Standard deviation
SPSS	**:**	Statistical package for the social sciences
TCC	**:**	Transitional cell carcinoma
TNM	**:**	Tumor, Node, Metastasis
TURBT	**:**	Transurethral resection of bladder tumor
TURP	**:**	Transurethral resection of prostate
UCC	**:**	Urothelial cell cancer
US	**:**	Ultrasonograohy
USA	**:**	United States of America
WHO	**:**	World Health Organization
WLC	**:**	Wight light cystoscopy

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

Aim of the work: The primary aim of the study was to compare the safety and the efficacy of plasmakinetic bipolar energy versus conventional monopolar energy in TURBT.

Patients and Methods: From November 2015 to June 2017, 40 patients underwent endoscopic resection for primary bladder cancer. They were randomly assigned to two groups: 20 patients underwent a TURBT with bipolar plasmakinetic energy and 20 were treated with conventional monopolar energy. Efficacy was assessed by resection time, catheterization time, hospital stay and pathology. Safety was assessed by obturator nerve reflex, bladder perforation, hemoglobin decrease, and transfusion. Resected tissue was examined by a pathologist who recorded tumor size (>3cm), grade, invasion of the muscularis propria, and presence of muscular invasion. Standard TURBT was performed with conventional Storz monopolar device and glycine fluid was used for irrigation. For bipolar resection, Karl Storz - AUTOCON II 400 ESU bipolar device and normal saline for irrigation was used.

Results: The mean operative time was 22.85 ± 7.52 min for bTURBT and 26.45 ± 5.73 min for mTURBT. In the mTURBT group; obturator reflex was seen in 5 (25%) patients. In the bTURBT group; obturator reflex was seen in one (5%) patient. Bladder perforation was reported in two cases for the mTURBT

group. Only one patient had TUR syndrome for the mTURBT group. No significant differences in the mean change of hemoglobin and serum sodium level were observed. Mean catheterization time was 1.70 ± 1.45 days and 2.55 ± 2.11days for bTURBT and mTURBT, respectively. The mean hospital stay was 1.25 ± 0.55 days and 1.70 ± 0.92 days for bTURBT and mTURBT, respectively.

Conclusions: The results of this study indicated that bTURBT have lower incidence of complications especially bleeding, TUR syndrome, obturator jerks and bladder perforation. bTURBT represents a safe and effective procedure in the management of primary bladder tumors.

Key words: Plasmakinetic energy, transurethral resection of primary bladder tumors (TURBT), bipolar transurethral resection of bladder (bTURBT); monopolar transurethral resection of bladder (mTURBT).

INTRODUCTION

Worldwide, bladder tumor is the fourth most common cancer in men and the eighth in women, with transitional cell carcinoma (TCC) comprising up to 90% of all primary bladder tumors. It is the second most common malignancy affecting the urinary system after prostate cancer. Bladder tumor is three to four times more common in men than in women ***(Jemal et al., 2010)***.

The majority of bladder tumors are TCC (around 90%) and the rest are squamous cell carcinomas, adenocarcinomas and rare varieties like small cell carcinoma. Around 70-75% of the bladder tumors are non-muscle invasive (pTa/pT1), while 25-30% are muscle invasive (pT2 and higher) at presentation ***(Thalmann & Stein, 2008)***.

Transurethral resection of bladder tumor (TURBT) is usually performed for the diagnosis and initial treatment of bladder tumor. Deep biopsy is a definitive step in TURBT for accurate pathologic diagnosis and for determining if conservative treatment is sufficient or more radical treatment is necessary ***(Park et a l, 2010).***

Traditionally, TURBT is performed by a monopolar electrocautery resecting loop with the use of hypotonic irrigation

fluid. The possible complications of this method include bladder perforation, bleeding and fluid absorption causing electrolyte imbalance. Recently, bipolar energy has been used for TURBT. There are several reports of favorable results of bipolar TURBT, including better hemostasis, shorter resection time, decreased obturator reflex, and shorter hospital stay ***(Wang et al, 2013).***

The main difference between monopolar and bipolar systems is in the configuration of the current pathway. The mainstay of bipolar technology depends on its ability to operate in a conductive fluid medium (normal saline) instead of the non-conductive irrigation fluid (glycine)**.** Furthermore, in the conventional monopolar TURBT (mTURBT), the active electrode is represented by the resecting loop, and the return electrode is a diathermic pad placed on the patient's body so that the energy travels a considerable distance through the body to complete the circuit ***(Ahyai et al, 2010).***

In bipolar TURBT (bTURBT), the current does not pass through the patient, as it travels from the active electrode through the irrigation fluid to a negative return electrode. The modified current flow significantly decreases the chances for obturator nerve stimulation, and subsequently the risk of bladder perforation due to spontaneous contraction of the adductor muscle ***(Wuand et al, 2012).***

The energy is transmitted from the loop electrode into the saline solution, allowing it to evaporate and form an interface

layer of gas around the loop. The addition of voltage to the gas causes excitation of the sodium ions to form plasma which is a highly energized layer ***(Zhu et al, 2012).***

During resection, the conductive fluid is converted into a plasma layer around the resecting loop, which gives precise dissection and efficient coagulation, together with a significant reduction of the carbonization process. The plasma layer also avoids the sticking effect of the resected tissue on the loop ***(Reich et al, 2010).***

An important advantage of bipolar electrocautery is less tissue charring and blackening. Excellent visualization of bladder tumor with bipolar resection provides controlled resection and avoids damaging of adjacent structures ***(Lee et al, 2013).***

Another advantage of bipolar energy becomes obvious when treating high-risk patients with bladder tumors, such as those with implanted pacemakers and pregnant women ***(Lee et al, 2013).***

Another proposed advantage of bTURBT is the ability to resect in saline, which helps to avoid TUR syndrome. Because the hypotonic irrigation fluid is essential when performing monopolar electrocautery, excess fluid absorption can lead to TUR syndrome. In the bipolar electrocautery system, by contrast, isotonic saline is used for irrigation. This advantage is very important because all

issues relating to the hypotonic irrigation fluid such as dilutional hyponatremia and TUR syndrome are expected to be eliminated ***(Thomas& Brien, 2010).***