

# HIGH-DEFINITION CAMERA SYSTEMS VERSUS CONVENTIONAL WHITE LIGHT IMAGING ASSISTED RESECTION FOR TREATMENT OF NON-MUSCLE INVASIVE BLADDER CANCER

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## ABSTRACT:

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**Background:** The goal of TURBT in Ta and T1 NMIBC is to make the correct diagnosis and completely remove all visible lesions. High-definition camera systems (1,080 p) provide a >5-fold increase in image resolution.

**Aim of the work:** evaluate its efficacy of HD camera in comparison to gold standard WLI technique in detecting residual or recurrent tumors in a prospective randomized trial

**Patients and methods:** The study conducted in a single referral specialized urology hospital. For patients allocated to treatment Arm A (WLI) Storz telecam SL NTSC color videoscopy system was the used machine. For patients allocated to treatment Arm B (High-definition camera systems), Karl Storz Image 1 HD HUB Camera System was used.

**Results:** Tumor size was  $2.2 \pm 0.8$  in WLI arm while it was  $2.3 \pm 1.1$  in HD camera arm with insignificant P value = 0.5. Re-TUR after 4 – 6 weeks after primary resection to search for residual or recurrent lesions which could be detected. Re-TUR using WLI detect about 16/75 (21.3 %) cases of residual lesions in WLI arm , while it detect 13/85 ( 15.2 % ) lesions in HD camera system arm. After 3 months showed recurrence in 20 patient in WLI arm and 16 patients in HD camera arm with insignificant difference . (p- value 0.6).

**Conclusion:** There is no difference in between gold standard WLI and HD camera mode regarding residual tumor, or tumor recurrence at 3 months.

**Key Words:** Bladder tumor, Recurrence, Resection, Oncology, Diagnosis

## INTRODUCTION:

The vast majority of the newly diagnosed cases are non-muscle invasive bladder cancers (NMIBC), which represent about 75%, and it can be treated with transurethral resection (TURBT). The goal of TURBT in Ta and T1 NMIBC is to make the correct diagnosis and completely remove all visible lesions. The quality of TURBT strongly determines patient prognosis and overall treatment<sup>(1)</sup>.

Recurrence in non muscle invasive bladder tumor could be attributed to one of the four mechanisms (incomplete resection of the primary tumor, tumor cell re-implantation, growth of small residual tumors which present at the time of previous resection, new tumor formation). All those mechanisms termed as " recurrence"<sup>(2)</sup>.

Since its first description, TURBT as all urological procedures used white light image (WLI) as a source of illumination. It is the

standard illumination technique for diagnosis and treatment of NMIBC. WLI has multiple limitations during screening and diagnosis of bladder tumors such as low sensitivity and specificity, residual small and new bladder growth, it is considered operator dependent also. These limitations rise the need more new modalities to enhance visualization of bladder tumors which may lead to better resection during the procedure<sup>(3)</sup>.

High-definition camera systems (1,080 p) provide a >5-fold increase in image resolution. In addition, image filtering and zooming improve picture quality by more than 30%<sup>(4)</sup>.

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#### **AIM OF THE WORK:**

In this study we aimed to test High-definition camera systems modality, which is one of the newest modalities used in the detection of superficial bladder tumors and evaluate its efficacy in comparison to gold standard WLI technique in detecting residual or recurrent tumors in a prospective randomized trial.

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#### **PATIENTS AND METHODS:**

The study conducted in a single referral tertiary hospital. The eligible patient presented with papillary bladder tumor were asked to participate in this study and were provided with an informed consent form in line with Good Clinical Practice and the Declaration of Helsinki. Study participants were enrolled and randomized, and the appropriate scheduled procedures will be performed.

Patients suggestive for NMIBC were included in this study. Exclusion criteria were; tumors beyond scope of resection, patients with poor performance status, history of bladder irradiation, and contracted bladder. The randomization process performed using computer-generated

random tables in a 1:1 ratio. Patients were randomly assigned to the study groups once they signed the informed consent for participation in the study.

All the surgeries performed in lithotomy position under spinal or general anesthesia. EUA and bladder cytology will be obtained in all patient before resection. Complete resection (TURB) of all papillary lesions, and obtain biopsies of all flat lesions and suspicious areas. All patients treated with immediate intravesical instillation of Epirubicin and maintenance therapy and followed up according to last EAU guidelines.

For patients allocated to treatment Arm A (WLI ) Storz telecam SL NTSC color videoscapy system was the used machine. For patients allocated to treatment Arm B (High-definition camera systems), Karl Storz Image 1 HD HUB Camera System was used.

The primary outcome was the three months tumor recurrence rate in both groups. The secondary outcome was to assess residual tumors detected in Re-TUR in both arms. Tumor specimens histopathological examination, which was carried out by an academic pathologist at our institute. Reports will rely on WHO grading 1973 and 2004.

#### **Sample size and statistical analysis:**

Data collected into IBM SPSS20 program (social package for statistical sciences, IBM Corporation; Armonk, New York, USA). The mean and standard deviation of all continuous measures will be recorded at baseline and all subsequent visits. Results will be compared between treatment groups using the chi-square test for categorical variables and the Student t-test for quantitative variables. A Prospective randomized two parallel groups trial is proposed.

Using enhanced imaging technique we would achieve 20 % reduction of 1 – year

## *High-Definition Camera For Bladder Cancer*

recurrence based on previous study of NBI Vs WLI. considering possible drop out of 5 % of cases<sup>(5)</sup>, so the sample size will be 160 patients Type 1 statistical error of less than 5% and Type 2 statistical error of less than 20% will be considered .

### **RESULTS:**

This study was conducted in between May 2019 to August 2021. It started with 200 patients, 160 patients were randomized into the two arms of the study. There were no statical difference in both groups regarding the demographic data which include (Age, sex, blood group, ASA score, Radiology, complain, medical illnesses,

smoking).

Tumor site, architecture, appearance, and number were also compared in the two groups with no significant difference seen in all these variables. Tumor size was  $2.2 \pm 0.8$  in WLI arm while it was  $2.3 \pm 1.1$  in HD camera arm with insignificant P value = 0.5 (table 1).

Re-TUR after 4 – 6 weeks after primary resection to search for residual or recurrent lesions which could be detected. Re-TUR using WLI detect about 16/75 (21.3%) cases of residual lesions in WLI arm, while it detects 13/85 (15.2 %) lesions in HD camera system arm (table).

Table: Tumor criteria at 1ry TURBT

Variables	WLI	HD camera system	P value
Recurrence			
<b>I.</b> Denovo	47 ( 45.6 % )	56 ( 65.8 % )	0.3
<b>II.</b> Recurrent	28 ( 49.1 % )	29 ( 34.1 % )	
Tumor number			0.5
<b>I.</b> Single	32 (42.6%)	48 (56.4%)	
<b>II.</b> Multiple	43 (57.4%)	37 (43.5%)	
Tumor architecture			0.07
<b>I.</b> Papillary	74 (98.6%)	81 (95.2%)	
<b>II.</b> Flat	1 (1.3%)	0	
<b>III.</b> Sessile	0	2 (2.3%)	
<b>IV.</b> Nodular	0	2 (2.3%)	
Tumor size	$2.2 \pm 0.8$	$2.3 \pm 1.1$	0.5
Presence of muscle			0.3
<b>I.</b> Present	61(81.3%)	67 (78.8%)	
<b>II.</b> Absent	14(18.6%)	18 (21.1%)	
Microscopic extent			0.5
<b>I.</b> Invade lamina propria	75 (100%)	85 (100%)	
<b>II.</b> Invade detrusor muscle	0	0	
Residual In Second Look TURBT	16(21.3%)	13(15.02%)	0.4

Inpatient follow up for all cases done using HD camera mode after 3 months and it showed recurrence in 20 patient in WLI arm

and 16 patients in HD camera arm with insignificant difference. (p- value 0.6) (Diagram).

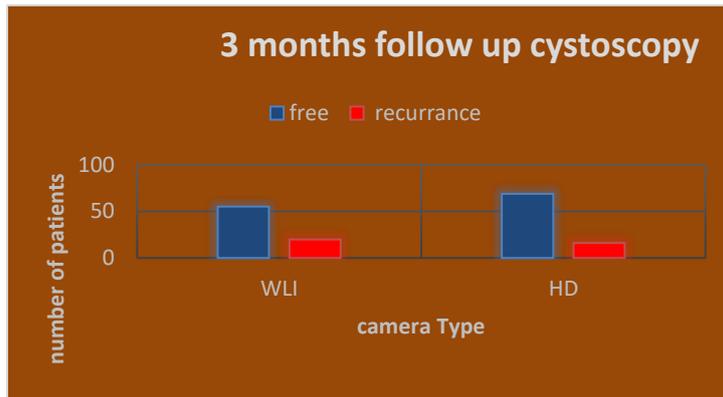


Diagram: Three months follow up cystoscopy

## DISCUSSION:

Bladder tumor is the 2<sup>nd</sup> most common type of urological oncology, 75% were NMIBC, WLI is the gold standard modality that is used to diagnose, treat, and monitor NMIBC. However, multiple cases of tiny papillary growths, CIS have missed<sup>(6)</sup>.

The sensitivity and specificity of WLI alone range from 62% to 84% and 43% to 98%, respectively. Multiple studies found a high level of recurrence or prediction of residual non-resected tumor during Re-TUR(1). For these causes, the need of other imaging modalities to increase the detection possibility of small growing lesions, as it may alter the treatment plan<sup>(7)</sup>.

Many researchers studied the difference between gold standard WLI and other multiple methods such as photodynamic diagnosis (PDD), narrow band image (NBI). NBI was one of the tested modalities, which have been studied for multiple times against the conventional WLI regarding to tumor recurrence rate after TUR resection of papillary bladder tumors.

Clinical trial by Naselli et al. which compared WLI against NBI in a prospective randomized clinical trial including 223 patients those underwent TUR resection using NBI and WLI. One year recurrence rate was 32.9% and 51.4% in NBI and WLI respectively ( $p = 0.0141$ )<sup>(5)</sup>.

The advantage of PDD appears mainly in the detection of NMIBC. On repeat TUR, significantly fewer lesions were found when the initial TURBT was done using PDD compared to conventional WLC: 4% compared to 28% for CIS lesions, 15% compared to 35% for pT1 lesions, and 17% compared to 37% for high grade lesions<sup>(8)</sup>.

Our study is one of the first studies that analyze, discuss, and monitor the probable efficacy of HD camera system modality in comparison to WLI. High-definition camera systems (1,080 p) provide a >5-fold increase in image resolution. In addition, image filtering and zooming improve picture quality by more than 30%<sup>(4)</sup>.

Our patients in both arms underwent Re-TUR after 4 – 6 weeks after primary resection to search for residual or recurrent lesions which could be detected. Re-TUR using WLI detect about 16/75 (21.3%) cases of residual lesions in WLI arm, while it detect 13/85 (15.2%) lesions in HD camera system arm.

The most commonly used approach to follow patients with NMIBC after TURBT (according to American Urological Association guidelines) consists of urinalysis, cystoscopy, and cytology every three months for two years, every six months until five years, and annually thereafter. In addition to clinical follow-up which involves an appropriate patient history including

voiding symptoms, hematuria, and urinalysis<sup>(9)</sup>.

Inpatient follow up for all cases done using HD camera mode after 3 months and it showed recurrence in 20 patient in WLI arm and 16 patients in HD camera arm with insignificant difference ( p- value 0.6).

**Conclusion:**

There is no difference in between gold standard WLI and HD camera mode regarding residual tumor, or tumor recurrence at 3 months. Other studies with larger number is recommended.

**Acknowledgment:**

Non

**Compliance with ethical standards:**

**Conflict of interest:**

Non

**Human and animal rights:**

All procedures were in accordance with the 1964 Helsinki Declaration. Informed consent was obtained from all participants.

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Non

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## دراسة مستقبلية عشوائية للمقارنة بين استئصال اورام المثانة السطحية ما بين استخدام الكاميرا عالية الدقة والكاميرا التقليدية

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**المقدمة:** استئصال اورام المثانة السطحية من العناصر المهمة لتشخيص وعلاج هذا الورم. ومع وجود الكاميرات عالية الدقة بقوة توضيح اكبر بخمس مرات من الكاميرات التقليدية هناك ازدياد لاحتمالية التشخيص الادرى.

**المرضى والطريقة:** تمت هذه الدراسة في مستشفى التامين الصحي على مرضى الاورام السطحية للمثانة البولية. وقد تم تقسيمهم بطريقة عشوائية الي مجموعتين احدهما خضع للتصوير بالكاميرا التقليدية والاخرى بالكاميرا عالية الدقة اثناء استئصال الورم بالمنظار.

**النتائج:** كانت المجموعات متشابهة من حيث الصفات الاكلينيكية للمرضى وايضا من حيث طبيعة الاورام. وتبين اثناء المتابعة بالمنظار بعد ٤-٦ اسابيع من المنظار الاولى وجود بواقي اورام بنسبة ٣,٢١٪ فى مجموعة الكاميرا التقليدية وبنسبة ٢,١٥٪ فى مجموعة الكاميرا عالية الدقة مع عدم وصول هذا الفارق الى فارق ذو قيمة احصائية.

**الخلاصة:** تشير هذه الدراسة الى عدم وجود فارق احصائى ذو قيمة علمية ما بين استخدام الكاميرا العادية والكاميرا عالية الدقة اثناء استئصال اورام المثانة السطحية باستخدام المنظار.