The role of Virtual cystoscopy in diagnosis of bladder mass

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SUMMARY AND CONCLUSION

Bladder carcinoma is the most common tumor among the low urinary tract, accounting for 90% of cancer cases. Several imaging techniques are available to detect bladder neoplasia. However, there is no reliable method for tumor detection, and negative findings require cystoscopy.

Conventional cystoscopy represents the gold standard for diagnosis and local management of bladder carcinoma. However it has many draw backs such as intense discomfort for the patient and bleeding; furthermore, the high cost, invasiveness, and local complications such as infections and mechanical lesions are another well-known drawbacks. Additionally, conventional cystoscopy does not provide information about extravescical extensions of the tumors.

Recent advances in CT including software developments have led to the use of three dimensional (3D) imaging reconstruction techniques and allow CT urography and virtual endoscopy to be used in daily practice.

The main goal of VC was to develop a non-invasive diagnostic tool that would be easily tolerated by the majority of patients, by producing images similar to those acquired by the conventional endoscopy.

At present virtual cystoscopy based on volumetric data obtained with thin section multislice CT and the use of perspective volume rendering technique, seems to be the most accurate radiological method regarding lesion detection in the urinary bladder.

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Mohamed Hassan Dawood Hassan

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LIST OF ABBREVIATIONS

2D : Two dimension

3D : Three dimension

CC : Conventional cystoscopy

CIS : Carcinoma in situ.

CT : Computed tomography

F+ve : False positive

Fig. : Figure

F-ve : False negative

HU : Hounsfield unit

IV : Intravenous

KVP : Kilovolt peak

mAs : Milliampere.seconed

MDCT : Multidetector CT

MIP : Maximum intensity projection

MPR : Multiplaner reconstruction

MRI : Magnetic resonant imaging

MSCT : Multislice CT

No. : Number

SCC : Squamous cell carcinoma

SSCT : Single slice CT

TCC : Transitional cell carcinoma

TUR : Transurethral resection

VC : Virtual cystoscopy

INTRODUCTION

Bladder cancer is one of the most common neoplasms of the urinary tract ,ranking the second most common genitourinary malignancy, also it is considered the forth most common male cancer (after prostate, lung and colon cancers). In women, bladder cancer ranks eighth. ***(Aldousari &Kassouf, 2010)***

It is responsible for 4.5% of all newly diagnosed malignant tumors and 1.9% of cancer deaths in the USA. The incidence of bladder cancer has greatly increased over the last few decades , with more than 60,000 new cases now diagnosed each year in the United States alone.The tumor has a peak incidence in patients 60 years of age and progressively increases with age. It affects males three- times more than females ***(Jamel et al, 2007)***.

Bladder cancer is more common in smokers and those exposed to certain chemicals, such as aniline dyes, a-naphthylamine and benzidine (which are used in the textile, rubber and leather industry) ***(O'Donnell,2007)***.

The majority of bladder cancers are transitional cell carcinomas. They are either superficial (confined to the bladder mucosa or submucosa) or invasive (extending into the muscle layer of the bladder). The two entities vary greatly in terms of management and prognosis, with the former being associated with excellent prognosis and the latter being associated with worse prognosis ***(Mohamed A et al, 2008)***.

The patient usually presents with hematuria. Gross hematuria is an important finding that requires complete

evaluation of the entire urinary tract. Intravenous urography (IVU) and ultrasound, which until now have been used as the first step in evaluating urinary tract, have limitations such as a low sensitivity for small lesion detection ***(Kim and Cho, 2003)***.

Diagnosis of bladder cancer depends on direct visualization of the tumor. This is performed by using Conventional Cystoscopy .This technique directly visualizes lower urinary tract anatomy and macroscopic pathology, and provide biopsy for histopathological diagnosis. It is the criterion standard and the most reliable method in the diagnosis of bladder tumors. During the procedure, diagnosis, staging, and treatment of the tumor can be performed, especially on superficial tumors in which biopsy and resection procedures are possible. ***(Kim et al.,2002)***

Although cystoscopy is the gold standard modality for detecting bladder cancer, it is an invasive procedure with some risk of complications, such as urinary sepsis and iatrogenic injury to the urethra or bladder. Besides, it is often difficult to perform adequate visualization when exploring the anterior bladder wall or a diverticulum cavity. Additionally, there are relative contraindications for conventional cystoscopy, such as urethritis, prostatitis, acute cystitis, obstructive prostatic enlargement and urethral stricture. ***(Lammle M et al,2002)***

CT is usually recommended as a useful radiologic approach for assessing bladder mass, but previous reports have shown that CT has low sensitivity for detection of small bladder lesions. ***(Kim et al, 2002)***.

For CT to depict a small bladder lesion, optimal imaging conditions, including adequate bladder distention and thin-slice scanning, must be satisfied. Therefore, negative findings on CT warrant performance of conventional cystoscopy in patients with hematuria ***(Kim et al, 2002)***.

Recently, three-dimensional computer-rendering techniques with rapid image acquisition have led to the development of virtual-reality imaging. With commercially available software, virtual-reality imaging allows interactive intraluminal navigation through any hollow viscus, simulating conventional endoscopy ***(Gualdi et al, 1999)***.

The urinary bladder is a good candidate for virtual endoscopy because of its simple luminal morphology, its relatively small volume, and the absence of involuntary peristalsis. Therefore, a virtual cystoscopic rendering of the bladder takes a short time to navigate and does not require that the operator have great skill. ***(Kim et al, 2002)***

CT virtual endoscopy images are generated from dedicated multislice helical CT data sets and various three-dimensional reconstruction techniques. These imaging technique can provide endoscopic images of the urinary tract and also provide high spatial resolution images helping overcome some of the limitations of intravenous urography and ultrasound. ***(Kim and Cho, 2003)***

One of the major drawbacks of any radiological technique, as sophisticated and refined as it could become, is that many bladder lesions start as tiny flat lesions more likely to be identified

by conventional cystoscopy rather than by any imaging technique requiring a minimal tumor volume. Inescapably though, it is likely that in the next decade, medicine will move more and more towards completely non-invasive diagnostic techniques, including functional imaging rather than invasive procedures even minimally invasive. ***(Zlotta AR., 2011)***

AIM OF THE WORK

To evaluate and analyze the efficacy of Virtual CT Cystoscopy in complementation of the role of conventional cystoscopy and providing additional data in diagnosis and management of patients with bladder mass and this is achieved by: Comparison between the results of Virtual Cystoscopy and Conventional Cystoscopy in these patients.