Role of CT Virtual Cystoscopy in the diagnosis of cancer bladder

Thesis
Submitted for Partial Fulfillment for M.D. Degree in Radiodiagnosis

By

Ahmed Hassan Farag Garamoun
M .B, B. Ch, M.Sc.

Supervised By

Dr. Omar Hussein Omar
Professor of Radiodiagnosis
Faculty of Medicine
Ain Shams University

Dr. Mostafa Mahmoud Gamal El-Din
Assistant Professor of Radiodiagnosis
Faculty of Medicine
Ain Shams University

Faculty of Medicine
Ain Shams University
2012

Acknowledgement

First and foremost, I feel always indebted to ***ALLAH****, the most kind and the most merciful.*

I would like to express my sincere thanks and deep gratitude to ***Prof. Dr. Omar Hussien Omar*** *Professor of Radiodiagnosis, Ain Shams University, for his encouragement, support and his extreme effort in making that study possible. I am greatly honored and pleased to have the opportunity to learn from his creative advice and expanded experience.*

I would like also to emphasis the great help of ***Dr. Mostafa Mahmoud Gamal El-Din,*** *Assistant Professor of Radiodiagnosis, Ain Shams University, for being a patient teacher and for his sincere help and guidance to bring this work to reality.*

Finally, I would like to express my deep gratitude to all the staff in ***Misr Radiology center*** *for their cooperation and continues help.*

TO My Family

CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATION

2D	**:**	Two dimensions
3D	**:**	Three dimensions
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 per second
MDCT	**:**	Multidetector CT
MIP	**:**	maximum intensity projection
MPR	**:**	multiplaner reconstruction
MRI	**:**	Magnetic resonant imaging
MSCT	**:**	Multislice CT
No.	**:**	Number
SCC	**:**	Squamous cell carcinoma
TCC	**:**	Transitional cell carcinoma
TUR	**:**	Transurethral resection
US	**:**	Ultrasound
VC	**:**	Virtual cystoscopy

INTRODUCTION

Bladder cancer is the most common malignant tumor of the urinary tract and it is two to five more common in males than females. Its prevalence increases with age.***(Masahiro et al., 2007)***

In Egypt, where Bilharziasis is endemic bladder cancer is the commonest cancer in male and the second in females, squamous cell carcinoma (SCC) is the commonest type found. It accounts for as many as 31% of all cancer cases. Currently, it ranks first in males representing 16.2% of male cancer. The estimated incidence in males in rural areas in Egypt is about 32 per 100.000. The male to female ratio is 5.5: 1. ***(Zarzour et al., 2008)***

The exact etiology of bladder cancer is still unknown. Several risk factors have been accused as being involved in its pathogenesis such as schistosomiasis, cigarette smoking, synthetic nitrogen fertilizers, organophosphate-based pesticides, aromatic amines, pelvic irradiation, cyclophosphamide, bladder stones, chronic cystitis and some occupations. The relative importance of such risk factors in the pathogenesis of the disease differs in different population. ***(Cohen and Johansson, 2006)***

Most patients present with hematuria that may be intermittent, other symptoms may include vesical irritability;

dysuria; flank pain from obstruction, and or a pelvic mass. Cytological results from urine specimens may provide a diagnosis or steer the differential diagnosis in the right direction. Imaging studies are important in the diagnosis, staging of bladder cancer. ***(Eduardo et al., 2005)***

Conventional radiography is of limited use in bladder cancer. Calcifications visible at plain radiography are rare. A pelvic mass needs to be large before it is visible on a plain radiograph. Intravenous urography has been the primary method of evaluating patients with hematuria for many years. Bladder wall irregularities and filling defects may point to the presence of neoplastic disease. Unfortunately, intravenous urography demonstrates only 60% of all known bladder tumors. Ultrasonography (US) is inexpensive and allows detailed visualization of the bladder. With the usage of color Doppler US, determination of vascularity within a lesion is possible. Color Doppler US remains a powerful way to determine the nature of a lesion, but US does not allow evaluation of the entire genitourinary tract. ***(Eduardo et al., 2005)***

CT allows recognition of vesical, ureteral, and renal synchronous lesions, as well as local spread, lymphadenopathy, and metastatic disease. Some tumors are not easily detectable with

CT and the role of CT in staging is limited by its inability to resolve the different layers of the bladder wall***.(Paula et al., 2006)***

CT virtual cystoscopy has emerged as a promising diagnostic tool for the detection of bladder cancer, as it combines both staging and visualization of the lesion by non invasive technique and its diagnostic merits have been proven by investigators.***(Masahiro et al., 2007)*.**

The final diagnosis of bladder cancer is usually established with cystoscopy and biopsy of the lesion and is considered as standard diagnostic approach; however it has its drawbacks like high cost, possibility of urinary tract injury, sepsis and inability to detect extravesical disease. ***(Jae Hong et al., 2002)***

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

The aim of the work is to evaluate the role of CT virtual cystoscopy in the diagnosis of cancer bladder and to compare it with other standard techniques.

ANATOMY OF THE URINARY BLADDER

I- Gross anatomy:-

(A) Embryology of the urinary bladder:-

The cloaca (the terminal hindgut expansion) is partitioned by the fusion of the urogenital folds so that the urogenital sinus acquires its own separate urogenital membrane. The urogenital sinus continues cranially as the allantios. The urogenital sinus is divided into three parts: a wide cranial part that will form the presumptive bladder, the narrower pelvic urethra and the wide presumptive definitive urogenital sinus. The urogenital sinus is an endodermal structure surrounded by mesoderm. ***(McLachlan, 1994).***

During differentiation of the cloaca the caudal portions of the mesonephric ducts are absorbed into the wall of the urinary bladder. Consequently, the ureters, initially outgrowths from the mesonephric ducts, enter the bladder separately. Since both the mesonephric ducts and ureters originate in the mesoderm, the mucosa of the bladder by incorporation of the ducts (the trigone of the bladder) is also mesoderm. With time the mesodermal lining of the trigone is replaced by endodermal epithelium, so that finally the inside of the bladder is completely lined with endodermal epithelium. ***(Sadler, 2000)***

The urachus, which is the fibrous remnant of allantios, runs superiorly in the extraperitoneal fat to the umbilicus as the median umbilical ligament ***(Kabala et al., 2003).***

(B) Anatomy of urinary bladder:

The urinary bladder is a muscular reservoir of urine which lies in the anterior part of the pelvis and gets emptied through the urethera ***(Chaurasia, 2010).***

The bladder varies in size, shape, position and relations according to the amount of fluid it contains, as well as with the state of distension of the neighbouring viscera ***(Williams et al., 1995).***

The bladder is an abdominal organ in infant and young child; it subsequently becomes a pelvic organ in adults ***(Tanagho, 1992).***

The empty bladder is situated entirely within the pelvic cavity. As the bladder distends, it domes up into the abdominal cavity. The empty bladder is a flattened three sided pyramid, with apex, triangular base (trigone), two infero-lateral surfaces, a neck and a superior surface (dome) ***(Sinnatamby, 1999).***

The apex of the bladder is directed toward the top of the pubic symphysis as the median umbilical ligament which continues from it superiorly up to the umbilicus ***(Drake, 2008)***

The base of the bladder is shaped like an inverted tri-angle and faces posteroinferiorly. The two ureters enter the bladder at each

of the upper corners of the base and the urethra drains inferiorly from the lower corner of the base. The triangular area between the openings of the ureters and urethra on the inside is known as the trigone ***(Drake, 2008).***

In the empty bladder, these three openings are 2.5 cm apart from each other but when distended, the uretral orifices may be 5 cm apart. ***(Tanagho and McAninch, 2008).***

In females, it is closely related to the anterior vaginal wall, in males it is related to the rectum, although separated from it above by recto-vesical pouch and below that by seminal vesicles and deferent ducts. In a triangular area between the deferent ducts, the bladder and rectum are separated only by recto-vesical fascia, commonly known as Denonvillier's fascia, the inferior part of this area may be obliterated by approximation of the deferent ducts above the prostate ***(Dyson, 1999).***

The inferior angle of the bladder in female lies at a lower level than in male and is closely related to the lower levator ani muscle ***(Weiss et al. 2001).***