Evaluation of The Role of Virtual Cystoscopy in Detection and Diagnosis of Bladder Masses

Essay
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Walaa Mohamed Gomaa

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List of Abbreviations

AJCC	**:**	The American Joint Committee on Cancer.
CT	**:**	Computed Tomography.
CTVC	**:**	Computed Tomography Virtual Cystoscopy
3D	**:**	Three Dimensional.
DD	**:**	Differential Diagnosis.
F	**:**	French.
H.U	**:**	Hounsfeild Unit.
IMT	**:**	Inflammatory Myofibroblastic Tumors
I.V	**:**	Intra Venous.
K V	**:**	kilo Volt.
L2	**:**	Second Lumbar Vertebrae.
mAs	**:**	Millie Ampere second .
Mic	**:**	microscopic.
MIP	**:**	Maximum intensity projection.
MRI	**:**	Magnetic Resonance Imaging.
MSCT	**:**	Multislice Computed Tomography .
PCs	**:**	Personal computers.
Rt	**:**	Right**.**
SCC	**:**	Squamous Cell Carcinoma.
SSD	**:**	Surface Shaded Display.
T11	**:**	Eleventh thoracic vertebrae.
TCC	**:**	Transitional Cell Carcinoma.
T.N.M	**:**	Tumor-Node-Metastasis.
UICC	**:**	The Union International Contre Le Cancer
US	**:**	Ultrasound .
VC	**:**	Virtual Cystoscopy**.**
VE	**:**	Virtual Endoscopy.
VR	**:**	Volume Rendering.
WHO	**:**	World Health Organization.

INTRODUCTION

Cancer of the urinary bladder is predominantly a disease of older men. This disease represents 6% of all malignancies in men , making it the fourth most common tumor. In women, bladder carcinoma represents 2% of malignancies, making it the seventh most common tumor (**Kundra and Silver, 2004**).

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**). For evaluation of the urinary bladder, conventional cystoscopy is a standard diagnostic approach; however, this procedure also has drawbacks, including its high costs and invasiveness that may lead to iatrogenic bladder injury and urinary sepsis (**Webb, 1997).**

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

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 external and 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).**

Aim of the Work

The aim of the work is to describe the techniqual aspects, the utility, advantages and limitations of computed topographic (CT) virtual cystoscopy in the detection and diagnosis of bladder tumors in comparison to conventional cystoscopy.

Anatomy of The Urinary Bladder

The urinary bladder is solely a reservoir and varies in size, shape, position and relations according to its content and the state of neighboring viscera (**Dyson, 1999).**

When empty, the adult bladder lies behind the symphysis pubis and is largely a pelvic organ. At birth (Fig.1), the bladder is relatively higher than in the adult, the internal urethral orifice being level with the upper symphyseal border; the bladder is abdominal rather than pelvic, extending about two-thirds of the distance towards the umbilicus. It progressively descends, reaching the adult position shortly after puberty. When over distended as in acute or chronic urinary retention, it may cause the lower abdomen to bulge visibly and it is easily palpable in the suprapubic region. The empty and contracted bladder is shaped rather like a truncated forepart of a ship having neck, apex and 4 surfaces (a superior, 2 inferolateral or sides and a posterior surface or base) (**Dyson,1999).**

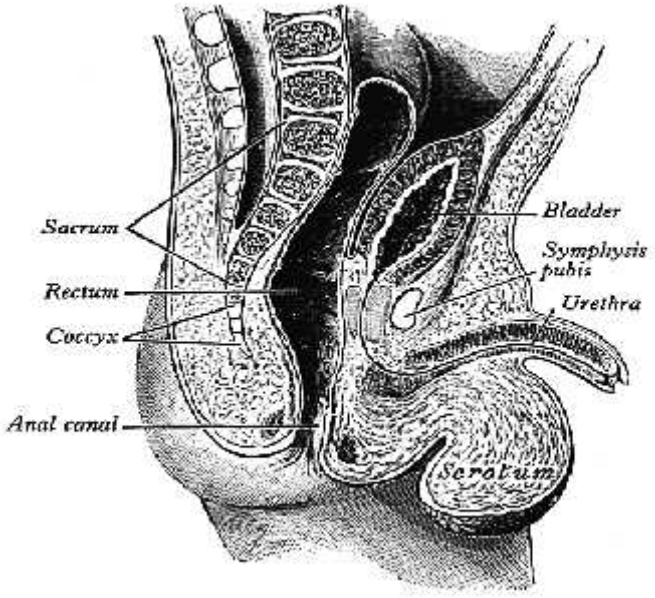

Fig. (1): Sagittal section of the pelvis of a newborn male infant
(Quoted from Dyson, 1999)

The neck :

Is the lowest and the most fixed part, It is 3-4 cm behind the lower part of the symphysis pubis. It is pierced by the internal urethral orifice and alters little in position with varying conditions of the bladder and rectum. There is no special vesical constriction at its neck, In males the neck rests on and in direct continuity with the base of the prostate.

The apex :

In both sexes faces towards the upper part of the symphysis pubis, from it the median umbilical ligament (urachus) ascends behind the anterior abdominal wall to the umbilicus, the peritoneum over it will be the median umbilical fold.

The Superior Surface :

In males it is completely covered by peritoneum extending slightly into the base and continued posteriorly into the rectovesical pouch (Fig.2), laterally into the paravesical fossae and anteriorly into the median umbilical fold. It is in contact with the sigmoid colon and the terminal coils of the ileum.

In females the superior surface is also largely covered by peritoneum but posteriorly this is reflected to the uterus at the level of the internal os forming the vesico-uterine pouch (Fig.3).

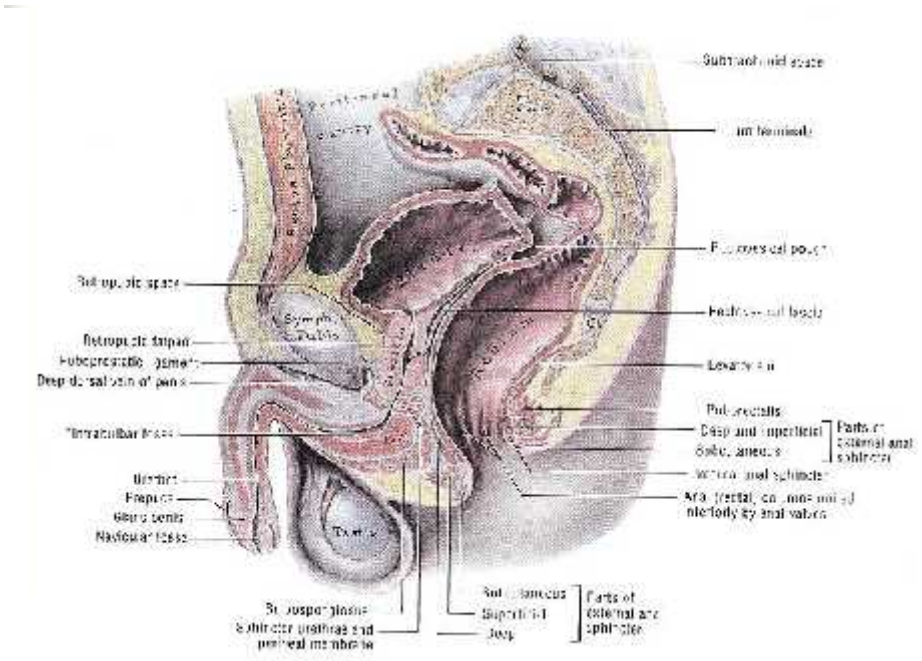

Fig. (2): Median sagittal section to show male internal and external genitalia and bladder ***(Quoted from Williams et al., 2005).***

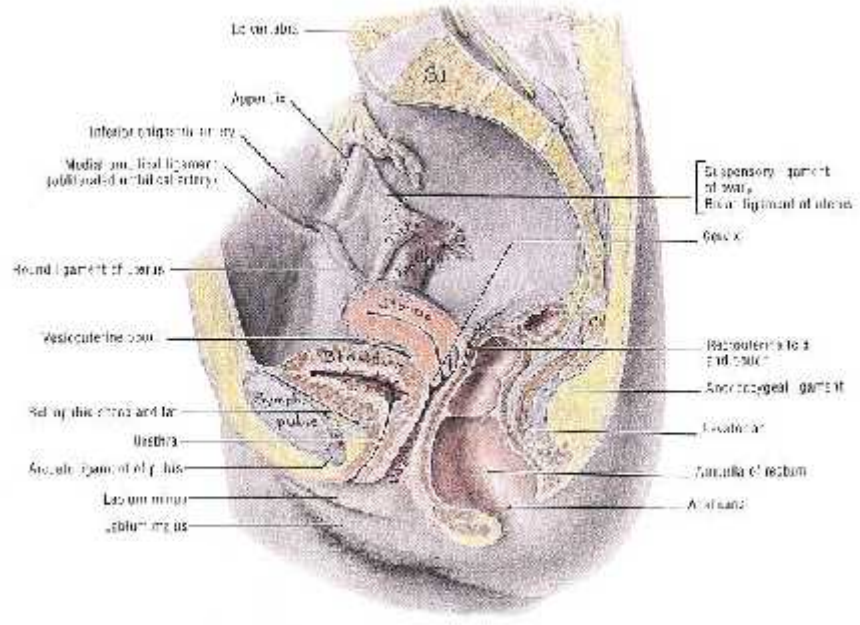

Fig. (3): A Median sagittal section through a human female pelvis. ***(Quoted from Williams et al., 2005)***