

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

Essay

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List of Figures

Fig. No.	Figure title	Page No.
1	Sagittal section of the pelvis of a newborn male infant.	3
2	Median sagittal section to show male internal and external genitalia, bladder.	5
3	A Median sagittal section through a human female pelvis.	5
4	Posterosuperior aspect of the male internal urogenital organs.	6
5	Normal bladder wall. Figure shows the histological anatomy of the urinary bladder	9
6	Anterior aspect of the interior of the urinary bladder.	10
7	Blood supply of the urinary bladder	12
8	Lymphatic drainage of the urinary bladder	13
9	Normal CT anatomy of male urinary bladder.	16
10	Normal CT anatomy of female urinary bladder	17
11	Gross picture of leiomyoma.	20
12	Microscopic picture of leiomyoma.	20
13	Microscopic picture of Neurofibroma.	21
14	Microscopic picture of Pheochromocytoma.	22
15	Gross picture of Pheochromocytoma.	22
16	Microscopic picture of Bladder Urothelial Carcinoma, Transitional Cell Carcinoma: papillary, invasive.	24
17	Gross picture. of bladder Urothelial Carcinoma, Transitional Cell Carcinoma	25
18	Papillary carcinoma of the bladder.	25










Fig. No.	Figure title	Page No.
19	Microscopic picture of Squamous cell carcinoma.	27
20	Illustration of the definitions of primary tumour (T) for primary bladder cancer, ranging from Ta to T4.	31
21	Stages of tumour invasion in bladder cancer.	32
22a, b	CT image and Virtual cystoscopy image of normal bladder	52
23	Bladder trabeculation. Virtual cystoscopy image.	55
24a,b,c.	Difference in virtual images quality at the late data sets with contrast filled urinary bladder at CTVC.	57
25a,b,c	Difference in virtual images quality of CTVC contrast filled image because of inadequate mixing of contrast material and urine	58
26a,b	False-positive finding of lesion is reported due to air bubble in bladder virtual image and CT image.	59
27	Motion artifact at CTVC	60
28	Squamous cell carcinoma in axial CT images	61
29a,b	A case of cystitis glandularis in the dome of the bladder seen only by CTVC.	62
30a,b	Importance of Axial images in evaluation of the extra luminal component or extra vesical pseudo lesions	63
31a,b	Various cases of sessile lesions.	64
32a,b	A case of urothelial carcinoma presented with a sessile lesion on the virtual images.	65
33a,b	A case of transitional cell carcinoma virtual image and CT image.	65
34a,b	Virtual cystoscopic and transverse CT images show a bladder mass extending into a bladder diverticulum	66

Fig. No.	Figure title	Page No.
35a,b	Capability of CTVC in detection of lesions less than 5 mm. example 1.	67
36a,b	Capability of CTVC in detection of lesions less than 5 mm. example 2	68
37a,b	Capability of CTVC in detection of lesions less than 5 mm. example 3	68
38	A case of TCC of the posterior wall of the UB.	69
39a,b	Areas of wall thickening are seen on virtual images, they are all conspicuous on the axial CT views.	70
40a,b	The calcification associated with polypoid masses are seen on only transverse images and not on the virtual images example 1.	71
41a,b,c	The calcification associated with polypoid masses are seen on only transverse images and not on the virtual images example 2.	71
42a,b	Direct invasion of adjacent malignant tumours to the bladder is demonstrated as a protruding mass into the bladder.	72
43a,b	Capability of Virtual cystoscopy in providing a unique aspect for viewing the bladder	73

List of Tables

Table No.	Table title	Page No.
1	Stage Grouping of urinary bladder carcinoma.	33

Contents

	Page
 Introduction.....	1
 Aim of the Work	2
 Anatomy of the urinary bladder	
▪ Gross anatomy	3
▪ CT Anatomy	15
 Pathology of urinary bladder tumors	19
 Technical aspect CT virtual cystoscopy	43
 Virtual cystoscopy of bladder tumors	61
 Summary and Conclusion	74
 References	79
 Arabic Summary.....	--

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 technical 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**).

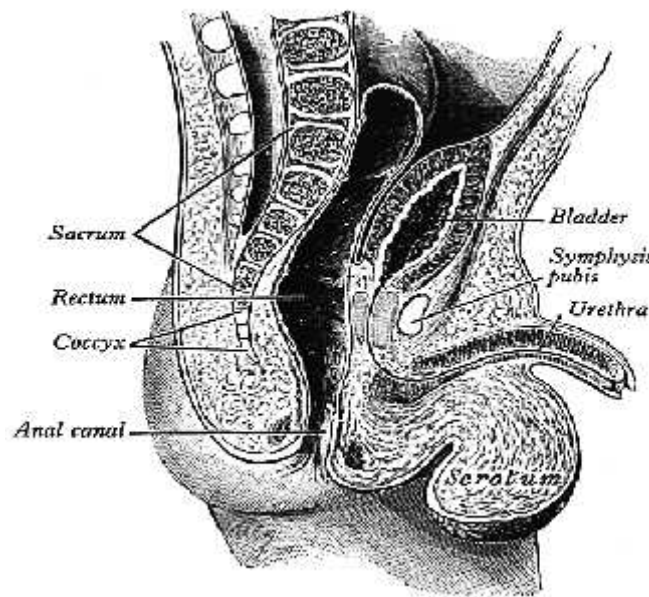


Fig. (1): Sagittal section of the pelvis of a newborn male infant
(*Quoted from Dyson, 1999*)

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).

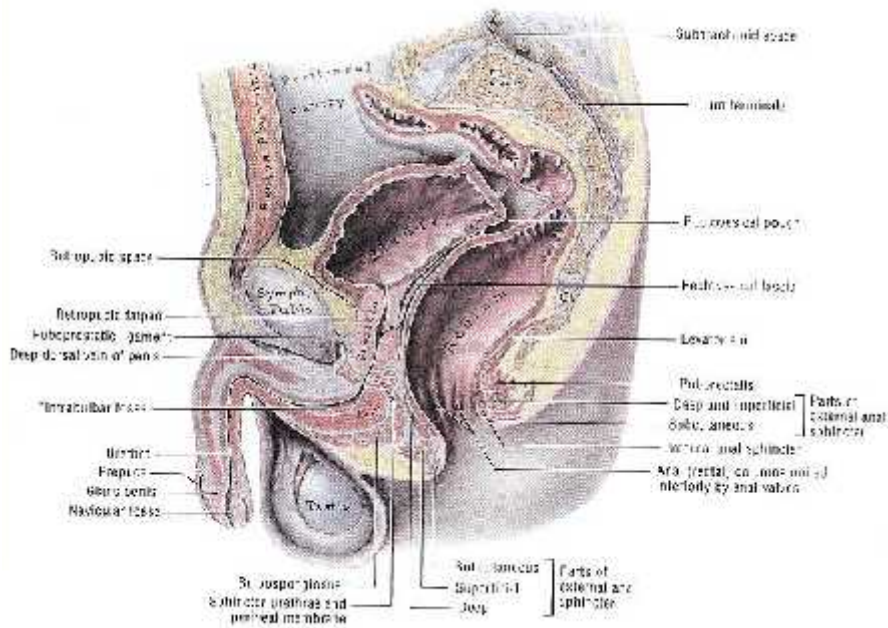


Fig. (2): Median sagittal section to show male internal and external genitalia and bladder (*Quoted from Williams et al., 2005*).

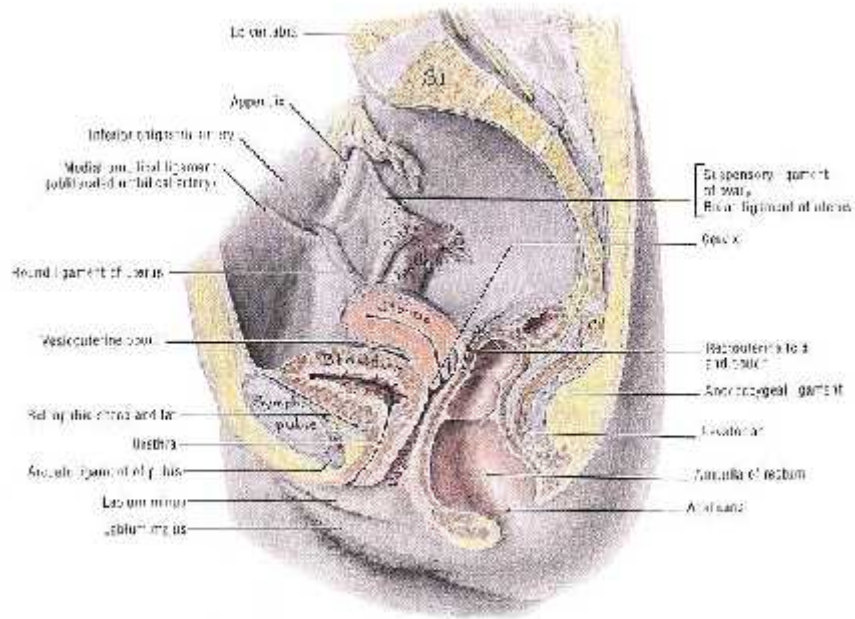


Fig. (3): A Median sagittal section through a human female pelvis.
(Quoted from Williams et al., 2005)