Sudan University of Science and Technology

College of post Graduate Studies

Study of Urinary Bladder Outlet Obstruction Using Ultrasound

دراسة قفل مخرج المثانة البولية بإستخدام التصوير بالموجات فوق الصوتية

A Thesis Submitted in Partial Fulfillment of the Requirements of M.Sc. Degree in Medical Diagnostic Ultrasound

By:

Hala Abdelaziz Eltyeb

Supervisor:

Dr. Mona Ahmed Mohammed

2017

الآيـة

بسم الله الرحمن الرحيم

قَالَ تَعَالَىٰ:

﴿ وَٱللَّهُ أَخْرَجَكُم مِّنۢ بُطُونِ أُمَّهَٰتِكُمْ لَا تَعْلَمُونَ شَيْـًٔا وَجَعَلَ لَكُمُ
ٱلسَّمْعَ وَٱلْأَبْصَٰرَ وَٱلْأَفْـِٔدَةَ ۙ لَعَلَّكُمْ تَشْكُرُونَ ﴾

صدق الله العظيم

سورة النحل الآية 78

Dedication

To my parents

To my sisters & brothers

To my teachers

To my friends

To every one help me in this work

Acknowledgement

My acknowledgements and gratefulness at the beginning and at the last is to **Allah** who gave us the gift of the mind.

My gratitude is extended to my supervisor **Dr. Mona Ahmed** for her support and guidance, without her help this work could not have been accomplished.

My gratitude is also extended to the radiology department in Sharg alnil Hospital for their help and support.

Finally, my profound thanks and gratitude to everyone who encourage me to complete this thesis.

Abstract

The main objective of this study is to evaluate the capability of ultrasound to identify the urinary bladder outlet obstruction (BOO) in Sharg Alneel Hospital during period from June 2016 to January 2017.

The sample of this study consisted of patients with age range from 60-80 years.

The result of this study showed that forty four patients 88% out of fifty patients had an enlarged prostatic gland, and two patients had calculi 4% and two patients 4% had bladder cancer, one patient 2% had diverticulum, one patient 2% had urethral stricture.

The study shows that bladder outlet obstruction (BOO) in men is mostly caused by benign prostatic hyperplasia. Bladder outlet obstruction induces significant alterations in the urinary bladder wall especially in advance cases and also impaired ability of the urinary bladder to store and empty urine.

According to these results there was a clear proportional relation between the prostatic gland's enlargement and the age of the patient.

The residual urine depends on the type of the cause of the obstruction.

The researcher found that measuring the prostatic gland size through an empty urinary bladder was not reliable.

المستخلص

كان الهدف من هذه الدراسة هو تقييم مقدرة الفحص بالموجات فوق الصوتية لمعرفة إعاقةمخرج المثانة البولية، أجريت هذه الدراسة في مستشفي شرق النيل في الفترة من يونيو 2016 الي يناير 2017.

نظمت طريقة جمع المعلومات بحيث توخذ بطريقة واحدة تعتمد أساسا علي فحص الموجات فوق الصوتية.

تم فحص خمسون مريضا بواسطةالموجات فوق الصوتية باستخدام جهاز ميندري ذو تردد 3,5-5 ميقا هيرتز.

وجدت الدراسة أن هناك أربعة و أربعين 88% من جملة الخمسين كان لديهم تضخم في غدة البروستات وأن مريضين 4% لديهم حصوة ، ومريضين 4% لديهم ورم في المثانة البولية، وواحد مريض 2% لديه ضيق في مجري البول، وواحد مريض 2% لديه الرًدب.

وأيضا وجدت الدراسة أن إعاقة مجري المثانة البولية يحدث تغيرات في سماكة جدار المثانة وعلي الأخص في الحالات المتقدمة وكذلك له تأثير في تخزين وتفريغ البول من المثانة البولية وهذا يعتمد علي نوع المرض، كما وجدت الدراسة أن هنالك علاقة طردية واضحة بين حجم غدة البروستات وعمر المريض.

كما وجد أنه لايمكن الإعتماد علي نتائج قياس حجم غدة البروستات عبر مثانة بولية فارغة.

List of Contents

Contents	Page No
الآية	I
Dedication	II
Acknowledgement	III
Abstract	IV
المستخلص	V
List of contents	VI
List of Tables	IX
List of Figures	X
List of Abbreviations	XI
Chapter one	
Introduction	
1 -1 Introduction	1
1-2 Problem of study	2
1-3 Objectives of the study	2
1-4 Importance of the Study	2
1-5 Overview of the study	2
Chapter two	
Literature Review and Background Studies	
2-1.The Urinary Bladder	4
2-1.2 Anatomy	4
2-1-2-1.Blood supply	6
2-1-2-2. Lymph Drainage	7
2-1-2-3. Nerve Supply	7
2-1-3. Urinary Bladder Functions	7
2-1-4. Micturition	8
2-1-5. Bladder Pathology	9
2-1-5-1.Bladder Wall Thickening	9
2-1-5-2. Cystitis	10
2-1-5-3.Neurogenic Bladder	10
2-1-5-4.Bladder Diverticula	11
2-1-5-5.Dislodged or Obstructed Foley Catheters	11
2-1-5-6. Bladder Calculi	11

2-1-5-7.Blood Clots ………………………………………. 11
2-1-5-8. Foley Catheter …………………………………… 12
2-1-5-9. Tumors of the urinary bladder……………………….. 12
2-1-5-10. Bladder Neck Obstruction ………………………….. 12
2-1-5-11.Urachal Anomalies ……………………………… 13
2-2-1.Prostate Anatomy …………………………………... 14
2-2-2. Prostate Pathology …………………………………... 15
2-2-2-1.Nodular hyperplasia of the prostate…………………… 15
2-2-2-2. Prostate cancer …………………………………… 16
2-3.The Ultrasound (U/S) ………………………………….. 17
2-3-1. Definition …………………………………………... 17
2-3-2.Ultrasound generation and detection …………………… 18
2-4. Normal Bladder Ultrasonography ……………………..…. 19
2-4-1. Imaging technique ……………………………..…. 19
2-4-2. Adult Bladder Volume Measurement …………………..…. 20
2-5. General Appearance of Abnormal Bladder…………….….. 23
2-5-1. Generalized Thickening of the Bladder Wall…………….. 23
2-5-2. Localized Thickening of the Bladder Wall …………….. 24
2-5-3. Differential Diagnosis of Localized Bladder Wall Thickening …………………………………………… 25
2-5-4. Density With in The Bladder ……………………… 25
2-5-6. Small Bladder ……………………………………… 30
2.6 Previous studies ………………………………………. 32

Chapter three

Methodology

3-1.Materials ……………………………………………
3-1-1.Patient ……………………………………………
3-1-2.Equipment Used …………………………………..… 31
3-2.Methods ……………………………………………… 31
3-2-1. U/S Technique …………………………………… 31
3-2-2. Data Analysis ……………………………………
3-2-3.Data collection sheet ……………………………..… 31

Chapter four

Results

Results 31-35

Chapter Five

Discussion, Conclusion &Recommendations

5-1. Discussion 36

5-2. Conclusion 38

5-3.Recommendations 39

Reference 40

Appendices... 42-47

List of Tables

Table No.	Title	Page
4-1	the frequency distribution of the urinary bladder outlet obstruction according to the study	31
4-2	Bladder size before micturition and Bladder size after micturition statistics	34
4-3	Bladder size before micturition and Bladder size after micturition Test	34

List of Figures

Fig NO	Title	Page
(2-1)	Male urinary bladder	5
(2-2)	Urinary bladder	6
(2-3)	Normal full bladder and measurement: transverse scan (left) and longitudinal scan (right).	21
(2-4)	Two transverse scans showing thickening and irregularity of the bladder wall.	27
(2-5)	A sessile polyp in the bladder .	27
(2-6)	Transverse scan: Pseudo tumor in the bladder, caused by blood clots.	28
(2-7)	Transverse scan prominent uretrocile.	28
(2-8)	longitudinal scan a markedly enlarge prostate.	28
(2-9)	Transverse scan distortion of the bladder wall by pressure from a large utering myoma.	29
(2-10)	Longitudinal of the urinary bladder demonstrating a small diverticulum which was found incidentally	29
(2-11)	Transverse bladder in a patient with diabetes, pyelonephritis and hydronephrosis.	30
(4-1)	the frequency distribution of the urinary bladder outlet obstruction according to the study	31
(4-2)	Age of patient and prostate size	32
(4-3)	Prostate size and bladder size before micturition	32
(4-4)	Prostate size and bladder size after micturition	33
(4-5)	Bladder size before micturition and Bladder size after micturition	33

List of Abbreviations

BOO	Bladder Outlet Obstruction
Cm	Centimeter
S2	The Second Sacral Vertebra
S4	TheFourth Sacral Vertebra
i.e.	In example
ML	Milliliter
CT	Computed tomography
BPH	Benign prostatic hypertrophy
U/S	Ultrasound
KHz	Kilohertz
Cycles/s	Cycles per Second
MHz	Megahertz
TA	Transabdominal
R.U.V	Residual Urine Volume
T.C.C	Transitional Cell Carcinoma
S.D.	Standard Deviation
T	Tumor

Chapter One

Introduction

Chapter one

1-1.Introduction:

Formal Urologic Ultrasound is adetailed examination of urinary bladder performed by a radiologistor radiology technician .Recent advances in technology have made ultrasound equipment readily available for internal medical practice .The development of versatile portable and hand-carried ultrasound machines has significantly improved its utility and clinical accuracy.Many clinicians without formal radiologic training have acquired sufficient skills to perform limited focused examinations. While portable is not apreferred tool for a comprehensive examination,it is a powerful and inexpensive modality particularly well-suited for quick and efficient evaluation. Ultrasound has become a valuable tool to supplement the information obtained through routine history,physical examination, and laboratory studies.

Easy accessibility of major organs of the urinary system makes ultrasound acommonly performed test.Urinary bladder sonography has multiple applications including initial evaluation of patients with flank pain, haematuria, complicatedurinary tract infection,decreased or absent urine output, lower urinary tract syndrome, urolithiasis. In addition, many abnormalities may be found incidentally during sonographic evaluation (Alexander& etal, 2011).

1-2.Problem of study:

Many patients coming with the urinary bladder outlet obstruction complaining of dysuria (painful micturition) ,haematuria(blood in urine),reduced amount of urine or even Anuria which lead to complications such as renal failure.

1-3.Objectives of the study:

1-3-1.General Objectives:

To study the urinary bladder outlet obstruction to detect main causes of it.

1-3-2.Specific Objectives:

-To measure the urinary bladder size and prostate size.

-To correlate the age of the patient with prostate size.

-To correlate between the bladder size before and after micturition.

1-4. Importance of the Study:

This study will show the role of ultrasound in assessment of urinarybladder outlet obstruction and it show also limitation of this method in diagnosing some bladder diseases.

1-5. Overview of the study:

The following chapters will be laid in five chapters:

Chapter One: Introduction, Objectives of study, Importance of the study, and overview of the study.

Chapter Two: Literature Review and background studies

Chapter Three: Methodology.

Chapter Four: Results.

Chapter Five: Discussion, Conclusion, Recommendations.

Reference.

Appendices.

Chapter Two

Literature Review

& Background Studies

Chapter two

Literature Review

2-1.The Urinary Bladder:

2-1.1.Embryology:

The urinary bladder develops in two stages from the cloaca and the urogenital sinus. The urogenital sinus arises from the partitioning of the cloaca into the dorsal rectum and the more ventral urogenital sinus. The urogenital sinus serves as the origin of the urachus, urinary bladder, and proximal urethra. Progressive attenuation of the urachus forms the umbilical ligament in the adult, which retains and attachment to the bladder dome.

The caudal urogenital sinus makes contact with an ectodermal invaginationat the urogenital membrane, there by forming the complete urethral lumen. Thus, the bladder and the urethral urothelium are of endodermal origin. With exception of the most distal segment, which is ectodermal (Emanuel R, John, Farber, 1999).

2-1.2 Anatomy:

The bladder is a muscular reservoir that receives urine via the ureters and expels it via the urethra. In children up to 4 years of age, it lies predominantly in the abdomen; in the adult it is a pelvic organ, well protected in the bony pelvis. Superiorly, the bladder is covered with peritoneum, which separates it from coils of small bowel, the sigmoid colon and,in female, the body of the uterus. Posteriorly lie the rectum, supra-vaginal cervix in the female. Inferiorly, the neck of the bladder transmits the vas deferens and seminal vesicles in the male, and the vagina and the urethra and fuses with the prostate in the male and with pelvic fascia in the female. The bladder is composed of whorls of detrusor muscle, which in male become circular at the bladder neck. They are richly supplied with sympathetic nerves that cause contraction during ejaculation, thereby preventing semen from entering the bladder (retrograde ejaculation).

There is no such sphincter in the female. The bladder is lined with specialized waterproof epithelium, the urothelium.This is thrown into folds over most of the bladder, except the trigone where it is smooth.

The male urethra is 20 cm long; the prostatic urethra descends for 3 cm through the prostate gland, and the membranous urethra is 1-2 cm long and intimately associated with the main urethral sphincter, the rhabdosphincter. The spongy urethra is 15 cm long and is surrounded by the corpus spongiosus throughout its complete length, opening on the tip of the glans penis as the external meatus. The spongy urethra is further subdivided into the proximal bulbar urethra and the distal penile urethra. The female urethra is 3-4 cm long, descending through the pelvic floor surrounded by the urethral sphincter and embedded in the anterior vaginal wall to open between the clitoris and the vagina.

In the male, the prostate is pyramidal, with its base uppermost. It resembles the size and shape of a chestnut and surrounds the prostatic urethra. Traditionally described as having a median and two lateral lobes, it is better considered as being composed of a small centraland a larger peripheral zone.(James Braddury& etal 2007).

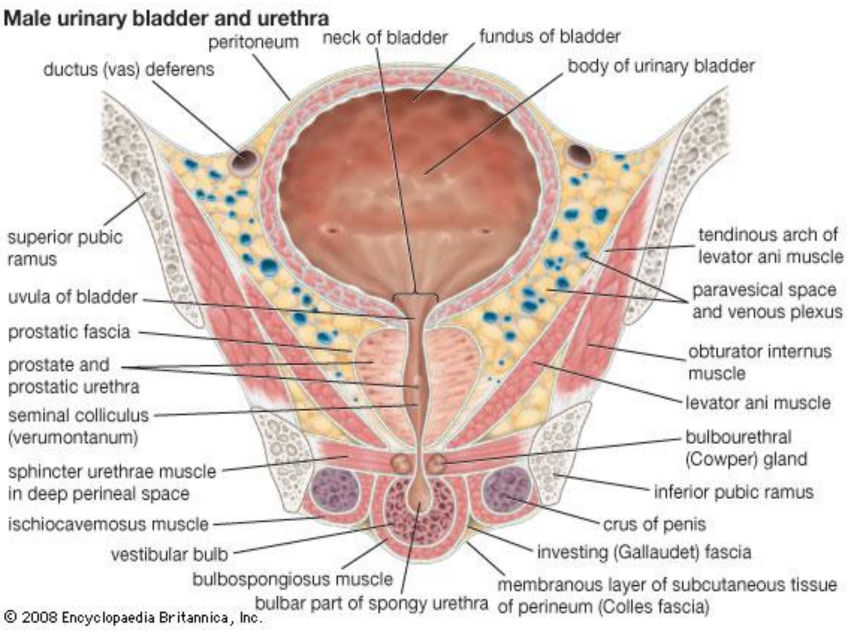


Fig (2-1) male urinary bladder(source:Alexander etal2011)

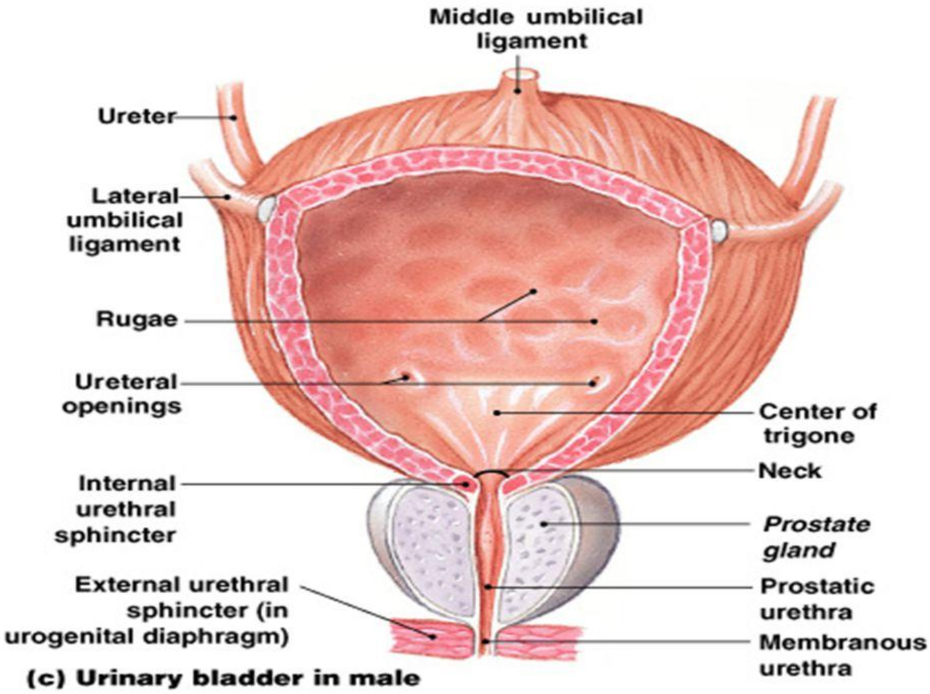


Fig (2-2) male urinary bladder(source:Alexander etal2011)

When the urinary bladder is distended the peritoneum forms two potential spaces in the pelvis, the anterior Para vesical space and posteriorly, the posterior cul-de-sac. Inferior to the anterior peritoneal reflection, the urinary bladder is in direct contact with the pubic bones. In men, the posterior bladder wall is adjacent to the seminal vesicles, the vas deferens, and more inferiorly at the bladder base, the prostate. The uterus and adnexal structures are the posterior borders in women and because of the various normal anatomic placement. Their position is variable.

Bladder out let obstruction (BOO) is blockage at the base of the bladder that reduces or prevents the flow of the urine into the urethra, the tube that carries urine out of the body (Alexander& etal2011).

2-1-2-1.Blood supply:

Blood is supplied from the superior and inferior vesical branches of the internal iliac artery. The vesical veins form aplexus which drains into the internal iliac vein. (Harold ellis, 2002)

2-1-2-2. Lymph Drainage:

Lymphatics drain alongside the vesical blood vessels to the iliac and then para-aortic nodes.(Harold ellis, 2002)

2-1-2-3. Nerve Supply:

Efferent parasympathetic fibers from S2 to S4 accompany the vesical arteries to the bladder. They convey motor fibers to the muscles of the bladder wall and inhibitory fibers to its internal sphincter. Sympathetic efferent fibers are said to be inhibitory to the bladder muscles and motor to its sphincter, although they may be mainly vasomotor in function, so that normal finding and emptying of the bladder are probably controlled exclusively by its parasympathetic innervations. The external sphincter is made up of striated muscle. It is also concerned in the control of micturition and is supplied by the pudendal nerve. Sensory fibers from the bladder, which are stimulated by distention, are conveyed in both the sympathetic and parasympathetic nerves, the latter pathway being the more important. (Harold ellis, 2002)

2-1-3. Urinary Bladder Functions:

The urinary bladder is a rather simple organ. The urine produced by the kidneys is transported by the ureters towards the bladder to be stored there. Therefore the bladder is neededfor storage of urine,so that the humans do not lose urine all day long. A second important feature of the bladder is the voiding of stored urine once a suitable spot has been found to do that, i.e. a toilet. In order to get this done as quickly as possible, the bladder wall is equipped with muscle fibers, so that the bladder can shrink itself into the size of a tennis ball. Emptying the bladder seems a simple feat, but is not contrary to what many people think. It is not the action of the abdominal wall muscles that empties the bladder. Straining, i.e. using the muscles of the abdomen is a rather inefficient way to void urine. Straining will enhance the pressure on the bladder contents and thus causes a more powerful flow of urine, but will also squeeze the bladder outlet and enhance the outflow resistance.

That is the reason why nature gave the bladder its own muscle. At the same moment, however the sphincter around the urethra, that normally closes the outlet to prevent leaking, has to relax; if you donot open the tap, nothing will come out of it.

Fortunately, we do not have to think about those things while passing urine; everything is controlled by nerve cells in the spine and around the bladder. The sensitive spot in the bladder consists of the triangular area between the openings of the ureter and the bladder outlet, the trigone. Once this area gets stretched at a certain degree of bladder filling, the brain gets a signal that the bladder is going to need emptying.

The signals will get stronger while the bladder gets fuller; if you keep resisting the control center in the spine will take over and will start the voiding procedure the bladder will empty itself completely. The pressure exerted by simultaneous contraction of the abdominal muscles also assists bladder emptying. However, the increases in the abdominal pressure when sneezing or coughing can also provoke a loss of urine (stress incontinence). This tends to be more common in women, if they have become weakened following childbirth. Babies always passing urine (Alexander etal2011).

2-1-4. Micturition:

The bladder is a part to be invaded organisms passing backwards from the urethra; this invasion’s easier through the female urethra. Serious infection is often prevented partly by the washing out of organisms at micturition, partly. By the bactericidal activity of normal bladder mucosa and partly, in the male, by the antibacterial properties of prostatic secretion (George Donald & Colinr, 1980).

In the adult, passing urine is a voluntary act, However, there are underlying reflex mechanism, which deserve special description for the understanding of disturbances of micturition.

Urination is initiated by stimulating stretch receptors in the detrusor muscle in the bladder wall by the increasing volume (about 300ml for adult) of urine afferent impulses arise from this receptors in the bladder wall and enter the spinal cord (S2-S4) via the pelvic splanchnic nerves can be assisted by contraction of the abdominal muscles, which increasesthe intra- abdominal and pelvic pressures (George Donald& Colinr, 1980).

Involves the following processes:

-Sympathetic fibers induce relaxation of the bladder wall and constrict the internal sphincter, inhibiting emptying. (They may also activate the detrusor to prevent the reflex of semen into the bladder during ejaculation).

-Parasympathetic preganglionic fibers in the pelvic splanchnic nerves synapse in the pelvic (inferior hypogastric) plexus; postganglionic fibers to the bladder musculature induce a reflex contraction of the detrusor muscle and relaxation of the internal sphincter, enhancing the urine to void.

-Somatic motor fibers in the pudendal nerve cause voluntary relaxation of the external urethral sphincter, and the bladder begins to void.

-At the end of micturition, the external urethral sphincter contracts and bulbo-spongious muscles in the male expel the last few drops of urine from the Urethra. (Kyung . 2000)

2-1-5. Bladder Pathology:

2-1-5-1.Bladder Wall Thickening:

The bladder wall is thickened when it exceeds 4 mm in diameter with the bladder distended.

Diffuse wall thickening may be caused by inflammation, muscle hypertrophy or neoplasia focal wall thickening is most commonly caused by inflammation or neoplasia.

2-1-5-2. Cystitis:

The most cases, cystitis is secondary to infection of the bladder, factors related to bladder infection and development of cystitis include the age and sex of the patient, presence of the bladder calculi, bladder outlet obstruction, diabetes mellitus, immunodeficiency, prior instrumentation or catheterization and radiation therapy or chemotherapy .The risk of cystitis in female is increased because of short urethra, especially, during pregnancy. Bladder outlet obstruction associated with prostatic hyperplasia predisposes men to cystitis. Introduction of pathogens in the bladder may also occur during instrumentation and is particularly common in patient in whom indwelling catheters remain for prolonged periods.

In the large majority of cases, coli form bacteria are the cause of cystitis, most frequently Escherichia coli, Proteus, Pseudomonas, and Enterobacter. Tuberculosis of the bladder is almost always, secondary to renal tuberculosis. Fungal cystitis may be seen in immunosuppressed patients. Gas forming bacilli, usually in persons with diabetes, may produce characteristic interstitial bubbles in the lamina propria of the urinary bladder (emphysematous cystitis).

Schistosomiasis as a cause of cystitis is virtually unknown in the western world but is common in areas where Schistosoma haematobium is endemic, namely, Africa and the Middle East.(Emanuel ,John,Farber, 1999)

2-1-5-3.Neurogenic Bladder:

The detrusor muscle of the bladder and the internal and external urethral sphincters are controlled by the brain .Trauma or lesions interfering with the related neurologic control result in a bladder that cannot function properly known as neurogenic bladder.The patient is usually catheterized and routinely evaluated as these patients are prone to infection. Stone formation and upper urinary tract obstruction. "If neurogenic bladder dysfunction is not properly diagnosed and treated, rapid deterioration of renal function may occur.

Sonographically neurogenic bladder results in bladder wall thickening, trabeculations (marked irregularity of the luminal surface of the bladder) and incomplete bladder emptying.

2-1-5-4.Bladder Diverticula:

Diverticulum presents sonographically as a sonolucent mass adjacent to the bladder. A large bladder diverticulum does not always empty and may be visible on post void scans.

2-1-5-5.Dislodged or Obstructed Foley Catheters:

A dislodged or obstructed Foley catheter is a common cause of "anuria" in critical care patients. Bladder ultrasound may promptly visualize a distended bladder and locate the Foley catheter balloon within or outside a full bladder. (Alexander &Anthony , 2011)

2-1-5-6. Bladder Calculi:

The calculi may originate in the bladder or the kidneys. Bladder calculi characteristically develop in the presence of urine stasis, chronic infection or prolonged use of an indwelling catheter. Calculi are often irritating to the bladder and may be cause cystitis. They rarely obstruct the bladder neck.

Sonographically, they are highly echogenic focal mobile structures that produce shadows.

2-1-5-7.Blood Clots:

Most patients have gross haematuria. Blood clots appear as moderately echogenic nodules that often adhere to the bladder wall. Fluid-fluid levels caused by the layering of blood and urine are often present.

Sonographically, fixed hemorrhagic masses may be similar to bladder tumors. Color or power Doppler may be helpful to demonstrate the presence of flow and distinguish tumors from clots. Lack of flow in the mass is not diagnostic since not all exhibit flow.

2-1-5-8. Foley Catheter:

The catheter wall are seen as two highly echogenic lines and the balloon has highly echogenic walls with an anechoic interior. The patient may
Have an incompletely filled bladder resulting in bladder walls that are thick and irregular which is normal for partially filled bladders.

2-1-5-9. Tumors of the urinary bladder:

Tumors arising in the urinary bladder range from small benign papillomas to large invasive cancers. The very rare benign papillomas are 0.2 to 1.0 cm frond like structures having a dedicatedfibro vascular care covered by multilayered, will differentiated transitional epithelium. In some of these lesions, the covering epithelium appears as normal as the mucosal surface. Where these tumors arise;such lesions are usually solitary.(Vinay kumar, Ramzis, Cortan& Stanleyl, Robbins 2003)
Bladder tumors are a well-known industrial hazard in workers in the aniline dye industry, in which 2-naphthylamine has been incriminated. There is also an increased incidence in workers in the rubber industry. The incidence is also increased in cigarette smokers. A high incidence of bladder tumors complicates infection with Schistosoma haematobium. (Roderick NM, Keith W., 1992)
Bladder cancer in the second most common urologic cancer, it occurs more commonly in men than women (2.7:1) and the mean aged patients at diagnosis is 65 years. (Lawrence, Stephen &Maxine. 2000)

2-1-5-10. Bladder Neck Obstruction:

Congenital or acquired, postoperative,rare, probably more common in males. Submucosal fibrosis of the bladder neck, hypertrophied smooth muscles, or inflammatory changes. (Zorahl,1991)

Calculi, transitional cell carcinoma, prostatic hypertrophy, prostatic carcinoma, urethral strictures, ectopic ureterocele and posterior urethral valves can obstruct the bladder outlet causing the bladder walls to become diffusely hypertrophied and trabeculated and if untreated will result in dilated ureters and bilateral hydro nephrosis.

Caudal angulation of approximately 15 degree is necessary to demonstrate the urethra using the transabdominal approach.

2-1-5-11.Urachal Anomalies:

Patent Urachus:

There is persistent opening of the bladder in the umbilicus.

The bladder may be in a normal or abnormal position. Patency may be demonstrated either cystography or retrograde injection of contrast into the umbilical opening. Lateral projection is required. Outflow bladder obstruction should be excluded or corrected if present. (Zorahl,1991)

Partially Patent Urachus:

Partially patent urachus may have its opening at the bladder dome or at the umbilical end and may be of varying length. The opposite end is atretic. Cystogram or retrograde sonogram are the methods of examination, just as in patent urachus. (Zorahl,1991)

Urachal cyst:

Closure at both ends and incomplete obliteration of the urachal lumen allows formation of an urachal cyst. These usually develop in the distal third of the urachus and close to the bladder dome. The urachal cyst may be small but may also attain enormous size and produce symptoms of an intra-abdominal mass. These may appear in adulthood and for no apparent reason. Since there is no communication with the bladder, only indirect signs of the presence of a mass can be detected because of poster lateral bladder displacement. Cross-sectional imaging provides direct evidence for a fluid-filled mass in the characteristic anterior location. (Zorahl,1991)

If one is confident of the diagnosis, aspiration and perhaps instillation of sclerosing agents may be considered. (Zorahl,1991)

Urachal cysts may become infected. Severe lower abdominal pain, fever, and dysuria may be presenting symptoms. (Zorahl,1991)

Urachal Neoplasms:

Mucinous adenocarcinoma is the most common tumor, followed byno mucinous-producing adenocarcinoma, sarcomas, squamous cell carcinoma, and transitional cell carcinoma. Haematuria is a common presenting sign.

Adenocarcinoma is usually observed in the midline, at the dome of the bladder, and is several centimeters large when first detected. Either cystic or solid tumors may be observed on CT. (Zorahl,1991)

Calcifications within the tumor are common. Local invasion into the bladder, abdominal wall, regional lymph nodes and peritoneum is common at the time of diagnosis. Local recurrence after excision is also common. Prognosis is worse that of the bladder carcinoma. (Zorahl,1991)

Clinical Significance ofUrachal Anomalies:

A patent urachus is usually associated with urethral obstruction which results in urine discharge through the umbilicus of a newborn. A patent urachus is associated with an increased incidence of adenocarcinoma.

An urachal diverticulum may cause urine stasis, recurrent urinary tract infections and stone formation. There is also an increased incidence of carcinoma. Anurachal sinus or cyst may become infected resulting in abscess formation. (Alexander L.& Anthony S 2011)

2-2-1.Prostate Anatomy:

The prostate 3cm long is the largest accessory gland of the male reproductive system. The glandular part comprises approximately two-thirds of the prostate; the other third is fibro muscular.

The firm, walnut sized prostate, surrounding the prostatic urethra, has a dense fibrous prostatic capsule that is surrounded by a fibrous prostatic sheath, which is continuous with the pub prostatic ligament. The prostate has:

A base closely related to the neck of the bladder.

An apex that is in contact with fascia on superior aspect of the urethral sphincter and deep perineal muscles.

A muscular anterior surface, featuring mostly transversely oriented muscle fibers continuous interiorly with the urethral sphincter,that is separated from the public symphysis by retroperitoneal fat in the retro pubic space.

A posterior surface that is related to the ampulla of the rectum.

Inferolateral surfaces that are related to the levator ani.

Although not clearly distinct anatomically, the following lobes of the prostate are traditionally described.

The anterior lobe, or isthmus, lies anterior to the urethra, it is fibromuscular, the muscle fibers representing a superior continuationof the urethral sphincter muscle, and continuous little, if any, glandular tissue.

The posterior lobe lies posterior to urethraand inferior to the ejaculatory ducts; it is readily palpable by digital rectal examination.

The lateral lobes on either sides of the urethra form the major part of the prostate.

The middle (median) lobe lies between the urethra and the ejaculatory ducts and is closely related to the neck of the bladder.

2-2-2. Prostate Pathology

2-2-2-1.Nodular hyperplasia of the prostate:

The normal prostate consists of glandular and stromal elements surrounding the urethra. The prostatic parenchyma can be divided into several biologically distinct regions, the most important of which are the peripheral, central, transitional, and periurethral zones. The types of proliferative lesions are different in each region. For example, most hyperplastic lesions arise in the inner transitional and central zones of the prostate, while most carcinomas (70% to 80%) arises in the peripheral zones.

Nodular hyperplasia, also termed glandular and stromal hyperplasia, is an extremely common abnormality of the prostate. It is present in a significant number of men by the age of 40, and its frequency rises progressively with age,reaching 90% by the eighth decade. Prostatic hyperplasia is characterized by proliferation of both epithelial and stromal elements, with resultant enlargement of the gland and, in some cases, urinary obstruction. "Benign prostatic hypertrophy" (BPH), a time-honored synonym for nodular hyperplasia of the prostate, is both redundant and a misnomer, because all hypertrophies are benign and the fundamental lesion is a hyperplasia rather than a hypertrophy.

Although the cause of nodular hyperplasia remains incompletely understood, current evidence indicates that androgens and estrogens play a synergistic role in its development.

2-2-2-2. Prostate cancer:

Almost all malignant tumor of the prostate are carcinomas. If a prostate is examined by serial section. A small malignant focus is detected in almost all men over the age of 80. Thus, there is a very high prevalence of histological prostate cancer and many men will die with a cancer of the prostate, but not from the cancer. It is estimated that the prevalence of the focal historical cancer in men aged 50-75 is a proximately 40%, where as the prevalence of clinical prostate cancer is a proximately 8%, one-quarter of whom will die from that cancer. (James Braddury & Rowan Paks 2007)

Prostatic cancer is the most common cancer detected in American men and the second leading cause of cancer-related death. In the United States in 2005, over 232.000 new cases of prostate cancer were diagnosed, and about 30.300 deaths resulted. However, the clinical incidence of the disease does not match the prevalence noted or autopsy, where more than 40% men over 50 years of age are found to have prostatic carcinoma. Most such occult cancers small and contained within the prostate gland. Few are associated with regional or distant disease. The incidence of prostatic cancer increase with age. Where 30% of men aged 60-69 years will have disease, autopsy incidence increases to 67% in men aged 80-89 years.

Prostatic cancer is high in North America and European countries, intermediate in South America, and low in the Far East. (Lawrence M. T. Jr. Stephen J.M.& Maxine A.2006)

2-3.The Ultrasound (U/S):

2-3-1. Definition:

Ultrasound is the name given to high- frequency sound waves. U/S is a form of energy consisting of mechanically produced waves with frequencies above the range of human hearing. Sound waves between 20Hz-20 KHz are audible, sound waves below 20Hz which are not audible known as infrasound, waves above 20KHz known as ultrasound, and are also inaudible to humans, the frequency is the number of oscillations per second that the particles in the medium make as they vibrate about their resting position. Frequency is determined by the sound source, that is, by the number of oscillations per second it makes. The unit for frequency is cycles per second (Cycles/S) or hertz(Hz). (James A. Zagzebski,1996)

Because diagnostic ultrasound imaging uses very high transducer frequencies, the unit megahertz is usually the unit of choice to express sound frequency. The prefix mega means million. One million hertz in one megahertz. Megahertz is abbreviated MHz useful diagnostic (Medical) ultrasound is in the range of (1MHz-10MHz).

Sound waves generated by a source exert a force (pressure) on the molecules of a medium immediately adjacent to or in contact with the source. These molecules are displaced towards and away from the source in a cyclic fashion. The sound energy emanating from the source is transmitted into the medium by the virtue of the intermolecular elastic forces which hold them together. It is important to realize that the molecules of the insonated media are displaced back and forth (disturbed) only a very minute distance from their mean resting position (the position that they maintain when no sound is present).Molecules do not zip along from one end of the medium to the other, that is, there is no actual flow of molecules (as opposed to the case of electron movement in electricity).

The medical uses of ultrasound may be divided into diagnostic imaging, surgical or interventional procedure guidance and therapeutic (diathermy). These three major categories used approximately the same ultrasound frequency range. What differs more significantly between them is the mode of operation of the ultrasound equipment and the output power levels.

2-3-2.Ultrasound generation and detection:

The U/S waves are generated by a piezoelectric transducer.A transducer is advice that converts one form of energy into another. Ultrasoundtransducers are designed to convert electrical energy into mechanical energy (ultrasound) and also can convert the reflected ultrasound energy (echoes) into electrical signals.

The piezoelectric effect is the formation of an electrical charge on the surfaces of the crystal when pressure (mechanical energy) is applied.

The choice of transducer frequency used in diagnostic ultrasound is limited by two basic factors, the first is tissue penetration or imaging depth, and the second is image resolution. On the one hand we must consider the distance that the sound must travel, and on the other, how well the structure of interest can be displayed. To image a structure the sound must be able to reach it and return to the transducer. The best images are produced using the highest frequency that will penetrate to the region of interest.

In theory, the higher the transducer's frequency the better the resolution using the highest frequency that will penetrate to the region of interest.

However, in practice this is not always the case. Some manufacturers have 5.0 MHz transducers which produce better images than 7.5MHz or even 10MHz transducers from competitors. This happens because factors other than transducer frequency affect image resolution including focusing and computer processing techniques. In general, the higher the transducer frequency, the better the transducer resolution.

2-4. Normal Bladder Ultrasonography:

Bladder ultrasound is usually performed to them with renal ultrasound since bladder abnormalities may cause changes in the upper urinary tract (e.g. urinary retention may cause hydro nephrosis) limited bladder ultrasound is commonly used to evaluated postvoiding residual urine volume in patients with lower urinary tract syndrome.

2-4-1. Imaging technique:

The bladder can be examined only when it is distended. The average adult bladder comfortably holds about 500ml. Sonographic evaluation is usually performed trans-abdominally with the patient in the supine position. A probe is place 1cm above the symphysis and angled laterals, inferiorly, and superiorly- most commonly, a transverse scan is obtained first. The normal bladder is located midline and appears symmetric and smooth, without irregularities of the inner surface. On the longitudinal scan the bladder is oriented toward the umbilicus and tapered interiorly.

Transverse and longitudinal scans provide a fairly accurate calculation of bladder volume by measuring the horizontal and vertical dimensions of the bladder on transverse image and the maximum longitudinal dimension on longitudinal image and using formula:(0.52 x length x width x height) (this calculation is performed automatically by the most current ultrasound machine). Sonographic estimation of the post void residual urine volume provides immediate diagnosis of urinary retention or incomplete bladder emptying in patients with decreased or absent urinary output without the need to attempt urethral catheterization. (Alexander L, & Anthony S, 2011)

2-4-2. Adult Bladder Volume Measurement:

"Quantification of the overall bladder volume is important in patients who have urinary retention. Attempts to measure the various dimensions of the bladder and then derive volume measurements have met with limited success. So far, none of these methods produces an exact volume but the final product may be satisfactory for clinical use.

The lack of accuracy has been attributed to the variations in the bladder shape secondary to filling, transducer frequency, and inability to image the anterior aspect of the bladder base. Because the operator controls the scan plan during real time studies, variations in the plane chose for 500ml without major discomfort.

Normal findings, volume measurements the urinary bladder is systematically screened in supra pubic transverse and sagittal sections when it is full usually achieved after the intake of a large amount of fluid.

A representative transverse section fig(2-3)shows the normal bladder in the shape of a rounded rectangle behind the rectum muscles and in front of and above the rectum and the longitudinal section delineates the bladder more a trianglewith prostate gland and ranging, respectively, seen below the bladder.

The post void residual should be calculated by measuring the maximum transverse and sagittal diameter of the bladder after the patient has voided. There after the transducer is turned 90° and angled inferiorly to measure the cranio-caudal diameter. Using the simplified volume formula

(vol. U.B.=A x B x C x 0.5). (Matthias and Tatjan 1999)

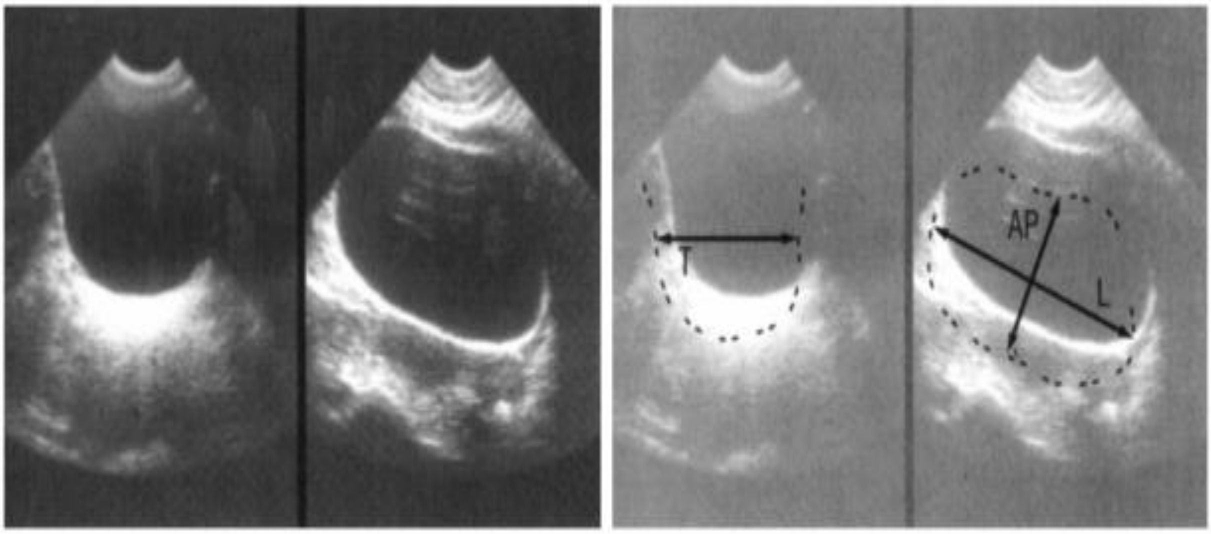


Fig. (2-3) Normal full bladder and measurement: transverse scan (left) and longitudinal scan (right).

The urinary bladder is usually well seen with sonography and determination of post void residuals, using the formula for an ellipsoid (length x width x height x 0.52), is a common request. However, a number of other abnormalities can be visualized.

The most common abnormalities seen on sonography is bladder wall thickening. This is the most commonly due to bladder outlet obstruction. Other causes include neurogenic bladder, cystitis, edema from adjacent inflammatory processes, radiation, and primary or secondary neoplasms. Detection with cross-sectional imaging is somewhat subjective because thickening will vary with the degree of bladder distention. Reasonable guidelines for upper limits of normal are 3mm for a well distended bladder and 5mm for a poorly distended bladder.

Bladder tumors are frequently detected on sonography, usually in patients who are have inrenal sonograms for hematuria. 90% are transitional cell carcinomas. Smoking, analgesics abuse, and industrial carcinoma exposure all predispose to transitional cell carcinoma. 5% are squamous cell carcinomas. These occur in patients with bladder schistosomiasis, neurogenic bladder, or chronic inflammatory conditions of the bladder. 2% of bladder tumors are adenocarcinomas, which tend to occur in urachal remnants and in bladder extrophy (James Braddury & Rowan Paks 2007).

Bladder carcinoma is three times more common in men and tends to occur in middle aged and older populations. The prognosis is dependent on the depth of invasion and in particular, the degree of involvement of the muscularis.

The majority of transitional cell carcinomas of the bladder arise along the posterior wall, in the region of the trigone.

Sonographically, the majority are polypoid with a mass arising from the bladder wall extending into the bladder lumen. Less often they are infiltrative with diffuse of localized thickening of the bladder wall. The presence of a transitional cell cancer in the bladder or in the upper tracts places the entire urothelium at risk and periodic imaging is required. The primary differential diagnosis for bladder cancer is blood clots. The useful findings that distinguish bladder cancer from blood clots are immobility and presence of blood flow. The differential diagnosis also includes other intraluminal lesions such as stones and fungus balls, other causes of focal wall thickening such as invasion by adjacent tumors(prostate, rectum, cervix), involvement by adjacent inflammatory processes, fistulas with adjacent organs, wall trabeculation, benign prostatic hypertrophy, endometriosis, malakoplakia, leukoplakia, tuberculosis, and schistosomiasis, and rare tumors such as adenocarcinoma, squamous cell carcinoma, and pheochromocytoma.

Bladder stones are easily distinguished from other abnormalities by the combination of shadowing and mobility(James Braddury & Rowan Paks 2007). Benign prostatic hypertrophy may produce a prominent mass in the base of the bladder that simulates transitional cell cancer.

In most cases, lesions of benign prostatic hypertrophy will be located in the midline and continuity with the prostate will be apparent.

Bladder diverticula are other common abnormalities that are visible on sonography. They usually occur due to outlet obstruction and often coexist with a thick bladder wall. They appear as a fluid-filled structure adjacent to the bladder.In the majority of cases, careful scanning will demonstrate the connection between the bladder and the diverticulum. When the connection is not visible on gray scale sonography. Compression of the bladder with the transducer may demonstrate urine flow between the bladder and diverticulum on color Doppler imaging.

Urinary stasis in the diverticulum predisposes to infection, stone formation, and cancer. Because it may be difficult for the urologist to pass a cystoscope through the neck of a diverticulum, it is important to scan them carefully to exclude these potential complications.

Another unusual perivesicular fluid collection is the urachal diverticulum or cyst. These from it there is incomplete closure of the urachus. If the umbilical segment closes but the vesicular segment does not, a diverticulum is formed. If the segment between the bladder and umbilicus

Fails to close then an urachal cyst forms. Both abnormalities are characterized by their location adjacent to the anterior dome of the bladder (James Braddury & Rowan Paks 2007).

2-5. General Appearance of Abnormal Bladder:

2-5-1. Generalized Thickening of the Bladder Wall:

- In men, bladder wall thickening is usually the result of prostatic obstruction. If suspected, check the prostate exclude hydro nephrosis by scanning the ureter and the kidneys. Search for associated diverticula; these project outwards but are only visible if over 4cm in diameter.

Diverticula are usually echo-free with good sound transmission. Sometimes the opening of a diverticulum can be demonstrated; diverticula may be collapse or increase in size after micturition.

- Severe, chronic infection/cystitis. The inner wall of the bladder may be thickened and irregular. Check the rest of the renal tract for dilatation.

- Schistosomiasis. The bladder walls may be thickened, with increased echogenicity and scattered dense (bright) areas due to calcification. The calcification varies and may be throughout or patchy, and differing in thickness. The calcification is in the intramural ova and does not prevent normal contraction of the bladder. (Breyer& etal 2000)

Poor bladder emptying indicates superimposed active infection, or prolonged or recurrent infection. The extent of the calcification does not decrease in the later stages. However, the bladder wall usually remains thickened and does not easily distend. There may also be hydronephrosis.

- Very thick trabiculated bladder walls in children may result from outlet obstruction caused by urethral valves or urogenital diaphragm.

- A thickened bladder wall may occur in neurogenic bladder. (Breyer& etal 2000).

2-5-2. Localized Thickening of the Bladder Wall:

Whenever localized bladder wall thickening is suspected, multidirectional scans are needed, particularly to exclude a polyp. Moving the patient or increasing the volume of the fluid in the bladder will help to identify bladder folds. (Folds will disappear as the bladder distends). If there is any doubt, repeat after 1 or 2 hours; do not let the patient micturate before the examination is repeated.

Localized thickening may be due to:

- Bladder fold due to incomplete filling.

-Tumour; sessile or polypoid, single or multiple.fig (2-5)

- Localized infection due to tuberculosis or to schistosomal plaques (granulomas).

- Acute reaction to schistosomal infection in children.

- hematoma following trauma.(Breyer. C.A. Bruguera.H.A.S.Harbi2000)

2-5-3. Differential Diagnosis of Localized Bladder Wall Thickening:

Most bladder neoplasms are multiple but located in one areas. Some only thicken the bladder wall, but most are also polypoid. It is essential to recognize when the tumor has spread through the bladder wall. Calcification in the tumor or wall due to associated schistosomiasis may cause bright echoes.

Bladder polyps are often mobile on a stalk, but some, especially those due to infection, may be sessile and not easily differentiate from a malignant tumor.

Granulomas (e.g. tuberculous) cause multifocal but localized thickening. The bladder is often small and becomes painful when distended, resulting in frequent micturition; in malignancy, bladder distention is painless.

Schistosomiasis may cause multiple flat plagues and polyps. Any chronic infection will eventually decrease bladder capacity. (Breyer& etal 2000) Fig (2-4)

Trauma. If there is localized thickening following trauma, scan the pelvis to exclude fluid (blood or urine) outside the bladder. Repeat the scan after 10-14 days. If the thickening is due to a hematoma, the swelling should have decreased.

Schistosomiasis. Children who are reinfected can have an acute "urticarial" reaction in the bladder wall causing marked local thickening of the bladder mucosa. This subsides with treatment or spontaneously over a few weeks. (Breyer& etal 2000)

2-5-4. Density With in The Bladder:

-Attacked to the wall:

Polyp. A polyp on along stalk may appear freely mobile.

Change the patient position and rescan.

Adherent calculus. Calculi can be single or multiple, small or large; they usually have acoustic shadowing. Some may become adherent to the bladder mucosa, especially when there is infection; can do with the patient in different positions to asses movement.

Ureterocele. Anureterocele presents as a cystic mass within the bladder, near a ureteric orifice. It will change in size scanned at different times. In children, the ureteroceles are sometimes bilateral but are seldom symmetrical. If suspected, scan the kidneys and the ureters for a symmetrical hydronephrosis and hydro ureter, and for duplication of the ureters fig (2-7).

Enlarged prostate. An echogenic, non-mobile mass located centrally at the base of the bladder in a male patient is most likely and enlarged prostate. In women, an enlarged uterus can also distort the bladder. (Breyer& etal 2000) Fig (2-8).

-Mobile density within the bladder:

Calculus. Unless they are very large, most calculi move within the bladder, However, Calculi may be trapped in diverticulum or be so large that they seem to fill the bladder; the capacity of the bladder to hold urine will be reduced when there is a large stone. When there is doubt about a bladder calculus, change the position of the patient and rescan. Most small and medium-size calculi change position, but a large calculus may not able to move.

Foreign body. Catheters must be recognized, very rarely a foreign body is introduced into the bladder. If this is suspected, a careful history is necessary; X-rays may be helpful.

Blood clot. A thrombus can resemble a calculus or a foreign body; not all blood clots are freely mobile.

Air. Introduced into the bladder either through a catheter or by infection or through a fistula, air appear as an echogenic, mobile, non-dependent (floating) area. (Breyer& etal 2000)

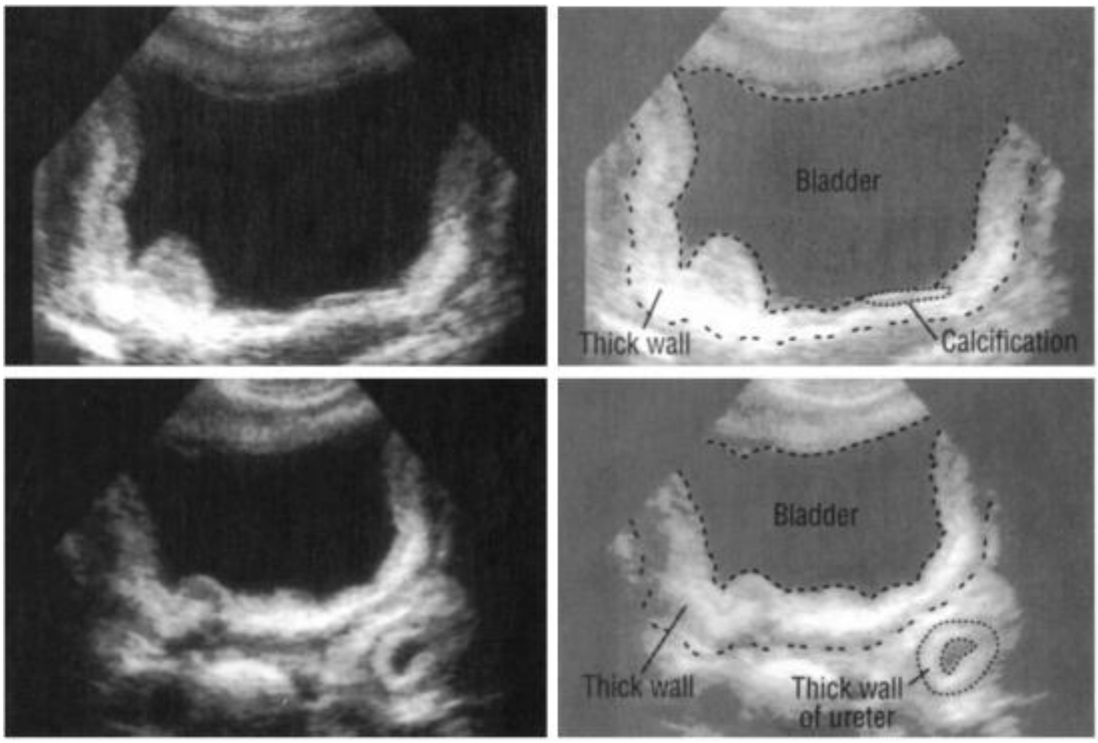


Fig (2-4) Two transverse scans showing thickening and irregularity of the bladder wall.(Source: Breyer&etal2000)

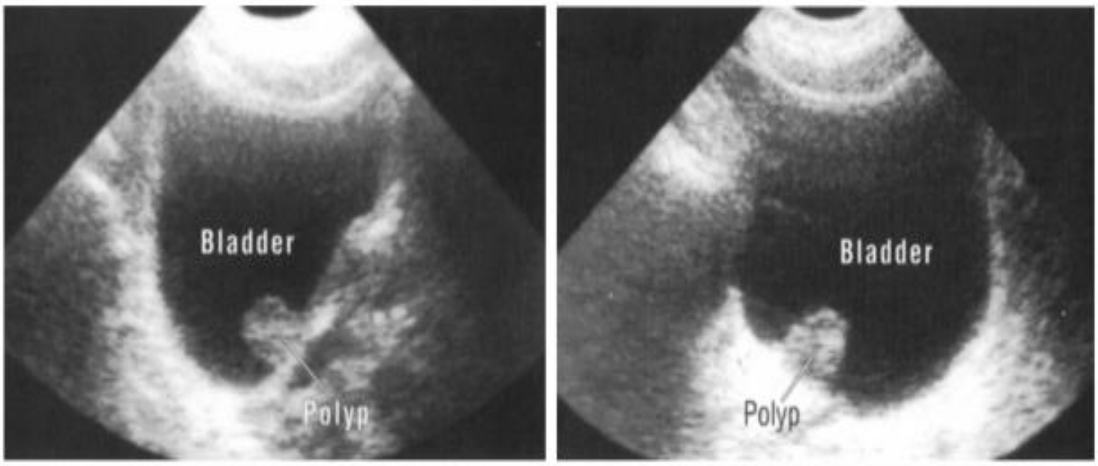


Fig (2-5) A sessile polyp in the bladder longitudinal (left) and transverse (right) scans. (Source: Breyer&etal2000)

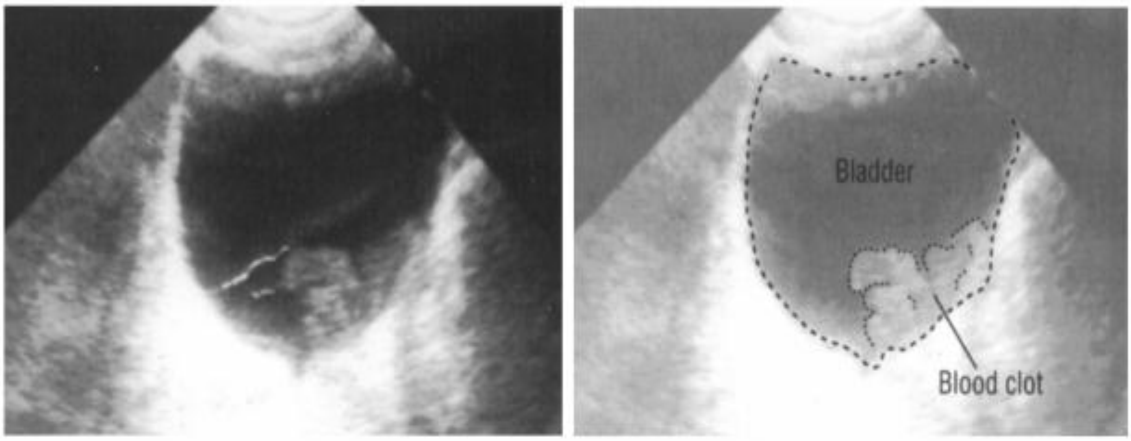


Fig (2-6) Transverse scan: Pseudotumor in the bladder, caused by blood clots.
(Source: Breyer&etal2000)

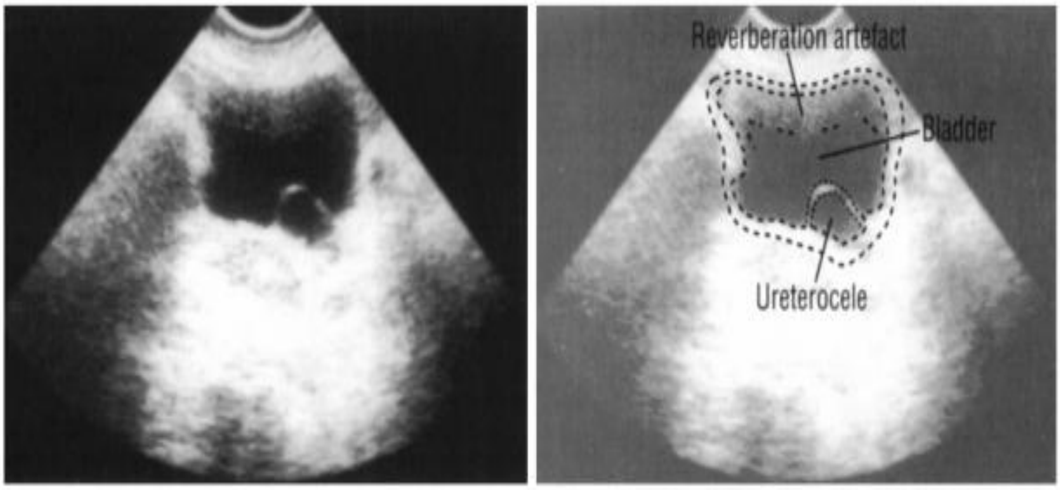


Fig (2-7) Transverse scan prominent uretrocile.(Source: Breyer&etal2000)

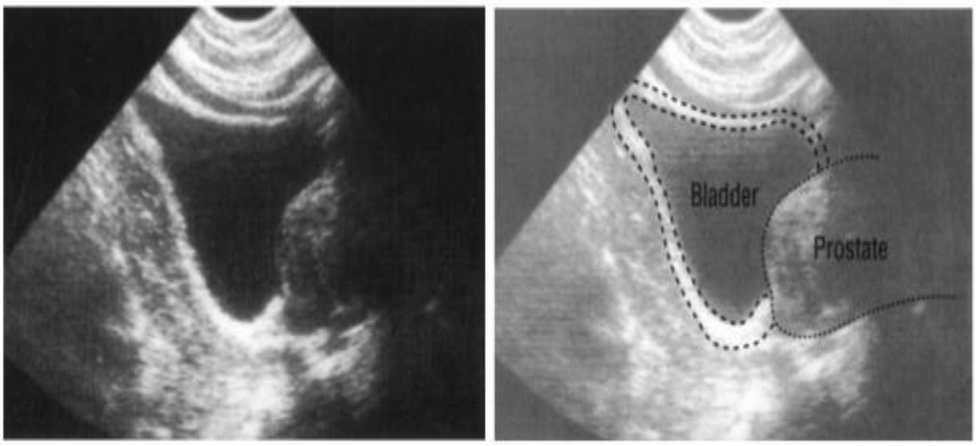


Fig (2-8) longitudinal scan a markedly enlarge prostate.(Source: Breyer&etal2000)

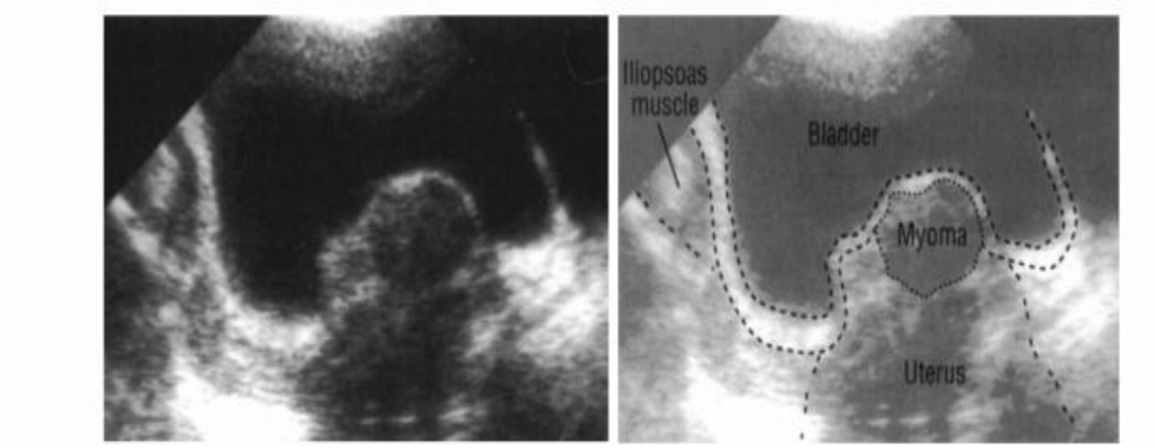


Fig (2-9) Transverse scan distortion of the bladder wall by pressure from a large uterine myoma. (Source: Breyer&etal2000)

Fig (2-10)Longitudinal scan of the urinary bladder demonstrating a small diverticulum which was found incidentally.(Source:Betty&Temptin1993)

Fig(2-11) Transverse bladder in a patient with diabetes, pyelonephritis and hydronephrosis. She had no pelvic symptoms. Note the large shadowing bladder calculus. (Source:Betty&Temptin1993)

Always look for the ureters and check the kidneys for hydronephrosis.

Ask the patient to empty the bladder and rescan to see if it is completely empty.

Common causes of bladder distention are:

- Enlargement of the prostate.
- Urethral stricture in the male.
-Urethral calculus in the male.
-Bruising of the urethra in the female.
- A neurogenic bladder from damage to the spinal cord,
- Urethral valves diaphragm in newborn infants.
- Cystocele in some patients.

2-5-6. Small Bladder:

A bladder may be small because of cystitis, which prevents the patient from holding urine and causes a clinical history of frequent and painful micturition. The bladder may also be small because the walls have been damaged or fibrosis, reducing the bladder capacity, micturition will then be frequent but not painful.

If there is any doubt, give the patient more fluid and ask him or her not to micturate; rescan in 1-2 hours (Breyer& etal 2000).

A small bladder may be due to:

Late schistosomiasis. There may be bright echoes due to calcification.

Recurrent cystitis. Particularly due to tuberculosis. Bladder wall thickening is likely.

The rare infiltration neoplasm. When there is a tumor, the bladder wall is nearly always asymmetrical.

Radiotherapy or surgery for malignancy. Check the clinical history(Breyer& etal 2000).

2.6 Previous studies

Introduction

Bladder outlet obstruction (BOO) is a common cause of lower urinary tract symptoms (LUTS) in elderly men over50 yr of age . BOO results from various etiologic factors that may have functional and anatomical components .Because of the complex etiological aspects, the issue of how to accurately evaluate BOO in men with LUTS has been debated for decades. Thus, when considering management of men with LUTS suggestive of BOO, it is important to take into account the specific aspects of BOO. Currently, pressure flow studies (PFS) are widely accepted as the gold standard diagnostic method for identifying BOO. Even though PFS is essential for the evaluation of BOO before invasive treatment is considered, many clinicians do not perform PFS as they consider it is invasive, time consuming and expensive . In clinical practice, most often non invasive methods are used to evaluate men with LUTS such as the maximal flow rate, post void residual volume, prostate size, and International Prostate Symptom Score (IPSS). Inter-national guidelines suggest that mandatory and recommended tests are sufficient to conclude the diagnosis of BOO in men with LUTS (7). However, others have argued that these tests are not sufficient for the diagnosis of BOO (8, 9). In addition, it was suggested that Asian men have a similar frequency of BOO and more severe symptoms despite having a smaller prostate volume. However, most literature have been based on the population of Western, and there are few data for the Asian men with LUTS with regard to the clinical features of BOO and the factors that can predict BOO. Thus, the aim of this study was to evaluate clinical and urodynamic results associated with LUTS in Korean men with BOO and to determine whether non-invasive parameters can be used to predict BOO.

Materials And Methods

This study was approved by the Institutional Review Board of the Seoul National University Hospital. All clinical data was prospectively collected from the patients undergoing evaluation

Roger R Dmochowski, MD, FACS

found that:(Numerous gender-specific etiologies are responsible for bladder outlet obstruction (BOO). BOO may be induced by specific functional and anatomic causes. The resulting obstruction frequently produces lower urinary tract symptoms (LUTS). Categorizing and understanding these entities is crucial when proceeding with a LUTS evaluation as specific diagnostic modalities may then be used to fully delineate the degree of BOO and any secondary issues. Although urodynamic evaluation and pressure flow evaluation is the gold standard diagnostic tool, other modalities may also be used, including post void residual analysis, urinary flow rates, cystoscopy, and selected radiologic ones. Patient self-appraisal of symptoms using various inventories such as the American Urologic Association Symptom Index or the International Prostate Symptom Score is relevant to the initial assessment and subsequent longitudinal follow up. Analysis of secondary symptoms of obstruction in women is often performed using a subjective symptom appraisal and is determined uro dynamically, assessing the pressure-flow relation during voiding. The complete assessment of LUTS arising from BOO often includes several of these modalities to fully define the obstructive impact on the individual's urinary function and quality of life).

Min-Yong Kang, Ja Hyeon Ku, and Seung-June Oh
Department of Urology, Seoul National University
Hospital, Seoul National University College of Medicine,
Seoul, Korea

Found that:(in Korean men with lower urinary tract symptoms (LUTS) and to determine non-invasive parameters for predicting bladder outlet obstruction (BOO). Four hundred twenty nine Korean men with LUTS over 50 yr of age underwent clinical evaluations for LUTS including urodynamic study. The patients were divided into two groups according to the presence of BOO. These two groups were compared with regard to age, the results of the uro flow metry, serum prostate-specific antigen (PSA) level, prostate volume, International Prostate Symptom Score (I-PSS), and the results of the urodynamic study. Patients with BOO had a lower maximal flow rate (Q

max), lower voided volume, higher serum PSA level and larger prostate volume ($P<0.05$). BOO group had a significantly higher rate of involuntary detrusor contraction and poor compliance compared to the patients without BOO (
$P<0.05$). The multivariate analysis showed that Q max and poor compliance were significant factors for predicting BOO. Our results show that Q max plays a significant role in predicting BOO in Korean men with LUTS.
In addition, BOO is significantly associated with detrusor dysfunction, therefore, secondary bladder dysfunction must be emphasized in the management of male patients with LUTS).
2010 The Korean Academy of Medical Sciences.
*Dean S. Elterman, Bilal Chughtai, Richard Lee, Alexis E. Te, Steven A. Kaplan James Buchanan Brady Department of Urology, Weill Cornell Medical College of Cornell University, New York, USA Said that:(Lower urinary tract symptoms (LUTS) caused by benign prostatic hyperplasia (BPH) commonly affect older men. Fifty percent of men in their sixties and 80% of men in their nineties will be affected. Many of these men will seek care for their bothersome symptoms and decreased quality of life. There is a poor association between LUTS and objective measures such as post void residual, voided

volumes, or maximal flow. Pressure flow studies are considered the gold standard for detecting bladder outlet obstruction. These studies tend to be cumbersome, expensive, and have exposure to ionizing radiation. There are several techniques which may offer noninvasive methods of detecting bladder outlet obstruction (BOO) in men).

*Also Matthias Oelke

Department of Urology, Academic Medical Center, University of Amsterdam, The Netherlands Department of Urology, Medical School Hannover, University of Hannover, Germany Department of Urology, Evangelic Hospital, Oberhausen, Germany Department of Clinical Epidemiology, Biostatistics and Bioinformatics, Academic Medical Center, University of Amsterdam, The Netherlands when done a previous studies found that:(Measurements of DWT can detect BOO better than free uro flow metry, post void residual urine, or prostate volume. In clinical routine, DWT measurements can be used to judge BOO noninvasively).

Objectives:

The aim of this prospective study was to compare the diagnostic accuracy of detrusor wall thickness (DWT), free uro flow metry,
Post void residual urine, and prostate volume (index tests) with pressure–flow studies (reference standard) to detect bladder outlet obstruction (BOO) in men.

Methods:

During a 2-yr period, men older than 40 yr with lower urinary tract symptoms and/or prostatic enlargement had the following tests: ultrasound measurements of DWT, free uro flow metry (Q max), post-void residual urine, and prostate volume. Pressure–flow studies were used to divide obstructed from non obstructed bladders.

Results:

One hundred sixty men between 40–89 yr of age (median: 62 yr) were included in the study; 75 patients (46.9%) had BOO according to pressure–flow studies. The results of all investigated index tests differed significantly between obstructed and non obstructed men. DWT was the most accurate test to determine BOO: the positive predictive value was 94%, specificity 95%, and the area under the curve of ROC analysis 0.93. There was an agreement of 89% between the results of DWT measurement and pressure–flow studies.

.

Chapter three

Methodology

Chapter three

Materials and Methods

3-1.Materials:

3-1-1.Patient:

The sample of this study was fifty adult malepatients presenting to the referral clinic with signs and symptoms of pelvic pain and difficultly of passing urine (dysuria).

3-1-2.Equipment Used:

All the examinations and ultra-sonographic measurement were performed by the author in the department of the ultrasound in the hospital using standardized trans-abdominal a scan (TAS). Using mindary machine with 3.5 – 5 MHz convex array transducer.

3-2.Methods:

This study is designed as a prospective descriptive cross- sectional study in Sharg alnil hospital, department of ultrasound imaging. The study conducted during the period from June 2016 to January 2017.

3-2-1. U/S Technique:

-preparation of the patient.

-position of the patient.

-choice of transducer.

-scanning technique.

-measurement of the urinary bladder volume before and after micturition.

3-2-2. Data Analysis:

-SPSS.

-Excel.

3-2-3.Data collection sheet:

- Patient age.

-patient residence.

-Hospital.

-Patient complications.

-Bladder volume (before and after micturition). (P.V.R.U.)

-Ultrasound findings.

Chapter Four

Results

Chapter four

Results

Fifty patient who are suffering from difficulty to path urine, with ages range from 60-80 years old, referred to ultrasound clinic some of those patients present with ultrasonography or radiologic reports while others present for the first time, they were studied in period from June 2016 to January 2017.

The results are obtained and built on four factors as following:

- Studying the urinary bladder outlet obstruction.
- Measuring the prostatic gland with the age of the patient.
- Calculate the urinary bladder volume (before and after micturition).
- Calculate the residual urine in the bladder at BOO.

Table (4-1) shows the frequency distribution of the urinary bladder outlet obstruction according to the study:

Cause	Frequency	Percent
Prostatic hypertrophied	44	88.0
U.B. cancer	2	4.0
Calculi	2	4.0
Urethral stricture	1	2.0
Diverticulum	1	2.0
Total	**50**	**100.0**

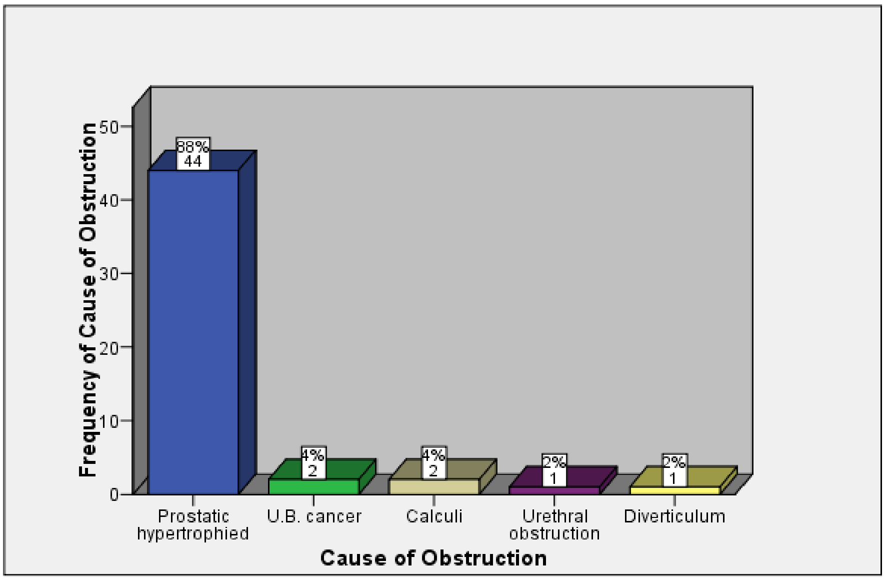


Figure (4-1) shows the frequency distribution of the urinary bladder outlet obstruction according to the study

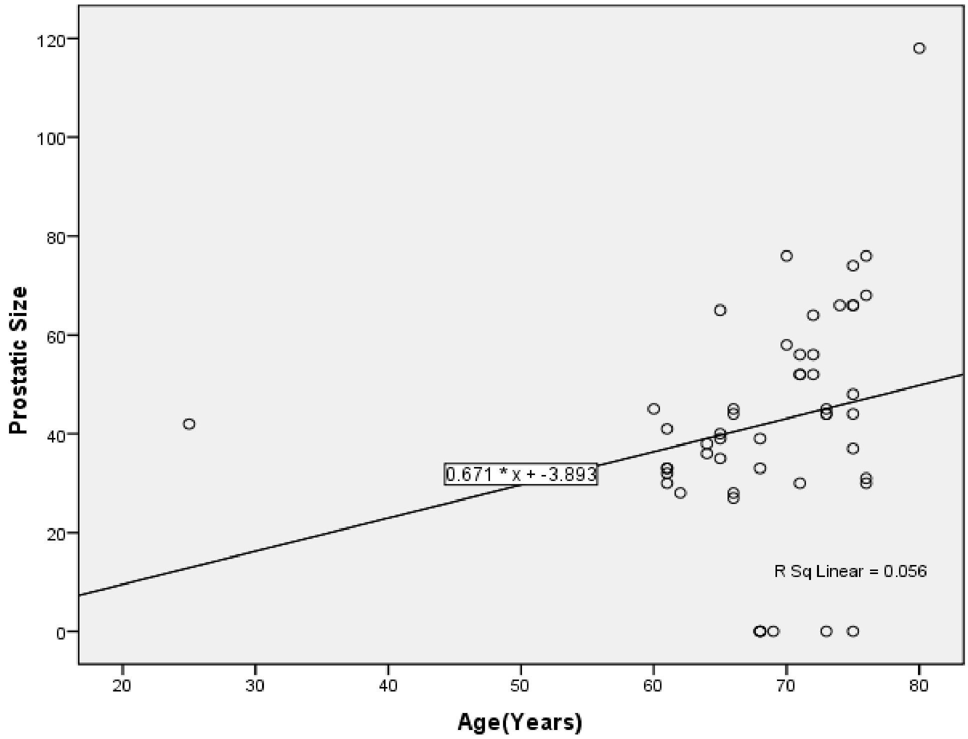


Figure (4-2) Age of patient and prostate size

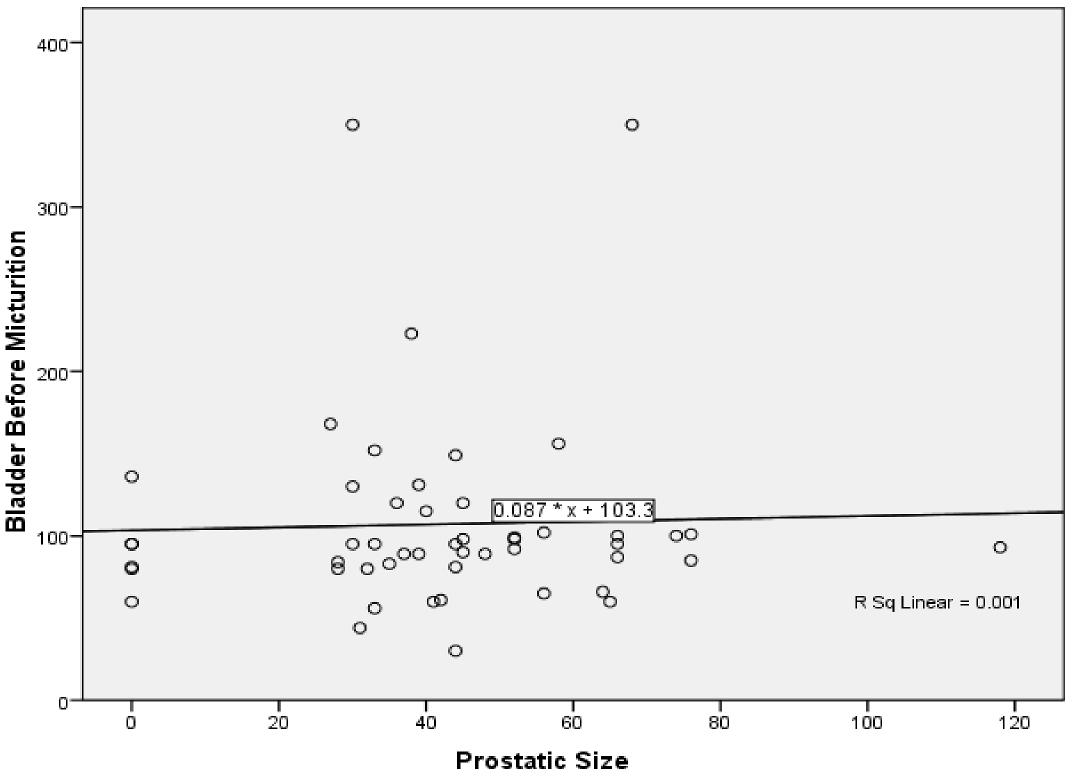


Figure (4-3) Prostate size and bladder size before micturition

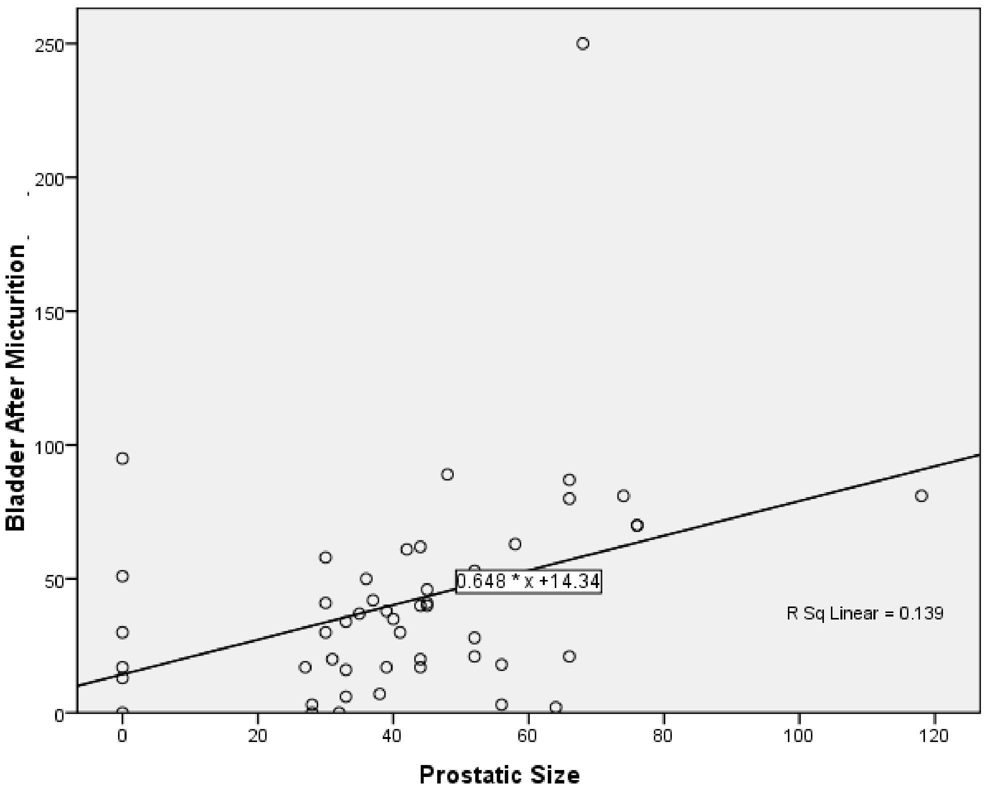


Figure (4-4) Prostate size and bladder size after micturition

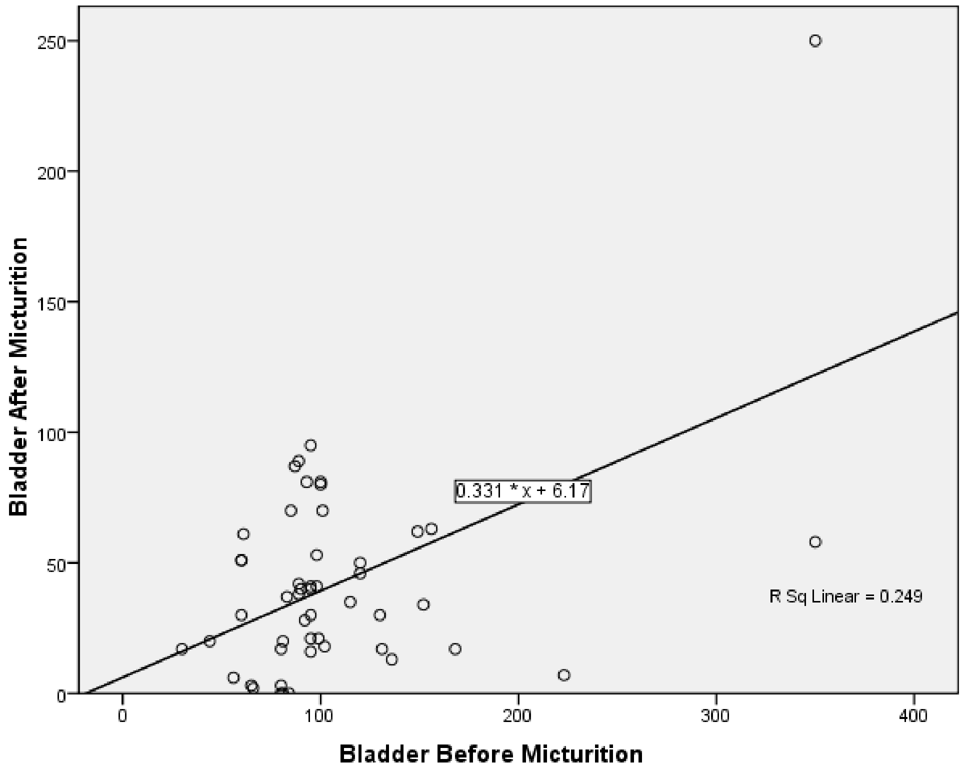


Figure (4-5) Bladder size before micturition and Bladder size after micturition

Table (4-2) Bladder size before micturition and Bladder size after micturition statistics:

	Mean	N	Std. Deviation	Std. Error Mean
Bladder Before Micturition	107.06	50	60.095	8.499
Bladder After Micturition	41.64	50	39.863	5.638

Table (4-3) Bladder size before micturition and Bladder size after micturition Test:

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Bladder Before Micturition - Bladder After Micturition	65.420	52.986	7.493	50.362	80.478	8.730	49	.000

Chapter Five

Discussion, Conclusion &Recommendations

5-1. Discussion:

This chapter evaluates the capability of the ultrasound in studying the urinary bladder outlet obstruction.

Table (4-1) and fig (4-1) shows that 88% of patients their cause ofurinary bladder outlet obstructionwere prostatic hypertrophy, while 4% had bladder cancer, 4% had calculi, 2% had urethral stricture, and 2% had diverticulum.

Fig. (4-2) shows the relationship between the patient's age and the prostatic enlargement.

Fig. (4-3) shows the prostate size &the bladder size before micturition.

Fig. (4-4) shows the prostatic size & the bladder size after micturition.

Fig. (4-5) shows the bladder size before micturition & the bladder size after micturition.

Table (4-2) shows the bladder sizemean before micturition =107.06±60.095 with standard error of mean 8.499 & after micturition =41.64±39.863 with standard error of mean 5.638.

Table (4-3) shows the mean difference between bladder size before micturition and after micturition =65.42±52.986, also the table shows the paired sample (t) test with Sig. = 0.000, which implies that the mean bladder size before micturition and after micturition are statistically significantly different.

These findings reflect that bladder outlet obstruction mostly caused by the prostatic hypertrophied, there was a clear proportional relationship between the prostatic gland enlargement and the ages of the patients.

There is residual urine in all causes of the urinary bladder outlet obstruction, depending on the type of the cause. There is a significant relationship between the volume of the urine before and after the micturition. The prostatic hypertrophy is the most influence the ability of the urinary bladder to store and empty the urine.In the previous studying, find that the thickening of the bladder wall 5 mmis also causing B.O.O.

So from the above we can easily find the fact that the ultrasonography is informative method and playing an important role in studying bladder outlet obstruction.

5-2. Conclusion:

As the main of the study is to show screening bladder outlet obstruction (BOO) in Sharg alneel Hospital for 50 patients ,their ages range between 60-80 years old, by using ultrasonography scanning tool. The researcher concluded that:

-Ultrasound is the good diagnostic tool in the screening of the bladder outlet obstruction with highly accuracy and efficiency.

-The most causing of the bladder outlet obstruction is the prostatic hypertrophy.

-There is significant proportional relationship between the patient age and the enlarged prostate.

-The bladder outlet obstruction impaired the ability of the urinary bladder to storing and emptying the urine.

-The patient preparation is important factor to achieve good quality sonograms and accurate detecting of bladder outlet obstruction cause.

5-3.Recommendations:

-Transabdominal ultrasound screening should be used in studying of the bladder outlet obstruction, because it is being safe, non- invasive, accurate and easy to operate.

-Clear and specific instructions must give to patient before sufficient time, so the patient will tend with adequate full bladder which represents an ideal sonographic window for studying of the bladder outlet obstruction(BOO).

-Complete abdominal-pelvic sonographic examination should be done to detect any associated pathologies' complications.

-The government should encourage establishing ultra-sonographic department and should supply the health centers and the hospitals with high quality ultrasound machines especially in the rural areas.

Referenc

Alexnder L, Apostolos, &Anthony S Bed side ultrasonography in clinical medicine. 7th edition. Edward Williams; California:2011.p153-158-161.

Breyer C.A. Bruguera. H.A. Sharbi, B. B. F. E. Htan .M.W. Manual of diagnostic ultrasound; France:2000 p180-182,184-185.

Emanuel R, John, Farber, Lippincott pathology. 3rd edition. Rayen Lippincott; Philadelphia:1999. p923.

Georgeh B. Donald E. Textbook of physiology. 10th edition.Colinr. London:1980. P262.

Harold Ellis. clinical Anatomy .10th edition. Sauders company; Phladilphia: 2002.P121-122.

James A. Zagzebski. Essentials of ultrasound physics. 4th edition. Mosby; London:1996. p5.

Kyung W. Gross Anatomy. 4th edition. Lippincott Williams; Phladelphia: 2000.P247.

Matthias Hofer, with the collaboration of Tatjana Reihs. Ultrasound Teaching Manual.8th edition. Thieme; New York: 1999. p54.

Roderick NM. Mac Sween and Keith Whaley. Muri's Textbook of pathology .14th edition.Edward Arnold;London:2008. p942.

Vinay kumar, Ramzis S. Cotran, Stanley L. Robbins. Basic pathology .8th edition. Saunders Elevier; Phaladelphia:2007.P541-665-666.

Zorahl. R. Principles of Genitourinary Radiology.8th edition. Thieme; California: 1991.P364-365.

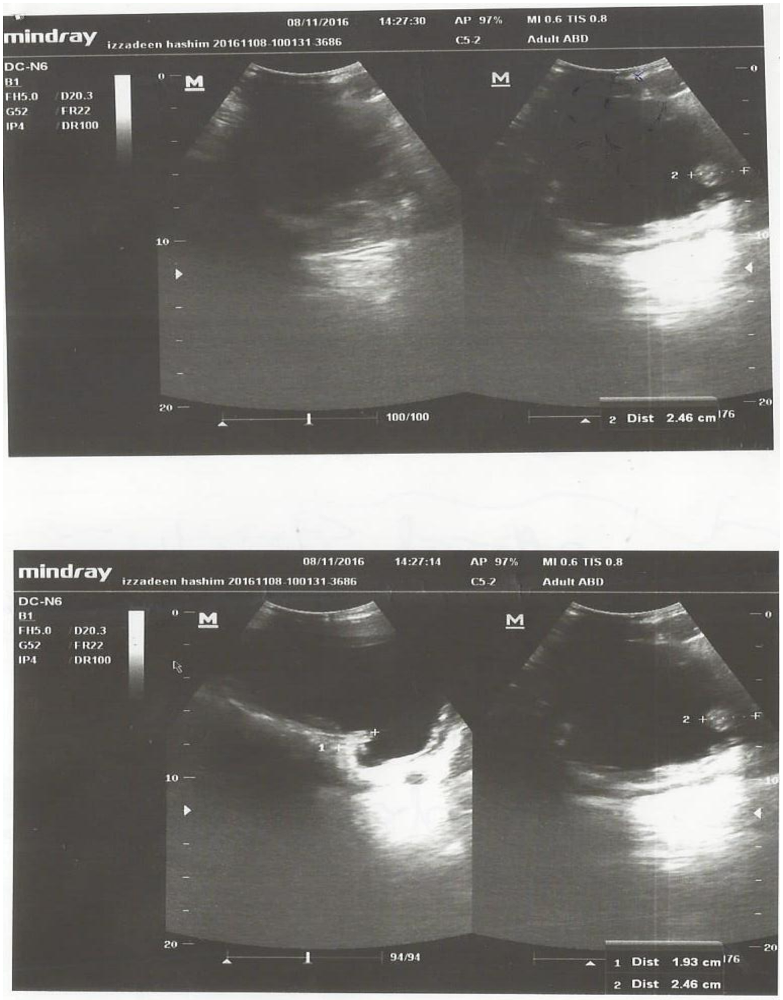
Appendices

Appendix (1):

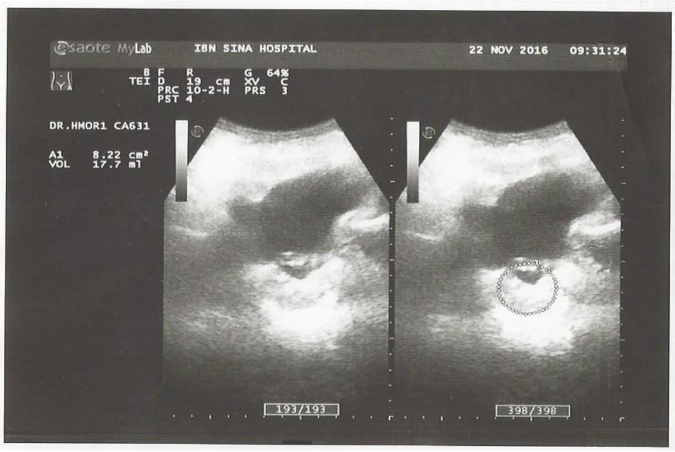
Table (4-1): Studying bladder outlet obstruction

Bladder After Micturition	Bladder Before Micturition	Prostatic Size	Age	Cause of Obstruction

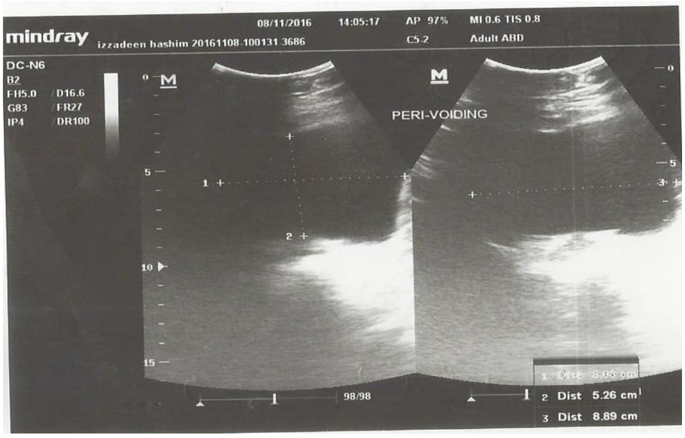
Appendix(2): Ultrasound images from the sample of the study:



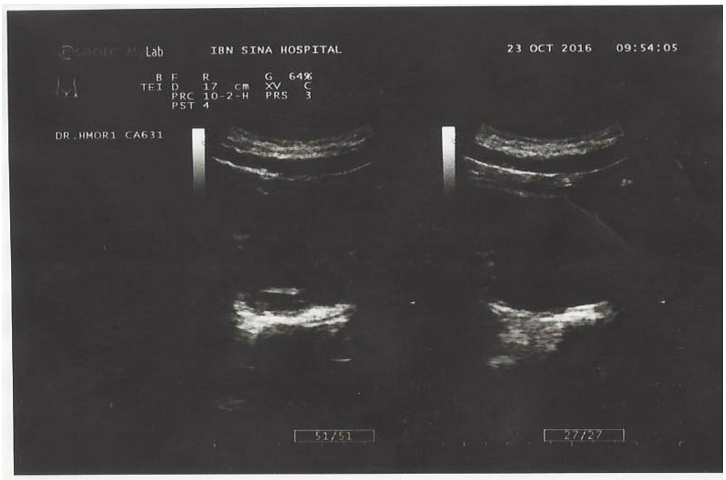
Transverse& Longitudinal transabdominal scan for 62yearsold male show the urinary bladder diverticulum



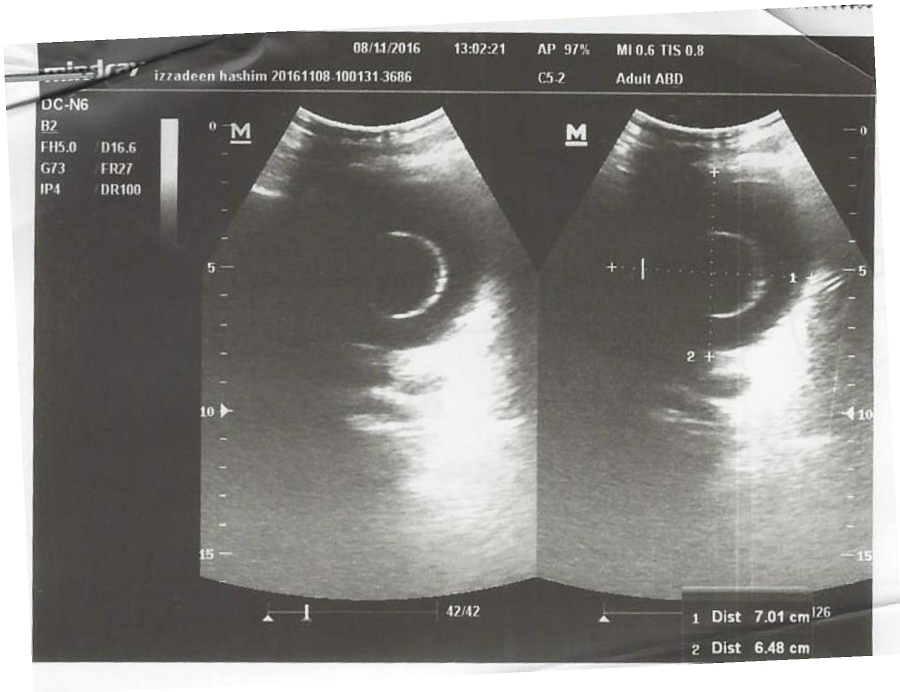
Transverse transabdominal scan for A70yearsold male show the urinary bladder after Prostatectomy



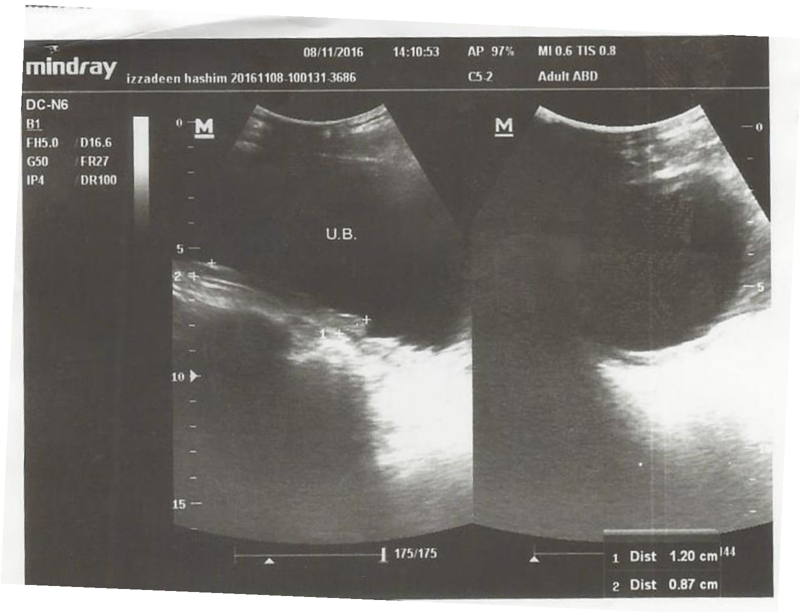
Transverse transabdominal scan for A79yearsold man show the normal urinary bladder



Transverse transabdominal scan for A 68yearsold male show the urinary bladder with enlarged prostate



Transverse transabdominal scan for A75yearsold man show the balloon catheter within the urinary bladder



Transverse transabdominal scan for A 63yearsold male with the urinary bladder trabeculation

Longitudinal & Transverse transabdominal scans for the urinary bladder of A70yearsold man with enlarged prostate