بسم الله الرحمن الرحيم

SUDAN UNIVERSITY OF SCIENCE AND TECHNOLOGY

COLLEGE OF GRADUATE STUDY

Study of Residual Urine In Benign Prostatic Hypertrophy Using Ultrasound

دراسة المتبقي من البول في حالة تضخم البروستاتا الحميد باستخدام الموجات فوق الصوتية

Thesis Submitted For Partial Fulfillment Of M.Sc. Degree

Medical Ultrasound

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الآيـــــــة

بسم الله الرحمن الرحيم

قــال تعالي:

﴿وَفِي أَنفُسِكُمْ أَفَلَا تُبْصِرُونَ﴾

صدق الله العظيم

سـورة الذاريات، الآيـة (21)

Dedication

I dedicate this research to my mother and father and my family whom help me in all my steps

Acknowledgment

Praise and thanks are Alla first and last

I would like to specify my acknowledgment to my supervisor Dr. Caroline Edward Ayad for sincere supervision and guidance.

I thanks all the teaching staff.

Abstract

This research is conducted so as to know the importance of ultrasonography in residual urine volume in benign prostatic hypertrophy.

This study is about benign prostatic hypertrophy that causes pressure on urethra and urinary bladder and change their anatomy and function, it also give rise to residual urine post micturation.

The data were collected from Gandi clinic and Sanhuri clinic, using an ultrasound machine and data collection sheet which include patient age above 47 years old ,also includes bladder volume **pre** and **post** micturation urine, prostate volume, sign and symptoms, measurement of kidneys, uriter **pre** and **post** micturation

The results conclude that the causes of urine retention haematurea, disurea, burning micturation in male above 47 years is benign prostatic hypertrophy which is related with cystitis, calcification and urine infection, residual urine.

Ultrasound scanning is very important modality to detect any prostatic changes in old men patients and to diagnose it early.

- Benign prostatic hypertrophy had been in male above 47 years.
- When the male age was increased Benign prostatic hypertrophy increased.
- The residual urine increased incase of increased prostatic volume.
- There was relationship between volume of urinary bladder **pre** and **post** micturation.

- Calcification and cystitis associated with benign prostatic hypertrophy in 40% of patients.
- There was relationship between residual urine volume and cystitis.

ملخص البحث

هذا البحث أجرى لمعرفة أهمية التصوير بالموجات فوق الصوتية لتحديد المتبقي من البول في حالة تضخم البروستاتا الحميد.

هذه الدراسة حول تضخم البرستاتا الحميد الذي يتسبب في الضغط على مجرى البول والمثانة البولية مما ينتج عنه تغيرهم تشريحياً ووظيفياً والمتبقي البول بعد التبول يعطى مؤشرعلى ذلك.

هذه البيانات جمعت من مجمع غاندي ومجمع سنهوري بأم درمان باستخدام جهاز موجات فوق الصوتية وورقة جمع البيانات التي تشمل العمر، حجم المثانة قبل وبعد التفريغ، حجم البرستاتا، المؤشرات والأعراض وقياس الكلى والحوالب قبل وبعد التبول.

النتيجة تتلخص في أن السبب الأساسى للبول الاضطراري، رجوع البول في الحالب، البول الدموي، تعسر البول، حرقان البول عند الذكر فوق 47 هو تضخم البرستاتا الحميد يتسبب فى التهاب المثانة، تكلس البروستاتا، زيادة البول المتبقي.

التصوير بالموجات فوق الصوتية مهم جداً للتوصل لأي تغير في البروستاتا عند المرضى الرجال وتشخيصه مبكراً .

- تضخم البروستاتا الحميد كان عند الذكور فوق 47عاماً .
- كلما زاد عمر الذكور زاد تضخم البروستاتا الحميد.
- كلما زاد حجم البروستاتا يزيد معه حجم البول المتبقي في المثانة البولية.
- هنالك علاقة بين حجم المثانة البولية قبل وبعد تفريغ البول.
- تكلس البرستاتا والتهاب المثانة مرتبط بتضخم البروستاتا في نسبة 40% من المرضى.
- هنالك علاقة بين حجم البول المتبقي في المثانة والتهاب المثانة

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List of Abbreviation

-CZ: Central zone

- PZ: Peripheral zone
- TZ: Transitional zone
- BPH: Benign Prostatic Hyperplasia
- DRE: Digital Rectal Exam
- PSA: Prostate Specific Antigen
- CP: Chronic Prostatitis
- CPPS: Chronic Pelvic Pair Syndrome
- TRUS: Trans Rectal Ultra sound
- DWT: Detrusor Wall Thickness
- BOO: Bladder Outlet Obstruction
- PVR: Post Void Residual urine

Chapter One

Introduction

Chapter One

1-1 Introduction:

Men home have urgency or feeling of urine in the urinary bladder after micturation always in old age above 47years old. Sometimes patient come with complete obstruction of urethra due to pressure of prostate on the urethra this indications .Benign Prostatic Hypertrophy cause pressure on the urethra and urinary bladder,this pressure sever or mild or moderate which cause obstruction complete or not,in complete one folly's catheter indeed for micturation of urine.Residual urine presented in mild and moderate obstruction but in complete obstruction there is no residual urine.Residual urine may cause cystitis,pylonephritis,urine retention(dilated uriter),hydronephrosis,thick urine changed to vesical stone in long time of obstruction.

The urethra across through prostate so in old patients any pathology change of prostate affect the urethra mainly by pressure that causing narrowing of urethra or close it which cause of residual urine in urinary bladder. This residual urine sometimes cause cystitis because the urine contain chemical.

Residual urine when it stay long time may change to be thick and from it component of chemicals changed to vesical stone.

The infection by long time transverse to the uriter and to the kidneys .In doing scanning the patient must be full urinary bladder, ultrasound done **pre**-micturation (full) and **post** micturation (empty) and measured the urine volume **pre** and **post** micturation of urinary bladder.

Also in ultrasound was measured the prostate volume to compare between the degree of benign prostatic hypertrophy and the amount of the residual urine, and the degree of obstruction inthe urethra.

1-2 Statement of the problem:

Benign Prostatic Hypertrophy is main cause of residual urine in old men, many tools of investigations are used to find out the right diagnosis. This includes clinical examination, urine investigation, ultrasonography and different types of other radiological modalities. By conducting this research, The research aim to know the best way to reach the diagnosis and to help the health workers in the treatment of the residual urine in benign prostatic hypertrophy.

1-3 Research objectives:

1-3-1 General objectives:

To diagnose the different pathological causes of residual urine in benign prostatic hypertrophyusing ultrasound.

1-3-2 Specific objectives:

- To measure the volume and nature of prostate,urinary bladder pre and post micturation of urine, measured dilated uriter in patients with benign prostatic hypertrophy.
- To characterize the benign prostatic hypertrophy.
- To measure the volume of the prostate.
- To diagnose the cystitis complaining of benign prostatic hypertrophy
- To compare between urine volume pre and post micturation and prostate size.

1-4 Theses overview:

This study consists of five chapters:

Chapter one: contains introduction and objectives (general and specific).

Chapter two: literature review anatomy, physiology,pathology and normal sonographic appearance of the prostate and urinary bladder.

Chapter three: contains the materials and methods.

Chapter four: contains the results presentation.

Chapter five: contains the discussion, conclusion and recommendations.

Chapter Two

Literature Review

Chapter Two

Literature Review

2-1 Anatomy of the prostate:

The prostate is a gland of the male reproductive system. It is located in front of the rectum and just below the bladder, the organ that stores urine. It is about the size of a chestnut and somewhat conical in shape, {www.cancer.gov}

Consists of a base, an apex,(an anterior, a posterior, median and two lateral lobes). The main purpose of the prostate is to produce fluid for semen, which transports sperm during the male orgasm. The prostate is also divided, by scientists, into different zones according to their function: the central zone, peripheral zone,and transverse zone. {www.cancer.gov}.

(a) (b)

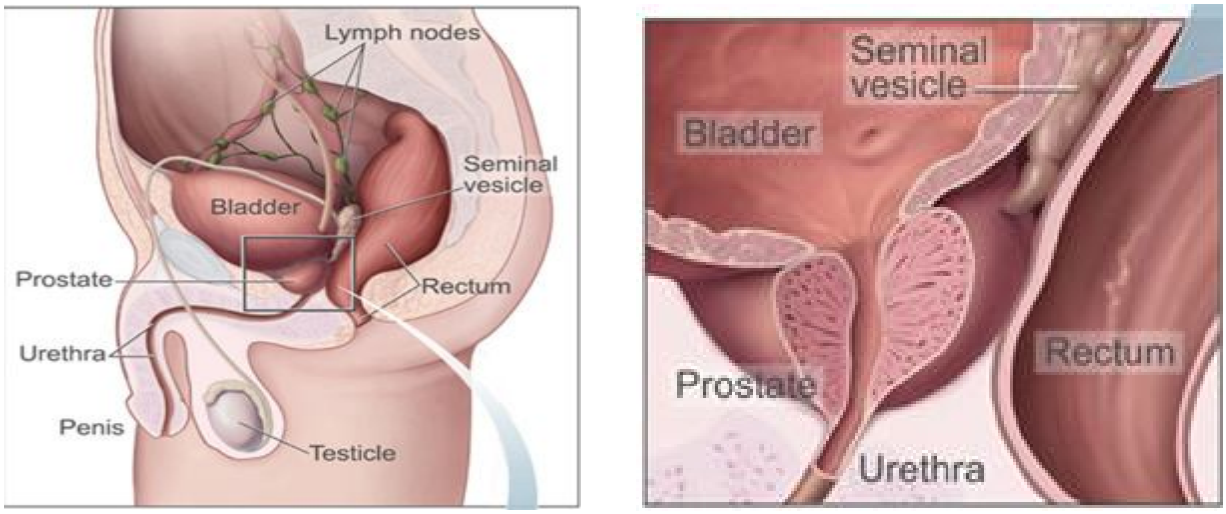


Figure 2-1 (a) show the anatomy prostate and the near organs vesicle. (b) show the internal prostate, urinary bladder and rectum {www.cancer.gov}

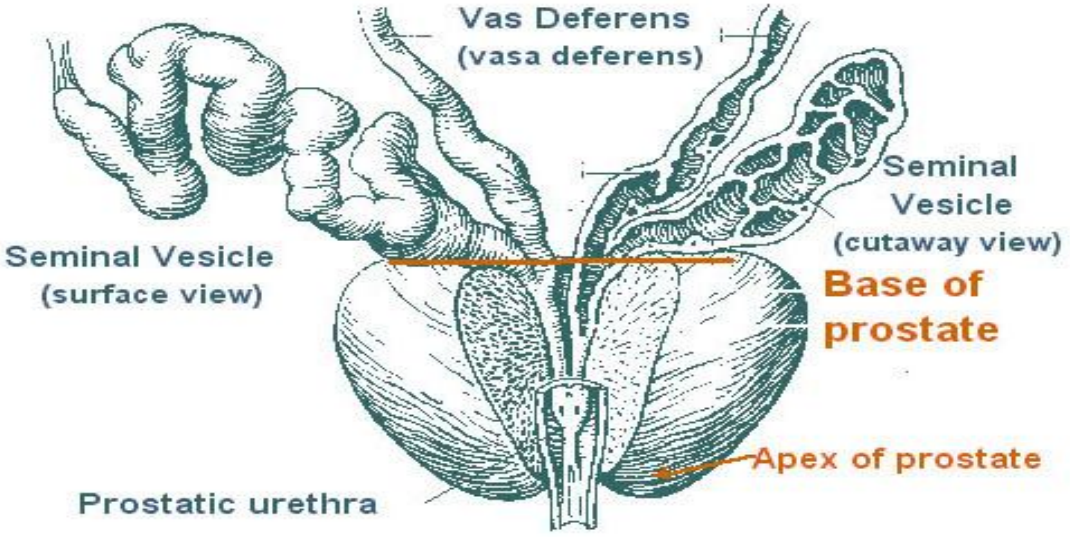


Figure 2-2 Show internal and surface prostate and seminal vesicle{www.cancer.gov}

2-1-1 Base of the Prostate:

The base is directed upward near the inferior surface of the bladder. The greater part of this surface is directly continuous with the bladder wall.(training.seer.cancer.gov).

2-1-2 Apex of the Prostate:

The apex is directed downward and is in contact with the superior fascia of the urogenital diaphragm. .(training .seer .cancer.gov).

2-1-3 Lobes of the prostate:

The prostate is divided into several lobes.(training .seer .cancer.gov).

2-1-3-l Anterior Lobe:

The anterior lobe is used to describe the anterior portion of the gland lying in front of the urethra. It is devoid of glandular tissue being formed completely of fibro muscular tissue. (training .seer .cancer.gov).

2-1-3-2Median Lobe:

The median lobe is a cone-shaped portion of the gland situated between the two ejaculatory ducts and the urethra. (training .seer .cancer.gov).

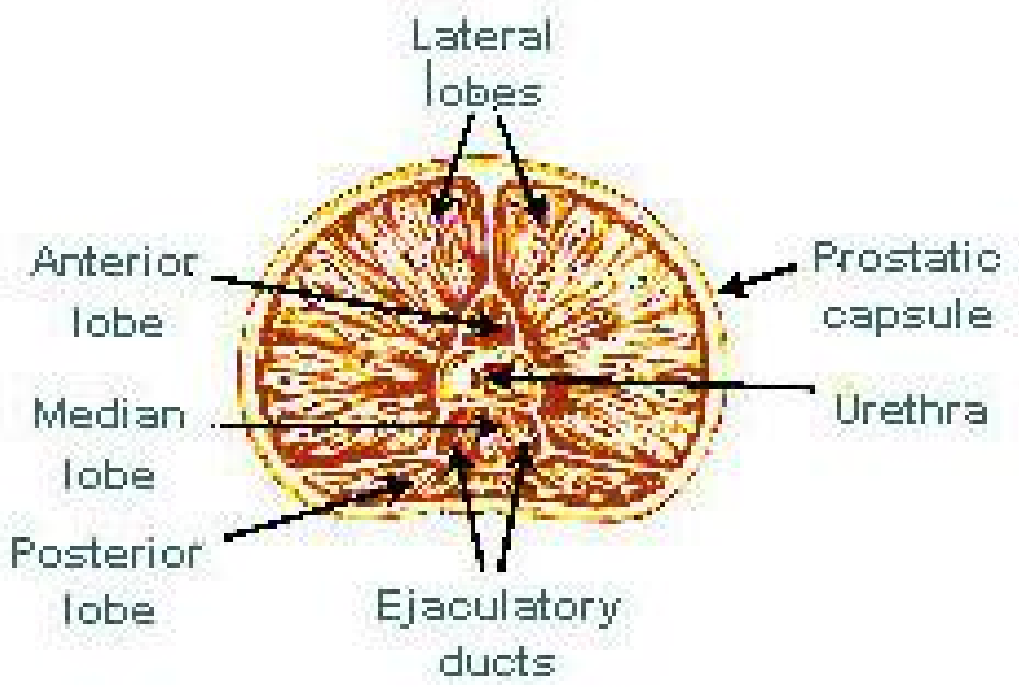


Figure 2-3 Show cross section of the prostate gland {www.cancer.gov}

2-1-3-3Lateral Lobes:

The lateral lobes (right and left lobes) form the main mass of the gland and are continuous posteriorly. They are separated by the prostatic urethra. (training .seer .cancer.gov).

2-1-3-4Posterior Lobe:

The posterior lobe is used by some to describe the postero-medial part of the lateral lobes that can be palpated through the rectum during digital rectal exam . (training .seer.cancer.gov)

2-1-4 zones of the prostate:

Scientists divide the prostate up into different zones according to their function. The zones are Central (CZ), Peripheral (PZ) and Transitional (TZ). (training .seer.cancer.gov).

Throughout early childhood the prostate gland is very small (about the size of a pea) but grows rapidly during puberty in response to the production of the male hormone testosterone. Once it reaches about the size of a walnut it remains relatively stable until around 40 years of age, when it often begins growing again. From this point, though the growth is very slow, it doesn't stop growing for the rest of a man's life.

Abnormal prostate enlargement occurs in 50% of men over 60 and up to8O% of men over 70. It is the abnormal enlargement, combined with the crucial location of the prostate that can lead to the problems with what is commonly called an enlarged prostate or BPH (Benign prostatic hyperplasia). (training .seer .cancer.gov)

2-2 Physiology of the Prostate:

2-2-1 Secretion:

The prostate produces a secretion that makes up a large portion of semen volume. The prostatic secretions are a milky white mixture of simple sugars (such as fructose and glucose), enzymes, and alkaline chemicals. The sugars secreted by the prostate function as nutrition for sperm as they pass into the female body to fertilize ova. Enzymes work to break down proteins in semen after ejaculation to free sperm cells from the viscous semen. The alkaline chemicals in prostatic secretions neutralize acidic vaginal secretions to promote the survival of sperm in the female body.(www.inner body.com/... /repo09-new4.ht...).

2-2-2 Ejaculation:

The prostate contains the ejaculatory duct that releases sperm during ejaculation. The ejaculatory duct opens to allow semen to pass from the ducts deferens into the urethra and eventually out of the body. During orgasm, smooth muscle tissue in the prostate contracts in order to push semen through the urethra. (www.inner body.com/.../repoo9-new4.ht...)

2-2-Urination:

Urine released from the urinary bladder is carried by the urethra to the body's exterior. Undernormal conditions, urine in the urethra passes through the prostate with no complications whatsoever. The prostate enlarges slowly throughout a man's lifetime, potentially leading to the restriction or blockage of the urethra by the time a man reaches his fifties or sixties. An enlarged prostate can lead to difficulty urinating or eventually even an inability to urinate.(www.inner body.com/.../repo09-new4.ht...).

2-3 Pathology of the prostate:

There are a number of problems associated with the prostate gland. The most common of these is benign prostatic hyperplasia (BPH).

Most prostate problems can be associated with similar symptoms including:

- Frequent urination or the feeling of needing to urinate.
- Feeling that the bladder does not empty completely.
- Post void dribbling.
- Waking or frequently at night to urinate.
- Sudden or urgent need to urinate.
- Difficulty in starting to urinate.
- Slow flow of urinate and difficulty in stopping.
- Discomfort or pain deep inside the pelvis.
- Painful ejaculation.

- Blood in the urine or semen.
- Decrease in libido(sex urge).
- Reduced ability to get an erection.

The common tests your doctor may perform to help ascertain the relative health of the prostate gland, include digital rectal exams (DRE) and blood tests prostate -specific antigen (PSA) are often included in routine physical examinations for men over 50. For men with a family history of prostate cancer, it is recommended that tests be started at age 40.

The prostate gland produces a substance called PSA. or prostate specific antigen. A small amount of SA can be found in blood, but it is mostly present in semen .A blood test is done to measure the amount of PSA, the level of which is used as an indicator of risk for prostate cancer.

Whilst a PSA test helps the doctor access the overall health of the prostate, it is not definitive and several factors are not associated to cancer or even to prostate problems at all, can also elevate blood PSA levels .these include:

Ejaculation raises PSA levels (so no ejaculation at least two days prior to the test). PSA levels can naturally increase with age.

Higher than “normal” PSA levels can be caused by non cancerous enlargement of the prostate benign prostatic hyperplasia (BPH).

Higher than “normal” PSA levels can be caused inflammation of the prostate gland.(www.inner body.com/…/repo09-new4.ht...)

2-3-1 Benign prostatic hyperplasia (BPH):

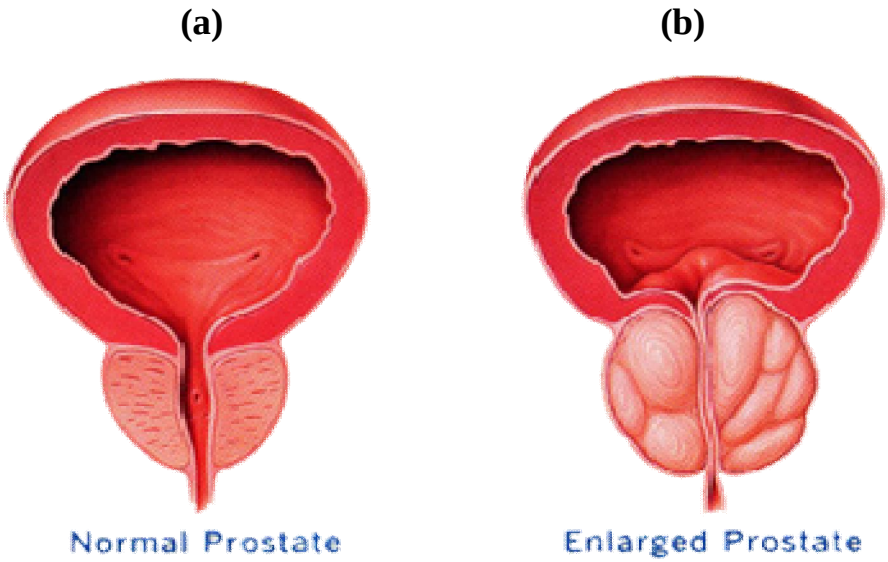


Figure 2-4 Show (a) normal prostate and (b) changes of urethra and urinary bladder in the enlargedprostate {www.cancer.gov}.

This condition, which is a growth of' non-cancerous cells within the transition section of the prostate, causes an enlargement of the gland and exerts pressure on the urethra which, in turn. leads to difficulties in urinating.

About half of all men suffer enlargement of the prostate by the percent of the male population will experience an enlarged prostate.

Symptoms of prostate enlargement include the need to urinate frequently. having the feeling that the bladder does not empty completely and/or urine dribbling after you have finished peeing.

Although prostate enlargement is very common, in many men it may not he problem enough to require any treatment. There are many nutritional and herbal supplements available from health stores and many pharmacies which support prostate function and normal healthy prostate growth. These

supplements may help resolve some the less serious, but very pesky symptoms associated with BPH including the need for frequent trips to the bathroom at night and the post void dribbling. (www.inner body.com/…/repo09-new4.ht...)

2-3-2 Prostatitis:

The term prostatitis refers, in its strictest sense, to microscopic inflammation of the tissue of the prostate gland. although it is loosely (and confusingly) used to describe several completely different conditions including: (www.inner body.com/.../rcpo09-new4.ht...).

2-3-2-1 Acute prostatitis:

Is a serious bacterial infection of the prostate gland. Men with this disease often have chills, fever. pain in the lower back and genital area, urinary frequency and urgency often at night, burning or painful urination, body aches and a demonstrable infection of the urinary tract, as evidenced by white blood cells and bacteria in the urine. A cute prostatitis may be a complication of prostate biopsy or surgery. This infection is a situation requiring immediate expert medical a attention. .(www.inner body.com/... ./repo09-new4.ht...).

2-3-2-2 Chronic bacterial prostatitis:

Is a relatively rare condition that usually presents as intermittent urinary tract infections.

2-3-2-3 Chronic prostatitis /Chronic pelvic pain syndrome (CP/CPPS):

Accounting for 90%-95% of prostatitis diagnoses. is also known as chronic nonhacterial prostatitis. Men in this category have no known infection. but do have extensive pelvic pain lasting more than 3 months. There are no standard diagnostic tests; diagnosis is by exclusion of other disease entities.

Therapies administered by doctors are hit and miss at best. (training.seer.cancer.gov).

2-3-2-4 Asymptomatic inflammatory prostatitis:

Patients have no history of genitourinary pain complaints, hut leukocytosis (increased immunewhite blood cells in the blood) is noted, usually during evaluation for other conditions. Between 6-19% of men have pus (dead white blood cells)in their semen but no symptoms.

The causes of prostatitis are not clearly understood. Bacterial infection account for approximately 5% of cases. It is though that certain bacteria can laying deep in the prostate, or autoimmune factors can contribute to chronic and asymptomatic prostatitis. It is also thought by some that too much sex (yes. there is such a thing as too much. especially as you get order), sexual abstinence or sitting too long can have significant influence on the health of the prostate and is considered a common cause of non-bacterial forms of prostatitis. (training .seer .cancer.gov)

2-3-3 Prostate cancer:

Prostate cancer tends to develop in men over the age of fifty and although it is one of the most prevalent types of cancer in men, many never have symptoms, undergo no therapy, and do not die from the condition. This is because cancer of the prostate is, in most cases,slow-growing. symptom-free, and since men with the condition are older they often die of causes unrelated to the prostate cancer, such as heart/circulatory disease, pneumonia, other unconnected cancers, or old age. There is ongoing debate about the risk versus benefits of treatments such as surgery or chemo and radiotherapy. These treatments have a very high risk of causing more problems than they solve.

Prostate cancer detection is usually by routine prostate examination and prostate specific Antigen(PSA) Blood test. As discussed above, the accuracy and therefore the value of this test is also asubject of controversy and debate. (training.seer.cancer.gov).

2-3-4 Prostate calcification:

Some chronic prostatitis and enlarged prostate suffers over 40 years old can be checked out prostatic calcification or prostate stones. The calcification checking way is ultrasound, have strong echo image, echo with shadow is calcification, haven't shadow is prostate stones. Many sufferers wonder why prostatic calcification and prostate stones have in prostate gland. The prostate calcification, stones, fibrosis are scar the prostate inflammation did, but some calcification patients don't have symptoms, even some urologist tell don't need treat calcification, it determinately is wrong, because calcification is premonitory of prostate stones, if don't treat it timely the calcification will become stones to bring more difficult to treatment. And it's easy for growth of bacteria in prostate gland calcification and prostatic stones, if don't get rid of prostate calcification and stones, don't cure calcification prostate gland, prostatitis never be cured really. (training.seer.cancer.gov).

The prostate calcification causes is blockage and lower heat in prostate gland. Prostate is sex gland, during sexual life, erection, and ejaculate, the prostate always is engorgement and congestion, when engorgement action is over and over, the circulation become blocking, to cause heat and toxin in prostate not to clear out, these toxin deposit to calcification finally, the prostate calcification and stones reason is same with the river flows, the sediment become blockage in prostate tubes, more and more blockage stop the prostate circle, make tubes swollen to oppress the bladder, bowel,

abdominal cavity organ, make pelvis pain or urine pain. Bring other else symptoms, of course, if enlarged prostate calcification doesn't oppress other organs, maybe don't feel symptoms, but calcification never stop deposit unless remove prostatic calcification and stones, calcification only grows more and more larger to become. (training. seer.cancer.gov).

2-4 Sonographic appearance of the prostate:

2-4-1 Normal prostate:

A healthy human prostate is classically said to be slightly larger than a walnut. The mean weight of the normal prostate in adult males is about 11 grams, usually ranging between 7 and 16 grams. It surrounds the urethra just below the urinary bladder and can be felt during a rectal exam(training. seer.cancer.gov).

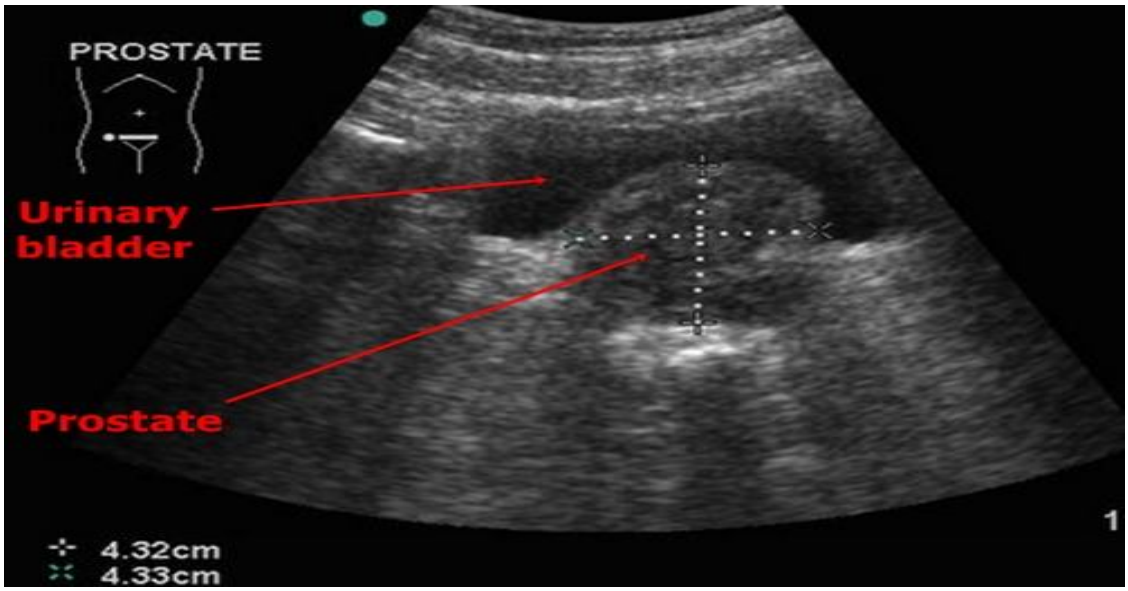


Figure 2-5 Show normal ultrasound appearance of prostate (trans abdomen image)

2-4-1-1 Trans rectal ultrasound (TRUS) technique:

It is ideal to have a small amount of urine in the bladder.

Ask the patient to try and relax and ‘bear down” to open the sphincter as the transducer in inserted slowly. Ensure the transducer has a latex free dedicated probe cover with plenty of gel. The highest frequency sector probe 7-12MHz should be used.

The scanning begins in the axial plane. The seminal vesicles are examined initially. As the probe is angled caudally the base of the prostate is seen.

Once the prostate is examined in its entirety in this plane the probe is turned 90 degrees in sagittal plane. The probe is angled from one side across to the other.

A volume is taken by measuring height x length in the sagittal plane and x width in axial plane and multiply 0.52.

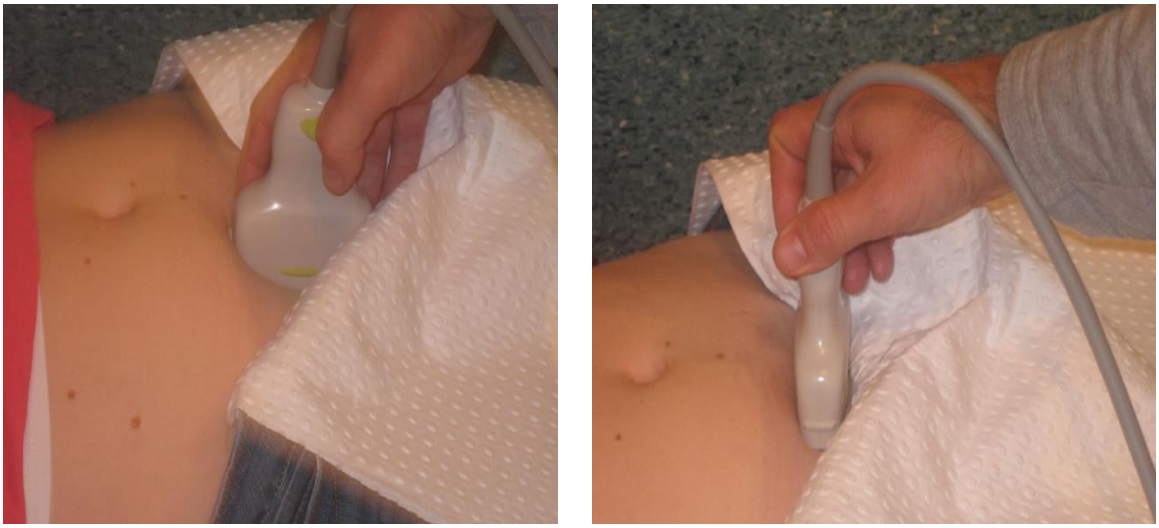
Normal volume of prostate = $20cm^3$.

Figure 2-6 Show normal prostate images trans rectal (TRUS) {www.cancer.gov}

2-4-1-2 Transabdominal technique:

The patient lies supine. The patient should have a half full bladder. 500 mls of water 1 hr beforethe scan if possible is recommended.

The probe is angled approximately 30 degrees caudal using the bladder as a window. Slight compression to ensure the inferior portion of the prostate is not obscured by the shadow artifact from the base of the bladder.(www.inner body.com/.../repo09-new4.ht...).



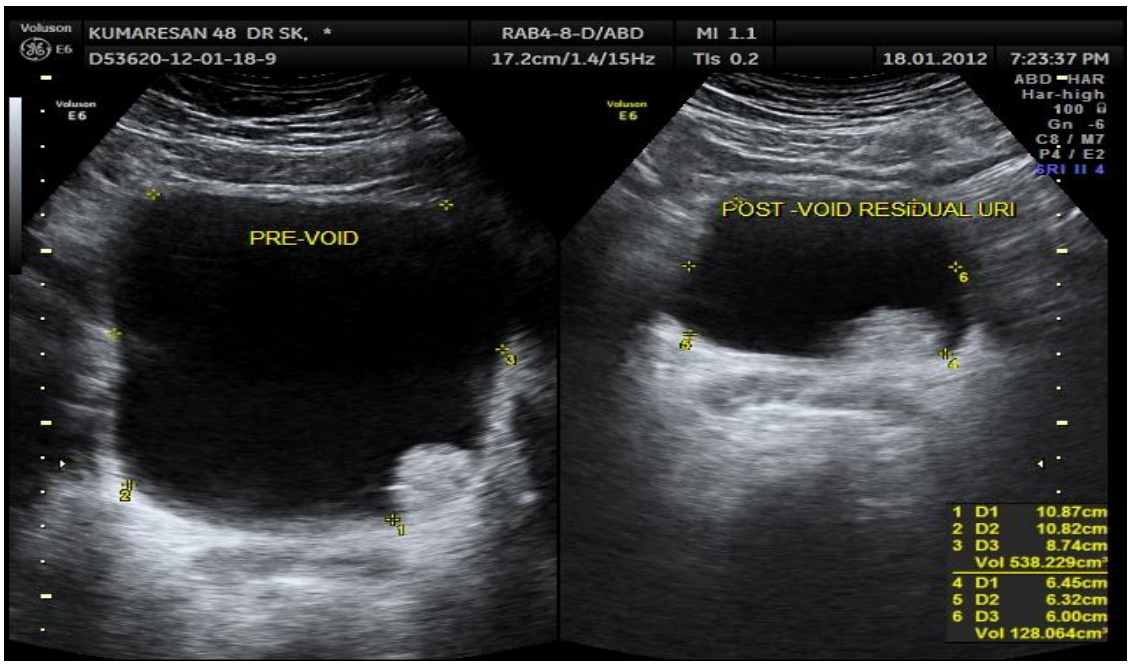
(a) **(b)**

Figure 2-7 Show prostate trans abdominal technique (a) sagittal view and (b) transverse view with caudal angle {www.cancer.gov}.

2-4-2Sonographic appearance of benign prostatic hypertrophy:

Ultrasound has become the standard first line investigation after the urologists finger. Typically there is an increase in volume of the prostate with a calculated volume exceeding 30cc ((A x B x C)/2). The central gland is enlarged. and is hypo echoic or of mixed echogenicity Calcification can be seen both within the hypertrophied gland as well as in the pseudo capsule

(representing compressed peripheral zone). .(www.inner body.com/... /repo09-new4.ht...).



(a) (b)

Figure 2-8 Show residual urine in the urinary bladder with benign prostatic hypertrophy: (a) full urinary bladder (b) residual urine post micturation {www.cancer.gov}.

2-4-3 Sonographic appearance of Prostatitis:

Focal hypo echoic region in the peripheral zone of the gland. Discrete fluid collection suggests abscess formation. Color Doppler ultrasound demonstrates increase flow in the periphery of the abscess.

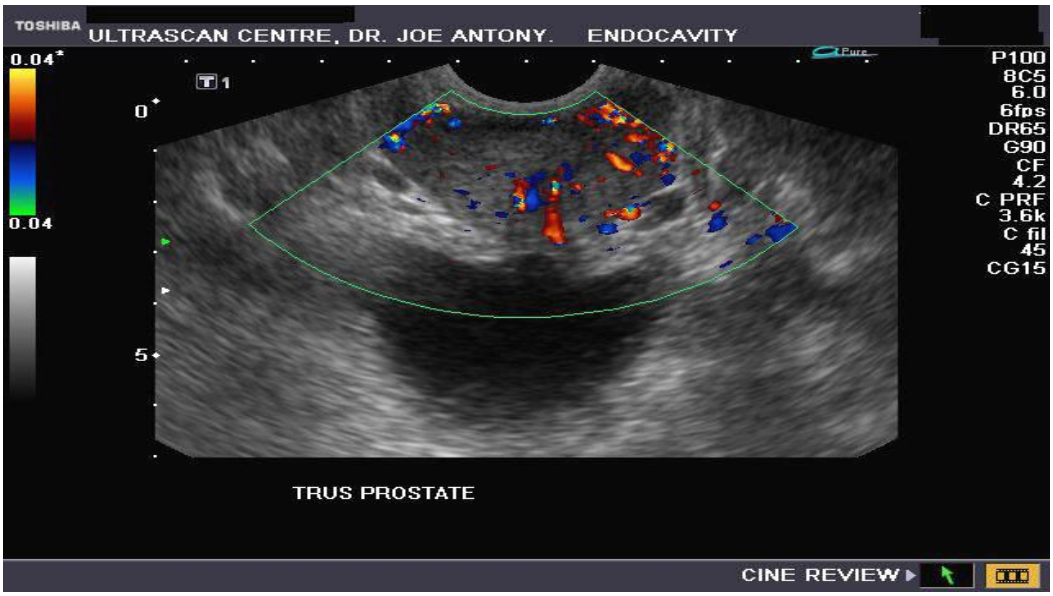


Figure 2-9 Show Color Doppler imaging of prostatitis (http://www.ultrasoundimages.com/prostate.htm)

2-4-4 Sonographic appearance of prostate calcification:

Calcifications appear as brightly echogenic foci that may or may not show posterior shadowing.

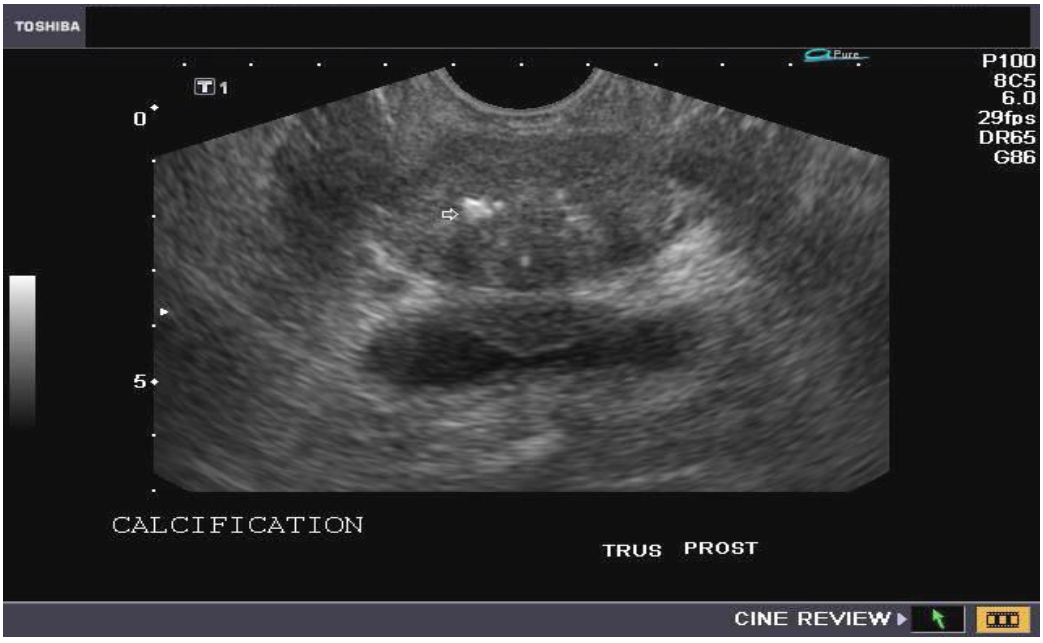


Figure 2-10 Show calcification in prostate (http ://www. ultrasound-images.com/prostate.htm).

2-5 Previous studies in residual urine in benign prostatic hypertrophy:

-N.C.BIRCH, eta (2008)had studied, thirty men with prostatic hypertrophy who were scanned on 3 occasions on a day five commonly used formulae to estimate residual urine were used .All of these methods are subject to large degrees of errors, 66% of these patients had residual volumes that varied significantly on the same day.

The study suggested that it is of no clinical value to perform a single residual urine measurement in patients with prostatic hypertrophy.

- Study done by McNei II SA etal (2008). In there population of men with lower urinary tract symptoms suggestive of benign prostatic hyperplasia, the post void residual urine volume and bladder capacity were related to the baseline Omax (maximum flow rate). Alfuzosin significantly reduced the post void residual urine volume compared with placebo, and this effect was more marked in patients with a high post void residual urine volume at baseline. Acute urinary retention occurred mainly in patients with a post void residual urine volume greater than 100 mls and was less frequent in patients taking alfuzosin than in those taking placebo .No relationship was found between post void residual urine volume and age.

-Study of one hundred sixty men between 40-89 of age,75 had pressure-flow studies. The results of all investigated index tests differed significantly between obstructed and no obstructed men.

Wall thickness was the most accurate test to determine bladder outlet obstruction : 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.

Their study showed that measurements of DWT can detect BOO better than free uroflowmetry. Postvoid residual urine, or prostate volume. In clinical routine, DWT measurements can be used to judge BOO noninvasively.

- Study done by author et.al.

Concluded that: The urinary flow rates PVR urine volume do not seem to be effected by the voidingposition (standing or sitting) either in patients with BPH or in healthy men.

- Study done be steel G. et. Al., 2001.

The study showed that combining the AUA symptom index, maximum urine flow and prostate volume reliably predicted bladder outlet obstruction in a small subset of patients only. Although bladder outlet obstruction was correctly predicted by our threshold values of AUA symptom index, maximum urine flow and prostate volume in only 39 men (26%) with obstruction, these patients represent a substantial group in any large urological practice treating male lower urinary tract symptoms.

Chapter three

Materials and methods

Chapter three

3-1 Materials and tools:

An ultrasound machine (Aloka) (with probe-convex 3.5 MHz) and, Ultrasound imaging system with a B mode capabilities was used. The transducer phased-array 3.5 MHZ, and ultrasound gel was applied to the transducer to prevent any attenuation or artifact. And thermal Paper Printer was used. A data collection sheet was used to collect the data and to number the patients.

3-2 Methods:

The study was conducted in (Gandi clinic and Sanhori clinic), Omdurman city, from the first of December 2013 to the thirty of June 2014. The study population ,in a selected way a total of fifty patients, age above 47years were selected to be the sample unit in this study.

3-2-1The inclusion criterion:

Any patient attending the clinic in that period mentioned complaining of urination problem his age above 55 years and his prostate enlarged (benign prostatic hypertrophy.

3-2-2The exclusion criteria:

Exclusion criterion, any patient his age under 48years, also any patient with no enlarged prostate (benign prostatic hypertrophy).

3-2-3Concent by the patients:

Anyone in the study signed a concent to be one of the study objects after had been told about what should be done for him.

3-2-4 Data collection:

To collect the suitable data for the study; personal information from any patient is written in the data collection sheet as well as the results .This includes the following:

3-2-5 Ultrasound technique of the urinary bladder and prostate:

The examination begins with the patient in the supine position. Scans are performed in the sagittal and transverse planes from the anterior approach with tilting the probe caudal using the full bladder as acoustic window (transabdominal) as well. The highest frequency transducer permitting adequate penetration is used. This is usually in the 3 to 5 MHz range. A convex probe is used and an acoustic gel is applied.

3-2-6- Measurement of prostate volume:

Was taken by measuring transverse and depth diameter in transverse plane, in sagittal plane was taken longitudinal diameter.

Volume of prostate =transverse diameter x depth diameter x longitudinal diameter multiply 0.52.

Normal volume of prostate = $20cm^3$.

3-2-7Measurement of urinary bladder volume pre and post micturation:

Was taken by measuring transverse and depth diameter in transverse plane, in sagittal plane was taken longitudinal diameter(www. cancer.gov).

Volume of urinary bladder=transverse diameter x depth diameter x longitudinal diameter multiply 0.52 to give us volume of the urine:**pre** micturation =full urinary bladder, **post** micturation=residual urine.

3-2-8 Statistics:

Finally these data was tabulated, described, represented and analyzed using SPSS version 16 ,putting in mind that the using the chi square test to know the significance and correlation coefficient between tow suitable variables.The results of this analysis put in a scientific frames and facts from which the medical decision and recommendations is created in the discussion chapter.

Chapter Four

Results

Chapter Four

Results

The following tables and figures presented the data obtained from 50 male patients coming to the ultrasound departments with different complains including urgency, burning micturation, haematurea, high frequency urination and disurea.

Descriptive Statistics

Patients' Data:

1/Age:

Table4. 1 The distribution of patients ages (percentages of patients according the age).

Age	Frequency	Percentages%
48-58	5	10%
59-69	20	40%
70-80	23	46%
81-91	2	4%
Total	50	100%

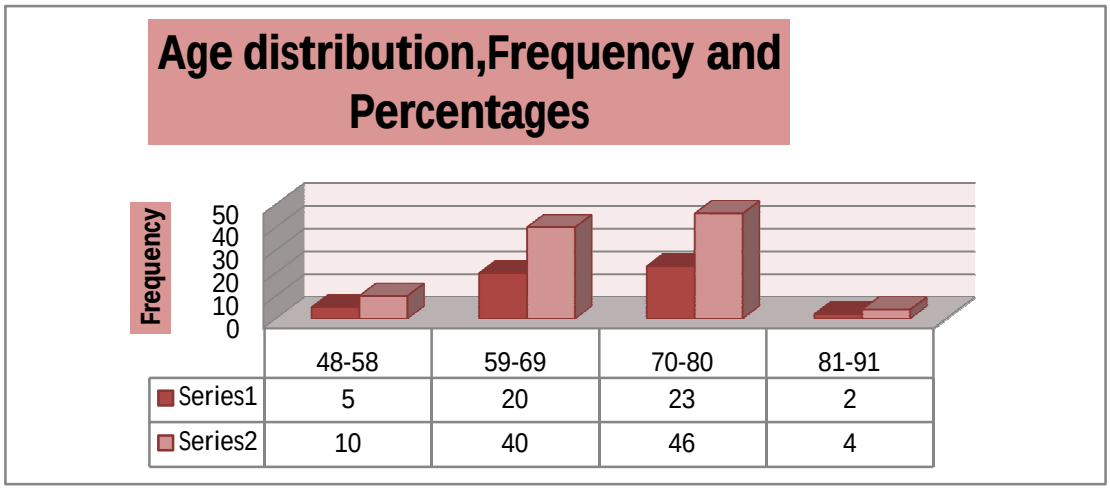


Figure 4. 1: The distribution of patient's ages

Table4. 2 The Mean and standard deviation of the variables

Variable	Age	Bladder volume pre micturation	Bladder volume post micturation	Prostate Volume
Mean	67.76	140.82	29.1	93.12
STDV	±7.49	±79.7	±43.27	±44.6

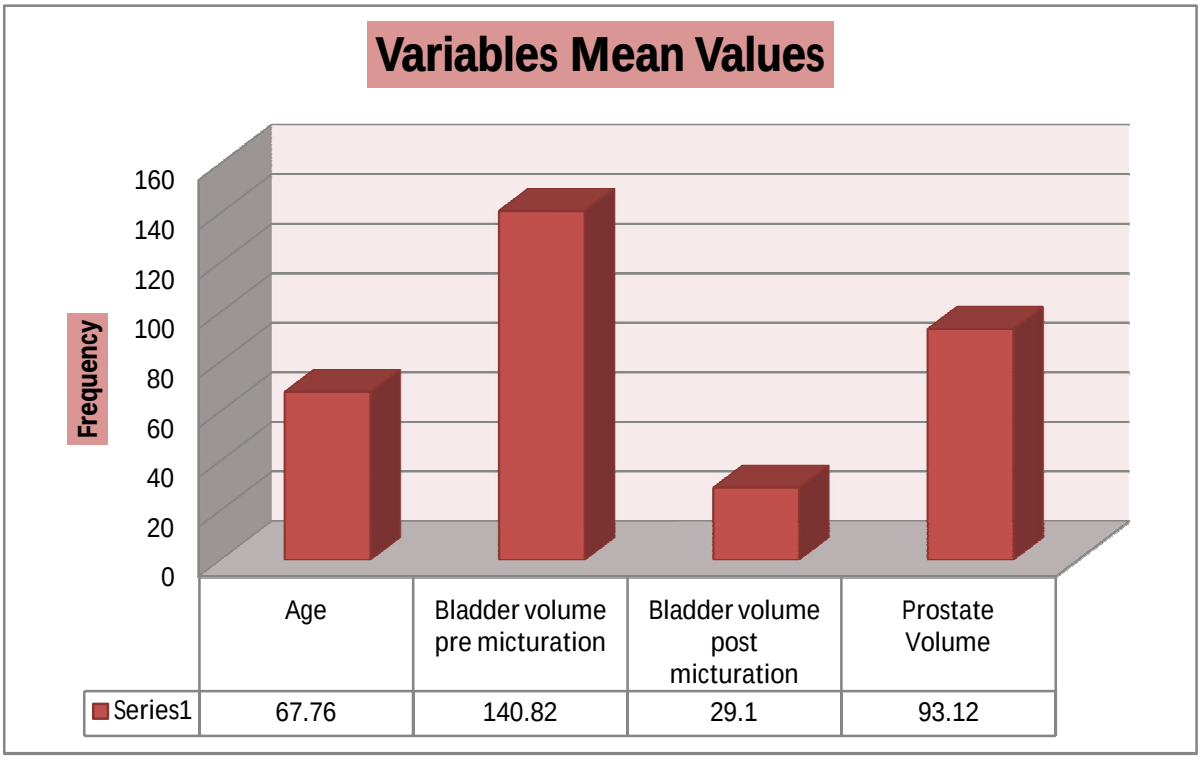


Figure 4.2The Mean Values of the variables(size of bladder volume pre and post micturation affected mainly with size of prostate which affect by patient age)

Table 4.3 The Frequency and percentages of the Ultrasound Findings

Diagnosis	Frequency	Percentages%
BPH*	31	62.0%
BPH+ Cystitis	5	10.0%
BPH+ Calcification	14	28.0%
Total	50	100.0

*BPH stands for benign prostatic hypertrophy

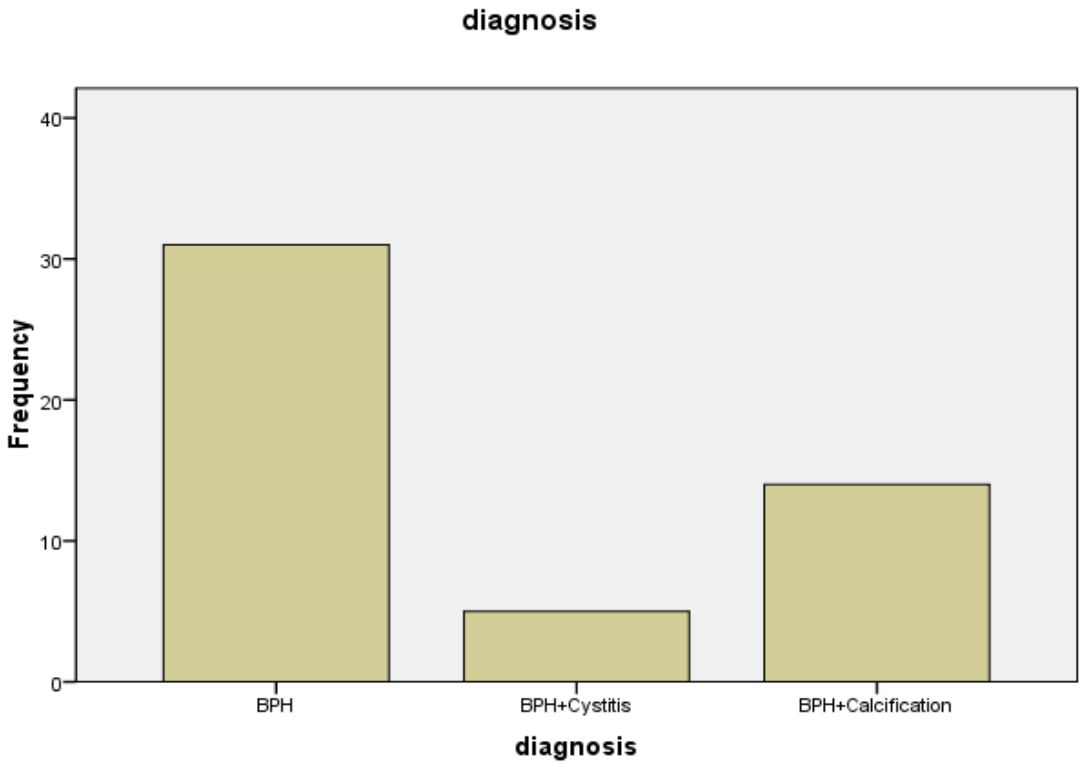


Figure 4.3 The Frequency and percentages of the Ultrasound Findings

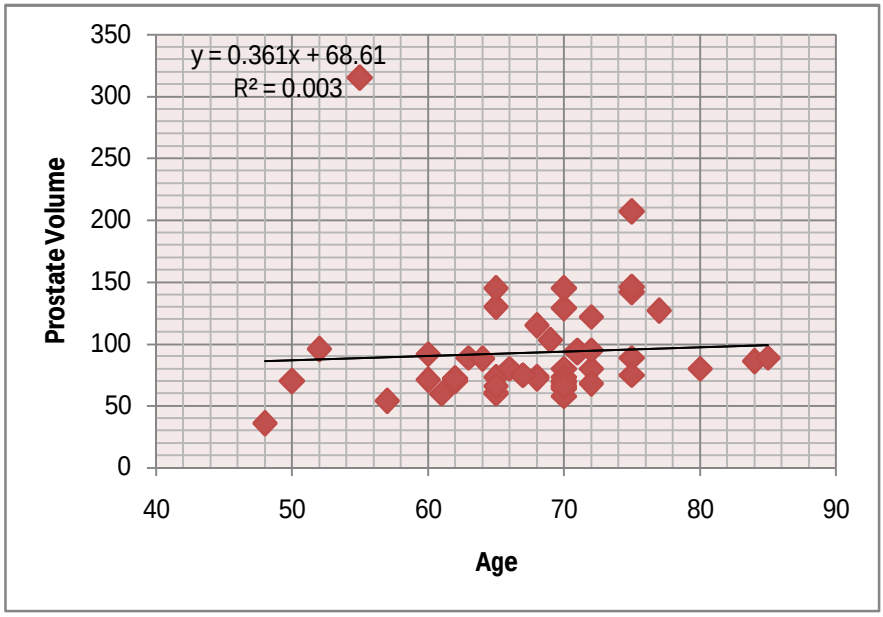


Figure 4.4 A scatter plot diagramme shows a linear relationship between the male age and Prostate Volume, As the age increased the prostate volume will also increase by 0.361 starting from 69.61 (R2=0.003)

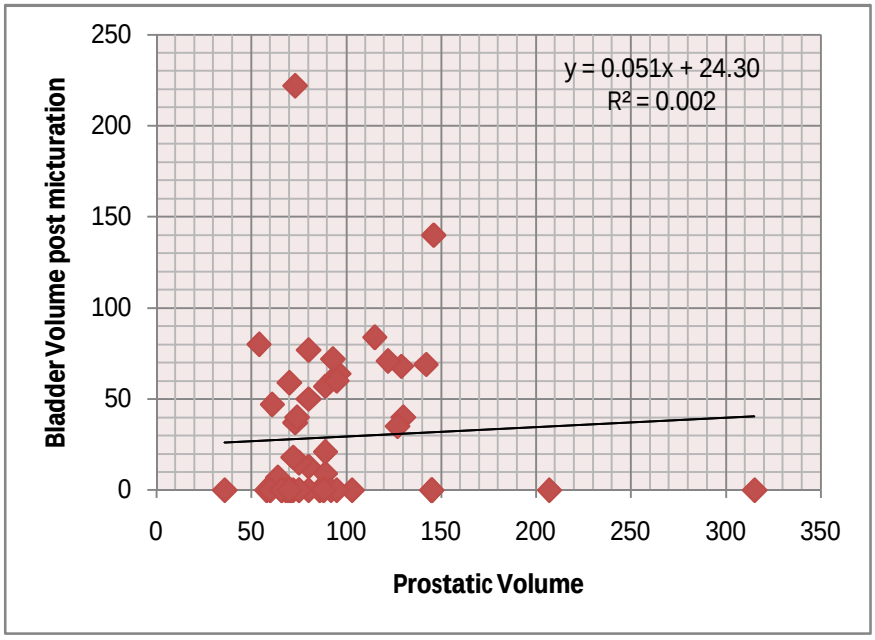


Figure 4.5 A scatter plot diagramme shows a linear relationship between the Prostate Volume and the bladder volume **post** micturation, when the prostate volume increased the bladder volume **post** micturation increased.

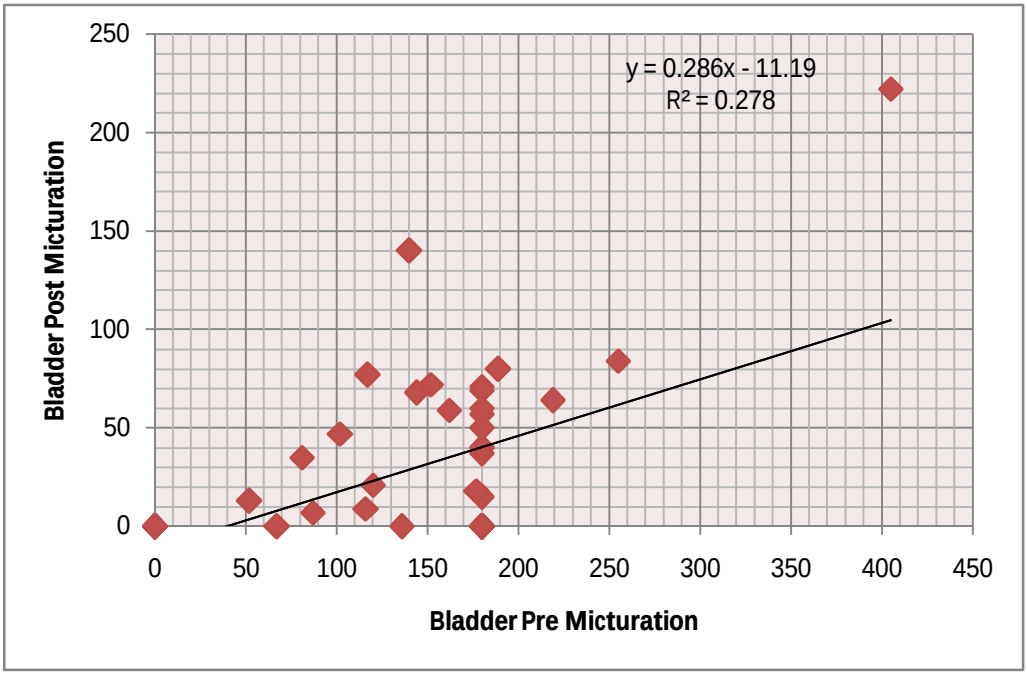


Figure 4.6 A scatter plot diagramme shows a linear relationship between the Bladder Volume Pre micturation and the bladder volume post micturation.

Table 4.4 The Correlation between The variables

Correlations									
		Diagnosis	RT Ureter Dilation	LT Ureter Dilation	RT Kidney Echo Texture	LT Kidney Echo Texture	Prostate Echo Texture	Bladder Echo Texture	Prostate Volume
Diagnosis	Pearson Correlation	1	-.037-	-.037-	.037	-.037-	.121	-.077-	-.165
	Sig. (2-tailed)	.009	.099	.059	.059	.004	.064	.064	.052
Prostate Echo texture	Pearson Correlation	.121	.088	.088	.88	.88	1	.227	.054
	Sig. (2-tailed)	.004	.044	.044	.044	.044		.112	.054
Prostate Volume	Pearson Correlation	-.165-	-.010-	-.010-	-.010-	-.010-	.264	.095	1
	Sig. (2-tailed)	.052	.046	.046	.046	.046	.054	.060	
	N	50	50	50	50	50	50	50	50

** Correlation is significant at the 0.01 level (2-taild).

Chapter Five

Discussion

Chapter Five

5-1 Discussion:

The main finding of this study there is linear relationship between the prostate volume and the urinary bladder volume **post** micturation, when the prostate volume increased the bladder volume **post** micturation is also increased.

Benign Prostatic Hypertrophy cause pressure on the urethra and urinary bladder,this pressure sever or mild or moderate which cause obstruction complete or not,in complete one folly's catheter indeed for micturation of urine.Residual urine presented in mild and moderate obstruction.

Relationship between the Bladder Volume Pre micturation and the bladder volume **post** micturation, when the urinary bladder volume pre micturation increased the volume of urinary bladder **post** micturation increased.

-By comparison between this research and previous studies (N.C.BIRCH,et al2008).

(a) there was variation in residual urine volume between patients.

(b) No relationship between residual urine and age.

5-2- Conclusion:

Ultrasound scanning is very important modality to detect any prostatic changes in old men patients and to diagnose it early.

- Benign prostatic hypertrophy was found in male above 47 years.
- While the men age increased Benign prostatic hypertrophy increased.
- While prostate volume increased **post** micturation urinary bladder volume (residual urine) increased.
- There was relationship between volume of urinary bladder pre and post micturation.

- Calcification and cystitis associated with benign prostatic hypertrophy in 40% of patients.
- There was relationship between residual urine and cystitis.

5-3 Recommendations:

After reading the results, analysis and the fruitful discussion we can send messages to all people in themedical field as follows:

- Ultrasonography could be used as routine checkup, follow up to help diagnosis, treatment and control of benign prostatic hypertrophy.
- The easy and safe way to diagnose benign prostatic hypertrophy, cystitis, prostatic calcification and residual urine as well is ultrasound.
- We can use ultrasound to know the volume of prostate and volume of urinary bladder pre and post micturation.
- Trans rectal sonography has high sensitivity and specificity in visualization of prostate.
- Color Doppler contributes to more accurate diagnosis in benign prostatic hypertrophy.

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- www.inner body.com/.../repoo9-new4.ht...
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Appendices

Appendix (1)

Images

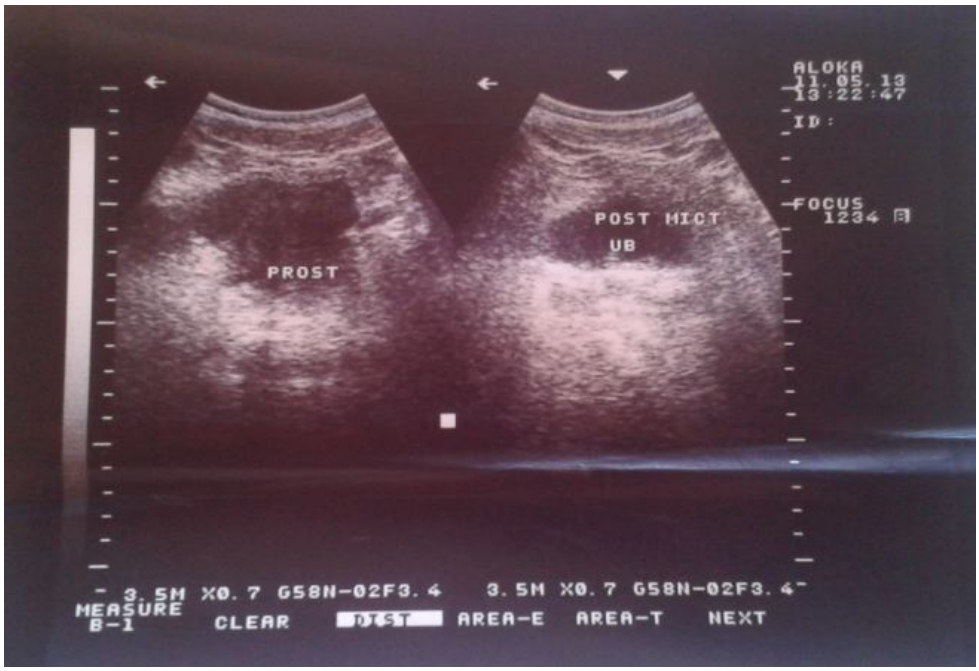


Image: (1) show benign prostatic hypertrophy with residual urine post micturation urinarybladder (patient 64 old), male

Image: (2) 62 years old show calcification in prostate,male.

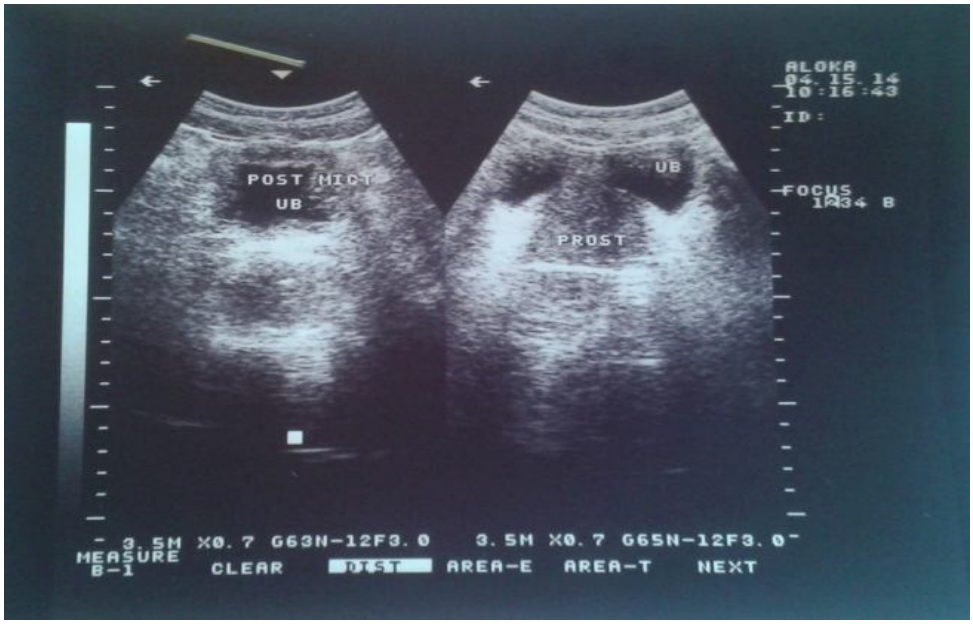


Image: (3) 55 years old residual urine with thick wall urinary bladder (cystitis), male.

Image: (4) 66 years old Post micturation residual thick urine, male

Image: (5) 57 years old enlarged prostate with thick urinary bladder wall,male.

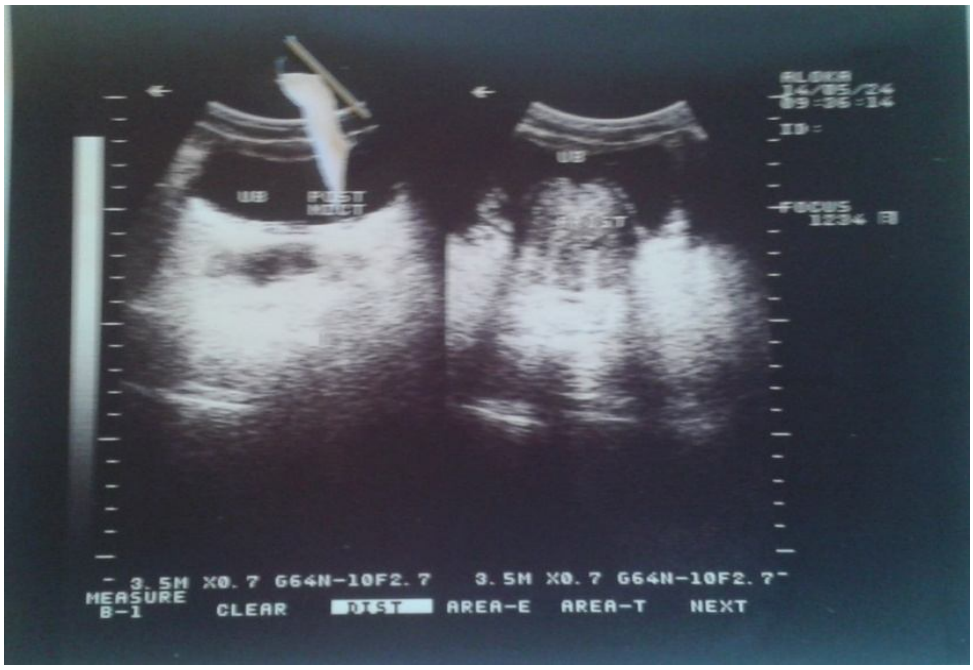
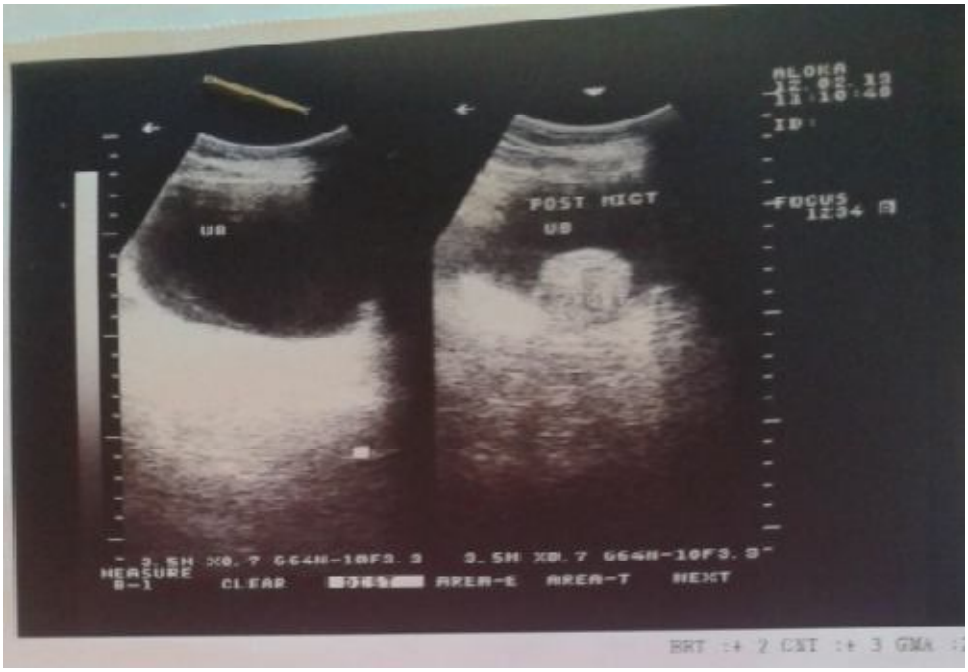


Image: (6) 70years old show benign prostatic hypertrophy with residual urine,male

(a)



(b)

Image:(7) 65 years old benign prostatic hypertrophy(a) upper pre and post micturation with residual urine (b)lower same patient with bilateral hydronephrosis and hydroureters, male.