Introduction

Benign prostatic hyperplasia (BPH) is an increasingly common condition in aged males. By the age of 60 years, more than 50% of men will have microscopic evidence of the disease, and more than 40% of men beyond this age will have lower urinary tract symptoms (LUTS) ***(Chute and Panser, 1993).***

LUTS are the most common problem that affects BPH patients, and include urinary frequency, urgency, weak stream, straining and nocturia ***(Trueman et al, 1999) (Wu et al, 2006).***

Although urologists normally attribute LUTS that are concomitant with BPH to urinary obstruction caused by enlarged prostate, some controversies still exist ***(Bosch et al, 2008).***

Several studies have shown that there are correlations between urinary symptoms and prostate volume, peak flow rate or residual urine volume ***(Madersbacher et al, 1997).***

However, others have found that prostate volume is not associated with LUTS, and objective parameters cannot predict the severity of symptoms in BPH patients ***(KEzzeldin et al, 1996) (Tubaroa and Vecchia, 2004).***

Because most of these studies have been carried in Western countries, evidence in Oriental populations is still lacking.

Almost 20 years ago, Barry and his collagues suggested that by using a simple questionnaire, which was later validated, physicians could quantify urine storage and voiding symptoms reported by patients with BPH or LUTS ***(Barry et al, 1995).***

The questionnaire also included a question about quality of life, which can also be called the "bothersome index" or "motivational index" question. That question asked, "If you were to spend the rest of your life with your urinary condition the way it is now, how would you feel about that?" From this was born the International Prostate Symptom Score (I-PSS), which became the gold standard outcome measurement for most clinical trials that assessed responses to interventions for the management of BPH ***(Becher et al, 2009).***

I-PSS symptom scores range from 0 to 8 for "mild" symptoms, 9 to 20 for "moderate" symptoms, and 21 to 35 for "severe" symptoms. Responses to the quality-of-life question range from 0 (delighted) to 6 (terrible) ***(AUA, 2010).***

Currently, evaluation for BPH includes digital rectal examination, the International Prostate Symptom Score (I-PSS), serum prostate-specific antigen levels (S.PSA), and uroflowmetry with postvoid residual urine (PVR). Pressure flow study and transrectal ultrasonography (TRUS) are done in special circumstances ***(AUA, 2010).***

In most instances, the enlarged prostate leads to obstruction and lower urinary tract symptoms (LUTS), which comprise frequency, urgency, weak stream, straining and nocturia. In order to evaluate the severity of the symptoms, several scoring systems have been created, among which the International Prostate Symptom Score (I-PSS) is accepted most extensively by urologists worldwide ***(AUA, 2010).***

Besides these subjective symptoms, some objective parameters, which include prostate volume, uroflowmetry, prostate specific antigen (PSA) and residual urine volume, are also used to assess the state of illness and the effect of treatment. Although LUTS are traditionally thought to be the sequelae of enlarged prostate and bladder outlet obstruction, the correlation between the severity of subjective symptoms and objective parameters remains unclear, especially in Oriental populations ***(Li et al, 2008).***

Aim of the work

Evaluate the relationship between LUTS - as stipulated in I-PSS - and some other parameters regarding DRE, PSA, Pelvic and Transrectal ultrasound criteria involving the estimated weight of the prostatic gland and its adenoma, Intravesical protrution of the prostate, Bladder wall thickness, full bladder capacity and post void residual urine, uroflometry and pressure flow studies in Egyptian population.

Anatomy of prostate

Normal prostate weighs 18 grams; measures 3 cm in length, 4 cm in width, and 2 cm in depth; and is traversed by the prostatic urethra Although ovoid, the prostate is referred to as having anterior, posterior, and lateral surfaces, with a narrowed apex inferiorly and a broad base superiorly that is contiguous with the base of the bladder ***(Benjamin et al, 2012).***

GROSS ANATOMY

OVERVIEW

The prostate is a compound tubuloalveolar gland whose base abuts the bladder neck and whose apex merges with the membranous urethra to rest on the urogenital diaphragm. The intact adult gland resembles a blunted cone, weighs approximately 18 to 20 grams.

The urethra enters the prostate near the middle of its base and exits the gland on its ventral surface above and in front of its apical portion. The ejaculatory ducts enter the base on its posterior aspect and run in an oblique fashion to emerge and terminate adjacent to the verumontanum. The capsule of the prostate gland is an inseparable condensation of stromal elements that is incomplete at the apex; it does not represent a true capsule. Fibrous septa emanate from the capsule, pierce the underlying parenchyma, and divide it into multiple lobules. These glandular units drain into branched tubules, which lead into 20 to 30 prostatic ducts ***(Woodburne et al, 1978).***

LOBES AND ZONES:

The prostate has been divided into five lobes: two lateral lobes, a median lobe, a posterior lobe, and an anterior lobe.

Mc Neal classification: By the Trans-rectal ultrasound, the prostate shows the following zones:

***1- Transitional zone*:** (5-10%) surrounds the prostatic urethra.

2- Central zone: *(25%)* cone shaped circumferentially and thought to be of wolffian origin.

3- Peripheral zone: (70%) covers the posterior and lateral aspects of the gland. Its ducts drain into the prostatic sinus along the entire length of the prostatic urethra.

4- Anterior fibromuscular stroma zone: extends from the bladder neck to the stiated sphincter.

5- Preprostatic sphincter zone: is composed of elastin, collagen, and smooth and striated muscle fibres ***(Mc Neal, 1972) (Figure 1).***

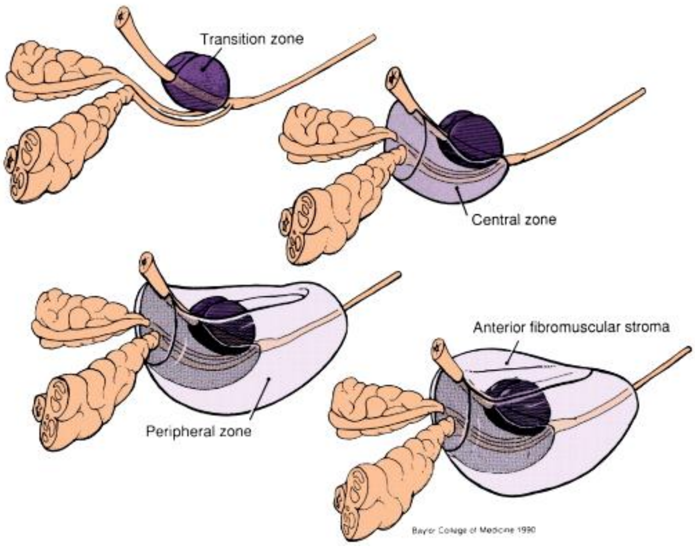

Figure (1): Zonal anatomy of the prostate as described by J.E. McNeal (Normal histology of the prostate. Am J Surg Pathol 1988; 12:619-33). The transition zone surrounds the urethra proximal to the ejaculatory ducts and projects under the bladder base. The peripheral zone constitutes the bulk of the apical, posterior and lateral aspects of the prostate. The anterior fibromuscular stroma extends from the bladder neck to the striated urethral sphincter. (1990, Baylor Collage of Medicine.)

Clinically, the prostate has two lateral lobes, separated by a central sulcus that is palpable on rectal examination, and a middle lobe, which may project into the bladder in older men. These lobes do not correspond to histologically defined structures in the normal prostate but are usually related to pathologic enlargement of the transition zone laterally and the periurethral glands centrally ***(Mc Neal, 1972).***

SAGITTAL CUTS THROUGH THE PROSTATE:

A near-centerline section (A) shows the anterior fibromuscular stroma and the peripheral zone. The ejaculatory duct passes from the ampulla of the vasto the verumontanum.

A section 1 cm from the centerline (B) shows the relation among the transition, central, and peripheral zones.

A section 2 cm from the midline (C) passes through the bulging peripheral zoneand a small amount of anterior fibromuscular stroma ***(Figure 2).***

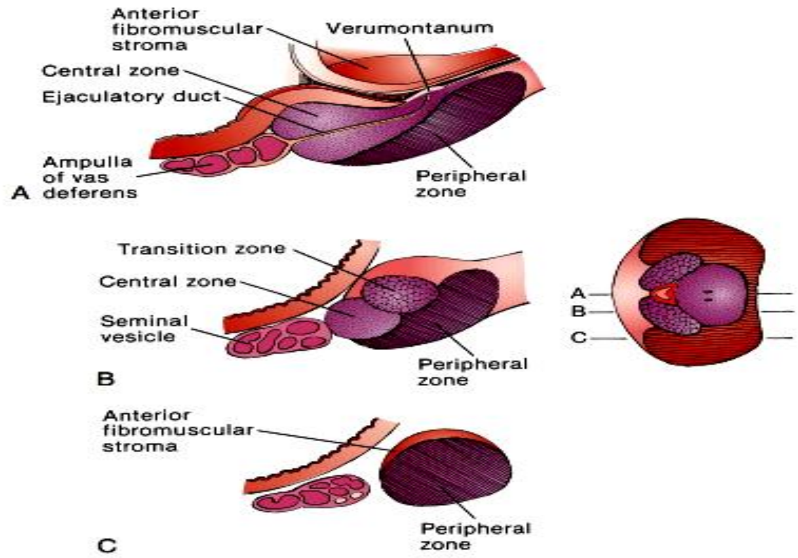

Figure (2): Sagittal cuts throught the prostate.
This axial vignette shows the sites of the three cuts from which the drawings of sonographic sagittal images were made.
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CAPSULE AND FASCIA:

The prostate has a tough capsule of fibrous tissue and muscular elements completely enveloping the prostate and is densely adherent to it. This capsule is actually a glandular prostatic tissue that is connected to the acini and inseparable from the parenchyma which is surrounded by a periprostatic fascia ***(Walsh, et al 1983).***

CONTIGUOUS STRUCTURES:

The prostate is inferior to the bladder and anterior to the rectum. The perineal anatomy is a complex of muscles and tendons that form the pelvic floor. Beginning from the skin of the perineum, the superficial (Camper's) and deep (Colle's) fascia. The latter is attached to the ischiopubic rami and the border of the urogenital diaphragm and is continuous with Scarpa's fascia ***(Weyrauch, 1959)***.

The most superficial pelvic musculature is the ischiocavernosus, the bulbocavernosus, the superficial transverse perineal muscles, and the external anal sphincter. These muscles are united in the midline as a central tendon (perineal body) and function as a single muscle. This central tendon is attached to the bulb of the rectum by fibrous bands of muscle fibers known as the rectus urethralis. Beneath this layer of muscles is the deep perineal compartment which is predominantly the urogenital diaphragm which is attached to the inferior rami of the ischia and pubis ***(Weyrauch, 1959)***.

VASCULAR ANATOMY:

The prostatic blood supply comes predominantly from the internal iliac artery and is a series of lateral pedicles, the most prominent and constant of which is the pedicle at the base of the prostate (superior prostatic artery). Additional branches may also exist most usually at the apex of the prostate. The superior prostatic artery enters just below the bladder neck and forms two branches, one to the capsule and the other to the urethra. As patients age, the latter becomes more prominent with prostatic enlargement. Other sites of origin for the prostatic artery are the internal pudendal, the superior vesical, or the obturator artery ***(Brendler, 1975).***

The neurovascular bundle can be located along the posterior lateral prostate at the base of the prostate beneath the anterior layer of Denonvillier's fascia. More distally, the neurovascular bundle crosses the apex of the prostate and enters the pelvic diaphragm posterior laterally to the membranous urethra.

The venous drainage of the prostate is via the anterior venous plexus (Santorini) which is found on the anterior and lateral prostate. This plexus receives blood from the dorsal vein of the penis and empties into the hypogastric vein ***(Burnett, 1995).***

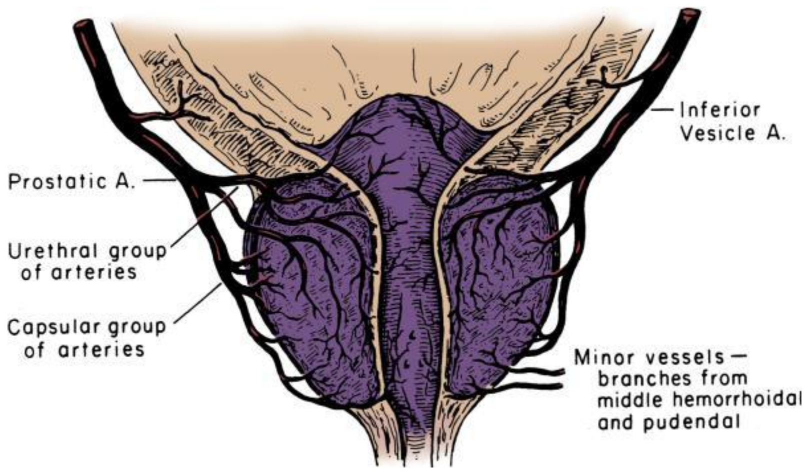

Figure (1): Arterial supply of the prostate (Adapted from Flocks RH: The arterial distribution within the prostate gland: Its role in transurethral prostatic resection (J Urol 1937; 37:524-548).

LYMPHATIC ANATOMY:

The lymphatic drainage of the prostate is predominantly along the path of the prostatic artery with the primary nodal drop site being the obturator nodes. Other potential sites of nodal metastases include the external iliac and presacral nodes ***(Burnett, 1995).***

NEUROANATOMY:

The prostate has sympathetic, parasympathetic, and somatic innervation. The sympathetic innervation is from L1 and L2 via the superior hypogastric plexus. The parasympathetic and somatic innervation is from S2, 3, 4 via the inferior hypogastric plexus and pudendal nerves respectively ***(Burnett, 1995).***

Benign prostatic hyperplasia

DEFINITION OF BPH:

Benign prostatic hyperplasia (BPH) refers to a regional nodular growth of varying combinations of glandular and stromal proliferation that occurs in almost all men who live long enough.

Histopathologically BPH is characterized by an increased number of epithelial and stromal cells in the periure-thral area of the prostate and thus correctly referred to as hyperplasia and not hypertrophy, a term often found in the older literature ***(Cunha et al, 1983).***

The observation of new epithelial gland formation is normally seen only in fetal development and gives rise to the concept of embryonic reawakening of the stroma cell's inductive potential ***(Isaacs, 2008).***

Macroscopic BPH refers to organ enlargement due to the cellular changes.

Clinically BPH refers to the lower urinary tract symptoms thought due to benign prostatic obstruction ***(Berry et al, 1984).***

INCIDENCE & EPIDEMIOLOGY:

BPH is the most common benign tumor in men, No convincing evidence exists regarding a positive correlation for any factors other than age and the presence of testes.

Autopsy data indicates that anatomic (microscopic) evidence of BPH is seen in about:

- 25% of men age 40 to 50 year.
- 50% of men age 50 to 60 year.
- 65% of men age 60 to 70 year.
- 85% of men age 70 to 80 year.
- 90% of men age 80 to 90 year.

(Verhamme et al, 2002).

It has been classically stated that from 25% to 50% of individuals with microscopic and macroscopic evidence of BPH will progress to clinically manifested BPH.

The prevalence of clinical BPH in an individual community in men ages 55 to 74 years may vary from 5% to 30%.

Some studies have suggested a genetic predisposition and some have noted racial differences ***(McConnell et al, 2003).***

AETIOLOGY:

The aetiology of BPH is not completely understood, but it seems to be multifactorial and endocrine controlled. The prostate is composed of both stromal and epithelial elements, and each, either alone or in combination, can give rise to hyperplastic nodules and the symptoms associated with BPH. Each element may be targeted in medical management schemes.

Previously it was thought that the clinical symptoms of BPH (prostatism) are simply due to a mass-related increase in urethral resistance. It is now clear that a significant portion of LUTS is due to age related detrusor dysfunction and other conditions such as polyuria, sleep disorders, and a variety of systemic medical conditions unrelated to the prostate-bladder unit. Historically, voiding symptoms have been related to obstruction of the bladder outlet ***(Chapple and Wein, 2008).***

However, it is well recognized that voiding symptoms poorly correlate with underlying pathophysiology.

Observations and clinical studies in men have clearly demonstrated that BPH is under endocrine control. Castration results in the regression of established BPH and improvement in urinary symptoms. Additional investigations have demonstrated a positive correlation between levels of free testosterone and oestrogen and the volume of BPH.