

INTRODUCTION

Benign prostatic hyperplasia (BPH), is one of the most common diseases of aging men, it can be associated with bothersome lower urinary tract symptoms (LUTS) that affect quality of life by interfering with normal daily activities and sleep patterns (*Welch et al., 2002*).

Lower urinary tract symptoms whether irritative; urinary frequency, urgency, nocturia or obstructive; decreased force of stream, and incomplete bladder emptying comprise a major health concern for many older men (*Anville, 2002*).

A wide range of treatment methods have been introduced, ranging from watchful waiting (*AUA Practice Guidelines Committee, 2003*) medical management using Alfa-blockers or 5-A Reductase inhibitors (*Dubeau, 2003*).

Phytotherapy, minimally invasive prostatectomy as laser prostatectomy and invasive by transurethral resection of the prostate (TURP) and finally transvesical prostatectomy .When surgical treatment is considered, transurethral resection of the prostate (TURP) is still the gold standard to which all other modalities are compared (*Emberton et al., 1995*).

TURP was the first successful, minimally invasive surgical procedure of the modern society. To this day, it remains the criterion standard therapy for obstructive prostatic

hypertrophy and is both the surgical treatment of choice and the standard of care when other methods fail (*Gilbert et al., 2004*).

The criteria for performing TURP surgery are now more stringent than before. In general, TURP surgery is reserved for patients with symptomatic BPH who have acute, recurrent, or chronic urinary retention; in whom medical management and less-invasive prostatic surgical procedures failed; who have prostates of an unusual size or shape (eg, a markedly enlarged median lobe, significant intravesical prostatic encroachment); who have azotemia or renal insufficiency due to prostatic obstruction; or who have the most severe symptoms of prostatism (*Blanchard et al., 2000*).

Although the morbidity associated with TURP can be low when performed by experienced surgeons, complications such as TUR syndrome and bleeding can still occur. For this reason, many alternative energy modalities have been developed in an attempt to not only provide an effective surgical treatment for BPH, but also to minimize the risk of complications and the period of hospital stay (*Mebust et al., 1989*).

Attempts at developing office-based surgical therapies with lower morbidity and efficacy rivaling TURP have led to the emergence of several minimally invasive techniques. Currently available are laser prostatectomy, transurethral electro vaporization of the prostate (TUVF), transurethral needle

ablation (TUNA), high-intensity focused ultrasound (HIFU) and transurethral microwave therapy (TUMT)(*Chapple, 2006*).

Laser prostatectomy is a new technology that provides minimal morbidity while attempting to treat bladder outlet Obstruction. The new laser procedures can deliver sufficient heat to the prostate so that either coagulation necrosis or frank vaporization occurs. Types of laser include Neodymium:Yttrium-Aluminum-Garnet (Nd:YAG) laser and Potassium Titanyl Phosphate (KTP) laser where coagulation and vaporization occurs. Holmium:Yttrium-Aluminum-Garnet (Ho:YAG) laser, Diode laser and Greenlight photoselective vaporization laser system where vaporization occurs (*Stein, 1994*).

Plasma kinetic vaporization resection (PKVP) of the prostate is one of the latest innovations developed to treat prostate problems, specifically when an enlarged prostate BPH causes problem with urination. The plasma kinetic system allows the vaporization or resection of enlarged prostate tissue by the creation of an ionized plasma corona, using an axipolar electrode and electro-conductive solutions (*Geavlete et al., 2010*).

Plasma vaporization is realized without direct tissue contact with minimal heat generation. The bipolar electrode generates a thin layer of highly ionized particles, allowing it to glide over the tissue. After the generation of an initial electrical

pulse, a constant plasma field is created, allowing it to vaporize a limited layer of prostate cells, without affecting the underlying tissue (*Ho and Cheng, 2008*).

Plasma vaporization of prostate significantly decreased the irrigation fluid volume used during the procedure in comparison with conventional TURP. The use of 0.9% saline as the irrigation fluid avoid the risks of dilutional hyponatremia and subsequent TUR syndrome. Owing to reduce fluid absorption it also decreases postoperative irrigation duration, catheter duration, and the length of hospital stay (*Smith et al., 2005*),

As a consequence of this technique, which realizes concomitant vaporization and coagulation, the bleeding is reduced significantly. Moreover, any potential bleeding can be stopped immediately by applying the electrode at the level of the open vessel in the coagulation mode (*Botto et al., 2001*).

AIM OF THE WORK

To compare between urethralgia and uroflowmetry assessment in patients after conventional TURP versus plasma kinetic vaporization of prostate PKVP.

ANATOMY OF THE PROSTATE

The normal prostate weighs 18-22 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 continuous with the base of the bladder (*James, 2007*).

Gross Anatomy

General Considerations:

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

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. Most of these ducts empty their contents into the prostatic urethra adjacent or distal to the verumontanum (**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 zones:

- 1- Transitional zone:** (5-10%) surrounds the prostatic urethra.
- 2- Central zone:** (25%) cone shaped circumferentially and thought to be of wolffian origin.

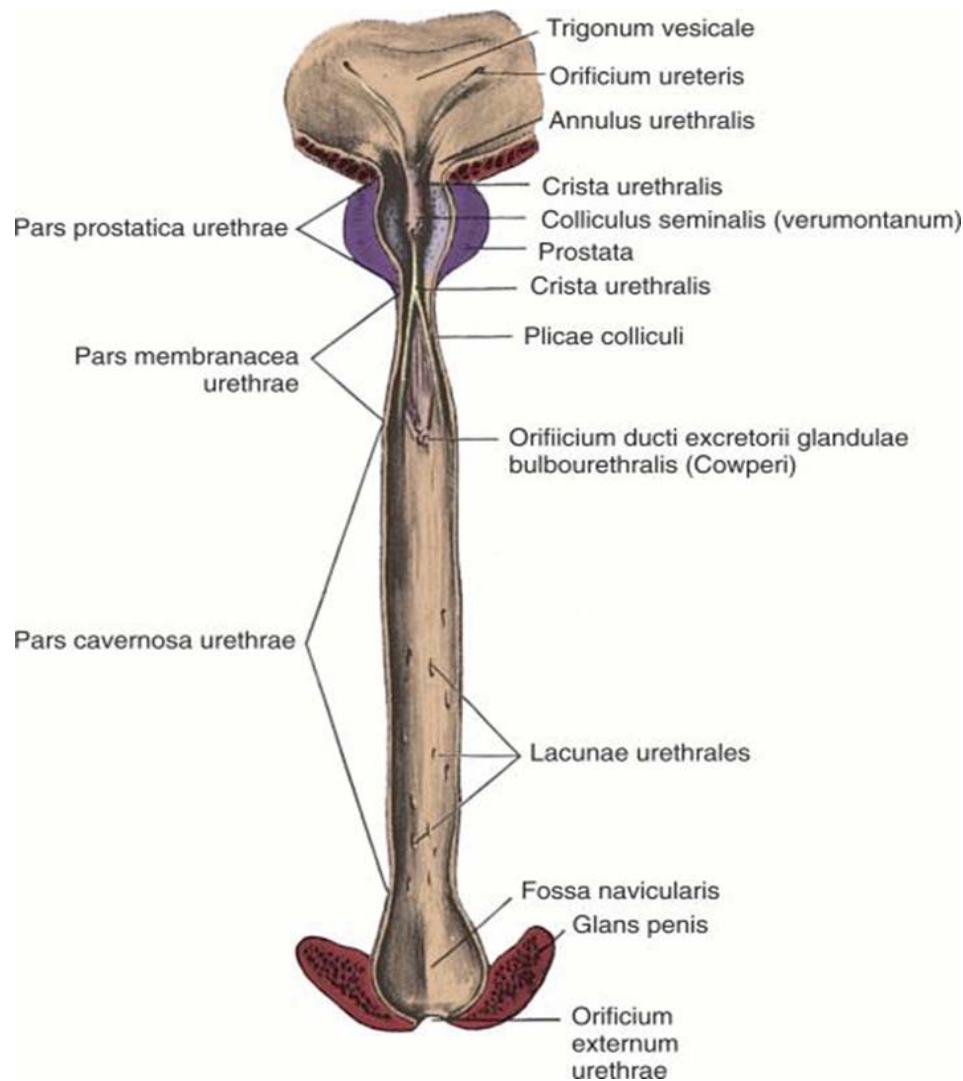


Figure (1): Posterior wall of the male urethra
(Anson and McVaym, 1984).

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 stromazone: extends from the bladder neck to the striated sphincter.

5- Preprostatic sphincter zone: is composed of elastin, collagen, and smooth and striated muscle fibers.

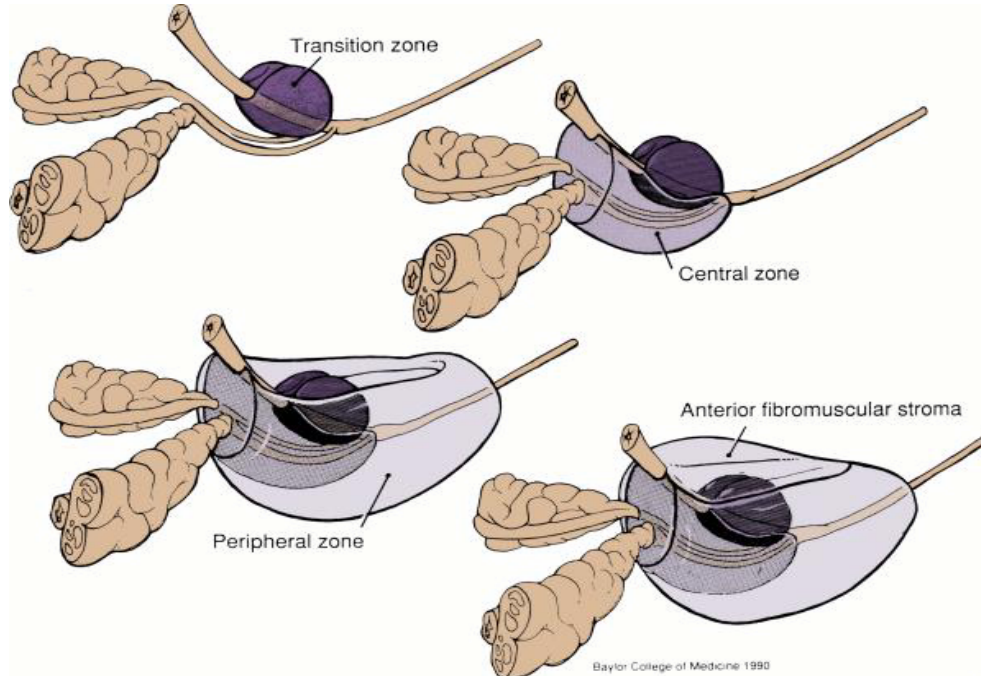


Figure (2): Zonal anatomy of the prostate as described by **McNeal (1988)**.

Clinically the prostate have 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**).

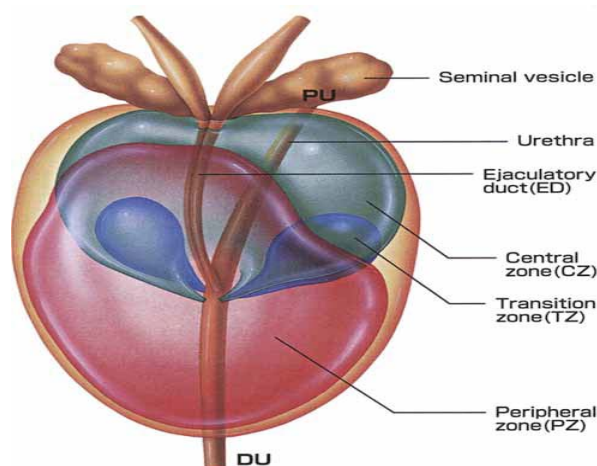
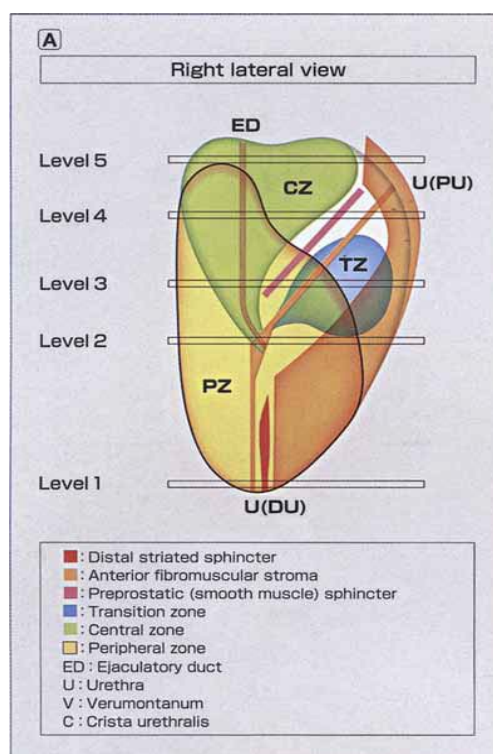


Figure (3): Three-dimensional structure of the prostate viewed from the right posterolateral angle and drawn based on the model by McNeal. The urethra, which runs through the midline, is divided into proximal (*PU*) and distal (*DU*) halves of equal length. The *PU* is tilted ventrally and is surrounded by a sleeve of smooth muscle fibers called the preprostatic sphincter. The distal end of the *PU* receives ducts derived from the transition zone (*TZ*) just proximal to the angulation. The central zone (*CZ*) ducts drain into the *DU* immediately surrounding the ejaculatory duct (*ED*) orifices. The ducts of the peripheral zone (*PZ*) open into the *DU* from the base of the verumontanum to the prostate apex (*McNeal, 1972*).

Figure (4): Structure of the prostate and approximate location of the central, transition, and peripheral zones. Restructured based on the model of McNeal (*McNeal, 1972*).



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. This 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 comprise 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. 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 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.

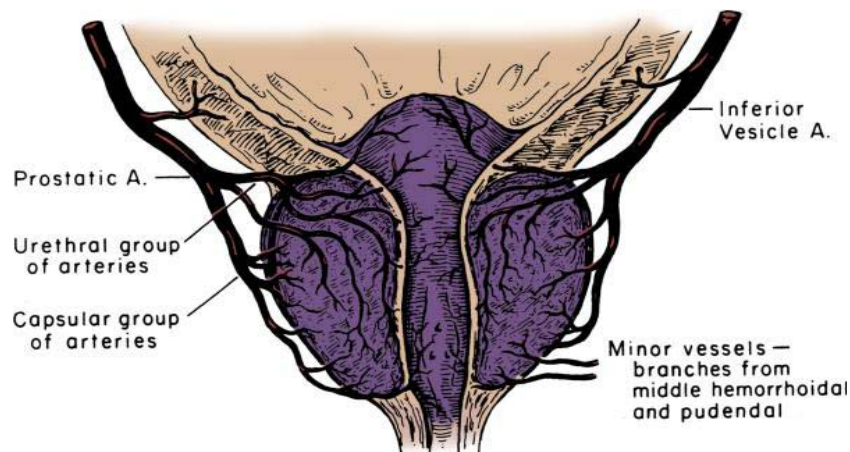


Figure (5): Arterial supply of the prostate (*Flocks, 1937*).

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.

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*).

Endoscopic Anatomy

As the endoscope is passed proximally through the membranous urethra, the distal margin or the apex of the prostate is identified by the presence of the verumontanum, also called colliculus seminalis. Mucosal folds of varying prominence can also be identified. In the proximal membranous urethra two folds of mucosa (the inframontanial folds) course laterally and distally from the verumontanum and merge into the urethral wall. Extending proximally from the verumontanum, the urethral crest is a longitudinal ridge on the posterior floor within the prostatic urethra. On either side of this ridge lies the area of prostatic sinus, which contains the orifices of the prostatic ducts from the lateral lobes (**Bagley, 1985**).

The verumontanum represents the elevation of urethral mucosa by the ejaculatory and utricle. The utricle itself is only a few millimetres long, running posteriorly within the substance of the prostate. It has been labelled the uterus masculinus since it is a remnant of the paramesonephric, or mullerian ducts, in male and is homologous with the uterus and upper portion of the vagina in female. The prostatic portion of the urethra runs proximally from the verumontanum to the bladder neck through the substance of the prostate gland. It is located more anteriorly than posteriorly within the gland. The lumen is indented by the lateral lobes of the prostate and is subjected to obstruction in the presence of prostatic hypertrophy (**Bagley, 1985**).

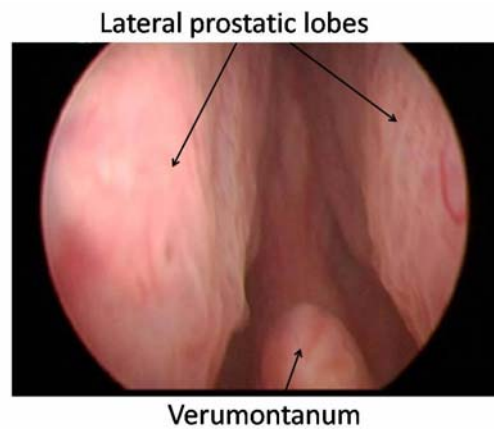
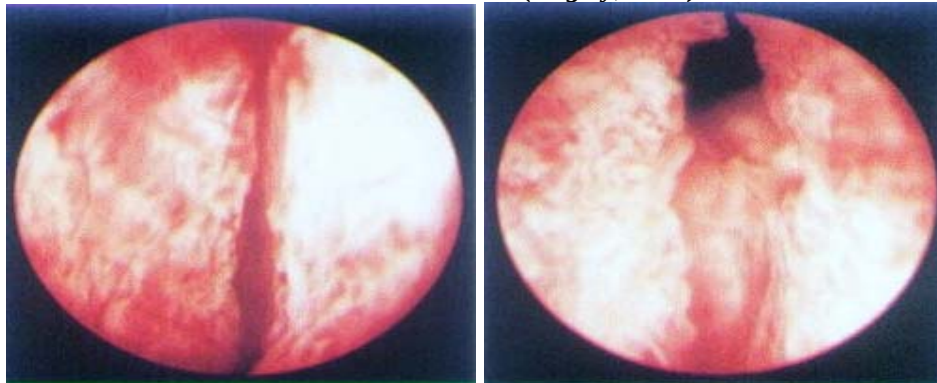


Figure (6): The two lateral lobes of the prostate and the verumontanum (*Bagley, 1985*).



A-The lateral prostatic lobes are touching each other

B) Lateral prostatic lobes are separated by endoscope.

Figure (7): Endoscopic view of the prostate (David M. Albala, Michael Grasso, Colour atlas of endourology: Normal lower urinary tract anatomy).



C - Small median lobe & bladder neck are seen in this view