Evaluation of Long Term Results of Bipolar Transurethral Resection of the Prostate: 6 Months Results

Thesis

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List of abbreviations

ACU	Ascending cysto-urethrogram
AR	Adrenergic receptor
AUA	American Urological Association
BOO	Bladder outlet obstruction
BPH	Benign prostatic hyperplasia
BPO	Benign prostatic obstruction
B-TURP	Bipolar transurethral resection of the prostate
B-TUVP	Bipolar transurethral vaporization of the prostate
B-TUEP	Bipolar transurethral enucleation of the prostate
DRE	Digital rectal examination
HF	High frequency
Ho-YAG	Holmium :yttrium-Aluminum-Garnet Laser
HOLEP	Holmium laser enucleation of the prostate
IPSS	International prostatic symptom score
KTP	Potassium-titanyl-phosphate
LUTS	Lower urinary tract symptoms
M-TURP	Monopolar TURP
MCU	Micturating cysto-urethrogram
Qmax	Peak flow rate
PK	Plasma kinetic
PKEP	Plasma kinetic enucleation of the prostate
PSA	Prostatic specific antigen

PVR	Post voiding residual urine
TRUS	Transrectal ultrasound
TUEP	Transurethral enucleation of the prostate
TUERP	Transurethral enucleation resection of the prostate
TUIP	Transurethral incision of the prostate
TULIP	transurethral ultrasound-guided laser-induced prostatectomy
TUMT	Transurethral microwave thermotherapy
TUNA	Transurethral needle ablation
TUR-syndrome	Transurethral resection syndrome
TURBT	Transurethral resection of bladder tumor
TURIS	Transurethral resection in saline
TURP	Transurethral resection of the prostate
TUVP	Transurethral vaporization of the prostate
USD	Urethral stricture disease
UTI	Urinary tract infection

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INTRODUCTION

Benign prostatic hyperplasia (BPH) is the nonmalignant enlargement of the prostate gland. It refers to stromal and glandular epithelial hyperplasia that occurs in the periurethral transition zone of the prostate that surrounds the urethra. BPH clinically manifest as lower urinary tract symptoms (LUTS) consisting of irritative (urgency, frequency, nocturia) and obstructive symptoms as hesitancy, a weak and interrupted urinary stream, straining to initiate urination, a sensation of incomplete bladder emptying **(Miller J and Tarter TH, 2009)**

Many complications may be developed from BPH such as increased post-voiding residual up to urine retention, bladder diverticula or calculi, vesico-ureteral reflux, hydronephrosis, and renal insufficiency. (**Oelke et al., 2012**)

Currently, the most common surgical treatment of BPH-related LUTS (lower urinary tract symptoms) is transurethral resection of the prostate (TURP) **(Baazeem A and Elhilali MM, 2008).**

Despite its excellent clinical outcomes, monopolar TURP is associated with well-known and potentially serious complications. Risks include thermal tissue damage from faulty patient grounding and peripheral nerve stimulation. Additionally, the need for an irrigant fluid (distilled water or glycine) can cause TUR syndrome, fluid overload, or specific irrigant toxicities, such as hyperammonemia, myocardial damage and transient blindness **(Amr Hawary and Karim Mukhtar, 2009).**

One approach to reduce electrosurgery-related complications has been the introduction of bipolar electrosurgical generators and electrodes in transurethral surgery. With bipolar technology, the ability to use normal saline as an irrigant and the physics of electrical current return theoretically reduce the chances of serious complications during TURP. Moreover it may have the prospects of better hemostasis **(Starkman JS and Santucci RA, 2005).**

Despite the fact that the bipolar current has a smaller depth of tissue penetration due to lower peak voltage and high frequency (**Wendt-Nordah et al, 2004)**, there were reports about it being associated with increased incidence of post-TURP urethral stricture **(Tefekli et al, 2005).**

Chapter 1 : Anatomy of the prostate

The surgical anatomy of the prostate gland is challenging and complex, owing to the significant variation of gland architecture among patients and the constraints imposed by the body habitus of the patients **(Brook, 2007)**.

The normal prostate weighs 18grams and measures 3 cm in length, 4 cm in width, and 2 cm in depth. It 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. It is enclosed by a capsule composed of collagen, elastin, and abundant smooth muscle. On the anterior and anterolateral surfaces of the prostate, the capsule blends with the visceral continuation of endopelvic fascia **(Brook, 2007)**.

According to the classification of Lowsely, the prostate consists of five lobes: anterior, posterior, median, right lateral and left lateral. This classification is often used in cystourethroscopic examinations. After a comprehensive analysis of 500 prostates, McNeal (1981) divides the prostate into four zones: peripheral zone, central zone (surrounds the ejaculatory ducts), transitional zone (surrounds the urethra), and anterior fibromuscluar zone **(Myers et al, 2010)**.

Relations :

The prostate gland lies behind the pubic symphysis. Located closely to the posterosuperior surface are the vas deferentia and seminal vesicles. Posteriorly, the prostate is separated from the rectum by the two layers of Denonvilliers' fascia and serosal rudiments of the pouch of Douglas, which extended to the urogenital diaphragm **(Raychaudhuri and Cahill, 2008).**

Structure :

The prostate is composed of approximately 70% glandular elements and 30% fibromuscular stroma. The stroma is continuous with capsule and is composed of collagen and smooth muscle. It encircles and invests the glands of the prostate and contracts during ejaculation to express prostatic secretions into the urethra. The urethra runs the length of the prostate and is usually closest to its anterior surface. It is lined by transitional epithelium, which may extend into the prostatic duct. Urethral crest projects inward from the posterior midline, runs the length of the prostatic urethra, and disappears at the striated sphincter. To either side of this crest, a groove is formed (prostatic sinuse) into which all glandular elements drain**.** At its midpoint, the urethra turns approximately 35˚ anteriorly. This angle divides the prostatic urethra into proximal (preprostatic) and distal (prostatic) segments that are functionally and anatomically discrete **(McNeal, 1988)**.

In the proximal segment, the circular smooth muscle is thickened to form the involuntary internal urethral (preprostatic) sphincter. Beyond to the urethral angle, all major glandular elements of the prostate open into the prostatic urethra. The urethral crest widens and protrudes from the posterior wall as the verumontanum**.** The small slit-like orifice of the prostatic utricle is found at the apex of the verumontanum and may be visualized cystoscopically. The utricle is a 6-mm müllerian remnant in the form of a small sac that projects upward and backward into the substance of the prostate. To either side of the utricular orifice, the two small openings of the ejaculatory ducts may be found. The ejaculatory ducts form at the junction of the vas deferens and seminal vesicles, and enter the prostate base where it fuses with the bladder. They course nearly 2 cm through the prostate in line with the distal prostatic urethra and are surrounded by circular smooth muscle **(Brooks JD, 2007).**

The glandular elements of the prostate have been divided into discrete zones. These zones can be demonstrated clearly with TRUS. Normally, the transition zone accounts for 5% to 10% of the glandular tissue of the prostate. A discrete fibromuscular band of tissue separates the transition zone from the remaining glandular compartments. The transition zone commonly gives rise to benign prostatic hypertrophy, which expands to compress the fibromuscular band into a surgical capsule seen at enucleation of an adenoma. It is estimated that 20% of adenocarcinomas of the prostate originate in this zone **(Brooks JD, 2007).**

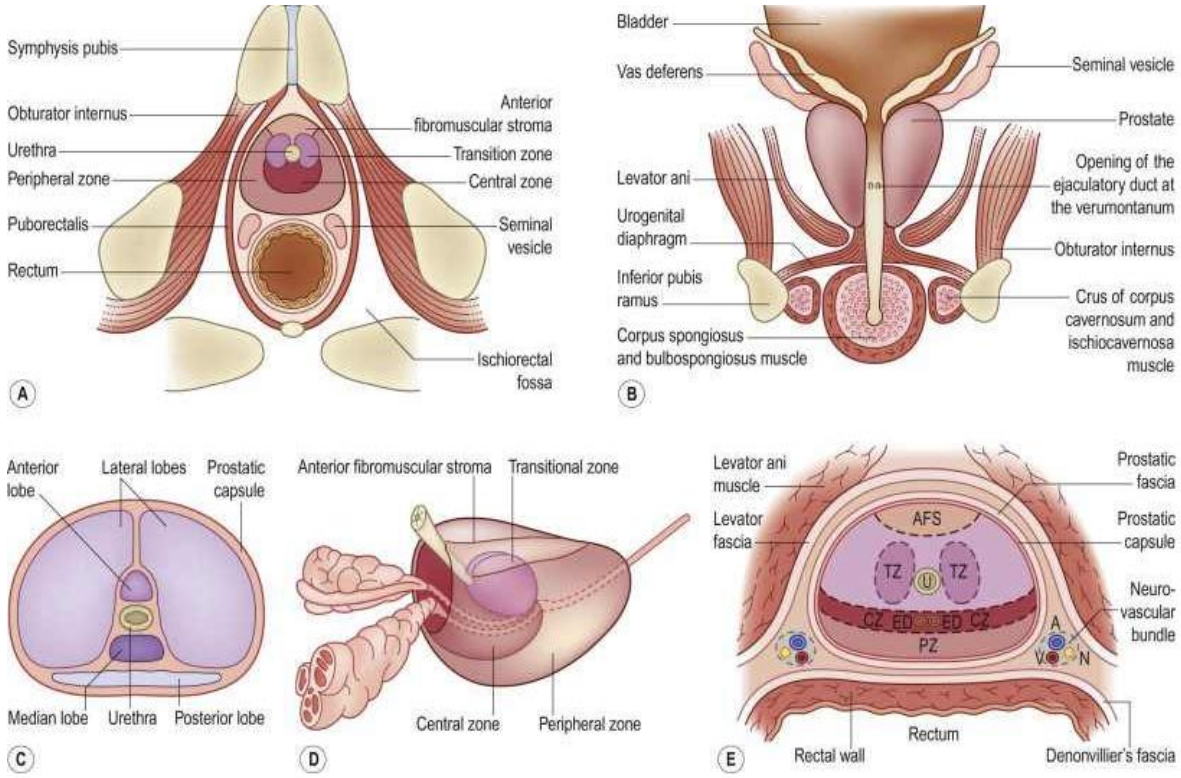

Figure 1: The anatomy of the prostate gland and surrounding structures.

A and B: Axial and coronal line illustrations of the prostate gland and its immediate anatomical relationships (modified from Patel U, Rickards D, Handbook of Transrectal Ultrasound and Biopsy of the Prostate, Martin Dunitz 2002).

C: Line illustration of the classical lobar anatomical model, which is now known to be inaccurate, although certain terminological derivations are still sometimes used, e.g. median lobe enlargement.

D: The zonal model of the gland (modified from Patel U, Diseases of the bladder and prostate, in Ultrasound of the Urogenital System, Baxter G, Sidhu P, Eds, Thieme, 2006).

E: The fascial planes around the gland. These planes are not generally identifiable on ultrasound, except for the capsule (AFS, anterior fibromuscular stroma; TZ, transition zone; CZ, central zone; PZ, peripheral zone; ED, ejaculatory duct; A, artery; V, vein; N, nerve).