INTRODUCTION

Prostatic hyperplasia is a common condition that can lead to disturbing and irritative symptoms that affect quality of life in middle aged to older men. It often produces chronic and progressive lower urinary tract symptoms (LUTS) or chronic complications, that affect quality of life by interfering with normal daily activities and sleep patterns leading many men to seek treatment ***(Roehrborn et al., 2002).***

During the last 50 years transurethral prostatectomy (TURP) has become the primary method in management of Prostatic hyperplasia despite of the introduction of alternative techniques, TURP still represents the gold standard in the operative management to relieve bladder outlet obstruction for those with benign prostatic hyperplasia ***(Gordon et al., 1997)***.

Despite the high level of safety and low incidence of mortality associated with TURP, urinary tract infections (UTIs) are the most common complication associated with this procedure ***(Rassweiler et al., 2006).***

Urologic patients should be considered at high risk for a health care associated UTI, because they are usually exposed both to urethral catheterization and instrumental urinary tract procedures which is considered one of the most important reasons for occurrence of pyuria ***(Christensen et al., 1990).***

UTIs take first place among nosocomial infections. Approximately 80% of UTI have been found to be associated with urethral catheters and urological interventions appear to be precipitating factors in 5–10% of them. Patients who have been exposed to some instrumentation, such as cystoscopy, are at high risk ***(Te Slaa et al., 1996).***

Persistent pyuria is one of the common complications after TURP. Postoperative pyuria has an effect on postoperative voiding symptoms. Thus, postoperative urinalysis and urine culture are reliable indicators for following up post TURP pyuria ***(Rassweiler et al., 2006).***

Aim of the Work

The aim of the work is to evaluate and compare different possible preoperative, intraoperative and postoperative risk factors influencing the development of urinary tract infections (pyuria & bacteriuria) in the patients after TURP.

TRANSURETHRAL RESECTION OF THE PROSTATE

The criteria for performing TURP surgery are now more strict 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 renal insufficiency due to prostatic obstruction; or who have the most severe symptoms of prostatism ***(Noble et al., 2002).***

The average age of patients currently undergoing TURP is approximately 69 years, and the average amount of prostate tissue resected is 22 g. Risk factors associated with increased morbidity include prostate glands larger than 45 g, operative time longer than 90 minutes, and acute urinary retention as the presenting symptom ***(Hoffmann et al., 2005).***

Indications

According to the Agency for Health Care Policy and Research guidelines for the diagnosis and treatment of BPH and the recommendations of the Second International Consultation on Benign Prostatic Hypertrophy, the absolute indications for primary surgical management of BPH are as follows ***(McConnell et al., 1994):***

- Refractory urinary retention
- Recurrent urinary tract infections due to prostatic hypertrophy
- Recurrent gross hematuria
- Renal insufficiency secondary to bladder outlet obstruction
- Bladder calculi
- Permanently damaged or weakened bladders
- Large bladder diverticula that do not empty well secondary to an enlarged prostate

Contraindications

The only absolute indication for an open prostatectomy over a TURP is the need for an additional open procedure on the bladder that must be performed at the same time as the prostatectomy. Such indications include open surgical resection of a large bladder diverticulum or removal of a bladder stone that cannot be easily fragmented by intracorporeal lithotripsy ***(Horninger et al., 1996)***.

A relative indication for the selection of an open prostate surgery over a TURP is generally based on prostatic volume and the ability of the surgeon to complete the TURP in less than 90 minutes of actual operating time (although < 60 min is considered optimal). In general, open prostatectomy can be justified in a patient with a prostate of 45 g or larger, but this is totally dependent on the skill and experience of the endoscopic urological surgeon. Most experienced urologists use a prostatic volume of 60-100 g as the upper limit amenable to endoscopic removal, but some highly skilled resectionists are capable of safely treating a 200 g prostate with TURP in less than 90 minutes ***(Horninger et al., 1996).***

Anatomic Considerations

The prostate is divided into three zones: peripheral, central, and transition (Figure 1).

The peripheral zone is the largest of the zones, encompassing approximately 75% of the total prostate glandular tissue in men without BPH. Most prostate cancers originate in the peripheral zone. It is located posteriorly and extends laterally on either side of the urethra. The central zone is smaller and extends primarily around the ejaculatory ducts. It differs from the peripheral zone primarily in cytologic details and architecture. The transition zone is usually the smallest of the three zones: it occupies only 5% of the prostate volume in men younger than 30 years. This is the zone thought to be the origin of BPH ***(Chatelain et al., 2001).***

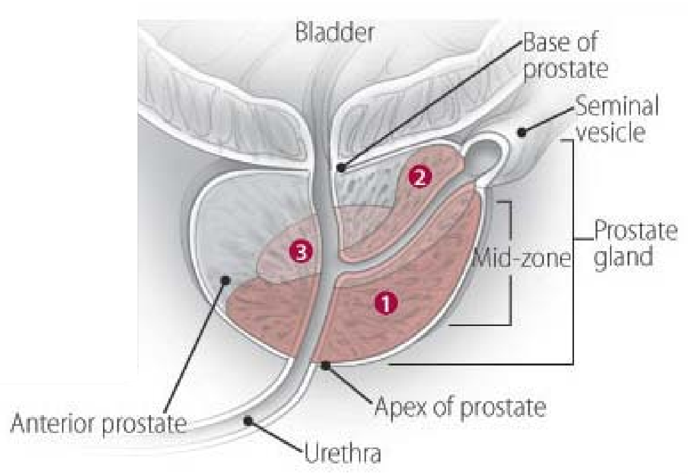

Figure (1): Zones of prostate: the (1) peripheral, (2) central, and (3) transition zones ***(http://www.harvardprostateknowledge.org/ prostate-basics).***

The prostate is thinnest and most narrow anteriorly (the 12-o'clock position when viewed through a cystoscope). Care should be taken when operating in this area to avoid perforating the prostatic capsule, especially if this portion of the prostate is resected early in the operation. Abundant venous blood vessels are located in the area just anterior to the prostatic capsule, which can cause significant bleeding that cannot be easily controlled if the vessels are damaged during resection **.**The verumontanum is the single most important anatomical landmark in TURP (Figure 2). It is a midline structure located on the floor of the distal prostatic urethra just proximal to the external sphincter muscle. It appears as a small, rounded hump that is best seen when withdrawing the telescope through the prostate while visualizing the prostatic floor at the 6-o'clock position ***(Kang et al., 2004).***

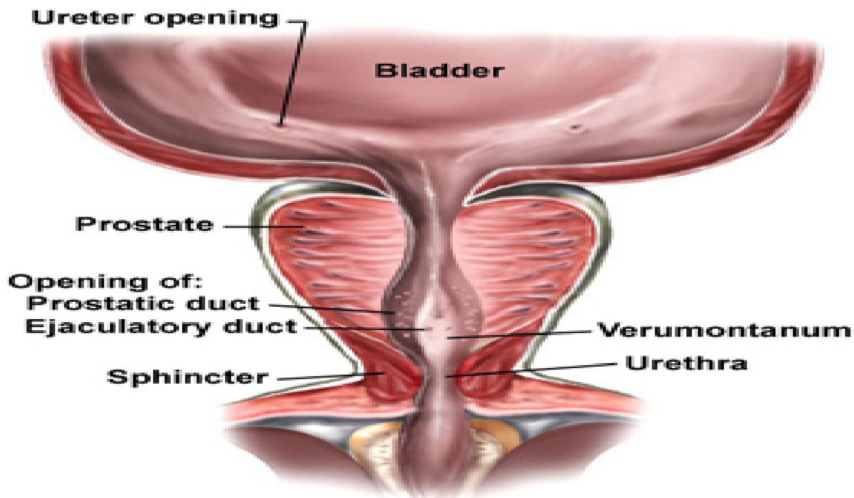

Figure (2): Section of the prostate gland shows the prostatic urethra, verumontanu ***(Walsh et al., 1992).***

Equipment for TURP

Irrigating solutions

A number of solutions may be used for irrigation during TURP. Saline cannot be used because it conducts electricity, which diffuses the current and prevents it from cutting or cauterizing tissue. In addition, the current can possibly be transmitted down the shaft of the resectoscope and affect the surgeon ***(Creevy et al., 1947).***

Sterile water is rarely used because, when absorbed in large quantities during the procedure, it causes hyponatremia, intravascular hemolysis, and hyperkalemia. Therefore, nonhemolyzing solutions of sorbitol/mannitol or glycine are used most often. These relatively isotonic agents protect against hemolysis but cannot prevent dilutional hyponatremia because their intravascular absorption increases fluid volume without adding any sodium **.**Currently, glycine is probably the most popular irrigation media used for TURP surgery, with an osmolality of approximately 200 mOsm/kg (compared to 290 mOsm/kg for normal serum). Though not truly isotonic, it is close enough to be essentially nonhemolyzing. The metabolism of glycine into glycolic acid and ammonia has been postulated as a contributing factor to TUR syndrome ***(Collins et al., 2005).***

Coaxial continuous-flow rectoscopes

In 1975, Jose Iglesias de la Torre reported a reliable external spring-loaded continuous-flow rectoscope that is the most popular resectoscope working element style used today (Figure 3) ***(Iglesias, 1975).***

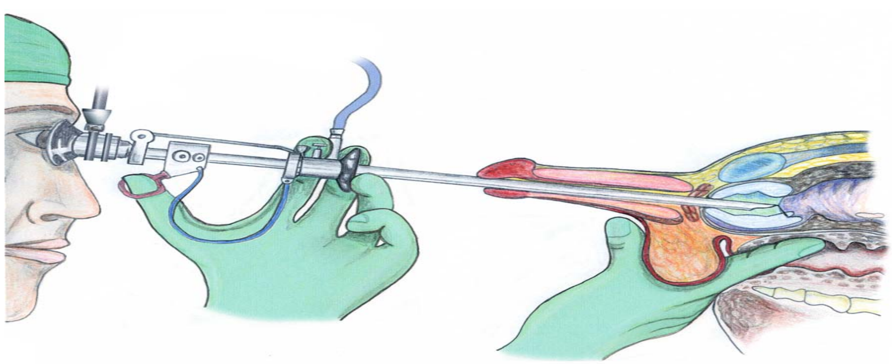

Figure (3): Iglesias resectoscope, with the free hand allowing a finger in the rectum to elevate the floor of the prostate ***(http: //emedicine . medscape. com/ article/ 449781-overview# a3).***

Suprapubic trocars

Suprapubic trocars can also be used to establish continuous-flow irrigation (Figure 4). These instruments require a small skin incision and create a small cystostomy wound in the bladder, but they offer several distinct advantages over the more popular single coaxial continuous-flow instruments. One advantage is that chips and irrigation flow away from the telescope toward the drainage tube in the bladder, which improves visualization ***(Noble et al., 2002).***

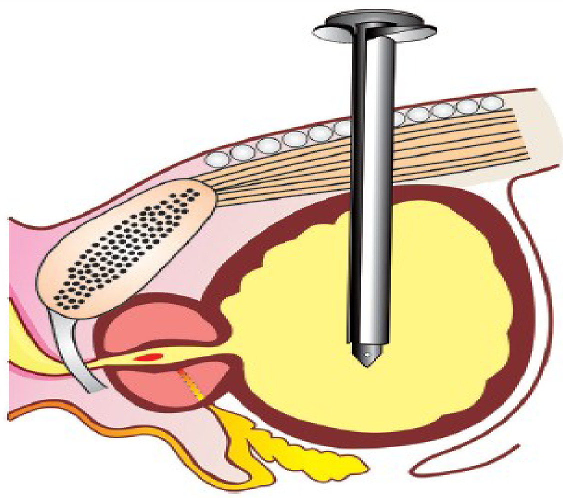

Figure (4): Suprapubic cystostomy trocar in the bladder ***(Goyal et al., 2012)***.

Coagulating intermittent cutting device

A modified cutting system designed to decrease blood loss and hematuria has been developed for TURP. This new coagulating intermittent cutting device uses a constant voltage pulse current with controlled pulse intervals to help reduce bleeding ***(Hartung et al., 2001).***

Resection techniques

Various systematic approaches to TURP have been proposed: In 1943, Nesbit described a procedure that starts with the ventral parts of the gland (between 11 and 1 o'clock), followed by both lateral lobes the, mid-lobe, and finishing with the apex ***(Nesbit, 1943).***

Flocks and Culp preferred to start with the mid-lobe then segmented the lateral lobes at 9 and 3 o'clock ***(Flocks, 1954).***

In Germany, the technique developed by Mauermayer ***(Mauermayer, 1962)*** and Hartung and May ***(Hartung et al., 2002)*** gained popularity. TURP is divided into four steps: mid-lobe resection, paracollicular transurethral resection (TUR), resection of lateral lobes and ventral parts, and apical resection. Another milestone was video-assisted resection ***(Faul et al., 1993).***

Nesbit resection technique

The Nesbit technique is probably the best-known and most commonly performed TURP method. It was first described by Reed M. Nesbit of Michigan in his landmark 1943 book on transurethral prostatectomy and is currently considered the standard approach to TURP surgery ***(Nesbit, 1943).*** As originally described by Nesbit, the procedure is divided into 3 stages: (1) intravesical or proximal, (2) extravesical, and (3) apical**.**

To begin the intravesical portion, the resectoscope is positioned with the tip between the bladder neck and the midpoint of the prostatic urethra proximal to the verumontanum. This point is determined by the relative size of the intravesical prostate. Resection begins by removing the intravesical portion of the prostate and bladder neck tissue. This is removed, along with the immediately adjacent prostatic adenoma, starting at the 12-o'clock position and working clockwise (Figure 5).

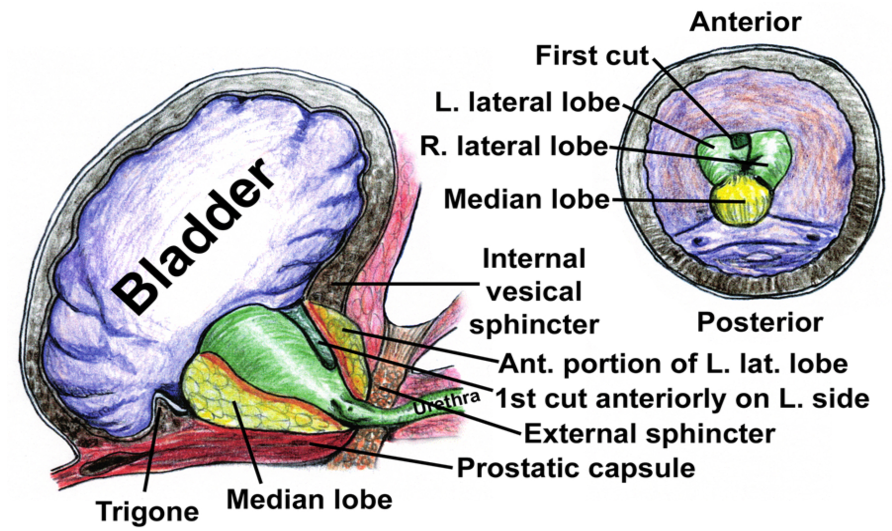

Figure (5): Demonstration of the Nesbit technique. First cut at the 12-o'clock position, intravesical portion ***(http: //emedicine . medscape. com/ article/ 449781-overview# a3).***.

The initial cut is on one side or the other of the actual midline. The length of the cut is proportionate to the size of the gland. After this stage, care must be taken to avoid resecting proximal to the established resected margin. During this initial intravesical stage of the resection, only the internal sphincter, ureteral orifices, bladder neck fibers, and the margin of resection are visible for use as landmarks.

To begin the extravesical phase of the procedure, the resectoscope is repositioned just in front of the verumontanum, and the resection is continued from the previous distal resected margin to just proximal to the verumontanum, starting again at the 12-o'clock position (see the first image below). This channel is continued from the 12-o'clock to the 4-o'clock position on the left side and to the 8-o'clock position on the right side. The intent is to create a channel between the surgical capsule and the bulk lateral lobe tissue (Figure 6).

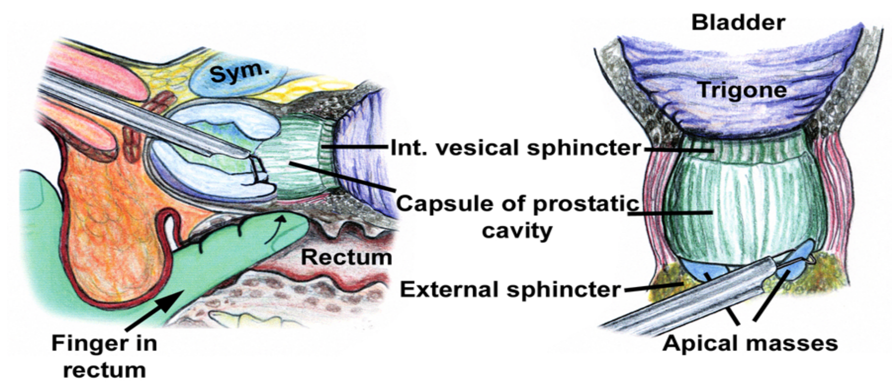

Figure (6): Demonstration of the Nesbit technique. Extravesical (second) and apical (third) portions. Inserting a finger in the rectum and tilting the resectoscope help expose tissue for removal ***(http: //emedicine . medscape. com/ article/ 449781-overview# a3).***.

This encircling maneuver, combined with the intravesical and bladder neck resection performed earlier, results in the bulk of the 2 lateral lobes falling onto the floor of the prostatic fossa. In addition, they are essentially devascularized and can be resected easily with minimal bleeding. The bulk of the prostate tissue is resected during this part of the procedure**.**

The remaining tissue in the posterior lobe is then resected. Nesbit recommended the use of a finger in the rectum to aid in judging the relative thickness of the remaining tissue; this remains a good idea (Figure 7).

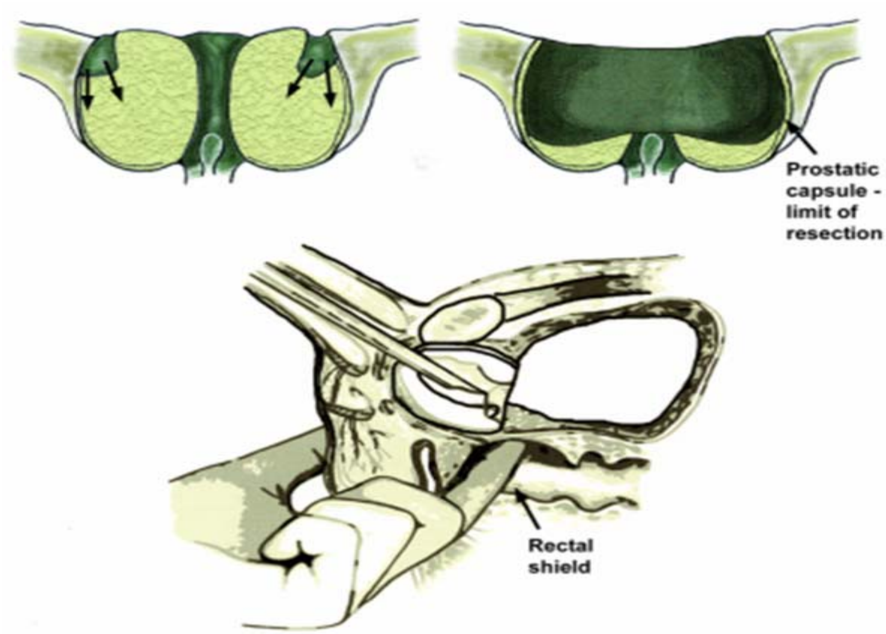

Figure (7): The prostatic capsule is the lateral limit of resection. Surgical removal usually starts at the proximal end. Tissue around the verumontanum is saved until the end. Inserting a finger in the rectum to lift the bladder neck and prostate can be helpful ***(http: //emedicine . medscape. com/ article/ 449781-overview# a3).***.

The final stage of the procedure is the apical stage, in which the remaining apical tissue around the verumontanum is carefully removed (Figure 8). Again, Nesbit started the apical portion of the procedure with an anterior resection (12-o'clock position), using the verumontanum as the main landmark.

Figure (8): Apical resection near the verumontanum. Elevation of the resectoscope, which may require that the surgeon stand briefly, facilitates this portion of the procedure ***(http: //emedicine.medscape.com/article/ 449781-overview# a3).***

Complications of TURP

1. Bleeding

Arterial bleeding can be more pronounced in cases of preoperative infection or urinary retention because of a congested gland. Venous bleeding generally occurs because of capsular perforation and venous sinusoid openings. The amount of intraoperative bleeding may depend on gland size and resection weight ***(Hoffmann, 2005).***