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Transurethral Enucleation and Resection of the Prostate: Contemporary Role in the Surgical Treatment of Benign Prostatic Hyperplasia

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Mini Review

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Abstract

Benign prostatic hyperplasia (BPH) is a very common urological problem affecting all men as they age. Despite the rapid evolution of BPH surgical treatment, transurethral resection of the prostate (TURP) is still considered the gold standard, which has prevailed over the past century. However, due to the safety issues associated with TURP, particularly with prostates larger than 80 ml together with the limited exposure of young urologists to the open prostatectomy, many urologists sought to modify the standard TURP in a way that would assure complete removal of the adenoma with lower risk of complications. Therefore, enucleation was incorporated into the standard TURP in a procedure called transurethral enucleation and resection of the prostate (TUERP), which has been used over the past decade. Besides its ability to provide complete removal of the adenoma, the main advantage of this modification is to help define the capsular plane early during the procedure, which will reduce the risk of capsular perforation and help control bleeders in a timely manner. The technique can be performed with monopolar or bipolar energy. The current evidence proved its safety and efficacy as an alternative to TURP and open prostatectomy in treating medium to large prostate sizes. In this mini review, we discuss the contemporary role of TUERP in the surgical treatment of BPH. We believe that our review will be of great benefit to readers particularly with the rapid evolution of surgical BPH treatment.

Keywords: Benign prostatic enlargement; Surgical treatment; Transurethral resection; Enucleation; Prostatectomy

Abbreviations: AUA: American urological association; AUR: Acute urinary retention; BOO: bladder outlet obstruction; BPH: benign prostatic hyperplasia; EAU: European association of urology; HoLEP: holmium laser enucleation of the prostate; IPSS: International Prostate Symptoms Score; LUTS: lower urinary tract symptoms; PVR: Post-void residual; PSA: prostate specific antigen; TURP: transurethral resection of the prostate; TUERP:

transurethral enucleation and resection of the prostate; TURS: transurethral resection syndrome; Qmax: maximum flow rate

Introduction

Benign prostatic hyperplasia (BPH) is a very common urological problem in men as they age. Its histological prevalence in autopsy studies has been found to be 50% and 80% in the 6th and 9th decades of life respectively [1]. Management options and decision-making should be guided by severity of lower urinary tract symptoms (LUTS), degree of bother and patient preference [2]. International Prostate Symptoms Score (IPSS) and other scores are frequently used for categorizing treatment options to watchful waiting, life style modification, medical or surgical management [2]. Moreover, according to several guidelines, surgery is indicated in case of Acute urinary retention (AUR) that fails voiding trial, recurrent gross hematuria, recurrent urinary tract infections, bladder stones, bladder diverticulum or renal insufficiency secondary to obstruction [3-5].

Over the past century, transurethral resection of the prostate (TURP) has prevailed as the gold standard surgical treatment for relieving bladder outlet obstruction (BOO) secondary to BPH [3]. However, it has been associated with several perioperative complications including hematuria, blood transfusion, transurethral resection syndrome (TURS) and clot retention particularly with prostates larger than 80 ml [6]. In addition, TURP has been associated with a 3%-15% reoperation rate [7]. Although improvements in training and technology have lead to significant reduction in the rate of these complications, mortality and morbidity are still concerning particularly when operating on high risk patients such as those with cardiac disease and/or anticoagulation therapy [7]. Therefore, the American urological association (AUA) and European association of urology (EAU) guidelines recommend open prostatectomy as the treatment of choice for prostates >80 ml.

Due to the extensive use of medical BPH treatment, the rate of prostate surgery has considerably fallen [8,9]. However, when surgery is eventually required, patients are significantly older with more comorbidity [10], which makes them unable to tolerate complications like bleeding and TURS. In addition, due to the widespread use of endoscopic approaches in the past few decades [11,12] the new generation of urologists are graduating with limited exposure on the open approach [13]. As a result, several alternative transurethral techniques have emerged in trials to provide similar functional outcomes with fewer complications as compared to TURP and open prostatectomy. Among those techniques comes the holmium laser enucleation of the prostate (HoLEP), which has shown a comparable functional outcome to the open prostatectomy in treating prostates larger than 80 ml [14]. However, due to reasons related to its steep learning curve and cost [15,16] HoLEP did not gain widespread popularity.

Given the suitability of TURP to all urologists in term of its learning curve, availability and cost effectiveness [17], many urologists sought to incorporate the enucleation technique into the standard TURP. The result would be a modified procedure; namely transurethral enucleation and resection of the prostate (TUERP). The main concept of this modification is to help define the capsular plane early during the procedure particularly at 2-5 and 7-10 o'clock positions of the bladder neck where most bleeders are located [18]. This would allow an under-vision one-step control of those bleeders that will help achieve a bloodless resection of the enucleated adenoma in a timely manner thereby reducing resection time and preventing complications particularly bleeding [18,19]. This is difficult to do during the standard TURP where vessels are repeatedly cut before reaching the capsule [20,21].

Being just a modification of the standard TURP, TUERP did not seem to impose any extra cost [22,23]. The technique was first described in 1989 by Hiraoka, et al. from Japan [24], which included the use of a detaching blade for the enucleation part that is inserted through the scope and aided by a digital rectal guidance. However, the technique did not gain popularity because of its complexity. In 2010 Liu and colleagues re-described the TUERP using plasma kinetics in which they performed the enucleation by a blunt dissection utilizing the beak of the resectoscope sheath in a retrograde fashion [25]. Due its ease of application that resembles the finger movement during open prostatectomy, many urologists adopted the technique, which lead to a plethora of studies.

Clinical Outcomes

When assessing the outcome of any new surgical technique, it is essential to compare it with the gold standard with intent to prove a non-inferiority profile. Despite the theoretical idea behind TUERP, some concern still exists regarding the monopolar version of the technique as it relies on hypotonic irrigation fluids that may cause absorption and TURS. Although Hiraoka has

described a similar technique more than 25 years ago, literature is still scarce when it comes to monopolar TUERP. To the best of our knowledge, the only study in the literature that assessed the difference between monopolar TURP and monopolar TUERP is the one reported by Zuo, et al. in 2014 [26]. In that study, around 600 patients were randomized to receive either TUERP or TURP. Both techniques achieved similar functional outcomes. However, TUERP was superior in terms of resection rate, operative time, irrigation time and blood loss. In addition, no significant drop has been noticed in the postoperative levels of sodium and hemoglobin in the TUERP group. This indicates that the risk of TURS in the monopolar TUERP, even if present, is much lower than that of the TURP counterpart.

When using plasma kinetics, Liu et al concluded that TUERP is a good alternative to TURP and Open simple prostatectomy even for prostate sizes up to 250 ml [25]. However, this conclusion was not based on a direct comparison between these 3 different surgical options. A retrospective study from China looked at the outcome of bipolar TUERP versus bipolar TURP [21]. They reported comparable functional outcomes between the two techniques. However, TUERP was superior in terms of amount of removed tissue and improvement in prostate specific antigen (PSA) and post-void residual (PVR). Although functional outcomes were comparable, the significant difference in the amount of removed tissue and postoperative PSA and PVR may support a more durable symptom relieve in favor of TUERP. Another retrospective study assessed the outcome of bipolar TUERP versus bipolar TURP for prostates larger than 60 ml [27]. In that study TUERP had a better outcome in terms of operative time, irrigation time and hospital stay. In addition, TUERP was also superior in terms of functional outcome including IPSS and maximum flow rate (Qmax), amount of resected tissue and complication rate. However, both studies were retrospective and non-randomized, which may impose a negative impact on their statistical power.

To eliminate the chance of any bias, a prospective study by Luo et al randomized 310 patients to either bipolar TUERP or bipolar TURP [28]. Patients were further categorized according to prostate size to either <60 ml or >60 ml. functional outcomes were comparable between both approaches however, TURP was associated with longer operative time and more blood loss for prostates >60 ml. To further elaborate on the role of TUERP in treating larger prostate sizes, another prospective randomized trial looked at the outcome of bipolar TUERP versus transvesical prostatectomy for prostates larger than 80 ml [29]. Functional outcomes and complication rate were comparable between the 2 groups. However, TUERP was superior in terms of catheterization time and hospital stay.

Another important aspect in assessing the outcome of TUERP is to compare it with other enucleation techniques. A prospective randomized trial by Gilling group looked at the outcome of plasma kinetic enucleaion of the prostate versus HoLEP [30]. Although functional outcomes were comparable between the two approaches, HoLEP was superior in terms of operative time and catheterization time. However, these results have to be interpreted with caution as all patients in the bipolar enucleation group had morcellation instead of resection, which has been proven to prolong operative time [31].

In summary, due to the relatively recent development of TUERP [25], the current literature lacks long term results. However, short-term data (2 years) proved that TUERP is a safe and feasible alternative to TURP and open prostatectomy in treating medium and large prostate sizes with more tissue removal, shorter operative time, shorter hospital stay and lower complication rate. In addition, its functional outcomes have been shown to be comparable to that of the HoLEP.

Complications

TUERP shares several TURP complications. The type and rate of those complications depend on several factors including prostate size, comorbidities, duration of surgery, type of electro-cautery and surgeon's experience. These complications include TURS, infection, bleeding requiring blood transfusion, urethral stricture, bladder neck contracture, reoperation and transient incontinence [29,32,33].

Due to the use of hypotonic fluid irrigation, monopolar TUERP is hypothetically expected to carry a similar risk of TURS as its TURP counterpart. However, when prospectively compared with monopolar TURP, TUERP has shown a very low risk of such complication [26]. This observation could be explained by its shorter operative time, early control of bleeders during enucleation and lower risk of capsular perforation. Furthermore, with the advent of plasma kinetics, the risk of TUR-syndrome with TUERP has further declined to negligible values [27,28,34]. Moreover, blood loss is another frequent complication that has been shown by several studies to be less frequent with TUERP than with TURP or open prostatectomy [28,29,34]. This can be explained by the

early control of bleeders as they exit the surgical capsule towards the adenoma [18,19].

A major concern during TURP is capsular perforation. Therefore, many urologists avoid deep resection, which may lead to a considerable amount of residual adenoma. This can probably explain the reported 3%-15% 5-year reoperation rate after TURP. However, because TUERP provides complete removal of adenoma, its rate of reoperation has been reported to be 0% at 2 years postoperatively [27].

One of the most commonly reported TUERP complications is transient incontinence, which occurs in 4.7%-17% of cases [28,32-34]. Although stress type has been reported, urge-related incontinence was more common in the majority of cases [28,32]. Nevertheless, almost all patients experience gradual improvement over a period of 3-6 months [32,33]. Moreover, looking at the rate of urethral stricture and bladder neck contracture, no difference has been noticed between TUERP and TURP [27].

Conclusion and Future Considerations

Despite its recent development, TUERP has been proven as a safe alternative to TURP in treating medium to large prostate sizes with more tissue removal, shorter operative time and lower complication rate. It has also shown functional outcomes that are comparable to those of HoLEP and open prostatectomy. Complications are mild and occur less frequently compared to those of the standard TURP and open prostatectomy. In addition, the technique did not seem to impose any extra cost, as it is just a modification of the conventional TURP. It utilizes readily available instruments that all urologists are familiar with, which makes it easy to learn. However, long-term data are still required to validate the current results. Nevertheless, based on the available evidence, we believe that TUERP, particularly bipolar, will soon surpass the conventional TURP as the new gold standard surgical treatment of BPH.

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