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Mini Review

A Mini-Review of Holmium Laser Enucleation of the Prostate *vs.* Robot-Assisted Simple Prostatectomy for Managing LUTS Due to BPH

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ABSTRACT

This study has explored the outcomes of RASP and HoLEP, further highlighting that although both modalities are safe and feasible Benign Prostatic Hyperplasia (BPH) treatment options, there is significant variability in perioperative outcomes and complications, such as operative time, blood loss, discharge time, and transient stress urinary incontinence. Some studies favor RASP while others favor HoLEP. Our study contributes to the body of literature of HoLEP *vs* RASP by demonstrating excellent outcomes with both modalities, comparable operative time, blood loss and transient stress urinary incontinence rate.

Keywords: Lower Urinary Tract Symptoms (LUTS); Transurethral Resection of the Prostate (TURP); Robotic-Assisted Simple Prostatectomy (RASP); Holmium Laser Enucleation of the Prostate (HoLEP); Transient Stress Urinary Incontinence (tSUI)

INTRODUCTION

Benign Prostatic Hyperplasia (BPH) affects nearly 80% of men over 70, leading to Lower Urinary Tract Symptoms (LUTS) and decreased quality of life [1]. Traditionally, the gold standard treatment for a small to medium-sized prostate was a Transurethral Resection of the Prostate (TURP), while an Open Simple Prostatectomy (OSP) was preserved for larger glands [2]. However, minimally invasive procedures like Holmium Laser Enucleation of the Prostate (HoLEP) and Robotic-Assisted Simple Prostatectomy (RASP) are now favored for their proven safety and improved outcomes. HoLEP and RASP have different post-operative recovery courses and complications, which are important to highlight during preoperative counseling [3-5].

HoLEP effectively removes the transition zone of the prostate, offering long-term symptom relief and low re-treatment rates of 0% to 1.4% over 7 to 10 years [6,7]. It also provides better hemostasis, shorter catheter times and reduced hospital stays compared to TURP [8,9]. Furthermore, in 2018, the American Urological Association (AUA) updated its guidelines to consider HoLEP as a size-independent treatment for BPH, as existing literature demonstrated comparable functional outcomes for HoLEP with any prostate size [10]. Despite its various advantages over TURP, HoLEP's steep learning curve and risk of transient stress urinary incontinence may be hindering its popularity among urologists.

RASP is similarly effective in removing prostate adenoma and alleviating symptoms, with lower transfusion rates and shorter hospital stays than OSP [11]. Current guidelines advise that RASP should only be considered for large to very large prostates [12].

While both procedures remove the prostatic adenoma completely, RASP and HoLEP have different recovery considerations: RASP typically requires longer catheterization, whereas HoLEP historically has been linked to higher post-procedural rates of Transient Stress Urinary Incontinence (tSUI). Of note, RASP has a faster learning curve; however, the high cost of robotic surgical systems might limit its use to more affluent medical institutions. In contrast, HoLEP generally incurs lower costs due to its reduced initial equipment expenses [13].

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LITERATURE REVIEW

This mini-review summarizes recent literature comparing the outcomes of HoLEP *vs* RASP in BPH treatment. Specifically, we highlight the implications of our recent study, "Propensity Score Matching Analysis of Differential Outcomes in Holmium Laser Enucleation of the Prostate *vs*. Robotic-Assisted Simple Prostatectomy", expanding upon the key findings and their contribution to the current literature [14]. By highlighting key points from various studies comparing HoLEP and RASP outcomes, this mini-review aims to assess the clinical significance of our recent study and its contribution to the existing literature and to help urologists make informed treatment decisions and improve surgical practices for managing LUTS due to BPH.

Perioperative outcomes of HoLEP *vs*. RASP

To begin with, variations in operative times between RASP and HoLEP, as reported by various groups, warrant detailed examination. These differences could be attributed to factors such as surgeon and institutional experience, prostate size, etc. For instance, studies by Zhang et al., and Bove et al., have both reported significantly shorter operative times for HoLEP compared to RASP, with Bove et al., reporting comparable preoperative prostate sizes [4,15]. Interestingly, Grosso et al., also have shown faster average operation times with HoLEP *vs*. RASP while adjusting for differences in prostate size through Propensity Score Matching (PSM) [16]. In contrast, several studies have reported comparable average operation times between HoLEP and RASP with similar average prostate sizes [3,17]. The differences between various studies in operative time and other perioperative outcomes may be attributed to the differences in surgeon and institution experience with certain modalities. In our study, both RASP and HoLEP surgeons had over 20 years of experience performing and teaching their respective procedures in high-volume institutions. Initially, our HoLEP cohort demonstrated a shorter median Interquartile Range (IQR) operation time than the RASP cohort (109.5 (77-134) mins *vs*. 131 (116.25-144.25) mins respectively, p<0.001). However, there was a significant difference in prostate size between HoLEP and RASP (84 (54.5-120) *vs*. 141.5 (104-158) ml respectively, p<0.001). To adjust for this difference, the PSM was performed based on age and prostate size. After PSM, there was no significant difference in mean operation time between the matched HoLEP and RASP patients (p=0.140) [14]. Our findings further support the notion that operation times are comparable with consideration of prostate size in experienced hands.

Another perioperative outcome that has been frequently discussed is Estimated Blood Loss (EBL) and its clinical significance when comparing HoLEP *vs*. RASP. Like many other studies, we observe lower median Interquartile Range (IQR) EBL with HoLEP *versus* RASP (40 (20-50) *vs*. 100 (50-100) cc respectively, p<0.001) [14]. Both Zhang et al., and Grosso et al., present similar reports of significantly lower average EBL with HoLEP *vs*. RASP [4,16]. However, despite the higher average EBL in the RASP cohort, we report no complications related to blood loss and no need for peri or post-operative blood transfusions in this group, rendering the higher EBL clinically insignificant [14].

Furthermore, many studies demonstrate comparable postoperative complication rates between HoLEP and RASP [3,4,17]. Similarly, in our study, both HoLEP and RASP demonstrated comparable rates of low peri and postoperative complications, both before and after PSM [14]. Thus, both HoLEP and RASP could be considered safe surgical treatments for BPH. Notably, AUA guidelines highlight the safety of HoLEP in patients on anticoagulants marking it as a significant advantage over other surgical modalities for BPH, including RASP [12]. In our study, the standard procedure was to instruct patients in the RASP cohort to discontinue anticoagulant use before surgery. Additionally, we did not record data on pre and postoperative anticoagulant use for HoLEP or RASP patients, which is a limitation that should be, addressed in future research.

The duration of postoperative catheterization has been a common concern after RASP, with most studies showing lower average catheter times for HoLEP *versus* RASP [3-5,15-19]. Similarly, our study found significantly shorter postoperative catheterization for HoLEP compared to RASP, with durations of 1 (1-4) days *vs*. 7 (7-8) days, respectively (p<0.001) [14]. Our institution's standard protocol for RASP is to leave the catheter in for 7 days, whereas post-HoLEP overnight catheterization with Continuous Bladder Irrigation (CBI) is the standard of care unless clinically indicated otherwise.

Additionally, multiple studies have reported shorter hospital stays for HoLEP compared to RASP [4,16,19]. In contrast, our study reported a longer average hospital stay for HoLEP *vs*. RASP (1 (1-2) *vs*. 0 (0) days, respectively p<0.001), reflecting our integration of a Same-Day Discharge (SDD) pathway for RASP [14]. Similarly, Palacios et al., demonstrated a 48% success rate with SDD after RASP [5]. However, these differences significantly depend on institutional and surgeon-specific practices. For instance, Lee et al., were one of the first to describe SDD following HoLEP demonstrating shorter hospital stays compared to RASP (0.65 ± 1.2 *vs*. 2.6 ± 1.9 days, respectively p<0.0001) [18]. At our institution, all HoLEP patients are admitted overnight for CBI and discharged after passing a voiding trial on postoperative day 1. The high rate of SDD following RASP at our institution could be attributed to the use of urethral mucosa anastomosis, which eliminates the need for postoperative CBI, and the implementation of a robotic TAP block at the end of the case, which improves pain control. Further research is needed to analyze the effects of SDD and shorter catheterization on healthcare economics and patient satisfaction.

Postoperative transient SUI rates

Transient Stress Urinary Incontinence (tSUI) is a common concern following various urological surgeries, particularly those aimed at addressing BPH. Our analysis indicates that both RASP and HoLEP yielded low rates of tSUI in the postoperative period. Specifically, our findings reveal that tSUI rates at three months' post-surgery were comparable. This outcome is particularly noteworthy considering that tSUI is a common post-

operative concern following HoLEP, particularly in larger prostates [3,5,6,19-21]. However, recent reports indicate a reduction in significant SUI, with rates now around 4%-10% at short-term follow-up [22]. Advancements in surgical techniques, such as early apical release, likely contribute to this decline in tSUI rates [14,23]. A recent study demonstrated that standard HoLEP technique corresponds to a 4.2X increase (6 weeks) and 8.3X increase (3 months) in probability of suffering from SUI as compared to HoLEP with early apical release [24].

At our institution, we employ early apical release and maintenance of an anterior mucosal strip in all HoLEPS to allow for earlier recovery of continence. This underscores that both RASP and HoLEP provide effective options for the surgical management of BPH, and can have comparable rates of tSUI.

RESULTS AND DISCUSSION

To summarize, this mini-review has explored the outcomes of RASP and HoLEP, further highlighting that although both modalities are safe and feasible BPH treatment options, there is significant variability in perioperative outcomes and complications, such as operative time, blood loss, discharge time, and transient stress urinary incontinence. Some studies favor RASP while others favor HoLEP. Our study contributes to the body of literature of HoLEP *vs.* RASP by demonstrating excellent outcomes with both modalities, comparable operative time, blood loss, and transient stress urinary incontinence rate. In our institution, RASP demonstrated shorter hospital stays. These results differ from some of the other studies' reports. This underscores the importance of surgeon practice preferences and experience on patient outcomes following these two surgeries. Compared to other studies, RASP was completed with a faster operative time and same day discharge at our institution. This can be attributed to the surgeon's vast experience (>20 years) with robotic surgery and the use of intraoperative robotic TAP blocks; as, same day discharge following RASP is not common practice around the country. On the other hand, there is significant literature on same day discharge following HoLEP. However, in our institution, the practice preference is to observe all HoLEP patients overnight with CBI, in order to reduce the number of post-discharge emergency room presentations. The low tSUI rates following HoLEP in this study can be attributed to the surgeon's experience (>20 years), early apical release, and preservation of anterior urethral mucosa.

CONCLUSION

Patients should be thoroughly counseled on the perioperative recovery processes associated with each technique to ensure informed decision-making. Both surgeries provide excellent outcomes. However, surgeons will need to assess their surgical experience and techniques with each modality before offering these treatment options, as this will greatly influence the patients' post-operative outcomes. Some surgeons will achieve better patient outcomes with RASP, while others will achieve better results with HoLEP. Surgeons with greater experience or at high volume centers will likely achieve improved outcomes. Consistently, HoLEP offers shorter post-operative catheterization time and is significantly less invasive than RASP. Further, HoLEP is size-independent while RASP is reserved for larger prostate glands. However, these benefits of HoLEP may be offset if a surgeon isn't able to achieve comparable low transient stress urinary incontinence rates and low blood loss compared to RASP.

FUTURE IMPLICATIONS

There is a necessity for continued research to delve deeper into the long-term outcomes and more specifically, patient perspectives following these procedures. Additionally, comprehensive cost-effectiveness analyses are imperative to evaluate the overall healthcare burden of both procedures.

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