Original Article

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Comparison of Perioperative Outcomes and Urethral Complications Between Using 24-French and 26-French Resectoscope Sheaths in Holmium Laser Enucleation of the Prostate

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Abstract

Aim: Although the 26F resectoscope is frequently used in transurethral prostatectomy, there are some concerns with high-caliber shafts. We compared 24F and 26F resectoscope used for Holmium Laser Enucleation of the Prostate (HoLEP) in terms of effects on postoperative urethral complications and perioperative outcomes.

Methods: Data from patients undergoing HoLEP from 2017 to 2021 was retrospectively analyzed. All surgeries were completed by a single surgeon. The patients were divided into one of two groups according to the resectoscope diameter (24F or 26F). All patients were followed up for urethral complications for 12 months. Perioperative outcomes and urethral complications were compared between the groups.

Results: The study included 301 patients. The mean age of patients was 68.5±8.3 and 69.1±8.6 for the 26F group (n=180) and the 24F group (n=121), respectively (p=0.608). A total of seven in the 26F group (3.8%) and 3 patients in the 24F group (2.4%) had postoperative urethral stricture (US) (p=0.503). Besides, 2 patients (26F) and 1 patient (24F) had postoperative bladder neck contracture (BNC) (p=0.807). The operation efficiency was 1.25 g/min in the 26F group and 1.17 g/min in the 24F group (p=0.005).

Conclusion: The use of 24F or 26F RS was not shown to cause statistically significant differences in the incidence of US and BNC during the 12-month follow-up. The use of the 24F RS significantly reduces surgical and morcellation efficiency.

Keywords: Urethral structure Holmium laser enucleation of the prostate (HoLEP), prostatic hyperplasia, complications

Introduction

Benign prostatic hyperplasia (BPH) is the main cause of lower urinary tract symptoms and is frequently seen in elderly men (1). Traditionally, the standard surgical treatment for BPH is transurethral prostatectomy (TUR-P). However, holmium laser enucleation of the prostate (HoLEP) is a strong alternative treatment method to TUR-P, providing advantages like short hospitalization duration, low complications, and low recurrence rates (2-4). Though HoLEP may be safely applied to all prostate sizes, complications like hemorrhage in the intraoperative or postoperative period, capsule perforation, bladder mucosa, and ureter orifice injury, urethral stricture (US), and bladder neck contracture (BNC) may be observed (5).

Excessive resection, urinary extravasation, use of thick urethral catheters, extended catheter use, and the presence of infection are situations that increase the incidence of urethral complications during transurethral surgeries (6,7). Additionally, previous studies showed that the use of a large-diameter resectoscope for TUR-P increases the risk of developing postoperative BNC and US (6,8). In our study, we aimed to compare the use of

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24-French (F) and 26F resectoscopes for HoLEP in terms of their effects on postoperative urethral complications and perioperative outcomes.

Methods

Study Design

After receiving ethical committee approval (Istanbul Okan University, date: 20.10.2021, approval number: 143) prospectively recorded data from patients undergoing HoLEP from 2017 to 2021 were retrospectively analyzed. All surgeries were completed by a single surgeon (MA) with appreciable HoLEP experience (200 cases). Patients with a history of prostate or urethra surgery, with US or BNC, and with neurogenic bladder diagnosed urodynamically were excluded from the study. The patients were divided into one of two groups according to the resectoscope diameter used for HoLEP (24F vs 26F).

Preoperative assessment included physical examination, digital rectal examination, transrectal ultrasound and biopsy when indicated, Q_{max} measurement, post-voiding residual volume, prostate volume with transabdominal ultrasound, serum prostate-specific antigen (PSA), International Prostate Symptom Score (I-PSS), International Index of Erectile Function-5 (IIEF-5) and urinalysis. Preoperatively, patients were assessed with the Charlson Comorbidity Index for comorbidities (9,10).

Technique and Equipment for the Procedure

All patients had HoLEP performed under general or spinal anesthesia using a 140 W Multipulse HoPLUS laser platform (Jena Surgical/Asclepion Laser, Jena, Germany) and a 600 nm laser fiber (Jena Surgical) with the 3-lobe technique. In the first section of the data collection stage, a 24F continuous-flow resectoscope (Wolf®) was used for patients. Due to a change in devices used in the surgery, later cases had a 26F continuous-flow resectoscope (Karl Storz) used. Energy setting was entered into the system with 140 W for the left pedal (4 J energy, 35 Hz frequency) and 60 W for the right pedal (2 J energy, 30 Hz frequency). In the morcellation stage, an integrated Multicut morcellator system (Jena Surgical) was used. For all procedures, normal saline was used as an irrigation fluid. At the end of the surgery, every patient had a 22 F 3-way Foley catheter inserted. All patients were administered perioperative antibiotic therapy.

Perioperative Evaluation and Follow-up

Morcellation efficiency, enucleation efficiency, and operation efficiency were calculated by dividing the resected weight by the morcellation duration, enucleation duration, and operation duration, respectively. All patients were reevaluated at 1, 3, 6, and 12-month follow-up by I-PSS, IIEF-5, Q_{max}, PSA level, and the existence of complications. US/BNC was diagnosed by performing uroflowmetry and cystoscopy in patients with signs of lower urinary tract obstruction. Perioperative and postoperative complications were recorded according to the Clavien-Dindo system (11,12).

Statistical Analysis

SPSS software (Statistical Package for the Social Sciences, Version 21.0, SSPS Inc., Chicago, IL, USA) was used for data analysis. Continuous variables are expressed as mean ± standard deviation, while categoric variables are expressed as a percentage (%). Normality analysis was performed using the Kolmogorov-Smirnov test. Differences between measurements at separate times were analyzed with ANOVA for repeated measures. Statistically, $p \leq 0.05$ were accepted as significant.

Results

A total of 301 patients were included in the study. The mean age of 180 patients operated with a 26F resectoscope was 68.5±8.3 years, while the mean age of 121 patients operated with a 24F resectoscope was 69.1±8.6 years (p=0.608). A comparison of the preoperative demographic and clinical features of the patients according to the group is summarized in Table 1. The most frequent indication for HoLEP surgery was the failure of medical treatment (182/301, 60.5%), followed by refractive urinary retention (90/301, 29.9%), recurrent urinary tract infections (25/301, 8.3%), and recurrent hematuria (4/301, 1.3%).

The mean prostate volume was 112.8±43.7 mL in Group 1 and 108.6±39.2 mL in Group 2 (p=0.39). The surgical durations in Groups 1 and 2 were 71.1±19 and 72.2±20.2 min, respectively (p=0.63). The operation efficiency was calculated as 1.25 g/min in the 26F group and 1.17 g/min in the 24F group. This difference was statistically significant in favor of the 26F group (p=0.005). During the procedure, 77 patients in the 26F group (42.7%) and 7 patients in the 24F group (5.7%) had bougie dilators used (p=<0.001). While 12 patients in the 26F group had intraoperative Otis urethrotomy performed, only 1 patient in the 24F group had this performed (p=0.017). Intraoperative and perioperative outcomes are summarized in Table 2. The improvement in Q_{max} levels and IPSS scores in the first, third, and twelfth follow-up months was similar in both groups (Figure 1).

The most common complications observed within the first 30 days postoperative were dysuria in 35/180 (19.4%) in the 26F group and 26/121 (21.4%) in the 24F group (p=0.884). During the 12-month follow-up, 7 patients in the 26F group (3.8%) and 3 patients in the 24F group (2.4%) had postoperative US (p=0.503). A total of 2 (26F) and 1 patient (24F) had postoperative BNC

Table 1. Patients preoperative demographics and clinical characteristics according to groups			
	26 fr group	**24 fr group**	**p-value***
Number of patients	180	121	
Age (years)	68.5 (±8.3)	69.1 (±8.6)	0.608
BMI	23.8 (±2.1)	23.6 (±2.2)	0.427
CCI	3 (0-7)	3 (0-7)	0.707
IPSS	27.3 (±4.2)	26.5 (±4.1)	0.102
Q_{max} (mL/sec)	11.6 (±6.1)	10.9 (±5.7)	0.317
PVR (mL)	150.9 (±79.2)	151.1 (±83.6)	0.983
PSA (ng/mL)	3.3 (±3.1)	3.4 (±3.3)	0.789
Prostate volume (mL)	112.8 (±43.7)	108.6 (±39.2)	0.395
IIEF score	18 (5-29)	18 (5-26)	0.182
Coagulopathy	26/154	14/107	0.471

*p-values were calculated using Student's t or Mann-Whitney U test for continuous and chi-squared test for categorical variables
BMI: Body mass index, CCI: Charlson comorbidity index, IPSS: International Prostate Symptom Score, Q_{max}: Maximum flow rate, PVR: Post-void residual volume, PSA: Prostate-specific antigen, IIEF: International Index of Erectile Function

(p=0.807). Additionally, postoperative US was observed in 3 (3.2%) and 2 (1.7%) patients who did not undergo bougie dilatation or Otis urethrotomy in the 26F and 24F groups, respectively (p=0.491). Complications in the postoperative early period (within 30 days) and long-term (12-month) are summarized in Table 3 according to the Clavien-Dindo rating system.

Discussion

HoLEP is a reliable and effective surgical method for the surgical treatment of BPH (13). HoLEP improves the I-PSS and urine flow rate (13). However, HoLEP has some disadvantages, like lowering the postoperative quality of life (incontinence, retrograde ejaculation, dysuria, hematuria, etc.), and the development of US and BNC (5). These complications are also observed after the traditional gold standard surgical treatment method for BPH, TUR-P (14). Important risk factors for the increase in postoperative US and BNC rates are the type of catheter inserted after the operation, catheterization duration, the diameter of the resectoscope, resection duration, and patient-related factors (7,15,16). As far as we know, there is no current study in the literature comparing the perioperative outcomes and postoperative urethral complications during the 12-month follow-up for HoLEP performed with 24F and 26F resectoscopes.

In randomized controlled studies, the incidence of US after TUR-P varies from 0 to 14.7% (14). These results may vary, linked to the diameter of the resectoscope and patient-related factors. Günes et al. (8) showed that the use of a large resectoscope significantly increased the incidence of US in a study comparing the outcomes of 71 patients with TUR-P performed with a 24F and a 26F resectoscope. In studies comparing urethral complications in patients with HoLEP performed using 26F and 28F resectoscope, no

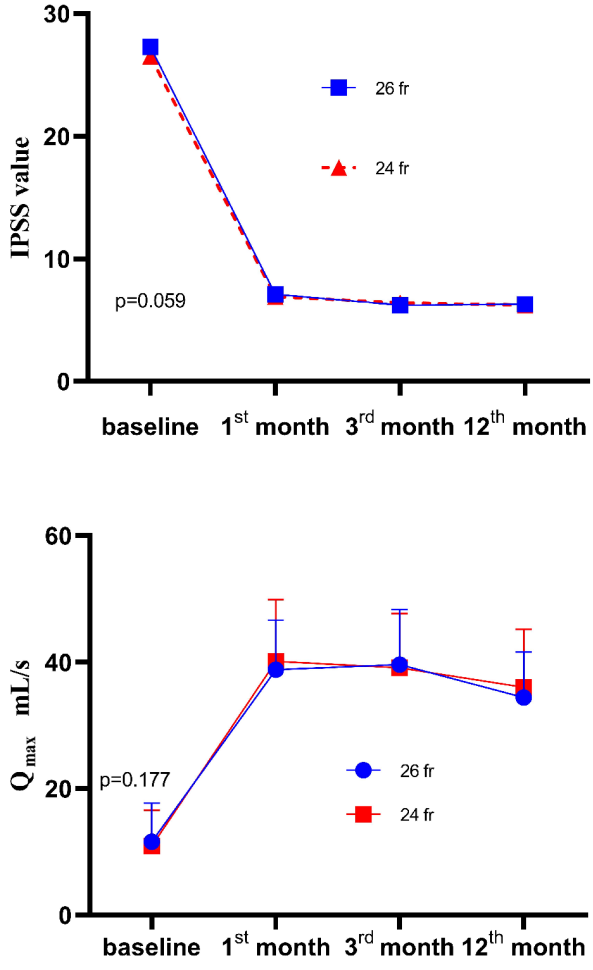

Figure 1. Changes in Q_{max} levels and IPSS scores in the groups during the first, third and twelfth month of follow-up

Table 2. Comparison of the intraoperative and perioperative parameters			
	26 Fr (n=180)	**24 Fr (n=121)**	**p-value[T]**
Urethral bougie dilation, n (%)	77 (42.7%)	7 (5.7%)	**<0.001**
Urethrotomy interna, n (%)	12 (6.6%)	1 (0.8%)	**0.017**
Pathologic specimen volume (g)	89.3 (±26.3)	84.7 (±29.1)	0.155
Operative time (mins)	71.1 (±19.2)	72.2 (±20.2)	0.633
Operation efficiency (g/mins)	1.25 (±0.2)	1.17 (±0.3)	**0.005**
Enucleation time (mins)	57.5 (±14.3)	56.9 (±14.1)	0.152
Enucleation efficiency (g/min)	1.55 (±0.41)	1.48 (±0.44)	0.159
Morcellation time (mins)	13.6 (±5.9)	15.3 (±6.1)	**0.016**
Morcellation efficiency (g/min)	6.56 (±3.1)	5.53 (±2.8)	**0.003**
Hematocrit decrease	2.6 (±1.8)	2.2 (±1.7)	0.054
Hospital stay (days)	1.07 (±0.2)	1.04 (±0.1)	0.128
Catheter removal time (days)	2.3 (±1.1)	2.2 (±1.2)	0.456
[T]Student's t-test. Data are presented as mean			

significant difference was identified for the incidence of US and BNC (17). A retrospective study by Günes et al. (8) showed that the use of a large resectoscope (24F or 26F) significantly increased the development of stricture in the bulbar urethra after TUR-P. In our study, the development rates for the US after HoLEP were 3.8% and 2.4% in the 26F and 24F groups, respectively. Though the incidence of US development was lower in the 24F group, this was statistically insignificant. Additionally, 2 patients in the 26F group and 1 patient in the 24F group developed BNC. As the diameter of the resectoscope used increases, more urethral ischemia forms secondary to compression (6). We believe that this situation may be a cause of the different US incidences.

Urethral bougie dilation was performed intraoperatively in 77 patients in the 26F group (42.7%) and 7 patients in the 24F group (5.7%). Additionally, 12 patients in the 26F group (6.6%) had intraoperative Otis urethrotomy performed, whereas only 1 patient in the other groups required Otis urethrotomy (0.8%). All patients developing the US in the 26F group had intraoperative Otis urethrotomy performed. The use of a wide resectoscope increases the need for intraoperative dilatation or urethrotomy, which may cause urethral mucosal damage and an increase in postoperative US incidence.

Small-diameter resectoscopes cause slower continuous flow and this may worsen intraoperative vision. Worsening image quality may lower surgical efficiency by lengthening operation durations. In our clinic, we experienced a clear fall in image quality when using the 24F resectoscope. However, our study shows the operation and morcellation efficiency were lower in the 24F group, while the morcellation duration was higher. Additionally, the enucleation efficiency was higher in the 26F groups however, this difference was statistically insignificant.

To observe the effect of the resectoscope sizes on perioperative parameters, we compared the hospitalization duration, catheter removal duration, and decrease in the hematocrit for patients in both groups.

Statistically significant differences were not identified between hospitalization duration, catheter removal time, and hematocrit decreases between the groups.

Table 3. Frequency of complications and assumed Clavien-Dindo grading of reported complications				
		Groups, n (%)		
Complication within 30-day period	**Clavien grade**	**26 Fr group**	**24 Fr group**	**p-value**
Dysuria	1	35 (19.4%)	26 (21.4%)	0.884
Transient incontinence	1	10 (5.5%)	8 (6.6%)	0.805
Mild to moderate dysuria	2	5 (2.7%)	2 (1.6%)	0.705
Hematuria/blood transfusion	2	1 (0.5%)	0	1.000
Urinary tract infection	2	0	1 (0.8%)	1.000
Severe hematuria/clot retention	3b	1 (0.5%)	1 (0.8%)	1.000
12-month follow-up complication				
Bladder neck stenosis	3b	2 (1.1%)	1 (0.8%)	0.807
Urethral stenosis	3b	7 (3.8%)	3 (2.4%)	0.503

Additionally, during the postoperative 12-month follow-up, when complications apart from stricture were assessed in our patients (dysuria, incontinence, hematuria, infection), we did not observe a significant difference between the two groups. Our perioperative findings and postoperative complication rates were similar to the results of a Holep review by Das et al. (18) in 2019.

Study Limitations

There are some limitations to our study. The first one is the retrospective design of the study. Though our design was retrospective, data for each patient was entered into the system prospectively. Another limitation is that the difference in experience of the surgeon (though the same surgeon has performed all the operations.) in the period when surgery was performed in both groups was not considered. Despite these limitations, the study will guide our colleagues in clinical practice due to the limited number of similar studies in the literature and the fact that high-caliber shafts are a concern in the minds of all urologists.

Conclusion

In our study, the use of a 24F or 26F resectoscope was not shown to cause statistically significant differences in the incidence of US and BNC during the 12-month follow-up. However, the use of a large-diameter resectoscope increases the need for perioperative urethral dilatation and urethrotomy, and this may cause more urethral ischemia and mucosal damage. The use of the 24F resectoscope significantly reduces surgical and morcellation efficiency. To identify the optimum resectoscope diameter for HoLEP, prospective randomized controlled studies on many participants on this topic will contribute to our preliminary outcomes.

Ethics

Ethics Committee Approval: Ethical committee approval was obtained from Istanbul Okan University (date: 20.10.2021, approval number: 143).

Informed Consent: Retrospective study.

Authorship Contributions

Concept: A.Y., S.A., M.A., Design: A.Y., S.A., M.A., Data Collection and/or Processing: A.Y., S.A., A.G., Analysis and/or Interpretation: A.Y., H.A., A.G., M.A., Literature Research: A.Y., H.A., A.G., Writing: A.Y., H.A., A.G.

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