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Original Article

Impact of metabolic syndrome on pre- and postoperative parameters in patients undergoing a HoLEP surgery

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ABSTRACT

Objective: We aimed to investigate the safety and success of the holmium laser enucleation of prostate (HoLEP) surgery in patients with metabolic syndrome (MS) versus those without MS who have similar prostate sizes.

Material and methods: Data from 120 patients who underwent HoLEP by a single surgeon between November 2015 and January 2018 were prospectively analyzed. Group 1 (n=40) and Group 2 (n=80) consisted of patients with and without MS, respectively. Preoperative-and postoperative third month control variables that were compared between the groups included hemoglobin (Hb) level; International Prostate Symptom Score (IPSS); uroflowmetry parameters, such as maximum flow rate (Qmax) and average flow rate (Qave); post-voiding residue (PVR); voiding time (VT); and time to maximum flow rate (MVT).

Results: For postoperative outcomes between the groups, only hospitalization time (HT) was significant among IPSS, Qmax, Qave, PVR, VT, MVT, Hb decrease, and catheterization time (p=0.03). A multivariate analysis showed that the triglyceride level positively correlated with HT among Group 1 patients (p=0.03). Perioperative outcomes, such as enucleated tissue weight, efficiency of enucleation, enucleation rate, efficiency of morcellation, enucleation time, morcellation time, total operation time, total laser energy, and laser efficiency, were compared as non-significant between the two groups (p>0.05).

Conclusion: We found that HoLEP can be considered a safe and effective surgical treatment for patients with MS.

Keywords: Benign prostate hyperplasia; HoLEP; holmium; metabolic syndrome.

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Introduction

Benign prostate hyperplasia (BPH) is a common condition in the elderly men. BPHassociated lower urinary tract symptoms (LUTS), such as nocturia, pollakiuria, urgency, and dysuria, are the leading causes of social life deterioration. The prevalence of BPH in the fifth decade of life varies as 50%-70%, whereas in the seventh decade, it reaches to 80%. The total incidence of BPH is 8.5-41/1000 men/years.[1]

Transurethral resection (TUR) of prostate is a common procedure used in prostate sizes with volumes of 30-80 cc, while suprapubic transvesical prostatectomy is used in prostate sizes with volumes >80 cc.[2]

Although the aforementioned, traditional surgical approaches are still in use, technology has led to the use of a new safe and efficient surgical treatment of BPH called the holmium laser enucleation of prostate (HoLEP). Recently, HoLEP has been shown to be effective in the treatment of all prostate sizes.[3]

Metabolic syndrome (MS) is a cluster of conditions including increased blood pressure (BP), high blood glucose level, excess body fat around the waist, and abnormal cholesterol or triglyceride (TG) levels that occur together, which further increasing the risk of heart disease, stroke, and diabetes. MS in patients is diagnosed based on the guidelines of National Institutes of Health. The prevalence of MS increases after the third decade of life, while it

peaks among men after the ages of 50-70 years, which shows a pattern similar to BPH. The existence of three or more of the following parameters is required for the diagnosis of MS: increased BP of ≥130/85 mm Hg, large waist circumference (WC) >102 cm for males, high TG (≥150 mg/dL), low density lipoprotein (LDL) >100, high density lipoprotein (HDL) <40 mg/dL, and elevated fasting blood glucose (FBG) >100 mg/dL.[4] Further, MS has been related to the aggravation of LUTSs. In patients with MS, complaints of LUTS continued following the TUR procedure.[5]

To date, few studies have investigated the impact of MS and its components on perioperative results of the surgical treatment modalities such as TUR and HoLEP.[6-9] Therefore, we aimed to compare the safety and success of the HoLEP surgery in patients with MS versus those without MS who have similar prostate sizes.

Material and methods

This prospective study was conducted on 120 patients who underwent the HoLEP procedure between November 2015 and January 2018. The study was approved by the ethical committee of Gazi University and was conducted in accordance with the principles of the Helsinki Declaration. Written informed consent was obtained from all participants.

All the patients received an alpha-blocker therapy for a specific period and were not completely satisfied with the medical therapy. Some patients also received a combination therapy of an alpha-blocker and a 5 alpha-reductase inhibitor. Patients were selected for surgery based on the following criteria: inadequate patient satisfaction to previous single/combined medical therapy, maximum flow rate (Qmax) <15 mL/s, BPH-related gross hematuria, recurrent urinary tract infection, post-voiding residue (PVR) volume >150 mL, and acute urinary retention. Patients with neurogenic bladder, prostate cancer, bladder cancer, urethral stricture, and previous prostate surgery were excluded from the study.

Patients were divided into two groups: Group 1 (n=40) and Group 2 (n=80) consisted of patients with and without MS, respectively. Three patients in Group 1 were previously catheterized due to bladder globe. The diagnosis of MS was made according to the National Institutes of Health guidelines.[4] Three or more of following traits were considered: the existence of increased BP ≥130/85 mm Hg, large WC >102 cm for males, TG level ≥150 mg/dL, LDL >100, reduced HDL <40 mg/dL, elevated FBG >100 mg/dL.

Age, prostate-specific antigen (PSA; ng/mL), prostate volume (mL), and body mass index (kg/m^2) were noted preoperatively. A preoperative abdominal ultrasonography was performed to calculate the prostate volume. Pre and postoperative third month control variables included hemoglobin level (Hb; g/dL); International Prostate Symptom Score (IPSS); uroflowmetry parameters, such as Qmax (mL/seconds) and average flow rate (Qave) (mL/seconds); PVR (mL), voiding time (VT, s), and time to maximum flow rate (MVT, s) were noted.

All procedures were performed using a 120-W holmium yttrium aluminum garnet (YAG) laser (Versapulse®, Lumenis Inc., Santa Clara, CA, USA) and a 550-nm end-firing fiber (SlimLine™ 550, Lumenis Inc., Germany) by the single surgeon (L.T.). A continuous-flow 26 F resectoscope (Karl Storz, Tubingen, Germany), rigid nephroscope with a 5-mm working channel (Karl Storz), and Versacut™ tissue morcellator (Lumenis Inc.) were used.

In all procedures, a two-pedal Lumenis 120-W holmium YAG laser was used, and the energy settings for each pedal were entered separately to the main computer prior to the surgery. Power settings were 100 Watt (2 J energy, 50 Hz frequency, and short-500 μs pulsewidth combination) for the left pedal and 37.5 Watt (1.5 J energy, 25 Hz frequency, and long-1200 μs pulsewidth combination) for the right pedal.

Statistical analysis

Statistical analysis was performed using the IBM Statistical Package for Social Sciences 20.0 software (IBM SPSS Corp.; Armonk, NY, USA). The Kolmogorov-Smirnov, Kurtosis, and Skewness Tests were used to assess the normality of the data. Descriptive statistics of nominal samples were expressed with numbers and percentages. Descriptive statistics of scale samples were expressed as mean ± standard deviation. The independent samples t-test and paired samples t-test were used for continuous variables with normal distributions. The Mann-Whitney U test and Wilcoxon test were used to analyze continuous variables that were not normally distributed. A p value of <0.05 value was considered statistically significant.

Results

In total, 120 patients were enrolled in this study. The demographic data of the study population is shown in Table 1. The mean age, serum PSA levels, and preoperative prostate volumes were not significant among the groups (Table 1). Relief of symptoms and the uroflowmetry parameters improved after the surgery in both groups (Table 2). The IPSS and uroflowmetry parameters including Qmax, Qave, PVR, VT, and MVT were improved 3 months postoperatively in each group (Table 2). In Group 1, 3 patients had bladder globe preoperatively, and the mean postoperative third month Qmax value of these patients was 21.6 mL/s.

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Table 1. Patients' baseline characteristics and preoperative data

	Group 1 (n: 40)	Group 1 IQR	Group 2 (n: 80)	Group 2 IQR	p
Patient age (years)	67±9.61	11.5	63±8.54	42	0.08
PSA (ng/mL)	4.25±3.7	4.53	3.87±4.14	4.45	0.98
BMI* (kg/m^2)	28.26±2.71	4.02	26.17±2.53	3.6	0.001
Hb level* (g/L)	14.41±0.85	1.13	14.59±1.24	1.4	0.42
Prostate volume (mL)	90±52.19	50	88±42.9	57	0.84
IPSS	22±5.41	8.5	24±6.52	35	0.1
QoL	4±0.84	1	4±1.15	2	0.39
Qmax (mL/s)*	10.25±2.94	4.5	9.07±4.21	5.5	0.14
Qave (mL/s)*	4.66±1.77	1.5	3.64±1.58	2.7	0.009
PVR (mL)	153.5±150	134.25	150±100.6	145	0.96
VT (s)	88.2±85.22	80.2	80±57.61	66.27	0.75
MVT (s)	12.2±28.72	32.3	14.5±32.86	27.97	0.7

*Statistically analyzed using Student t-test; others were analyzed using Mann-Whitney U test
n: number of patients; PSA: prostate-specific antigen; BMI: body mass index; Hb: hemoglobin; IQR: interquartile range; IPSS: International Prostate Symptom Score; QoL: quality of life; Qmax: maximum flow rate at voiding; Qave: average flow rate at voiding; PVR: post-voiding residue; VT: voiding time; MVT: voiding time to attain Qmax

Table 2. Comparison of preoperative data and postoperative outcomes of groups

	Group 1 (n: 40)			Group 2 (n: 80)		
Variables	**Preoperative**	**Postoperative**	**p**	**Preoperative**	**Postoperative**	**p**
IPSS	22±5.41	2±2.19	0.001	24±6.52	2±2.15	0.001
QoL	4±0.84	0±0.5	0.001	4±1.15	0±0.59	0.001
Qmax (mL/s)	10.25±2.94	28.3±8.57	0.001	9.07±4.21	28.6±13.28	0.001
Qave (mL/s)*	4.66±1.77	12.96±3.81	0.001	3.64±1.58	13.45±4.42	0.001
PVR (mL)	153.5±150	14±20.9	0.001	150±100.6	16.5±22.01	0.001
VT (s)	88.2±85.22	27±8.47	0.001	80±57.61	31±18.64	0.001
MVT (s)	12.2±28.72	8.3±3.55	0.027	14.5±32.86	8.25±5.08	0.001

*Statistically analyzed using paired samples t-test; others were analyzed using Wilcoxon test
n: number of patients; IPSS: International Prostate Symptom Score; QoL: quality of life; Qmax: maximum flow rate at voiding; Qave: average flow rate at voiding; PVR: post-voiding residue; VT: voiding time; MVT: voiding time to attain Qmax

The duration of hospitalization was the only significant postoperative parameter among patients with and without MS (Table 3). The mean hospitalization time (HT) was longer in patients with MS than in those without MS (33±7.53 h vs 28±6.75 h, p=0.03; Table 3). In contrast, IPSS, Qmax, Qave, PVR, VT, MVT, Hb decrease (g/dL), and catheterization time were not different among the groups (Table 3). The perioperative parameters enucleated tissue weight, efficiency of enucleation, enucleation rate, enucleation time, morcellation time, total operation time, total laser energy, and efficiency of laser were not significantly different among the groups (Table 4). The multivariate analysis showed that only triglyceride (TG) levels positively correlated with HT in Group 1 (p=0.03) (Table 5).

Discussion

The HoLEP procedure can be safely performed in patients with MS. The perioperative parameters did not significantly differ between the patients with MS and without MS. Symptom relief and uroflowmetry parameters improved after the surgery in both groups.

BPH and MS are frequently seen in aging men, and both the conditions usually accompany each other.[7] The components of MS are increased BP, large WC, and dysregulation of serum lipids and fasting serum glucose levels.[5] Diabetes mellitus is closely related

Table 3. Comparison of postoperative outcomes between groups

Variables	Group 1 (n: 40)	Group 1 IQR	Group 2 (n: 80)	Group 2 IQR	p
IPSS	2±2.19	4	2±2.15	3	0.771
QoL	0±0.5	2	0±0.59	0	0.79
Qmax (mL/s)	28.3±8.57	11.5	28.6±13.28	8.52	0.87
Qave (mL/s)*	12.96±3.81	6	13.45±4.42	6.03	0.96
PVR (mL)	14±20.9	30	16.5±22.01	25	0.95
VT (seconds)	27±8.47	14	31±18.64	12.15	0.75
MVT (seconds)	8.3±3.55	6	8.25±5.08	5	0.69
Hb decrease (g/dL)	0.1±0.21	0.19	0±0.41	0.35	0.22
Catheterization time (h)	31±19.63	25	28±21.08	26	0.64
Hospitalization time (h)	33±7.53	12	28±6.75	9	0.03

*Statistically analyzed using Student t-test; others were analyzed with Mann-Whitney U test
n: number of patients; IQR: interquartile range; IPSS: International Prostate Symptom Score; QoL: quality of life; Qmax: maximum velocity at voiding; Qave: average velocity at voiding; PVR: post-voiding residue; VT: voiding time; MVT: voiding time to attain Qmax; Hb: hemoglobin

Table 4. Comparison of perioperative outcomes between groups

Variables	Group 1 (n: 40)	Group 1 IQR	Group 2 (n: 80)	Group 2 IQR	p
Enucleated tissue weight (g)	34.5±41.74	40	36.5±28	34	0.17
Efficiency of enucleation	0.58±0.46	0.35	0.57±0.5	0.32	0.49
Enucleation rate (%)*	0.75±0.31	0.56	0.81±0.33	0.53	0.37*
Efficiency of morcellation	5.09±2.37	4.26	4.08±3.09	4.76	0.9
Enucleation time (min)	62±40.22	39	66.5±32.72	46.75	0.83
Morcellation time (min)	9±6.24	7.75	7±6.72	7	0.77
Total operation time (min)*	69±45.46	47	73.5±37.36	56.5	0.88
Total laser energy (J)	75±59.73	43.52	90±48.02	93.65	0.22
Efficiency of laser (J/g)	1.88±0.58	0.99	1.6±1.98	1.22	0.79

*Statistically analyzed using Student t-test; others were analyzed using Mann-Whitney U test
N: number of patients; IQR: interquartile range

Table 5. Multivariate analysis of MS parameters in Group 1

		95% CI for EXP (B)			
Variables	Beta	Lower	Upper	r^2	p
LDL (>100 mg/dL)	–0.18	0.542	1.276	0.69	0.39
FBG (>100 mg/dL)	–3.154	0.001	1.986		0.1
BP (≥130/85 mm Hg)	–1.092	0.030	3.754		0.37
WC (>102 cm)	–24.6 4	0.000	34.3		0.99
HDL (<40 mg/dL)	–2.951	0.001	1.860		0.1
TG (≥150 mg/dL)	–3.475	0.001	.723		0.03

LDL: low density lipoprotein; FBG: fasting blood glucose; BP: blood pressure; WC: waist circumference; HDL: high density lipoprotein; TG: triglyceride

to MS. Diabetes mellitus aggravates nocturia and pollakiuria and has a negative impact on LUTS caused by neurologic dysregulation. Prostatic inflammation and inhibition of Rho-kinase (ROK) are considered responsible for LUTS in patients with MS.[9] If the initial medical treatment options for BPH and LUTS are inadequate, surgery should be considered in patients with Qmax

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<15 mL/s, presence of gross hematuria, recurrent urinary tract infections, PVR volume >150 mL, and/or acute urinary retention. Studies have reported that MS might lead to the continuation of LUTS even after an appropriate surgical treatment.[7,9] Kwon et al.[7] investigated the possible effect of MS on the improvement of urinary tract symptoms in patients who underwent the HoLEP procedure. The preoperative data, including prostate volume, quality of life (QoL), Qmax, and PVR were not different between the groups. Postoperative total IPSS and voiding subscore improvements were higher in patients without MS. Kwon et al.[7] also reported that preoperative IPSS and the number of MS components were independently associated with the total IPSS improvement. The postoperative total IPSS and voiding subscore improvements were reported to be higher in patients without MS, and in our study, no significant difference was observed. This difference may be due to the variation in the age. In the cohort of the aforementioned study, the mean age of patients in the MS group was higher than that of the group without MS.[7]

Another study on TUR and/or open prostatectomy has also reported that postoperative IPSS and Qmax were improved significantly in patients without MS compared to those with MS.[9] Sener et al.[9] compared pre- and postoperative IPSS and Qmax values between the patients with and without MS who underwent TUR operations. The authors reported that postoperative IPSS was not different between patients with and without MS (11.2±0.87 vs 12.9±0.88, respectively). Postoperative Qmax values were 18.2±0.81 and 13.9±1.12 for the two groups, respectively ($p<0.05$). The authors concluded that elevated FBG and hypertension had a negative impact on Qmax, and hypertension and abdominal obesity had a significant correlation with QoL improvement.[9] In contrast to the aforementioned studies, no significant difference was found between the patients with and without MS in terms of perioperative parameters. This may be explained by the technical difference between the TUR and HoLEP procedures. During the TUR procedure, obvious tissue damage is created through cautery. However, during HoLEP, the laser energy is absorbed by the intercellular water. Prostate adenoma and prostate capsule dissections are performed without using cautery. Hence, tissue healing difficulties in MS patients who had undergone TUR may explain the significant differences in IPSS and QoL between the groups.

In our study, the only distinct parameter was the duration of hospitalization between the study groups. Although the duration of hospitalization was statistically different among the groups the 5-hour difference was not clinically relevant (33±7.53 hours in Group 1 and 28±6.75 in Group 2). The difference in the duration of hospitalization might be caused by the comorbid problems of patients with MS. We performed multivariate analysis to determine any correlation of MS parameters with HT (Table 5). Only TG levels positively correlated with HT in Group 1 ($p=0.03$).

Patients with MS are more susceptible to postoperative healing complications. Also, prostatic inflammation and inhibition of the ROK pathway are considered responsible for LUTS in patients with MS.[9] Beside a successful surgical procedure, the patient group requires a close follow up. In our study, Clavien complication classifications were defined as Clavien I-II and was nonsignificant between the groups.

In conclusion, the HoLEP procedure can be considered a safe and effective surgical treatment for patients with MS.

Ethics Committee Approval: Ethics committee approval was received for this study from the Ethics Committee of Gazi University (Date: 13.06.2017; Protocol number 2017-297).

Informed Consent: Written informed consent was obtained from all participants who participated in this study.

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