

Impact of Holmium Laser Enucleation of Prostate on Erectile Function: Results of 12 Months Follow-Up

Holmium Lazer Prostat Enükleasyonu'nun Eretil Fonksiyona Etkisi: 12 Aylık Takip Süresi Sonuçları

İlter ALKAN,^a
Eyyüp Sabri PELİT,^b
Halil Lütfi CANAT,^a
Hasan Anıl ATALAY,^a
Erhan ATEŞ,^c
Alper ÖTÜNÇTEMUR^a

^aClinic of Urology,
Okmeydanı Training and
Research Hospital,
İstanbul

^bDepartment of Urology,
Harran University Faculty of Medicine,
Şanlıurfa

^cDepartment of Urology,
Adnan Menderes University
Faculty of Medicine,
Aydın

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Yazışma Adresi/Correspondence:
İlter ALKAN
Okmeydanı Training and
Research Hospital,
Clinic of Urology, İstanbul,
TURKEY/TÜRKİYE
iltera@hotmail.com

ABSTRACT Objective: To evaluate erectile function in patients with symptomatic benign prostatic hyperplasia (BPH) treated by Holmium laser enucleation of the prostate (HoLEP) operation.

Material and Methods: We retrospectively reviewed our recorded data on BPH patients treated by HoLEP between May 2002 - December 2016. 106 patients were enrolled to the study. International Index of Erectile Function-5 (IIEF-5) questionnaires were completed both before the operation and during the follow-up period. First 12 months results on surgical outcome and erectile function after HoLEP were given in this study. **Results:** A total of 106 patients with a mean age 73.2 ± 4.5 years old were included in this study. The mean volume of the prostate was 77.5 ± 32.3 mL. Mean operative time was 92.6 ± 33.8 min. Total energy which was used during the surgery was 203.5 ± 120 kJ. Mean morcelation time was 14.2 ± 11.6 min. Catheterization and hospitalization times were 1.2 ± 0.7 day and 1.1 ± 0.5 day respectively. The mean preoperative IIEF-5 score was 16.5 ± 6 . The mean values at 1, 3, 6 months, 12 months were 15.9 ± 3.5 , 15.7 ± 4.5 , 16.2 ± 2.9 , 16.4 ± 3.8 , respectively ($P > 0.05$). There was no significant difference in the mean IIEF-5 scores compared with the preoperative scores during 12 months follow-up period. **Conclusion:** HoLEP is a safe and effective method of treatment for BPH patients. The short-term surgical outcomes from the point of score on the Turkish version of the International Prostate Symptom Score (IPSS), the maximum flow rate (Q_{max}) values, and post-voiding residual urine volume (PVR) were excellent. During the 12 months follow-up period, HoLEP has no negative impact on erectile function with no appreciable decrease on IIEF-5 scores.

Keywords: Prostatic hyperplasia; holmium; laser therapy; erectile dysfunction

ÖZET Amaç: Holmium lazer prostat enükleasyonu operasyonu (HoLEP) ile tedavi olan semptomatik iyi-huyumlu prostat hiperplazisi (BPH) li hastaların erektil fonksiyonlarını değerlendirmek. **Gereç ve Yöntemler:** Mayıs 2002- Aralık 2016 tarihleri arasında BPH nedeniyle opere edilen hastaların verileri geriye dönük olarak gözden geçirildi. 106 hasta çalışmaya dahil edildi. Uluslararası Eretil Fonksiyon İndeksi-5 (IIEF-5) sorgulama formu, operasyon öncesi ve takip periyodu süresince dolduruldu. Bu çalışmada, HoLEP operasyonunun cerrahi sonuçları ve erektil fonksiyona etkisinin ilk 12 aylık sonuçları değerlendirildi. **Bulgular:** Çalışmaya dahil edilen 106 hastanın ortalama yaşı 73.2 ± 4.5 yıl idi. Ortalama prostat hacmi 77.5 ± 32.3 mL idi. Ortalama operasyon süresi 92.6 ± 33 dk ve operasyonda kullanılan total enerji 203.5 ± 120 kJ idi. Ortalama morselasyon süresi 14.2 ± 11 dk iken, ortalama kateterizasyon ve yatış süresi sırasıyla; 1.2 ± 0.7 ve 1.1 ± 0.5 gündü. Preoperatif ortalama IIEF-5 skoru 16.5 ± 6 . 1, 3, 6 ayda ve 12 ayda ortalama IIEF-5 skoru sırasıyla; 15.9 ± 3.5 , 15.7 ± 4.5 , 16.2 ± 2.9 , 16.4 ± 3.8 ($P > 0.05$) idi. Preoperatif ortalama IIEF-5 skorları, takip süresince olan skorlar ve 12. aydaki skorlar karşılaştırıldığında anlamlı bir fark bulunmadı. **Sonuç:** HoLEP, BPH tedavisinde etkili ve güvenilir bir yöntemdir. Uluslararası Prostat Semptom Skoru Puanı (IPSS), maksimum akım hızı (Q_{max}) değerleri, ve işeme sonrası artık idrar miktarı (PVR) değerlerine bakıldığında HoLEP operasyonunun kısa dönem sonuçları çok iyi görünmektedir. Postoperatif 12 aylık takip süresince, HoLEP operasyonunun erektil fonksiyona negatif bir etkisi olmamış ve IIEF-5 skorlarında anlamlı bir düşme saptanmamıştır.

Anahtar Kelimeler: Prostat hiperplazisi; holmiyum; lazer tedavisi; sertleşme bozukluğu

Minimal invasive treatment modalities are developing with the advancement of surgical technology. There are several new surgical alternative methods in the treatment of benign prostate hyperplasia (BPH) patients with the laser technology. Holmium laser enucleation of the prostate has been found an effective method in the surgical treatment modalities of BPH since 1998.¹⁻⁹ European Urological Guidelines recommend open prostatectomy and HoLEP as the first line treatment option in BPH patients with prostate weight over 80 g.² It is also an effective and safe surgical method for patients who are on anticoagulant therapy.³ In meta-analysis of studies comparing the HoLEP with the other minimally invasive surgical modalities have found that HoLEP was at least equal or superior to the other methods in terms of efficacy and safety.^{4,5}

The aim of this study is to assess the effect of HoLEP on erectile function during the twelve months follow-up period.

MATERIAL AND METHODS

From May 2002 to December 2016, 124 patients who underwent HoLEP for benign prostate hyperplasia were reviewed retrospectively in tertiary institution in Turkey. All patients gave written informed consent and the Institutional Review Board approved the study. Severe erectile dysfunction (IIEF-5 score: 5-7), neurogenic bladder, previous prostate surgery, urethral stricture and prostate cancer were all accepted as the exclusion criteria for the study. Finally, 106 patients were enrolled to the study.

Medical history, complete blood count, serum biochemistry, urine analysis, urine culture, digital rectal examination (DRE), the maximum flow rate (Q_{max}), post-voiding residual urine volume (PVR volume; mL), score on the Turkish version of the International Prostate Symptom Score (IPSS), serum prostate specific antigen (PSA) level (ng/dL) were studied and quality of life (QoL) questionnaires were completed for all patients prior to surgery.⁶

Erectile function outcomes were evaluated by the independently validated International Index of Erectile Function-5 (IIEF-5) questionnaire. QoL

and IIEF-5 questionnaires were completed both before the operation and during the follow-up period. As in other studies, alteration more than 5 point in IIEF-5 scores accepted as the erection is worsening or improving.⁷ The results were evaluated retrospectively.

First 12 months results on surgical and erectile function after HoLEP were given.

All patients had sterile urine culture prior to surgery. Urinary tract infection was treated according to biosensitivity result of the urine culture. All patients were evaluated with urinary or transrectal ultrasound (USG) to measure the prostatic volume. All patients received intravenous antibiotic prophylaxis 1 hour before the surgery. The weight of enucleated tissue, enucleation time and morcellation time were recorded during the operation. Hospitalization time, catheterization time, pathology of specimen and complications assessed with using the Clavien-Dindo system were also recorded for each patient as postoperative data.⁸

SURGICAL TECHNIQUE

The operations were performed using a 100W Ho:Yag laser fitted with a 550µm end-firing fibre (Lumenis®, Santa Clara, CA, USA) and 25.6-or 27-Fr continuous-flow resectoscopes with modified working elements (25.6 Fr: ACMI®, Southborough, MA, USA; 27 Fr: Olympus, Hamburg, Germany) following Gilling's technique with minimal variations.⁹

FOLLOW-UP

Patients were re-evaluated as outpatients at 1, 3, 6, 12 months postoperatively in the first year and then yearly outpatient follow up was scheduled for each patient. IPSS, IIEF-5, QoL, uroflowmetry parameters, PSA, PVR values were recorded in each visits.

STATISTICAL ANALYSES

The Statistical Package for the Social Sciences (SPSS) for Windows, version 16.0 (SPSS Inc., Chicago, IL), was used for statistical analysis. The independent samples t-test was employed to compare continuous data. Statistical significance was set at $p < 0.05$.

RESULTS

A total of 106 patients with a mean age 73.2 ± 4.5 years old were included in this study. The mean volume of the prostate was 77.5 ± 32.3 mL (Table 1). Ninety three and 43 patients used alpha blockers and alpha blocker +5 alpha-reductase inhibitors, respectively. Mean operative time was 92.6 ± 33.8 min. Total energy which was used during the surgery was 203.5 ± 120 kJ. Mean morcellation time was 14.2 ± 11.6 min. Catheterization and hospitalization time were 1.2 ± 0.7 day and 1.1 ± 0.5 day respectively (Table 2). Demographics, preoperative, intraoperative, postoperative findings of patients are summarized in Tables 1, 2.

The mean preoperative IIEF-5 score was 16.5 ± 6 . The mean values at 1, 3, 6 months, 12 months were 15.9 ± 3.5 , 15.7 ± 4.5 , 16.2 ± 2.9 , 16.4 ± 3.8 , respectively ($p > 0.05$). There was no significant difference in the mean IIEF-5 scores compared with the preoperative scores during 12 months follow-up period. The postoperative IPSS, QoL scores and Q max values showed a dramatic and statistically significant improvement when compared with preoperative values ($p < .0001$) (Table 3).

Complications classified as Clavien IV-V were not observed in the study group. Two patients required blood transfusions. Stress urinary incontinence was observed in 1 patient and in this patient spontaneous resolution was not observed. This patient denied to be operated and follow-up with the urinary containments. Concomitant non-muscle invasive bladder tumor was seen in 3 patients which was diagnosed during the cystoscopy and these patients were treated with transurethral resection and follow-up according to the European Urological Guidelines recommendations in outpa-

tient urology clinics. Bladder stones were observed in 7 patients during the surgery and they were treated at the same session with the laser fragmentations. Seven patients developed urinary retention after catheter removal on the postoperative first day and they were re-catheterized, additional non-steroidal and antibiotics were prescribed and catheters removed 2 days later.

DISCUSSION

HoLEP has been used in the BPH treatment since 1998 and proved its effectiveness in comparative studies with the other treatment options.^{9,10} The advantage of this method is that it can be per-

TABLE 1: Preoperative demographic data.

Age (yr)	73.2 ± 4.5
IPSS score	23.6 ± 7.7
PSA (ng/dl)	4.7 ± 0.5
QOL score	4.9 ± 1.4
Q max (ml/sn)	11.2 ± 5.8
Prostate volume (g)	77.5 ± 32.3
Postmicturation volume (ml)	270.8 ± 198.5

IPSS: International Prostate Symptom Score; **PSA:** Prostate Specific Antigen; **QOL:** Quality of Life; **Q max:** Maximum flow rate in uroflowmetry.

TABLE 2: Perioperative and postoperative parameters of the patients.

Parameter	Mean \pm SD
Operation time (min)	92.6 ± 33.8
Total energy use (kJ)	203.5 ± 120.4
Morcelation time (min)	14.2 ± 11.6
Volume of enucleated tissue (g)	31.4 ± 10.9
Catheterization time (day)	1.2 ± 0.7
Hospitalization time (day)	1.1 ± 0.5

SD: Standard deviation.

TABLE 3: Postoperative parameters of patients during the 12 months follow-up period.

	Preoperative (n:106)	1 month (n:106)	3 months (n: 98)	6 months (n: 86)	12 months (n: 76)
IPSS	23.6 ± 7.7	6.2 ± 3.1	4.2 ± 2.3	5.4 ± 2.9	4.9 ± 1.1
QOL score	4.9 ± 1.4	1.8 ± 0.8	1.6 ± 1.2	1.5 ± 1.1	1.2
Q max, ml/sn	10.9 ± 5.1	23.1 ± 10.8	26.3 ± 9.1	25.3 ± 7.1	25.8 ± 8.6
IIEF score	16.5 ± 6	15.9 ± 3.5	15.7 ± 4.5	16.2 ± 2.9	16.4 ± 3.8

IPSS: International Prostate Symptom Score; **QOL:** Quality of Life; **Q max:** Maximum flow rate in uroflowmetry; **IIEF:** International index of erectile function.

formed in patients using anticoagulant medications and it has shorter catheterization time, hospitalization time and reduced blood loss.¹¹ In current literature, there relatively a few studies discussing the effect of HoLEP on sexual function. In this study, we aim to evaluate the impact of HoLEP on erectile function during the 12 months follow-up.

Klett et al. published the results of the HoLEP during the 3 years follow-up period. They performed 350 HoLEP procedures between 2007 and 2013 and evaluated the patients before HoLEP, and at 3, 6, 12, 24, and 36 months after surgery with using IIEF-5. Mean IIEF-5 scores at 3 (13.3 ± 8.37), 6 (12.1 ± 8.76), 12 (12.1 ± 8.83), 24 (12.6 ± 8.80), and 36 months (12.5 ± 8.45) showed no significant change from baseline. They concluded that HoLEP procedure has no negative impact on long-term patient reported sexual outcomes.¹² Placer et al retrospectively analyzed the 202 sexually active patients who underwent HoLEP. They assessed the patients at baseline and 3 and 12 months postoperatively with IIEF-5, ICIQ-male sexual matters associated with LUTS (ICIQ-MLUTSsex), American Urological Association symptom score (AUA-SS) and QoL score. They found no significant differences in erection quality between the preoperative and postoperative questionnaires scores. However, there is an increase or decrease in total IIEF-5 scores more than 5 points in 6.9% and 12.4% of the patients, respectively. And they also stressed that any preoperative or postoperative parameters were significantly affect the erection quality after the operation.¹³ In a most recent study, Capogrosso et al. reviewed the 135 patients that were underwent HoLEP with a mean follow-up of 12 years postoperatively which is the longest follow-up period up until now. In this study they stated that at least one IIEF-EF category was worsened in 50 (37%) patients, on the other hand, 23 (17%) patients had an improvement in postoperative IIEF-EF score; 75 (55.6%) and 10 (7.4%) patients maintained and eventually improved their IIEF-EF category, respectively.¹⁴ The mean preoperative IIEF-5 score was 16.5 ± 6 . The mean values at 1, 6 months, 1, 2, 3, 4, 5, 6, 8, 10 years were 15.9 ± 3.5 , 16.2 ± 2.9 , 16.4 ± 3.8 , 17.1 ± 4.4 , 16.7 ± 2.5 , 16.1 ± 5.3 , 16.3 ± 4.3 ,

15.8 ± 3.3 , 15.3 ± 3.7 , 16.1 ± 4.1 respectively ($P > 0.05$). According to the our data, there was no significant difference in the mean IIEF-5 scores compared with the preoperative scores during the 12 months follow-up period.

In the literature, many studies have compared the effect of HoLEP on erectile function with the other surgical methods. Briganti and colleagues first investigated the effect of HoLEP and TUR-P on sexual functions in their comparative prospective study. They evaluated the patients with IPSS, QoL, IIEF, 10 non-validated general assessment questions at 12 and 24-month follow-up visits. They concluded that HoLEP had no significant adverse effect on sexual function however HoLEP and TUR-P significantly lowered the IIEF orgasmic function with no differences between 2 methods due to the retrograde ejaculation.¹⁵ Hong et al. compared the HoLEP and 120-W thulium: YAG vapoenucleation of the prostate (ThuLEP) on erectile function in the treatment of BPH. They found that there was no significant differences between these 2 surgical method of treatment ($P > 0.05$), however the mean IIEF score was decreased from 22.8 ± 2.2 to 21.0 ± 2.7 after HoLEP in patients who had a relatively normal erectile functions before the operation ($P = 0.036$).¹⁶ Montorsi et al. reported their prospective randomize study that compared the TUR-P and HoLEP in 100 consecutive patients. They did not found statistically significant differences between 2 groups in terms of erectile function, orgasmic function, sexual desire, intercourse satisfaction, overall satisfaction during the 12 months follow-up period.¹⁷ Limitation of our study was that is not a comparative study however it is the first study from Turkey to evaluate the effect of HoLEP procedure on the erectile function of the patients.

Retrograde ejaculation is a frequent complication of minimal invasive surgical treatment of BPH. In current studies, retrograde ejaculation rates vary from 70% to 80%.¹⁵⁻¹⁸ However, all the studies about the HoLEP effect on sexual function stated that retrograde ejaculation had no impact on sexual satisfaction.

CONCLUSION

HoLEP is a safe and effective method of treatment for BPH patients. Short-term surgical outcomes of the point of IPSSs, Qmax values, and PVR volumes were excellent. HoLEP has no negative impact on erectile function with no appreciable decrease on IIEF scores during the 12 months follow-up period.

Conflict of Interest

Authors declared no conflict of interest or financial support.

Authorship Contributions

Idea/Concept: İlter Alkan; **Control/Supervision:** Lütfi Canat; **Data Collection:** Erhan Ateş; **Literature Review:** Hasan Anıl Atalay; **Writing the Article:** Eyüp Sabri Pelit; **Critical Review:** Alper Ötünçtemur.

REFERENCES

- van Rijn S, Gilling PJ. Holmium laser enucleation of the prostate (HoLEP) may be the new 'gold standard'. *Curr Urol Rep* 2012;13(6):427-32.
- Kuntz RM, Lehrich K, Ahyai SA. Holmium laser enucleation of the prostate versus open prostatectomy for prostates greater than 100 grams: 5-year follow-up results of a randomized clinical trial. *Eur Urol* 2008;53(1):160-6.
- Tyson MD, Lerner LB. Safety of holmium laser enucleation of the prostate in anticoagulated patients. *J Endourol* 2009;23(8):1343-6.
- Toohar R, Sutherland P, Costello A, Gilling P, Rees G, Maddern G. A systematic review of holmium laser prostatectomy for benign prostatic hyperplasia. *J Urol* 2004;171(5):1773-81.
- Eishal AM, Elmansy HM, Elhilali MM. Two laser ablation techniques for a prostate less than 60 mL: lessons learned 70 months after a randomized controlled trial. *Urology* 2013;82(2):416-22.
- Bozlu M, Doruk E, Akbay E, Ulusoy E, Cayan S, Acar D, et al. Effect of administration mode (patient vs physician) and patient's educational level on the Turkish version of the International Prostate Symptom Score. *Int J Urol* 2002;9(8):417-21.
- Rosen RC, Cappelleri JC, Smith MD, Lipsky J, Peña BM. Development and evaluation of an abridged, 5-item version of the International Index of Erectile Function (IIEF-5) as a diagnostic tool for erectile dysfunction. *Int J Impot Res* 1999;11(6):319-26.
- Mamoulakis C, Efthimiou I, Kazoulis S, Christoulakis I, Sofras F. The modified Clavien classification system: a standardized platform for reporting complications in transurethral resection of the prostate. *World J Urol* 2011;29(2):205-10.
- Fraundorfer MR, Gilling PJ. Holmium:YAG laser enucleation of the prostate combined with mechanical morcellation: preliminary results. *Eur Urol* 1998;33(1):69-72.
- Alkan I, Ozveri H, Akin Y, Ipekci T, Alican Y. Holmium laser enucleation of the prostate: surgical, functional, and quality-of-life outcomes upon extended follow-up. *Int Braz J Urol* 2016;42(2):293-301.
- Abdel-Hakim AM, Habib El, El-Feel AS, Elbaz AG, Fayad AM, Abdel-Hakim MA, et al. Holmium laser enucleation of the prostate: initial report of the first 230 Egyptian cases performed in a single center. *Urology* 2010;76(2):448-52.
- Klett DE, Tyson MD 2nd, Mmjeje CO, Nunez-Nateras R, Chang YH, Humphreys MR. Patient-reported sexual outcomes after holmium laser enucleation of the prostate: 3-year follow-up study. *Urology* 2014;84(2):421-6.
- Placer J, Salvador C, Planas J, Trilla E, Lorente D, Celma A, et al. Effects of holmium laser enucleation of the prostate on sexual function. *J Endourol* 2015;29(3):332-9.
- Capogrosso P, Ventimiglia E, Ferrari M, Serino A, Boeri L, Capitanio U, et al. Long-term sexual outcomes after holmium laser enucleation of the prostate: which patients could benefit the most? *Int J Impot Res* 2016;28(5):189-93.
- Briganti A, Naspro R, Gallina A, Salonia A, Vavassori I, Hurler R, et al. Impact on sexual function of holmium laser enucleation versus transurethral resection of the prostate: results of a prospective, 2-center, randomized trial. *J Urol* 2006;175(5):1817-21.
- Hong K, Liu YQ, Lu J, Xiao CL, Huang Y, Ma LL. [Effect and impact of holmium laser versus thulium laser enucleation of the prostate on erectile function]. *Zhonghua Nan Ke Xue* 2015;21(3):245-50.
- Montorsi F, Naspro R, Salonia A, Suardi N, Briganti A, Zanoni M, et al. Holmium laser enucleation versus transurethral resection of the prostate: results from a 2-center prospective randomized trial in patients with obstructive benign prostatic hyperplasia. *J Urol* 2008;179(5 Suppl):S87-90.
- Meng F, Gao B, Fu Q, Chen J, Liu Y, Shi B, et al. Change of sexual function in patients before and after Ho:YAG laser enucleation of prostate. *J Androl* 2007;28(2):259-61.