Greenlight laser enucleation of the prostate

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INTRODUCTION

Symptomatic benign prostatic hyperplasia increases greatly in men beginning in the sixth decade of life. The American Urological Association (AUA) and European Association of Urology (EAU) recommend surgical intervention in patients who fail medical therapy [1,2]. The surgical approach is dependent on patient anatomy, patient and surgeon preference, medical comorbidities, as well as surgeon experience and prostate size. Transurethral prostatectomy is historically prostate size-dependent because of irrigant absorption (dilutional hyponatremia) and procedure time [photovaporization of the prostate (PVP)]. Incomplete resection of large adenoma can fail to improve patient symptoms.

TRANSURETHRAL LASER OPTIONS

Simple prostatectomy achieves optimal resection, but with significant morbidity. Similar outcomes with lower morbidity can be achieved with transurethral laser enucleation of the prostate (LEP) [holmium (HoLEP), thulium (ThuLEP), and GreenLight (GreenLEP)]. Significant learning curves limit widespread adoption of HoLEP and ThuLEP, however [3].

GREENLIGHT LASER ENUCLEATION OF THE PROSTATE METHOD

Gomez-Sancha *et al.* [4] first described en-bloc excision of the prostate with a GreenLight HPS laser (Boston Scientific Corporation, Marlborough, Massachusetts, USA). Resection is begun proximal to the crista urethralis with a bilateral incision lateral to the verumontanum to identify the capsule. Lateral displacement of the adenoma with the resectoscope develops a plane between the capsule and the adenoma. Separation at the apex and bladder are performed using 80 W energy. The authors tested both the 2090 fiber (80/40 W cutting/coagulation) and the MoXy fiber (180/40 W) and preferred the 2090 fiber given the low power requirement and resistance to contact vaporization. Benefits of GreenLEP included: easier definition of the surgical capsule (lack of disruption with mechanical peeling), minimal thermal energy to the capsule (decreased dysuria), and easier learning curve (ability to transition to vapoenucleation/vaporization during surgery). Vapoenucleation (anatomical vaporization), an intermediary of the learning curve, represents a hybrid method with definition of the adenoma apex and capsular depth followed by anteriolateral vaporization [4].

GREENLIGHT LASER ENUCLEATION OF THE PROSTATE VS. HOLMIUM LASER ENUCLEATION OF THE PROSTATE

Peyronnet *et al.* [5] compared the learning curves and outcomes of GreenLEP vs. HoLEP. Surgical trifecta (complete enucluceation combined with morcellation within 90 min without conversion to TURP) and pentafecta (trifecta without stress incontinence or postoperative complications) were assessed for each cohort. Surgeons were defined as overcoming the learning curve when four consecutive patients satisfied the requirements. The Greenlep and HoLEP cohort had significant differences ($P < 0.0001$) in baseline characteristics: TRUS prostate volume (100 vs. 70 ml), International Prostate Symptom Score (I-PSS) (17 vs. 20), maximal flow rate (Q_{max}) (5 vs. 10 ml/s), postvoid residual (PVR) (100 vs. 59 ml), alpha-blocker use (95 vs. 75%), and aspirin use (52 vs. 19%). Despite the worse baseline characteristics in the GreenLEP vs. HoLEP cohort, the authors reported decreased total energy (58 vs. 110 kJ) and intra-operative time (60 vs. 90 min) in the former group even with prostate size normalization of energy and operative time (0.65 kJ/ml, 0.63 min/ml vs. 1.6 kJ/ml, 1.3 min/ml). Additionally, the weight of specimen was significantly higher in the GreenLEP group (62 vs. 48 g, $P < 0.0001$). Although HoLEP cohort had a significantly shorter catheterization time (1 vs. 2 days, $P < 0.0001$), all patients in the GreenLEP group were discharged without a catheter compared with only 58% in the HoLEP group. The difference in catheterization time likely,

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therefore, represented surgeon preference instead of treatment effect. Early postoperative complications were statistically equivalent between the two groups (25 vs. 19%). At 3 and 6 month follow-up, GreenLEP cohort demonstrated lower serum prostate-specific antigen (PSA) (0.85 ng/dl, −69.9% vs. 0.55 ng/dl, −83.9%) and prostate volume (23 ml, −55.7% vs. 25 ml, −72.6%) with associated higher change in Q_{max} [25 ml/s (+440.1%) vs. 20.3 ml/s (+180.6%)]. The HoLEP cohort reported greater improvement in outlet obstruction symptoms and erectile function (I-PSS −78.3 vs. −73.9%, $P=0.03$ and IIEF5 +58.4 vs. 15.2%, $P=0.15$). The rates of transient postoperative stress incontinence were comparable. In a subgroup analysis of each cohort for patients with prostates greater than 80 ml, the change in PSA, IPSS were no longer significantly different. Trifecta and pentafecta were achieved after 14 and 18 cases for GreenLEP and after 22 and 40 cases for HoLEP, respectively [5,6].

GREENLIGHT LASER ENUCLEATION OF THE PROSTATE VS. PHOTOVAPORIZATION OF THE PROSTATE

Misrai *et al.* [9] compared GreenLEP to PVP and reported shorter operative times (60 vs. 82 min, $P<0.0001$), higher Q_{max} (25 vs. 19 ml/s, $P<0.0001$), and fewer Clavien–Dindo complications (16.6 vs. 25%) in the GreenLEP cohort at 2-month follow-up. Postoperative incontinence was significantly higher in the GreenLEP group at 2 months (25 vs. 3.4%, $P<0.0001$), but that difference did not persist at 6-month follow-up [7].

The largest series of GreenLEP patients was reported in a retrospective, multicenter study by Cindolo *et al.* who retrospectively compared PVP, anatomical PVP, and GreenLEP in 367 patients with 14-month follow-up. Each patient was also evaluated for 'patient perception of improvement' using a single question survey, with categories defined as 'greatly improved,' 'improved,' 'not changed,' and 'worsened'). The GreenLEP cohort energy utilization (170 kJ) and lasing times (16 min) were significantly lower than both PVP (228 kJ, 24 min) and anatomical PVP (280 kJ, 29 min) cohorts $P<0.001$). The GreenLEP had a higher Q_{max} (13 ml/s) postoperatively compared with both PVP (10 ml/s) and anatomical PVP (11 m/s) ($P=0.02$). Although IPSS was not significantly different between the three groups, the GreenLEP patients achieved 100% perceived patient satisfaction, despite higher reported storage symptoms. These storage symptoms were attributed to direct application of laser energy to the prostatic capsule, compared with limited energy application to the capsule in the PVP and anatomical PVP techniques [8].

GREENLIGHT LASER ENUCLEATION OF THE PROSTATE VS. OPEN SIMPLE PROSTATECTOMY

Misrai *et al.* [9] reported longer operative times with OSP compared with GreenLEP (67 vs. 60 min, $P<0.0001$) but decreased transfusion rates (0.5 vs. 8.3%, $P=0.0001$) despite higher baseline antiplatelet use (42.1 vs. 28.4, $P=0.0002$), and decreased 30-day complications (20.6 vs. 37.2%, $P=0.0003$) with no significant difference in 6-month postoperative outcomes including IPSS, Q_{max}, PVR, prostate volume, PSA, urinary incontinence, stricture, or bladder neck sclerosis for GreenLEP patients.

CONCLUSION

GreenLEP of the prostate demonstrates decreased complication rates, similar postoperative outcomes, and shortened learning curve, and appears to be a well tolerated, reasonable modality for men with large prostates.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Foster HE, Barry MJ, Gandhi MC, *et al.* Surgical management of lower urinary tract symptoms attributed to benign prostatic hyperplasia. J Urol 2018; 200:612–619.
2. Gravas S, Cornu JN, Drake MJ, *et al.* Management of nonneurogenic male LUTS. Eur Urol 2017; 71:618–629.
3. Naspro R, Gomez Sancha F, Manica M, *et al.* From 'gold standard' resection to reproducible 'future standard' endoscopic enucleation of the prostate: what we know about anatomical enucleation. Minerva Urol Nefrol 2017; 69:446–458.
4. Gomez Sancha F, Rivera VC, Botsevski A, *et al.* Common trend: move to enucleation—is there a case for Greenlight® enucleation? Development and description of the technique. World J Urol 2015; 33:539–547.
5. Peyronnet B, Robert G, Comat V, *et al.* Learning curves and perioperative outcomes after endoscopic enucleation of the prostate a comparison between GreenLight® 532-nm and holmium lasers. World J Urol 2017; 35:973–983.
6. Peyronnet B, Misrai V, Aho T, *et al.* Greenlight® users should move from photoselective vaporization to endoscopic enucleation in larger prostates. World J Urol 2017; 35:1635–1636.
7. Misrai V, Kerever S, Phe V, *et al.* Direct comparison of Greenlight® Laser XPS photoselective prostate vaporization and Greenlight® laser en bloc enucleation of the prostate in enlarged glands greater than 80 ml: a study of 120 patients. J Urol 2016; 195(4 Pt 1):1027–1032.
8. Cindolo L, Ruggera L, Destefanis P, *et al.* Vaporize, anatomically vaporize or enucleate the prostate? The flexible use of the GreenLight® laser. Int Urol Nephrol 2017; 49:405–411.
9. Misrai V, Pasquie M, Bordier B, *et al.* Comparison between open simple prostatectomy and green laser enucleation of the prostate for treating large benign prostatic hyperplasia: a single centre experience. World J Urol 2018; 36:793–799.