# EVOLVING TECHNIQUES FOR SURGICAL TREATMENT OF BENIGN PROSTATIC HYPERPLASIA

***Andrea Tubaro, Cosimo De Nunzio**

*Department of Urology, Sant'Andrea Hospital, Sapienza University of Rome, Rome, Italy*
**Correspondence to andrea.tubaro@mac.com*

**Disclosure:** A.T. has served as a consultant for Allergan, AMS, Astellas, GSK, and Pfizer, as an investigator for AMS, Astellas, GSK, Pierre Fabre, and Shionogi, and has received a research grant from Astellas. C.D.N. is a paid speaker for Ferring, and a consultant and paid speaker for Pierre Fabre.
**Received:** 08.03.15 **Accepted:** 02.04.15
**Citation:** EMJ Urol. 2015;3[2]:119-122.

## ABSTRACT

The management of lower urinary tract symptoms due to benign prostatic hyperplasia (BPH) is one of the most topical areas in urology. Although most patients are adequately managed conservatively, many still require surgery to reduce bladder outlet obstruction or relieve symptoms by removing the inflamed adenomatous tissue. Transurethral resection of the prostate (TURP) remains the gold standard treatment in all national and international guidelines, with open prostatectomy and laser enucleation reserved for patients with a prostate >80 ml. The current trend in the surgical management of BPH is threefold: replacing open prostatectomy with transurethral enucleation of the adenoma, managing high-risk patients by photoselective vaporisation of the prostate thus minimising blood loss, and moving BPH surgery to ambulatory day surgery and one-day surgery units in selected patients. Laser enucleation has been pioneered using the Holmium laser, although the GreenLight™ laser has been recently proposed as an alternative approach. The absence of any bleeding in photovaporisation of the prostate allows surgery to be performed in a growing population of patients on anti-aggregant and anticoagulant medications. Randomised trials of the GreenLight XPS™ laser with the MoXy™ fibre versus TURP proved the effectiveness of photovaporisation in the surgical management of BPH and suggested that 50% of patients could be discharged within 24 hours. The demand for BPH surgery remains high and urologists have rapidly adapted to the increasing demand for minimally invasive surgery. Prostate surgery evolved from a heroic procedure that remained in the memories of the entire patient family for life into a day-case procedure, and the future hopefully holds ejaculation-sparing surgery.

Keywords: Prostatic hyperplasia, transurethral resection of the prostate (TURP), holmium laser enucleation of the prostate (HoLEP), GreenLight, laser.

## INTRODUCTION

Several guidelines for the management of lower urinary tract symptoms due to benign prostatic hyperplasia (BPH) are available. Transurethral resection of the prostate (TURP) is still considered the standard surgical treatment of BPH for prostates up to 80 ml, with open adenomectomy and holmium laser enucleation of the prostate (HoLEP) reserved for larger prostates.[1,2] For many years the major challenge of prostate surgery was to reduce complications, particularly intra and post-operative bleeding, with the consequent need for blood transfusion. This shortens hospital stays, which reduces costs and accelerates patient recovery, therefore decreasing the societal cost of the disease. Most of these goals were achieved with transurethral surgery, although the management of large prostates remained a challenge. The development of bipolar TURP helped in reducing the complications associated with longer operative time and allowed for the safer management of patients with cardiac pacemakers, meaning larger prostate volumes could be resected. Two major issues that remained unresolved with TURP were the management of high-risk patients on anticoagulants or antiplatelet drugs, and the management of BPH surgery as a

day case. The development of HoLEP provided a viable alternative to open adenomectomy, making the open approach obsolete.[3] Notwithstanding a long learning curve and the problems associated with morcellation, the HoLEP technique has gradually gained popularity, although it is usually performed by a single surgeon in most centres.

Vaporisation of the prostate with the GreenLight™ laser is one of the few alternatives to TURP that found its way into most guidelines on the management of BPH.[1,2] Photovaporisation of the prostate with the GreenLight laser was introduced in the early 2000s, with the first paper published in 2003.[4] The laser was limited in power (80 W), but the concept of prostate vaporisation with negligible blood loss, rapid removal of the indwelling catheter, and early patient discharge was proven. The particular wavelength of the GreenLight laser (532 nm) allowed the energy to be electively absorbed by oxyhaemoglobin with a previously unknown level of haemostasis that made bladder irrigation obsolete. Improvement of the laser technology allowed the development of more powerful systems that were able to deliver 120 W (GreenLight HPS™) and finally 180 W (GreenLight XPS™).[5,6] With the latter version of the laser came a new version of the glass fibre (MoXy™ fibre) and up to 650 kJ could be delivered. This new fibre includes a larger emission window and incorporates an irrigation channel that helps to extend the fibre function.[7]

Randomised studies of the GreenLight XPS laser versus TURP have definitively proven the effectiveness of photovaporisation.[8,9] According to the GOLIATH study[8,9] (a randomised non-inferiority study of TURP versus GreenLight XPS), TURP and GreenLight XPS offer comparable improvement of the signs and symptoms of BPH at 6 and 12 months. TURP remains a shorter procedure compared to photovaporisation with an average operative time of 39.3 minutes versus 49.6 minutes, but the 10 extra minutes required for the GreenLight XPS procedure result in a significant difference in the post-operative parameters compared with TURP: a shorter time in the recovery room (2.2 hours versus 2.9 hours); a shorter catheterisation time (40.8 hours versus 59.5 hours); a shorter time to health status (patients able to void with a post-void residual urine volume <100 ml [37.3 hours versus 63.5 hours]); and shorter hospital stay (65.5 hours versus 96.9 hours). Photovaporisation of the prostate has been associated with significant post-operative symptoms but the GOLIATH study proved that this was a false perception as the incidence of irritative symptoms/pain and discomfort was 19.1% in the GreenLight group and 21.8% in the TURP group. Evaluation of prostate volume showed a comparable reduction of prostate volume in the two arms, with a decrease from 48.6 ml to 23 ml in the GreenLight group and from 46.2 ml to 20.4 ml in the TURP group.

The comparison of photovaporisation of the prostate and open adenomectomy is something of a historical question as the number of open surgical procedures for BPH are rapidly decreasing worldwide, and enrolling patients in randomised studies of endoscopic versus open procedures is increasingly difficult. In 2007 Alivizatos and co-workers[10] published the results of a randomised study of the old GreenLight 80 W versus open adenomectomy in patients with prostate volume >80 ml. The photovaporisation procedure was longer than open surgery (80 minutes versus 50 minutes), but catheter time was shorter (24 hours versus 120 hours), as well as hospital stay (48 hours versus 144 hours). At 12 months similar results were observed for the International Prostate Symptom Score (IPSS) (9 versus 8), maximum flow rate (16.0 ml/s versus 15.1 ml/s), post void residual (17 ml versus 12 ml), sexual function (International Index of Erectile Function [IIEF] score 12 versus 12), and post-operative prostate-specific antigen (2.4 ng/ml versus 2.0 ng/ml). Open surgery resulted in a better quality of life (QoL): IPSS question 8 (1 versus 1) (p=0.035 because of a better standard deviation for open surgery) and lower prostate volume (55 ml versus 10 ml). At 12 months adverse events were observed in 21.5% of GreenLight patients and in 31.7% of the open surgery patients. A more recent analysis of GreenLight and open surgery patients suggests a significant economic advantage for the laser treatment with an additional cost of €1450 for open surgery due to a longer hospital stay (3.0 days versus 10.4 days), and a higher reoperation rate in the open surgery group (19.5% versus 1.9%).[11] The study was limited by the retrospective analysis of the open surgery data and by the unfavourable outcome of the open surgery patients compared with other published series.[11]

Long-term data of GreenLight vaporisation first became available in 2008 when Ruszat et al.[12] published their 5-year data showing the durability of the results in terms of lower urinary tract symptoms, QoL, and flow rate parameters. Analysis

of the long-term outcome of two case series of GreenLight 80 W and TURP showed comparable functional outcomes at 5 years, although the reoperation rate was higher in the laser group compared to the TURP group (18% versus 3% reoperation for recurrent adenoma), suggesting that the old and low-power laser unit offered an inferior tissue ablation capacity, opening the way to more powerful equipment such as the GreenLight HPS and XPS lasers that were eventually made available.[13]

After 25 years of managing patients with lower urinary tract symptoms due to BPH we believe that there is no single surgical technique that fits all patients. TURP (monopolar and bipolar), vaporisation, and enucleation techniques are here to stay, as we require all of these techniques in our departments. TURP can be the only available procedure in low-volume centres but tertiary referral institutes certainly need to have all techniques available for managing the various patients that may be referred. Although we would all like a surgical technique to have a short learning curve, an interesting study from Japan suggests that 81 procedures are required to reach a plateau in performing TURP.[14] Misrai et al.[15] recently published a figure of 50 patients as the number required to plateau the number of intra and post-operative complications with the GreenLight laser. Similar numbers (50 patients) were proposed by Shah and co-workers[16] for the learning curve of HoLEP.

The GreenLight laser is now part of the urologist's armamentarium in several centres worldwide, and the application of this new technology includes the management of patients at high surgical risk, in which maximal control of intra and post-operative bleeding and management of BPH surgery as a day case are required. Notwithstanding the obvious value of the GreenLight in managing patients on anticoagulant or antiplatelet drugs, the possibility of performing BPH surgery as a day case is the real 'game changer', the potential of which has not been fully explored or implemented. Although the evidence in the literature is limited, the possibility of managing BPH surgery as a day case using the GreenLight laser is there, and further evidence will become available in the near future.[17]

Moving BPH surgery from a standard ward into a day-case unit in selected patients is a paramount change in terms of hospital management, and has a profound effect on the cost of BPH surgery. Patients operated on with the GreenLight laser as a day case can also be managed in different ways according to the national, regional, and local health service organisation. In most centres patients can be discharged within the same day of surgery with an indwelling Foley catheter that can be removed over the next 24 hours, alternatively patients can be discharged within 24 hours from admission without an indwelling catheter. The combination of follow-up consultations and phone calls to manage patients in the early post-operative weeks varies accordingly in different centres. Will every BPH patient scheduled for surgery be a candidate for prostate vaporisation with the GreenLight as a day case? Certainly not, but nevertheless, beyond being able to operate on patients receiving anticoagulants and antiplatelet drugs, BPH surgery as a day case is the most impressive and interesting change we have seen in this area so far.

Day-case surgery for BPH is here to stay and it will soon be widely adopted; however, research never ceases and the next issue will be ejaculation-sparing surgery. We are beginning to understand how BPH surgery impacts ejaculation, and modifications of the standard techniques have already been proposed.[18] In the third millennium the evaluation of the effectiveness of a surgical procedure should always consider not only the improvement of the clinical condition but also the foreseeable consequences and the adverse events that often come with surgery. Retrograde ejaculation remains the number one reason for BPH patients to postpone or refuse surgery.

## REFERENCES


1. Oelke M et al. EAU guidelines on the treatment and follow-up of non-neurogenic male lower urinary tract symptoms including benign prostatic obstruction. Eur Urol. 2013;64(1):118-40.

2. McVary KT et al. Update on AUA guideline on the management of benign prostatic hyperplasia. J Urol. 2011;185(5):1793-803.

3. Fraundorfer MR, Gilling PJ. Holmium:YAG laser enucleation of the prostate combined with mechanical morcellation: preliminary results. Eur Urol. 1998;33(1):69-72.

4. Hai MA, Malek RS. Photoselective vaporization of the prostate: initial experience with a new 80 W KTP laser for the treatment of benign prostatic

hyperplasia. J Endourol. 2003;17(2):93-6.

5. Spaliviero M et al. Short-term outcomes of Greenlight HPS laser photoselective vaporization prostatectomy (PVP) for benign prostatic hyperplasia (BPH). J Endourol. 2008;22(10):2341-7.

6. Bachmann A et al. 180-W XPS GreenLight laser therapy for benign prostate hyperplasia: early safety, efficacy, and perioperative outcome after 201 procedures. Eur Urol. 2012;61(3): 600-7.

7. Tanchoux C et al. [Perioperative and early postoperative results of photoselective vaporization of the prostate using fiber 4090 (providing 120 watts) versus fiber MOXY (providing 180 watts)]. Prog Urol. 2012;22(9):529-33.

8. Bachmann A et al. 180-W XPS GreenLight laser vaporisation versus transurethral resection of the prostate for the treatment of benign prostatic obstruction: 6-month safety and efficacy results of a European Multicentre Randomised Trial--the GOLIATH study. Eur Urol. 2014;65(5):931-42.

9. Bachmann A et al. A European multicenter randomized noninferiority trial comparing 180 W GreenLight XPS laser vaporization and transurethral resection of the prostate for the treatment of benign prostatic obstruction: 12-month results of the GOLIATH study. J Urol. 2015;193(2):570-8.

10. Alivizatos G et al. Transurethral photoselective vaporization versus transvesical open enucleation for prostatic adenomas >80ml: 12-mo results of a randomized prospective study. Eur Urol. 2008;54(2):427-37.

11. Raimbault M et al. [Comparative analysis of photoselective vaporization of the prostate with the Greenlight laser and open prostatectomy for high volume prostate hypertrophy]. Prog Urol. 2014;24(7):470-6.

12. Ruszat R et al. GreenLight laser vaporization of the prostate: single-center experience and long-term results after 500 procedures. Eur Urol. 2008;54(4):893-901.

13. Guo S et al. The 80-W KTP GreenLight laser vaporization of the prostate versus transurethral resection of the prostate (TURP): adjusted analysis of 5-year results of a prospective non-randomized bi-center study. Lasers Med Sci. 2015;30(3):1147-51.

14. Furuya S et al. [A study of 4,031 patients of transurethral resection of the prostate performed by one surgeon: learning curve, surgical results and postoperative complications]. Hinyokika Kiyo. 2006;52(8):609-14.

15. Misrai V et al. [XPS Greenlight photoselective vaporization for benign prostatic hyperplasia: analysis of the learning curve and contribution of transrectal ultrasound monitoring]. Prog Urol. 2013;23(10):869-76.

16. Shah HN et al. Prospective evaluation of the learning curve for holmium laser enucleation of the prostate. J Urol. 2007;177(4):1468-74.

17. Emara AM, Barber NJ. The continuous evolution of the Greenlight laser; the XPS generator and the MoXy laser fiber, expanding the indications for photoselective vaporization of the prostate. J Endourol. 2014;28(1):73-8.

18. Tabatabaei S et al. Ejaculation-preserving photoselective vaporization of prostate(ep-pvp): six years experience from a multi-centre study. Abstract 2272. American Urological Association (AUA) Annual Scientific Meeting, Washington DC, USA, 18 May 2011.