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RESEARCH ARTICLE

GREEN LIGHT LASER (XPS) VAPORISATION OF LARGER PROSTATE: SINGLE CENTRE EXPERIENCE.

Mohammad Sajid Bazaz[1] , Nuzhat Tabasum[2], Aman Gupta, Dr Rajeev Sood[3].

1. Consultant, Urology & Renal Transplant Fortis Hospital.
2. Senior Resident, Nephrology Fortis Hospital.
3. Chairman, Urology & Renal Transplant Fortis Hospital.

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Corresponding Author

Mohammad Sajid Bazaz.

Abstract

Introduction and Objective:To evaluate the efficacy and safety of photo-selective vaporisation of prostate using Lithium Triborate Green Light System (180 watts) for benign prostatic hyperplasia (BPH) patients with prostate size more than 100 ml. Methods: We investigated 22 cases of BPH from November 2012 to August 2013. Efficacy in terms of maximum urinary flow rate (Q max), international prostate symptom score (IPSS), post-void residual urine (PVR) and quality of life were recorded. The operative time, hospital stay and catheter removal time was analysed. The follow up data was recorded postoperatively at1 week, 4 weeks and 3 months. Results: The Mean age was 68.8 years, mean prostate volume was 126.77 cc and mean S. PSA was 3.6 ng/dl. The mean lasing time was 3.04 gms/min and mean catheterization time was 1.27 days. The reduction of prostate size and serum PSA levels at three months was 69 to 94 % and 73 to 96 % respectively. Dysuria rates within first post-operative week were9%.Conclusions: The Green light XPS (Extreme Performance System) is aversatile energy source with effective outcomes for BPH patients even with higher sizes of prostates (>100 grams) with minimal complication rates and side effect profile

Introduction:-

Benign prostatic hyperplasia (BPH) is one of the most common urologic disorders in aging men and its management is currently under modification. Gland enlargement contributes to lower urinary tract symptoms (LUTS) by bladder outlet obstruction and the increased smooth muscle tone in reaction to augmented resistance. Transurethral resection of prostate(TURP) initially described in 1932, has long been considered the unopposed standard for minimally invasive surgical BPH treatments. In the past decades, several minimally invasive techniques have been introduced including several laser modalities (550-µm Holmium, 980-µm Diode, 2 µm-Thulium, and 532nm-GreenLight).[1]

Subsequently, TURP has steadily declined over the last 10 years. The Green light LASER photo-selective vaporization of the prostate (PVP) is the fastest growing modality currently in use in the US and is rapidly gaining wide acceptance worldwide. [2,3]

The latest XPS-180W (AMS, Minnetonka, MN) with an increased power setting of 180 W with improved energy delivery is expected to allow more efficient tissue removal. The technological improvements seem to translate into reduced operative time and more efficient clinical outcomes, particularly in patients with larger prostates.[4,5]

Aim of the Study:-

The aim of this study is to analyze the clinical performance and outcomes with Greenlight XPS 180W laser system in patients with larger prostates (>100 gms) in view of their co-morbid status.

Material and methods:-

We prospectively recorded the peri-operative and follow up data on patients being treated for BPH with green light XPS 180 watt system.

Inclusion criteria:-

- Subject is 50 to 80 years of age.
- Subject has provided informed consent and agrees to attend all study visits.
- Subject has diagnosis of lower urinary tract symptoms due to benign prostatic enlargement causing bladder outlet obstruction.
- IPSS >12 at the baseline visit.
- If Uroflow testing documentation is available within 90 days prior to the informed consent date, and the sample is greater than or equal to 150ml and the Qmax is less than 15ml/s.
- Prostate volume of more than or equal to 100g on USG KUB.

Exclusion criteria:-

- Active infection (eg, urinary tract infection or prostatitis)
- Urethral stricture or bladder neck contracture
- Neurogenic bladder or other neurological disorder that would impact bladder function (eg, multiple sclerosis, Parkinson's disease, spinal cord injuries)
- History of previous lower urinary tract surgery (eg, TURP, laser, urinary diversion, artificial urinary sphincter, penile prosthesis)
- Stress Urinary Incontinence
- Associated bladder stones
- Prostate cancer

All these subjects underwent Photoselective Vaporisation of Prostate (PVP) with the Greenlight XPS (Extreme Performance System) system. The Peri-operative data was recorded including surgery duration, lasing time, catheter size or type used after surgery, catheter removal time, secondary retention rate, hospital stay and any other complications noted during the stay.

After the cases were discharged they were followed up at interval of 1 week, 4 weeks and 3months interval. Data recorded at 1 week and 4 weeks interval follow up visits included:Functional status in terms of Qmax , IPSS and QOL scores Complication-free rate Subject satisfaction in terms of hematuria, dysuria and frequency

At the end of three months follow up, the residual prostate size on an ultrasound and serum PSA levels were measured. This was compared with the base line values before surgery and data were recorded.

Results:-

The mean age of the patients treated was 68.8 (58-84) years of age. The mean volume of prostates lased was 126.77 ± 10.8 ml. The baseline PSA of these cases was 3.6 ± 0.9 ng/dl. The average lasing rate while PVP was 3.04 ± 0.3 gms/min. The overall mean surgery duration was 55.25 ± 9.75 minutes. The mean catheterization time during hospital stay was 1.27 ± 0.88 days. Just one patient of all cases after surgery developed secondary retention and was discharged after re-catheterisation. His catheter was removed on 4th post-operative day. In post-operative period none of the patients required blood transfusion. No Dyselectrolytemia was observed in any of our patients in peri-operative period.

On first post-operative visit at 1 week, sub-meatal obstruction was noted in one case.Although we routinely performed urethral dilatation in all our cases prior to PVP, this particular patient required urethral dilatation at regular intervals. Dysuria at follow up was decided on the basis of patients symptoms who were all routinely put on tablet Paracetamol at the time of discharge. On follow up, those patients who still complained of painful micturition, were put on tablet Diclofenac sodium and considered to have persistent dysuria. Subsequently, dysuria rates at 1 week and 1 month follow up was 9% and nil respectively. At three month follow up, the

reduction in prostate size in our patients ranged from 69 to 94%. At the same time, the serum PSA fall noticed was approximately 73 to 96 %.

Of all the patients who underwent treatment, 7 were hypertensive and 6 had undergone some cardiac surgery for coronary arterial pathology. 4 were chronic kidney disease (CKD) patients and 13 were known case of diabetes mellitus. So, some of the patients were having more than single type of co-morbidities at the same time No adverse effect was noted in any of such patients in view of their co-morbid status.

Discussion:-

The performance and efficiency of Green Light laser in patients with larger prostate volume have been always been a topic of discussion. The latest version of the Greenlight system has been developed (2011) with an increased power setting (180 W) and a novel MoXy fiber, which claims to provide significantly enhanced vaporization efficiency resulting in the removal of twice the tissue over the same laser time when compared with HPS-120W, according to the manufacturer American Medical Systems, West Minnetonka, MN. In addition, the energy is delivered through a novel MoXy fiber with an enlarged fiber core diameter of 750 μM compared with 600 μM in the previous Mojo fibers used with the HPS system[6]This increase in fiber size generates a larger laser beam surface area 0.44mm^2 compared with 0.28mm^2 of the previous fiber generation, whereas preserving equivalent power density or irradiance(W/cm^2) compared with the previous HPS-120W system. Another upgrade of the fiber laser delivery system is the MoXy's Active Cooling Cap technology that uses saline to keep the fiber tip cooled. Cooling of the fiber tip minimizes the fiber devitrification process that is believed to significantly reduce power delivery throughout the procedure. Additionally, a protective steel cap incorporated at the MoXy fiber tip reduces degradation that can result from contact with the prostatic tissue.[6] Finally apulsed coagulation feature was added to optimize hemostasis control (Tru Coag - pulse modulated at 12 Hz 25% duty cycle, 5 -40 W)[7] obvious increased power setting and beam area developed to increase vaporization efficiency and reduce lasing time, the MoXy fiber advances were designed to better preserve the integrity of the fiber aiming for a 1-fiber per case usage. So far, limited published data on XPS is available. Bachmann etal [8] evaluated early safety, efficacy and perioperative outcomes in 201 procedures performed worldwide They showed that the XPS system is effective and safe for the treatment of lower urinary tract symptoms associated with BPH. At 6 months, improvements in international prostate symptom score, maximum urine flow, and postvoid residual were consistent and similar to previously published data with the use of the HPS-120W system. Furthermore, although a head-to-head comparison was not performed, compared with a previously published report using the HPS-120W, their results suggest that the XPS-180W applies more energy per PV without increasing side effects.[8] The use of the XPS system reduced lasing time by 55%, which enabled a significant, 34% reduction in total operative time. The total amount of energy delivered was only slightly higher with the XPS system (250 kJ vs 267 kJ; P = .043), whereas the laser time was more than halved (29.6 minutes vs 65.8 minutes'<.01).

Several studies have demonstrated that PVP with the use of theHPS-120W laser [9-11] the rate of retreatment is generally increased in patients with larger prostates. In the series reported by Al-Ansari et al, the retreatment rate in the PVP-treated group with prostate size > 80ml was 11% at 36 months. Again it was shown that lasing and operating time remain significantly longer in patients with larger glands, reflecting the need for higher energy delivery in patients with large prostates.[9] In this study, with the novel XPS system we have observed that retreatment was not required in any of our patients on a follow of three months.

In contemporary prospective, The GOLIATH study is the largest prospective randomised trial to date comparing TURP with laser prostatectomy.[13-16] The study was designed to evaluate the non inferiority of GL XPS to high quality TURP outcomes. The study also aimed to compare safety and efficacy parameters with the two forms of treatment.

Historically, GL has been viewed as less efficacious compared with TURP.[17-20] Given the rapid progression of the GL technology over the last decade, there are limited long term studies and the current literature largely reports data from early 80W and 120W systems.[14,21] Monopolar TURP removes about 30 -50% of the preoperatively measured PV.[22]It has been shown that PSA value is strongly correlated with total PV, and TRUS-determined adenoma volume correlates well with the tissue respected by TURP.[23] PSA and TRUS for prostate volume measurement can be used as surrogate parameters, although there are limitations due to other factors influencing the increase and decrease. In the Goliath study, the short term efficiency of XPS was comparable with TURP. But the crucial question of long-term functional results, re-intervention rate, and patient satisfaction are yet to be assessed. However, this study also demonstrated that length of catheterization, time until stable health, and length of stay were superior after XPS compared with TURP. Further, there were fewer grade 3 bleeding events in the XPS group, consistent with

the hypothesis that severe bleeding should be seen less frequently with this treatment compared with TURP. There was no statistical difference in the incidence of moderate urinary incontinence between XPS and TURP groups (p = 0.247)

With previous laser systems, the re-intervention rate was higher compared with TURP, mainly due to the inefficiency of immediate tissue removal.[18]The GOLIATH study provides evidence that the overall portion of patients free of any adverse effect was comparable between XPS and TURP. The treatment arms were similar with respect to re-intervention; however, the early reintervention rate within 30 days of treatment was three times higher after TURP. Previous reports of long-lasting dysuric complications (storage symptoms) range from 2.4% to 68.2% after holmium laser enucleation of the prostate (HoLEP), 7.6- 14.8% after 80-W/120-W GL PVP, and 10.7-13% after thulium yttrium-aluminium-garnet laser prostatectomy. The lack of a standardised definition for dysuria makes it difficult to compare results from previously reported studies. It is suspected that GL vaporisation results in a missed opportunity to diagnose prostate cancer. Historically, incidental prostate cancer was diagnosed in 4-22% of TURP specimens.[24] In a recent study of adenoma enucleations, prostate cancer was diagnosed in 3.1% of the pathologic specimens.[25] However, our study was not designed to study this aspect.

The limitations to the study are that the prespecified primary end point of results at 3 months represents relatively short follow-up. Nevertheless, most procedure-related adverse effects should occur within this time range, which provides confidence for the safety assessment.

In an era of escalating healthcare expenses, cost effectiveness is of concern when adopting a novel technology such as the Greenlight laser PVP with the use of the XPS-180W system. Although, a formal cost analysis was not performed in this study, still due to decreased operative time and decreased fiber usage, an economic advantage can be postulated with the use of the XPS. Additionally, with the use of preoperative prostate volume as a predictive indicator for operative parameters, the XPS system might allow better planning and more patients to be treated per day, adding another potential cost advantage compared with its predecessor models.

Conclusions:-

Based on our experience, we believe that Greenlight XPS system is a viable modality in surgical management of BPH patients with even larger PV (> 100 gms) and multiple co-morbidities. It significantly decreases not only the operative time but also the hospital stay duration of such patients. Thus, it helps in faster recovery of patients to their regular lifestyle with minimal complication rates.

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