Holmium Laser Enucleation of Prostate (HoLEP) : The Platinum Standard.

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***Abstract**: Lasers have come in a big way in surgical therapy of benign enlargement of prostate (B.E.P) Trans Urethral Resection of the prostate (TURP) has been regarded as gold standard; but last two decades have witnessed more than a dozen of minimally invasive therapies which have been compared with TURP both in terms of efficacy and safety, however TURP maintained its position. Morbidity of TURP particularly in large glands has led to the search for a better alternative. Open prostatectomy used to be only viable option for large glands. Despite numerous innovations in doing TURP, it is currently being challenged by the enucleation procedures, especially HoLEP (Holmium Laser Enucleation of Prostate) not only in terms of efficacy, safety, durability, versatility but also economy. Learning curve for HoLEP is steep and this article presents technique of performing HoLEP in detail. Once mastered HoLEP can be done very efficiently and is an endoscopic equivalent of open simple prostatectomy. While doing HoLEP Laser Fiber moves exactly in same way as surgeon's Index finger. Thus HoLEP is one time solution for patients needing surgery for BEP and is now being considered—The Platinum Standard.*

INTRODUCTION

Transurethral resection of Prostate (TURP) is facing a serious threat s the gold standard treatment for bladder outlet obstruction due to benign prostatic hyperplasia (BPH). It took almost 50 years of TURP to replace open prostatectomy as the established intervention. Holmium Laser enucleation of Prostate represents paradigm shift in the endoscopic management of BPH. It is based on the same surgical principles as open prostatectomy and is now ready to replace TURP.

LASER PROSTATECTOMY

Although many lasers are masquerading for treatment of BPH. Holmium with a wavelength of 2140 nm has cared a niche for itself due to its unique properties of haemostasis, short depth of penetration (0.4 mm) and absorption by water. Tissue is ablated faster than heat is conducted into surrounding tissues. Holmium is delivered in pulsed mode and each pulse has enough energy to vaporize tissue. Holmium treatment of prostate has evolved from ablation, resection to the current technique of enucleation. HoLAP (Holmium Laser Ablation of Prostate) is a tedious process due to slow rate of tissue ablation and was suitable only for small glands. HoLRP (Holmium Laser Resection of Prostate) which involves partial enucleation of each lobe of the prostate which is then divided into small pieces with the lobe still attached to the capsule. Although HoLRP was faster than HoLAP but it was still much longer in duration than TURP. The development of morcellator led to the present technique of HoLEP. Only drawback cited for HoLEP is the learning curve. However, the learning curve is certainly shorter than that of laparocopic procedures and TURP. 20-30 cases are required for an Urologist to become familiar and feel reasonable safe in performing HoLEP (1). This number is significantly reduced if learning curve is properly mentored. Most important pearl is to start first 10 cases with glands under 40 gms. Once the technique is mastered one can address easily all potential problems with large glands.

HOLEP: SURGICAL TECHNIQUE

Indications: are similar toTURP i.e large or multiple vesical calculi, recurrent/ persistent urinary tract infection, obstructive uropathy due to prostate, recurrent urinary retention; recurrent haematuria of prostatic origin and poor response to medical therapy for BPH.

Patient Preparation: Pre-operative work-up includes IPSS (International Prostatic Symptom Score); Uroflowmetry; ultrasound KUB (Kidney Ureter and Bladder); SPSA (Serum Prostatic Specific Antigen); Urine Culture & Sensitivity; digital rectal examination. Indications for preoperative biopsy are abnormal DRE (Digital Rectal Examination) & elevated SPSA.

Contra-Indications are active urinary infection, patient cannot be placed in lithotomy position, poor cardio-respiratory reserve not permitting anesthesia. Bleeding diathesis is not a contra indication for HoLEP (2). However, when anti-coagulants can be safely stopped, it is better to stop them 3-5 days prior to surgery and resume once urine is clear post operatively. However, when anti-coagulants cannot be stopped HoLEP can be perfomed safely.

Informed Consent: - Risks and benefits are explained to the patient. Benefits include noticeable improvement in urinary flow and decrease in symptoms scores. Recovery in storage symptoms like frequency urgency and nocturia however are patient specific and may require adjuvant anti-cholinergic medication. Patient with poor detrusor contractility may require a period of intermittent self catheterization. The risks and potential problems of HoLEP include risks of anaesthesia, Perforation, bleeding, retrograde ejaculation, stress incontinence, late development of urethral stricture or bladder neck contracture or decreased potency and must be explained prior to the procedure.

Preoperative Preparation: Spinal or general anesthesia is administrated and patient is placed in lithotomy position and prepared with providone- iodine.

Instrumentation: The holmium laser currently in use at our Institution is the 100 W versapulse holmium laser (Lumenis) with a 550 micron end – firing fiber. The power is set at 2 J at 50 Hz (100 w). The fiber is placed through a specially designed laser bridge (Figure 1) which is custom made. It avoids the use of ureteric catheter. HoLEP is performed with a 24-26 F continuous flow (lglesias) resectoscope of Storz (Germany) which is the standard resectoscope for TURP. 30 degree telescope is used during enucleation. Irrigation

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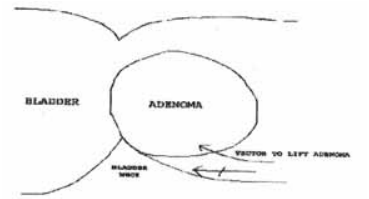
solution is normal saline. For morcellation versacut (Lumenis) is used which is composed of a hand piece with hollow reciprocating blades; suction pump and foot pedal. Morcellator is passed through the 26 F Nephroscope; Storz (German).

Procedures: can be done by standard three lobe or modified two lobe techniques.

A. Classic three lobe or standard technique

Involves giving incisions at 5 and 7 o'clock in bladder neck which are deepened down to the surgical capsule. The incisions are extended medially to both sides of verumontanum. Surgical capsule which is identified as circular fibers running transversely serves as the landmark. The incisions are extended laterally by undermining the lateral lobes. The beak of the resectoscope is helpful in separating the lobes and finding the correct plate of dissection (Figure 2). 5 and 7 o'clock incisions are joined transversely just proximal to verumontanum which helps in detachment of the median lobe into bladder.
The third incision is made at 12 o'clock position. Adequately maintaining the length and depth of incisions is crucial. As too long an incision can damage the sphincter while too short an incision will result in a difficult enucleation.



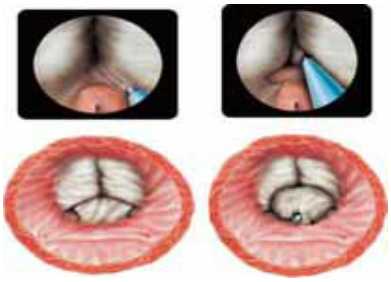
Incisions are extended laterally in proper plane with the help of beak of instrument and the laser fiber. These incisions join at 3 & 9 o'clock of each respective lateral lobe. The lobes are then pushed into bladder Figure 3.

B. Two lobe technique

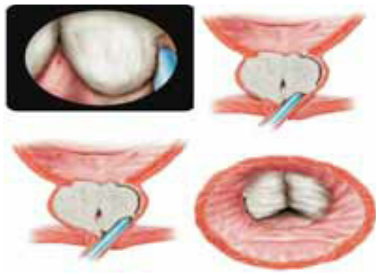
Our preference is the two lobe technique which involves giving incision at 5,6, or 7 o'clock position and 12 o'clock position. Incision are deepened down to capsule as in the classic or standard technique. Along with one of the lateral lobes the median lobe is also included. Rest of the steps are similar. Advantage which we have observed is reduction in operative time.

Morcellation: 26 Fr Storz Nephroscope with a working channel of 5 mm is used to insert a morcellator which at the bladder end has rotational blades which initially engage the prostatic tissue and then divide it. At the handle end of morcellation is a tubing through which resected prostatic lobes are collected.
It is ideal to perform morcellation with a full bladder. The danger of engaging bladder wall is real but it really occurs and the injury is minor. Major injuries are even more rare.
Max speed- 10 g/ min of morcellation. Average speed – 4 g/min. of morcellation.
At the end of the procedure it is mandatory to inspect bladder and prostatic fossa to ensure proper haemostasis.

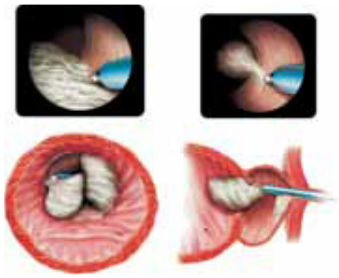
Post Operative Care: 20-22 Fr catheter is inserted. Intermittent bladder irrigation is done as required. Frusemide 20 mg is given and at the end of procedure to eliminate the saline absorbed. Catheter can be removed next morning and patient discharged after 2-3 satisfactory voids.
Any modality for the treatment of BPH should be evaluated on the following parameters; relief of obstruction , durability , morbidity and safety, versatility and cost effectiveness. Let us examine all these parameters in the light of the currently available literature.



Median Lobe Enucleated



Left Lobe Enucleated



All Lobes Enucleated

RELIEF OF OBSTRUCTION

An RCT comparing open prostatectomy with HoLEP has proven its efficacy, with much less morbidity[3,4]. The duration of catheterization and hospitalization was particularly striking as the values of HoLEP were less than half of those for the open procedure (1.5 vs 4.1 days of catheterization; 2.7 vs 5.4 days of hospitalization).
HoLEP has been shown to be superior to TURP for relief of bladder outlet obstruction as the tissue removed is greater with HoLEP[5]. Gilling reported a statistically significant difference in detrusor pressure at maximal flow 6 months post-operatively between HoLEP (from 76.2 cm of water to 20.8 cm water, a 73% reduction) and TURP (from 85.5 cm water to 40.7 cm water, a 52% reduction) (P<0…1).
The results of HoLEP in acute urinary retention were found to be better than that for other surgical modalities probably due to the completeness to adenoma removal as almost all patients with urinary retention treated by HoLEP were able to void post-operatively[6].

DURABILITY

All patients want a one-time solution to their problem. Whereas TURP remains a very effective treatment, second intervention is necessary in 10-15% of the patients within 10 years[7]. Ablative technique can be expected to have higher retreatment rates as the amount of tissue removed is much less. In a series by Gilling et al., the retreatment rate after HoLEP was 1.4 %, which is superior than TURP[8]. Prostate – Specific antigen (PSA) decline is considered as a marker for the amount of tissue removed. An 82-86% fall in PSA is expected after HoLEP, which shows near-complete removal of adenoma. Also, the reduction in trans rectal ultrasound (TRUS) volume with HoLEP is 76% at 3 years[9].

MORBIDITY AND SAFETY

Mebust et al., retrospectively analyzed 3885 patient undergoing TURP, with a mean of 22 g resected and found that the risk of blood transfusion was 25% and the risk of transurethral resection (TUR) syndrome was 2 %[10]. Prostate of > 45 g had a significantly higher incidence of intraoperative bleeding and TUR[12]. Also, the duration of catheterization was least of HoLEP.

The incidence of nursing events after laser surgery for prostate is much less than TURP. HoLEP was found to be safe even in patients with acute urinary retention requiring surgical intervention who were previously reported to be at a greater risk of adverse events.

As lasers are less likely to cause bleeding, Elzayat et al. [13] Studied the safety and efficacy of HoLEP in a series of 83 patients 8 required blood transfusion and one required platelet transfusion due to bleeding, which coincided with the resumption of anticoagulation therapy. The outcome measures in this subgroup were no different from other reported series on HoLEP.

Another concern in patients undergoing TURP is absorption of irrigation fluid during the procedure leading to electrolyte imbalance[10]. Lasers use saline irrigation, which should eliminate the risk of transurethral resection syndrome with its associated fluid shifts. Shah et al.[14] Performed a study to define fluid absorption during HoLEP using the breath ethanol technique with normal saline tagged with 1 % ehanol. Fluid absorption occurred in approximately 26 % of the patients; however, none of the patients developed transurethral resection syndrome.

VERSATILITY

Bladder outlet obstruction is known to result in formation of vesical calculi, diverticulum. Holmium laser in particular has an edge over other forms of treatment. Using the same equipment, fragmentation of vesical calculi can be performed effectively. With Holmium laser, diverticular neck can also be incised if indicated.

Lasers can be used for all sizes of prostates. The vaporization techniques are however more useful for smaller prostates. Matlaga et al[15]. Reported a series of 86 men with preoperative TRUS volumes of > 125 ml, who underwent HoLEP. The tissue retrieval rate was 1.09 g/min whereas serum PSA decline was 90.2 % and peak urinary flow rate went from a baseline of 9.1 ml/s to 24.9 ml/s at 12 months. These findings are superior to those previously reported for both open suprapubic prostatectomy as well as TURP for patients with extremely large prostates.

COST EFFECTIVENESS

Initial coset of laser equipment is more than the conventional TURP or open surgery instruments. However, reusability of the laser fibers, durability of the equipment and its use by multiple specialities, lead to a significant reduction in running cost. Multiple soft tissue applications of lasers, e.g resection of bladder tumor, incision of urethral stricture and ureteropelvic junction, use during flexible ureteronoscopy and fragmentation of calculi (Holmium Laser), help in increasing the scope of their use and thus decrease the cost.

The advantage of laser treatment, viz less hospital stay, early resumption of activity, less retreatment rates, safety in high-risk patients and capability to treat large prostates, also overcome the cost factor. Also, one-time surgical management for poor patient with bladder outlet obstruction can turn out to be cheaper than life-long medication with uncertain outcome.

Two studies have explored the economic issues of Holmium laser. One comparing HoLAP with TURP which found it to be more cost effective[16]. The second study compared HoLEP with open prostatectomy which showed significant hospital net cost savings in the HoLEP goup[17].

CONCLUSION

Laser Prostatectomy Procedures are being embraced with enthusiasm by many surgeons concerned about the morbidity associated with TURP. The key safety issue with laser prostatectomy techniques is the amount of bleeding that occurs during and after the procedure. It is the relative bloodlessness that is considered to be one of the primary benefits in comparison with TURP. Completeness of adenoma removal for any size of prostate provides unmatched superiority of lasers, especially HoLEP, in the relief of obstruction and long term durability.

Holmium laser versatility, reusability of fibers and multispecialty use make it cost effective. Thus HoLEP, undoubtedly is ' The Platinum standard and occupies a definite place in Surgical management of BPH.

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