Prospective Evaluation of the Learning Curve for Holmium Laser Enucleation of the Prostate

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Purpose: In a prospective manner we evaluated the learning experience of an endourologist inexperienced with holmium laser prostate enucleation and its impact on surgical outcome. We also reviewed the literature to document technical features of holmium laser prostate enucleation at different institutions.

Materials and Methods: Patient demographic, perioperative and followup data were analyzed. To assess the impact of the learning curve on postoperative outcome patients were divided into group 1—patients 1 to 50, group 2—51 to 100 and group 3—101 to 162. The effect of the learning curve and weight of resected tissue on enucleation and morcellation efficiency was studied.

Results: Holmium laser prostate enucleation was successfully completed in 93.82% of patients. Eight patients required conversion to transurethral prostate resection. Enucleation and morcellation efficiency was 0.49 and 2.75 gm per minute, respectively. Enucleation efficiency attained a plateau after 50 cases. Postoperative outcome was compared in the 3 patient groups. There was a higher incidence of capsular perforation and stenotic urethral complications in group 1. In the literature a mean of 57.09% of tissue (range −9.6 to 81.9%) was retrieved after holmium laser prostate enucleation and mean efficiency was 0.52 gm per minute (range −0.11 to 1.09). Efficiency increased proportionally with resected prostate weight.

Conclusions: An endourologist inexperienced with holmium laser prostate enucleation can perform the procedure with reasonable efficiency after about 50 cases with an outcome comparable to that of experts, as described in the literature. During the learning curve conversion to transurethral prostate resection can be done without any harm to the patient.

Key Words: prostate, holmium, lasers, prostatectomy, prostatic hyperplasia

The urology armamentarium for bladder outlet obstruction expanded dramatically in the last decade. HoLEP combined with mechanical morcellation represents the latest refinement of holmium:YAG surgical treatment for benign prostatic hyperplasia. It allows effective treatment for even the largest of glands with minimal morbidity. No less than 5 randomized, controlled trials were reported that analyzed this modality.[1] Although the technique was refined and its popularity has increased exponentially, its application is still limited to expert teams at high volume centers.

A prolonged learning curve is considered the main disadvantage of HoLEP, limiting its acceptance in the urological community. Currently no tutoring for HoLEP is offered by companies in most countries and, therefore, learning the procedure is left exclusively to the initiative of interested urologists.[2] We prospectively evaluated the learning experience of an endourologist in HoLEP and its impact on the outcome of surgery. We also reviewed the literature to document technical features of HoLEP at different institutions.

MATERIALS AND METHODS

The residency trained urologist (HNS) serving as the trainee in this model previously performed approximately 150 TURPs and bladder tumor transurethral resections. In April 2003 he joined an institution that incorporated the HoLEP program in December 2000. The consultant urologist, who had performed 180 HoLEP procedures at that institution since its inception, served as mentor in the model. He left the institute 1 month after the trainee joined the hospital. The trainee had an opportunity to assist 4 HoLEP procedures with the mentor. He also had a discussion with the mentor regarding the pitfalls, and tips and tricks of the procedure. He followed the valuable experience in the international literature and intensively studied the recorded unedited videocassette of 30 HoLEP procedures performed previously by the mentor at the department. From June 2003 through June 2005 the trainee urologist performed 162 HoLEP procedures independently.

Preoperative Evaluation

All patients were evaluated by AUA symptom score, digital rectal examination, prostate specific antigen estimation, urinalysis and urine culture. Abdominal sonography to measure prostate volume, PVR measurement and uroflowmetry were performed in all patients except those in urinary retention.

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Surgical Technique

All HoLEP procedures were performed as described previously in the literature.[3] Spinal or epidural anesthesia was usually preferred except in patients with coagulopathy and failed regional anesthesia, in whom general anesthesia was used.

Our energy source consisted of a 100 W holmium:YAG laser with a 550 μ laser fiber (Lumenis®). A 26Fr continuous flow resectoscope (Karl Storz™) with a laser bridge was used. Normal saline was used for irrigation. The laser fiber with its 6Fr stabilizing ureteral catheter was introduced into the laser bridge. Most of the enucleation process was done using laser settings at 2 J and 50 Hz, changing to 2 J and 40 Hz during apical lobe dissection. After enucleation hemostasis was achieved by defocusing the laser over targeted areas at 2.5 J and 40 Hz settings.

Enucleated tissue was morcellated using a VersaCut morcellator (Lumenis) introduced through an offset rigid nephroscope. After the first 20 cases the urethra was calibrated to 30Fr in all patients using an Otis urethrotome before the start of enucleation. Similarly throughout the procedure the urethra was lubricated every 20 minutes. At the end of surgery a 22Fr urethral Foley catheter was placed in situ.

Postoperative Course and Followup

The urethral catheter was removed postoperatively 12 hours after the urine cleared of hematuria. Patients were discharged home after catheter removal. AUA symptom score evaluation, uroflowmetry and PVR measurement were done during followup at 1, 3 and 6 months, 1 year and yearly thereafter.

Analysis

Patient demographic, perioperative and followup data were analyzed using SPSS®, version 10.0. To assess the impact of the learning curve on procedure outcome patients were divided into 3 subgroups, including group 1—patients 1 to 50, group 2—51 to 100 and group 3—101 to 162. The postoperative outcome of surgery was compared among the 3 groups using the paired Student t test with $p < 0.05$ considered significant. The effect of the learning curve on enucleation and morcellation efficiency was studied with scatterplots (figs. 1 and 2). Similarly a scatterplot was done to study the impact of resected prostate weight on the overall efficiency of the HoLEP procedure (fig. 3).

A detailed PubMed® search was done with the key words HoLEP and laser prostatectomy. All articles regarding HoLEP were reviewed for preoperative prostate weight, resected prostate tissue weight, enucleation and morcellation efficiency, and overall procedure efficiency (table 4).[1–19] A scatterplot was done to study the impact of resected prostate weight on HoLEP efficiency, as described in the literature (fig. 4).

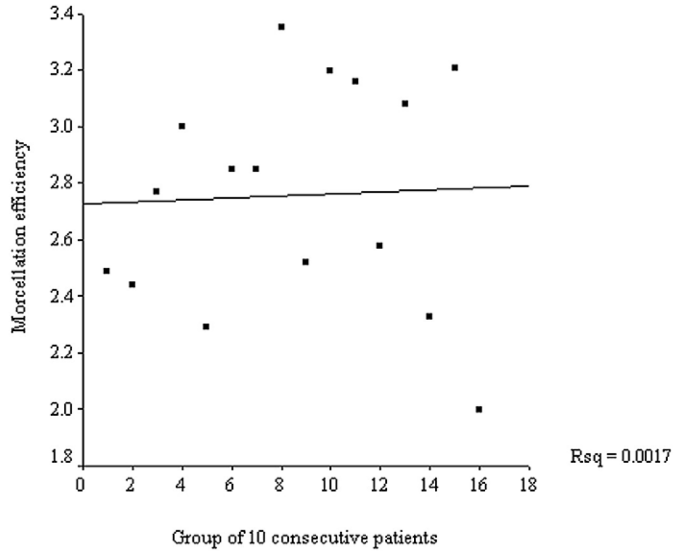

FIG. 2. Scatterplot demonstrates effect of learning curve on morcellation efficiency in gm per minute. Patients were subdivided into groups of 10 each.

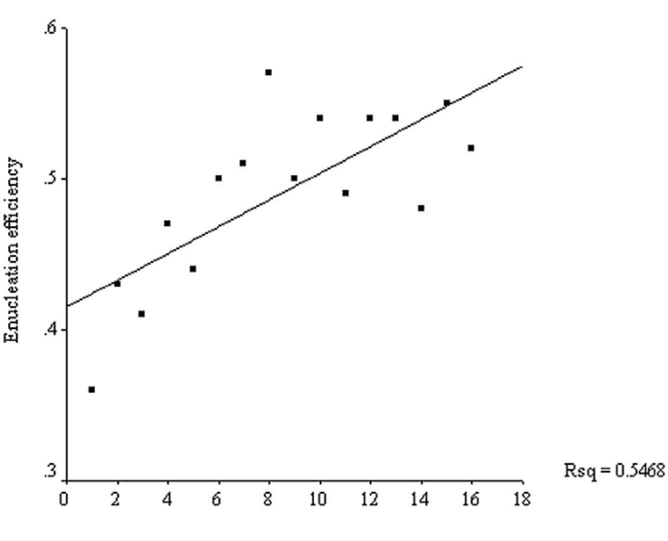

FIG. 1. Scatterplot shows effect of learning curve on enucleation efficiency in gm per minute. Patients were subdivided into groups of 10 each.

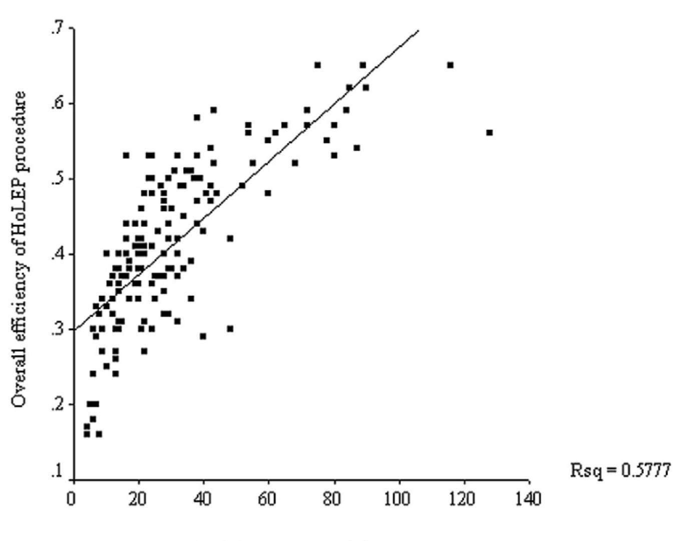

FIG. 3. Scatterplot reveals effect of resected prostate tissue weight in gm on HoLEP efficiency in gm per minute.