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Holmium laser enucleation prostate. Experience in Hospital Germans Trias i Pujol

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A B S T R A C T

Objectives: Evaluate the introduction of the enucleation with Holmium laser in our center, including the surgeon's learning curve by the analysis of the patients.
Materials and methods: 150 procedures have been analyzed in a retrospective manner with an average follow-up of 11 months. Qmax, IPSS and Qol have been determined before surgery, at 6 months and 12 months, realizing their statistic analysis. PSA was measured before surgery and after 3 months. Complications, surgical time and hospital stay have been analyzed.
Results: Average patient age was 72.4 years. Average prostatic size was of 71.3gr (18-150). Average hospital stay was of 22h. Qmax before surgery, 6 months, 12 months was of 7.53ml/s, 23.24ml/s and 21.62ml/s being statistically significant ($p<0.01$). Transfusion rate was of 1.3% and urethral stenosis rate of 4%. IPSS improvement at 6 and 12 months was statistically significant as well ($p<0.01$).
Conclusions: Enucleation with Holmium laser is a safe and effective technique with a lower complication rate than TURP, included during the learning curve.

Enucleación prostática con láser de holmio. Experiencia del Hospital Germans Trias i Pujol

Palabras clave:
HBP
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R E S U M E N

Objetivos: Evaluar la implantación de la enucleación con láser de holmio en nuestro centro incluyendo la curva de aprendizaje de un cirujano mediante el análisis de los pacientes tratados por este método.
Material y métodos: Se analizaron 150 procedimientos de manera retrospectiva con un seguimiento medio de 11 meses. Se determinaron preoperatoriamente, así como a los 6 y a los 12 meses, los valores de Q max, IPSS y Qol realizando su análisis estadístico. El PSA fue medido preoperatoriamente, así como a los 3 meses de la cirugía. Se analizaron las complicaciones, así como el tiempo quirúrgico y el tiempo de ingreso hospitalario.

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Resultados: La edad media de los pacientes fue de 72,4 años. El tamaño prostático medio fue de 71,3 g (18-150 g). Las horas medias de ingreso fueron 22. Los datos de Q max preoperatoria a los 6 y a los 12 meses fueron de 7,53, 23,24 y 21,62 ml/s, siendo estadísticamente significativa ($p < 0,01$). La tasa de transfusión fue del 1,3% y la de estenosis de la uretra del 4%. La mejoría del IPSS a los 6 y a los 12 meses también obtuvo significación estadística ($p < 0,01$).

Conclusiones: La enucleación con láser de holmio es una técnica segura y eficaz con una tasa de complicaciones inferior a la resección transuretral de próstata, incluso durante la curva de aprendizaje.

Introduction

Transurethral resection of the prostate (TURP) continues to be the treatment of choice for lower urinary tract symptoms secondary to BPH recommended by both US and European clinical guidelines.[1,2]

However, there have appeared in recent years so-called minimally invasive procedures which have been shown to achieve functional results similar to TURP with a lower complication rate.[3-5] Among these, vaporization of the prostate has been one of the most commonly used. Despite the low complication rate, the poor decrease in PSA levels and the impossibility to measure the amount of volume vaporized raise doubts about its durability over the years.

Holmium laser enucleation of the prostate, described by Gilling et al,[6] mimics the retropubic adenomectomy procedure, and its long-term results should therefore be similar. Decreases in PSA seen with this procedure, of approximately 80%,[7] agree with the enucleated volume. However, despite achievement of lower hospitalization and transfusion rates as compared to retropubic adenomectomy and TURP, use of this procedure has not been generalized because of its main problem, a learning curve estimated at approximately 50 patients.[8]

Objectives

To analyze the experience with holmium laser enucleation at our center, including the learning curve of a single surgeon, as assessed based on data from 150 procedures with a mean follow-up of 11 months.

Materials and methods

Patients

From June 2007 to June 2009, and after acquisition of a holmium laser generator by the urology department of Hospital Germans Trias y Pujol (Badalona, Barcelona), 150 holmium laser enucleations of the prostate were consecutively performed. For this, prior training consisting of educational videos and attendance to two centers with previous experience (Hospital del Mar, Barcelona; Viktoria Augusta Clinikum, Berlin) was provided.

Preoperative patient assessment included a clinical history, physical examination, digital rectal examination, PSA measurement, flowmetry including assessment of Qmax, IPSS, and QoL, and measurement of prostate volume by suprapubic ultrasound. A prior ultrasound-guided prostate biopsy was performed in patients with PSA levels >4 ng/mL, who were excluded from the study if they had a prostate tumor.

Inclusion criteria were as follows: failure of medical treatment, IPSS >15, and free flowmetry with Qmax <15 mL/s.

Exclusion criteria were as follows: history of prostate surgery, suspected urethral stenosis and neurogenic bladder, or presence of prostatic carcinoma. Patients with an indwelling bladder catheter before surgery were not excluded.

All patients receiving anticoagulation were switched to low molecular weight heparin in the 5 days prior to the procedure. Any antiplatelet aggregant treatment was discontinued 7 days before surgery.

Spinal anesthesia was used in all patients but two in whom this could not be achieved and orotracheal intubation was required. Antibiotic coverage with broad spectrum penicillin was administered to all patients except for those allergic to penicillins, who received quinolones.

Procedure

A 26Fr continuous irrigation resectoscope (Karl Storz, Tuttlingen, Germany) with a Storz working element for laser fiber introduction was used. Saline irrigation was used. A 100 W VersaPluse generator (Lumenis, Tel Aviv, Israel) was used. The generator was adjusted to an energy of 2 J and a frequency of 50 Hz, and energy was reduced to 1.2 J during hemostasis. A 550 micron front shot fiber (SlimLine® Lumenis) was used. Once enucleation of prostate and hemostasis were

completed, enucleated tissue was morcellated by introducing the VersaCut® morcellator (Lumenis, Tel Aviv, Israel) through a Storz nephroscope adapted to the outer sheath of the nephroscope.

A 20 Fr three-way urethral catheter was finally inserted under continuous irrigation. Patients were discharged when hematuria subsided, and urethral catheter was removed three days later.

All procedures were performed by the same surgeon. The procedure described by Gilling,[6] with small modifications introduced by the Kuntz et al group, was used. Such modifications include that enucleation started at 6 o'clock is continued to 11 o'clock, unlike in the Gilling procedure, where enucleation is stopped at 9 o'clock and subsequently started at 12 o'clock and continued to 9 o'clock.

Follow-up

All patients were seen again at 3, 6, and 12 months. At 3 months, PSA levels were measured and presence of incontinence, rated as none, mild, moderate, or severe, was assessed.

At 6 and 12 months, IPSS, QoL, and free flowmetry were assessed, and patients with prior incontinence were re-evaluated. Results at 6 and 12 months were compared to preoperative values using SPSS 11.0 statistical software. A Student's t test was used for paired data, and a value of $p<0.05$ was considered statistically significant.

Operating time and complications occurring during and early after surgery were analyzed. Enucleated prostate weight and hospital stay, determined by the need for irrigation through the urethral catheter, were measured. All morcellated tissue specimens were sent for histological study.

The need for both repeated catheterization and transfusion was analyzed. Incontinence at 3, 6, and 12 months and occurrence of urethral stenosis and its treatment were also recorded.

Results

Mean patient age was 72.4±4.1 years (54-84 years). PSA level before surgery was 5.20±4.59 ng/dL (0.8-28 ng/dL). Preoperative prostate volume, as measured by ultrasound examination, was 71.36 cm^3±25.36 (18-150 cm^3). Thirty-seven patients (24.6%) had an indwelling bladder catheter at the time of surgery. Mean follow-up time was 10.52±5.97 months (1-24 months).

Mean operating time was 66.64±33.92 min (18-180 min). Mean enucleated volume was 41.79±22.59 cm^3 (1-140 cm^3). Duration of hospital stay was 28.74±39.06 h (18-400 h). Histological study revealed the presence of adenocarcinoma of the prostate in four patients. Two patients had an adenocarcinoma with a Gleason score of 3+3 in <5% of the specimen (pT1a), and another patient in 15% of the specimen. Another patient had a Gleason score of 4+3 in 20% of the specimen.

PSA level measured at 3 months was 1.144±1.41 ng/dL (0.23-11 ng/dL).

Table 1 – Preoperative and postoperative data

	Hospital Germans Trias i Pujol	
Preoperative PSA, ng/dL	5.20±4.59 (0.8-28)	
Preoperative Qmax, mL/s	7.53±2.65 (3-14)	
Preoperative IPSS	21±4.74 (8-30)	
Preoperative QoL	4.068±0.61 (2-5)	
PSA at 3 months, ng/dL	1.144±1.41 (0.23-11)	
Qmax at 6 months, mL/s	23.24±5.9 (7-44)	* $p<0.01$
IPSS at 6 months	5.8±3.61 (1-18)	* $p<0.01$
QoL at 6 months	1.16±0.92 (1-4)	* $p<0.01$
Qmax at 12 months, mL/s	21.62±4.42 (6-32)	* $p<0.01$
IPSS at 12 months	5.62±3.4 (1-19)	* $p<0.01$
QoL at 12 months	1.25±0.73 (1-4)	* $p<0.01$

Table 1 shows flowmetry, IPSS, and QoL data recorded before and 6 and 12 months after surgery. Both flowmetry improvement and IPSS and QoL decreases were statistically significant ($p<0.05$).

The procedure could be completed in 148 of the 150 patients (98.6%). Conversion to open surgery was required in two patients due to hematuria, which was resolved by performing hemostasis through a bipolar resector.

Two capsular perforations required postoperative diuretic administration due to extraperitoneal suffusion, which was resolved conservatively without complications.

Two patients required repeat surgery within a few hours because of hematuria not controlled with conservative measures. Hematuria could be resolved endoscopically in one patient, while the other required hemostatic bladder neck suture.

At the 3-month follow-up, 5 patients showed stress incontinence (mild in one and moderate in three), and one total incontinence. Patients with moderate incontinence were included in a pelvic floor rehabilitation program, and had no incontinence in the 6-month evaluation.

The patient with total incontinence required placement of an artificial sphincter (AMS 800®).

Four patients experienced infection after surgery. One of these evolved to suppurative orchiepididymitis and required surgical debridement. Another patient showed colonization of a hip prosthesis three months after prostate surgery. No organisms were found in joint fluid or prosthesis and urine culture was negative, and prosthesis replacement was required. While both patients had a bladder catheter before surgery, antibiotic prophylaxis was performed as established for the procedure in both cases.

Six patients showed urethral stenosis during follow-up. Meatal stenosis requiring ventral meatotomy was found in three of them. Another two patients had bulbar urethral stenosis, which was treated with internal urethrotomy. One of these patients relapsed and is pending performance of an end-to-end urethrotomy. The remaining patient had multiple stenoses in the penile urethra and perineal urethrostomy was performed.

Discussion

Prostate enucleation using holmium laser is one of the most widely studied minimally invasive procedures intended to treat obstructive symptoms secondary to BPH, which is the reason why it is recommended in clinical practice guidelines.[9]

Its safety and efficacy have been assessed in several studies.[10,11] Lower transfusion requirements, less repeat surgeries, and shorter hospital stays as compared to TURP were reported in all of them. Overall complication rates were also lower as compared to TURP.

These good results were independent from prostate size[12,13] and were similar to those achieved with both TURP[14] and retropubic adenomectomy.[15]

Functional outcomes were similar to those reported in previous series even with a higher number of patients and taking into account that the learning curve was included. We think that if our series would have included a higher number of patients, the complication rate would have been lower (table 2).

Urethral stenosis rate in our series was 4%, but we think that prophylactic meatotomy could have prevented some of them. We think that the multiple stenoses in bulbar urethra occurring in a patient were influenced by operating time (152 min). In our view, use of narrower endoscopic material, such as the 24.5Fr material already available in the market, or performance of a prophylactic urethrotomy should be considered for such long procedures.

No neck sclerosis was seen in our series, unlike in other series which reported sclerosis and attributed it to enucleation of small prostates.[16] We think that small prostates may be enucleated provided a wide cervical incision is made at the end of the procedure, as we learned from that author (Placer et al).

As regards bleeding, two patients (1.3%) required transfusions and underwent repeat surgery for bleeding. This rate is similar to that reported by other authors. These two patients were receiving before surgery anticoagulant treatment which had been replaced by low weight molecular heparin, and did not therefore influence postoperative bleeding.

As regards the amount of tissue enucleated, several authors postulate that 10%-15% of tissue is vaporized during enucleation. Assuming that the peripheral prostate that will persist after surgery represents 20% of prostate volume and 10%-15% is vaporized, enucleated tissue will represent approximately 60%-65% of total prostate tissue. Our results were approximately 58.5%, including the learning curve, which is similar to the results reported by series with a greater patient number and experience.

All authors agreed in reporting PSA decreases by approximately 80%[7] after prostate enucleation. In our series, PSA decrease was 79.1%. If PSA decrease is a measure of the volume enucleated, as reported by Lepor et al.,[17] such decrease should be similar to that achieved after retropubic adenomectomy.

Table 2 – A comparison to similar series

	n	Prostate volume, cm^3	Preoperative		At 6 months		At 12 months	
			Q max, mL/s	IPSS	Q max, mL/s	IPSS	Q max, mL/s	IPSS
Gilling et al, 2006	71	58.5±31 (14-152)	8.1±2.7 (2-14)	25.7±5.9 (14-35)	23±10.7 (5-65)	7.5±5.8 (0-26)	20.9±7.6 (6-38)	6.6±6.4 (0-31)
Vavassori et al, 2004	196	54.3±30.8 (8-168)	9.3±3.2 (3-18.3)	26.2±5.2 (12-35)	22.7±7.7	2.9±2.4	22.5±6.8	2.0±1.5
Kuntz et al, 2004	100	53.5 (20-95)	3.8±3.6	4.9±3.8 (0-11)	25.1±6.9 (10-49)	2.2±1.6	27.9±9.9 (5-53)	1.7±1.8 (0-9)
Placer et al, 2009	125	75.8±29.7 (16.6-157)	8.8±3 (4-17)	21.5±6.7 (6-35)	26.1±9.4 (10-56)	6.1±4.3 (0-20)	27.8±9.7 (14-57)	5.1±2.7 (0-10)
HUGTIP, 2010	150	71.36±25.36 (18-150)	7.53±2.65 (3-14)	21±4.74 (8-30)	23.24±5.9 (7-44)	5.8±3.61 (1-18)	21.62±4.42 (6-32)	5.62±3.4 (1-19)

Holmium laser enucleation also allows for pathological study, which may detect prostatic carcinoma in the enucleated tissue specimen without altering histological study.[18] In our series, this finding was made in 4 patients (2.6%). One of these patients underwent antegrade radical prostatectomy, and was therefore excluded from follow-up.

As regards incontinence evaluation, we think that more reliable results are obtained 3 months after surgery than one month after surgery. In our view, bladder readaptation changes following deobstruction are not definitive until 3 months. Therefore, there will be patients with initial urge incontinence that will spontaneously resolve after that readaptation period. One of the greatest difficulties during prostate enucleation lies in anterior release of lobe apex, as the urinary sphincter may be damaged at this site. We think that this was the reason for incontinence in the patient who required an artificial sphincter.

All 4 patients with moderate stress incontinence were >75 years of age and had significant comorbidity, and intrinsic sphincter deficiency in such patients is known to be able to cause incontinence after deobstruction in patients with no incontinence under obstructed conditions. Overall incontinence rate in our study was 3.3%, which does not differ from the rate seen after TURP.

Mean hospital stay at our department was 28.7 h (range, 18-400 h). While a patient stayed at the hospital for 400 h (this was the patient with suppurative orchiepididymitis who required surgical debridement), the mode was 22 h. We think that length of hospital stay depends to a greater extent on the setting, and the most important thing is to shorten hospital stay of patients with prostates that were previously amenable to retropubic adenomectomy.

In our experience, the learning curve was not associated to a significant increase in morbidity. Rates of urethral stenosis, repeat surgery, and postoperative transfusion were similar or even lower as compared to TURP or retropubic adenomectomy. We think that the existence of a greater number of centers with experience in the procedure, and the possibility of attending surgical procedures or direct tutoring of centers that want to implement the procedure, will probably facilitate and shorten the learning curve, estimated at approximately 50 patients.[8]

Conclusions

In our experience, holmium laser enucleation is a safe and effective procedure resulting in a rapid improvement of obstructive symptoms secondary to BPH and causing little morbidity even at centers with little experience in the procedure. Once the learning curve is surmounted, increasingly greater prostate volumes will be managed, which will allow us for replacing retropubic adenomectomy by an endoscopic procedure, thus decreasing patient morbidity and hospital stay.

Conflict of interest

Authors state that they have no conflicts of interest.

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