

Original Article

Holmium laser enucleation of the prostate. Experience in a medical center in Paraguay

Enucleación prostática con láser de holmio. Experiencia en un Servicio de Uroología en Paraguay

Abarzúa Cabezas, Fernando Guillermo; Hanano Nagasawa, Luis Yuichi; Novais Peña, José María; Vera Nuñez, Blas Marcelo; Vera Franco, Sergio Ariel; Esquivel Oviedo, Luis Fernando; Volpe Avila, Alejandro Ernesto; Speratti Cano, Ricardo Daniel; Rotela Rivelli, Luis Eduardo; Cantero Zácaras, Rubén Darío

¹Centro Médico La Costa. Asunción, Paraguay.

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ABSTRACT

Introduction: Holmium Laser Prostate Enucleation (HoLEP) is an endoscopic surgical technique used to treat obstructive prostatic growth. Currently, the guidelines from the American Urological Association and the European Association of Urology consider HoLEP as a surgical treatment alternative to TURP (Transurethral Resection of the Prostate) and open prostatectomy. **Materials and Methods:** A cross-sectional retrospective observational study of prevalence was conducted from 2022 to 2024. **Results:** Data from 182 patients who underwent HoLEP at the La Costa Medical Center by the same surgical team were analyzed. Regarding the age of the patients, the mean was 66.59 years. For prostate size, the mean was 77.10. The average surgical time was 99.8 minutes. Concerning complications, there was a 2.7% reoperation rate due to hematuria, 1% of patients required blood transfusion, and 1.6% of patients experienced acute urinary retention upon catheter removal, resulting in an overall complication rate of 5.5%. **Conclusion:** Prostate gland enlargement is a natural event of male aging. Among the valid therapeutic alternatives, HoLEP is an option regardless of prostate size. It is currently considered the gold standard in the surgical management of the prostate gland. Our aim is to present the first cases described in our country with results comparable to those found in global medical literature.

Keywords: vening porstatic hyperplasia, Holmium láser enucleation of the prostate, lower urinary tract, symptoms, prostate, urologic surgical procedures.

Corresponding author: Dr. Fernando Guillermo Abarzúa Cabezas. Centro Médico La Costa. Asunción, Paraguay.
Email: fernando.abarzucabezas@gmail.com.

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*Universidad Nacional de Asunción, Facultad de Ciencias Médicas. San Lorenzo, Paraguay.

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RESUMEN

Introducción: La enucleación prostática por láser de Holmio (HOLEP por sus siglas en inglés) es una técnica quirúrgica endoscópica para tratar el crecimiento prostático obstructivo. Actualmente las guías de la Sociedad Americana de Urología y la Sociedad Europea de Urología consideran al HOLEP como alternativa de tratamiento quirúrgico a RTU-P y a la prostatectomía abierta. **Materiales y métodos:** Se realizó un estudio de tipo observacional, descriptivo de prevalencia de corte transversal retrospectivo del año 2022 al 2024. **Resultados:** Se analizaron los datos de 182 pacientes operados de HOLEP en el Centro Médico La Costa por un mismo equipo quirúrgico. Con respecto a la edad de los pacientes operados se encontró una media de 66,59 años. Sobre el tamaño prostático se encontró una media de 77,10. Como tiempo promedio de cirugía un valor de 99,8 minutos. Con respecto a complicaciones se tuvo un 2,7% de episodios de reintervención por hematuria, 1% de pacientes necesitaron transfusión sanguínea y 1,6% de los pacientes presentaron episodios de retención aguda de orina al retiro de la sonda, dando una tasa global de complicaciones de 5,5%. **Conclusión:** El agrandamiento de la glándula prostática es un evento natural del envejecimiento del varón, dentro de las alternativas terapéuticas validas independientes del tamaño se encuentra el HoLep. El mismo es considerado actualmente como el Gold Standard en el manejo quirúrgico de la glándula prostática, nuestra intención presentar los primeros casos descritos en nuestro país con resultados comparables a los descritos en la literatura médica mundial.

Palabras clave: hiperplasia protática venigna, enucleación prostática con láser de Holmio, sintomas del tracto urinario inferior, prostata, procedimientos quirúrgicos urológicos

Introduction

Benign prostatic hyperplasia (BPH) is a fairly common clinical condition that becomes clinically significant when it produces symptoms such as decreased strength and caliber of the urinary stream and increased nocturia, all of which are defined as lower urinary tract symptoms. Enlargement of the prostate gland is considered an event inherent to male aging, with growth influenced by hormonal factors. It is estimated to affect between 50% and 70% of men over 50 years of age, and 80% of men over 70 years of age will experience symptoms associated with benign prostatic hyperplasia. Medical treatment is considered the first line of symptomatic management in patients; when refractoriness is reached, the surgical alternative remains the method of choice for the management of mild and severe symptoms ⁽¹⁾.

The etiology of BPH is still not completely known; however, it is suggested to be influenced by factors such as age, family history, hormonal conditions, increased inflammation, and metabolic syndrome ⁽²⁾.

Histologically, Benign Prostatic Hyperplasia is a proliferation of glandular elements, smooth muscle, and connective tissue of the transition zone of the prostate. This progresses to benign prostatic enlargement that may extend outward from the prostatic urethra or compress it and ultimately cause lower urinary tract obstruction. This, combined with prostatic inflammation, is considered the main cause of lower urinary tract symptoms (LUTS) ⁽³⁻⁵⁾.

Transurethral resection of the prostate (TURP) was considered the standard treatment for benign prostatic hyperplasia smaller than 80 g. Its indication is limited by prostate volume. For prostates larger than 80 g, open techniques (Millin or Freyer) were considered ⁽⁶⁾. Subsequently, various methods were developed to treat large prostate volumes with better results. Bipolar transurethral resection of the prostate (TURP-Bi) and bipolar transurethral enucleation of the prostate (BPEP) showed lower perioperative morbidity and favorable efficacy in the medium and long term. The emergence of techniques

using laser energy, especially Holmium-YAG, allowed extension of applicability independent of prostate size, in addition to providing greater safety and relatively fewer complications than TURP⁽⁴⁾.

HoLEP, an acronym for Holmium Laser Enucleation of the Prostate, is an endoscopic surgical technique used to treat obstructive prostatic enlargement. It was first introduced in 1998 by Drs. Frank Rücker and Gilling, whose trilobular technique is the most studied type of endoscopic prostate surgery and is notable for its safety, efficiency, and speed⁽⁵⁾.

Currently, both the American Urological Association (AUA) and the European Association of Urology (EAU) guidelines consider HoLEP a surgical treatment alternative to TURP and open prostatectomy. The AUA states that it is a procedure independent of prostate size. The EAU highlights that it is an effective and safe procedure⁽⁶⁾.

HoLEP has been shown to be more effective than TURP, with better outcomes such as improved hemostasis, greater improvements in urinary parameters in a short period of time, shorter transurethral catheterization times, and shorter hospital stays⁽⁷⁾.

The objective of this study is to present the recent introduction of the HoLEP technique in Paraguay, describe the first treated cases, and highlight its clinical relevance as an internationally endorsed procedure with the potential to establish itself as the new gold standard in the surgical treatment of benign prostatic hyperplasia.

OBJETIVES

General Objetive:

To describe the initial experience with holmium laser enucleation of the prostate (HoLEP) in a urology service in Paraguay during the period 2022–2024.

Specific Objetives:

1. **To characterize** the treated population

by describing its demographic distribution (age).

2. **To quantify** the baseline characteristics of the disease, including prostate size and pre-procedure PSA values.
3. **To determine** the surgical parameters of the procedure, such as average operative time.
4. **To analyze** the frequency and types of postoperative complications observed in the series.
5. (*Optional but recommended to close the cycle*) **To compare** the obtained results with those reported in the international literature to contextualize their clinical relevance.

Materials and Methods

Study design: An observational, descriptive, cross-sectional retrospective prevalence study was conducted from 2022 to 2024.

Equipment used for the procedures: Laser from the Italian company Quanta System®, Cyber Ho 100-watt model. Endoscopic equipment from Karl Storz®, including laser resectoscope and morcelloscope. Morcellators from Lumenis, VersaCuT™ model, and Karl Storz, DrillCut-X® II model.

POPULATION

Target population: Patients undergoing laser prostate enucleation with holmium laser during the period 2022 to 2024.

Accessible population: Patients undergoing laser prostate enucleation with holmium laser during the period 2022 to 2024 at La Costa Medical Center and performed by the same surgical team.

Inclusion criteria: Patients undergoing laser prostate enucleation with holmium laser at La Costa Medical Center during the period 2022

to 2024, performed by the same surgical team, and with complete data available for statistical analysis.

Exclusion criteria: Patients undergoing laser prostate enucleation with holmium laser performed by another surgical team, with incomplete statistical data, or outside the study period.

Sampling: Non-probabilistic consecutive case sampling.

VARIABLES

Variable	Type
Age	Quantitative
Prostate weight	Quantitative
PSA value	Quantitative
Surgical time	Quantitative
Complications	Qualitative

DATA ANALYSIS

A database was generated from Google.doc using a survey system and subsequently processed using Microsoft Excel 2021®. The presentation of the study was prepared using the Microsoft Word Office LTSC Professional Plus 2021® word processor.

Results

Data from 182 patients who underwent HoLEP at La Costa Medical Center from 2022 to 2024 by the same surgical team were analyzed; incomplete records or cases performed by another operator were excluded.

Regarding patient age, the youngest patients were 47 years old (3 patients) and the oldest were 87 years old (2 cases), yielding a mean age of 66.59 years.

Considering prostate size, a mean of 77.10 was found, with the smallest prostate measuring 20 grams and the largest 230 grams, as measured by ultrasound.

The preprocedure PSA value had a mean of 3.84, with the lowest value being 0.06 and the highest 57.

The average surgical time was 99.8 minutes.

Regarding complications, there were 5 episodes of reintervention due to hematuria, two patients required blood transfusions, and three patients experienced episodes of acute urinary retention after catheter removal.

Discussion

Of the 182 patients who underwent HoLEP at La Costa Medical Center between 2022 and 2024, the mean age was 66.6 years (SD = 8.9; 95% CI $\approx \pm 1.3$), with a range of 47 to 87 years and a median of 67 years. The first quartile was 60, the third quartile 72.25, and the coefficient of variation was 13.3%, indicating a relatively homogeneous population in terms of age. The distribution was approximately symmetrical (skewness = -0.05) with slight platykurtosis (kurtosis = -0.53). These values are consistent with those reported in the literature, such as the study by Blanco Fernández et al., where the average age of treated patients was 65.1 years, which is expected since this age range corresponds to the period of highest incidence of obstructive lower urinary tract symptoms that lead to surgical indication for prostatic enlargement (1,8).

The average prostate size was **77.1 \pm 37.6 g** (range: 20–230 g), with a median of 70 g. The distribution was skewed toward higher values (skewness = 0.95), reflecting the presence of large glands. These results are consistent with series such as that of Gild et al., which report an average of 80 g, and confirm the applicability of HoLEP in prostates of various sizes, including those larger than 80 g.

The box plot shows the distribution of ultrasound-measured prostate weight as a function of age, evidencing a wide variation in gland volume across all analyzed decades and confirming that HoLEP was applied to prostates of different sizes regardless of patient age.

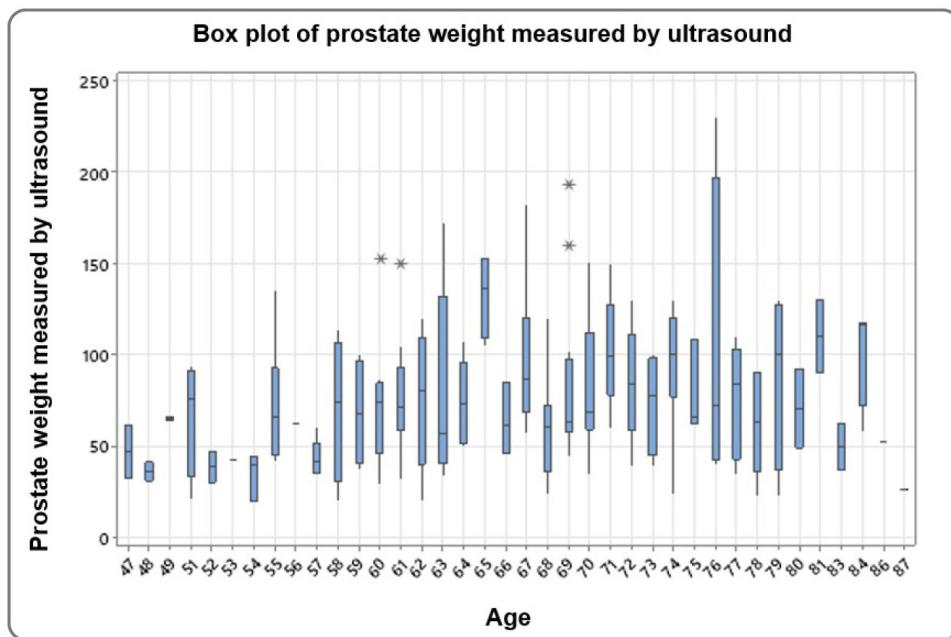


Figure 1. Box plots of age and ultrasound-measured prostate weight in the 182 patients undergoing HoLEP. The median and quartiles show the central distribution of each variable, while extreme values reflect the variability of the studied population. The wide dispersion of prostate size demonstrates the applicability of the procedure in glands of different volumes.

The pre procedure PSA value showed a **mean of 3.84 ng/mL** (SD = 3.67; standard error = 0.27), with a median of 2.74 ng/mL and a wide range between **0.06 and 24.93 ng/mL**, evidencing the clinical heterogeneity of the sample. The first quartile was 1.41 ng/mL and the third quartile 4.87 ng/mL, with a high coefficient of variation (95.4%), positive skewness (2.41), and high kurtosis (8.07), indicating the presence of extreme values. This parameter is relevant both for initial prostate cancer screening and for postoperative follow-up, as studies such as that by Bâcle et al. have demonstrated a significant reduction in PSA after prostate enucleation⁽¹³⁾.

The **average operative time was 99.8 minutes** for the 182 included cases, a value

lower than that reported in other series, such as that of Gürßen et al., who described 178.7 minutes for 200 procedures⁽¹⁴⁾. This result is clinically relevant, as operative times under 100 minutes have been associated with faster recovery of urinary continence, as reported by Doersch and colleagues⁽¹⁵⁾.

Regarding complications, there was a 2.7% rate of reintervention due to hematuria (five patients), 1% of patients required blood transfusion (two patients), and 1.6% of patients experienced episodes of acute urinary retention after catheter removal (three patients), resulting in an overall complication rate of 5.5%.

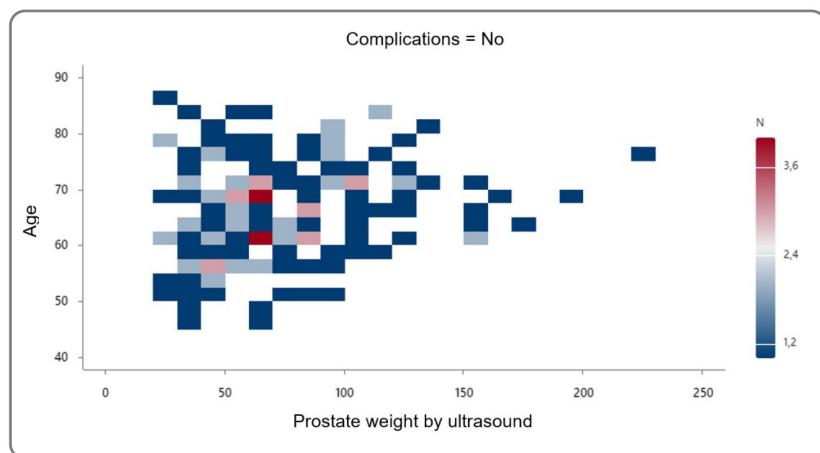


Figure 2. Joint distribution of age and prostate weight in patients without postoperative complications.

Conclusion

Holmium laser enucleation of the prostate (HoLEP) was successfully implemented in our center, constituting the first documented experience in Paraguay. In this initial series of 182 patients, the procedure proved to be safe and effective, with competitive surgical times, a low complication rate (5.5%), and results comparable to those reported in the international literature. These findings support the applicability of HoLEP in prostates of different volumes and consolidate its role as a valid surgical alternative independent of gland size.

Considering the obtained results, HoLEP represents a high value option for the management of benign prostatic hyperplasia in our setting and is projected as the reference standard for the surgical treatment of the disease. The expansion of this technique in Paraguay will strengthen local urological practice, reduce morbidity associated with conventional procedures, and align with the recommendations of major international societies.

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Conflict of interest: The authors declare that there is no conflict of interest.

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Annexes

