World Journal of Urology (2024) 42:281
https://doi.org/10.1007/s00345-024-04984-5

ORIGINAL ARTICLE

Predictive factors of post-HoLEP incontinence: differences between stress and urgency urinary incontinence

Fernando Agreda-Castañeda[1] · Roger Freixa-Sala[1] · Marco Franco[1] · Ramón Bultó-Gonzalvo[1] · Joan Areal-Calama[1]

Received: 25 January 2024 / Accepted: 5 April 2024

Abstract

Introduction The analysis of post-HoLEP urinary incontinence (UI) has traditionally focused on stress UI. Our aim is to evaluate the factors associated with stress and urgency UI in the first month after the surgery.

Methods Data were obtained from patients who underwent HoLEP by the same experienced surgeon. UI was evaluated at one month and at 6 months after the surgery. Three groups were defined: continent patients, patients with pure urgency UI and patients with stress or mixed UI. Preoperative, intraoperative, urodynamic and clinical variables were analyzed and compared between the three groups.

Results In total, 235 subjects were included. One month after the surgery, 156 (66.5%) were continent (group 1), 49 (20.8%) reported pure urgency UI (group 2), and 30 (12.7%) reported some level of stress UI (group 3). In Group 2, the factors associated with urgency UI in the univariate analysis were age, presurgical urgency UI, having diabetes or hypertension. In Group 3, age, prostatic volume, preoperative PSA, time of enucleation, weight of the resection in grams, having an IDC or being diabetic were significant in the univariate analysis. In the multivariate analysis, age predicts both types of UI, while prostatic volume and having an IDC predict stress or mixed UI.

Conclusion In the first month post-HoLEP, age is a predictive factor of urgency UI and stress UI. In addition, prostatic volume and the presence of an indwelling urinary catheter are predictive factors of stress UI.

Keywords HoLEP · Benign prostatic hyperplasia · Stress urinary incontinence · Urgency urinary incontinence · Outcome assessment

Introduction

Holmium laser enucleation of the prostate (HoLEP) is a widespread surgical technique and one that has been in use for more than 20 years [1]. HoLEP has proven to be effective and safe in the treatment of urinary symptoms caused by benign prostatic hyperplasia [2]. Despite its excellent results, urinary incontinence (UI) in the first month after the operation remains an issue. The rates of reported UI cases range from 2 to 30% at thirty days after surgery [3–5]. The extensive range of reported UI cases is related to the wide variety of factors that have been associated with it: surgeon's experience, prostatic volume, age, body mass index, diabetes and duration of the surgery [6–10].

Analyses of post-HoLEP UI have focused on stress UI. Stress UI and urgency UI have been analyzed together in certain cases. Despite the fact that both types of UI differ in causes and treatments, there are no studies that separately analyze each type of UI.

With this study, our aim is to identify predictive factors of each type of UI in the first month post-HoLEP by analyzing a series of cases performed by an experienced surgeon.

Methodology.

Data were obtained from a prospectively maintained database. Included in the data were patients who consecutively underwent HoLEP between 2018 and 2021, with a minimum of 6 months of follow-up and who were operated on by the same surgeon with 200 cases of experience. The study was approved by the Ethics Committee of our Institution (PI-23–085). The data collected included demographic data (age, diabetes, hypertension, smoking habit, the history of ischemic heart disease, pre-surgical urgency urinary incontinence), the use of an indwelling urinary catheter (IDC)

✉ Fernando Agreda-Castañeda
fagreda.germanstrias@gencat.cat

[1] Hospital Universitari Germans Trias I Pujol [Germans Trias I Pujol University Hospital], Barcelona, Spain

Published online: 02 May 2024

at the time of the surgery, micturition questionnaires, uroflowmetry data, prostatic volume, prostate specific antigen (PSA), body mass index (BMI), surgery data (time of laser enucleation, energy applied per gram of resection, resection weight in grams) and postoperative data (micturition and continence questionnaires) at one month and 6 months. HoLEP was performed by the same surgeon (FAC) as per the bilobar technique [11]. A 100-W holmium laser (Lumenis) was used. For morcellation, the VersaCut (Lumenis) device was used. Urinary incontinence (UI) was defined as any need for protection (pads or adult diapers). If the subject was classified as incontinent, to assign each one to the most appropriate continence status group, we asked them the question 6 of the International Consultation on Incontinence Questionnaire-Urinary Incontinence Short Form (ICIQ-UI SF). When post-HoLEP UI is analyzed, urgency UI and stress UI tend to be grouped together and studied as a single variable [6, 10, 12, 13]. We believe the best approach would be to perform an independent analysis. If a patient reports pure urgency UI, it should not be assumed that there is a primary deficit of the external sphincter. On the contrary, if a subject describes stress UI, it should be assumed that the sphincter deficit is a result of the surgery. Then, we divided postoperative continence status into 3 groups: Group 1 (patients who do not use protection, continent patients); Group 2 (patients who report pure urgency UI; i.e., they do not report stress UI); and Group 3 (patients who report stress UI or mixed UI).

The ANOVA test was used to analyze the continuous variables and the chi-square test was used for the categorical variables. The significant variables of the univariate analysis were included in the multivariate analysis. In order to identify predictive factors of UI, pure urgency UI and stress or mixed UI, a multivariate binary logistic regression model was performed (Group 1 was used as reference). The program SPSS version 23 was used.

Results

235 subjects were included for the analysis. Out of these subjects, 92 (39.3%) had an IDC at the time of the surgery. One month after the surgery, 156 (66.5%) were continent (group 1), 49 (20.8%) reported pure urgency UI (group 2), and 30 (12.7%) reported some level of stress UI (group 3). Table 1 describes the three groups analyzed. As can be seen, there are differences in age, prostatic volume, preoperative PSA, time of enucleation, weight of the resection in grams and percentages of the following: patients with an IDC, subjects with pre-surgical urgency UI, diabetes and hypertension.

Table 1 Baseline characteristics: demographic, preoperative and postoperative characteristics

Continence status at one-month post-HoLEP	Group 1 Continent subjects at one month	Group 2 Pure urgency UI	Group 3 Stress and mixed UI	p-value
n (%)	156 (66.5%)	49 (20.8%)	30 (12.7%)	–
Age, years	69 (9)	73 (8)	75 (8.5)	0.002
IPSS voiding, score	14 (9)	12.5 (5.5)	12 (6.75)	NS
IPSS storage, score	10 (7)	10 (5.75)	9.5 (7)	NS
Episodes of nocturia, n	3 (2)	3 (1)	3 (2)	NS
Quality of life, score	5 (2)	5 (2)	5 (2.75)	NS
Maximum flow, mL/s	7.7 (5)	8 (3.8)	7 (5)	NS
Post-void residual urine, mL	109.5 (165.5)	100 (110)	100 (228)	NS
Prostatic volume, mL	90.0 (50.0)	100 (60)	115.6 (65)	0.02
PSA, ng/dL	3.6 (4.25)	3.23 (4.46)	6.16 (6.36)	0.005
BMI, Kg/m^2	27.0 (4.32)	28.41 (5.01)	28 (4.75)	NS
Enucleation time, minutes	35.0 (18.0)	35.5 (19.75)	45 (21.25)	0.03
Energy applied per resected gram (Kj/g)	1.94 (1.52)	2.42 (1.78)	1.47 (1.03)	0.02
Resected grams, grams	49 (33.56)	54.5 (50.75)	71.79 (54.51)	0.01
Subjects with an IDC (%)	35.5	36.7	63.3	0.0001
Presurgical urgency UI (%)	19.8	38.1	40.1	0.03
Smoker (%)	26.3	22.4	17.2	NS
Ischemic heart disease (%)	19.1	33.1	23.1	NS
Diabetes (%)	26.1	43.8	48.3	0.01
Hypertension (%)	61.4	81.3	75.9	0.02

Continuous variables are shown as median (interquartile range); categorical variables are shown as percentages

In Group 2 (pure urgency UI), the factors associated with urgency UI in the univariate analysis were age, pre-surgical urgency UI, having diabetes or hypertension. In this Group, the only independent predictive factor in the multivariate analysis was age (OR 1.01; 95%CI 1.01–1.15), Table 2.

In Group 3 (stress or mixed UI), age, prostatic volume, preoperative PSA, time of enucleation, weight of the resection in grams and having an IDC or being diabetic were significant in the univariate analysis. In this Group, the independent predictive factors in the multivariate analysis were age (OR 1.09; 95%IC 1.01–1.17), weight of the resection in grams (OR 1.01; 95%IC 1.0–1.02) and having an IDC (OR 3.12; 95%IC 1.10–8.88), Table 2.

When analyzing Groups 2 and 3 together vs. Group 1, the independent predictive factors were age (OR 1.09; 95%IC 1.03–1.15) and prostatic volume (OR 1.01; 95%IC 1.0–1.02).

In the assessment at 6 months, 216 (92%), 10 (4%) and 9 (4%) respectively, were continent, reported pure urgency UI and reported stress or mixed UI.

Discussion

Traditionally, post-HoLEP UI studies have focused on stress UI. Our study is the first one to separately analyze the different types of UI, in the first month after the surgery, and at the hands of an experienced surgeon. Our results prove that age is the most significant independent predictive factor in UI of any type. In addition, in the case of stress UI, the presence of an indwelling urinary catheter and the prostatic volume are independent predictive factors.

In our cohort, patients with pure post-HoLEP urgency UI are elderly patients, more often have urgency UI before the surgery, and more often have diabetes or hypertension compared to continent patients. All these factors have been reported in cases of overactive bladder [14, 15]. The role of diabetes in post-HoLEP incontinence is subject to debate. There are studies that prove its connection and others that rule it out [6, 13, 16, 17]. These authors do not distinguish between urgency and stress UI, a fact that could affect the analysis. Before this report, hypertension had not been described as a factor associated with post-HoLEP UI.

El Tayeb et al. describe pre-surgical urgency UI as a predictive factor of post-HoLEP UI (any type) [10]. Given that urgency UI is the most severe grade of overactive bladder, it is to be expected that, in the first month following surgery, it is these patients who have a greater risk of urgency UI.

Our multivariate analysis shows us that the only independent predictive factor of urgency UI one month after HoLEP is age. Age is one of the factors that is most associated with post-HoLEP UI (of any kind) [6, 10, 12, 13]. In addition, one author described frailty (measured using a validated scale) as a predictive factor of UI [10]. All of the above leads us to believe that pure, post-HoLEP urgency UI is associated with factors of frailty and aging in the subject.

By contrast, post-HoLEP stress UI has been widely studied. Associated factors and techniques aiming to reduce it have been described [7–9, 18]. In our cohort, the subjects with post-HoLEP stress UI are elderly, have larger prostates (resulting in greater levels of PSA, a greater length of surgery, a higher weight of resection in grams), they are more likely to have an IDC, more likely to have urgency UI before surgery, and are more likely to have diabetes compared to continent subjects. Age has been described as a factor for post-HoLEP stress UI by most authors who have analyzed it [6, 12, 13].

Prostatic volume is a factor that is widely associated with post-HoLEP incontinence [6, 8, 10]. A theory has been put forward that a greater gland volume results in greater manipulation of the sphincter during enucleation, which could result in damage caused by stretching or de-epithelialization [4, 18]. Our analysis confirms these findings. The resected volume is an independent predictive factor of stress UI. In contrast, resected volume does not predict urgency UI; continent subjects and subjects with urgency UI have prostates of the same volume (Table 1), nor does it show a difference between the energy applied per gram in terms of post-HoLEP urgency UI. These findings have not been previously described and lead us to believe that urgency UI is inherent to patient factors but not to surgery/prostate factors.

Having an IDC at the time of surgery has also been described as a factor for post-HoLEP stress UI. Having a catheter and the time the patient has had it for are associated with a loss of sphincter tone [6, 8, 12]. In our cohort, the presence of an IDC is not related to post-HoLEP urgency UI: having an IDC affects the function of the striated sphincter

Table 2 Multivariate analysis: factors of urinary incontinence at one month post-HoLEP

	Factor	OR[a]	95% CI[b]	P-value
Pure UUI (Group 2)	Age	1.01	1.02–1.15	0.006
	Diabetes	0.59	0.25–1.37	0.224
	Hypertension	0.65	0.25–1.73	0.398
	Presurgical urgency UI	0.50	0.21–1.18	0.116
Stress + mixed UI (Group 3)	Age	1.09	1.01–1.17	0.025
	Indwelling UC	3.13	1.11–8.88	0.032
	Resection weight in grams	1.01	1.00–1.02	0.044
	Prostatic Volume	0.99	0.98–1.00	0.661
	PSA	0.99	0.90–1.08	0.844
	Diabetes	0.50	0.23–1.11	0.091
	Enucleation time	0.99	0.91–1.01	0.654

a = Odds ratio; b = 95% confidence interval

but does not increase the risk of postoperative pure urgency UI.

The table summarizing the multivariate analyses (Table 2) enables us to draw some conclusions. Age predicts both types of UI. Additionally, in patients with stress UI, the gland volume and the presence of an IDC at the time of surgery are independent predictive factors. This leads us to believe that postoperative urgency UI depends on non-prostatic factors (age) and that stress UI is directly affected by prostatic and non-prostatic factors (IDC, prostatic volume and age).

This study is not without limitations. Our definition of incontinence could leave out of the analysis those patients with such mild loss that they do not use protection. We also do not have studies on pre- or postsurgical pressure/flow. Despite this, this is the first study performing an analysis that makes a distinction between the types of UI in the first month after surgery and provides independent factors that help to predict short-term continence outcomes.

Conclusion

In the first month post-HoLEP, age is a predictive factor of urgency UI and stress UI. In addition, prostatic volume and the presence of an indwelling urinary catheter are predictive factors of stress UI. This information could be useful for informing subjects about their probable postoperative course.

Acknowledgements To all the wonderful people of Can Ruti.

Author contributions Agreda-Castañeda, Fernando: conceptualization, methodology, formal analysis, investigation, data curation, writing original. Freixa-Sala, Roger: conceptualization, investigation, data curation, review & editing draft. Franco, Marco: data curation, review & editing draft. Bulto-Gonzalvo, Ramón: investigation, data curation. Areal-Calama, Joan: review & editing draft, supervision.

Funding No funds, grants, or other support was received.

Data availability The data that support the findings of this study are available on request from the corresponding author (FAC).

Declarations

Conflict of interest The authors certify that they have no conflicts of interest to declare. The authors have no relevant financial or non-financial interests to disclose.

References

1. Gratzke C, Bachmann A, Descazeaud A, Drake MJ, Madersbacher S, Mamoulakis C et al (2015) EAU guidelines on the assessment of non-neurogenic male lower urinary tract symptoms including benign prostatic obstruction. Eur Urol 67(6):1099–1109
2. Zhang X, Shen P, He Q, Yin X, Chen Z, Gui H et al (2016) Different lasers in the treatment of benign prostatic hyperplasia: a network meta-analysis. Sci Rep 6(1):23503
3. Agreda Castañeda F, Buisan Rueda Ó, Areal Calama JJ (2020) Análisis de las complicaciones en el aprendizaje del HoLEP: revisión sistemática. Actas Urol Esp 44(1):1–8
4. Saitta G, Becerra JEA, del Álamo JF, González LL, Elbers JR, Suardi N et al (2019) 'En Bloc' HoLEP with early apical release in men with benign prostatic hyperplasia. World J Urol 37(11):2451–2458
5. Placer J, Gelabert-Mas A, Vallmanya F, Manresa JM, Menéndez V, Cortadellas R et al (2009) Holmium laser enucleation of prostate: outcome and complications of self-taught learning curve. Urology 73(5):1042–1048
6. Houssin V, Olivier J, Brenier M, Pierache A, Laniado M, Mouton M et al (2021) Predictive factors of urinary incontinence after holmium laser enucleation of the prostate: a multicentric evaluation. World J Urol 39(1):143–148
7. Cho KJ, Koh JS, Choi JB, Kim JC (2018) Factors associated with early recovery of stress urinary incontinence following holmium laser enucleation of the prostate in patients with benign prostatic enlargement. Int Neurourol J 22(3):200–205
8. Das AK, Teplitsky S, Chandrasekar T, Perez T, Guo J, Leong JY et al (2020) Stress urinary incontinence post-holmium laser enucleation of the prostate: a single-surgeon experience. Int Braz J Urol 46(4):624–631
9. Oka S, Kobayashi K, Matsuda K, Takai K (2020) Significance of membranous urethral length for recovery from postoperative urinary incontinence following holmium laser enucleation of the prostate. Int Neurourol J 24(4):358–364
10. Elsaqa M, Dowd K, El Mekresh A, Doersch K, El Tayeb M (2023) Predictors of postoperative urinary tract infection following holmium laser enucleation of prostate. Can Urol Assoc J. https://doi.org/10.5489/cuaj.8269
11. Buisan O, Saladie JM, Ruiz JM, Bernal S, Bayona S, Ibarz L (2011) Diode laser enucleation of the prostate (Dilep): technique and initial results. Actas Urol Esp 35(1):37–41
12. Fujisaki A, Goto A, Endo F, Muraishi O, Hattori K, Yasumura S (2016) Practical index of urinary incontinence following holmium laser enucleation of the prostate: a case-series study of the 24-hour pad test immediately after catheter removal. Urol Int 97(3):310–319
13. Nam JK, Kim HW, Lee DH, Han JY, Lee JZ, Park SW (2015) Risk factors for transient urinary incontinence after holmium laser enucleation of the prostate. World J Mens Health 33(2):88
14. Zhu Y, Zhu Z, Chen J (2019) Risk factors associated with the progression of overactive bladder among patients with type 2 diabetes. Int J Clin Pract. https://doi.org/10.1111/ijcp.13395
15. Shaw C, Wagg A (2020) Overactive bladder in frail older adults. Drugs Aging 37(8):559–565
16. Acikgoz O, Yilmaz M, Aybal HC et al (2021) Impact of diabetes mellitus on urinary continence after holmium laser enucleation of the prostate due to lower urinary tract symptoms: a retrospective study. Cent European J Urol 74:535–540
17. Hout M, Gurayah A, Arbelaez MCS, Blachman-Braun R, Shah K, Herrmann TRW et al (2022) Incidence and risk factors for postoperative urinary incontinence after various prostate enucleation procedures: systemic review and meta-analysis of PubMed literature from 2000 to 2021. World J Urol 40(11):2731–2745
18. Agreda-Castañeda F, Freixa-Sala R, Franco M, Areal-Calama J (2023) Sphincter First HoLEP: a new technique to improve continence. Videourology. https://doi.org/10.1089/vid.2023.0030