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Benign Prostatic Hyperplasia Endoscopic Surgical Procedures in Kidney Transplant Recipients: A Comparison Between Holmium Laser Enucleation of the Prostate, GreenLight Photoselective Vaporization of the Prostate, and Transurethral Resection of the Prostate

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Abstract

Purpose: The main objective of this multicentric retrospective pilot study was to evaluate the 1-year follow-up safety (i.e., minor [Clavien–Dindo I–II] and major [Clavien–Dindo ≥III] complications) of holmium laser enucleation of the prostate (HoLEP), GreenLight photoselective vaporization of the prostate (GL PVP), and transurethral resection of the prostate (TURP) performed after kidney transplantation (KT). The secondary objectives were to evaluate the efficacy and to assess the impact of these procedures on graft function.
Materials and Methods: We retrospectively included all KT recipients who underwent a HoLEP or GL PVP or TURP for benign prostatic hyperplasia (BPH) in three French university centers.
Results: From January 2013 to April 2018, 60 BPH endoscopic surgical procedures in KT recipients were performed: 17 HoLEP (HoLEP group), 9 GL PVP (GL PVP group), and 34 TURP (TURP group). Age, body mass index, preoperative serum creatinine, preoperative International Prostatic Symptom Score, preoperative $Q_{\max}$, preoperative prostate-specific antigen, medical history of acute urinary retention (AUR), urinary tract infection (UTI), and indwelling urethral catheter were similar in all study groups. Mean preoperative prostate volume was higher in HoLEP group. The rate of overall postoperative complications was statistically higher in the HoLEP group (11/17 [64.7%] *vs* 1/9 [11.1%] *vs* 12/34 [35.3%] in HoLEP group, GL PVP group, and TURP group, respectively, $p=0.02$), with higher rate of long-term UTI and AUR. $Q_{\max}$ improved in all groups after operation. Delta postoperative month 12—preoperative serum creatinine was similar in the all groups.
Conclusions: Although our study is underpowered, the rate of postoperative complications is higher with HoLEP procedure, in comparison with GL PVP, for the treatment of BPH after KT. One-year efficacy is similar in HoLEP, GL PVP, and TURP groups. Further prospective randomized controlled trials are needed to confirm our results.

Keywords: HoLEP, GreenLight, TURP, BPH, kidney transplantation, LUTS

Introduction

Kidney transplantation (KT) is currently the best therapeutic option for patients with end-stage renal disease (ESRD).[1,2] The mean age of patients undergoing KT has been increasing in recent years. Indeed, in 2017, >4000 KTs were performed in recipients 65 years or older and 16,000 KTs in recipients <65 years, in the United States.[3] KT in elderly patients reduces mortality risk compared with dialysis[4] and presents similar graft survival rates compared with those observed for younger recipients.[5,6]

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Benign prostatic hyperplasia (BPH) is one of the most common causes of lower urinary tract symptoms (LUTS) and one of the most common diseases in elderly men. In general population, LUTS has a prevalence ranging from 16% to 52% and the prevalence increases with age.[7] Moreover, the prevalence of bladder outlet obstruction (BOO) because of BPH may be occult and underdiagnosed in older men on dialysis, owing to oliguria or anuria.

Transurethral resection of the prostate (TURP) is considered the ''gold standard'' treatment for LUTS attributable to BPH and its safety have been confirmed in large series.[8,9] Volpe et al.[10] and Sarier et al.[11] reported that TURP for LUTS attributable to BPH in KT recipients is safe and effective because it improves urinary flow, bladder emptying, and related urinary symptoms and allows significant improvement of graft function.

Recently, holmium laser technology and GreenLight laser technology have been developed for BPH endoscopic procedure to reduce the morbidity of the surgical procedure, with less bleeding and fewer complications. In addition, laser technologies use saline for irrigation, eliminating the risk of post-TURP syndrome.[12,13] To our knowledge, no previous studies evaluated the use of the holmium laser technology and GreenLight laser technology for BPH endoscopic procedure in KT recipients. Thus, these new technologies could be useful in KT recipients, patients subject to surgical complications because of immunosuppression. However, these new surgical procedures have some particularities that need to be evaluated. Indeed, after prostate enucleation with holmium laser, a morcellator is used, with a high risk of bladder damage in KT recipient, owing to bladder dissection for ureterovesical anastomosis. Moreover, during GreenLight photoselective vaporization of the prostate (GL PVP), a potential risk of ureterovesical anastomosis lesion exists because of the design of the fiber (70° deflecting and side firing).

The main objective of this multicentric retrospective pilot study was to evaluate the 1-year follow-up safety (i.e., minor [Clavien–Dindo I–II] and major [Clavien–Dindo ≥III] complications) of holmium laser enucleation of the prostate (HoLEP), GL PVP, and TURP performed after KT.

The secondary objectives were to evaluate the efficacy and to assess the impact of these procedures on graft function.

Materials and Methods

Patients and database

After informed consent from the patients, we retrospectively included all KT recipients (from living and deceased donors) who underwent BPH endoscopic procedure (HoLEP or GL PVP or TURP) in three French university centers.

According to French legislation, retrospective studies are not subject to an ethics committee.

Indications of BPH endoscopic procedure

Indications of BPH endoscopic procedure, in accordance with European clinical practice guidelines, were as follows: (1) acute urinary retention (AUR) necessitating a permanent indwelling urethral catheter, (2) moderate to severe lower urinary tracts symptoms (LUTS) (International Prostatic Symptom Score [IPSS] ≥10), (3) maximum urinary flow rate (Q_{max}) <10 mL/s, (4) previous medical therapy failure, (5) postvoiding residual urinary volume (PVR) >100 mL in the presence of recurrent urinary tract infections (UTIs), and (6) increased serum creatinine owing to AUR.

The exclusion criteria of this study were as follows: (1) LUTS as a result of prostate cancer confirmed at pathology analysis and (2) neurological disorders confirmed at urodynamic tests.

Urological assessment before BPH endoscopic procedure

Preoperative evaluations included digital rectal examination, urinary ultrasound, transrectal ultrasound, serum prostate-specific antigen (PSA), uroflowmetry with maximum urinary flow rate (Q_{max}), PVR, IPSS assessment, serum creatinine, and urinary analysis with culture. Urodynamic test was performed in selected patients with a distrust of neurological disease.

Surgical procedure

Holmium laser enucleation of the prostate. HoLEP procedures were performed by two experienced surgeons, according to a previously described standardized surgical technique.[14]

A Lumenis™ 100 W laser generator with a 550 μm reusable laser fiber was used for all HoLEP procedures along with complete endoscopic instrumentation, including a 26F double-flow endoscope and a Piranha™ morcellator manufactured by Richard Wolf. HoLEP surgeons performed an ''*en bloc*'' technique (i.e., enucleation of the whole prostate adenoma as a single piece).

GreenLight photoselective vaporization of the prostate. GL PVP procedures were performed by three experienced surgeons, as previously described by Misrai et al.[15]

A GreenLight XPS™ 532 nm laser generator (Boston Scientific) was used for all GL PVP procedures with HPS™ 120 W laser fibers. GL PVP was conducted with a Wolf double-flow 24.5F endoscope while the bladder was continuously irrigated with saline.

Transurethral resection of the prostate. TURP was performed by five experienced surgeons using a 26F continuous-flow bipolar resectoscope according to the standard technique.

Pre- and postoperative management. All BPH endoscopic procedures were performed under general or spinal anesthesia. Preoperative antibiotic prophylaxis was administrated to all patients, according to local practice guidelines.

Following the different BPH endoscopic procedures, a three-way 24F silicon Foley catheter, with irrigation, was inserted with a 30 mL balloon postoperatively and removed at the surgeon's discretion typically 24-hour after the procedure.

Collected variables and outcomes

Collected patients preoperative characteristics variables were as follows: age (years), time between KT and BPH endoscopic procedure (months), body mass index (BMI [kg/m^2]), preoperative serum creatinine (μmol/L), preoperative IPSS, preoperative Q_{max} (mL/s), preoperative PSA (ng/mL), preoperative prostate volume (cm^3), medical history of previous BPH surgeries, medical history of AUR, medical history of UTI, medical history of indwelling urethral catheter, KT indications, ureterovesical anastomosis type, and KT side.

Collected intraoperative outcomes and postoperative complications outcomes were as follows: operative time (minutes), weight of removed tissue/operative time ratio (g/min), delta postoperative day (POD) 1—preoperative hemoglobin (Hb; g/dL), length of hospital stay (days), early (<28 days) postoperative complications, and 1-year follow-up postoperative complications (according to the Clavien–Dindo classification[16]).

Collected functional and urological outcomes after BPH procedure were as follows: delta postoperative month (POM) 3—preoperative serum creatinine (μmol/L), delta POM 6—preoperative serum creatinine (μmol/L), delta POM 12—preoperative serum creatinine (μmol/L), delta POM 3—preoperative PSA (ng/mL), and delta POM 6—preoperative Q_{max} (mL/s).

Statistical analysis

Sixty BPH endoscopic surgical procedures in KT recipients were included. Quantitative data were expressed as median with 95% confidence intervals and qualitative data as numbers and proportions. Patient preoperative characteristics, intraoperative outcomes, postoperative complications outcomes, functional and urological outcomes after BPH endoscopic procedure were compared between HoLEP, GL PVP, and TURP. Quantitative values were compared with Kruskal–Wallis test. If the result indicates that at least one of the treatments is different from others, we used Tukey–Kramer multiple comparison method. Wilcoxon test was used for comparison between two groups. Qualitative values were compared with the χ^2 test or Fisher's exact test. Analyses were performed using Prism 7.0a (GraphPad Software, Inc., La Jolla, CA), SPSS 20.0 (SPSS, Inc., Arlington, VA), and SAS software, version 9.4 of the SAS System for Windows (Copyright© 2019 SAS Institute, Inc.). A bilateral value of $p < 0.05$ was considered statistically significant.

Results

Patients characteristics

From January 1, 2013 to April 30, 2018, 60 BPH endoscopic surgical procedures in KT recipients were performed in three French university centers. Seventeen patients were in the HoLEP group, 9 patients in GL PVP group, and 34 patients in TURP group.

Age, BMI, preoperative serum creatinine, preoperative IPSS, preoperative Q_{max}, preoperative PSA, medical history of AUR, medical history of UTI, and medical history of indwelling urethral catheter were similar between the three groups (Table 1). The median time between KT and BPH endoscopic procedure was statistically longer in HoLEP group (64.5 [4.2–123.1] months *vs* 8.3 [5.2–52.9] months *vs* 6.6 [2.4–42.6] months in HoLEP group, GL PVP group and TURP group, respectively, $p = 0.02$). The median preoperative prostate volume was statistically higher in the HoLEP group (56.0 [50.0–70.0] cm^3 *vs* 40.0 [40.0–40.0] cm^3 *vs* 40.0 [40.0–50.0] cm^3 in HoLEP group, GL PVP group and TURP group, respectively, $p = 0.01$). The KT indications were similar in the three study groups (Table 1). All urinary anastomosis, performed during the KT, were ureterovesical anastomosis. Six patients, in HoLEP group, had an ureterovesical anastomosis according to the Politano Leadbetter technique and all the others patients had an ureterovesical anastomosis according to the Lich–Gregoir technique ($p = 0.0002$). Right KTs were statistically more frequent in HoLEP group (15/17 [88.2%] *vs* 3/9 [33.3%] *vs* 18/34 [52.9%] in the HoLEP group, GL PVP group, and TURP group, respectively, $p = 0.01$). Patient characteristics are given in Table 1.

Intraoperative outcomes and postoperative complications

The median operative time was statistically longer in HoLEP group (55.0 [47.0–85.0] minutes *vs* 40.0 [30.0–46.0] minutes *vs* 60.0 [45.0–80.0] minutes in HoLEP group, GL PVP group, and TURP group, respectively, $p = 0.04$), because of higher mean preoperative prostate volume in HoLEP group. The weight of removed tissue/operative time ratio was similar in HoLEP and TURP groups (Table 2). Because of vaporization, weight of removed tissue measure was not possible in the GL PVP group. The mean energy delivered to the prostate was 75.7 ± 8.3 kJ in HoLEP group and 135.4 ± 38.1 kJ in GL PVP group. There were no differences in delta POD 1—preoperative Hb in the three groups. The median length of hospital stay was statistically shorter in HoLEP group (1.0 [1.0–2.0] days *vs* 3.0 [3.0–4.0] days *vs* 4.0 [4.0–5.0] days in HoLEP group, GL PVP group, and TURP group, respectively, $p < 0.0001$).

The rate of overall postoperative complications was statistically higher in the HoLEP group (11/17 [64.7%] *vs* 1/9 [11.1%] *vs* 12/34 [35.3%] in HoLEP group, GL PVP group, and TURP group, respectively, $p = 0.02$) (Table 2). The rate of overall postoperative complications was only statistically higher in the HoLEP group in comparison with the GL PVP group (overall postoperative complications rate: HoLEP *vs* GL PVP [$p = 0.02$]; TURP *vs* HoLEP [$p = 0.05$] and TURP *vs* GL PVP [$p = 0.2$]).

In terms of early (<28 days) postoperative complications, there were no differences concerning minor (Clavien I–II) and major (Clavien ≥III) complications rate between the three study groups (Table 2). Indeed, anemia necessitating blood transfusion occurred in one patient in HoLEP group (1/17 [5.9%]) ($p = 0.3$). UTI occurred in one patient in TURP group (1/34 [2.9%]) ($p = 0.7$). AUR necessitating bladder catheterization occurred in four patients in HoLEP group (4/17 [23.5%]), in one patient in GL PVP group (1/9 [11.1%]), and in seven patients in TURP group (7/34 [20.6%]) ($p = 0.7$). Clot retention necessitating surgical recovery occurred in four patients in TURP group (4/34 [11.8%], $p = 0.2$). No major complications Clavien ≥IV occurred.

In terms of 1-year follow-up postoperative complications, minor (Clavien I–II) and major (Clavien ≥III) complications rate were statistically higher in the HoLEP group (Table 2). Indeed, UTI occurred in five patients in HoLEP group (5/17 [29.4%] *vs* 0 [0%] *vs* 0 [0%] in HoLEP group GL PVP group and TURP group, respectively, $p = 0.001$). AUR necessitating bladder catheterization occurred in five patients in HoLEP group (5/17 [29.4%] *vs* 0 [0%] *vs* 1 [2.9%] in HoLEP group,

Table 1. Patients Preoperative Characteristics

	Overall population (n = *60*)	*HoLEP group* (n = *17*)	*GL PVP group* (n = *9*)	*TURP group* (n = *34*)	p
Age (years)					
Median (95% CI)	68.6 (64.1–72.6)	67.1 (63.9–71.7)	65.6 (58.9–74.1)	69.6 (65.1–73.0)	0.7
Time between KT and BPH endoscopic procedure (months)					
Median (95% CI)	10.6 (2.7–65.0)	64.5 (4.2–123.1)	8.3 (5.2–52.9)	6.6 (2.4–42.6)	**0.02**
BMI (kg/m^2)					
Median (95% CI)	24.0 (21.9–26.0)	23.5 (22.1–26.0)	24.0 (21.0–26.0)	24.0 (22.0–26.0)	0.9
Preoperative serum creatinine (μmol/l)					
Median (95% CI)	176 (132.0–248.0)	176 (166.0–248.0)	145 (120.0–160.0)	191 (132.0–281.0)	0.1
Preoperative IPSS					
Median (95% CI)	15.0 (11.0–17.0)	14.0 (6.5–28.5)	16.0 (15.0–16.0)	14.5 (14.0–15.5)	1
Preoperative Q_{max} (mL/s)					
Median (95% CI)	9.0 (6.0–12.0)	10.5 (6.0–14.0)	8.6 (5.0–15.0)	9.0 (5.9–11.0)	1
Preoperative PSA (ng/mL)					
Median (95% CI)	2.7 (1.2–9.5)	2.7 (1.7–8.4)	19.5 (12.0–27.0)	1.3 (0.7–4.0)	0.2
Preoperative prostate volume (cm^3)					
Median (95% CI)	40.0 (40.0–50.0)	56.0 (50.0–70.0)	40.0 (40.0–40.0)	40.0 (40.0–50.0)	**0.01**
Previous BPH operation, *n* (%)	1 (1.7)	0 (0)	0 (0)	1 (2.9)	0.7
Medical history of AUR *n* (%)	34 (56.7)	10 (58.8)	5 (55.6)	19 (55.9)	1
Medical history of UTI *n* (%)	9 (15.0)	5 (29.4)	1 (11.1)	3 (8.8)	0.1
Medical history of indwelling urethral catheter, *n* (%)	31 (51.7)	8 (47.1)	4 (44.4)	19 (55.9)	0.8
KT indications, *n* (%)					
IgA nephropathy	6 (10)	3 (17.6)	0 (0)	3 (8.8)	0.2
Diabetic nephropathy	12 (20)	2 (11.8)	2 (22.2)	8 (23.5)	
Polycystic kidney disease	14 (23.3)	1 (5.9)	2 (22.2)	11 (32.4)	
Nephroangiosclerosis	9 (15)	4 (23.5)	1 (11.1)	4 (2.9)	
Glomerulonephritis	13 (21.7)	3 (17.6)	2 (22.2)	8 (23.5)	
Chronic interstitial nephritis	4 (6.7)	3 (17.6)	1 (11.1)	0 (0)	
Malformities uropathy	2 (3.3)	1 (5.9)	1 (11.1)	0 (0)	
Ureterovesical anastomosis type, *n* (%)					
Lich–Gregoir	54 (90)	11 (64.7)	9 (100)	34 (100)	**0.0002**
Leadbetter	6 (10)	6 (35.3)	0 (0)	0 (0)	
KT side, *n* (%)					
Left	24 (40)	2 (11.8)	6 (66.7)	16 (47.1)	**0.01**
Right	36 (60)	15 (88.2)	3 (33.3)	18 (52.9)	

Boldface values indicate statistical significance.

AUR = acute urine retention; BMI = body mass index; BPH = benign prostatic hyperplasia; CI = confidence interval; GL PVP = GreenLight photoselective vaporization of the prostate; HoLEP = holmium laser enucleation of the prostate; KT = kidney transplantation; IgA = immunoglobulin A; IPSS = International Prostatic Symptom Score; PSA = prostate-specific antigen; Q_{max} = maximum urinary flow rate; TURP = transurethral resection of the prostate; UTI = urinary tract infection.

Table 2. Intraoperative Outcomes and Postoperative Complications

	Overall population (n = *60*)	*HoLEP group* (n = *17*)	*GL PVP group* (n = *9*)	*TURP group* (n = *34*)	p
Operative time (minutes)					
Median (95% CI)	60 (40.0–80.0)	55.0 (47.0–85.0)	40.0 (30.0–46.0)	60.0 (45.0–80.0)	**0.04**
Weight of removed tissue/operative time ratio (g/min)					
Median (95% CI)	0.4 (0.35–0.49)	0.4 (0.29–0.66)	*	0.4 (0.35–0.43)	0.3
Delta POD1–preoperative hemoglobin (g/dL)					
Median (95% CI)	−0.6 (−1.5 to 0.0)	−1.1 (−1.8 to −0.6)	−0.5 (−0.5 to 0.0)	0 (−1.5 to 0.3)	0.1
Length of hospital stay (days)					
Median (95% CI)	4.0 (3.0–4.0)	1.0 (1.0–2.0)	3.0 (3.0–4.0)	4.0 (4.0–5.0)	**<0.0001**
Overall postoperative complications (Clavien–Dindo classification), *n* (%)					
None	36 (60)	6 (35.3)	8 (88.9)	22 (64.7)	**0.02**
At least one complication	24 (40)	11 (64.7)	1 (11.1)	12 (35.3)	
Early postoperative complications (<28 days) (Clavien–Dindo classification), *n* (%)					
I–II					
Anemia necessitating blood transfusion	1 (1.7)	1 (5.9)	0 (0)	0 (0)	0.3
UTI	1 (1.7)	0 (0)	0 (0)	1 (2.9)	0.7
IIIa					
AUR necessitating bladder catheterization	12 (20)	4 (23.5)	1 (11.1)	7 (20.6)	0.7
IIIb					
Clot retention necessitating surgical recovery	4 (6.7)	0 (0)	0 (0)	4 (11.8)	0.2
IV–V	0 (0)	0 (0)	0 (0)	0 (0)	1
One-year postoperative complications (Clavien–Dindo classification), *n* (%)					
I–II					
Anemia necessitating blood transfusion	1 (1.7)	1 (5.9)	0 (0)	0 (0)	0.3
UTI	5 (8.3)	5 (29.4)	0 (0)	0 (0)	**0.001**
IIIa					
AUR necessitating bladder catheterization	6 (10)	5 (29.4)	0 (0)	1 (2.9)	0.01
IIIb					
Clot retention necessitating surgical recovery	1 (1.7)	0 (0)	0 (0)	1 (2.9)	0.7
IV–V	0 (0)	0 (0)	0 (0)	0 (0)	1

Boldface values indicate statistical significance.
POD = postoperative day.

Table 3. Functional and Urological Outcomes After Benign Prostatic Hyperplasia Endoscopic Procedure

	Overall population (n=60)	*HoLEP group* (n=17)	*GL PVP group* (n=9)	*TURP group* (n=34)	p
Delta POM 3—preoperative serum creatinine (μmol/L) Median (95% CI)	−13.0 (−50.0 to 7.0)	−19.0 (−34.0 to −4.0)	−0.5 (−20.0 to 8.0)	−9.5 (−60.0 to 6.5)	0.6
Delta POM 6—preoperative serum creatinine (μmol/L) Median (95% CI)	−1.5 (−35.5 to 30.5)	1.0 (−23.0 to 45.0)	5.0 (−4.0 to 6.0)	−8.5 (−41.0 to 3.0)	0.5
Delta POM 12—preoperative serum creatinine (μmol/L) Median (95% CI)	−2.5 (−43.5 to 35.5)	5.0 (−38.0 to 114.0)	−4.0 (−26.0 to −1.5)	−3.0 (−52.5 to 18.5)	0.6
Delta POM 3—preoperative PSA (ng/mL) Median (95% CI)	−1 (−2.5 to −0.04)	−1.45 (−3.8 to −0.9)	−1.5 (−2.5 to −0.1)	0.2 (0.0–0.6)	0.2
Delta POM 6—preoperative Q_{max} (mL/s) Median (95% CI)	8.0 (5.0–14.1)	9.95 (5.0–14.9)	10.0 (2.0–14.1)	8.0 (7.0–8.0)	0.9

POM = postoperative month; PVR = postvoiding residual urine volume.

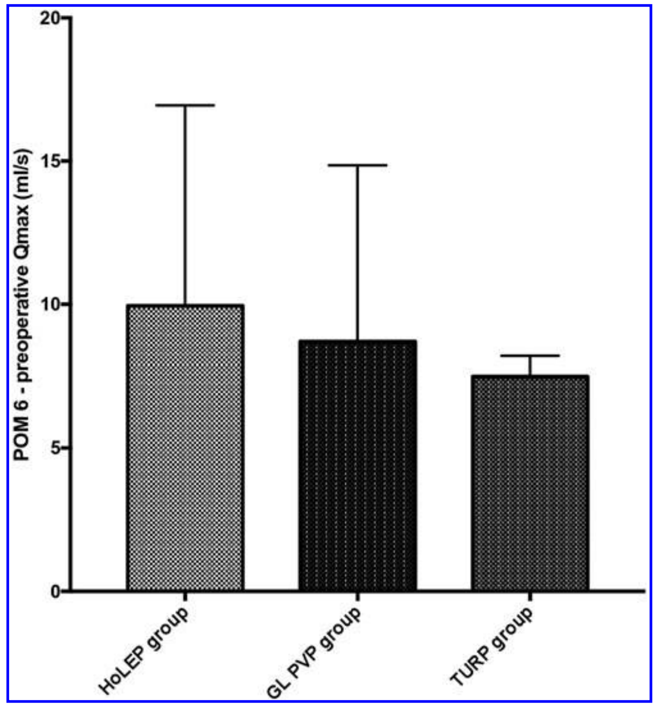

FIG. 1. POM 6—preoperative peak flow rate (Q_{max}) at uroflowmetry. POM = postoperative month.

GL PVP group and TURP group, respectively, $p = 0.01$). No majors complications Clavien ≥IV occurred. Intraoperative outcomes and postoperative complications are given in Table 2.

Functional and urological outcomes after BPH endoscopic procedure

There were no differences in delta POM 3—preoperative serum creatinine, POM 6—preoperative serum creatinine, and POM 12—preoperative serum creatinine in the study groups (Table 3). Although there is no significant statistical difference, GL PVP procedure allows the best improvement of the serum creatinine value at POM 12 (Table 3). Likewise, delta POM 3—preoperative PSA is similar in the three groups (Table 3). Q_{max} improved in the three study groups after operation and delta POM 6—preoperative Q_{max} was similar whatever the surgical technique (Figure 1). Functional and urological outcomes after BPH endoscopic procedure are summarized in Table 3.

Discussion

Improvement of immunosuppressive therapies, surgical procedures, and postoperative management has strongly reduced the morbidity of the KT. Thus, the mean age of patients undergoing KT has been increasing in recent years.[3]

Meanwhile, LUTS owing to BPH prevalence increases with age.[7] Numerous studies have shown that BPH is a progressive disease,[17,18] which can lead to complications including AUR, recurrent UTIs, and renal failure.[19]

Moreover, LUTS is underestimated in ESRD patients because of the decreased or absent diuresis[20] and are revealed after KT. The chronic urinary retention caused by BPH leads to a dysfunction of the detrusor muscle, which can result in graft failure because of hydronephrosis.

The purpose of this study was to evaluate the safety and efficacy of HoLEP, GL PVP, and TURP performed after KT and to assess the impact of these procedures on graft function. We reported a higher overall postoperative complications rate and a higher long-term postoperative complications rate in HoLEP group, in comparison with GL PVP, with higher UTI and AUR rates. However, in the HoLEP group, 7/9 (77.8%) patients who presented postoperative AUR had a preoperative medical history of AUR. One-year efficacy is similar in HoLEP, GL PVP, and TURP groups. The median volume of the prostate was similar in the three groups, because of the practice of one center to perform HoLEP for each BPH endoscopic procedure.

TURP is the BPH endoscopic surgical treatment in KT recipients.

Indeed, in 1992, Reinberg et al.[21] was the first to evaluate retrospectively TURP in KT recipients. They compared eight KT recipients who underwent TURP within 10 days of KT and eight KT recipients who did not undergo prostate operation. There was no statistically significant difference in patient survival (6 *vs* 7) and graft survival (56% *vs* 88%) between the two groups. They reported a 25% incidence of major perioperative complications (including one death) in the TURP group, directly attributable to the procedure. In 2013, Volpe et al.[10] evaluated prospectively TURP in KT recipients. They included 32 patients with follow-up of ≥48 months. TURPs were performed at a mean of 6 months after KT. No intraoperative complications have been reported and seven postoperative complications were observed: two Clavien II and five Clavien III. They reported Q_{max}, IPSS, and PVR improvement and serum creatinine levels decrease after TURP. In 2018, Sarier et al.[11] evaluated retrospectively TURP in KT recipients. They included 89 patients with follow-up of 12 months. TURPs were performed at a mean of 13 months after KT. They reported no intraoperative and no postoperative major complications. Twelve patients developed UTI in the postoperative period. The serum creatinine, IPSS, and PVR values significantly decreased, whereas Q_{max} significantly increased at the 1-month follow-up. In 2018, Sarier et al.[22] compared retrospectively TURP and transurethral incision of the prostate (TUIP) in KT recipients. They included 47 patients in TURP group and 32 patients in TUIP group with 12-month follow up. In both groups, serum creatinine, PVR, and IPSS decreased significantly after surgical procedure, whereas Q_{max} increased significantly ($p < 0.001$). There was no difference between the two groups in terms of increase in Q_{max} and decrease in IPSS, serum creatinine, and PVR.

Laser prostatectomy has gained wide acceptance over the past few years[12] and several transurethral prostatic laser systems have shown equivalent efficacy and lower morbidity compared with TURP to relieve BOO.[23] The major drawback of the laser procedures (HoLEP and GL PVP) is a long and steep learning curve, preventing its widespread use throughout the urological community. Several studies have evaluated the learning curve for HoLEP and GL PVP and have suggested that a range of 40–70 cases is required to achieve a stable outcome level.[14,24,25]

This pilot study has several limitations that should be acknowledged. First, this is a retrospective study that can lead to bias selection. Hence, because of the lack of randomization, the median preoperative prostate volume was statistically higher in HoLEP group involving a higher median operative time in HoLEP group. Finally, the relatively short follow-up period could also be considered as a limitation. Moreover, this study is a pilot study; a power analysis was not performed before the beginning of the study. From the results we can say that the study has enough power to show a difference between 11% and 65% but not between 65% and 35%, which could be because of a too small number of people and therefore a lack of power.

However, to our knowledge, this pilot study is the first to evaluate the 1-year follow-up safety (i.e., minor and major complications) of HoLEP, GL PVP, and TURP performed after KT. Further prospective randomized controlled trials are needed to confirm our results.

Conclusions

Although our study is underpowered, the rate of postoperative complications is higher with HoLEP procedure, in comparison with GL PVP, for the treatment of BPH after KT. One-year efficacy is similar in HoLEP, GL PVP, and TURP groups. Further prospective randomized controlled trials are needed to confirm our results.

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Abbreviations Used

AUR = acute urinary retention
BMI = body mass index
BOO = bladder outlet obstruction
BPH = benign prostatic hyperplasia
CI = confidence interval
ESRD = end-stage renal disease
GL PVP = GreenLight photoselective vaporization of the prostate
HoLEP = holmium laser enucleation of the prostate
IgA = immunoglobulin A
IPSS = International Prostatic Symptom Score
KT = kidney transplantation
LUTS = lower urinary tract symptoms
POD = postoperative day
POM = postoperative month
PSA = prostate-specific antigen
PVR = postvoiding residual urinary volume
Q_{max} = maximum urinary flow rate
TUIP = transurethral incision of the prostate
TURP = transurethral resection of the prostate
UTI = urinary tract infection