Comparative Results of Transurethral Incision with Transurethral Resection of The Prostate in Renal Transplant Recipients with Benign Prostate Hyperplasia

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Purpose: The aim of this study is to compare the results of transurethral incision of the prostate (TUIP) and transurethral resection of the prostate (TURP) for the surgical treatment of benign prostate hyperplasia (BPH) in patients with renal transplantation.

Materials and Methods: Between April 2009 and May 2016, BPH patients with renal transplants whose prostate volumes were less than 30 cm^3 were treated surgically. Forty-seven patients received TURP and 32 received TUIP. The patients' age, duration of dialysis, duration between transplant and TURP/TUIP, preoperative and postoperative serum creatinine (SCr), International Prostate Symptom Score (IPSS), maximum flow rate (Qmax) and postvoid residual volume (PVR) were recorded. At 1-,6- and 12-month follow-up, early and long-term complications were assessed. Results were evaluated retrospectively.

Results: In both groups, SCr, PVR and IPSS decreased significantly after the operation, while Qmax increased significantly ($P < .001$). There was no difference between the two groups in terms of increase in Qmax and decrease in IPSS, SCr and PVR ($P = .89$, $P = .27$, $P = .08$, and $P = .27$). Among postoperative complications, urinary tract infection (UTIs) and retrograde ejaculation (RE) rates were higher in the TURP group than the TUIP group (12.7% versus 6.2% and 68.1% versus 25%,respectively), whereas urethral strictures were more prevalent in the TUIP group (12.5% versus 6.3%).

Conclusion: For the treatment of BPH in renal transplant patients with a prostate volume less than 30 cm^3, both TUIP and TURP are safe and effective.

Keywords: benign prostate hyperplasia; renal transplantation; transurethral resection of prostate; transurethral incision of prostate; TUIP; TURP.

INTRODUCTION

Benign prostatic hyperplasia (BPH) is a chronic progressive disease affecting one-third of men older than 60 years of age. Obstructive symptoms due to BPH will eventually demand surgical intervention in approximately 25% of patients.[1] The mean age for renal transplantation has been increasing lately, and functional results of transplanted kidneys in the elderly are quite satisfying.[2] Presumably, the incidence of BPH in elderly male transplant patients is increasing.[3] Bladder dysfunction, particularly due to BPH, is common in elderly male patients.[4] However, BPH incidence in renal transplant recipients is often miscalculated, as patients with chronic renal failure are oliguric or anuric. BPH and related lower urinary tract symptoms (LUTS) emerge after the restoration of diuresis following transplantation and may compromise graft function and patient outcomes.[5] Therefore, optimal bladder function is crucial for patients who undergo renal transplantation. Transurethral resection of the prostate (TURP) is currently accepted as the gold standard treatment for LUTS caused by BPH. Although TURP is associated with low mortality and morbidity, it is not completely complication-free. Transurethral incision of the prostate (TUIP) is a simpler and less invasive procedure than TURP. For this reason, TUIP is mostly recommended as an ideal treatment option for younger, sexually active males with prostate volumes less than 30 cm^3.[6,7] There are numerous studies comparing the results of TURP and TUIP. However, there is no comparative study evaluating the effects of these two procedures in renal transplant patients. The aim of this study is to compare the results of TUIP with TURP in renal transplant recipients with small benign prostate adenomas less than 30 cm^3 in volume.

MATERIALS AND METHODS

Between April 2009 and March 2016, a total of 3453 renal transplantation procedures were performed in the organ transplant unit of Medical Park Hospital. Patients who underwent renal transplantation and suffered from

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Table 1. Characteristics of patients in TURP and TUIP groups.

Characteristica	TURP	TUIP	*P*
Age (years), mean (SD)	60.1 ± 7.7	44.2 ± 8.2	< .001
Duration of dialysis before RT (months)	28 (0-180)	34 (0-204)	.939
Time between RT and TURP/TUIP (months)	14 (0-84)	19 (0-66)	.231
Mean PSA (ng/ml), mean (SD)	1.31 ± 0.8	0.96 ± 0.6	.019
Mean prostate volume (cm^3), mean (SD)	24.1 ± 3.3	20.2 ± 4.2	< .001
Duration of catheterization following TURP/TUIP	2.65 ± 0.7	1.46 ± 0.6	< .001
Median follow-up after TURP/TUIP (months)	42 (12-94)	38 (12-46)	.006

[a]Data is presented as mean ± SD or medain(range)

BPH refractory to medical treatment received surgery for BPH. Of these, 89 received TURP and 32 received TUIP. In order to ensure standardization, patients with prostate volumes greater than 30 cm3 on transrectal ultrasound (TRUS) were excluded from the study. A total of 47 TURP and 32 TUIP patients who received surgery for bladder outlet obstruction (BOO) caused by BPH after renal transplantation were included in the study. This study compared these two different patient series retrospectively. The study was approved by the local ethics committee and written informed consent was obtained from all patients before the surgery.

For each patient, digital rectal examination, urinary ultrasonography (USG), TRUS, prostate specific antigen (PSA), uroflowmetry, voided volume, maximum flow rate (Qmax), average flow rate (Qave), postvoid residual urine volume (PVR), serum creatinine (SCr), urine analysis and urine culture tests were carried out preoperatively. Based on these results, flexible cystoscopy was performed if necessary. Indications for surgery were moderate to severe LUTS (International Prostate Symptom Score IPSS ≥ 10, if applicable, i.e. not with an indwelling urethral catheter for urinary retention), Qmax<10 ml/s, previous medical therapy failure, PVR>100 ml in the presence of recurrent UTI, urinary retention and BPH-related upper tract dilatation in the transplanted kidney on USG along with an increase in SCr. Candidates for surgery were assessed for medical and surgical suitability before the procedure. TURP or TUIP was performed under spinal anesthesia or general anesthesia. All patients received antibiotic prophylaxis 30 minutes prior to surgery, and antibiotherapy was continued for 24 hours after surgery.

TURP was performed using 26 Fr continuous-flow bipolar resectoscopes according to standard technique. TUIP was performed using the Orandi technique, by creating incisions with Collin's knife at the 5 and 7 o'clock positions bilaterally on the bladder neck and prostate. After the TUIP or TURP procedures, an 18 or 20 fr 3-way foley catheter was inserted and the bladder was continuously irrigated until next morning. The volume of resected prostate tissue was measured after TURP procedure. Dufour catheter was removed when urine became clear. Complete blood count, SCr and urine culture tests were performed in the postoperative period. PVR measurement was repeated before discharge in all patients.

Urine analysis with cultures, SCr, uroflowmetry and PVR were measured at 1-month follow-up; and retrograde ejaculation (RE) presence was investigated at 6-month follow-up. The minimum follow-up duration was 12 months. On long-term follow-up, all patients were assessed for operation outcomes and long-term complications such as urethral stricture and bladder neck contractures. The results were evaluated retrospectively.

All statistical analyses were performed using the SPSS statistical software (SPSS for Windows, version 22.0; SPSS, Inc., Chicago, IL, USA). The normality of data distribution was determined using Shapiro-Wilk tests. Data with normal distribution were presented as mean and standard deviation. Data showing non-normal distribution were presented as median (min-max). The comparison of the pre- and post operation data was made using t-test and Wilcoxon signed rank test. Comparison of the two independent operation groups was made using the t-test and Mann Whitney U test. Qualitative variables were expressed as frequencies with percentages and comparisons between proportions were made with the chi-square test. A p-value < 0.05 was considered statically significant.

RESULTS

The mean age of the 47 patients in the TURP group was 60.1±7.7. The median dialysis duration was 28 (0-180) months. The median duration between renal transplantation and TURP was 14 (0-84) months. Preoperatively, the mean SCr level was 2.06 ± 0.8 mg/dL, the mean serum total PSA was 1.31 ± 0.8 mg/mL, and the mean prostate volume was 24.1 ± 3.3 cm^3 (**Table 1**). The mean IPSS was 18.8 ± 2.8. Uroflowmetry parameters Qmax and Qave were 9.7 ± 3.6 ml/s and 6.2 ± 2.3 ml/s, respectively. The mean PVR was 90 (5-400) mL. None of the patients had preoperative complications. None of the patients needed blood transfusion postoperatively. The mean duration of catheter use was 2.65 ± 0.7 days. As short-term postoperative complications, one (2.1%) patient experienced acute urinary retention (AUR) af-

Table 2. Urological and renal functional outcomes of TURP and TUIP.

		Preoperative	Postoperative	*P* value
SCr (mg/dL)[a]	TURP	2.06 ± 0.8	1.76 ± 0.7	< .001
	TUIP	2.01 + 0.8	1.65 ± 0.6	= .001
Qmax (mL/s)[a]	TURP	9.7 ± 3.6	23.6 ± 10.8	< .001
	TUIP	9.4 ± 4.2	26.9 ± 9.5	< .001
Qave (mL/s)[a]	TURP	6.2 ± 2.3	13 ± 6.1	< .001
	TUIP	5.8 ± 2.4	14.7 ± 6.2	< .001
PVR (ml)[a]	TURP	90 (5-400)	10 (0-200)	< .001
	TUIP	80 (5-300)	5 (0-205)	< .001
IPSS[a]	TURP	18.8 ± 2.8	5.5 ± 2.4	< .001
	TUIP	18.6 ± 3	6.1 ± 2.2	< .001

[a]Data is presented as mean ± SD or medain(range)

ter catheter removal. Postoperative urinary tract infections (UTIs) were observed in 6 (12.7%) patients. None of the patients developed urinary incontinence. At 1 month follow-up, the mean SCr value significantly decreased to 1.76 ± 0.73 mg/dL ($P < .001$). Likewise, the mean IPSS significantly decreased to 5.5 ± 2.4 and the mean PVR significantly dropped to 10 mL (0-200) ($P < .001$). Both Qmax and Qave increased significantly (23.6 ± 10.8 ml/s and 13 ± 6.1 ml/s, respectively, $P < .001$) (**Table 2**). The median long-term follow-up duration was 42 (12-94) months. The RE rate was 68.1% for the TURP group. During follow-up, re-operation was performed on 3 (6.3%) patients due to urethral stricture, and 2 patients (4.2%) were re-operated for bladder neck contracture (BNC) (**Table 3**).

The mean age of the 32 patients in the TUIP group was 44.2 ± 8.2. The median duration of dialysis was 34 (0-204) months. The median duration between renal transplantation and TUIP procedure was 19 (0-66) months. Preoperatively, the mean SCr was 2 ± 0.8 mg/dL, the mean serum total PSA was 0.96 ± 0.6 ng/mL and the mean prostate volume was 20.3±4.2 cm3 (**Table 1**). The mean IPSS was 18.6 ± 3. Uroflowmetry parameters Qmax and Qave were 9.4 ± 4.2 ml/s and 5.81 ± 2.4 ml/s, respectively. The mean PVR was 80 (5-300) ml. None of the patients in the TUIP group experienced peroperative complications. The mean urinary catheter use was 1.46 ± 0.6 days. One (3.1%) patient experienced urinary retention in the postoperative period. Two (6.2%) patients developed UTI in the postoperative period. None of the patients developed urinary incontinence. The mean serum creatinine levels decreased to 1.65 ± 0.6 mg/dL at 1 month follow-up ($P = .001$). The IPSS and PVR values dropped significantly 6.1 ± 2.2 and 5 (0-205) mL, respectively, ($P < .001$). Both Qmax and Qave increased significantly 26.9 ± 9.5 ml/s and 14.75 ± 6.2, respectively, ($P < .001$) (**Table 2**). The median long-term follow-up duration was 38 (12-46) months. The RE rate in the TUIP group was 25%. During follow-up, re-operation was performed on 4 (12.5%) patients due to urethral stricture, and one patient (3.1%) was operated for BNC (**Table 3**).

There was no difference between the two groups by means of dialysis duration and the duration between transplantation and TURP/TUIP procedure ($P = .939$ and $P = .231$). The mean catheter duration was significantly longer in the TURP group ($P < .001$). When the effectiveness of the two procedures on the voiding parameters and renal functions were compared, there was no difference between two groups in terms of improvement in Qmax, Qave, PVR IPSS and SCr values ($P = .89$, $P = .11$, $P = .24$, $P = .27$ and $P = .08$). Postoperative UTIs were more frequent in the TURP group. (TURP: 12.7% versus TUIP: 6.2). On long-term follow-up, RE rate was significantly higher in the TURP group ($P < .001$). Urethral stricture rates were higher in the TUIP group compared to the TURP group. (TUIP: 12.5%; TURP: 6.3%).

Table 3. Comparison of TURP and TUIP complications

Complication	TURP (n)	TUIP (n)
Postoperative UTIs	12.7% (6)	6.2% (2)
Postoperative AUR	2.1% (2)	3.1% (1)
Retrograde ejaculation	68.1% (32)	25% (8) ($P < .001$)
Re-opr. due to urethral stricture	6.3% (3)	12.5% (4)
Re-opr. due to BPH	-	3.1% (1)
Re-opr. due to BNC	4.2% (2)	-

Re-opr, Re-operation; UTIs, Urinary Tract Infections; AUR, Acute Urinary Retantion; BPH, Benign prostate hyperplasia; BNC, Bladder neck contracture.

*Statistical analysis was made only for the group of retrograde ejaculation, since the number of cases in other groups were deemed too small for analysis.

DISCUSSION

Being a well-standardized operation, renal transplantation is the most suitable method for kidney replacement for end-stage renal disease.[4] Urological complications following renal transplantation may cause significant morbidity and mortality, frequently warranting a second surgical procedure.[8] Urological complications arise in 2.5 to 30% of all graft recipients.[9] BOO due to BPH is a serious urological complication that may affect graft survival in the long term. BPH is directly or indirectly associated with recurrent urinary tract infections, bladder stones, bladder diverticuli, vesicoureteral reflux, hydronephrosis, renal insufficiency, and urinary retention.[10] Therefore delayed diagnosis and treatment of clinical BPH constitutes an independent risk factor for transplant failure in renal transplant recipients.

Though TURP is the gold standard surgical treatment in men with BOO due to BPH, it is also associated with some risks, such as sexual function problems and blood loss requiring transfusion. TUIP is a simpler and less invasive procedure than TURP. Therefore, due to its low morbidity rate, TUIP is recommended by the American Urological Association and the European Association of Urology guidelines as an alternative to TURP for the surgical treatment of BPH in appropriate patient groups.[11,12] Despite these suggestions, TUIP is not performed very frequently by urologists. For instance, in England, TUIP is considered an under-utilized procedure. The annual number of TUIP procedures in England is approximately 2500, whereas the annual number of TURP procedures is 25000.[13] Similarly, according to Medicare program for 1999 data, the ratio of TURP vs TUIP is 36 to 1.[14] In the light of the findings obtained from the literature, it appears that TURP is favored in renal transplant recipients with BOO caused by BPH. While there are few studies focusing on the results of TURP and TUIP in renal transplant recipients, studies evaluating TUIP are even fewer. Currently, there is no published study comparing the long term results of TURP and TUIP in renal transplant recipients. Vedrine et al conducted a study analyzing the results of TUIP and TURP in the early period after transplantation and reported similar results for both procedures.[15] However, this study had limitations such as being based on a low number of cases and including only the patients who underwent TUIP/TURP shortly after renal transplantation.

Many studies in literature indicate that TURP improves renal functions both in the short and long term in non-transplant chronic kidney disease patients.[16,17] Similarly, there are studies reporting improved SCr levels following TURP in renal transplant recipients.[18] In our study, the fact that the improvement in SCr after TUIP is equivalent to TURP suggests that TUIP, when applied to appropriate renal transplant patients, may not only improve LUTS but also improve renal function.

UTIs are principal causes of morbidity and hospitaliza-

tion following renal transplantation.[19] BPH is known to be linked with UTIs, and UTIs are commonly present on BPH diagnosis. Therefore, recurrent UTIs caused by chronic urinary retention in men with BPH form an independent risk factor affecting graft loss in renal transplant recipients.[20] UTIs in BPH may cause not only a risk in the preoperative period but also serious morbidity and mortality in the postoperative period. Reinberg et al. reported death due to urosepsis in the postoperative period after TURP.[21] All UTIs are classified into four categories. Asymptomatic bacteriuria, lower UTI, acute pyelonephritis and urosepsis.[22] In our study, the UTI presentations detected in both groups after TURP and TUIP were asymptomatic bacteriuria or lower UTI. In the postoperative period, none of the patients had fever exceeding 38°C. According to the European Urology Guideline, the ideal perioperative prophylaxis for TURP is a single preoperative dose.[23] Because immunosuppressive therapy renders transplant recipients vulnerable to infections and thus poses great risks, we applied antibiotics for up to the first postoperative day. Volpe et al. have adopted an antibiotic regimen similar to ours in their study and reported that postoperative UTI rate after TURP was 3.1%.[18] However, in our study, UTI rates were 6.2% and 12.7% in the TUIP and TURP groups, respectively.

Renal transplantation not only improves renal function but also significantly improves quality of life and sexual functions. Several studies have reported enhancement in libido and sexual function following transplantation.[24] It is especially important to take into account the sexual-life expectancies of young renal transplant patients. RE is one of the most important causes of morbidity after TURP and TUIP procedures. RE has a serious negative impact on quality of life because it impairs both orgasmic function and fertility. In literature, RE rates have been reported as 52.5-65.4% and 18.2-22.5% for TURP and TUIP, respectively.[6,25] The incidence of RE was not affected by the volume of removed prostate tissue by TURP.[26] Considering the concomitant comorbidities, patient age is an important factor influencing the choice of transurethral surgical option. Along with the increased quality of life after renal transplantation, strategies aimed at securing ejaculatory function should also be taken into account in the elderly. In this study, RE rates for TURP and TUIP were 68.1% and 25%, respectively. In light of these results, TUIP should always be considered as the first option for sexually active renal transplant recipients with a prostate volume less than 30cm^3.

Many studies conducted on non-transplant patients have shown that urethral stricture is one of the long-term complications of transurethral procedures. In these studies, urethral stricture incidence was found to be 2.2-9.8% for TURP[27] patients and 4.1% for TUIP[25] patients. Urethral stricture may cause significant morbidity especially in renal transplant patients. However, literature regarding the incidence of urethral stricture following TURP/TUIP in renal transplant patients is scarce. Volpe et al. reported that 2 (6.25%) of the 32 kidney transplant patients undergoing TURP developed urethral stricture.[18] Our study yielded similar results, with an urethral stricture incidence of 6.3%. In their study, Dörsam et al. have not reported any data on urethral stricture incidence following TUIP, since the follow-up period for their study was at most 6 months.[28] In our study, though the follow-up period of the TUIP group was shorter than the TURP group (TUIP 38 months; TURP 42 months), urethral stricture incidence in the TUIP group was considerably high (12.5%).

There are multiple suggestions explaining the etiopathogenesis of urethral stricture following transurethral procedures. An iatrogenic urethral mucosa rupture has been determined as a major risk factor for urethral stricture, by causing urine leakage underneath the epithelium, which in turn leads to inflammation and scar formation.[29] We believe that the determining factor here is age. The mean age of TUIP and TURP groups were 44.2 years and 60.1 respectively. Young patients may be much more prone to scar formation. In their study, Balbay et al. found that urethral stricture development after TURP is inversely correlated with age, which is further strengthening our argument.[30] For this reason, we conclude that young renal transplant patients should be closely monitored for evidence of urethral stricture after transurethral procedures.

This study has some limitations because of its design. The significant difference between TUIP and TURP groups with respect to age may be seeen as a drawback. The reason why TUIP was performed more frequently, especially in young patients, is to avoid postoperative ejaculatory dysfunction which is a well-documented complication of TURP operations in non-transplant patients in the literature.

CONCLUSIONS

For the treatment of BPH in renal transplant patients with a prostate volume less than 30 cm^3, both TUIP and TURP are safe and equally effective in achieving symptomatic improvement. TUIP stands out with low UTI rates after surgery and low RE rates, while TURP stands out with the relative infrequency of long-term complications requiring reoperation such as urethral strictures.

CONFLICT OF INTEREST

No potential conflict of interest was reported by the authors.

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