RESEARCH ARTICLE

Voiding profile in recipients post renal transplant: A prospective observational study [version 1; peer review: 1 approved, 1 approved with reservations]

Dyandra Parikesit^{1,2}, Indra Wicaksono², Muhamad Iqbal Tawfid², Fina Widia^{1,2}, Harrina Erlianti Rahardjo²

¹Department of Urology, Faculty of Medicine, Universitas Indonesia, Universitas Indonesia Hospital, Depok, West Java, 16424, Indonesia

²Department of Urology, Faculty of Medicine, Universitas Indonesia, Cipto Mangunkusumo Hospital, Central Jakarta, DKI Jakarta, 10430, Indonesia

V1 First published: 31 Oct 2019, 8:1836
<https://doi.org/10.12688/f1000research.21024.1>

Latest published: 31 Oct 2019, 8:1836
<https://doi.org/10.12688/f1000research.21024.1>

Abstract

Background: Renal transplantation (RTX) is thought to have high survival rates. However, patients with long-term dialysis have decreased bladder function due to disuse. High urine production after RTX surgery might cause patients to have urinary symptoms, thus decreasing their quality of life. The aim of this study was to evaluate voiding characteristics of patients after RTX surgery.

Methods: All patients were diagnosed with chronic kidney disease (CKD) and underwent kidney transplantation from a living donor. Anthropometric parameters, physical examinations, cause of CKD, daily urine production, types and duration of dialysis, and basic laboratory examination were collected before transplant surgery. Post-operative examinations included laboratory examination, international prostate symptom score (IPSS; for male patients only), overactive bladder symptom score (OABSS), uroflowmetry, and post void residue (PVR).

Results: 71 patients were evaluated with a mean age of 46 ± 17.9 years, with male and female ratio of 52:19. Significant negative correlation was seen between duration of dialysis and daily urine production ($r: -0.68, p < 0.01$). Majority of patients had a maximum flow rate of >15 cc/s (70.4 %) with average flow of 22 ± 9.8 cc/s. The majority of patients had PVR <100 cc (91.5%) with median PVR of 33.5 cc (range, 2.3 – 142 cc). IPSS result showed that frequency [2 (0 – 5)] and nocturia [2 (0 – 5)] are the main problem in these patients ($n = 52$). OABSS questionnaire also showed that frequency (OABSS 1; score 1 [1-2]) and nocturia (OABSS 2; score 2 [0-3]) was the main symptoms reported by patients.

Conclusion: After RTX, the majority of patients experienced urinary frequency and nocturia problems due to various causes such as

Open Peer Review

Approval Status

	1	2
version 1
31 Oct 2019	view	view

1. **Marcelo Lopes de Lima**, University of Campinas, Campinas, Brazil

2. **Doaa M Salah**, Cairo University, Cairo, Egypt

Any reports and responses or comments on the article can be found at the end of the article.

increased daytime and nighttime urine production, urinary tract infection, changes in bladder capacity (both small and large), and a decrease in bladder compliance.

Keywords

renal transplant, uroflowmetry, international prostate symptom score, overactive bladder symptom score

Corresponding author: Harrina Erlianti Rahardjo (harrinaerlianti@gmail.com)

Author roles: **Parikesit D:** Conceptualization, Data Curation, Formal Analysis, Investigation, Methodology, Validation, Writing – Original Draft Preparation, Writing – Review & Editing; **Wicaksono I:** Data Curation, Formal Analysis, Investigation, Project Administration, Validation, Writing – Original Draft Preparation; **Tawfid MI:** Data Curation, Formal Analysis, Investigation, Project Administration, Validation, Writing – Original Draft Preparation; **Widia F:** Conceptualization, Investigation, Methodology, Supervision, Validation, Writing – Review & Editing; **Rahardjo HE:** Conceptualization, Funding Acquisition, Methodology, Resources, Supervision, Writing – Review & Editing

Competing interests: No competing interests were disclosed.

Grant information: We received internal funding from our institution Cipto Mangunkusumo Hospital, Jakarta as annual operational research grant to develop better medical service in our institution. The researchers were only obligated to conduct complete research as stated in the proposed protocol and reporting the results as objectively as possible without any external pressure. No external funding from sponsor was received.

The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Copyright: © 2019 Parikesit D *et al.* This is an open access article distributed under the terms of the [Creative Commons Attribution License](#), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

How to cite this article: Parikesit D, Wicaksono I, Tawfid MI *et al.* **Voiding profile in recipients post renal transplant: A prospective observational study [version 1; peer review: 1 approved, 1 approved with reservations]** F1000Research 2019, 8:1836 <https://doi.org/10.12688/f1000research.21024.1>

First published: 31 Oct 2019, 8:1836 <https://doi.org/10.12688/f1000research.21024.1>

Introduction

Chronic kidney disease (CKD) is a health burden affecting the global population, which has a high economic cost to health care, increases the risk of cardiovascular morbidity and decreases overall quality of life (QoL)¹. The global prevalence of the five stages of CKD is between 11 – 13% with the majority of patients being stage 3, while stages 3–5 (end stage renal disease) is 10.6% (9.2 – 12.2%)¹. Diabetes mellitus (DM) and hypertension (HT) is known to be significantly associated with CKD, with global prevalence of 8.5% in 2014² and 31% in 2010³, respectively. According to the Basic Health Research in Indonesia (Riskesdas) in 2018⁴, prevalence of DM and HT was 10.9% and 34.1%, however both non-communicable disease contribute to around 52% and 24% of people with CKD, respectively⁵. Previously, dialysis was thought to be the best treatment for patients with CKD, nowadays transplantation is a more attractive treatment due to its higher survival rates, QoL, cost effectiveness, and better clinical results^{6,7}. On the other hand, patients with CKD who experienced prolonged oliguria and or anuria may develop bladder function complications and high intravesical pressure, known as neurogenic bladder, which may lead to renal impairment⁸. QoL might also be impacted due to obstruction and an overactive bladder, thus evaluation of bladder function is paramount after RTX⁹.

The aim of this study is to evaluate voiding characteristics of patients that have undergone RTX surgery in Jakarta, Indonesia.

Methods

Study design, setting and participants

In this prospective observational study, 71 patients diagnosed with CKD and had undergone a kidney transplantation from a living donor between January and December 2018 in Cipto Mangunkusumo General Hospital, Jakarta were examined. Total sampling method were implemented to include all potential subjects. Inclusion criteria for participants were consenting adults (> 18 years old) with sterile urine. Patients with neurogenic bladder and history of urinary obstruction were excluded.

RTX procedure

RTX procedures were performed according to standardized techniques including a Gibson incision, extraperitoneal dissection, and end-to-side or side-to-side anastomosis of the donor to the recipient iliac vessels. Extravesical ureteral implantation (ureteroneocystostomy) was performed in an antireflux manner according to the Lich-Gregoir technique¹⁰. In all patients, a double-J stent was placed for 4 weeks and a transurethral catheter for the duration of hospital stay after operation.

Data collection

Patients were informed regarding data collection before undergoing transplantation surgery. Pre and post-operative parameters were collected from medical record data. Voiding data

(uroflowmetry), IPSS, and OABSS questionnaire was collected directly from the patients during follow up 1 month after the surgery.

Before transplant, anthropometric parameters, physical examinations, cause of CKD, daily urine production, types and duration of dialysis, and basic laboratory examination were collected (Table 1). Anuria and oliguria were defined as urine production of <100 cc/day and between 100 and 400 cc/day, respectively¹¹.

Post-transplant, laboratory examination, international prostate symptom score (IPSS; male patients only), overactive bladder symptom score (OABSS), uroflowmetry, and post void residue (PVR) was gathered (Table 2).

Frequency, urgency, and nocturia were added and categorized as storage score, while the sum of incomplete emptying, intermittency, weak stream and straining were considered to be voiding score. Total IPSS score were classified into two groups: mild (score 0 – 7), and moderate-severe (score 8 – 35). A QoL question was also included as part of the IPSS questionnaire. The

Table 1. Characteristics of patients who had undergone renal transplant in Jakarta, Indonesia.

	Value
Age, years (mean ± SD)	46 ± 17.9
Sex, male:female (n, %)	52:19 (73.2:26.8)
BMI, kg/m ² (mean ± SD)	22.85 ± 5.49
Cause of CKD (n, %)	
Hypertension	42 (59.2)
Diabetes mellitus	1 (1.4)
Both	19 (26.8)
Other	9 (12.7)
Urine per day, cc (mean, range)	400 (0 – 4.000)
Anuria (n, %)	20 (28.2 %)
Oliguria (n, %)	19 (26.8 %)
Normal (n, %)	32 (45.1 %)
Dialysis form, HD:CAPD (n, %)	70:1 (98.6:1.4)
Duration of dialysis, month (mean, range)	10 (0.3* – 120)
Laboratory results (preoperation)	
Creatinine, mg/dL (mean ± SD)	5.86 ± 1.3
FBG, mg/dL (n=21) (mean, range)	87 (72 – 242)
RBG, mg/dL (n=42) (mean, range)	119 (56 – 290)
HbA1c, % (n=26) (mean, range)	5.1 (4 – 8.2)

BMI: body mass index; CKD: chronic kidney disease; HD: hemodialysis; CAPD: continuous ambulatory peritoneal dialysis; FBG: fasting blood glucose; RBG: random blood glucose. * Preemptive dialysis

IPSS questionnaire was translated into Indonesian, reviewed and validated by the Indonesian Urological Association¹². The sum score of daytime frequency, nocturia, urgency and urge incontinence made up the OABSS questionnaire with a maximum (worst) score of 2, 3, 5, and 5, respectively. A higher score indicated more severe symptoms with a maximum score of 15. A validated Indonesian version of this questionnaire was used¹³.

The maximum flow rate (Qmax) was measured with stationary uroflow recorder (Medtronic Uroflow® 1000 system), where <15 cc/s were associated with lower bladder outlet obstruction (BOO) (specificity of 38%, positive predictive value of 67%, and sensitivity of 82%)¹⁴. Consecutive urine voided >150 cc was accepted as valid¹⁴. PVR was measured after uroflowmetry examination with ultrasonography in supine position using an elliptical formula¹⁵. This examination was taken 4 weeks after RTX.

Statistical analysis

Spearman's correlation was used to analyze the association between all continuous variables. Wilcoxon signed rank test was used for comparing medians in abnormally distributed and paired T test was used for comparing means in normally distributed continuous values. A *P* value of less than 0.05 and 0.001 were considered statistically significant and very statistically significant, respectively. All analyses were performed with commercial statistical software (SPSS version 23 for Macintosh; SPSS, Chicago, IL).

Ethical permission and consent

This research was conducted under ethical review and approval from The Ethics Committee of Faculty of Medicine, University of Indonesia corresponding to protocol number 17-07-0631 and ethical approval number 602/UN2.F1/ETIK/2017.

All participants included in this research provided written informed consent according to ethical guideline from The Ethics Committee of Faculty of Medicine, University of Indonesia.

Results

Between January and December 2018, there were 107 RTX surgeries performed in Cipto Mangunkusumo Hospital, Jakarta, Indonesia. A total of 36 patients were excluded from this study due to various reasons (15 had previous surgeries for urinary tract obstruction, 2 had previous RTX surgeries, 4 had acute rejection, 2 had hyper-acute rejection and immediate allograft nephrectomies, and 13 patients did not give consent). Therefore, a total of 71 patients were included in this study (Table 1). The mean age of patients were 46 ± 17.9 years old with male and female ratio of 52:19, respectively.

The major cause of CKD was HT (59.2%), followed by a combination of HT and DM (26.8%), other cause such as glomerulonephritis, nephrotic syndrome, polycystic kidney disease, and autoimmune disease (12.7%), and DM alone (1.4%). The mean preoperative creatinine was 5.86 ± 1.3 mg/dL. The majority of diabetic patients had controlled glucose level with median fasting blood glucose of 87 (72 – 242) mg/dL and HbA1c of 5.1%

(4 – 8.2), according to the American Diabetes Association guidelines¹⁶. A total of 28% and 26.8% of patients had anuria (urine production <100 cc per day) and oliguria (urine production <400 cc per day), respectively. The main renal replacement therapy (RRT) used by patients was hemodialysis (98.6%) with median duration of 10 months [range, 0.3 (preemptive dialysis) – 120 months]. Significant negative correlation was seen between duration of dialysis and daily urine production (r : -0.68, $p < 0.01$), as shown in Figure 1.

All postoperative variables are shown in Table 2. There are trends of decreased creatinine from the first day of 4.8 ± 2.27 mg/dL to 1.2 mg/dL (0.6 – 7.9) at day 5-post operation. The increase in urine production was also seen before and after the operation. During the first day, urine production varied between patients with a median of 6150cc (1530 – 16150) per day. However, from the second day onwards, urine production started to decrease from 6428.3 ± 3035.7 cc per day to 4800.2 ± 1705 cc per day at day 5. On uroflowmetry examination, the majority of patients had Qmax >15 cc/s (70.4%) with average flow of 22 ± 9.8 cc/s. Median voided volume was 208cc (25 – 800); 19 patients (26.8%) had insignificant voided volume (<150cc), which made the examination invalid. However, only 2 out of 19 patients had urinary retention (PVR >100 cc). The majority of patients had PVR <100 cc (91.5%) with median PVR of 33.5 cc (2.3 – 142). IPSS result shows that frequency [2 (0 – 5)] and nocturia [2 (0 – 5)], components of irritative symptoms, were the main problem in these patients with a total number of 20/52 (38.5%) and 40/52 (76.9%) patients, respectively. In total, 35 patients (67.3%) had only mild symptoms, with a median total IPSS score of 6 (0 – 21). Nevertheless, the majority of patients were “pleased” [1 (0 – 3)] on their QoL assessment. Similar to IPSS, the OABSS questionnaire showed that frequency (OABSS 1) and nocturia (OABSS 2) was the main symptoms reported by patient, with scores of 1 (0 – 2) and 2 (0 – 3), respectively.

Discussion

RTX is thought to be a better alternative RRT compared to dialysis in terms of QoL, long-term survival, and financial burden^{6,7}. However, a sudden increase in urine volume inside the bladder, a smaller bladder capacity, and bladder smooth muscle atrophy might cause irritative and/or obstructive symptoms, which in the long term might lead to decrease of graft function^{17–21}. Low-pressure urine storage, effective bladder emptying, and minimal residual volume is necessary for maintaining sufficient and prolonged renal function.

Median daily urine production in our study was 400cc (0 – 4000) with 28.8% and 26.8% of patients having anuria and oliguria, respectively. Median duration of dialysis, 98.6% used hemodialysis, was 10 months (preemptive – 120). There was significant negative correlation between daily urine production and duration of dialysis (r : -0.68, $p < 0.01$). This shows that longer duration of dialysis may decrease urine production, resulting in smaller bladder capacity^{8,17,19–24}. Mean Qmax was 22 ± 9.8 cc/s, with 70.4% of patients exceeding 15 cc/s and valid examination (voided volume > 150 cc) in only 73.2% of patients.

Table 2. Postoperative parameters of patients who had undergone renal transplant in Jakarta, Indonesia.

	Day 1	Day 2	Day 3	Day 4	Day 5
Creatinine, mg/dL (mean ± SD)	4.8 ± 2.27 [⊗] **	2.1 (0.4 – 10.1) **	1.4 (0.2 – 12.2) **	1.2 (0.6 – 13.1) **	1.2 (0.6 – 7.9) **
Daily urine production, cc (mean, range)	6150 (1530 – 16150) **	6428.3 ± 3035.7 [⊗]	5636.3 ± 2185.9 [⊗] *	5345.3 ± 1911.2 [⊗]	4800.2 ± 1705 [⊗] *
Uroflowmetry (1-month post operation)					
Qmax, cc/s (mean ± SD)	22 ± 9.8 [⊗]				
< 15 cc/s (n, %)	21 (29.6)				
> 15 cc/s (n, %)	50 (70.4)				
Voided volume (cc)	208 (25 – 800)				
< 150 cc	19 (26.8 %)				
> 150 cc	52 (73.2 %)				
PVR, cc (mean, range)	33.5 (2.3 – 142)				
< 100 cc (n, %)	65 (91.5)				
> 100 cc (n, %)	6 (8.5)				
IPSS (men only; 1-month post operation; n = 52)					
Frequency	2 (0 – 5)				
Urgency	0 (0 – 5)				
Nocturia	2 (0 – 5)				
Irritative score	5 (0 – 14)				
Incomplete emptying	0 (0 – 5)				
Intermittency	0 (0 – 4)				
Weak stream	0 (0 – 2)				
Straining	0 (0 – 5)				
Obstructive score	0 (0 – 11)				
IPSS total score	6 (0 – 21)				
Mild	35 (67.3 %)				
Moderate – severe	17 (32.7 %)				
QOL score	1 (0 – 3)				
OABSS (1-month post operation)					
OABSS 1	1 (0 – 2)				
OABSS 2	2 (0 – 3)				
OABSS 3	0 (0 – 5)				
OABSS 4	0 (0 – 5)				
Total OABSS	4 (1 – 13)				

PVR: post-void residual; IPSS: international prostate symptom score; QOL: quality of life; OABSS: overactive bladder symptom score. Wilcoxon signed rank test was used for statistical analysis. [⊗] Normally distributed, paired T test was used for statistical analysis. * p < 0.05, compare to previous value; ** p < 0.001, compare to previous value.

Figure 1. Scatter plot and Spearman's correlation coefficient regarding duration of dialysis to daily urine production.

This result was not associated with gender ($p > 0.05$). There was no definitive normal value of Qmax in women to determine BOO. However, a study by Mahfouz *et al.* shows that normal range of Qmax in asymptomatic women was 13 to 25 cc/s²⁵. Therefore, in the present study we set the same threshold for Qmax between men and women to define BOO. To the authors knowledge, there are not many studies evaluating Qmax in patients after RTX; however, a study by Gratzke *et al.*, concluded that in male patients with a long history of dialysis, early operative intervention due to urinary retention must be anticipated after RTX²⁶. In our study, 6 patients (3 male and 3 female) had urinary retention (PVR > 100 cc) after uroflowmetry. Two patients had HT alone and 4 patients had both HT and DM as the cause of CKD. In both animal models and human, HT is shown to cause bladder dysfunction by altering beta-adrenergic receptor-mediated detrusor relaxation and alpha(1)-adrenergic receptor-mediated contraction of the bladder neck²⁷.

In the present study, the main symptoms patients experienced after RTX was frequency of urination and nocturia with a total of 20/52 (38.5%) and 40/52 (76.9%) patients, respectively. This result was similar to other studies by Zermann *et al.*²¹ (frequency 87% and nocturia 94%), Van der Weide *et al.*²⁰ (frequency 54% and nocturia 60%), and Lebadi *et al.*²⁸ (nocturia 71.1%). Frequency might be due to thick-walled uncompliant high-pressure bladders, which might be caused by increased daytime production of urine, urinary tract infection (UTI) (common condition in post-transplant patients), and small bladder capacity (due to bladder atrophy)²⁰. On the other hand, nocturia is mainly caused by increase in nighttime urine production (due to dysfunctional diurnal rhythm in urine production), large bladder capacity (which might lead to increase PVR and UTI),

and decreased bladder compliance due to aging²⁸. Both symptoms might also be caused by increased oxidative stress, which damages nerves, epithelium and smooth muscle of the bladder; however more studies are warranted. Similar results were shown with the OABSS questionnaire in the current study, which suggests patients after RTX have symptoms of mild-moderate overactive bladders. Regardless of this fact, the majority of patients' QoL were not affected; 94.2% of all patients were pleased after RTX due to the fact that they do not need RRT, and a similar result was found by another study²¹.

In this study, one male older patient had decreased urine production (910 cc/day at day 3 to 375 cc/day at day 5) and increased creatinine (12.2 mg/dL at day 3 to 13.1 mg/dL at day 4, decreased to 7.9 mg/dL at day 5) starting from the third day after RTX, which suggested delayed graft function. This patient had left ventricular ejection fraction (LVEF) of 56%, chronic heart failure, and long term controlled HT. According to Rusinaru *et al.*, renal dysfunction was found in around 14% of cases with heart failure (LVEF $\pm$ 50%), which is caused by intrinsic nephropathy, poor renal perfusion, vasoconstriction, and renal venous congestion²⁹. Renal dysfunction is increased considerably with the degree of heart failure³⁰. One month after surgery the patient had creatinine level of 1.9 mg/dL with normal Qmax and PVR of 33 cc/s and 35.4 cc, respectively. This proves that patients with decreased LVEF had increased risk for delayed graft and worse long-term graft function³¹.

Several limitations of this study were: 1) urodynamic evaluation was not used due to the limited financial and technical resource, 2) short duration of follow-up (1 month) was due to the variety of origin of transplant patients across Indonesia's archipelago (difficult to maintain long-term follow up). In the

future, prospective long-term follow up studies may be needed to precisely confirm our findings.

Conclusion

Daily urine production significantly correlates to duration of dialysis which, in the long-term, might alter lower urinary tract function. After RTX, the majority of patients experienced frequency and nocturia problems due to various causes, such as increased daytime and nighttime urine production, UTI, bladder capacity (both small and large), and decreased bladder compliance. Regardless of this fact, the majority of patients' QoL were not affected; 94.2% of all patients were pleased after RTX due to the fact that they do not need RRT.

Data availability

Harvard Dataverse: Voiding Profile in Recipients Post Renal Transplant, <https://doi.org/10.7910/DVN/XGKFWV>³²

This project contains the following underlying data:

- Data File 4. SPSS tabular data

Extended data

Harvard Dataverse: Voiding Profile in Recipients Post Renal Transplant, <https://doi.org/10.7910/DVN/XGKFWV>³²

This project contains the following extended data:

- Data File 1. Ethical approval from The Ethics Committee The Ethics Committee of Faculty of Medicine, University of Indonesia
- Data File 2. Scatter plot and Spearman Correlation Coefficient of duration of dialysis to daily urine production.

Reporting guidelines

Harvard Dataverse: STROBE checklist for 'Voiding Profile in Recipients Post Renal Transplant', <https://doi.org/10.7910/DVN/XGKFWV>³²

Data are available under the terms of the [Creative Commons Zero "No rights reserved" data waiver](#) (CC0 1.0 Public domain dedication).

References

- Hill NR, Fatoba ST, Oke JL, *et al.*: **Global Prevalence of Chronic Kidney Disease - A Systematic Review and Meta-Analysis.** *PLoS One.* 2016; 11(7): e0158765.
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
- Roglic G: **WHO Global report on diabetes: A summary.** *Int J Noncommun Dis.* 2016; 1(1): 3–8.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Bloch MJ: **Worldwide prevalence of hypertension exceeds 1.3 billion.** *J Am Soc Hypertens.* 2016; 10(10): 753–4.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Health Research and Development: **Basic Health Research (RISKESDAS).** 2018.
[Reference Source](#)
- Indonesian Society of Nephrology: **9th Report Of Indonesian Renal Registry.** 2016.
[Reference Source](#)
- Roodnat JJ, Zietse R, Mulder PG, *et al.*: **The vanishing importance of age in renal transplantation.** *Transplantation.* 1999; 67(4): 576–80.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Silva SB, Caulliraux HM, Araujo CA, *et al.*: **Cost comparison of kidney transplant versus dialysis in Brazil.** *Cad Saude Publica.* 2016; 32(6): pii: S0102-311X2016000605005.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Asakura H, Nakamura K, Tachibana M, *et al.*: **Evaluation of lower urinary tract function in renal transplant recipients by urodynamic study.** *Transplant Proc.* 1998; 30(1): 119–21.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Yanishi M, Kawa G, Nakamoto T, *et al.*: **[Lower Urinary Tract Symptoms and Functions after Renal Transplantation at Our Hospital].** *Nihon Hinyokika Gakkai Zasshi.* 2015; 106(4): 249–54.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Riedmiller R, Gerharz EW: **Antireflux surgery: Lich-Gregoir extravesical ureteric tunneling.** *BJU Int.* 2008; 101(11): 1467–1482.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Bellomo R, Ronco C: **Indications and criteria for initiating renal replacement therapy in the intensive care unit.** *Kidney Int Suppl.* 1998; 66: S106–9.
[PubMed Abstract](#)
- Monoarfa R, Mochtar C: **Validation of Indonesian version of IPSS.** *Indonesian Journal of Urology.* 2014; 21(1): 15–9.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Sumardi R, Mochtar CA, Junizaf, *et al.*: **Test - retest reliability of the Indonesian version of the Overactive Bladder Symptom Score (OABSS) and its correlation with standard assessment tools.** *Acta Med Indones.* 2012; 44(3): 214–21.
[PubMed Abstract](#)
- Gratzke C, Bachmann A, Descaseaud A, *et al.*: **EAU Guidelines on the Assessment of Non-neurogenic Male Lower Urinary Tract Symptoms including Benign Prostatic Obstruction.** *Eur Urol.* 2015; 67(6): 1099–109.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Chan E, Smith K, Mohamoud G, *et al.*: **Tri-Axial Ellipsoid Volume Calculation: A Method for Bladder Volume Estimation.** *J Med Imaging Radiat Oncol.* 2008; 44(1): 46–47.
[PubMed Abstract](#) | [Publisher Full Text](#)
- American Diabetes A: **6. Glycemic Targets: Standards of Medical Care in Diabetes-2018.** *Diabetes Care.* 2018; 41(Suppl 1): S55–S64.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Mitsui T, Moriya K, Morita K, *et al.*: **Risk Factors for Lower Urinary Tract Dysfunction and Symptoms After Successful Renal Transplantation.** *Ann Transplant.* 2015; 20: 757–63.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Sarier M, Tekin S, Duman I, *et al.*: **Results of transurethral resection of the prostate in renal transplant recipients: a single center experience.** *World J Urol.* 2018; 36(1): 99–103.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Serrano DP, Flechner SM, Modlin CS, *et al.*: **Transplantation into the long-term defunctionalized bladder.** *J Urol.* 1996; 156(3): 885–8.
[PubMed Abstract](#)
- Van der Weide MJ, Van Achterberg T, Smits JP, *et al.*: **Causes of frequency and nocturia after renal transplantation.** *BJU Int.* 2008; 101(8): 1029–34.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Zermann DH, Janitzky A, Hohne M, *et al.*: **Frequency and nocturia after successful renal transplantation: a normal situation?** *BJU Int.* 2006; 97(3): 555–8.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Chen JL, Lee MC, Kuo HC: **Reduction of cystometric bladder capacity and bladder compliance with time in patients with end-stage renal disease.** *J Formos Med Assoc.* 2012; 111(4): 209–13.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Hotta K, Miura M, Wada Y, *et al.*: **Atrophic bladder in long-term dialysis patients increases the risk for urological complications after kidney transplantation.** *Int J Urol.* 2017; 24(4): 314–9.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Schmaelzle JF, Cass AS, Hinman F Jr: **Effect of disuse and restoration of function on vesical capacity.** *J Urol.* 1969; 101(5): 700–5.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Mahfouz W, Al Afraa T, Campeau L, *et al.*: **Normal urodynamic parameters in women: part II--invasive urodynamics.** *Int Urogynecol J.* 2012; 23(3): 269–77.
[PubMed Abstract](#) | [Publisher Full Text](#)

26. Gratzke C, Pahde A, Dickmann M, *et al.*: **Predictive factors for urinary retention following kidney transplantation in male patients.** *Scand J Urol Nephrol.* 2012; **46**(1): 44–7.
[PubMed Abstract](#) | [Publisher Full Text](#)
27. Michel MC, Barendrecht MM: **Physiological and pathological regulation of the autonomic control of urinary bladder contractility.** *Pharmacol Ther.* 2008; **117**(3): 297–312.
[PubMed Abstract](#) | [Publisher Full Text](#)
28. Lebadı M, Monfared A, Atrkar Roshan Z, *et al.*: **The Prevalence of Nocturia and Nocturnal Polyuria After Renal Transplantation and Associated Factors.** *Nephro-Urol Mon.* 2018; **10**(1): e60128.
[Publisher Full Text](#)
29. Rusinaru D, Buiciuc O, Houpe D, *et al.*: **Renal function and long-term survival after hospital discharge in heart failure with preserved ejection fraction.** *Int J Cardiol.* 2011; **147**(2): 278–82.
[PubMed Abstract](#) | [Publisher Full Text](#)
30. Sarnak MJ: **A patient with heart failure and worsening kidney function.** *Clin J Am Soc Nephrol.* 2014; **9**(10): 1790–8.
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
31. González Monte E, Mora MT, Polanco N, *et al.*: **Impact of left ventricular dysfunction on renal transplant survival: study of paired kidneys from the same donor.** *Transplant Proc.* 2015; **47**(1): 70–2.
[PubMed Abstract](#) | [Publisher Full Text](#)
32. Parikesit D: **Voiding Profile in Recipients Post Renal Transplant.** Harvard Dataverse, V1, UNF:6:AP2A2KeUpyVddKO4irntA== [fileUNF]. 2019.
<http://www.doi.org/10.7910/DVN/XGKFWV>

Open Peer Review

Current Peer Review Status:

Version 1

Reviewer Report 10 June 2021

<https://doi.org/10.5256/f1000research.23135.r87269>

© 2021 Salah D. This is an open access peer review report distributed under the terms of the [Creative Commons Attribution License](#), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Doaa M Salah

Department of Pediatrics, Cairo University, Cairo, Egypt

Comments to the authors:

This study is interesting, well written and informative about voiding profile after RTX. The authors well-addressed the issue having impact on graft function and patient QoL and found that prolonged dialysis duration negatively impacted urine flow after RTX, they also reported frequency and nocturia as the most prevalent symptoms. Nevertheless; patient's QoL is still very satisfactory.

More specific comments:

The term CKD is better to be replaced in certain places (as when authors mention need for RRT or RTX or stage 5) by ESKD (end stage kidney disease).

Introduction:

- Too many details were mentioned about CKD epidemiology, prevalence and causes while only the last paragraph focused on the importance of this study.
- It would be better to summarize CKD data in one small paragraph than to mention in more details the hypothesis of voiding dysfunction (and its pattern) after RTX and its impact on renal graft and patient QoL.

Method:

- It is not clear what the authors meant by inclusion of adults with sterile urine. Do you mean those with no history of UTI before RTX or those who did not experience UTI after RTX until they were enrolled into the study? Please clarify.

Results:

- 26.8% of included patients had DM. Why are the authors sure that diabetic neuropathy is not a confounding factor of interpretation of voiding disorders during evaluation? This issue has to be clarified in the methods and discussion sections.

- In Tables 1 & 2; the authors have to change its title or to mention the number of patients (n=71). It's impressive from the current title of the table that all transplanted patients were described. While it was mentioned that 36 transplanted patients were excluded from this analysis.
- The authors did not mention UTI incidence/frequency after RTX among included patients, taking into account that UTI is one of the most common causes of urine retention after RTX.

Discussion:

- The authors mentioned in the 2nd paragraph that "Median duration of dialysis was 10 months (preemptive - 120)". What do you mean by 'preemptive - 120'?
- The authors stated "In both animal models and human, HT is shown to cause bladder dysfunction by altering beta-adrenergic receptor-mediated detrusor relaxation and alpha(1)- adrenergic receptor-mediated contraction of the bladder neck". The explanation is perfect however it does not rule out that HT is a confounding factor for incidence of urine retention (PVR > 100 cc) after RTX - I think this should be mentioned in limitations of your study.
- "The majority of patients' QoL were not affected due to the fact that they do not need RRT, and a similar result was found by another study²¹" - Too many studies (old and recent ones) reported this fact. The authors can use at least more than one study to prove this fact and ensure that RTX still carries better QoL than RRT despite some voiding abnormalities.
- "In this study, one male older ... This proves that patients with decreased LVEF had increased risk for delayed graft and worse long-term graft function" - I wonder how this story is relevant to your main aim and focus of the study?

Is the work clearly and accurately presented and does it cite the current literature?

Yes

Is the study design appropriate and is the work technically sound?

Yes

Are sufficient details of methods and analysis provided to allow replication by others?

Partly

If applicable, is the statistical analysis and its interpretation appropriate?

I cannot comment. A qualified statistician is required.

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Pediatric Nephrology and Transplantation

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Reviewer Report 10 June 2021

<https://doi.org/10.5256/f1000research.23135.r86192>

© 2021 Lima M. This is an open access peer review report distributed under the terms of the [Creative Commons Attribution License](#), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Marcelo Lopes de Lima

Renal Transplant Research Laboratory (LINT), School of Medical Sciences, University of Campinas, Campinas, Brazil

It is a study that is very interesting and properly conducted.

I suggest some changes with the intention of improving the understanding of the results:

1. If the aim of this study was to evaluate voiding characteristics of patients after RTX surgery, it would be better concluded only with the phrase "After RTX, the majority of patients experienced frequency and nocturia problems"; all the other affirmations are pertinent in the discussion of the paper, but not in the conclusion.
2. I think that urinary infection can not be labeled as cause of symptoms based on the results of this paper, because inclusion criteria for participants were adults with sterile urine.
3. Patients with neurogenic bladder and history of urinary obstruction were excluded, but urodynamic evaluation was not performed. How do the authors explain this?
4. I agree that the most influential of limitations of this study were absence of urodynamic evaluation and short follow-up, but the findings may guide early drug control of symptoms in kidney transplant patients. This may be discussed.

Good job, I hope I've helped.

Is the work clearly and accurately presented and does it cite the current literature?

Yes

Is the study design appropriate and is the work technically sound?

Partly

Are sufficient details of methods and analysis provided to allow replication by others?

Partly

If applicable, is the statistical analysis and its interpretation appropriate?

Yes

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Kidney Transplant.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

The benefits of publishing with F1000Research:

- Your article is published within days, with no editorial bias
- You can publish traditional articles, null/negative results, case reports, data notes and more
- The peer review process is transparent and collaborative
- Your article is indexed in PubMed after passing peer review
- Dedicated customer support at every stage

For pre-submission enquiries, contact research@f1000.com

F1000Research