

Original Article

Incidence of nocturia in post kidney transplant patients at Chiang Mai University Hospital: a descriptive study

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Abstract

Objective: Kidney transplantation is the most effective long term treatment for ESRD patients one reason being the decrease in complications related to hemodialysis/peritoneal dialysis. However, the transplantation is associated with high urine volume which makes ESRD patients experience increased nocturia affecting quality of life. The objective of this study is to investigate incidence and frequency of nocturia at different periods of time after kidney transplantation and the percentage of increase in bladder capacity.

Materials and Methods: This descriptive and ambispective study was carried out using data from medical records and self-frequency voiding charts recorded after transplantation at 1, 3 and 6 months. Data used was pertinent to kidney transplant patients at Chiang Mai University Hospital from June 2018 to February 2020 and August 2020 to December 2021.

Results: Data from a total of 132 patients fitted the criteria, 68 patients from prior study and 64 patients who were enrolled onto a prospective study. Virtually 100% of patients (131/132) have nocturia (nighttime voiding ≥ 2) at 1 month after surgery, the frequency decreasing in incidence at 3 and 6 months (96.21 & 87.88% respectively). The mean frequency of nighttime voiding is also decreasing at 1, 3, and 6 months (5.72, 4.24, 3.29 respectively). Meanwhile, the mean post-operative bladder capacity(ml) is increasing, at 360, 449, and 486 ml at 1, 3, and 6 months respectively. These results may show a correlation between increase in bladder capacity and decrease in frequency of nighttime voiding

Conclusion: Post-kidney transplant patients will face nocturia, but in most cases this will improve in time because of the increase of bladder capacity. Further research into this area needs to include a longer follow up period to enable the identification of the timing of the plateau phase when nighttime voiding and bladder capacity are stable. This will enable both patients and health professionals to plan and advise regarding any idiosyncracies in recovery after kidney transplantation.

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Introduction

Due to the development and improvement in medical treatment and technologies, Thailand is becoming an elderly population. Chronic kidney disease affects health, well-being and national expenditure. The prevalence of therapies associated with chronic kidney disease and kidney failure such as peritoneal dialysis and hemodialysis are also increasing. However, those techniques have many complications such as cardiovascular and infectious complications and poor quality of life (QoL).

Kidney transplant (KT) has become the gold standard treatment for end-stage renal disease (ESRD) due to fewer complications and better QoL in comparison to the various therapeutic procedures. Preoperative anuria/oliguria in end-stage renal disease and post-operative polyuria after transplantation² can cause lower urinary tract symptoms (LUTs) such as frequency and nocturia.^{1,3,4}

Nocturia, nighttime voiding ≥ 2 , is one symptom that affects QoL.⁵⁻⁹ This study investigates the incidence, correlation between bladder capacity and nocturia, and frequency of night-time voiding at different periods of time after transplant.¹⁰

The Primary outcome is the incidence of nocturia in post KT patients

Secondary outcomes are the frequency of nocturia and volume of bladder capacity at different periods of time post-transplant, with a view to application of the data to be able to inform patients before surgery and collect data for more studies in the future.

Materials and Methods

This study is an ambispective study. Earlier data from a prior study at our institute was used. In the cohort of that study 68 patients from June 2018 to July 2020 fitted the criteria for this study. We also collected prospective data from patients who underwent kidney transplant at Chiang Mai University Hospital from August 2020 to May 2022

The inclusion criteria were patients who underwent kidney transplantation at our institute, of ≥ 20 years of age and could follow up at our out-patient department for at least 6 months.

The exclusion criteria were patients who did not consent to inclusion in the study, had an indwelling catheter postoperatively, urinary diversion patients and who had urine output per day less than 1.5 l/day.

Data collected included patient characteristics such as age, sex, body mass index (BMI), underlying disease and voiding volume or duration of anuria before transplantation.

Bladder capacity was measured by bladder filling intraoperatively, a routine procedure before kidney transplant surgery.

At the time of discharge, patients were provided with a bladder diary and were instructed to complete a voiding diary diligently. The diary was to be presented to our physicians during their follow-up appointments. We also recorded creatinine levels both prior to discharge and during subsequent follow-up assessments.

This study is a descriptive study and the results are shown as the mean of each parameter.

Ethical approval was given by the Ethical Committee of Chiang Mai University (Study Number: 125/2023) (Fig. 1)

Results

Data was collected from 68 patients from a prior study and all 83 patients that fitted the inclusion criteria were initially enrolled Nineteen patients were excluded from the study due to a delay in graft function necessitating hemodialysis (5), death (3), lost to follow up (3), urine volume less than 1.5 L/day (3), graft failure (2), ureteric stricture that need diversion (1) and language problems (2). Therefore, data from a total 132 patients were included in the study.

The majority of patients were aged 31 to 60 years, with males outnumbering females by nearly two to one (85 males compared to 47 females).

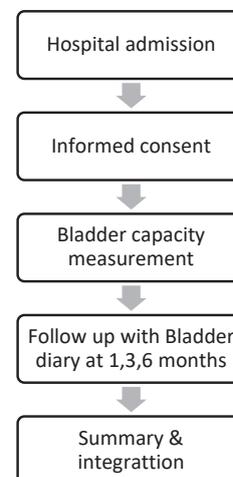


Figure 1. Diagram to show how the data was collected and integrated

Table 1. Demographic data of post kidney transplant patients (N=132)

Parameters	n (%)
Age (years), mean (SD)	42.80 (12.15)
Age (years)	
≤ 20	3 (2.27)
21-30	19 (14.39)
31-40	35 (26.52)
41-50	32 (24.24)
1-60	35 (26.52)
> 60	8 (6.06)
Sex	
Male	85 (64.39)
Female	47 (35.61)
BMI (kg/m ²), mean (SD)	20.87 (3.02)
BMI (kg/m ²)	
≤ 17	19 (14.39)
18-23	93 (70.45)
24-30	20 (15.15)
Co-morbidity	
HT	59 (44.70)
DM	19 (14.39)
HBV	6 (4.55)
SLE	8 (6.06)
Others	25 (18.94)
None	28 (21.21)
RRT before KT	
None	2 (1.52)
HD	104 (78.79)
CAPD	23 (17.42)
HD+CAPD	2 (1.52)
Pre-emptive	1 (0.76)
Cause of ESRD	
DM	11 (8.33)
IgA nephropathy	9 (6.82)
Chronic glomerulonephritis	13 (9.85)
ADPKD	4 (3.03)
Stone	8 (6.06)
Lupus nephritis	9 (6.82)
Others	19 (14.39)
Unknown	59 (44.70)

RRT = Renal replacement therapy, CAPD = continuous ambulatory peritoneal dialysis, HD = hemodialysis, BMI = body mass index, HT = hypertension, DM = diabetes mellitus, HBV = hepatitis B viral infection, SLE = systemic lupus erythematosus, ADPKD = autosomal dominant polycystic kidney disease

Over 70.00% of the patients exhibited a normal BMI and presented with comorbidities. Characteristics of patients are shown in Table 1.

The vast majority of the patients had nocturia after surgery, nearly 100% (99.24%) had nocturia at 1st month numbers decreasing to 88.00% in six months (Table 2).

Table 2. Incidence of nocturia in post kidney transplant patients at 1, 3, 6 months

Parameters	n (%)
1 st month nocturia frequency	
< 2	1 (0.76)
≥ 2	131 (99.24)
3 rd month nocturia frequency	
< 2	5 (3.79)
≥ 2	127 (96.21)
6 th month nocturia frequency	
< 2	16 (12.12)
≥ 2	116 (87.88)

Table 3. Mean of nighttime voiding and bladder capacity in post kidney transplant patients at 1, 3, and 6 months

Parameters	Mean (SD)
1 st month nighttime voiding	5.72 (2.54)
3 rd month nighttime voiding	4.24 (2.09)
6 th month nighttime voiding	3.29 (1.73)
1 st month bladder capacity	360.07 (138.90)
3 rd month bladder capacity	449.17 (162.92)
6 th month bladder capacity	486.10 (160.84)

SD = standard deviation

Table 4. Mean percentage difference of bladder capacity and nighttime voiding between 1st vs 3rd and 6th months

Parameters	Mean (SD)
% Increase of bladder capacity at 1 & 3 months	30.50 (42.19)
% Increase of bladder capacity at 1 & 6 months	43.45 (49.50)
% Decrease of nighttime voiding at 1 & 3 months	22.43 (33.07)
% Decrease of nighttime voiding at 1 & 6 months	37.69 (34.38)

SD = standard deviation

The mean numbers of patients experiencing nighttime voiding also decreased with time after surgery; a frequency of 5.72, 4.24, 3.29 at 1st, 3rd, 6th months respectively (Table 3).

Mean percentage decrease of nighttime voiding was calculated at 1st vs 3rd month and 1st vs 6th month, the results were 22.43 and 37.69 respectively (Table 4).

The mean bladder capacity that we inferred from functional bladder capacity from maximal voiding volume recorded in the bladder diary was increasing in line with time after surgery from 360 ml to 486 ml over the 6 months (Table 3).

Average percentage increase in bladder capacity at 1st vs 3rd month and 1st vs 6th month were 30.5 and 43.45 respectively (Table 4).

Discussion

A prior study carried out by der Weide et al in 2008¹, investigated lower urinary tract symptoms in post kidney transplant patients with a sample size of 52 patients. They found that the incidence of nocturia was 60.00% and they used subgroup analysis with structural equation modelling to find risk factors. Results showed that factors associated with nocturnal polyuria were small bladder capacity and dysfunctional voiding.

Our study showed that nearly 100% of post kidney transplantation patients encountered nocturia which decreased by around 12.00% in 6 months. In study risk factors were not investigated but the results indicate an inverse correlation between bladder capacity and nighttime voiding.

The mean numbers of nighttime voiding decreased over the six month period by approximately twice and the mean percentage of decrease of nighttime voiding was more than 33.00% in 6 months. The mean bladder capacity increased by around 150 ml and the mean percentage of increase in bladder capacity was nearly 50.00% by the 6 month follow up.

From this prospective data, we found that the incidence of nocturnal polyuria was 100% but the data from the retrospective patients was insufficient to draw any conclusions.

The limitations of this study are that the research team could not measure bladder capacity by the same interventions in the patients who were not under anesthetic due to the invasiveness nature of the bladder filling. In addition the ESRD patients who had anuria/oliguria pre-operatively could not provide the detailed bladder diary.

This study investigated only nocturia and bladder capacity in association with kidney transplant, however, nocturia and other LUTs can also be caused by urinary tract infections, benign prostate hypertrophy, bladder disease, and dysfunctional voiding, all of which could have impacted on our results. The short period of follow-up and the reliability of the bladder diary are also limitations of this investigation which would need to be addressed in future studies.

Conclusion

Post-kidney transplant patients will face nocturia, but this will improve over time largely because of the increase in bladder capacity. A longer follow up period is essential for future studies

in order to identify the plateau phase following surgery to document the time that nighttime voiding and bladder capacity are stable. This will enable both patients and health professionals to plan and advise regarding any idiosyncrasies in recovery after kidney transplantation.

Conflict of Interest

The authors declare no conflict of interest.

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