

# Early Stent Removal After Kidney Transplantation: Is it Possible?

Majid Ali Asgari,<sup>1</sup> Farid Dadkhah,<sup>1</sup> Seyed Ahmad Tara,<sup>1</sup> Hassan Argani,<sup>1</sup> Ali Tavoosian,<sup>1</sup> and Alireza Ghadian<sup>2,\*</sup>

<sup>1</sup>Urology and Nephrology Research Center, Department of Urology and Kidney Transplantation, Shahid Modarress Hospital, Shahid Beheshti University of Medical Sciences, Tehran, IR Iran

<sup>2</sup>Nephrology and Urology Research Center, Baqiyatallah University of Medical Sciences, Tehran, IR Iran

\*Corresponding author: Alireza Ghadian, Nephrology and Urology Research Center, Baqiyatallah University of Medical Sciences, Tehran, IR Iran. Tel: +98-2181262073, Fax: +98-2181262073, E-mail: p\_ghadian@yahoo.com

Received 2015 June 07; Accepted 2015 June 08.

## Abstract

**Background:** The most important surgical complications of renal transplantation are stenosis and obstruction of the ureterovesical anastomosis. Routine use of ureteral stents can prevent this complication, but the optimal time for ureteral stent use is still controversial.

**Objectives:** The purpose of this study is to compare the benefits and complications of early and delayed stent removal after surgery. Early ureteral stent removal can decrease some complications, such as urinary tract infections (UTIs), bladder irritation symptoms, persistent hematuria, and the risk of stent crusting; its benefits include easier stent removal and shorter hospitalization time.

**Patients and Methods:** All patients who underwent kidney transplantation from May 2011 until March 2012 in Modarres Hospital were included in this study. We classified the patients into three groups, based on time of stent removal (10, 20, and 30 days after transplantation).

**Results:** Ninety-one patients were studied; urologic complications (hydronephrosis and urinoma) in these three groups were analyzed and showed no statistical significant difference.

**Conclusions:** We can remove the ureteral stent earlier after kidney transplantation with no increase in the prevalence of surgical complications.

**Keywords:** Ureteral Stent, Renal Transplantation, Ureterovesical Anastomosis

## 1. Background

In recent decades, renal transplantation surgery has increased dramatically (1). The occurrence of urologic complications after surgery is inevitable (1, 2). These complications can include urinary leakage from the ureteral anastomosis, fistula, stenosis, and obstruction of the ureteral anastomosis (1-3).

The most important surgical complications are stenosis and obstruction of the ureteral anastomosis to the bladder, which occurs in 2% - 7.5% of cases (1, 4). These complications can cause high morbidity, increased hospitalization time, and subsequent increased costs (1, 2). Therefore, routine use of ureteral stents during kidney transplantation as prophylaxis to prevent such complications seems logical (1-3).

Ureteral stent placement decreases surgical complications without significant costs (4, 5). Removal of a ureteral stent is an endoscopic procedure; thus, ureteral stenting to avoid ureteral anastomosis complications is cost effective (1, 2, 5). The major complications of ureteral stent include increased rates of UTI (urinary tract infections) (5, 6). Other

problems include stent migration, persistent hematuria, bladder irritation, and complications of stent removal (5, 6).

A ureteral stent after renal transplantation usually will be removed after 4 - 6 weeks (7), but it should be noted that the optimal length of time for retaining ureteral stents is controversial and is not specified yet (1, 7).

## 2. Objectives

The purpose of this study is to compare the benefits and complications of early and delayed stent removal after surgery. Early remove of a ureteral stent can decrease some complications, such as UTIs, bladder irritation symptoms, persistent hematuria, risk of stent crusting; benefits include easier stent removal and shorter hospitalization time.

## 3. Patients and Methods

Participants in this study were patients who underwent kidney transplantation from May 2011 until March

2012 in Modarres Hospital. Exclusion criteria included:

- Previous history of kidney transplant rejection.
- Serum creatinine levels higher than 3 before remove of the ureteral stent.
- Significant hydronephrosis, urinoma, or substantial fluid collection around the graft in ultrasonography before removing the stent.
- Previous history of chemotherapy or radiotherapy to the pelvis.
- Patients who had undergone a kidney transplant from a cadaver.

Based on inclusion and exclusion criteria, we studied 91 patients.

Before ureteral stent removal, all patient assessments included:

- Serum creatinine levels.
- A urine culture.
- Renal ultrasonography to assess hydronephrosis, fluid collection, and urinoma.

Then the patients were classified into three groups, according to random table. In the first group, ureteral stents were removed 10 days after transplantation; in the second group, ureteral stents were removed 20 days after transplantation; and in the third group, stents were removed 30 days after transplantation.

One month after ureteral stent removal, we reevaluated the patients using the same assessments as before stent removal. The resulting data were analyzed by SPSS 18 software.

#### 4. Results

We studied 91 patients who had undergone renal transplantation surgery at Modarres Hospital from May 2011 until March 2012.

These individuals were classified in three groups. In the first group, the ureteral stent was removed 10 days after transplantation; in the second group, the ureteral stent was removed 20 days after transplantation; and in the third group, the stent was removed 30 days after transplantation.

Of the 91 patients, 54 were male and 37 were female; the gender breakdown for each group is shown in [Table 1](#).

The patients' mean age was  $41.1 \pm 14.2$ ,  $38.03 \pm 13.49$ , and  $43.7 \pm 14.37$  in Groups 1, 2, and 3, respectively. The minimum and maximum ages of the patients in all three groups are shown separately in [Table 2](#).

Urine cultures were performed before stent removal in 17 patients; these cultures confirmed UTIs six patients in Group 1, three patients in Group 2, and eight patients in Group 3. After removing the ureteral stents, urine cultures

**Table 1.** Gender Breakdown<sup>a</sup>

Groups	Gender	
	Female	Male
Group 1	12 (40)	16 (60)
Group 2	14 (45.2)	17 (54.7)
Group 3	11 (36.7)	19 (63.3)

<sup>a</sup>Date are expressed as No. (%).

**Table 2.** Patients' Ages

Groups	Minimum	Maximum	Mean $\pm$ SD
Group 1	20	68	$41.1 \pm 14.2$
Group 2	15	68	$38.03 \pm 13.49$
Group 3	15	64	$43.7 \pm 14.37$

were done again; they showed that five patients had positive urine cultures three patients in Group 1 and three patients in Group 2 ([Table 3](#)).

**Table 3.** Urine Cultures<sup>a</sup>

Groups	Before Removal of Stent	After Removal of Stent
Group 1	6 (20)	3 (10)
Group 2	3 (9.7)	2 (6.5)
Group 3	8 (26.7)	NA
Total	17 (18.6)	5 (5.4)

<sup>a</sup>Date are expressed as No. (%).

Ultrasonography performed before stent removal showed two patients had mild hydronephrosis one patient in Group 1 and one patient in Group 3.

Ultrasonography performed before stent removal showed that four patients had urinoma one patient in the first group, one patient in the second group, and two patients in the third group. According to the ultrasound after stent removal, only one patient in Group 1 had fluid collection around the graft.

Ultrasonography was performed a month after the ureteral stents were removed. Of six patients with hydronephrosis, two patients with mild hydronephrosis were in Group 1, one patient with moderate hydronephrosis was in Group 2, and in Group 3, two patients had mild hydronephrosis.

One patient in Group 2 and two patients in Group 3 had urinoma after stent removal. In addition, one month after removal of the ureteral stents, one patient in Group 2 had

fluid collection around the transplanted kidney. Mean creatinine in Group 1 patients before stent removal was 1.3 (1 - 1.8); in Group 2, it was 1.44 (1.1 - 2.8), and in Group 3, it was 1.37 (1 - 2.4).

The patients' mean creatinine after stent removal in Group 1 was 1.37 (1 - 1.9), in Group 2 it was 1.42 (1 - 2.5), and it was 1.45 (1 - 2.2) in Group 3.

After analyzing the data obtained, it was found that the average age showed no statistically significant difference among the three groups ( $P = 0.25$ ). The presence of an active UTI before stent removal showed no statistically significant difference among the three groups ( $P = 0.22$ ).

The results showed that before ureteral stent removal, there are no statistically significant differences among the three groups in hydronephrosis, fluid collection, and urinoma ( $P = 0.59, 0.35, \text{ and } 0.76$ , respectively). Results after stent removal also confirmed that there are no significant differences among the three groups in hydronephrosis, fluid collection, urinoma, and UTIs ( $P = 0.71, 0.37, 0.76, \text{ and } 0.22$ , respectively). Tables 4 and 5 show the results summarized above.

Data analysis also showed that among the three groups there is no statistically significant differences in creatinine levels before and one month after stent removal ( $P = 0.15 \text{ and } .42$ , respectively); the results are given in Table 6.

## 5. Discussion

Urologic complications following transplantation surgery can cause great morbidity (1-6). Two major complications are anastomotic stenosis of the ureter to the urinary bladder and urinary leakage (3). The use of ureteral stents as prophylaxis to prevent complications during transplantation has been proven in many studies (1, 3, 5). However, there is no consensus about the ideal time to remove a ureteral stent graft (3). According to some studies, stent removal can usually be done four to six weeks after surgery (7).

Typically, an endoscopic procedure is performed to remove the stent (2,5), but some studies evaluated external stenting procedures to remove the stent when the patient did not undergo cystoscopy.

In the study Minnee et al. conducted in 2009 to assess the five-day external stented ureterocystostomy protocol, the participants showed that the protocol has been associated with satisfactory results (3). In a study conducted in 1995, Bassiri had shown that a ureteral stent could remain in place for six to eight weeks (8). Stents that stay in place longer are associated with some side effects, including an increased risk of UTI, hematuria, irritable bladder symptoms, and complications when removing stents, due to stent crusting during long-term placement (1, 3, 5,

6). For example, in the Bassiri et al. study, 33% of the patients with ureteral stents had UTIs, and in a 2002 study conducted in India by Balbir S Verma et al. it was 25% (8, 9). However, studies have not observed an increased risk of UTIs in patients with ureteral stents, which between them can be pointed to a Pleass et al. study in 1995 (10).

In our study, the UTI rate in the three groups showed no statistically significant differences when removing the ureteral stent 10, 20, or 30 days after surgery. However, the UTI rate before removing the stent was 18.6%. All patients were seen one month after stent removal, and the rate was reduced to 5.45 of total patients. In the Balbir S Verma et al. study, patients were divided into two groups. The ureteral stents were removed two and four weeks after surgery. In this study, the rate of urinary infection was higher in the group that had stent removal performed four weeks after surgery, but it was not statistically significant (9). In this study, the stent was removed at the same administration in the hospital after transplantation, and it was cost effective (9).

This study recommended the removal of the ureteral stent within two weeks of surgery without increased (9).

As noted in our study, the ureteral stents were removed at 10, 20, and 30 days after surgery.

Creatinine before and one month after stent removal showed no statistically significant difference among the three groups. Urologic complications in the three groups consisted of hydronephrosis, urinoma, and fluid collection and were not statistically significant. In our study, patients who had their stents removed 10 days after transplantation surgery, the stent was removed at the same administration in hospital, and as a consequence, hospital treatment costs were reduced.

We can conclude that according to the routine use of ureteral stents during kidney transplantation surgery, we can remove the stent after surgery with no increased risk of urologic complications at shorter intervals after renal transplantation.

## Footnote

**Authors' Contribution:** Majid Ali Asgari and Farid Dadkhah performed the operations, Seyed Ahmad Tara and Hassan Argani were the patients' nephrologists, Ali Tavoosian collected data, and Alireza Ghadian contributed analysis and wrote the manuscript.

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**Table 4.** Complications Before Stent Removal<sup>a</sup>

Variables	Group 1 (n = 30)	Group 2 (n = 31)	Group 3 (n = 30)	P value
U/C	6 (20)	3 (9.7)	8 (26.7)	0.22
Hydronephrosis	1 (3.3)	0	1 (3.3)	0.59
Urinoma	1 (3.3)	1 (3.2)	2 (6.7)	0.76
Fluid collection	1 (3.3)	0	0	0.35

<sup>a</sup>Data are expressed as No. (%).

**Table 5.** Complications After Stent Removal<sup>a</sup>

Variables	Group 1 (n = 30)	Group 2 (n = 31)	Group 3 (n = 30)	P value
U/C	3 (10)	2 (6.5)	0	0.22
Hydronephrosis	2 (6.7)	4 (12.9)	3 (10)	0.71
Urinoma	1 (3.3)	1 (3.2)	2 (6.7)	0.76
Fluid collection	0	1 (3.2)	0	0.76

<sup>a</sup>Data are expressed as No. (%).

**Table 6.** Serum Creatinine Levels in Different Groups Before and After Stent Removal<sup>a</sup>

Variables	Group 1 (n = 30)	Group 2 (n = 31)	Group 3 (n = 30)	P value
Creatinine before stent removal	1.30 ± 0.20	1.44 ± 0.32	1.37 ± 0.26	0.15
Creatinine after stent removal	1.37 ± 0.19	1.42 ± 0.31	1.45 ± 0.23	0.42

<sup>a</sup>Data are expressed as mean ± SD.

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