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Should transplant ureter be stented routinely or not?

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Abstract. – OBJECTIVE: To compare early complications in patients with/without stents following renal transplantation and to determine whether routine stenting should be used in all renal transplant patients or not.

PATIENTS AND METHODS: 194 patients (108 males, 86 females, mean age: 45.2 ± 13.2 years) who were followed-up at the Division of Nephrology of Istanbul Bilim University between 2006 and 2013 were included in the study. Demographic characteristics, etiologies of renal disease, comorbidities, type of renal transplantation, early complications, delayed graft function were retrospectively recorded. All patients were divided into two groups according to stent replacement. Early complications were compared.

RESULTS: 101 patients were inserted double-J(DJ) stent (48 females, mean age 46.5 ± 13.7 years, mean body mass index [BMI] 26.1 ± 4.7 kg/m^2) and 93 patients were not inserted stent (38 females, mean age 43.7 ± 12.6 years, mean BMI 24.3 ± 4.2 kg/m^2).

The rate of early complications of urinary tract infections, lymphocele, urinary leaks, wound infection and perirenal hemorrhage of patients with stent were 28.9%,3.0%,4.0%, 5.1% and 1.3%, respectively, while these rates among patients without stent were 35.5%, 2.2%,3.2%,6.5% and 1.2%,respectively. There was no significant difference between with stent and without stent groups with regard to early complications.

CONCLUSIONS: Routine DJ stenting in all renal transplant patients is not necessary. Prophylactic use of DJ stent has no effect on early complications. Prophylactic DJ stent replacement can be used in obese patients, in patients receiving cadaveric transplants or in patients receiving transplants from unrelated donors.

Key Words:
Renal transplantation, Double J stent, Early complication, Urinary tract infection, Urinary leak.

Introduction

Urinary complications are the most common technical complication associated with contemporary renal transplantation[1-3]. Urological complications are associated with significant morbidity, mortality, and prolonged hospital stay and frequently require a second surgical intervention.

Ureteric double-J (DJ) stents are frequently used in various aspects of modern urologic practice. In renal transplantation, the use of DJ stents to treat postoperative complications like urine leaks or strictures is well-known[4]. However, routine intraoperative placement of DJ stents at the time of ureteroneocystostomy is debatable. This controversy has been observed in both retrospective studies[5-8] and in prospective randomized trials[9-13]. Three controlled trials have suggested that routine stent insertion decreased the incidence of postoperative urologic complications by favoring the healing of the vesicoureteral anastomosis[9-11]. In contrast, 2 studies showed no significant improvement from stenting[12,13], even describing an increased incidence of associated urinary tract infection (UTI).

In this study, we aimed to compare early complications (during the first 3 months) in patients with or without stent following renal transplantation and to determine whether routine stenting should be used in all renal transplant patients.

Patients and Methods

We analyzed the records of 194 patients who underwent renal transplantation at Istanbul Bilim University Renal Transplantation Unit, from January 2006 to December 2013. Patients who were above 18 years old and who had their first renal transplantation were included in this study.

Demographic characteristics such as age, gender, body mass index (BMI), etiologies of primary renal disease, presence of comorbid diseases (hypertension, cardiovascular disease, cerebrovascular events, malignancy) presence of diabetes mellitus, history of dialysis, type of renal

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transplantation (living or deceased), degrees of related living donors, pharmacologic therapy (induction and maintenance therapy) and presence or absence of prophylactic double-J stent were recorded from the patients' medical charts.

Ureterovesical stents (DJ stents) were rather implanted on a subjective basis when the transplant surgeon experienced an unfavorable anatomy and expected complications.

Early complications (during the first 3 month) such as, UTI, lymphocele, urinary leaks, perirenal hemorrhage, ureteral obstruction or stenosis, delayed graft function (DGF) and acute rejections were established after renal transplantation operation.

Antibiotic prophylaxis included a single intravenous dose of ampicillin sulbactam 1 g at anesthetic induction and all patients received prophylactic co-trimoxazole for 3 months after transplantation.

At surgery, we use extravesical technique of ureteroneocystostomy including an antireflux tunnel. Tunneling procedure is performed in a similar method to Lich-Gregoir technique, by imbricating the seromuscular layer over the ureter, with or without DJ stents. The graft was revascularized in a standard way, with the renal vein anastomosed to the side of the external iliac vein. The renal artery was end-to-side anastomosed to the external iliac artery, or common iliac artery. The Lich-Gregoir ureterovesical anastomosis was performed in the stented group around a 4.8-French, 24 cm silicone DJ stent (Vortek, Coloplast, Humlebaek, Denmark) that was endoscopically removed on the 15th postoperative day.

The stent was removed by flexible cystoscopy under local anesthesia on a day case basis by a urologist. Antibiotic prophylaxis was not given before removing the stents, the DJ tips were cultured for bacteria and fungi. A midstream specimen of urine was sent 48 h prior to removal of stent and this was repeated if blood or protein was present in urine or the patient was symptomatic.

Urinary tract infection was defined as the patient having one of the following symptoms of dysuria, fever, urgency, frequency, suprapubic tenderness, and positive urine culture with $\geq 10^5$ microorganism/cm^3 or two of the above signs and pyuria (5 > WBC/mm^3) or $<10^5$ microorganism/cm^3 if patient was on antibiotics.

Clinical presentation of a urinary leak was regarded as urine output from drain, fever, pain, and/or swelling at the graft site or peritoneum as well as signs of sepsis. Delayed graft function (DGF) was defined as requirement for dialysis within the first week of transplantation.

Immunosuppression comprised rabbit antithymocyte globulin (ATG) and/or IL-2 receptor blockers (basiliximab) according to induction therapy, methylprednisolone (1000 mg given intraoperatively, followed by sequential tapering to daily oral prednisone 30 mg by one week, 10 mg at one month and 5 mg at 6-12 months), mycophenolate-mofetil (MMF) (2 g/d postoperatively with dose adjustment for side effects), calcineurin inhibitors (tacrolimus or cyclosporin-A started within 24 hours after surgery).

All patients were divided into two groups according to DJ stent replacement (with stents, without stents) and early complications were compared. We evaluated if routine ureteric stenting is necessary in all renal transplants or not.

Statistical Analysis

Statistical analysis was done by Scientific Package for Social Science (version 17.0; SPSS Inc., Chicago, IL, USA). χ^2-test was used for nonparametric variables. Independent-samples *t*-test was used for analyzing parametric variables. Correlation analysis were tested Pearson correlation statistics. Differences were considered statistically significant if *p*-value was less than 0.05.

Results

A total of 194 patients were included in study, of whom 86 were female. Mean age was 45.2 ± 13.2 years and mean BMI was 25.2 ± 4.5 kg/m^2. 177 (91.2%) patients were performed living donor kidney transplantation, remaining 14 patients were performed preemptive kidney transplantations.

The most common causes of renal failure were diabetic nephropathy (21.1%), chronic glomerulonephritis (17.5%), reflux nephropathy and chronic pyelonephritis (4.1%) and autosomal dominant polycystic kidney disease (2.6%) while 52.6% of patients had no known etiology. Cardiovascular events in 14 patients, hypothyroidism in 8 patients, and chronic respiratory problems in 2 patients were determined as comorbidity.

Among the living donors, 61.7% were first-degree relatives (mother, father, siblings, children), 23.8% were spouses, 6.6% were second degree relatives (grandparents, uncle, etc.) and 7.9% were ethics committee approved unrelated persons.

Table I. The demographic characteristics of the patients.

	Stented (n=101)	Non-stented (n=93)	p
Age (years)	46.5 ± 13.7	43.7 ± 12.6	0.15
Gender (female %)	48	38	0.35
BMI (kg/m^2)	26.1 ± 4.7	24.3 ± 4.2	0.012
Presence of diabetes mellitus	23	18	0.27
Number of live donors	84	93	< 0.001
Number of preemptive transplants	7	7	0.87
History of dialysis (%)	91.6	89.1	0.57

BMI: Body mass index.

A total of 9 patients had DGF and 14 patients had acute rejection attacks in early period. The most common complications during the first 3 months after surgery were UTIs in 61 (32.1%) patients. On the other hand, wound infections were detected in 11 patients, urinary leaks in 7 patients, lymphocele in 5 patients and perirenal hemorrhage in 2 patients. None of the patients had ureteral obstruction or stenosis, lost their grafts or died during the follow-up period.

One hundred and one patients had a DJ stent inserted during transplant operation, remaining 93 patients did not have any stents. The demographic characteristics of the patients with and without stent replacement are shown in Table I. Among the stented group, the majority of transplants (83.2%) were from living donors and 16.8% were from deceased donors. All of the transplants without stent replacement were from living donors. Thus, there was a significant difference between with stented and non-stented groups with respect to the type of organ donor ($p < 0.001$). Delayed graft function was established in 9 patients with stent, while none of patients had DGF in the non-stented group ($p = 0.003$).

As induction treatment, 44 patients received ATG and 57 patients received basiliximab in the stented group, whereas 57 patients received ATG and 36 patients received basiliximab in the non-stented group. There was a significant difference between stented and non-stented patients regarding the induction therapy ($p = 0.011$).

The most common maintenance treatment were MMF + tacrolimus (88% of patients), MMF + cyclosporine (7% of patients) and MMF + rapamycin (5% of patients) in the stented group, while this rate was 90.3%, 6.5% and 3.2%, respectively, in the non-stented group. Maintenance therapies were found similar between stented and non-stented patients ($p = 0.81$).

Complications at the first three months are shown in Table II. There was also no significant difference between the stented and non-stented groups with regard to UTIs, acute rejection, lymphocele, urinary leaks, wound infection and perirenal hemorrhage.

Micro-organisms were isolated in (78.6%) 48 of patients. Infection was caused by multiple organisms in 6 (9.8%) of the patients but *Escherichia coli* (39.3%) was the commonest single isolate in 24 of the patients. Other coliforms amounted to 9.8%, whereas Klebsiella species and *Proteus mirabilis* were cultured in 13.1% and 6.5% cases, respectively.

We found a significantly positive correlation between DJ stent and BMI, deceased donor kidney transplantation, DGF (r = 0.193, 0.297 and 0.212, $p = 0.01, 0.001$ and 0.003, respectively),

Table II. Early (the first 3 months) complications of patients.

	Stented (n = 101)	Non-stented (n = 93)	p
Delayed graft function (n)	9	0	0.003
Acute rejection (n)	9	5	0.40
Lymphocele (%)	3 (3.0)	2 (2.2)	0.71
Urinary leaks (%)	4 (4.0)	3 (3.2)	0.77
Wound infection (%)	5 (5.1)	6 (6.5)	0.76
Perirenal hemorrhage (%)	1 (1.3)	1 (1.2)	0.95
Urinary tract infection (%)	28 (28.9)	33 (35.5)	0.35

negative correlation between DJ stent and degrees of related of living donor (r = -0.184, $p = 0.024$). There was no correlation between DJ stent and lymphocele, urine leaks, perirenal hemorrhage, UTIs and acute rejection (r = 0.027, 0.021, 0.004, -0.071 and 0.075, $p = 0.71, 0.77, 0.95, 0.33$ and 0.33 respectively).

Discussion

In this study, prophylactic DJ stent replacement was not found to affect the early complications. Early complications were similar in stented and non-stented patients. There was a significant correlation between stenting and deceased donor kidney transplantation, high BMI and DGF. The most common early complication was UTI infection both in stented and non-stented patients.

Prophylactic stenting causes concern for some surgeons because of stent-related complications. Double-J stents are often placed by most of the transplant surgeons, when the healing process either is expected to be delayed or there is an increased risk of urine leak after transplantation. There are many theoretical benefits of prophylactic stenting. A stent has been reported to make the anastomosis technically easier to perform and the final luminal diameter may be larger[11]. A stent probably avoids ureteral bending, kinking or external compression from perigraft fluid collections. Moreover, prophylactic stenting can treat minor leaks and obstruction at the anastomotic site, but the most significant theoretical complication in the use of a stent is an increase in the number and severity of UTIs. Other possible complications include persistent hematuria, bladder discomfort, stent migration, breakage, encrustation and complications during removal[2].

Early complications such as urinary tract infections have been shown to be increased in patients with ureteric stents[14-17]. A meta-analysis of 49 published studies comparing the stented and non-stented anastomoses in extravesical ureteroneocystostomy during renal transplantation was done[18]. It was concluded that there was lower complication rate among the stented group as compare with the non-stented group; however, the results were statistically not significant. Zavos et al[19] compared the results in a stented and non-stented group of patients, primarily with transplants from deceased donors according to the operating surgeon's preference. The authors showed no significant difference in complication rates between the groups. In our study, the rate of early complications were similar.

Urinary tract and non-urinary tract infections are also significantly increased in renal transplant population. UTI occurred in 32.1% of our patients. The reported frequency of UTI may vary from 18% to 79%[20,21]. Differences in the definition, follow-up period, immunosuppression and the use of antimicrobial prophylaxis could explain this wide range. A recent report[22] showed that stenting of the vesicoureteral anastomosis is a predictor factor for UTI after kidney transplantation. Others could not identify such an association[16,23,24]. Tavakoli et al[16] demonstrated that there was a significantly increased risk of UTI's in patients with stents in place longer than 30 days. Ranganathan et al[17] also supported this, showing a significantly raised risk of UTI's in stented patients. Bassiri et al[12] reported an equal incidence of ureteral complications between the 2 arms, with a significant increase in the incidence of UTI among the stented group. In contrast, Kumar et al[11] reported an equal incidence of positive urine cultures in both groups, with the incidence of ureteral complications significantly greater among the non-stented group. Although frequency of UTI's were found less in stent inserted patients, this was not statistically significant between the two groups, in our study. It can perhaps be due to the short duration of stenting and routine antibiotic prophylaxis for each patient.

The pathogens isolated from renal transplant recipients with UTI have been previously reported to be similar to those causing UTI in the general population[13]. A renal transplant series reported recently that *Escherichia coli* would be the most common uropathogen (32%) and Enterococcus isolated in 18%[25,26]. The most common pathogen has been identified as *Escherichia coli* in our data.

Vesicoureteric complications present either as urine leaks, ureteric stenosis or obstruction. Ureteroneocystostomy anastomotic leakage and/or strictures complicate 3-9% of all renal transplants[1,2,18]. Some studies have demonstrated urinary leaks were less than 5%[27]. In our study, urinary leaks were found in 3.6% of all patients. Our finding that urine leak rate was not affected by the placement of ureteric stents is similar to the report by Dharnidharka et al[28] who showed that stents offered no benefit in preventing ureteric stenosis or leaks. Some studies have demonstrated lower leak rates in the stented group[16,29-31], whereas a study by Osman et al[15] found a small increase in leakage in the stented

group. Perhaps factors like stripping of the ureter, ureteric injury, multiple renal arteries, damage to lower polar artery, operative technique, cold ischaemia time and donor vascular disease are more important in determining whether urine leak or ureteric necrosis occurs or not. Urinary leakage complications were not affected by the placement of DJ stents according to our data.

In centers where patients are routinely stented after a renal transplant, there is no consensus on the optimal duration of stenting. A 5-day stenting protocol with the ureterocystostomy stented externally draining, using urinary catheter has been reported to achieve good results in live-donor recipients, with a nonsignificant change in UTI rates[32]. In a case-controlled study, it was found that stenting for two weeks avoids complications of prolonged use of stents without compromising the benefits[33]. A retrospective study[34] showed no change in the urologic complication rates in patients that had stents in for 2 weeks, compared with those that had them removed at a later time. The 2-week stent group had a lower UTI rate. Double J stents of patients were removed at a mean of two weeks in our unit. When DJ stent is retained in an immunocompromised transplant recipient, it adds to the additional morbidity.

Delayed graft function was frequently shown particularly in deceased donor kidney transplantation. Some studies demonstrated that serum creatinine levels were lower in patients with stents, which may reduce the occurrence of acute rejection[35]. In our patients DGF was significantly higher in the stented group. Although the frequency of acute rejection was higher in the stented group, this was not statistically significant. This situation can be due to the deceased donor kidney transplants in this group.

This is a retrospective study with a relatively small number of patients. Morreover, ureterovesical stents were rather implanted on a subjective basis when the transplant surgeon experienced an unfavorable anatomy and expected complications. In the absence of technical complications, ureteric ischemia is thought to be chiefly responsible for the early ureteric complications post transplantation.

Conclusions

The routine DJ stenting in renal transplantation is not mandatory. Prophylactic use of DJ stent has no effect on early complications. Prophylactic DJ stent replacement should be used in obese patients, patients receiving deceased donor kidney transplants, and living donor kidney transplantation only from unrelated donors.

Conflict of Interest

There are not any non-financial competing interests we would like to declare in relation to this paper.

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