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Original Article

Ureteric complications following renal transplantation: An eight years experience

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Abstract

Objectives: Ureteric complications (UCs) following renal transplantation (RT) cause significant morbidity and ureteric stents are employed to bridge the vesico-ureteric anastomosis with a view to preventing these complications. The purpose of this study was to examine the incidence of UCs and outcomes following RT in both stented (STG) and non-stented groups (NSTG) of RT patients.

Methods: This is a retrospective study of a cohort of 650 consecutive RTs [STG (N=267; 41%) and NSTG (N=383; 59%)] performed over a period of 8 years, where the data were retrieved from a prospectively maintained computerised database and case-notes.

Results: The overall incidence of UCs was 6.5% (42/650), which consisted of ureteric obstruction (UO) in 4.3% (28) and ureteric leak (UL) in 2.2%(14) of patients. The incidence of UO was significantly high in the NSTG compared to the STG (6.3% vs.1.5%; P=0.002). However, the incidence of UL (3.4% vs.1.3%; P=0.1) and post-transplant urinary tract infection (UTI) (44% vs.41%; P=0.57) were not significantly different between the STG and NSTG groups. UO and UL were associated with significantly high incidence of UTI (P=0.001 and 0.01, respectively). All UCs were managed successfully without allograft loss.

Conclusions: Routine stenting of ureteric anastomosis resulted in reduced incidence of UO without concomitant increased risk of UTI.

Key words: Renal transplantation, vesico-ureteric anastomosis, stent, complications

Ureteric complications (UCs) following renal transplantation (RT) contribute significantly to patient morbidity and compromise graft function. Improvements in the surgical techniques have reduced the incidence of UCs to 1-10%, although this has remained unchanged over previous twenty years.[1-3] Routine insertion of ureteric stent (US) during vesico-ureteric anastomosis has remained a subject of dispute and is guided by the experience and personal preference of individual transplant surgeon and the protocol of the institution. A number of centres have adopted a policy of routine prophylactic stenting at the time of RT to reduce the incidence of urine leaks (UL) and ureteric obstruction (UO).[4] In this article, we present the incidence of UCs following RT, evaluate the influence of US on the outcome, and review the pertinent literature related to contemporary practice.

Material and Methods

Over a period of 8 years commencing January 1993, 650 consecutive RTs were performed on 545 patients and the data were retrieved from our existing prospective computerised transplant database and case-notes. The median follow-up period was 4.7 (range, 0.5- 8.6) years. The demography of the patients is shown in the Table 1.

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Table 1 Patient demography

	STG (N=267)	**NSTG(N=383)**
Number of transplants	267(41)	383(59)
Age (Years) Mean ± SD	43±14.7	42±16
Male/Female	175/92(34)	236 /147(38)
Diabetes	27 (10)	26 (6.8)
Donor age (Years, Mean ± SD)	42±17	41±16
Donor source		
Cadaveric	238(89)	347(91)
Living-related	29(11)	36(9)
Previous transplants	56(21)	53(20)
Cold ischaemia time (Hours, Mean ± SD)	21.5±10	20±9
Graft function		
Immediate function	194(73)	292(77)
Delayed function	68(25)	79(20)
Non-function	5(2)	12(3)
Immunosuppressive regimen		
Cyclosporin-based	206	269
Tacrolimus-based	44	95
OKT3 induction	7	19
Figures in the parentheses indicate percentages		

All donor nephrectomies were open procedures where ureter was harvested with preservation of the periureteric fat and the hilar dissection was avoided in all cases limiting this medial to the gonadal vein. The vesico-ureteric anastomosis was fashioned after revascularisation of the kidney using the stented extravesical ureteroneocystostomy technique described by Lich-Gregoir et al, where the full thickness of the ureter was anastomosed to the bladder mucosa with a continuous 4/0 PDS suture. The muscle layer of the bladder was then approximated over the distal ureter to form a tunnel.[5, 6] Of the four consultant transplant surgeons involved in RT, two of them placed US on a routine basis, whereas other two surgeons placed US only if there was concerns over the vesico-ureteric anastomosis. A 14 cm 5.2 Fr. double-J (DJ) stent (Cook Urological, Indiana, USA) was used for this purpose. In all cases, the bladder was drained with a Foley catheter for at least 5 days and the DJ stent was removed using a flexible cystoscope after 3-6 weeks on an outpatient basis.

Ureteric obstruction was diagnosed by deterioration of renal function, dilated pelvicalyceal system on ultrasonography, which responded to nephrostomy drainage (Fig 1). Urine leaks presented with discomfort around the operative site, back or leg pain, and increasing discharge from the wound, which was confirmed by the presence of a perinephric collection on ultrasonography (Fig 2) and the aspirated fluid had composition that of urine on its biochemistry. The site of UO and UL were established by performing an antegrade pyelogram (Fig 3 and 4). Following establishment of the diagnosis, treatments were instituted in the form of either radiological interventions or open surgery as described in appropriate result sections. The results were assessed using Chi-squared and Fisher's exact tests, with $P<0.005$ taken to indicate statistical significance

Fig 1 Ultrasound scan showing hydronephrosis

Fig 2 Ultrasound scan showing perinephric collection

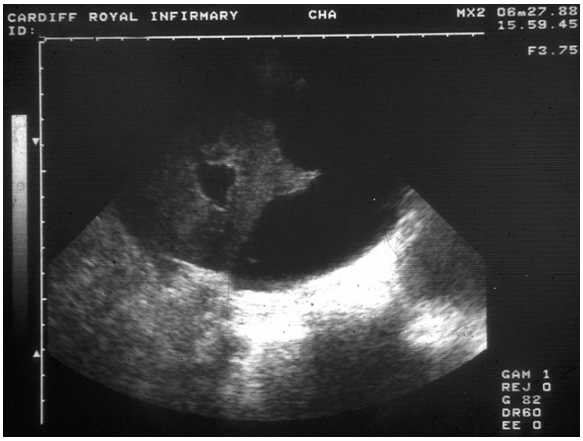

Fig 3 Antegrade pyelogram showing ureteric obstruction

Fig 4 Antegrade pyelogram showing urine leak

Results

The overall incidence of UCs was 6.5% (42/ 650), where UO occurred in 4.3% (28) and UL in 2.2 % (14) of patients. UO occurred in 1.5% (4/267) of patents in the STG and 6.3 % (24/383) in the NSTG (P=0.002); and UL was occurred in 3.4% (9/267) of the STG and 1.3% (5/383) of the NSTG (P=0.09) (Table 2). There was no renal allograft loss directly related to these complications.

Ureteric obstruction

Three patients in the SG presented with UO within first 4 months, and 1 after 1 year (median 87, range:

69-388 days) post-transplantation; whereas in the NSG, 15/24(63%) patients presented with UO within first 4 months (median 32, range: 2-120 days), 7(29%) within first year (median 210, range: 127-338 days) and 2(8%) at 4 and 5 years post-transplantation, respectively. The obstruction was demonstrated at the level of vesico-ureteric junction in both groups, except 5 patients in the NSTG where lymphocele caused extrinsic compression of the ureter (Fig). The procedures carried out to relieve UO are shown in Table 3.

Ureteric leak

The median time to presentation with UL in STG and NSTG were 13 (range, 1-31 days) and 58 days (range, 1-97 days), respectively. Small and late leaks were managed by bladder drainage alone or in combination with percutaneous nephrostomy if there was concomitant partial ureteric obstruction; otherwise, ureteric reimplantation and stenting were carried out. UL was demonstrated at the vesico-

ureteric junction in all but one patient, the latter required Boari flap reconstruction as the lower two-thirds of the ureter was non-viable from ischaemic necrosis (Table 4).

Urinary tract infection

There was significant increase in the overall incidence of culture-positive UTI following RT, 13% before RT compared with 42% following RT (P=<0.001); although the difference in the incidence of UTI between the STG and NSTG post-RT was not significant (44% vs. 41%; P=0.57). However, there was significantly high incidence of UTI in the presence of UO (71%; P=0.001) and UL (85%; P=0.01).

Table 2: Urological complications in the stented and non-stented groups

	STG (N=267)	**NSTG(N=383)**	**P**
Ureteric obstruction	4(1.5%)	24(6.3%)	0.002
Urinary leak	9(3.4%)	5(1.3%)	0.09
Urinary tract infections	114(44%)	159(41%)	0.57

Table 3: Treatment of ureteric obstruction

SG (N=4)	
Antegrade stenting	3
Reimplantation	1
NSG (N=24)	
Percutaneous nephrostomy	2
Antegrade stenting	10
Drainage of lymphocele	5
Ureteric reimplantation	7

Table 4 Treatment of ureteric leak

STG (N=9)	
Bladder drainage	1
Nephrostomy+bladder drainage	1
Antegrade stenting+bladder drainage	1
Ureteric reimplantation and stenting	5
Boari flap reconstruction	1
NSTG (N=5)	
Bladder drainage	1
Antegrade stenting	1
Nephrostomy+bladder drainage	1
Ureteric reimplantation and stenting	2

Discussion

The incidence of UCs following RTs has been reported to range from 1-10% in various studies and this has significant impact on the morbidity and postoperative recovery in the setting of immunosuppressed state of RT recipients.[3, 7] UO is the commonest UC following RT and the donor age greater than 65 years of age, multiple renal arteries and anti-HLA antibody level greater than 25% have been considered as independent risk factors for the development of UO.[8]

The original technique of Leadbetter-Politano[9] involves a large cystototomy and submucosal tunnelling of the ureter, which has been replaced by an extravesical ureteroneocystostomy technique[5, 6], which has proven to reduce UCs significantly in prospective studies.[10, 11] Endeavours should be made to prevent UCs by paying attention to details at every stage of transplant operation, which begins with donor nephrectomy, bench dissection and concludes with the recipient operation. The recognition of the importance of the preservation of the blood supply of

the distal ureter by careful preservation of the periureteric fat and the appropriate length of the ureter has made significant contribution towards the prevention of distal ureteric necrosis.[12]

The potential hazard of the use of the stents relates to an increased incidence and severity of UTI, although this was not seen on our study. Complications related to stents include calcification, bleeding, stent migration, discomfort, and on occasions, stents may be missed for several years before removal.[13] One of ours patients required extracorporeal shockwave lithotripsy for extensive encrustation prior to its successful removal. Removal of stent requires a second procedure, which not only increases cost, but can also be a source of morbidity.

Successful management of UCs mandates an early diagnosis through high index of clinical suspicion, appropriate investigations and correction of UO and UL on an emergency basis, which help preserve renal function. Percutaneous decompression of an obstructed ureter has proven to be useful,[14] while majority of early UL require reimplantation of ureter.[15]

Since the introduction of DJ stents in 1978[16], various conflicting results have been reported from both prospective and retrospective studies in relation to the effectiveness of US in the prevention of UC following RT.[17] The major problem experienced in all prospective studies was that they could not be adequately powered due to the paucity of the urological complications and requirement of large number of patients in the study to demonstrate a statistically significant benefit of one over the other.[18, 19] A recent systematic review in collaboration with Cochrane Renal Group has incorporated seven randomized controlled trials (1154 patients), and has demonstrated significant reduction of UCs by prophylactic ureteric stenting (relative risk 0.24; 95% CI: 0.07 - 0.77; P=0.02; number needed to treat = 13).[20] The data accrued from our own study conforms to the previous reports and has shown advantage of stenting ureter in reducing the incidence of UO.

In conclusion, the incidence of UCs observed in our study were similar to those reported in the past. Routine use of ureteric stents led to reduction in the incidence of ureteric obstruction and there was no demonstrable increase in the risk of UTI post-transplantation. Currently available body of evidence supports the routine use of ureteric stent in renal transplantation.

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