Comparative Urologic Complications of Ureteroneocystostomy in Kidney Transplantation: Transvesical Leadbetter-Politano Versus Extravesical Lich-Gregoir Technique


ABSTRACT

Background. The incidence of urologic complications after kidney transplantation remains high despite improvements in diagnosis and operative techniques. Urinary tract reconstruction is usually done by ureteroneocystostomy (UCNS), and several techniques are available. In this study, we evaluated the outcomes of 2 different UCNS techniques performed in our department, the transvesical Leadbetter-Politano (L-P) and the extravesical Lich-Gregoire (L-G) technique.

Material and Methods. We evaluated the outcomes of 2 different UCNS techniques, L-P versus L-G, performed in our department between July 1, 2006, and December 31, 2011. During this period, we performed 524 consecutive renal transplantations—264 cases using the L-P technique (50.3%) and 260 cases with L-G technique (49.7%). Renal grafts were obtained from cadaveric donors in 146 cases (27.86%) and from living-related donors in 378 cases (72.14%). Recipient mean age was 35.64 years and the male to female ratio was 1.63:1.

Results. Urologic complications after kidney transplantation occurred in 22 cases in the L-P UCNS group (8.33%). The most common complications were ureteral stenosis (3.41%) and leakage (2.65%). Other complications recorded were lymphoceles (1.89%) and hematoma with secondary ureteral obstruction (0.38%). Compared with the L-P UCNS technique, the L-G technique was associated with fewer overall complications (6.15% vs 8.33%; \( P = 0.06 \)), a lesser rate of ureteral stenosis (2.31% vs 3.41%; \( P = 0.08 \)), and a similar rate of leakage. However, statistical analysis revealed no differences between the 2 techniques (\( P = 0.06 \)). In addition, we did not note any differences in graft and patient survival between the 2 groups.

Conclusions. In our study, the extravesical L-G technique has a lower complication rate compared with transvesical L-P procedure, but without statistical differences. Furthermore, the L-G technique is easier and faster to perform, it avoids a separate cystotomy, and requires a shorter ureteral length. In conclusion, we recommend L-G technique as technique of choice in kidney transplantation.

Kidney Transplantation is now considered “gold standard” treatment in patients with end-stage renal disease [1,2]. Successful renal transplantation increases overall survival and quality of life, and reduces morbidity in most patients with end-stage renal disease when compared with dialysis [3]. Technically, it is a standardized procedure with high success rate. However, the outcome of renal transplantation depends on several surgical and technical factors, including reconstruction of the urinary tract.
continuity of the urinary tract. Incidence of urologic complications after kidney transplantation remains high despite meticulous harvesting procedure and improvements in surgical techniques [4–14]. Two major urologic complications are frequently associated with urinary tract reconstruction: ureteral stenosis and leakage. Management of urologic complications should be treated promptly because they can result in significant morbidity and even graft loss [6–14]. Urinary tract reconstruction is usually achieved by ureteroneocystostomy (UCNS) using several techniques. Over the past years, there have been lively debates about finding the best UCNS technique with the lowest complication rate. In this study we performed a retrospective analysis to evaluate the outcome in 2 different techniques of UCNS performed in our department; The transvesical Leadbetter-Politano (L-P) and the extravesical Lich-Gregoire (L-G) technique.

MATERIAL AND METHODS

We retrospectively evaluated the outcomes of 2 different UCNS techniques, L-P and L-G, performed in our department between July 1, 2006, and December 31, 2011. All patients had ≥8 months of follow-up. Data regarding donors, transplantation procedures, and recipient characteristics were collected retrospectively from our internal department database. The following parameters were recorded: recipient age and sex; donor age, sex, and source; and cold and warm ischemia times. The reconstruction of the urinary tract was performed after revascularization of the kidney and after bladder distension.

In the L-P technique, the transplant ureter was tunneled under the bladder mucosa to create a “flap valve” and prevent reflux after making an anterior cystostomy. Vescouretic anastomosis was performed directly with bladder mucosa by using absorbable sutures. L-G is an extravesical technique of UCNS that involves first incising the detrusor muscle followed by anastomosis with bladder mucosa using a continuous suture over a ureteric stent. Subsequently, the bladder muscle was closed with 3 separate stitches to create a tunnel with an antireflux valve and prevent reobstruction. Diagnosis of ureteral stenosis was achieved by exams routinely performed in these patients—ultrasonography and computed tomography urography—or was driven by increased levels of serum creatinine. Stenosis of the transplanted ureter was managed both by endourologic and open operative approaches, depending on the site and length of the affected segment.

Ureteral leakage was suspected when drainage was increased, urine flow was reduced, or graft function delayed. Ultrasound evaluation revealed in a fluid collection. When renal function was appropriate, computed tomography urography was performed to observe collection characteristics and establish location. Urinary leakage was treated endoscopically by retrograde insertion of a ureteric catheter or antegrade insertion via nephrostomy tube when renal function was compromised or the patient was unstable. Open surgery was performed in cases with ureteral necrosis or anastomotic leak. This was managed by resection of the affected area and reimplantation.

In this study, we used the arithmetic mean and standard deviation for normally distributed variables and proportion for binary variables. Nonparametric variables were described as median (lower quartile and upper quartile). For continuous variables, differences between groups were assessed with the Student t test or Mann-Whitney U test, depending on the normality of the data. Categorical variables were compared with the $\chi^2$ test. All P values are 2 tailed, with $P < .05$ considered significant.

RESULTS

Between July 1, 2006, and December 31, 2011, we performed 524 consecutive renal transplantations. In 264 cases, urinary tract continuity was obtained using L-P technique (50.3%) and in 260 cases using L-G technique (49.7%). Renal grafts were harvested from cadaveric donors in 146 cases (27.86%) and from living-related donors in 378 cases (72.14%). Donor mean age was 44.63 ± 14.51 years and 13.5% were >60 years old (n = 71). Donor to female ratio was 0.947:1. Recipient mean age was 35.64 years and male to female ratio was 1.63:1. A second transplantation was performed in 29 cases (5.5%). Preferred location of transplanted kidney was the right iliac fossa in 84.3% of cases (n = 442). Cold ischemia time was 230.22 ± 376.92 minutes with a minimum of 15 and a maximum of 1500 minutes. Warm ischemia time was 27.97 ± 3.51 minutes. Characteristics of the 2 groups are shown in Table 1.

Urologic complications after kidney transplantation occurred in 22 cases in the L-P UCNS group representing 8.33% (Table 2). The most common complications were ureteral stenosis (3.41%) and leakage (2.65%). Other complications observed in this group (n = 264) were lymphocele (1.89%) and hematoma with secondary ureteral obstruction (0.38%).

Compared with L-P UCNS technique, the L-G technique was associated with fewer overall urologic complications (6.15% vs 8.33%), lower rate of ureteral stenosis (2.31% vs 3.41%) and similar rate of leakage (2.31% vs 2.65%).

Ureteral stenosis represented 39.5% of all urologic complications and were diagnosed at a mean of 111.37 ± 42.99 days posttransplantation in the L-P group and 93.75 ± 37.37 days in the L-G group, with no differences in time of diagnosis between the 2 groups. We identified stenosis at the anastomotic site in 46.67% of cases (n = 7). The remaining were characterized by the length of the narrowed segment (limit 2 cm) in short (n = 3) and long (n = 5) strictures. An open surgical approach (resection of the stenotic segment and reanastomosis protected or not by an autostatic stent) was performed in 66.7% of cases (all cases with a long ureteral stricture >2 cm and the majority of anastomotic stenosis). Short ureteral strictures (n = 3) and anastomotic stenosis (n = 2) responded successfully to endourologic balloon dilation and stent placement (33.3%).

Urinary leaks represent the second major urologic complication in our study (34.21%) and were diagnosed at 19.43 ± 31.87 days posttransplantation (median, 12.5), with no differences between the 2 techniques. It consisted in
anastomotic leaks (n = 6), marginal ureteric fistula (n = 2), and major ureteral necrosis (n = 5). After diagnosis, emergency treatment was initiated. Eight cases (61.5%) required an open surgical approach, consisted in resection of the ischemic lesion and reanastomosis (applied to all ureteral necrosis and 3 anastomatic lesions). For marginal ureteral fistulae and the rest of the anastomotic leaks (38.5%), successful endourologic approach consisted of percutaneous drainage and stenting.

Lymphoceles and hematoma with secondary ureteral obstruction are not related with the UCNS technique and no differences between the 2 were noted (Table 2). These urologic complications are strongly associated with kidney harvesting and receptor vascular preparation techniques.

**DISCUSSION**

Surgical complications after renal transplantation occur in ≤23% of transplant recipients and can have a detrimental impact on graft survival [6–14]. Their incidence is owing to many factors, mainly technical errors and ischemia. Therefore, to decrease the urologic complications, the surgical approach in both donor and recipient is equally important. Also, preservation of periureteral fat and at the lower pole of the kidney (golden triangle), as well as optimal ureteral blood supply (especially lower pole renal artery branch), helps to avoid ureteral complications.

Numerous UCNS techniques are described in literature. In 1954, Murray et al. [15] performed the first successful kidney transplant using a Leadbetter-Politano technique for urinary tract reconstruction. This transvesical procedure uses 2 different cystotomies, one to access the interior of the bladder and another to implant the graft ureter in a normal anatomic position. The extravesical UCNS was first described by Witzel in 1896, then by Gregoir and soon after by Lich [16–18]. This technique was designed to avoid a second cystotomy. Another advantage is that it allows the use of a shorter ureter. Several variation of this type of extravesical procedure has been described [12,13,19,20]. However, our single-center study analyzing 524 consecutive kidney transplants performed between July 1, 2006, and December 31, 2011, shows that the extravesical L-G UCNS technique has a lesser urologic complication rate compared with transvesical L-P procedure (6.15% vs 8.33%); however, statistical significance was not achieved.

Ureteral stenosis of the transplant ureter is among the most commonly reported urologic complications after renal transplantation occurring within 3 months in approximately 1%–8.3% of recipients [5,8,21–24]. Although Thrasher et al. [9] advocated in 1990 for the use of an extravesical technique over L-P, recently reported data have not established any significant difference in ureteral obstruction between the 2 techniques [8,11,14,21–24]. In this study, ureteral stenosis had an overall incidence of 2.86%; namely, 3.41% with the transvesical technique and 2.31% with the extravesical procedure. Ureteral stenosis was diagnosed at 111.37 ± 42.99 days posttransplantation in the L-P group and 93.75 ± 37.37 days in the L-G group.

Because pain owing to hydronephrotic graft is rare, diagnosis of ureteral stenosis is usually driven by an increased level of serum creatinine or is observed on routine ultrasonography or computed tomography urography. The obstruction can be extraluminal, ureteral (ischemic), or endoluminal. It is important to establish the site and the length of ureteral stricture before planning the treatment strategy. In our study, stretched ureteral stenosis was found mainly at the anastomotic site, probably owing to distal ureteral ischemia. Open surgery or an endourologic approach can be used, depending on the characteristics of the stenosis and surgeon preference. In our transplant center, an open surgical approach with resection of the stenotic segment and reanastomosis protected or not by an autostatic stent was successfully performed.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Total (n = 524)</th>
<th>Leadbetter-Politano (n = 264)</th>
<th>Lich-Gregoir (n = 260)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>38/524 (7.25%)</td>
<td>22/264 (8.33%)</td>
<td>16/260 (6.15%)</td>
<td>.06</td>
</tr>
<tr>
<td>Stenosis</td>
<td>15/524 (2.86%)</td>
<td>9/264 (3.41%)</td>
<td>6/260 (2.31%)</td>
<td>.08</td>
</tr>
<tr>
<td>Leakage</td>
<td>13/524 (2.48%)</td>
<td>7/264 (2.65%)</td>
<td>6/260 (2.31%)</td>
<td>.18</td>
</tr>
<tr>
<td>Lymphoceles</td>
<td>8/524 (1.53%)</td>
<td>5/264 (1.89%)</td>
<td>3/260 (1.15%)</td>
<td>.35</td>
</tr>
<tr>
<td>Hematoma</td>
<td>2/524 (0.38%)</td>
<td>1/264 (0.38%)</td>
<td>1/260 (0.38%)</td>
<td>.91</td>
</tr>
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</table>
The incidence of ureteral leaks varies from 0% to 9.3% of cases [5]. Several retrospective analyses and prospective trials showed no differences in the proportion of fistulas between transvesical and extravesical UCNS techniques [8–10,21,23]. Urine leaks can be ureteral or vesical in origin [13]. Theoretically, L-G technique decreases the risk of fistulas because it avoids a separate cystotomy and needs a shorter length of the ureter. Technical difficulties may be encountered with L-G procedure when bladder wall and mucosa is extremely thin [13,25]. Treatment should be initiated immediately upon diagnosis this complication. Some cases (short ureteral stenosis or anastomotic leakage) can be managed by an endourologic approach, but in the majority of cases, open surgical management is needed. In our study, the ureteral leaks had an overall incidence of 2.48%, with no differences between techniques (2.31% L-G vs 2.65% L-P). This urologic complication was also diagnosed at 12 days after renal transplantation, most commonly at the anastomotic site, and was caused by ischemia with necrosis of the transplanted ureter. We prefer open surgery for these early ureteral leaks.

In conclusion, urologic complications after renal transplantation at present are unavoidable, despite improvements in diagnosis and operative techniques. In our opinion, the quest to find the best UCNS technique remains open.

REFERENCES