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Urological Complications of Absorbable and non Absorbable Suture in Ureteral Anastomosis in Kidney Transplantation

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Abstract: *Introduction:* Urological complications are the most common surgical complication after kidney transplantation. This study was performed to compare urologic complications of fine prolene as a non absorbable material with catgut chromic suture in ureteral anastomosis in kidney transplantation. *Material and Methods:* In this interventional study, 115 patients whom their ureteral anastomosis was performed with Catgut chromic and 105 patients whom their ureteral anastomosis was performed with fine prolene, were participated. The ureteral implantation was performed with Modified Lich technique. All patients were followed for 18 months. Urologic complications including stone formation on the site of anastomosis, stenosis, urinary leakage, urinary tract infections, collection and paraclinical tests were collected. *Results:* We detected no stone in two groups. Three patients had urinary leakage and one patient had ureteral stricture in catgut group. 24.3% in catgut chromic group and 18.1% in prolene group had collections ($p>0.05$).18.9% in catgut chromic group and 19.6% in prolene group had experienced one episode of urinary tract infection ($p>0.05$). *Discussion:* In our study urologic complications in prolene group was not more than catgut chromic group and prolene can be used in ureteral implantation in renal transplantation.

Key words: Kidney transplantation · Urologic complications · Catgut chromic · Prolene

INTRODUCTION

Kidney transplantation is a treatment for restoring renal functions in patients with end-stage renal disease [1]. After the first successful kidney transplantation, improvements in the techniques of kidney transplantation had better outcomes for kidney transplant recipients. Urological complications can have a significant effect on the outcome of kidney transplantation and reducing the complications due to improvement the quality of life of transplant recipients [2].Vascular complication occur in 0.5 to 23% of renal graft [3]. Urinary anastomotic complications following kidney transplantation cause significant patient morbidity [4]. The incidence of ureteral complications following kidney transplant varies from 2% to 20% in different transplant centers [5]. The causes for post transplant complications are donor-related, recipient-related, medical management and surgical technique and these complications include urinary leakage, urinary obstruction, ureteral necrosis, fistulas, malignancies and calculi. Poor techniques with damage of a lower polar artery, stripping the ureter or surgical problems at the time of implantation are the main reasons for ureteral problems [4].

Sutures are exposed to urine permanently in urinary system so that urinary proteins and bacteria can affect function of suture and produce layering, stone formation, inflammatory reactions, scar formation and stenosis [6,7]. An optimal suture should have these characteristics in urinary system: conserve its resistance until wound healing, Produce minimal tissue reaction and be absorbable and not be a nidus for stone formation. [8,9]. This study was performed to compare the urological complications of catgut chromic 4-0 (natural absorbable suture) with fine prolene 6-0 (synthetic non absorbable suture) in ureterovesical anastomosis (Modified Lich method).

MATERIALS AND METHODS

This interventional study was done in kidney transplantation center of Babol University of Medical

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Sciences during seven years. All kidneys in transplantation processing were provided from live donors. Modified Lich method was done for ureteral anastomosis in kidney transplantation. Ureteral amastomosis was performed with 4-0 catgut chromic as absorbable suture in 115 patients and with 6-0 prolene as non-absorbable suture in 105 patients. All patients in both groups received intravenous cephalothin as an antibiotic in admission after transplantation and triple or quadruple induction therapy with immunosuppressive drug and after transplantation. Foly catheter removed one week after kidney transplantation in all patients. All cases were followed for 18 months (3rd, 6th, 12th and 18th month after transplantation) by urine culture, ultrasonography, IVP (Intravenous pyelogram), VCUG (Voiding Cystourethrography) and Radionuclide cystography. Urologic complications including stone formation at anastomotic site, stenosis and obstruction of anastomotic site, urinary leakage, urinary tract infection (UTI), perirenal fluid collection and projection of prolene suture during cystoscopy were analyzed. The analyses had been done with SPSS and Chi-square and Fisher's Exact and T-Test and Mann- Whitney tests. $P<0.05$ was significant.

RESULTS

The mean age of patients at time of transplantation, duration of Hemodialysis before transplantation, duration of stenting after transplantation and sex and diabetes distribution were not significant difference between two groups (Table 1).

No stone was detected at ureterovesical anastomotic site or in the bladder in both groups. Stone was detected at transplanted kidney 1 patient after transplantation in prolene group. There was urinary leakage only in 3 patients which were in chromic catgut group. All of urinary leakage occured in first 3 months. There was only one case of transient stricture at ureterovesical anastomotic site in chromic catgut group. Other urological complication in both groups shown in table 2. In chromic catgut group 13 cases showed re-infection. In prolene group 5 cases showed re-infection and 3 patients had persistent infection.

DISCUSSION

The most important complication which confirmed and evaluated in majority of research studies is suture- induced stone formation. D'silva and colleges think that suture acts as a nidus for stone formation regardless its physical and chemical structure and increases chance of UTI and infective stone formation. This susceptibility to stone formation depends to time of exposure of sutures with urine. So it can be said that nonabsorbable sutures have the greatest chance to be as nidus of stone [10,11].

In our study, no stone is detected at bladder or ureterovesical anastomotic site on chromic catgut or prolene sutures. Kaminske *et al.* [11] reported that in rats which have alkaline urine and great susceptibility to stone formation, production of stone on prolene suture is more possible than chromic catgut suture. In mice, chance of stone formation is equal on both sutures. In dogs, no stone is produced on both sutures. Healy and his colleagues reported a big stone on prolene suture in bladder in 1979 [12]. Lock and colleagues reported 6 patients with stone formation on vicril suture (absorbable suture) at renal pelvis, 2 years after surgery in 1997 [13]. Klein introduced 7 patients with infective and calcium oxalate stone formation on prolene suture after kidney transplantation in 1997[14]. Kehinde and colleagues evaluated 7 patients with bladder stone after use of

Table 1: Demographic characteristic of patients in both groups

Demographic characteristic	Catgut N=115	Prolene N=105	p-value
Age at transplantation (year)	38.1±14.5	37.9±15.5	0.921
Duration of Hemodialysis before transplantation (month)	20.4±18.6	17.3±14.5	0.208
Duration of stenting after transplantation (month)	48.8±19.6	45.7±10.5	0.151
Sex (male)	71 (61.7%)	74 (70.5%)	0.406
Diabetes	9 (7.8%)	21 (20%)	0.01

Table 2: Urological complications of catgut and prolene groups in kidney transplantation

Urological complication	Catgut N=115	Prolene N=105	p-value
Collection	28 (24.3%)	19 (18.1%)	0.323
Hydronephrose	4 (3.4)	10 (9.5)	0.096
Infection *	21 (18.9)	20 (19.6)	1

* 4 patients in catgut group and 3 patients in prolene group had predisposing factor for infection and exclude in infection analysis.

nonabsorbable sutures (nylon, prolene and silk) in 1999 [7]. Watanabe and colleagues introduced 3 patients with bladder stone, 3-15 months posttransplantation, after use of absorbable sutures (polyglyconate and ploydixanon) [15]. According to these different results and result of our study, in can be deduced: 1. Absorbable sutures can act as nidus for stone formation during their absorbtion. Crystals can accumulate slowly on nidus and stone slowly grows after absorbtion of suture with lasting of time. 2. Nonabsorbable sutures are covered with fibroblasts and urothelium regrows on this suture, so this event can decrease the contact of urine with suture and chance of stone formation is decreased.

In our study, ureterovesical suture was extravesical (tie of suture is outside of bladder) so that this decreases chance of exposure of suture with urine. Only fine prolene suture is in contact with urine but is covered with urothelium later.

Another complication is UTI due to suture [16,17]. In our study, 18.9% of chromic catgut group and 19.6% of fine prolene group had tolerated at least one period of UTI. There is no significant difference of frequency of UTI between two groups ($p>0.05$). This can be due to covering of prolene suture by connective tissue fibroblasts and growth of urothelium on suture; so contact of suture with urine is decreased and this decreases chance of infection. In our study prolene suture had not been projected to bladder so that there is no foreign body effect of suture and no increased chance of stone formation and UTI.

In our study there is no significant difference of frequency of fluid collection, its volume and interval of its production after transplantation between 2 groups ($p>0.05$). Wainstein and colleagues showed that acute and chronic inflammation and tissue reaction are very severe in chromic catgut sutures in first 10 days- 5 weeks [18].

In wound healing, deposition of collagen is an important stage; every factor that decreases synthesis and deposition of collagen on increases its lysis causes wound disruption and can be a cause of urinary leak or fluid collection [19,20]. When chromic catgut suture is there at suture site (until 70 days), chance of wound disruption and urinary leak and fluid collection can be more than prolene suture.

Previous studies show that chance of fibrosis is high around of prolene suture [7,21]. However in our study no stricture or obstruction was seen due to prolene suture; only one case of stricture was seen and this case was in chromic catgut group, which occurred after spontaneous removal of stent and seemed be due to perianastomotic edema. The stricture was removed with transient nephrostomy. Absence of stricture in both groups can be due to live kidney donation and Modified Lich surgical method.

CONCLUSION

In this study we deduced that chance of urologic complications with prolene suture is not more than chromic catgut suture and it can be used for ureterovesical anastomosis.

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