

Surgical management of stricture urethra in patients with chronic renal failure: Ten years' experience at a tertiary center

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Abstract

Introduction: Patients suffering from stricture urethra and deranged renal function have poor quality of life. The incidence of urethral stricture co-existing with renal failure is comparatively small and cause may be multifactorial. There is paucity of literature on management of urethral stricture associated with deranged renal function. We present our experience of managing stricture urethra associated with chronic renal failure.

Materials and Methods: This was a retrospective study conducted from 2010 to 2019. Patients with stricture urethra and deranged renal function (serum creatinine > 1.5 mg/dl) who underwent urethroplasty or perineal urethrostomy were included in our study. A total of 47 patients met the inclusion criteria and were included in this study. Patients were followed every 3 months in their 1st year of surgery and 6 monthly thereafter. Statistical analysis was done using SPSS version 16.

Results: There was a significant increase in the mean postoperative maximum and average urinary flow rates when compared to the preoperative values. The overall success rate was 76.59%. Out of 47 patients, 10 had wound infection and delayed wound healing, 2 patients developed ventricular arrhythmias, 6 patients developed fluid and electrolyte imbalance, 2 patients developed seizures, and 1 patient developed septicemia in the postoperative period.

Conclusion: Prevalence of patients with chronic renal failure associated with stricture urethra was 4.58% and features suggestive of deranged renal function at presentation were present in 1.81% patients. In the present study, complications related with chronic renal failure occurred in 17 (36.17%) patients. Multidisciplinary care of the patient along with appropriate surgical management is a viable option in this sub-group of patients.

Keywords: Chronic renal failure, perineal urethrostomy, stricture urethra, urethroplasty

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Received: 25.12.2021, **Accepted:** 17.01.2022, **Published:** 16.09.2022.

INTRODUCTION

Patients with urethra stricture may present with lower urinary tract symptoms (LUTS), acute or chronic urinary retention, difficult catheterization, recurrent urinary tract

infection, urethrocutaneous fistula or abscess, and sexual dysfunction and have poor quality of life.^[1] Presentation of stricture urethra associated with chronic renal failure is rare. Rourke and Hickie in their study of 611 patients

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How to cite this article: Pathak H, Purkait B, Hameed S, Das AK, Sarkar K, Ghoshal P. Surgical management of stricture urethra in patients with chronic renal failure: Ten years' experience at a tertiary center. Urol Ann 2023;15:22-6.

Access this article online	
Quick Response Code:	Website: www.urologyannals.com
	DOI: 10.4103/ua.ua_196_21

reported that 1.3% patients presented with renal failure as the initial symptoms of urethral stricture and overall 4.1% patients had renal failure in their study.^[1]

Over the last 20 years, urethroplasty had been established as the most successful and cost-effective treatment option for stricture urethra.^[2,3] Along with improved subjective and objective outcome of flow rate, urethroplasty is also associated with improvement in quality of life.^[4]

There is paucity of literature on the management of stricture urethra associated with chronic renal failure. Surgical management in patients with chronic renal failure is challenging and known to have higher rate of complication and morbidities, hence multidisciplinary approach with involvement of urologists, nephrologists, anesthesiologists, cardiologists, and critical care team is warranted for proper management. Herein, we are presenting our long-term experience of surgical management of stricture urethra associated with chronic renal failure.

MATERIALS AND METHODS

This was a retrospective analysis from 2010 to 2019. Ethical approval was obtained from the institutional ethical committee. Patients with stricture urethra and chronic renal failure (serum creatinine >1.5 mg/dl) who underwent urethroplasty or perineal urethrostomy were included in this study. Patients managed by other means for stricture urethra (e.g., dilatation or optical internal urethrotomy [OIU]) were excluded from this study.

Patients whose serum creatinine was normalized after suprapubic catheter (SPC) placement and patients with <3-month follow-up were excluded from the study. Patient age, associated comorbidities, etiology of the stricture, site and length of stricture, type of surgery, any previous intervention, surgical outcome, and complication were recorded in this study. Forty seven patients who met the inclusion criteria were included in this study. Twenty one patients underwent preoperative insertion of SPC; followed by urethroplasty after 2–3 weeks.

Primary success of urethroplasty was defined as objective improvement in urinary flow rate (Q_{max} >15 ml/s), absence of radiographic evidence of recurrent stricture (Retrograde urethrography-[RGU]), minimum caliber of 12 Fr and no need for subsequent instrumentation till the last follow-up.

Patients were discharged on per-urethral catheter (PUC) with or without SPC *in situ* and were followed after 2–3 weeks in the outpatient department. Peri-catheter

RGU was performed as an outdoor procedure. If there was no evidence of extravasation, then catheter-free trial was given. If peri-catheter study showed extravasation, then PUC was kept *in situ* for another 1 or 2 weeks. Patients were followed up every 3 monthly for the 1st year and 6 monthly thereafter. Detailed history was taken at each visit and uroflowmetry was repeated at every visit. If Q_{max} was <15 ml/s or patient complained of poor flow (LUTS score >6), then additional investigations, e.g., RGU or urethro-cystoscopy, were carried out. Statistical analysis was performed by SPSS version 16 (SPSS for Windows, Chicago, SPSS Inc).

RESULTS

Data of 1025 patients who underwent surgical treatment for urethroplasty were analyzed for deranged renal function. Out of which, 47 (4.58%) patients were found to have chronic renal failure and included in this study. The mean age of the group was 45 years (28–67 years), as shown in

Table 1: Patients' demographics

Variables	Patients number (n=47), n (%)
Age (years)	
Mean±SD	45.39±11.00
Range (years)	28-67
<50	31 (65.96)
≥50	16 (34.04)
Duration of symptoms	
Mean±SD (months)	58.94±33.85
Range (year)	7-180
≤1	5 (10.64)
>1-5	30 (63.83)
>5	12 (25.53)
Previous intervention (total)	35 (74.46)
Dilatation	24 (51.06)
DVIU	11 (23.40)
Serum creatinine (mg/dl)	
At time of presentation	
Mean±SD	3.42±1.87
Range	1.82-10.8
At time of surgery	
Mean±SD	2.22±0.47
Range	1.7-3.7
Follow up in months	
Mean±SD	14.52±6.06
Range	3-36
Etiology	
Idiopathic	21 (44.68)
Inflammatory	13 (27.66)
Postcatheterization	9 (19.15)
Traumatic	4 (8.51)
Site of stricture	
Bulbar	6 (12.77)
Pan-anterior	12 (25.53)
Peno-bulbar	14 (29.79)
Penile	15 (31.91)
Length of stricture (cm)	
<2	3 (6.38)
2-5	17 (36.17)
>5	27 (57.45)

Table 1. Duration of symptoms varied from 7 months to 15 years (mean: 59 months). Overall, most (63.83%) patients in the study have LUTS for 1–5 years. Of the 47 patients, 19 (1.85% of total) had symptoms suggestive of deranged renal function at presentation and rest 28 patients have deranged renal function with no or minimal symptoms at presentation. Symptoms suggestive of deranged renal function at the time of presentation were decreased appetite, fatigue, nausea, vomiting and body swelling.

Apart from SPC, 74.46% patient had a history of previous intervention e.g., urethral dilatation in 51.06% patients and OIU in 23.40% patients. At the time of presentation and at the time of surgery, serum creatinine ranged from 1.82 to 10.8 mg/dl (mean 3.42) and 1.7–3.7 mg/dL (mean 2.22) respectively. Seven (14.89%) patients in this study had to undergo preoperative hemodialysis [Table 1].

Overall, 37 (78.72%) patients in the study have associated co-morbidities (17 had diabetes mellitus, 11 had hypertension and 9 patients had both). Follow up period ranged from 3 to 36 months (mean 14 months). Most common etiology of urethral stricture was idiopathic followed by inflammatory, postcatheterization and traumatic in 44.68%, 27.66%, 19.15% and 8.51% cases respectively. Location of stricture was penile, peno-bulbar, pan-anterior and bulbar urethral stricture in 15, 14, 12 and 6 patients respectively. 27 patients had stricture length >5 cm.

Buccal mucosa graft urethroplasty (BMGU) was performed in 10 (21.28%) patients. Graft was harvested from single cheek in 8, both cheeks in 1 and combined cheek and lip in 1 patient. Location of graft placement was dorsolateral in 6 patients, ventral on lay in 3 and dorsal inlay in 1 patient. BMGU and combined flap and graft urethroplasty were done in patients with serum creatinine \leq 2 mg/dl to avoid the complication of poor graft uptake. Three patients underwent combined flap and graft repair and 5 patients underwent end to end anastomosis urethroplasty [Table 2].

Of the 47 patients, 13 underwent two stage urethroplasty with average interval of 4 months between the first and second stage. 16 patients in our study opted for perineal urethrostomy as shown in Table 2.

Mean preoperative Q_{max} was 5.84 ml/s which increased significantly after the urethroplasty to 21.45 ml/s (mean) while mean preoperative average flow increased significantly from 3.86 ml/s to 17.84 ml/s postoperatively [Table 3].

Table 2: Type of urethral surgery

Type of urethroplasty	Number of patients (%)
BMGU	10 (21.28)
VO-BMGU	3
DL-BMGU	6
DI-BMGU	1
Combined flap and graft	3 (6.38)
Two Stage urethroplasty	13 (27.66)
End to end anastomotic urethroplasty	5 (10.64)
Permanent perineal urethrostomy	16 (34.04)

BMGU: Buccal mucosa graft urethroplasty, VO: Ventral on lay, DL: Dorsolateral, DI: Dorsal inlay

Table 3: Outcome of surgical management of stricture urethra

Variables	Mean \pm SD (range)		P
	Preoperative	At last follow up	
Q max (ml/s)	5.84 \pm 2.44 (0-10)	21.45 \pm 5.27 (0-36)	<0.0001
Average flow (ml/s)	3.86 \pm 2.10 (0-9)	17.84 \pm 4.44 (0-32)	<0.0001
Cumulative intervention during follow-up	At last follow up (n=47)		
Dilatation			9
OIU			1
Both			1
Revision urethroplasty			0
Overall objective success of urethroplasty (%)			36 (76.59)

OIU: Optical internal urethrotomy, SD: Standard deviation

Overall success of urethroplasty was 76.59%. 3 patients who underwent buccal graft/combined flap and graft urethroplasty, 3 patients who underwent two stage urethroplasty, 1 patient who underwent end to end anastomosis urethroplasty developed recurrent stricture while 4 patients who opted for perineal urethrostomy developed stenoses which was managed by dilatation or DVIU till last follow up. None of the patients required revision urethroplasty in our study [Table 3].

Out of 47 patients, 17 (36.17%) developed complications related to deranged renal function. 10 patients had wound infection leading to delayed wound healing. 7 of these were managed by regular dressing and 3 patients had to undergo secondary suturing of the wound. 2 patients in our study developed postoperative ventricular arrhythmia which was managed conservatively. 6 patients developed fluid and electrolyte imbalance along with acidosis and hyperkalemia and were managed conservatively under nephrology guidance. 3 of these had to undergo few sessions of hemodialysis. 2 patients developed single episodes of seizures in immediate peri-operative period which was managed by intravenous administration of lorazepam along with other supportive measures. They were started on long term anticonvulsant drugs as per neurologist opinion. One patient in our study developed septicemia which was managed conservatively by culture specific broad-spectrum antibiotics and vasopressors [Table 4].

Table 4: Complications specific to deranged renal function

Complications	Number of patients (%)
Superficial skin infection and poor wound healing	10 (21.28)
Cardiac complications	2 (4.25)
Bleeding	1 (2.13)
Electrolyte imbalance	3 (6.38)
Neurological complications	2 (4.25)
Fluid overload (pleural effusion and respiratory difficulty)	3 (6.38)
Sepsis	1 (2.13)
Overall complications	17 (36.17)

DISCUSSION

Chronic renal failure in the setting of stricture urethra is an uncommon presentation. Pathophysiology of renal failure in stricture urethra is not known, probable reasons may be the development of proximal urinary fistulae, static anatomic obstruction in stricture urethra, early presentation of patients due to more severe symptoms than other form of bladder outlet obstruction, relatively less number of patients with associated comorbidities because of younger patient profile. The etiology of deranged renal function in stricture urethra may be multifactorial, combining the effect of associated medical co morbidities and obstructive uropathies. Surgery in patients with deranged renal function is challenging for both the surgeon and the anesthetist. Deranged renal function is associated with various endocrine alterations particularly secondary and tertiary hyperparathyroidism, hypothalamic-pituitary-thyroid axis dysfunction. The pathogenesis of these complications is complex, multifactorial and poorly understood.^[5-7]

Chronic kidney disease (CKD) is a risk factor for development of cardiovascular disease.^[8-10] Patients with deranged renal function also have increased susceptibility for arrhythmias which may be caused by intermittent volume overload, metabolic disturbance, renal anemia, structural and electrophysiological changes of the myocardium and inflammatory mechanisms.^[11-13] In our study, 2 patients developed ventricular arrhythmias in the immediate postoperative period. Prolonged bleeding time in deranged renal function is primarily due to impaired platelet function. Anemia, dialysis, accumulation of drugs due to poor clearance and anticoagulation used during dialysis may have some detrimental effect on homeostasis in chronic renal failure. Intrinsic platelet abnormalities and impaired platelet–vessel wall interaction contributes to platelet dysfunction.^[14,15] Dialysis may be helpful to partially correct these defects, but cannot eliminate them. The hemodialysis process itself may in fact contribute to bleeding in deranged renal function patients.

Preoperative evaluation should identify and correct any modifiable risks if present. Despite optimization, patients with CKD are at higher risk of complication in the peri-operative period. Peri-operative goals of euvolemia, maintenance of renal perfusion, and avoidance of nephrotoxic agents may delay the kidney damage in such patients.^[16]

Anesthesia in patients with deranged renal function is challenging. Regional anesthesia has its place in such patients as it helps avoid the detrimental effects of muscle relaxants, narcotics and potent volatile anesthetics. Spinal anesthesia is preferred as the standard procedure.^[17] In our study, 12 surgeries were done under regional anesthesia and the rest under general anaesthesia. Buccal mucosa graft was harvested under local anesthesia in patients who underwent BMGU under regional anesthesia in our study.

Wound healing may be poor in patients with deranged renal function. Delayed granulation, disruption of keratinization kinetics and large epithelial gap were responsible for poor wound healing in mouse model with deranged renal function. The underlying chronic inflammatory state, low rate of vascularization and cell proliferation were also identified as mechanisms leading to poor wound healing.^[18] Human studies have also confirmed higher rate of wound disruption in patients with deranged renal function.^[19]

There is paucity of literature regarding optimal surgical technique for management of urethral stricture associated with deranged renal function. In our study, most of the patients who underwent BMGU had urethral stricture length of up-to 5 centimeters and serum creatinine level ≤ 2 mg/dl. Most of the patients who underwent two stage urethroplasty had long and complex strictures and serum creatinine ≤ 2 mg/dl while majority of patients who underwent permanent perineal urethrostomy had long and complex stricture and serum creatinine level more than 2 mg/dl.

Limitation

The current study is limited by its retrospective design. Surgeries were performed by multiple urologists and trainees. All patients do not have the similar follow-up.

CONCLUSION

The prevalence of patients with chronic renal failure associated with stricture urethra was 4.58%. In the present study, complications related with chronic renal failure occurred in 17 (36.17%) patients. Surgical intervention should be offered to patients with stricture urethra and

chronic renal failure with good success rate. Peri operative complications are slightly higher. Multidisciplinary approach and proper preoperative counseling should always be considered for optimal management.

Acknowledgments

We are thankful to urology department staff of our institution for cooperation during this study.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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