

## Role of Two Stage Urethroplasty in Modern Era with Special Reference to Impact on Sexual Health Function

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### ABSTRACT

**Introduction:** Urethral stricture is a prevalent problem throughout the globe. However, with improvement in surgical skill there is a shift towards single stage repair with substitution urethroplasty for long strictures. One concerning complications of urethroplasty is postoperative erectile dysfunction (ED). The purpose of this study is to highlight the role of two stage urethroplasty (in current era and impact on sexual function).

**Materials and Methods:** We retrospectively analyzed data of patients who underwent urethroplasty between January 2011 to December 2014 at Government Medical College, Kota, Rajasthan. Patients with stricture length > 9 cm, or involving more than two segments of the urethra and urethral caliber < 6 Fr were included. Pelvic fracture urethral distraction defect were excluded. Patients demographic and surgical information included were collected and analysed.

**Results:** The mean age of patients (37.3±12.1 years and 40.4±7.5 years in single stage and two stage urethroplasty respectively) and mean stricture length (9.7 ± 1.2 cm in single stage and 9.25 ± 2.1cm in two stage urethroplasty. The success rate after urethroplasty at one year was 86% in single stage urethroplasty and 70 % in two stage urethroplasty

(p=0.046). The erectile function was noted using the IIEF-5 questionnaire.

**Conclusion:** Single stage urethroplasty dominates the modern era, two stage repair has a definite role in the management of complex pan urethral strictures. Also, two stage urethroplasty have poor erectile function compared to single stage repair, which shows improvement over the time.

**Keywords:** Urethral Stricture, Urethroplasty, Sexual Health.

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### INTRODUCTION

Anterior urethral stricture disease is quite a prevalent problem throughout the globe & commonly encountered by any practicing urologist. The bulbar urethra is the usual site of narrowing and is relatively easy to manage but extensive or pan-urethral strictures involving both the pendulous and bulbar urethra, pose a great challenge to urologist. Very often there is paucity of tissue to cover these long segments of narrowing and these strictures are more likely to be associated with complications.<sup>1</sup> These long segment strictures are often a consequence of inflammation and are associated with spongiofibrosis which further lessens the chances of successful outcome.<sup>2</sup> There are several management options available<sup>3</sup> & conventionally most of these long segment strictures have been managed with 2-stage repairs using scrotal skin.<sup>4,5</sup> However, with evolution in the field of urethral reconstruction, there is a shift towards single stage repair with substitution urethroplasty for long strictures<sup>6,7</sup> using buccal grafts, pedicle-

based flaps or combined approaches.<sup>8-14</sup> One of the more concerning complications of urethroplasty is postoperative erectile dysfunction (ED). The theoretical risk of ED comes from the close relationship of the cavernous nerves with the proximal urethra when they emerge from the pelvic floor. The purpose of this study is to highlight the role of two stage urethroplasty (modified Johanson) in current era and study the impact of urethral stricture and urethroplasty on sexual health function based upon the data from a high volume centre in north India.

### MATERIALS AND METHODS

We retrospectively analyzed the data of all patients of stricture urethra undergoing open surgical repair between January 2011 to December 2014 at Government Medical College, Kota, Rajasthan. Patients with stricture length > 9 cm, stricture involving more than two segments of the urethra and urethral caliber < 6 Fr were

included (Figure 1 and 2). Patients with stricture length < 9cm, involving only single urethral segment, urethral caliber > 6 Fr and pelvic fracture urethral distraction defect were excluded. The collected data were the demographic and surgical information including the etiology, length, location of the urethral stricture, surgical technique. All the long segment urethral strictures are managed with single stage urethroplasty, preferably buccal mucosal graft urethroplasty (BMGU), irrespective of the urethral caliber, except in case of long segment strictures with poor quality urethral plate of urethral caliber < 6 Fr associated with poor status of penile skin (lichen sclerosus), unavailable BMGU (tobacco/gutkha chewers), urethra-cutaneous fistulae and previous failed BMGU or penile flap urethroplasty when technical expertise of free vascular flap urethroplasty is unavailable. The erectile function of stricture urethra patients was assessed using International Index of Erectile Function (IIEF-5) questionnaire that

was filled by the patients (aided by health care professionals for illiterate patients) preoperatively, 3 month and 6 month postoperatively. All patients with stable sexual relationship with their partners were included & those with diabetes mellitus, hypertension or other co-morbidities were excluded. Serum testosterone, luteinizing hormone (LH), follicle stimulating hormone (FSH) and estrogen were determined and those with abnormal values were further excluded from the study. The follow-up records were also reviewed to know the outcome and complications like recurrent stricture, fistula, urethral diverticulum, hair growth, chordee, meatal stenosis, skin graft necrosis, and ejaculatory dysfunction. Patients were divided into two groups: Group A included patients undergoing single stage urethroplasty (Mc Aninch/ Orandi Penile skin flap urethroplasty, BMGU) and Group B included patients undergoing two stage urethroplasty (modified johanson).

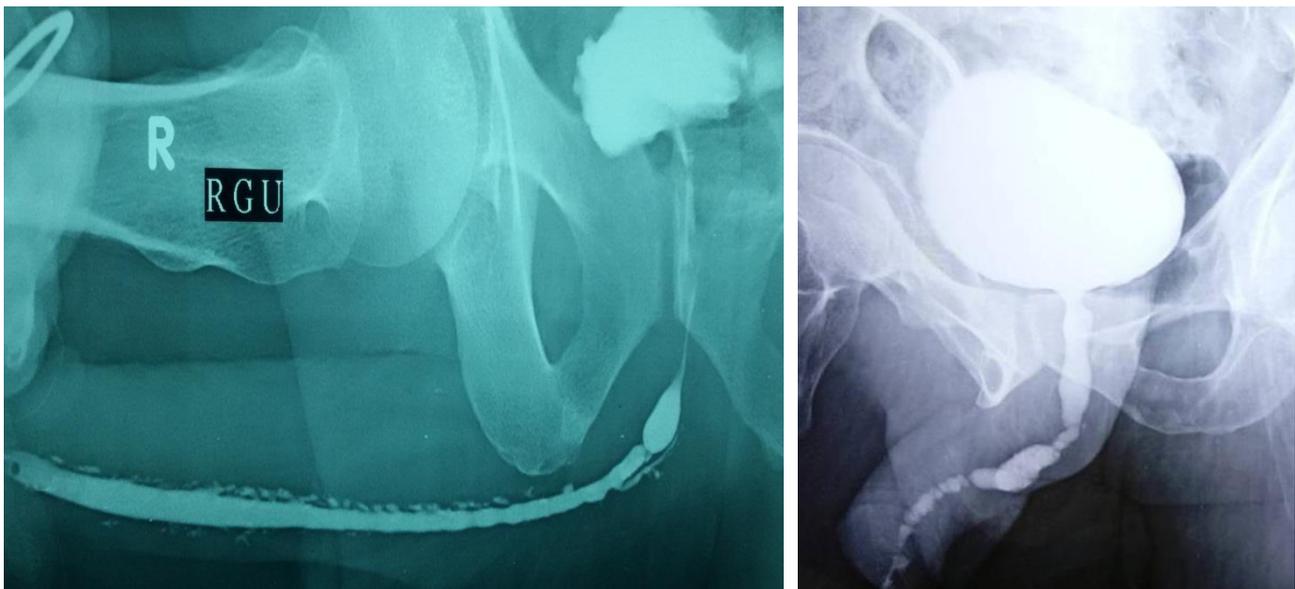


Figure 1,2: Retrograde/micturating cysto urethrogram showing long segment urethral .



Figure 3. Perineal urethrostomy was created proximal to the stricture segment .

## SURGICAL TECHNIQUE

### Staged Urethroplasty

Two stage urethroplasty was done by modified Johanson technique. In the first stage, the urethra and the corpus spongiosum at the stricture site are marsupialized. This exposure is extended to the intact urethral segments at the proximal and distal ends of the stricture with excision of adjacent abnormal tissue and perineal urethrostomy was created proximal to the stricture segment of urethra and corpus spongiosum is then sutured to skin with an interrupted 4-0 polyglactin (vicryl) suture (Figure 3). The second stage was performed after minimum of 3 months when urethral plate was considered to be soft and pliable, ready for re-tubularization. With modified Johanson technique, two parallel incisions are made on the skin at each side of the urethra encircling previously created urethrostomy and the harvested skin flap is tubularized on 14-F silicon foley catheter by 4-0 interrupted vicryl sutures. Another covering layer of the surrounding dartos tissue or the tunica vaginalis was drawn onto the suture line and fixed (Figure 4 and 5). Urethral catheter was removed after 4 weeks. The follow up of patients was done at 3 months and 6 months postoperatively.



Figure 4, 5. Modified Johanson technique, incisions are made on the skin at each side of the urethra encircling previously created urethrostomy and the harvested skin flap is tubularized on 14-F silicon Foley.

### Single Stage Urethroplasty

Single stage urethroplasty was done by different techniques like BMGU, Orandi flap, McAninch flap. In penile flap techniques, the hair-free skin of the ventral penis is harvested as a flap and the defect is covered by mobilization of adjacent penile skin.

### Follow Up

All the procedures were carried out under antibiotic cover. Patients were discharged around one week postoperatively and followed at 4 weeks when catheters were removed and voiding

cystourethrogram (VCUG) with retrograde urethrogram (RUG), uroflowmetry and post void residual urine measurement was carried out. A successful surgical outcome is considered, if proper voiding achieved with unobstructed uroflowmetry pattern, no fistula and RUG was normal. The need of endoscopic procedure like optical internal urethrotomy (OIU) or endodilation is considered failure. The 1-year outcomes of the 1-stage and 2-stage repairs were compared using the chi-square test and the Fisher exact test in this study.

Table 1: Baseline patient characteristics.

Parameters	Group A (n=76)	Group B (n=53)	P value
Number	76	53	
Age (mean $\pm$ SD)	37.3 $\pm$ 12.1	40.4 $\pm$ 7.5	0.1003
Duration of symptoms (months)	11	15	
Etiology of stricture			
Inflammatory	21 (27.6%)	14 (26.41%)	1.000
Catheter Induced	26 (34.21%)	21 (39.62%)	0.57
Idiopathic	29 (38.15%)	18 (33.96%)	0.711
Stricture length (mean $\pm$ SD) (cm)	9.7 $\pm$ 1.2	9.25 $\pm$ 2.1	0.12
Previous urethroplasty	00	34	
Existing complication			
ARF	00	04	P=1.0
Urethral abscess	00	05	
Type of surgery-			
Orandi flap	13	00	
McAninch	12	00	
BMGU	51	00	
Modified Johanson repair	00	53	

Table 2: Complications following single stage and two stage urethroplasty

Complications	Group A (n=76)	Group B (n=53)	P-value
Re-stenosis	06 (7.8%)	09 (16.9%)	0.16
Fistule	03 (3.9%)	05 (9.43%)	0.27
Diverticulum	02 (2.6%)	00	1.00
Meatal stenosis	00	02 (3.7%)	1.00

## RESULTS

Baseline patient characteristics are shown in Table 1. While 76 patients underwent single stage urethroplasty by one of the several techniques, two stage urethroplasty (modified Johanson) was done in 53 patients. The mean age of patients ( $37.3 \pm 12.1$  years and  $40.4 \pm 7.5$  years in single stage and two stage urethroplasty respectively) and mean stricture length ( $9.7 \pm 1.2$  cm in single stage and  $9.25 \pm 2.1$  cm in two stage urethroplasty) was comparable in both the groups. Inflammatory strictures including lichen sclerosis were present in 35 patients (27.13%), (Group A/Group B - 21/14), 47 patients (Group A/Group B - 26/21) had catheter induced strictures constituting (36.43%) and no cause of strictures could be found in 47 (Group A/Group B - 29/18) patients (36.43%). 34 patients in Group B had previous urethroplasty (21 BMGU, 09 Orandi flap, 04 Mc Aninch flap). Out of 53 patients, 4 had associated renal failure (serum creatinine  $> 1.5$  mg %) and 5 patients had necrotizing scrotal skin was managed with emergency suprapubic cystotomy. BMGU was done in 51 patients (Ventral-25, Dorsolateral-26) while 13 patients underwent Orandi flap urethroplasty and 12 underwent Mc Aninch flap urethroplasty. Patients in both groups had symptoms like thinning of urine stream and dysuria for more than one year. Single stage procedures were offered to the patients who were considered apt for the procedure and the procedure chosen depended upon the length of stricture, availability of local healthy skin for flap repairs and availability of buccal mucosa for grafting. Re-stenosis of stricture was found to be the most common complication. It was present in 06 patients (7.8%) undergoing

single stage repair and 09 patients (16.9%) undergoing two stage urethroplasty and the difference between the two was statistically insignificant ( $p=0.16$ ). Urethro-cutaneous fistula developed in 03 (3.9%) and 05 (9.43%) patients in Group A and Group B respectively. Urethral meatal stenosis was found in 1 patient in two stage repair while diverticulum of urethra (02 cases) was more common in ventral BMGU compared to dorsal BMGU. (Table 2)

The success rate after urethroplasty (defined as adequate flow rate, no need of any intervention and no fistula) at average one year was 86% in single stage urethroplasty and 70 % in two stage urethroplasty and the difference was statistically significant ( $p=0.046$ ). Majority of failed cases in both the groups were managed by optical internal urethrotomy or suprapubic cystostomy and three cases in Group A requiring lay open urethroplasty with perineal urethrostomy. (Table 3)

The erectile function status of these patients was noted using the IIEF-5 questionnaire both pre operatively and post operatively at 3 months and 6 months. (Table 4) Erectile function was poor in staged urethroplasty compared to single stage repair and it was still less compared to primary urethroplasty patients after 6 months. The preoperative IIEF-5 score was  $17.2 \pm 2.1$  in Group A and  $16.7 \pm 4.5$  in Group B. The IIEF-5 score declined after surgery in both the groups ( $13.7 \pm 1.3$  and  $12.4 \pm 3.6$  in single stage and two stage respectively at 3 months) but showed improvement over time ( $16.6 \pm 2.3$  and  $13.6 \pm 3.2$  in single stage and two stage respectively at 6 months) although this difference was statistically insignificant.

**Table 3: Success rate of urethroplasty at one year.**

Success rate	Group A (n=76)	Group B (n=53)	P-value
Average 1 year follow up	65 (86 %)	37 (70%)	<b>0.046</b>
Failure	11	16	
<b>Management of Failed cases</b>			
OIU	05	07	
Patient self dilation	03	05	
Lay open urethra	03	04	

**Table 4: Showing the IIEF-5 score preoperatively and post operatively.**

Procedure	Pre-operative IIEF	Post-operative IIEF (3 months)	Post-operative IIEF (6 months)	P- value
Group A	$17.2 \pm 2.1$	$13.7 \pm 1.3$	$16.6 \pm 2.3$	0.47
Group B	$16.7 \pm 4.5$	$12.4 \pm 3.6$	$13.6 \pm 3.2$	0.29

## DISCUSSION

Extensive or pan urethral stricture disease pose a serious challenge to the urologist. Traditionally these long segment strictures have been managed with 2-stage repairs using penile and scrotal skin which was associated with its inherent complications like hair growth that required repeated intervention like epilations. However, with the evolution in the field of urethral reconstruction, there has been a shift towards single stage repair using free grafts, pedicle-based flaps or combined approaches. Single stage substitution urethroplasty can be performed when there is availability of urethral plate and suitable graft or flap material. Several flap/graft materials have been used in the past including full-thickness skin, buccal mucosa, ureter, saphenous vein, appendix and bladder mucosa<sup>15</sup> with buccal mucosa and

skin being most commonly used.<sup>16</sup> El- Kasaby et al were the first to report buccal mucosa urethroplasty for treatment of penile and bulbar urethral strictures in 1993.<sup>17</sup> Since then buccal mucosa has become an increasingly popular graft tissue for penile or bulbar urethral reconstruction because it can be easily harvested from the cheek or lip with a concealed donor site scar.<sup>18</sup>

Despite the preference for single stage urethroplasty, there are certain instances when single stage repair is not feasible. These include unavailability of suitable local penile skin for flaps (as in lichen sclerosis), poor oro-dental hygiene precluding buccal mucosal grafts (BMG) and urethral lumen  $< 6$  Fr on caliberation or cystoscopy.<sup>19</sup> Even in a industrialized countries complication like associated renal failure or urethral abscess directly linked to urethral stricture occur in 4.1 and 3.3 % of patients, respectively

as described by Rourke et al.<sup>20</sup> A good method described in literature to assess the condition of urethral plate is to perform urethroscopy using 6Fr pediatric endoscope or calibrate with 6 Fr ureteric catheters. Stricture caliber more than 6Fr and good urethral plate favours single stage reconstruction and stricture calibre less than 6 Fr and poor quality urethral plate favours two stage repair.<sup>21</sup> Thus single stage urethroplasty have been favoured in literature for long segment urethral strictures with good quality urethral plate and urethral calibre more than 6 Fr. Strictures with poor quality urethral plate and urethral calibre less than 6 Fr are managed with two stage urethroplasty. This study is unique because here long segment strictures with poor quality urethral plate and poor urethral calibre were managed with one stage and two stage repair and the results between two were compared.

Thus the current practical indications of two stage urethroplasty can be summed up into long segment urethral strictures with extensive scarring, infection, previous failed urethroplasty and lack of usable penile skin or BMGU for repair.<sup>22</sup> Geographical differences exist between the type of stricture and plays an important role in the type of urethroplasty. Patients in developed countries report more of short segment strictures (iatrogenic most common) that can be easily managed with anastomotic urethroplasty or substitution urethroplasty using a buccal mucosal graft. In contrast, developing countries report more of neglected long segment urethral strictures, often associated with complex features like urethrocutaneous fistulae, and often require two stage repair.<sup>23</sup> Another important aspect to consider in developing countries like India is the poor oral hygiene and tobacco chewing which make the buccal mucosa unhealthy and unsuitable for being used as graft in urethroplasty, leaving two stage urethroplasty as the last option.

Iatrogenic strictures were most common in our study followed by inflammatory strictures including lichen sclerosus. BMGU was the most commonly performed urethroplasty followed by penile flap surgeries. Restenosis / recurrence of stricture was the most common complication reported in our study (7.8% in single stage repair and 16.9% patients in two stage urethroplasty). Also, urethro-cutaneous fistula was reported in 3.9% and 9.43% patients in single stage and two stage urethroplasty respectively. The success rate at the end of one year was 86% in single stage urethroplasty and 70 % in two stage urethroplasty in our study. Similar study was done by moradi and moradi et al<sup>23</sup>, in which 45 patients of average urethral stricture length  $7.16 \pm 3.65$  cm, underwent urethroplasty (both single stage and two stage). He reported overall success rate of 71.4% and 90% for the 1-stage and 2-stage urethroplasty with 10% and 28.6% cases of re-stricture and 10% and 8.6% cases of fistula in the patients with the 1-stage and 2-stage operations, respectively. Previous studies have shown that patients of long segment urethral strictures managed with single-stage surgery report about 10% complications commonest being re-stenosis.<sup>24</sup> The higher rate of stricture recurrence and complications associated with lower success rate in two stage urethroplasty can be attributed to the technique of modified johanson urethroplasty in which penile skin is used for tabularization in second stage. Since lichen sclerosus constituted significant percentage among these and suitable BMG was not available in majority of cases (pan/gutkha chewing), both these factors in combination resulted in higher recurrence.

The above hypothesis is given weight by another study from Motiwala et al<sup>25</sup>, who reported success rate of 100% and 75% in the 1-stage and 2-stage operations respectively. They used vascularized flap of the longitudinal ventral penile skin in most 1-stage cases and transverse scrotal flap and Duckket transverse preputial flap in 2 stages.

We also studied the effect of stricture urethra and urethroplasty on erectile status of the patients. The risk of erectile dysfunction (ED) is supported by previous reports of ED after anterior and posterior urethroplasty.<sup>26</sup> Fortunately most studies have shown an improvement over time. Majority of patients in this study had mild to moderate ED. The erectile function status of panurethral stricture patients showed improvement when they underwent second stage repair, although this improvement was less compared to primary urethroplasty patients. Similar findings were reported by Erickson BA et al<sup>27</sup> and Bradley A et al.<sup>28</sup> The reason for poor erectile function in two stage johanson repair can be explained by the more complicated nature of stricture associated with spongiofibrosis and multiple episodes of surgery in staged urethroplasty, thereby causing damage to the surrounding neurovascular bundles. Associated with the anatomical causes, psychogenic factors play an equally important role in ED especially in two stage repair as majority of patients felt depressed regarding their open urethra and had decreased sexual desire.

A study by Coursey et al.<sup>29</sup> corroborated our findings about the erectile status in stricture urethra patients and suggested that erectile function were worse with a longer stricture as compared with those with shorter stricture. As these authors suggested that the longer the stricture segment, the higher is severity and magnitude of fibrosis in the urethra and surrounding tissue, which likely leads to the damage of erectile function. Similarly, Carlton et al<sup>30</sup> further suggested the lesser likelihood of neuronal damage with shorter segment urethral stricture.

The two stage procedure has its own advantages and disadvantages. It can lead considerable inconvenience in some men and exposes them to increased morbidity because of staged nature of treatment & multiple anesthetic administrations.<sup>31</sup> The advantage of two-stage procedure is that in strictures due to LS, there is a positive impact on the natural history of the disease.<sup>32-35</sup> Urinary diversion via a perineal urethrostomy avoids unremitting extravasation of urine into the corpus spongiosum and facilitates urethral tissue healing, as suggested by Blandy and Fowler.<sup>36</sup>

Thus this study confirms the important role played by two stage urethroplasty in the management of complex and difficult to treat pan urethral strictures, especially in developing countries where patients have delayed presentation and unavailable healthy buccal mucosa. This study also throws light on the erectile function status of stricture urethra patients and report a steady improvement in the erectile function with time which enables them to have reasonably satisfactory sexual life. Hence, this study unlike the previous ones highlights the present role of two stage johanson urethroplasty and single stage repairs in difficult to manage long segment strictures.

## CONCLUSION

Panurethral strictures are difficult to treat as they are often associated with inflammation and other complications. They have relatively poorer outcomes as compared to the shorter or single segment strictures of urethra. There is no one technique that can

be considered superior to others. Although, single stage urethroplasty dominates the modern era, two stage repair has a definite role in the management of complex pan urethral strictures, especially in developing countries, where poor orodental hygiene precludes BMGU and BXO constitutes significant proportion of cases. Also, two stage urethroplasty patients have poor erectile function compared to single stage repair, which shows improvement over the time and patients should be properly counseled and managed accordingly.

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