Original Article

Management of recurrent anterior urethral strictures following buccal mucosal graft-urethroplasty: A single center experience

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Abstract

Objective: To describe the safety, feasibility and outcome of redo buccal mucosal graft urethroplasty in patients presenting with recurrent anterior urethral stricture following previous failed BMG urethroplasty.

Materials and Methods: This was a retrospective chart review of 21 patients with recurrent anterior urethral stricture after buccal mucosal graft urethroplasty, who underwent redo urethroplasty at our institute between January 2008 to January 2014. All patients underwent preoperative evaluation in the form of uroflowmetry, RGU, sonourethrogram and urethroscopy. Among patients with isolated bulbar urethral stricture, who had previously undergone ventral onlay, redo dorsal onlay BMG urethroplasty was done and vice versa (9+8 patients). Three patients, who had previously undergone Kulkarni-Barbagli urethroplasty, underwent dorsal free graft urethroplasty by ventral sagittal urethrotomy approach. One patient who had previously undergone urethroplasty by ASOPA technique underwent 2-stage Bracka repair. Catheter removal was done on 21st postoperative day. Follow-up consisted of uroflow, PVR and AUA-SS. Failure was defined as requirement of any post operative procedure.

Results: Idiopathic urethral strictures constituted the predominant etiology. Eleven patients presented with stricture recurrence involving the entire grafted area, while the remaining 10 patients had fibrotic ring like strictures at the proximal/distal graft-urethral anastomotic sites. The success rate of redo surgery was 85.7% at a mean follow-up of 41.8 months (range: 1 yr-6 yrs). Among the 18 patients who required no intervention during the follow-up period, the graft survival was longer compared to their initial time to failure.

Conclusion: Redo buccal mucosal graft urethroplasty is safe and feasible with good intermediate term outcomes.

Key Words: Buccal mucosal graft-urethroplasty, recurrent anterior urethral strictures, redo surgery

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INTRODUCTION

Urethral reconstruction using a buccal mucosal graft (BMG) to substitute the urethral mucosa has become a well-established modality in the management of bulbar and penile urethral strictures, not amenable for excision and anastomosis.[1,2] The various configurations of BMG urethroplasty have included ventral onlay,[3] dorsal onlaly,[4] dorsal inlay via a ventral sagittal urethrotomy approach,[5] dorsolateral onlay with one sided mobilization of the urethra,[6] combined dorsal plus ventral double mucosal grafts,[7,8] two stage repairs,[9] and augmented anastomotic urethroplasty.[10]

Regardless of the surgical technique, all buccal graft-urethroplasty have the potential to fail or deteriorate with time. Stricture recurrence after substitution urethroplasty may take the form

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of either short segment fibrous ring strictures at the proximal or distal anastomotic sites or extensive fibrosis involving the entire grafted area.[11] Patients with anastomotic ring strictures may be managed with minimally invasive procedures, such as dilatation or optical internal urethrotomy (OIU). However, management of patients who fail these minimally invasive options or those with extensive fibrosis involving the entire grafted area is challenging. Furthermore, there is sparse literature regarding the optimal management of such patients. The objective of this study was to describe the safety, feasibility, and medium term outcome of redo BMG urethroplasty in patients presenting with recurrent anterior urethral stricture following previously failed substitution (BMG) urethroplasty.

MATERIALS AND METHODS

This was a retrospective analysis of our urethroplasty database. Between January 2008 and January 2014, we treated 25 patients who presented to our institute with recurrent anterior urethral stricture, having previously undergone BMG urethroplasty. Out of the total of 25 patients, two patients were excluded upfront from the analysis because of lack of adequate operative records/documentation and two further patients were excluded because of the loss to follow-up. Hence, 21 patients were included in the final analysis. Previous operative notes and discharge summary were thoroughly evaluated and following points were noted:

- Type of urethroplasty previously undergone, with specific reference to placement of the buccal graft (dorsal or ventral onlay or dorsal inlay)
- Location and length of the urethral stricture at the time of the first operation
- Etiology
- Time to failure after the first BMG urethroplasty
- Failure was defined as a requirement of any postoperative procedure like dilatation, OIU, or redo urethroplasty. Time to failure was defined as the interval between catheter removal and first intervention (dilatation/OIU/urethroplasty). A similar definition was used after redo BMG urethroplasty. Patients with no previous operative and follow-up records were excluded from analysis upfront.

Further preoperative evaluation consisted of a detailed clinical history and physical examination, urine culture, uroflowmetry, post void residual urine, serum creatinine, ultrasound of kidney-ureter-bladder, retrograde urethrography, sonourethrogram, and urethroscopy with a 6/7.5 Fr semi-rigid ureteroscope. Present stricture length and location were noted. Institutional review board approval was obtained. All surgeries were performed by either one of two surgeons: HKN/TDJ. Table 1 gives the details of first BMG urethroplasty. Table 2 analyses failure after first BMG urethroplasty. Table 3 gives results after second BMG urethroplasty.

The surgical technique of redo BMG urethroplasty was selected based on the knowledge of previous operative procedure, the site and length of the present stricture, current intraoperative findings (tissue planes and ease of dissection) as well as surgeon preference.

The buccal mucosal graft was harvested from the cheek using a two-team approach. The donor site was closed with 3–0 polyglactin. The graft was preferentially harvested from the cheek opposite to the one used in the previous surgery. However, when longer grafts were necessary, both cheeks were used. Lingual grafts were not used in any patients.

The urethroplasty was done in the lithotomy position using either a midline or λ incision. The bulbocavernosus muscle was divided and the bulbar urethra was exposed. Among patients with isolated bulbar urethral stricture, who had previously undergone ventral onlay (nine patients), dorsal onlay redo BMG urethroplasty was done; and in those with a previous dorsal onlay (eight patients), a ventral onlay BMG urethroplasty was performed by the standard surgical techniques.[3,4] In both situations, the urethrotomy (dorsal/ventral) through the strictured tract was extended 1 cm into the normal urethra, to calibrate the distal and proximal lumina to at least 24 Fr. This procedure remained the same, whether the pattern of recurrence was an anastomotic ring stricture or stricture of the entire grafted area.

Three patients (pt. nos. 10, 11, and 14) who had previously undergone BMG urethroplasty by the Kulkarni-Barbagli technique,[6] (two of whom had pan-anterior urethral stricture recurrence due to lichen sclerosus [LS] and the other who had a catheter induced isolated penile stricture) underwent dorsal free graft-urethroplasty by ventral sagittal urethrotomy approach.[5] In all these three patients midline, perineal incision and penile inversion technique were used to access the penile urethra.[12]

Patient number 16, with LS induced penile stricture, who had previously undergone urethroplasty by the Asopa technique, underwent two-stage Bracka repair.[9]

In all these 21 patients with redo-BMG urethroplasty, perioperative antibiotics consisted of intravenous second generation cephalosporin and aminoglycoside at induction of anesthesia and two subsequent doses, followed by oral cephalosporin till catheter removal.

In all patients, the catheter was removed at 21 days and voiding cystourethrography was performed to rule out extravasation. Follow-up protocol consisted of uroflowmetry and postvoid residual assessment, as well as urine culture and American Urological Association symptom score (AUA-SS), every

Table 1: Details of first BMG urethroplasty surgery

Patient number	Age years	Etiology	Stricture location and length (cm)	Number of dilatations/ OIU prior to first surgery	Details of first BMG urethroplasty
1	36	Idiopathic	Bulbar, 2.8	1	Ventral onlay
2	42	Idiopathic	Bulbar, 2.8	2	Ventral onlay
3	39	Idiopathic	Bulbar, 4.6	8	Ventral onlay
4	21	Iatrogenic	Bulbar, 3.3	5	Ventral onlay
5	56	Inflammatory	Bulbar, 4.0	0	Dorsal onlay
6	61	Iatrogenic	Bulbar, 3.5	2	Ventral onlay
7	59	Iatrogenic	Bulbar, 1.8	3	Dorsal onlay
8	29	Inflammatory	Bulbar, 2.7	1	Dorsal onlay
9	18	Idiopathic	Bulbar, 3.9	1	Dorsal onlay
10	33	LS	Pan urethral	0	Dorso-lateral onlay, one sided mobilization (Kulkarni–Barbagli)
11	47	LS	Pan urethral	0	Dorso-lateral onlay, one sided mobilization (Kulkarni–Barbagli)
12	22	Idiopathic	Bulbar, 3.8	2	Dorsal onlay
13	39	Inflammatory	Bulbar, 3.1	1	Dorsal onlay
14	55	Catheter induced	Penile, 3.2	1	Dorso-lateral onlay, one sided mobilization, penile inversion through perineal incision
15	43	Iatrogenic	Bulbar, 3.4	1	Dorsal onlay
16	44	LS	Penile, 4.5	1	Dorsal inlay through ventral sagittal urethrotomy (Asopa)
17	38	Catheter induced	Bulbar, 2.0	2	Ventral onlay
18	29	Idiopathic	Bulbar, 2.5	3	Ventral onlay
19	35	Iatrogenic	Bulbar, 4.0	1	Dorsal onlay
20	46	Catheter induced	Bulbar, 2.2	1	Ventral onlay
21	34	Idiopathic	Bulbar, 3.6	1	Ventral onlay

BMG: Buccal mucosal graft, OIU: Optical internal urethrotomy, LS: Lichen sclerosus

Table 2: Stricture recurrence after first BMG urethroplasty

Patient number	Time to failure (years)	Pattern of failure	Number of dilatations/ OIU subsequent to failure of first surgery	Stricture location/ length (cm) prior to second surgery	Preoperative Qmax (ml/s) prior to second surgery	Preoperative AUA-SS prior to 2nd surgery
1	3.5	Distal anastomotic ring	1	Bulbar, 2	5	24
2	2	Distal anastomotic ring	2	Bulbar, 1.5	12	18
3	2.5	Entire grafted area	1	Bulbar, 5	8	15
4	1.5	Proximal anastomotic ring	1	Bulbar, 2	11	14
5	3	Proximal anastomotic ring	1	Bulbar, 1.5	7	28
6	4	Entire grafted area	0	Bulbar, 4	10	16
7	1.5	Entire grafted area	0	Bulbar, 2.5	11	15
8	1	Entire grafted area	0	Bulbar, 3	6	28
9	7 months	Distal anastomotic ring	1	Bulbar, 2	5	24
10	1.5	Entire grafted area	0	Pan urethral	6	29
11	2	Entire grafted area	0	Pan urethral	9	16
12	2 years 3 months	Distal anastomotic ring	1	Bulbar, 1.5	9	14
13	15 months	Proximal anastomotic ring	0	Bulbar, 1.5	10	15
14	2.5	Entire grafted area	0	Penile, 4	6	19
15	8 months	Proximal anastomotic ring	1	Bulbar, 2.8	8	20
16	1	Entire grafted area	2	Penile, 5	12	16
17	1	Distal anastomotic ring	1	Bulbar, 1	6	27
18	3.5	Proximal anastomotic ring	1	Bulbar, 1.5	11	12
19	2 years 7 months	Entire grafted area	0	Bulbar, 6	5	22
20	6 months	Entire grafted area	0	Bulbar, 3.5	6	21
21	3 years 3 months	Entire grafted area	0	Bulbar, 4	5	19

BMG: Buccal mucosal graft, OIU: Optical internal urethrotomy, AUA-SS: American Urological Association symptom score

4 months for the first 2 years and then 6 monthly thereafter. Retrograde urethrography and urethroscopy was performed if a stricture was suspected based on obstructive symptoms, deterioration of flow rate or AUA-SS scores or increase in postvoid residual volumes. Failure was defined as requirement of any postoperative procedure like dilatation or OIU.

RESULTS

A total of 21 patients were included in the final analysis. Of these 21 patients, 4 were previously operated at our own institute. Mean patient age was 39.33 years. Idiopathic urethral strictures constituted the predominant etiology (7 cases),

Table 3: Results after second BMG urethroplasty

Patient number	Details of second BMG urethroplasty	Complications	Follow-up (months)	Qmax at last follow-up (ml/s)	AUA-SS at last follow-up	Result
1	Dorsal onlay	Nil	66	17	6	Success
2	Dorsal onlay	Wound infection	72	19	10	Success
3	Dorsal onlay	Nil	63	16	9	Success
4	Dorsal onlay	Wound infection	60	20	7	Success
5	Ventral onlay	Nil	58	19	12	Success
6	Dorsal onlay	Foot neuralgia	54	16	12	Success
7	Ventral onlay	Nil	54	15	9	Success
8	Ventral onlay	Nil	56	16	5	Success
9	Ventral onlay	Nil	48	17	8	Success
10	Dorsal inlay (Asopa), hypospadiac meatus	Splayed stream	42	20	5	Success
11	Dorsal inlay (Asopa)	Dilatation, once after 2 years	39	17	12	Failure
12	Ventral onlay	Transient epididymo-orchitis	38	19	11	Success
13	Ventral onlay	Nil	30	22	7	Success
14	Dorsal inlay (Asopa)	Restricture, perineal urethrostomy	30	18	13	Failure
15	Ventral onlay	Nil	32	16	4	Success
16	2 stage, Bracka	Nil	31	15	11	Success
17	Dorsal onlay	Dilatation, once after 6 months	28	15	13	Failure
18	Dorsal onlay	Nil	30	17	11	Success
19	Ventral onlay	Nil	24	16	6	Success
20	Dorsal onlay	Nil	24	22	4	Success
21	Dorsal onlay	Nil	12	21	5	Success

BMG: Buccal mucosal graft

followed by iatrogenic (5 cases), inflammatory, catheter-induced and LS (3 cases each)., followed by iatrogenic (5 cases), inflammatory, catheter-induced and LS (3 cases each).

Out of the 21 patients, 9 patients had undergone ventral onlay BMG urethroplasty and 8 patients had undergone dorsal onlay BMG urethroplasty for isolated bulbar urethral stricture. The mean stricture length in these 17 patients with bulbar stricture was 3.18 cm (range: 1.8–4.6 cm). Two patients with pan-anterior urethral stricture due to LS had undergone single stage dorsal onlay BMG urethroplasty by Kulkarni-Barbagli technique. The remaining two patients had isolated penile urethral stricture, one of which was catheter induced and the other due to LS The mean number of dilatations prior to the first BMG urethroplasty was 1.76 (range: 0–8). The mean time to failure in patients with isolated bulbar urethral stricture who had undergone either a dorsal/ventral BMG urethroplasty was 24.4 months. The three patients with LS had a comparatively shorter time to failure (1.5, 2, and 1-year). Eleven patients presented with stricture recurrence involving the entire grafted area while the remaining 10 patients had fibrotic ring like strictures at the proximal/distal graft-urethral anastomotic sites.

Some of the patients with recurrent strictures were again temporarily managed with dilatation/OIU by either their primary surgeon/elsewhere, before presenting to our institute with intractable symptoms.

On evaluation at our institute, the mean Qmax among the 21 patients prior to the redo urethroplasty was 8 ml/s and mean preoperative AUA-SS score was 19.62. Details of the second BMG urethroplasty are given in Table 3 and have already been discussed in the materials and methods section above.

Postoperative complications included wound infection in two patients, foot neuralgia in one patient and transient epididymo-orchitis in one patient. One patient (no. 10) who had undergone dorsal inlay urethroplasty had splayed stream because of the surgically created hypospadiac meatus.

The success rate was 85.7% at a mean follow-up of 42.4 months (range: 1–6 years). One patient developed pan-anterior urethral stricture and underwent permanent perineal urethrostomy. Two patients (pt. no. 11 and 17) required a single session of dilatation, 6 months and 2 years after the redo surgery respectively, and then remained symptom-free till the end of their follow-up period. Among the 18 patients who required no intervention during the follow-up period, the graft survival was longer compared to their initial time to failure.

DISCUSSION

There is a dearth of literature regarding the management of patients with recurrent anterior urethral strictures following previous BMG urethroplasty as well as the outcomes of these patients who undergo redo BMG urethroplasty. Blaschko *et al*. analyzed the outcomes of 130 patients who underwent repeat urethroplasty after initial failed urethral reconstruction.[13] However, in this study, in 73% of patients the details of previous urethral reconstruction were not known. Furthermore,

the technique employed during redo surgery was end-to-end anastomosis in 42% of patients, fasciocutaneous flap in 23% of patients and combined flap plus graft in 12% of patients. They also included urethral stricture due to hypospadias, which is a totally different entity altogether. Only 31 out of the 130 patients underwent onlay graft-urethropalsty, but the nature of the graft (skin/buccal mucosa/lingual mucosa) is not mentioned in the paper, as is the type of previous urethral reconstruction undergone by this cohort of patients. Contrary to the Blashcko paper, our study, specifically deals with redo BMG urethroplasty in patients with previous failed urethral reconstruction using BMG. To the best of our knowledge, our study is the largest series of redo BMG urethroplasty with intermediate-term outcomes. The first point we would like to highlight is the safety and feasibility of redo BMG urethroplasty. There are no uniform rules regarding the management of failed BMG urethroplasty cases. However, in our experience, employing ventral onlay technique for those who had previously undergone dorsal onlay and vice versa, ensures easier dissection. The history of urethral reconstructive surgery has witnessed wide-ranging debates regarding the best technique for placement of the buccal graft, with each group highlighting the superiority of one over the other. Barbagli *et al*. showed that the placement of BMGs into the vental, dorsal or lateral surface of the urethra showed the same success rate and the outcome were not affected by the surgical technique.[14] Surgeons involved in the urethral reconstructive surgery should be well versed in the various techniques of BMG urethroplasty so that they can employ the technique best suited for the particular situation in redo cases.

Anastomotic ring strictures cannot be indefinitely managed by minimally invasive techniques like dilatation/OIU; though this may be the only viable option in some patients. Ultimately a proportion of these patients may present with intractable strictures that are best treated with redo BMG urethroplasty. Recurrences in the form of strictures involving the entire grafted area, either a result of a technical error or a progression of the native urethral disease are also amenable for redo urethroplasty. This is borne out the mean stricture free period (45.06 months) among the successful 16 cases of isolated bulbar stricture redo cases in our series, which was longer than the mean time to failure after the first BMG urethroplasty in these cases (25.18 months). However, technical aspect could have contributed to failure after the first surgery in these cases.

We acknowledge certain limitations in our study. This was a retrospective study with a limited sample size. Furthermore, it was a heterogeneous cohort of patients consisting of pan-anterior urethral as well as isolated bulbar and penile urethral strictures of varied etiology and operated at various centers. There were no strict predetermined criteria regarding the management of patients with recurrent anterior urethral strictures with repeated dilatations versus subjecting them to redo surgery. This was left to the discretion of the treating surgeon taking various factors into account like length and location of stricture based on retrograde urethrogram, degree of spongiofibrosis based on sonourethrogram, number and frequency of minimally invasive procedure already undergone by the patient after the previous failed surgery and patient preference regarding long-term cure with a redo surgery versus continuing to remain on frequent dilatation.

CONCLUSIONS

Redo BMG urethroplasty is safe and feasible with good intermediate-term outcomes. Surgeons need to be well versed in various techniques of BMG urethroplasty to manage patients with recurrent anterior urethral strictures.

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