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Salvage Buccal Urethroplasty after Prior Open Intervention: 10 Year Experience

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Abstract

Purpose: To report our 10-year experience and evaluate the outcomes and complications of repeat ventral onlay buccal mucosal graft urethroplasties (BMU) as a subsequent procedure after prior open urologic intervention.

Methods: Consecutive patients receiving BMU between February 2001 and April 2009 were retrospectively reviewed. A total of 32 male patients with anterior urethral stricture disease experienced recurrence after previous attempted open urologic operative intervention and underwent subsequent BMU. Recurrence is defined as inability to pass a 16 fr flexible cystoscope. The mean follow up time was 26.6 months (range 6.6 - 91.3).

Results: Primary disease etiology of the patients included: balanitis xerotica obliterans (3.1%), iatrogenic (18.8%), hypospadias (25%) and pelvic trauma (18.8%), and idiopathic (34.4%). The majority of the strictures (62.5%, 20 patients) were in the bulbar urethral, with the rest located in the penile urethra. The complication and reoperation rate in the salvage cohort were 41% (13/32) and 34% (11/32) respectively. Fistula (1/13), meatal stenosis (3/13) and re-stricture (9/13) were the types of complication. Only one patient who experienced complications required formal graft revision urethroplasty.

Conclusions: Buccal urethroplasty is a proven technique in primary repair of urethral stricture disease, but this retrospective analysis demonstrates it to be a viable option after prior open management. Our experience provides long term follow up results in a consecutive series of repeat BMU by a single surgeon. Though the complication and reoperations rates are increased compared to primary BMU as reported in the literature, the results demonstrate that BMU is a viable option for those requiring a second formal urethroplasty.

Introduction

Urethral stricture disease is a complex urologic problem with multiple etiologies and multiple surgical approaches. Although there is no one single technique employed for all types of strictures, buccal mucosal graft urethroplasty (BMU) has proven to be a versatile surgical option for the reconstructive urologist since its first use in the 1940s. Although there are multiple large, single-center experiences with buccal urethroplasty, only recently have short and long term results become available for these grafts [1-5]. There is a paucity of literature regarding the long-term reconstructive outcomes in patients that have failed previous open reconstructive attempts. It is our intent to present our long-term follow-up results from a contemporary series of ventrally placed BMU as a subsequent technique for failed previous open surgical attempts.

Materials and Methods

Study design

A retrospective analysis was performed of consecutive patients who underwent buccal mucosa urethroplasty at the Indiana University Medical Center from February 2001 through April 2009 after Institutional Review Board approval. Medical records were reviewed to capture variables regarding patient demographics, disease etiology, operative details, post-operative complications and their management, length of stay, and follow-up information.

Between February 2001 and April 2009, a total of 32 consecutive salvage buccal mucosa urethroplasties were performed. We examined patients based on stricture characteristics (etiology, length, and location), type of prior operative intervention, and post-salvage BMU complications.

Operative technique

The surgical procedures were performed by a single surgeon (RB) using a standard ventral-onlay technique. The urethra was mobilized with the patient in lithotomy position using a penoscrotal approach for penile strictures and perineal for bulbar strictures. After division of the bulbocavernous muscles, the ventral surface of the urethra was incised longitudinally until healthy tissue was encountered. Stricture length and degree of spongiofibrosis was determined. The buccal graft was selected and harvested by various otolaryngology surgeons. The graft was de-fatted on the non-mucosal surface, tailored and anastamosed to the urethral epithelium using 4 - 0 PDS suture in running fashion. A 14F Silastic catheter was placed. Spongiosum tissue was then reapproximated over the graft.

Follow-up

All patients were discharged with indwelling catheter drainage and returned to outpatient clinic at 2 weeks for voiding cystourethrography prior to catheter removal. RUG performed at 4 weeks. Urinalysis and uroflowmetry were routinely performed at

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Table 1: Patient characteristics: underlying disease processes predisposing patients to stricture; location of stricture.

Etiology	n
Balanitis Xerotica Obliterans	1
Iatrogenic	6
Hypospadias	8
Pelvic Trauma/Straddle Injury	6
Unknown	11
Stricture Location	**n**
Bulbar	20
Penile	12

Table 2: Previous open repairs; 3 patients with a combination of previous open repairs, with one patient undergoing 9 previous procedures.

Failed Open Repair	n
Buccal Graft	5
Primary Urethroplasty	10
SIS Graft	1
Hypospadias	7
Pedicle Island Flap (PIFU)	6
Combination (BMU/PIFU/Johansen	3

Table 3: Complications among 13 patients, 41%; only one patient with recurrent stricture required revision urethroplasty

Complication	n	Management
Fistula	1	Conservative
Meatal Stenosis	3	Operative meatotomy [2]
		Conservative
Stricture	9	Operative dilaion [6]
		Conservative [1]
		Revision urethroplasty [1]
		DVIU [1]

Table 4: Perioperative patient characteristics: stricture and graft length was determined intraoperatively. Post-operative uroflow rate was determined within the first 3 months after intervention.

n	Prior Open 32
Age (y)	45.6 (17 - 78)
Stricture Length (cm)	3.1 (1.5 - 8.0)
Graft Length (cm)	4.2 (2.5 -8.0)
Operative Time (min)	177 (135 - 210)
Preoperative Uroflow Rate (mL/s)	9.9 (7.7 - 12.0)
Postoperative Uroflow Rate (mL/s)	18.2 (8.6 -39.3)
Follow-up Time (mo)	26.6 (6.6 - 91.3)
Reoperation	11 (34%)
Complication	13 (41%)
Time to Complication (mo)	10.8 (0.7 - 28.1)

3 months and annually as indicated. We defined graft failure as the inability to pass a flexible cystoscope.

Analysis

The chi-squared test was used to compare categorical data. Kaplan-Meier analysis was used to demonstrate overall graft survival as well as complication timing. A p value < 0.05 was considered statistically significant.

Results

All men included in our retrospective study had previous open urologic intervention. The mean age of all patients was 46 years (17 - 78). The mean stricture length in this population was 3.1 cm (1.5 - 8.0). All patients were symptomatic with a pre-intervention uroflow of 9.9 ml/sec (7.7 - 12). The patient characteristics predisposing stricture disease and location are listed in table 1**.** Six patients had strictures caused by pelvic trauma, 8 patients had a history of hypospadias, 6 were identified as iatrogenic, and one patient had distal BXO; the rest were iatrogenic. The majority of urethroplasties were performed for bulbar strictures. The prior open repair techniques are detailed in table 2. These patients underwent at least 1 prior open repair, 3 with multiple open procedures, up to 9 in one patient. The stricture had a mean length of 3.1 cm (1.5 - 8) at the time of the procedure.

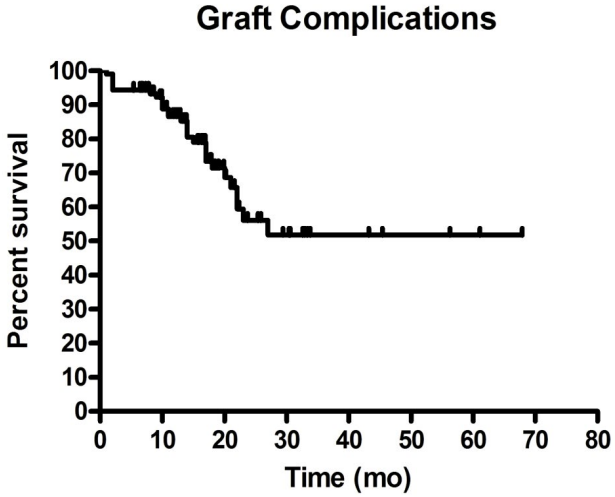

Figure 1: A Kaplan-Meier analysis of complications: there was 59% survival of the graft. Over a mean follow up of 26.6 months, 13 patients experienced complications with 11 undergoing re-operation.

Post-salvage complications occurred in 13 cases (41%). These are listed in table 3**.** No mortality was observed. One patient developed a small urethrocutaneous fistula which was managed with conservative measures. Three patients developed meatal stenosis; two required operative meatotomy and the other was managed conservatively. Nine patients developed recurrence of stricture disease. Six of these patients required operative urethral dilation. The overall reoperation rate was 34% (11/32). One patient required formal graft revision (3%, 1/32).

The direct comparison of stricture length, graft length, operative time, follow-up duration, complication rates and reoperation rates are detailed in table 4. Post procedural uroflow demonstrated improved rates: 18.2 ml/sec (8.6 - 39.3).

The mean follow-up was 26.6 months (range 6.6 - 91.3) in the salvage cohort. A Kaplan-Meier analysis of complications is depicted in figure 1. The mean time to over-all complication was 10.8 months (0.7 - 28.1) with 91.4% of all complications occurring within 24 months of the urethroplasty.

Discussion

Our series investigated the timing and occurrence of post-operative complications in a unique subset of a large heterogeneous series with extended follow-up. Overall, we had 13 (41%) complications in our 32 patients. The mean time of overall complication was 10.8 months. These results correlate with a large series consisting of 234 patients which reported all failures occurring in the first 18 months [6]. Although most complications occur early and could be the result of poor graft inosculation, we did observe a small number of late strictures > 5 years from urethroplasty, similar to a multi-institutional experience by Kane et al. [7]. Although this may be late progression of the original stricture etiology, we would recommend continued intermittent evaluation on an annual basis driven by patient symptomatology.

Our results demonstrated that the primary disease etiology and number of prior operations had no statistically-significant effect on graft success post-operatively. We did find however, an association between urethral stricture length and multifocality with surgical outcomes. These findings were similar to another large series of 495 urethroplasties which noted a correlation between stricture length > 4 cm and surgical failure [8]. Additionally, observationally, buccal mucosa for penile reconstruction had higher rates of complication in our study compared to bulbar reconstruction. Buccal mucosa has proven to be an extremely reliable tissue for urethroplasties [9] as it

contains a thick epithelium and vascular lamina propria which allow successful graft incorporation [10]. There is evidence that onlay or tubularized graft in the penile compared to the bulbar urethra has worse outcomes because of its relatively decreased vascularity [11,12]. This is confirmed in the salvage patients.

Overall, the outcomes of BMU as a salvage technique are inferior when directly compared to reported rates of BMU as a primary repair. In the first and first 5 years, for example, strictures were noted in 12% and 21% respectively of primary BMU compared to a stricture rate of 28% over 2 years in the salvage group [13]. This likely attributed to underlying tissue abnormalities such as BXO and pathologic scarring which require salvage open procedures as the urethral plate is devascularized and fibrotic. Importantly our reoperation rate was 20.6%, also higher than other large series. This is again attributed to urethral tissue quality as well as a large degree of spongiofibrosis, which increases the complexity of these repairs [14]. In those patients with local tissue bed scarring and concern over onlay graft survivability, our results in concert with other series would indicate a two-stage urethroplasty may produce better results [15].

A limitation of this study is the inherent selection bias of a retrospective review. Given the time period of review, a learning curve may be inherent. Our graft harvest was performed by multiple otolaryngologists, which may further insert confounders. Additionally, as a tertiary referral center many patients re-established follow-up with physicians closer to home, limiting the follow-up duration. Lastly, there is no examination of patient factors such as nutrition, immunodeficiency, radiation and other markers of poor wound healing.

Conclusion

Urethral stricture disease is a difficult problem to manage, with high propensity for recurrences. Our results indicate that the ventral onlay buccal mucosa urethroplasty, even in the salvage setting, can provide durable outcomes in a variety of situations. The timing of complications, although minor, generally occurs in the first 24 months but necessitates extended follow-up. Our series demonstrates, consistent with primary urethroplasty, a longer stricture length corresponds with higher risk of complications. Careful patient selection is paramount and consideration should be given to 2-stage repairs in the salvage setting.

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