

Dorsal Onlay Buccal Mucosal Graft Urethroplasty in Long Anterior Urethral Stricture

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ABSTRACT

Objective: To assess the success of buccal mucosal graft (BMG) urethroplasty by the dorsal onlay technique in long anterior urethral stricture (> 2 cm long) through the midline perineal incision.

Materials and Methods: From January 1998 to December 2003, 43 patients with long anterior urethral strictures were managed by dorsal onlay BMG urethroplasty. After voiding trial, they were followed up at 3 months with uroflowmetry, retrograde urethrogram (RGU) and American Urological Association symptoms score (AUA symptoms scores). Successful outcome was defined as normal voiding with a maximum one attempt of VIU after catheter removal. Patients were further followed-up with uroflowmetry at 3 months interval and RGU every 6 months interval.

Results: Mean stricture length was 4.8 cm (range 3 to 9 cm) and mean follow up was 48 months (range 12 to 84 months). Only five patients were found to develop stricture at anastomotic site, during follow-up. Two of them voided normally after single attempt of VIU. Other three patients (6.9%) required further open surgery or repeat VIU during follow up and were considered as failure.

Conclusion: Dorsal onlay BMG urethroplasty is a simple technique with good surgical outcome.

Key words: urethral stricture; buccal mucosa; graft

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INTRODUCTION

The treatment of urethral strictures varies according to location, length, depth and density of the stricture. Urethral reconstruction remains a challenge in modern urology practice. Visual internal urethrotomy (VIU) may be useful for short annular strictures, but this procedure is associated to a very high recurrence rate (1). Urethral reconstruction with excision of the strictured segment and end-to-end anastomosis is successful in more than 95% of patients

with a stricture of up to 2 cm in length (2). Patients with long strictures (> 2 cm in length) are not suitable for end-to-end urethroplasty due to the risk of postoperative chordee formation (3). Substitution urethroplasty is ideal for the management of long anterior urethral strictures. The ideal material for substitution urethroplasty remains controversial (4). Urethra is the best substitute for urethra - Turner-Warwick's opinion is still true (3).

Urethral substitution has long been accomplished by using genital skin flaps, grafts of genital or extragenital tissue. However, use of genital skin pedicle flap is a difficult procedure requiring extensive penile and scrotal dissection to mobilize the flap to the deep perineum, and associated to postoperative torsion and penile scarring (5,6). Extragenital skin flap is associated to higher complication rates, but post auricular full thickness free grafts have been associated to better results (7). Memmelar was the first to report the use of bladder mucosa in substitution urethroplasty, but result was discouraging due to the problems of tissue harvesting as well as complications like urethral exuberance and diverticula formation (8). Buccal mucosa has recently gained its popularity as a substitute for urethral reconstruction for both strictures and complex hypospadias (9, 10). In comparison to bladder mucosa, buccal mucosa offers the advantages of being accustomed to a wet environment, having good vascularity, hair less, easy to harvest, thick epithelium making it easy to handle and less chance of graft contracture, having a thin lamina propria allowing early inosculation, reduced rate of pseudodiverticulum formation (4). Though Humby has described the use of buccal mucosa for urethral substitution in 1941, it has become popular only after 1990 (11). In our study, we describe our initial experience with dorsal buccal mucosal graft (BMG) urethroplasty through a dorsal sagittal urethrotomy technique for repairing long anterior urethral strictures.

MATERIALS AND METHODS

From January 1998 to December 2003, 43 patients with long anterior urethral stricture were managed by single stage urethroplasty with a dorsal onlay patch BMG. Each patient was evaluated with detailed case history, physical examination, imaging study with retrograde urethrogram (RGU) and voiding cystourethrogram (VCUG), uroflowmetry, AUA symptom score assessment and other routine investigations required for anesthetic fitness. Of the strictures, 23 were idiopathic in origin, 9 were traumatic, 4 associated to lichen sclerosus (BXO), 4

due to catheter induced trauma (iatrogenic) and 3 infective in origin (Table-1). Mean stricture length, as measured by preoperative RGU was 4.8 cm (range 3 to 9 cm). The sites of strictures were panurethral in 16, penile in 9 and bulbar in 18 (Table-2). Institute Ethical committee's approval was taken to perform the study.

Operation was performed under general anesthesia with nasotracheal intubation and the patient put in exaggerated lithotomy position. Operation was done in a 2-team approach-one team engaged in urethral procedure, and other team in harvesting the buccal mucosa. Through a midline perineal incision, the bulbocavernosus muscle was divided exposing the corpus spongiosum of the anterior urethra. Then the bulbar urethra was easily dissected from corpora cavernosa. By invaginating the penis, the penile urethra was similarly dissected up to the coronal sulcus (12). Then the strictured segment of the urethra was identified. The other team then harvested the buccal mucosal graft of adequate length, from the inner cheek area below the Stensen's duct without injuring it. Usually, 6-cm. long graft can easily be harvested from the inner cheek. If the required graft length is more than 6 cm, then the incision line is extended along the lower lip up to the midline to get the additional length of buccal mucosa. In this way, buccal mucosal graft up to a length of 10-12 cm. can easily be harvested. Lignocaine (2%) with adrenaline (1:200000) was injected into the edges of the desired graft length before harvesting to get better hemostasis. Stay sutures are placed into the corners and the graft is harvested. Graft donor site is closed with continuous, 3-0 chromic catgut sutures to achieve good hemostasis. The graft is then defatted and tailored to its proper size.

The dissected urethra was rotated 180°. The dorsal surface of the strictured segment was exposed and opened vertically extending the incision for about 1 cm both proximally and distally into the normal urethral lumen. The proximal and distal urethral lumina of the urethra were calibrated. The graft was sutured, splayed and quilted over the corpora cavernosa using few 5-0 polyglactin quilting sutures for reinforcement with good support and minimizing the dead space. The left margin of the urethral mucosa was sutured to the graft using 4-0 polyglactin interrupted stitches. A 16F

pure silicone Foley catheter was inserted through the urethra into the urinary bladder. Then the urethra was rotated back to its original position and the right margin of the urethral mucosa was sutured similarly to the remaining margin of the buccal mucosal graft. At the end of the procedure, the graft was completely covered by the urethra.

Suprapubic catheter is generally not used unless the patient is already presented with it. The patient is maintained on antibiotics until the catheter is removed.

A retrograde pericatheter contrast study was done 3 weeks after the operation and voiding trial given. At 3 months after catheter removal, uroflowmetry, RGU and AUA symptom score assessment were performed. A successful outcome is defined as normal voiding with the need for maximum one attempt of subsequent VIU. Patients were further followed-up with uroflowmetry at 3 months and RGU every 6 months interval.

RESULTS

A total of 43 patients (mean age 31 years, range 21 to 56 years) underwent BMG urethroplasty by dorsal onlay graft between January 1998 and December 2003. Mean operative time was 115 min (range 105 to 160 min) and mean follow-up 48 months (range 12 to 84 months). Only two patients required postoperative blood transfusion. Mean duration of hospitalization was 4.5 days (range 4 to 6 days). Two patients showed extravasation of contrast medium on retrograde contrast study after 3 weeks of operation, near the anastomotic site (one at proximal and another one at distal anastomotic site) and managed successfully by extended catheterization for another 2 weeks. When repeat contrast study showed no leak, voiding trial was given. Five patients developed stricture at proximal anastomotic site (one of them showed extravasations of contrast medium at proximal anastomotic site on VCUG, requiring 2 weeks of extended catheterization). Two of them voided normally after single attempt of VIU. Other three patients could not void normally after the first attempt of VIU, though one of them voided successfully after

another VIU and other two patients required open surgery to void successfully. These three patients (6.9%) were considered to be failure. Two patients developed wound infection, managed successfully with change in antibiotics as per wound swab culture sensitivity test. No patient developed diverticulum, fistula, sacculation formation or protrusion of the graft at external meatus. Peak urinary flow rates improved from a mean of 8.4 ml/sec (range 4 to 11 ml/sec) preoperatively to 28.8 ml/sec. (range 16 to 11 ml/sec) after 6 weeks post operatively ($p < 0.001$), Table-1.

AUA symptom scores decreased from a mean of 22.4 (range 12 to 28) preoperatively to 4.8 (range 4 to 9) after 6 weeks postoperatively ($P < 0.001$). In our series, minimum follow-up was 12 months and maximum follow up was 84 months from the date of operation (Table-3).

COMMENTS

Long anterior urethral stricture (> 2 cm long) should be treated with substitution urethroplasty to avoid postoperative chordee formation (3). Substitution urethroplasty may be a patch graft or tube

Table 1 – Etiology of strictures.

Cause of Strictures	N of Patients
Idiopathic	23
Traumatic	9
Lichen sclerosus (BXO)	4
Iatrogenic	4
Infective	3
Total	43

Table 2 – Sites of strictures.

Site	N of Patients
Panurethral	16
Penile	9
Bulbar	18
Total	43

Table 3 – Improvement in Q-max and AUA symptom score after operation.

Assessment Criteria	Preoperative	Postoperative	p Value
Mean Q Max (range)	8.4 mL/sec (04-11)	28.8 mL/sec (16-34)	<0.001
Mean AUA Symptom Score (range)	22.4 (12-28)	4.8 (4-9)	<0.001

* $p < 0.05$ is significant.

graft (13-16). Free skin grafts used as patch or tube graft in substitution urethroplasty are associated with complications like graft shrinkage, diverticulum formation and recurrent stricture, although results of patch grafts are better than tube grafts (17-19).

Humby was the first to use buccal mucosa for urethral reconstruction in a series of single stage hypospadias repair. However, BMG urethroplasty has emerged as a popular technique in 1990s. Whether to place the graft dorsally, ventrally or laterally is still controversial now. Ventral onlay graft is more prone to fistula formation, sacculation and diverticula formation leading to urinary stasis and ejaculatory dysfunction (4). On the other hand, dorsal onlay graft procedure for the anterior urethral stricture provides the advantages of better mechanical support by the corporal bodies for the graft's better take up, with less incidence of sacculation and fistula formation (20,21). It has been reported that dorsally placed graft can do better because of better mechanical support for the graft and a richer vascular bed from the underlying corporal bodies (13). In different series, ventral onlay urethroplasty has revealed a success rate of 57.1 % to 100% with a follow-up ranging from 20 to 64 months (22-25). On the other hand, dorsal onlay BMG urethroplasty has shown a success rate from 87.5% to 100% with a follow-up ranging from 22 to 41 months (26,27). Recently, Barbagli et al., published a retrospective study of 50 cases with bulbar urethral stricture where buccal mucosal graft urethroplasty were done (28). In their study, grafts were placed as ventral, dorsal and lateral onlay in 17,27 and 6 patients respectively. After a mean follow-up of 42 months, placement of graft into ventral, dorsal or lateral surface of the bulbar urethra showed the similar success rate. In our series of 43

cases, only five patients developed re-stricture at anastomotic sites, (one of them at distal and other four at proximal anastomotic site). Three patients developed stricture within 6 months of operation and another two patients showed evidence of stricture on RGU after 24 months of operation. Three of them (6.9%) were considered as failure, because two out of 5 patients developing stricture after BMG urethroplasty could be managed successfully with single attempt of VIU. Our mean follow-up is also long enough (mean 48 months, range 12-84 months), only very few series has concluded their results after such a long follow-up (13,20,24,29).

Use of the AUA symptom score to assess outcomes of urethroplasty was previously used in different series with BMG urethroplasty for bulbar urethral reconstruction (5,30). In those series, it has already been reported that there is an inverse relationship between the peak urinary flow rate (Q max) and AUA symptoms scores (5). Our study similarly proved a statistically significant difference in pre-operative and post-operative AUA symptom scores in successful cases.

CONCLUSION

In our study, it has been shown that dorsal BMG urethroplasty is a reliable and satisfactory procedure to manage long anterior urethral strictures with minimum complications. Harvesting the graft is simple, only requiring good co-ordination between the two team of surgeons. Few cases, considered as failure with stricture formation can be managed with VIU. Use of AUA symptom score can be another tool to assess the outcome result in follow-up. Though we have a long follow-up period, further long term

follow-up should be continued to confirm the durability of the results. The question of placing the BMG dorsally, ventrally or laterally is still unresolved. A randomized controlled trial with careful patient selection and long-term evaluation of results is required to shed a light on this controversial issue.

CONFLICT OF INTEREST

None declared.

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EDITORIAL COMMENT

In this interesting article, the authors assess the success of one-stage dorsal buccal mucosal graft for the treatment of long anterior urethral strictures. The mean stricture length was 4.8 cm and the etiology of strictures was idiopathic in the majority of patients. In our experience stricture longer than 4 cm are usually due to lichen sclerosus or catheterization during cardiovascular surgery. The idiopathic strictures, that have an unknown etiology, are probably the result of a remote unrecognized perineal trauma experienced during childhood (1). These strictures are located in the bulbar urethra and are not more than 3 cm in length. The reader will appreciate a comment on the cause of the long pan-urethral strictures reported by the authors.

In our experience, the repair of stricture longer than 4 cm using various one-stage bulbar urethroplasties showed a higher failure rate when compared to shorter strictures. The use of two-stage urethroplasty should be preferred in patients with pan-

urethral diseases, often associate with local adverse condition such as lichen sclerosus. The authors, however, should be praised for having treated these complex cases using a one-stage urethroplasty thus avoiding to the patient the discomfort of perineal urinary diversion that many time is not accepted by the patient for religious, hygienic, cultural or psychological reasons.

Andrich et collaborators suggested that substitution urethroplasty steadily deteriorated with time, so that by 15 years more that half of the patients required evaluation for stricture recurrence (2).

Our series of original dorsal skin onlay graft urethroplasty using penile skin showed a steadily deterioration over time of success rate at the interim follow-up (3) and the deterioration rate is more evident at the long-term follow-up (data available on-line at the website: www.urethracenter.it). Surprisingly, in this series of patients, with follow-up longer than 5 years, the recurrence rate is very low and the

recurrence were located in the proximal part and not in the distal-penile tract, were the thin spongiosum tissue should not assure an adequate vascular support to the graft. Probably, this is due to the fact that the authors have used a dorsal onlay, thus preserving the urethral plate as vascular support to the graft. Five patients developed stricture at the proximal anastomotic site and this is a typical feature of stricture recurrence after any substitution urethroplasty (4). It will be interesting to know if were there risk factors (i.e. smoke) or medical problems that should be taken into account (i.e. Diabetes) in patients with stricture recurrence.

Finally, it will be interesting for the readers to know why the authors suggested the use of exaggerated lithotomy position for strictures located in the penile and bulbar urethra, not involving the posterior tract and why two patients require postoperative blood transfusion for penile or bulbar urethral reconstruction.

The question of placing the buccal mucosal graft dorsally, laterally or ventrally is not a controversial issue. Surgical treatment of urethral stricture diseases is a continually evolving process, and the superiority of one technique over another has yet to be clearly defined. The urologist must be familiar with the use of various surgical techniques to deal with any condition of the urethra during surgery, as no one technique is appropriate for all stricture diseases (5).

Reconstructive urologists are, however, aware that several cautionary details to be considered when evaluating, interpreting, or performing urethral surgery. They include the history of urethral stricture disease (etiology and previous therapies), choice of appropriate procedure, length of the stenosis, homogeneous population, economic issues, age of patient, the surgical techniques and methods of outcome assessment (success/failure). Thus, many of us are disputing formally and systematically how to find an appropriate response to these issues and how to provide long-term follow-up.

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