

Research Article

A comprehensive study on buccal mucosal graft urethroplasty: 10 years single surgical unit experience

Akhilesh Ratnakar*, Sudesh Sharda

Department of Surgery, Gandhi Medical College, Bhopal, Madhya Pradesh, India

Received: 23 May 2014

Accepted: 10 June 2014

***Correspondence:**

Dr. Akhilesh Ratnakar,

E-mail: dr.akhilesh777@gmail.com

© 2014 Ratnakar A et al. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: The use of Buccal Mucosa Graft (BMG) urethroplasty represents the most widespread method of urethral stricture repair. We present our long-term experience with buccal mucosal grafts, placed either ventrally or dorsally with their short and long term complications.

Methods: We repaired 43 bulbar urethral strictures with BMG from 2008 to 2011. Mean patient age was 31 years. The graft was harvested from the cheek under local anaesthesia. The graft was placed on the ventral or dorsal bulbar urethral surface in 18 and 25 cases, respectively. A recurrence even after single attempt of Direct Visual Internal Urethrotomy (DVIU) will be deemed as treatment failure. Data were analyzed using the 't' test and Fischer test.

Results: Mean stricture length was 5.25 cm (range 1.5 to 9 cm) with mean follow up of 58 months (range 10 to 84 months). Only five patients were found to develop stricture at anastomotic site. Three of them voided normally after single attempt of DVIU. Other two patients (4.65 %) required further open surgery or repeat DVIU during follow up and were considered as failure. Five patients develop wound infection and one presented with urethrocutaneous fistula with no long term donor site complication.

Conclusion: With long-term follow-up our series confirms the durability of BMG for the treatment of urethral strictures of more than one centimetre (cm) length with fewer side effects and we conclude that the site of placement of the graft did not affect the outcome.

Keywords: Urethral stricture, Buccal mucosal graft, Complications

INTRODUCTION

Urethral strictures are the common disease, which have affected mankind since the beginning. Urethral strictures are fibrotic narrowing composed of dense collagen and fibroblasts. These narrowing restrict urine flow and cause dilation of proximal urethra and prostatic ducts. In today's world of high velocity trauma, urethral stricture has become a more common¹ and major problem faced by surgeons all over the world. At the same time, the morbidity associated with stricture urethra is tremendous and the patient has to undergo a lot of misery before he can get a cure.

Although gonococcal urethritis is seldom a cause of stricture, long term use of indwelling catheter is the major source of infection. Pelvis fracture can partially or completely sever the membranous urethra and cause severe and complex stricture. Straddle injury can produce bulbar stricture.

The management of urethral stricture in the male is one of the oldest problems known to urology and the earliest records of attempts to deal with stricture urethra have been traced to Indian medicine at about 6th century BC where Sushruta described the use of green bamboo sticks for urethral dilatation.

As stricture presents a very complex problem, at the same time, no single procedure as appropriate for all urethral strictures because, procedure selection is determined by many factors including the location of stricture, its etiology, length, density, multiplicity, proximity to sphincter mechanism and the presence of local adverse factors.

Various modalities of treatment ranging from simple dilatation, end to end anastomosis and various urethroplasties have been advocated over the years but, even today there is not much agreement as to be the best mode of tackling this problem. The goal of treatment of urethral stricture is to provide sufficient permanent patency of the urethra.

This study was aimed to study the success rate of Buccal Mucosal Graft (BMG) in stricture urethra, to compare buccal mucosal graft urethroplasty with various other treatment modalities for long stricture urethra and to study short term and long term complication associated with buccal mucosal graft urethroplasty.

METHODS

A study was conducted between January 2008 and January 2011, includes patients who are medically fit for surgery and patients undergoing operative intervention for mid to long segment stricture urethra. It excludes the patient having short segment (less than 1 cm length) stricture urethra.

In all the patients, the protocol of documentation was followed and a detailed history, physical examination, uroflowmetry and radiological investigation like retrograde urethrogram (RGU) and voiding cystourethrogram (VCU) were done to evaluate the patient.

A total of 43 patients were included in the study. Of the strictures, 18 were traumatic, 14 were idiopathic in origin (includes congenital or patients who were not able to give a proper history), four associated to lichen sclerosis (BXO), four due to catheter induced trauma (iatrogenic) and three infective in origin (Table 1). Mean stricture length, as measured by preoperative RGU was 5.25 cm (range 1.5 to 9 cm). The sites of strictures were panurethral in 10, penobulbar in 24 and bulbomembranous in nine (Table 2). Institute ethical committee's approval was taken to perform the study.

Table 1: Causes of urethral stricture.

| Cause of stricture | No. of patients |
|--------------------|-----------------|
| Traumatic | 18 |
| Idiopathic | 14 |
| Iatrogenic | 4 |
| Infective | 7 |

Table 2: Showing site of stricture urethra.

| Site of stricture | No. of patients |
|----------------------|-----------------|
| Penobulbar (PB) | 24 |
| Bulbomembranous (BM) | 9 |
| Panurethral (PU) | 10 |

With the patient under epidural anaesthesia a perineal midline incision is made. The bulbocavernosus muscle is divided exposing the corpus spongiosum of the anterior urethra.

The stricture segment is identified and opened. Urethrotomy is done and extended proximal and distal to stricture until healthy corpus spongiosum is encountered. Buccal mucosa graft of adequate length is harvested from the inner cheek area below the Stensen's duct under local anaesthesia (adrenaline 1:50000). This reduces the bleeding potential and as well as elevates the graft and provides a plane of dissection. In four patients graft donor site was closed with continuous, 3-0 chromic catgut sutures to achieve good haemostasis and in the rest, donor site was not sutured. The graft is then defatted and tailored to its proper size. The proximal and distal urethral lumina of the urethra are calibrated. The graft is sutured, using few 3-0 polyglactin sutures for reinforcement with good support and minimizing the dead space. A 16 F silicone Foley catheter is inserted through the urethra into the urinary bladder.

Then the urethra is rotated back to its original position and margin of the urethral mucosa is sutured to the remaining margin of the buccal mucosal graft. Suprapubic catheterization is generally not done. Antibiotics are used until the catheter is removed. At three months, after catheter removal, uroflowmetry and RGU is performed. Normal flow rate on uroflowmetry is treated successful outcome and those with abnormal values are subjected to Direct Visual Internal Urethrotomy (DVIU), normal voiding after single attempt of DVIU is treated as success.

A recurrence even after this single attempt of DVIU will be deemed as treatment failure.

Patients were further followed-up with uroflowmetry at three months and RGU every six month interval. A working proforma was developed to collect all relevant patient information.

RESULTS

A total of 43 patients with mean age 31 years (range 15 to 60 years) underwent BMG urethroplasty by dorsal or ventral onlay graft. Mean duration of follow-up is 58 months (range 10 to 84 months).

Five patients (11.6%) developed resticture in which three had proximal and two had distal anastomotic site

stricture. Three of them had normal flow on uroflowmetry after single attempt of DVIU. Other two patients had reduced flow after the first attempt of DVIU, though one of them had normal flow after another DVIU and rest required open surgery. These two patients (4.65%) were considered to be failure. So success rate of BMG as per our protocols were 95.35%.

Five patients developed wound infection, managed successfully with change in antibiotics as per culture sensitivity test. One patient developed urethrocutaneous fistula and was managed conservative. Graft donor site complication includes postoperative pain which was seen in most of the patients on the same day and was managed by good analgesia, facial swelling was reported by two patients, no patients encountered damage to Stensen's duct or lip paresthesia but four patients reported restriction in mouth opening. All complains were resolved in the first month of operation. Peak urinary flow rates improved from a mean of 2.1 ml/sec (range 0 to 7.5 ml/sec) preoperatively to 23.2 ml/sec (range 19.5 to 25.5 ml/sec) after 6 months post operatively ($P < 0.001$).

Table 3: Comparison between dorsal vs. ventral BMG.

| | Dorsal BMG | Ventral BMG | P value* |
|---|--------------|-------------|----------|
| No. of patients | 25 | 18 | |
| Mean age in years | 30.4 ± 10.91 | 32.2 ± 9.75 | 0.58 |
| Increment in peak flow rate (in ml/sec) | 21.3 ± 1.81 | 20.6 ± 0.95 | 0.15 |
| Restricture (in No. of patients) | 1 | 1 | 1 |
| Complications (in No. of patients) | 5 | 3 | 1 |

* $P < 0.05$ is considered as statistically significant.

Table 4: Complication of buccal mucosal graft.

| Complications | No. of Patients |
|--|-----------------|
| Restricture (after one attempt of OLU) | 2 |
| Wound of infection | 5 |
| Urethrocutaneous fistula | 5 |
| Meatal Prolapse | 0 |
| Sacculation | 0 |
| Numbness | 0 |
| Facial Swelling | 2 |
| Restriction in mouth opening | 4 |
| Problem in food ingestion | 0 |

*Symptoms resolve within one month of operation.

DISCUSSION

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 is associated with postoperative torsion² and penile scarring.³ Extragenital skin flap is also associated with higher complication rates.

BMG was first described for urethral reconstruction by Humby in 1941.⁴ It has become an ideal urethral substitute because of ease of harvest,⁵ surgical handling characteristics, hairlessness,⁶ and compatibility in a wet environment, its early in-growth and graft survival.

Because of these unique characteristics, buccal mucosa has endeared itself to the realm of reconstructive urology. BMG also offer an inherent resistance to BXO.⁷⁻⁹

In the present series, the substitution graft urethroplasty using buccal mucosa has a success rate of 95.35 % at a median follow-up of 58 months. Elliott SP et al.¹⁰ in the year 2003 on 60 patients with mean follow up of 47 months reported 97% success rate after 1 attempt of OIU. Kane CJ et al.¹¹ reported a success of 94.3 % after a mean follow up of 25 months. Iselin & Webster (1999)¹² in their series of 29 men who underwent dorsal onlay graft urethroplasty reported a high early success rate of 97% at a median follow-up of 19 months.

They, however, maintained that a long-term follow-up is mandatory as the success of urethroplasty is measured in decades.

There is controversy as to whether BMG should be placed dorsally or ventrally. In the penile urethra, most experts would place it dorsally. In the bulbar urethra, many experts place it ventrally, or mix ventral, dorsal and even lateral placement as the clinical situation warrants.¹³ Multiple studies have shown that both dorsal and ventral-onlay BMG has good blood supply and mechanical support. The success rate for dorsal onlay is reported between 85 and 100%.^{6,12,14,15} Ventral-onlay BMG graft placement have shown comparable success rates of 84 to 100%.^{10,11,14,16} Barbagli et al.¹⁴ in their report on 50 cases they placed a graft on the ventral, dorsal or lateral surface of the urethra and found no significant difference in the success rate. In our study 18 patients have undergone ventral graft substitution and 25 patients have undergone dorsal graft substitution and success rates are no different (Table 3).

In general, complications (Table 4) are rare after BMG urethroplasty. Post-operative complications can occur in two areas, the site of harvest and the site of urethral stricture repair.⁸ Potential buccal mucosal harvest site complications include haemorrhage, pain, facial swelling, and damage to Stensen's duct, lip paresthesia, numbness and restriction in mouth opening. Facial swelling and restrictions in mouth opening are common, but are self-limiting and will resolve within the first few months of surgery^{11,17} as reported in our study. In a one study¹⁸ 57%

of patients developed numbness after surgery, in that, in 16% the complaints tend to persist for a year.

Wood et al reported that closure of the harvest site was associated with worse pain and suggested that this may be improved by not closing.¹⁹ Although Dublin et al. reported that patients did well with closure of the donor site, but 16% and 32% had long-term complaints of numbness and mouth tightness respectively. In our study we reported no difference of pain in two groups. Overall, the inner cheek harvest site for BMG regardless of management appears to heal without complications as reported in our study.^{11,17}

Perineal complications are similarly rare. Restricture, wounds infections, hematomas, skin paresthesia, and other local infections do sometimes occur. In a study by Fichtner J et al.¹⁰ they reported overall complication rate of 25% (8 of 32). In one more study¹¹ overall complication rate was 5.4% with 5.7% restricture rate and in our study we reported 18.6 % overall complication rate which include restricture, wound complication and urethrocuteaneous fistula.

CONCLUSION

Reconstructing the urethra continues to be challenging for the reconstructive surgeon; buccal mucosa has proved to be a useful alternative to skin. It is easy to harvest and to handle, is resilient to infections and accustomed to a wet environment. We conclude that the BMG has been used successfully for treating all types of strictures, with less donor site morbidity and fewer complications. Because of its inherent advantages buccal mucosa has become the recommended source for tissue substitution during urethral reconstruction.

A CKNOWLEDGEMENTS

Sincere gratitude is hereby extended to the following who never ceased in helping until this paper is structured.

The clinical instructor Dr. M. C. Songra, the thesis advisor for unwavering guidance.

Respected professors Dr. M.C Songra, Dr. Arvind Rai, Dr. A. K. Chaurasia, Dr. I. D. Chaurasia, Dr. Yogesh Tiwari, Dr. Devendra Chaudhri of general surgery department of Hamidia hospital.

For the unwaveral moral, emotional & financial support for the proponents, family and friends.

Above all, utmost appreciation to the almighty god for the divine intervention in this academic.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the institutional ethics committee

REFERENCES

- Andrich DE, Mundy AR. Substitution urethroplasty with buccal mucosal-free grafts. J Urol. 2001;165:1131-3.
- Barbagli G, Palminteri E, Guazzoni G, Montorsi F, Turini D, Lazzeri M. Bulbar urethroplasty using buccal mucosa grafts placed on the ventral, dorsal or lateral surface of the urethra: are results affected by the surgical technique? J Urol. 2005;174:955-7.
- Barbagli G, Palminteri F, Rizzo M. Dorsal onlay graft urethroplasty using penile skin or buccal mucosa in adult bulbourethral strictures. J Urol. 1998;160:1307-9.
- Blandy JP. Urethral stricture. Postgraduate Med J. 1980;56:383-418.
- Dubey D, Kumar A, Bansal P, Srivastava A, Kapoor R, Mandhani A, et al. Substitution urethroplasty for anterior urethral strictures: a critical appraisal of various techniques. BJU Int. 2003;91:215-8.
- Greenwell TJ, Venn SN, Mundy AR. Changing practice in anterior urethroplasty. BJU Int. 1999;83:631-5.
- Dublin N, Stewart L. An audit of oral complications after buccal/lip mucosal harvest for urethroplasty. BJU Int. 2003;91:22.
- Dublin N, Stewart LH. Oral complications after buccal mucosal graft harvest for urethroplasty. BJU Int. 2004;94:867-9.
- Elliott SP, Metro MJ, McAninch JW. Long-term follow-up of the ventrally placed buccal mucosa onlay graft in bulbar urethral reconstruction. J Urol. 2003;169(5):1754-7.
- Fichtner J, Filipas D, Fisch M, Hohenfellner R, Thüroff JW. Long-term outcome of ventral buccal mucosa onlay graft urethroplasty for urethral stricture repair. Urol. 2004;64:648-50.
- Humby G. A one-stage operation for hyposadiu repair. Br J Surg. 1941;29:84-92. Iselin CE, Webster GD. Dorsal onlay graft urethroplasty for repair of bulbar urethral stricture. J Urol. 1999;161:815-8.
- Kane CJ, Tarman GJ, Summerton DJ, Buchmann CE, Ward JF, O'Reilly KJ, et al. Multi-institutional experience with buccal mucosa onlay urethroplasty for bulbar urethral reconstruction. J Urol. 2002;167(3):1314-7.
- Kellner DS, Fracchia JA, Armenakas NA. Ventral onlay buccal mucosal grafts for anterior urethral strictures: long-term follow-up. J Urol. 2004;171:726-9.
- Kulkarni S, Barbagli G, Kirpekar D, Mirri F, Lazzeri M. Lichen sclerosus of the male genitalia and urethra: surgical options and results in a multicenter international experience with 215 patients. Eur Urol. 2009;55:945-54.
- Morey AF, McAninch JW. Technique of harvesting buccal mucosa for urethral reconstruction. J Urol. 1996;155:1696-7.

16. Morey AF, McAninch JW. When and how to use buccal mucosal grafts in adult bulbar urethroplasty. *Urol.* 1996;48:194-8.
17. Tolstunov L, Pogrel MA, McAninch JW. Intraoral morbidity following free buccal mucosal graft harvesting for urethroplasty. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 1997;84:480-2.
18. Venn SN, Mundy AR. Urethroplasty for balanitis xerotica obliterans. *Br J Urol.* 1998;81:735-7.
19. Wood DN, Allen SE, Andrich DE, Greenwell TJ, Mundy AR. The morbidity of buccal mucosal graft harvest for urethroplasty and the effect of nonclosure of the graft harvest site on postoperative pain. *J Urol.* 2004;172:580-3.

DOI: 10.5455/2320-6012.ijrms20140856

Cite this article as: Ratnakar A, Sharda S. A comprehensive study on buccal mucosal graft urethroplasty: 10 years single surgical unit experience. *Int J Res Med Sci* 2014;2:1011-5.