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Original Research Article

Buccal mucosal graft urethroplasty in the treatment of urethral strictures: a prospective study

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ABSTRACT

Background: Anterior urethral strictures develop due to a process of fibrosis and cicatrix formation of the urethral mucosa and the surrounding tissues. Its surgical management is a challenging problem, and has changed dramatically in the past several decades. Open surgical repair using grafts has become the gold standard procedure for anterior urethral strictures that are not amenable to excision and primary anastomosis. Oral mucosa harvested from the inner cheek (buccal mucosa) is an ideal material, and is most commonly used for substitution urethroplasty. Objective of current study was to establish the efficacy of the buccal mucosal graft urethroplasty by different onlay techniques in anterior urethral strictures.
Methods: The study was a prospective study, done between August 2009 and December 2011. 25 cases of long anterior urethral strictures were managed by onlay urethroplasty by different techniques. Follow up ranged from 8-20 months.
Results: 3 patients lost follow up after first visit. Post operative uroflowmetry was done in all patients after 1 month at the time of first follow up visit. Of 25 cases 21 (84%) were successful and 4 (16%) failed.
Conclusions: In our study we have found that buccal mucosal graft can be safely used for substitution urethroplasty in all long anterior urethral strictures including cases with balanitis xerotic obliterance. It was very efficient in terms of less graft shrinkage or contracture as it is a full thickness graft.

Keywords: Urethral stricture, Onlay technique, Buccal mucosa

INTRODUCTION

Urethra in males acts as a conduit for passage of urine and semen. It constitutes of anatomically and functionally different parts. Anterior urethral stricture develops due to a process of fibrosis (spongiofibrosis) and cicatrix formation of the urethral mucosa and the surrounding tissues. Any process that causes urethral inflammation can cause varying degree of urethral stricture. In adult male patients, the anterior urethral stricture can be inflammatory, traumatic, ischemic, iatrogenic or idiopathic in origin. However, at present time the main causes of stricture urethra are iatrogenic and traumatic.[1]

The treatment of urethral stricture depends on the location, length, depth and density of the spongiofibrosis. Urethral dilatation or optical internal urethrotomy may be helpful only for short annular strictures, particularly strictures limited to mucosal fibrosis. These procedures are associated with high recurrence rate. Urethral reconstruction by excision of strictured segment and end to end anastomosis gives better results in patients with

stricture length 2 cms or less. In stricture length more than 2 cms, end to end anastomosis is not feasible as there is risk of cordee formation due to shortening of urethral length. So, anterior urethral strictures which are not amenable to OIU or dilatation or end to end anastomosis, require substitution urethroplasty. This may be achieved using various free graft tissues like penile skin graft, bladder mucosal graft, post auricular skin graft, buccal mucosa graft etc.[2]

Buccal mucosa graft (BMG) was first described for urethral reconstruction by Humby in 1941. The buccal mucosal graft is fast emerging as the most versatile urethral substitute, as it has ideal graft characteristics and can be harvested easily, available in plenty and with no significant donor site morbidity. It is also the preferred substitute in strictures related to BXO, as use of penile skin graft or flap is contraindicated in such cases. In complicated strictures, buccal mucosal graft can be combined successfully with other urethral reconstructive techniques. Buccal mucosa has recently gained its popularity as a substitute for urethral reconstruction for both strictures and complex hypospadias[3].Buccal mucosa graft can be placed laterally for bulbar urethral reconstruction; however, placing the graft dorsally or the ventrally is the most widely practiced technique.[4] In current study, we tried to study the buccal mucosal graft with respect to its indications, efficacy, versatility ,safety, donor site morbidity, complications and limitations, short term and medium term results.

METHODS

The study was a prospective study, carried out between August 2009 and December 2011, at Dr. D. Y. Patil Medical College, Hospital and Research centre, Pimpri, Pune. This study was approved by the ethical committee and consent was taken from all the patients in a detailed consent form. A total of 25 cases were included and since it is a prospective study comparing different surgical onlay techniques of BMG urethroplasty, controls were not required and hence not included in the study.

Inclusion criteria

Selection criteria for cases were; adult male patients with long anterior urethral strictures which were not amenable to or suitable for dilatation, OIU or end to end anastomosis, adult male patients with recurrent anterior urethral strictures.

Exclusion criteria

Patients with following conditions were excluded from the study group; anterior urethral stricture which extended to membranous urethra and posterior urethral strictures, patients who had unhealthy or diseased buccal mucosa such as submucosal fibrosis, ulcers etc.

A detailed history was taken including patient's age, complaints and duration, possible aetiology and previous treatments taken if any. A thorough physical, systemic and local examination including per rectal examination was done to reach a provisional diagnosis. Preoperative workup was done including the following investigations, complete haemogram, blood grouping and Rh typing, BT, CT, blood urea, serum creatinine, HIV, HBSAg, urine routine and microscopy. ECG and chest X-ray if indicated were done.

Special investigations were also done in all the patients like; ultrasonography of abdomen and pelvis to know the prevoid and postvoid urinary residue, uroflometry to determine the urinary stream and also to know the level of obstruction, RGU and MCU to know the stricture characteristics like location, length and number and urethroscopy intra operatively to visualize the stricture and to pass a small feeding tube across the stricture.

Pre anaesthetic evaluation of the patient was done by the anesthesiologist. The 4 patients who had come with retention of urine, an emergency trocar SPC was done in all of them. If patients's oral hygiene was poor, then he was advised to start povidone iodine mouth gurgles 7 to 10 days before surgery. Patients were prepared in the usual manner the previous night. One hour before surgery an antibiotic dose, a 3rd generation cephalosporin was given. The procedure was performed under spinal plus epidural regional anaesthesia.

Procedure

The buccal substitution urethroplasty was performed with a two team approach as one team harvested the buccal mucosal graft, the other team performed the perineal dissection. Buccal graft harvest was begun with painting and draping the face and cheek in the usual sterile fashion. Two 3-O silk sutures were placed through the lip to provide traction. The graft was outlined 2.5 cm wide and as long as is required. Local anaesthetic infiltration of lidocaine with adrenaline was injected underneath the graft for good pre-emptive analgesia and intraoperative hemostasis. The graft was then incised and dissected off of the buccinator muscle, while avoiding Stensen's duct. The defect was closed with an absorbable suture. The graft was spread and defatted. It was kept in saline until the time of implantation.

Urethroscopy was done intraoperatively to visualize the stricture and the lumen of the stricture was intubated with either an 8 French feeding tube or with a 0.035 inch guide wire. The urethroplasty was performed in the high lithotomy position. Great care was taken to ensure the patient is properly padded and secured. Subsequently, the patient's perineum was prepped and draped in normal sterile fashion. A 14 Fr nelaton catheter was used to delineate the urethral contour, and to determine the exact location of the distal portion of the stricture. After urethral exposure, a number 15 blade scalpel was used to

incise the urethra over a 8 French feeding tube or a 0.035 inch guide wire and the urethral stricture was opened completely. The stricture was incised until normal urethra was identified. Both proximal and distal urethral stumps were bougied to ensure they are wide open to 30 French. The buccal mucosa was then sewn dorsally, laterally or ventrally onto the defect using a running 4-O polydioxanone suture, locking every third stitch for a water tight seal. A 16 French silicone catheter was placed through the urethra and secured to the glans with a suture. The tunica of the spongiosum was closed over the graft for a well vascularized bed. The bulbospongiosus muscle was closed with a running 3-O polyglactin suture. A corrugated rubber drain was placed before closing the dartos fascia with a running 2-O polyglactin and the skin was closed with multiple vertical mattress stitches using 2-O nylon. Postoperatively chlorhexidine mouthwash was used four times daily after meals. Diet was reinstituted on the same evening with clear liquids, followed by full liquid, the next day and then resuming regular diet. The patients were on antibiotics, usually third generation cephalosporin until the Foley catheter was removed after two weeks.

Follow up

During 1st follow up of the patient after one month, uroflowmetry was repeated to document the improvement in the urine stream and relief of obstruction. RGU was repeated at 3 months. Thereafter, follow up was done every 3 months for a year. The clinical outcome was considered a failure, if a patient required any additional procedures including simple urethral dilation, within one year of the procedure. The data was analyzed statistically by applying Chi-square test with Yate's correction.

RESULTS

A total of 25 male patients with age ranging from 19- 65 yrs with anterior urethral (penile or bulbar) stricture longer than 2.5 cm underwent BMG urethroplasty between August 2009 and December 2011. The distribution of cases in different age groups is shown in (Table 1). The etiologies of the strictures were trauma in 4(16%), infection in 2(8%), iatrogenic in 3(12%), BXO 5(20%) and idiopathic in 11(44%) patients (Table 2).

Table 1: Distribution of cases in different age groups.

Age group (years)	N	%
21-30	5	20
31-40	5	20
41-50	3	12
51-60	8	32
61-70	4	16

The most common complaints were poor stream in 22 patients, frequency in 20 patients, straining in 18 patients and burning micturition in 4 patients. Four patients had come with retention and underwent emergency trocar SPC. The duration of symptoms ranged from 2-12 months (Table 3).

Table 2: Distribution of etiology.

Etiology	N	%
Infection	2	8
Iatrogenic	3	12
Trauma	4	16
BXO	5	20
Idiopathic	11	44

Table 3: Symptomatology.

Complaints	N	%
Poor stream	22	88
Frequency	20	80
Straining	18	72
Burning micturation	4	16
Retension	4	16

Uroflowmetry was performed in 21 patients excluding 4 patients who were on SPC. The maximum flow rate of urine (Q Max) ranged from 6-15 ml/sec, demonstrating poor flow and obstruction. Prevoid and postvoid urine residue was determined in all patients except 4 patients who were on SPC. Postvoid residue ranged from 15-200 ml. RGU and MCU was performed in all 25 patients. The site of stricture was penile in 5 pts, bulbar in 13 pts, penobulbar in 6 pts and pan anterior urethral in 1 pt. The stricture length ranged from 2.5- 10.5 cms, a mean length of 4 cms. The mean stricture length in ventral, dorsal and lateral onlay was 3.9, 4.4 and 4.3 cms respectively (Table 4).

Table 4: Distribution of site stricture.

Site of stricture	N	%
Penile	5	20
Bulbar	13	52
Penobulbar	6	24
Pan anterior urethral	1	4

All of the operations were done by the same surgical team. Out of 5 (20%) pts with penile urethral strictures, 4 underwent dorsal onlay and 1 underwent lateral onlay. In 13 (52%) bulbar urethral strictures, 3 underwent dorsal onlay, 4 underwent ventral onlay and 6 underwent lateral onlay. Among 6 (24%) pts with penobulbar strictures, 4 pts underwent dorsal onlay and 2 pts underwent lateral onlay. One (4%) patient with pan anterior urethral stricture underwent dorsal onlay. In 5 (20%) patients buccal mucosa was harvested from inside of both the cheeks as the stricture length was more than 6 cms. In the immediate postoperative period, 8(32%) patients had minor complications. These included discharge of pus and urine leak in 3 pts and 1 pt respectively, from the

perineal wound (16%). The pus was sent for culture and sensitivity and appropriate antibiotics were started and wound healed well in all 3 pts. In patient with urine leak, the per urethral catheter was left insitu for a month, after which urine leak subsided. In all other patients, catheter was removed after 2 weeks (Table 5). 3 patients experienced pain and one patient had swelling at the donor site (16%). In all these patients the pain subsided after a day and the swelling resolved after a week without any intervention (Table 6).

Table 5: Immediate complications of different onlay procedures.

Technique	N	Patients with immediate complications
Dorsal	12	1 (discharge)
Lateral	9	2 (urine leak, discharge 1in each patient)
Ventral	4	1 (discharge)

Table 6: Donor site morbidity.

Donor site morbidity	N	%
Immediate	4 (3pain,1swelling)	16
Delayed	6 (2 cyst)	8

DISCUSSION

Treatment of urethral stricture disease includes numerous reconstructive surgical techniques. The choice of reconstructive technique depends on the stricturelength, degree of spongio fibrosis, and surgeon's preference and experience. There are a variety of options in managing urethral strictures, and are mainly categorized into two groups: one is transurethral procedures including dilation and urethrotomy, and the other is open surgical management (urethroplasty). The success rate of urethroplasty is excellent, but it is technically more demanding than transurethral procedures.[4,5]

Penile skin flaps had been popular for urethroplasty until several decades ago, but have gradually been replaced by oral mucosa grafts because of their simplicity and little potential for morbidity. Harvesting a penile skin flap is fastidious, and has to be prepared carefully, which takes time.[6] Over the years, the use of free graft materials like pre auricular skin, bladder mucosa, small intestinal mucosa and penile skin has seen a decreasing trend partly because of the complications associated with them, both at donor site and at the recipient site and partly because of the technical difficulty in harvesting such grafts. There is no doubt, both subjectively and objectively, that oral mucosa is proving very satisfactory as a material for urethral reconstruction. This may be due to growth factors within the mucosa that promote rapid healing, revascularization occurs quickly because of the thin lamina propria and high vascularity.[7,8] Oral mucosa is easy to harvest, tough, resilient and easy to handle. It takes readily and inosculates early, because its thick epithelium has a thin lamina propria and dense panlaminar vascular plexus. Oral mucosa is an appropriate urethral substitute for strictures associated with LS.[9] Burger et al have described that full thickness grafts are usually used because they are less likely to contract or shrink than split thickness grafts. The use of oral mucosa was first mentioned in the year 1941 and was reintroduced in the year 1992.[10] In our study, we have found that it is relatively easy to harvest buccal mucosa and it is available in plenty. In our study, 5 patients had stricture length more than 6 cms, necessitating us to take buccal mucosa from both the cheeks without any significant morbidity at the donor site.

In our study, we found that buccal mucosa was safe to use in long anterior urethral strictures. It was very efficient in terms of less graft shrinkage or contracture as it is a full thickness graft. It is very versatile tissue because of thick epithelium of thin dermis with a dense subdermal vascular plexus, which facilitated the early imbibition of nutrients from the wound bed as well as early inosculation that allowed early in growth of blood vessels.[11] There was least donor site morbidity with few minor complications which subsided without any interventions. Dublin et al found that in the postoperative period the major symptoms were pain, numbness and tightness of the mouth. In their patients, the donor site was sutured which probably led to more pain.[12] Only few limitations to its use were diseased buccal cavity as in cases of submucosal fibrosis and ulcers and in cases where adequate urethral plate was absent.

A graft such as oral mucosa carries no blood supply of its own. Its survival depends on the absorption of nutrients from a well vascularized recipient bed (imbibition phase) and later, on the in-growth of capillaries from the recipient bed to the graft (inosculation phase). Early failure of a free graft can result from inadequacy of either phase and frequently reflects a poorly-vascularized recipient bed, infection, or hematoma. Late recurrence may owe to progression of the original disease. In a recent study, Castagnetti et al reported that at long term assessment 28% of patients had perioral sensory deficit.[13] This deficit was seldom perceived by the patients and was only reported if the oral surgeon examined them. From this study we can infer that long term morbidity after graft harvest is minimal. On the basis of medium term results our study found that, buccal mucosa is an ideal graft for substitution urethroplasty. Both dorsal and lateral onlay are comparable in terms of the success rate of the procedure. The ventral onlay procedure cannot be commented upon in terms of success rates because of the relatively small sample size.

CONCLUSION

In current study we have found that buccal mucosal graft can be safely used for substitution urethroplasty in all long anterior urethral strictures including cases with

BXO. It was very efficient in terms of less graft shrinkage or contracture as it is a full thickness graft. Our study substantiates the fact that, it is a very versatile tissue because of thick epithelium of thin dermis with a dense subdermal vascular plexus, which facilitates the early imbibition of nutrients from the would bed as well as early inosculation that allows early in growth of blood vessels, which is essential for good graft uptake. Also we found that there was least donor site morbidity with few minor complications which subsided without any interventions. Only few limitations we found to its use were diseased buccal cavity as in cases of submucosal fibrosis and ulcers and in cases were adequate urethral plate was absent. Short term and medium term results were encouraging in our study. 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.

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