SINGLE STAGE VENTRAL ONLAY BUCCAL MUCOSAL GRAFT URETHROPLASTY BASED ON TUNICA VAGINALIS FLAP FOR BALANITIS XEROTICA OBLITERANS RELATED URETHRAL MEATAL AND NAVICULAR FOSSA STRICTURES

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ABSTRACT

BACKGROUND

Balanitis Xerotica Obliterans (BXO), also known as lichen sclerosus of penis is a chronic, progressive disease of the glans and prepuce that leads to phimosis and stricture of the urethra that can extend from the meatus and glanular urethra to the prostatic urethra. Urinary and sexual functions are affected and there is a severe reduction in quality of life. Many patients have been initially treated with tacrolimus or circumcision, when the disease has involved the prepuce and glans superficially, but conservative management has a limited role in this condition. Once stricture develops, surgical intervention in the form of grafts or flaps becomes necessary. We present our results with single-stage Ventral Onlay Buccal Mucosal Graft Urethroplasty (VOBMGU) based on tunica vaginalis flap for BXO related strictures of meatus and fossa navicularis.

MATERIALS AND METHODS

From July 2014, six patients who underwent single stage Ventral Onlay Buccal Mucosal Graft Urethroplasty Graft (VOBMGU) based on tunica vaginalis flap for BXO related strictures of urethral meatus and navicular fossa were included in the study. Patients presenting with BXO were clinically assessed for the extent of involvement as having BXO affecting the foreskin, glans, meatus, penile shaft, urethra and scrotum. They were radiologically assessed with a retrograde urethrogram and ultrasound abdomen. Outcome was assessed in terms of uroflowmetry, cosmetic appearance, stricture recurrence and complications.

RESULTS

Patients were reviewed every three months for over one year and six monthly. Only one patient had mild stenosis of the urethral meatus, as evidenced by change in flow, which was treated successfully with dilatation. One patient reported moderate splaying of urine, but this was mild in all other cases. All patients had a normal slit-like meatus, satisfactory voiding and sexual functions.

CONCLUSION

Isolated involvement of fossa navicularis and meatal stenosis stricture due to BXO can be treated with Ventral Onlay Buccal Mucosal Graft Urethroplasty (VOBMGU) based on tunica vaginalis flap especially in cases where the glans appeared unhealthy and compromised vascularity. It provides good short-term results with various advantages of tunica vaginalis like easy harvestability, close proximity to the penis, high vascularity and good support to BMG graft.

KEYWORDS

Balanitis Xerotica Obliterans, Buccal Mucosa Graft, Ventral Onlay, Tunica Vaginalis.

HOW TO CITE THIS ARTICLE: Kumar GS, Haris CH, Singh S, et al. Single stage ventral onlay buccal mucosal graft urethroplasty based on tunica vaginalis flap for balanitis xerotica obliterans related urethral meatal and navicular fossa strictures. J. Evid. Based Med. Healthc. 2017; 4(53), 3223-3227. DOI: 10.18410/jebmh/2017/640

BACKGROUND

BXO involvement of the urethra poses a surgical challenge. The most important goals in treatment are excision of diseased tissue, restoring adequate urinary flow and sexual function, good cosmesis and long-term disease free status. In the literature, various surgical procedures have been described for urethral reconstruction in BXO with varying degrees of success.[1,2,3] Circumferential fasciocutaneous flaps of the prepuce and penile skin have been used as ventral or dorsal augmentation urethroplasty. This use of genital skin leads to high recurrence rate.[4]

In the past, anterior urethral strictures were mostly repaired using a staged approach, but today are now more commonly managed with single stage reconstruction. Controversies exist in the literature about advantages and disadvantages of one stage versus two-stage repairs.[5] Morbidity and graft loss are the main drawbacks of two stage

Financial or Other, Competing Interest: None.
Submission 26-05-2017, Peer Review 30-05-2017,
Acceptance 15-06-2017, Published 03-07-2017.
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DOI: 10.18410/jebmh/2017/640

procedures, paving way for one stage procedures. Today, excision of the diseased urethra and substitution urethroplasty with nongenital mucosal grafts as single stage is the modality of choice.[6] Many published studies have recently confirmed good results with one-stage mucosal graft substitution urethroplasty.[7,8,9]

In any reconstructive surgery, vascularity of the repaired site is a major concern.[10] In order to obtain better outcomes in substitution urethroplasty, vascularised flaps like dartos fascia and tunica vaginalis flap were introduced. These vascularised flaps are placed on the neourethra as the second layer to supply vascularity to the original graft.

Aims and Objectives

The aim of our study is to assess the outcome of balanitis xerotica obliterans related fossa navicularis and urethral meatal stricture cases treated by single stage buccal mucosa substitution urethroplasty based on tunica vaginalis flap.

MATERIALS AND METHODS

Inclusion Criteria

1. Clinically-proven cases of balanitis xerotica obliterans.
2. Cases with isolated involvement of urethral meatus and fossa navicularis.
3. Patients with BXO and history of meatoplasty or meatotomy were also included.

Exclusion Criteria

Patients with BXO strictures extending proximally beyond the glanular urethra.

Surgical Technique

Under general anaesthesia, the patient was positioned supine on the operating table. Preoperative cystoscopy with ureteroscope was done to rule out involvement of urethra beyond fossa navicularis. If the meatus was too tight to allow the ureteroscope, it was ventrally split. Glans wings were raised after extending the incision proximally to normal healthy mucosa. All diseased tissue was excised taking care to leave a 2-3 mm strip of healthy mucosa on the dorsal aspect. A rectangular BMG with an approximate length of 4.0 cm x 2.0-2.5 cm was harvested and defatted. An 18-Fr silicon catheter was passed up the urethra. One lateral edge of the graft was then anastomosed to the margin of the native dorsal strip of mucosa of the fossa navicularis. The graft was then rolled over the silicon catheter with its mucosa facing inward and the other longitudinal edge of the BMG was sutured to the free lateral margin of the native dorsal mucosal strip (Figure 2, 3). The proximal edges were sutured together.

Once the proximal anastomosis of the BMG was completed, the testis was delivered via a short scrotal incision. Tunica vaginalis was incised near the lower pole of the testis. A vascularised tunica vaginalis flap was raised off the testis and the cord structures up to the external ring, taking care not to damage the vas and vessels. The flap was transferred to the site of surgery through a wide subcutaneous tunnel (Figure 4, 5). The flap was placed over the buccal mucosal graft with intermittent sutures, thus ensuring good vascularity and support to BMG graft and preventing any haematoma formation underneath. Distal edge of the tunica vaginalis flap was then sutured to the edge of the glans wings at the level of the urethral meatus. Anchoring sutures were taken between the glans wings and the tunica vaginalis flap in a proximodistal direction beneath the glans wings. Glans apposition was started proximally. The glans wings were closed with horizontal mattress sutures. Fine reconstruction of neomeatus was done by excising the redundant buccal mucosa and suturing the edge to the initial ventral slit made on the meatus allowing adequate room for the 18-Fr. silicon catheter. Sterile dressing was done and catheter was fixed to the abdomen to immobilise the graft.

The Foley catheter was removed after 3 weeks for trial voiding and uroflowmetry was performed. Postoperatively, patient was reviewed 7 days after catheter removal and during follow up at 1, 3 and 6 months, one year and sixth monthly thereafter. During each visit, patients underwent subjective assessment of voiding symptoms with AUA symptom score, objective calibration of urethral meatus with an 18-Fr. catheter as well as uroflowmetric studies and post-void residual assessment. A successful outcome was defined as the subjective and objective improvement in urinary flow and sexual satisfaction.

RESULTS

A total of 6 patients of BXO were operated in this study period. Median age was 47.2 years. In a median follow-up of 24 months (range 20-26 months), success was achieved in 5 (83%) patients. One patient with BXO developed mild meatal narrowing as evidenced by change in uroflow and was managed with dilatation followed by intermittent urethral self-calibration. A cosmetic and functional distal urethra could be obtained in all the remaining cases. The mean substituted urethral stricture length measured was 3.0 cm (range 2.5-3.5 cm). At the last follow-up, the mean Qmax (mL/s) increased from an average 5.0 preoperatively to 22 mL/s postoperatively. The mean AUA score decreased from 26.8 ± 3.4 preoperatively to 6 ± 4 postoperatively. Three patients had no splaying of the urinary stream, two had mild and one had moderate splaying. Splaying subsided in all cases within 6 months. Four patients were very pleased, one was pleased and one was unhappy with the final cosmetic appearance.

Characteristic	Median	Range
Age (yrs.)	47.2	25-60
Stricture length (cm)	3.0	2.5-3.5
Breadth of dorsal urethral strip preserved (cm)	2.5	1.5-3.5
BMG length (cm)	3.5	2.5-4.5
Preoperative Qmax (mL/sec.)	5.0	4-6
Postoperative Qmax (mL/sec.)	18	16-20
Preoperative AUA score	27	22-32
Postoperative AUA score	8	6-10
Follow up (months)	20	18-22

Qmax-Peak Urinary Flow Rate; AUA-American Urological Association; BMG-Buccal Mucosal Graft.

Figure 1. BXO with Meatal and Fossa Navicularis Stricture

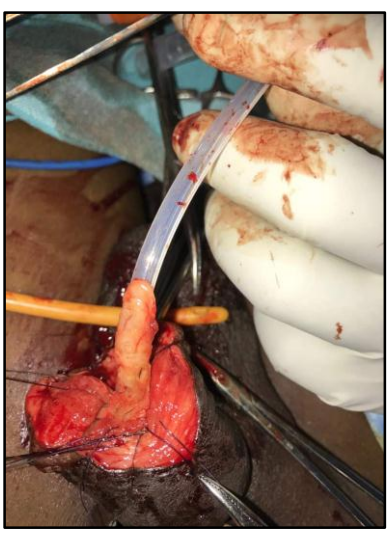

Figure 2

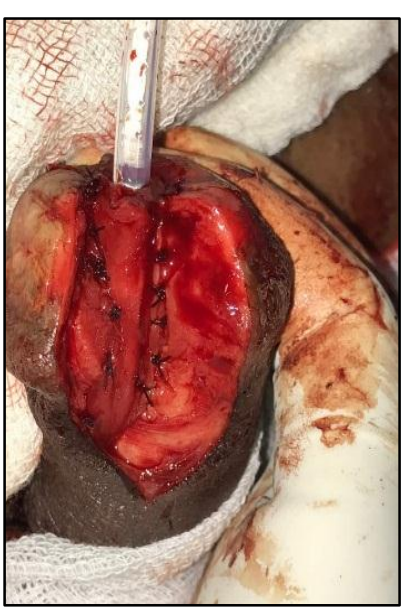

Figure 3

Figure 4

Figure 5

DISCUSSION

Balanitis Xerotica Obliterans (BXO) related strictures are complex and challenging because successful reconstruction requires the creation of a functional urethra (for voiding and sexual function) as well as maintaining cosmesis of glans penis. BXO involvement of the urethra can range from isolated strictures in glanular urethra to panurethral disease. The most severe inflammatory reaction is seen at the meatus and navicular fossa.[11] Ventral meatotomy, circumferential fasciocutaneous flaps of the prepuce and the penile skin, (including onlay urethroplasty using transverse island ventral penile skin flap), one stage and two stage repair using BMG are reconstructive options for the management of distal strictures.[12-20] Success with BMG as a urethral substitute will depend upon the vascularity of the bed. Glans penis has good blood supply and provides good vascularity to the buccal mucosal graft.[16,19]

Patient has to be advised regarding the various options available and the possible complications.[20,21] A multi-staged approach with a long waiting period and risk of graft shrinkage would not appeal to most adult men. A ventral meatotomy, which may result in a hypospadiac meatus[22] and

Blandy's urethroplasty[23]have proved to be unacceptable to many patients.

Single stage ventral onlay BMG using the glanular bed following excision of diseased mucosa is well described in BXO-related strictures.[20,21] In severely strictured urethra, the diseased, fibrotic mucosa should be completely excised. In such cases, BMG can be tubularised over a tube or catheter to make one-stage reconstruction possible with acceptable outcomes. Here, vascularity is provided by the raw surface of the vascular glans wings following excision of the diseased mucosa. Traditionally, the use of BMG as a circumferential graft has been criticised for its high overall failure rates compared with onlay or two-stage techniques.[24,25,26] In recent times, however, reports have revealed an improved success rates with circular BMG for urethral substitution. Onol et al in their series of circular BMG for distal urethral strictures have reported impressive results in the short-term followup.[27]

In our study, we considered using TV flap as second layer to provide vascularity in few cases because of unhealthy appearance of the glans. The diseased mucosa was excised leaving behind a 2-3 mm wide longitudinal strip of the native mucosa dorsally. The BMG was fixed along its lateral margins and also proximally and distally around an 18-Fr. silicon catheter. The TV flap was virtually wound around the BMG. The presence of the TV flap provides adequate vascularity and also prevents overlapping of the suture lines of BMG with the suture lines of glans wings, thereby reducing the chances of postoperative fistula formation and providing an efficient circumferential graft take. We used 5-0 Vicryl sutures used for anastomosis, so that there are no visible scars at 1 year follow-up. Thus, a highly acceptable cosmetic outcome may be achieved without compromising on the graft uptake.[28] We do not advocate VOBMGU reconstruction in longer strictures extending beyond corona, because of lack of ventral support proximally leading to various complications.

CONCLUSION

Isolated involvement of fossa navicularis and meatal stenosis is uncommon and the number of cases surgically corrected with circumferential buccal mucosal graft urethroplasty is few in literature. Even in this surgery, postoperative recurrence of the original condition has been reported (within two years of surgery) though the overall failure rate is small compared with the circumferential fasciocutaneous flaps and other modalities employed to increase the vascularity of the graft.

In our present study, we have employed a well-described flap, the tunica vaginalis flap as the second layer above the BMG in severe cases of BXO, where the glans appeared unhealthy and there was history of previous interventions. In our short follow up, all operated patients have been doing well with good uroflow. We do not claim that our modification is in anyway superior to the original ventral onlay graft with glans surface as the vascular bed described in literature, but can be a good alternative in selected cases.

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