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Ventral Buccal Mucosa Graft Urethroplasty for Penile Urethral Strictures: A Predictable Failure?

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Rezumat

Uretroplastia cu grefă de mucoasă bucală fixată ventral în cazul stricturilor de uretră peniană: eșec previzibil?

Introducere: În cazul uretroplastiilor cu grefă de mucoasă bucală (BMG) pentru stricturi ale uretrei peniene (PUS) se presupune că fixarea ventrală a grefei (VO) nu ar asigura un suport mecanic şi nutriţional suficient. Deoarece VO necesită doar o incizie ventrală a segmentului uretral stenozat şi nu afectează vascularizaţia uretrală, am realizat un studiu prospectiv în care am urmărit rezultatele acestei tehnici.
Metodă: Am selectat 27 pacienţi consecutivi cu PUS, nedatorată lichenului scleros sau multiplelor operaţii pentru hipospadias. Tehnica chirurgicală a constat în: incizia circulară a pielii penisului chiar sub gland, degloving, incizie mediană ventrală a segmentului uretral stenozat, croirea grefei de mucoasă bucală pe sondă 22 Ch şi fixarea de marginile mucoasei uretrale, acoperind grefa cu 2 lambouri laterale din dartos.
Rezultate: Urmarirea a constat în examinare clinică, uroflowmetrie şi ecografie peniană. Un pacient a dezvoltat postoperator o fistulă uretrală, la 2 pacienţi formându-se o diafragmă fibroasă la capătul proximal al neouretrei. În restul pacienţilor neolumenul uretral a fost stabil, între 6 şi 7 mm la ecografia de control, rata de succes fiind de 88.89%.
Concluzii: Tehnica chirurgicală descrisă de VO în BMG reprezintă o soluţie bună de tratament al pacienţilor cu PUS.

Cuvinte cheie: fixare ventrală, grefa de mucoasă bucală, strictura uretrală, uretroplastie

Abstract

Background: In the case of buccal mucosa graft (BMG) urethroplasty for penile urethral strictures (PUS), it is supposed that the ventral onlay (VO) would not assure sufficient nutritional and mechanical support. Because VO requires only one ventral incision of the stenotic urethral segment and does not affect the urethral vasculature, we have design a prospective study related to this issue.
Methods: We selected 27 consecutive patients with PUS, other than due to lichen sclerosus or to multiple hypospadias surgery. Surgical technique used: circular incision of the penile skin just below the glans, degloving without dartos, ventral median incision of the stenosed urethral segment, tailoring of the buccal mucosa graft over a 22 Ch catheter and fixation at the urethral mucosa edges, covering the graft with two lateral dartos flaps.
Results: Follow-up consisted of clinical examination, uroflowmetry, and urethral ultrasonography. In one patient urethral fistula occurred and in two patients a fibrous diaphragm at the proximal end of the neourethra appeared. For the rest of the patients the neourethra lumen was stable, between 6 and 7mm at urethral ultrasonography control, the success rate being 88.89%.
Conclusion: The VO of BMG by the technique described, is a good solution for selected patients with PUS

Key words: buccal mucosa graft, urethra stricture, urethroplasty, ventral onlay

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Introduction

There are a variety of surgical techniques used for treating the penile urethral strictures, focused on reducing the morbidity rate and reaching the best result, with the lowest number of complications. However, the superiority of a certain technique over the others hasn't been clearly demonstrated yet (1-3).

One of the procedures that have been less commented in the literature refers to the ventral fixation of the buccal mucosa graft at the level of the penile urethra. In order to evaluate this procedure, we have performed a prospective study between January 2009 and November 2011. The results have then been compared with the ones in the specialty literature.

Matherial and Method

The study included consecutive patients with penile urethral strictures, excluding the ones with the stricture having a lichen sclerosus et atrophicus etiology or multiple surgeries for hypospadias. In these cases, the glans and meatus are cicatriceal, the penile skin is also deficient and cicatriceal, ventral chordee is often present and the dartos fascia is absent or fibrous, the recommended procedure being the two stage urethroplasty. Another criteria for exclusion was the diameter of the urethral lumen in the affected area. Patients with a lumen less than 2mm in diameter have been excluded as in this case the two stage technique is more appropriate.

The pre-surgical evaluation consisted of anamnesis, clinical examination, urine culture, measuring of the post void residual bladder volume, uroflowmetry, urethral ultrasound, retrograde and anterograde urethrography. During the above mentioned period, 27 patients were included in the study. In 4 of the cases, the stricture also included the fossa navicularis. The medium lenght of the penile urethral strictures treated with the method described below was of 3 centimetres, the minimum and maximum limits being of 2 and 12 cm.

A circular incision is made 5 millimeters inferior of the glans, followed by the degloving of the skin to the base of the penis. The penile urethra is exposed through minimum dissection. The strictured area is identified and marked. The urethra is opened through a ventral, longitudinal incision on the median line at the stricture level. A 22 Ch silicone urethro-bladder catheter is inserted. The graft of buccal mucosa is suttured at the edges of the urethral mucosa incision, using a 4-0 absorbable multifilament suture. The graft is usually harvested from the right cheek, however, if the required lenght is not covered, the left cheek is used as well. The presence of the catheter previously inserted allows for the precise tailoring of the graft. The neourethra is covered with a lateral dartos flap, sutured to the corpus cavernosum albuginea. The dartos flap offers mechanical and vascular support for the graft. In case the strictures are too long to be covered by a singular flap, two latteral ones can be used, fixated in the vest manner. The penile skin is sutured, similarly to the circumscision, after the excision of the excess skin which, if not removed, would represent a high risk of post-operatory necrosis. A circular, slightly compressive bandage is used to avoid the postsurgery edema and penile ischemia. The penis is fixed on the abdominal wall and the patients spend 3 post-operatory days in the hospital, the urethro-bladder silicone catheter being removed 10 days after surgery.

Results

Patients have been under surveillance for an average of 21 months, the minumum period being of 4 months, while the maximum of 35 months. The surveillance protocol consisted of anamnesis, clinical examination, uroflowmetry and urethral ultrasound. We considered as insucces the necessity of instrumentalization and fistula appearance. There were problems with 3 out of the 27 patients. One of the cases presented a urethral fistula on the median ventral line, at the level of the

Figure 1. *Preoperator aspect*

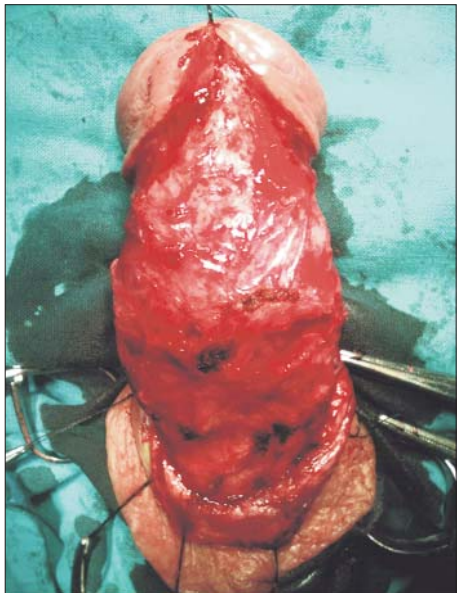

Figure 2. *Degloving*

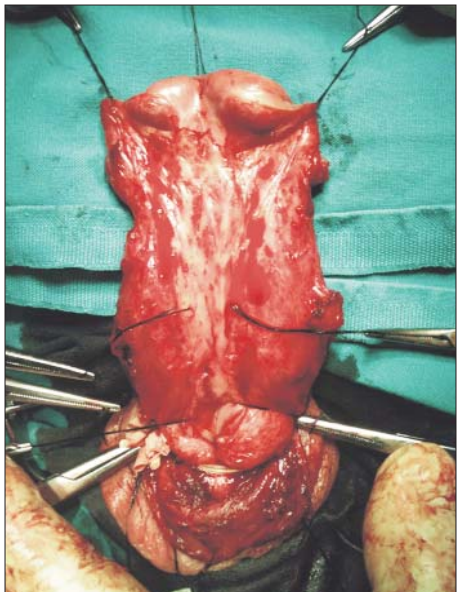

Figure 3. *Ventral incision of the urethra*

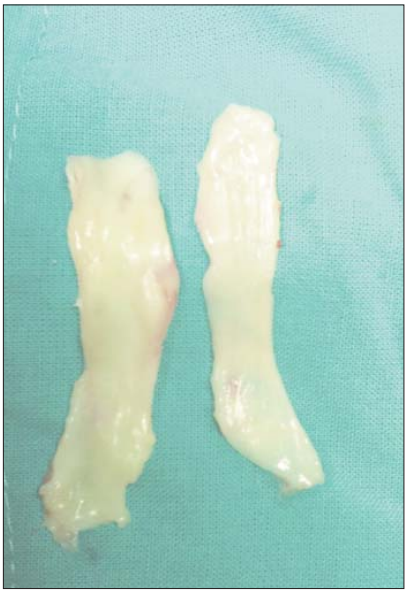

Figure 4. *Buccal mucosa graft*

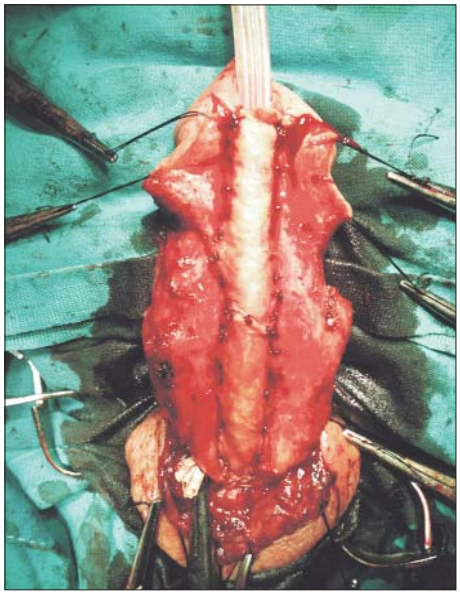

Figure 5. *Ventral fixation of the graft*

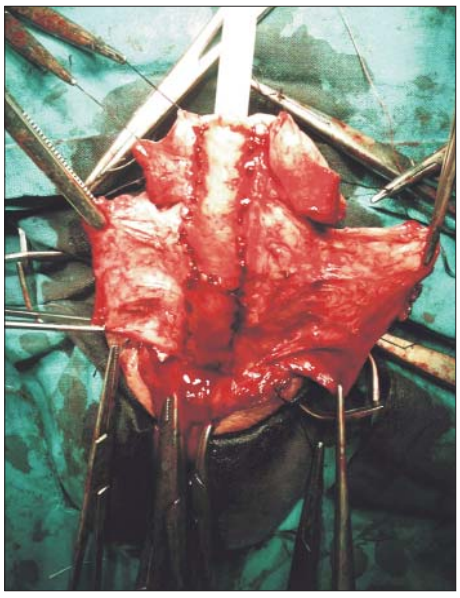

Figure 6. *Lateral Dartos Flaps*

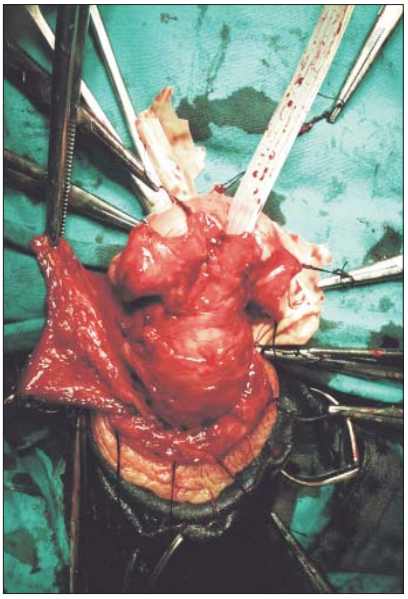

Figure 7. *Left Flap*

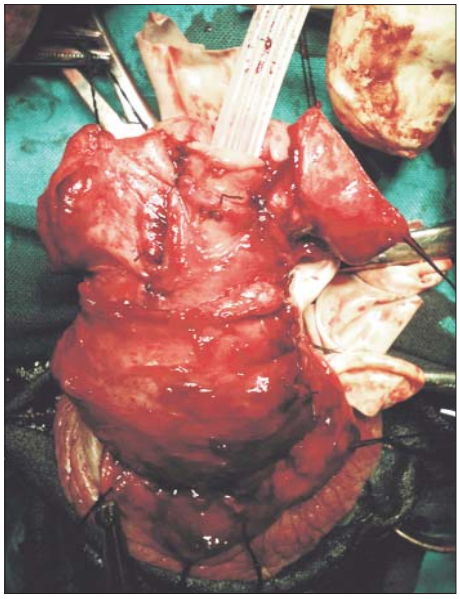

Figure 8. *Right Flap*

Figure 9. *Postoperator Aspect*

skin suture. Two other patients developed a diafragma at the proximal end of the neourethra and an optical internal urethrotomy had to be performed. In all the other cases, the urethral lumen maintained a 6-7 milimeters diameter over time, as it appeared on the urethral ultrasound, therefore, the success rate was 88.89%. All patients were satisfied with the cosmetical aspect of the penis and with their sexual life after surgery.

Discussions

The modern history of one stage urethroplasty in the cases of penile urethral strictures dates back to 1999, when Hayes and Malone, paediatric surgeons from the UK, described the dorsal fixation of the buccal mucosa graft (BMG) after the incision of the urethral plateau in hypospadias cases. The authors combined the Sbodgrass technique principles (4) and the utilisation of the buccal mucosa graft, placed in the space formed after the incision of the urethral plateau (5). In 2001, Asopa et al. from India described a similar technique for the anterior urethral strictures. The Asopa technique is considered to be the most important evolution of one stage urethroplasty (6).

The various studies that have focused on using dorsally placed buccal mucosa grafts present a success rate between 67% (Barbagli et al.) and 100% (Andrich, Mundy et al) (3). Therefore, with a 88.89% success rate, the results of our study follow the literature accordingly. In regard to the ventral fixation of the buccal mucosa grafts, the literature doesn't

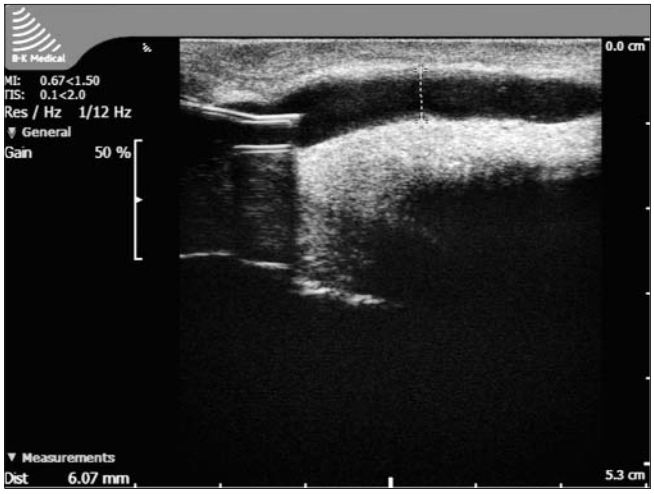

Figure 10. *Urethral ultrasound 6 months after surgery*

present a great ammount of data, considering that the ventrally placed buccal mucosa graft wouldn't have a good survival rate as there isn't enough tissue to cover the neourethra (7). In 1963, Devine et al. presented a study in which he proved that using the foreskin graft fixed in a ventral manner has its advantages, such as lower impact on the albuginea of the corpus cavernosum and on the integrity of the urethra, the exact evaluation of the affected area and the precise built of the graft on the catheter. However, the graft didn't have a sustainable nutritional and mechanical support (8).

There are many differences in favour of the current study when comparing it to the one performed by Devine at al. in 1963, leading to a great difference between the 88.89% success rate and the 59.6%. One of the key differences might be the use of a buccal mucousa graft and not a foreskin one, ventrally placed.

The buccal mucosa is not easy to harvest and in case of patients with longer strictures, the donor area might be extended to both cheeks (9). Also, the buccal mucosa is easy to manipulate due to its epithelium being rich in elastin and using it in various urethroplasties is encouraged (10,11). The buccal mucosa has a thin lamina propria, very well vascularized, which facilitates the imbibition and inosculation (10,11). By using buccal mucosa, the cosmetical consequences caused by the usage of genital or extra-genital skin are also avoided as the donor place is not visible. The buccal mucosa is very resistant to infections due to the fact that it already hosts a number of microorganisms and the tissue's response to inflamation is minimum (10,11). There are a multitude of immunologic processes of the buccal mucosa which make it impermeable to bacterian colonisation (10,11). Histological studies have proven that the buccal mucosa is compatible with the urethral mucosa, being almost impossible to be distringuished from the normal urethral tissue surrounding it (10,11). The structural integrity of the buccal mucosa graft stays intact when transporting it to a greater distance (10,11). It is elastic, mobile and very malleable when compressed or stretched due to the particular interface between the lamina propria and the oral epithelium (10,11). The buccal mucosa can easily be adapted to any type of urethroplasty and is rarely affected by lichen sclerosus et atrophicus (10,11).

The first phase of the grafting is also known as a plasmatic imbibition. In this stage, the transplanted tissue feeds from the existent exudate on the wound. The diffusion of nutrients, oxygen and metabolites is being made to and from the wound bed (12). This process lasts for the first 48 hours, followed by the second stage in the acceptance of the graft, the inosculation. This process consists of the formation of anatomical connections between the hosts and the graft and neoformation vessels are being formed (13). A new vascular system is being created in this way, which will continue to sustain the graft. To make sure the graft is sustained, an adequate vasculary support is neccesary. Another major cause related to the failure of the graft transplant is the formation of a hematoma which can interrupt the fragile vascular communication of the first days. Therefore, there is a great need for a mechanical support, apart from the nutritional one (14).

In the above described technique, these two goals are achieved, considering that the dartos flaps cover the neourethral and compensate for the relative deficit of tissue which appeared in the ventral fixation described by Wessells et al. It is also essential to remember that in the case of the Devine et al. study, the neourethra was covered with spongy tissue only (8), which can be inssuficient in some cases.

Conclusion

The results obtained in the discussed study are similar to those described by the specialty literature in case of penile urethral strictures treated through an urethroplasty performed with a buccal mucosa graft dorsally fixed. The dartos flap that covers the neourethra assures a mechanical and nutritional support sufficient for the survival of the graft, lowering the risk of fistula formation. The advantages of the ventral fixation of the graft consist in the low interference with tunica albuginea of corpus cavernosum integrity, as the graft is not placed on it and in the facile tailoring of the graft, on the 22Ch uretro-bladder catheter. In addition, the vascularization of the urethra is less affected than in the case of the dorsal fixation of the graft, when the disection and the mobilisation of the urethra are more agressive.

The conclusion is therefore that in the selected cases, the ventrally placed buccal mucosa graft urethroplasty for penile urethral strictures is a viable alternative.

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Conflict of interest

None of the contributing authors have any conflicts of interest, including specific financial interests and relationships and

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References

1. Andrich DE, Mundy AR. What is the best technique for urethroplasty? Eur Urol. 2008;54(5):1031-41.
2. Mundy AR, Andrich DE. Urethral strictures. BJU Int. 2011; 107(1):6-26.
3. Mangera A, Patterson JM, Chapple CR: A systematic review of graft augmentation urethroplasty techniques for the treatment of anterior urethral strictures. Eur Urol. 2011;59(5):797-814.
4. Ionescu S, Andrei B, Țîrlea S, Amăriuței O. Hypospadias--one-stage repair. Chirurgia (Bucur). 2012;107(3):361-5. Romanian
5. Hayes MC, Malone PS. The use of a dorsal buccal mucosal graft with urethral plate incision (Snodgrass) for hzpospadias salvage. BJU International. 1999;83(4):508-9.
6. Asopa HS, Garg M, Singhal GG, Singh L, Asopa J, Nischal A. Dorsal free graft urethroplasty for urethral stricture by ventral sagittal urethrostomy approach. Urology 2001;58(5):657-9.
7. Wessels H, McAninch JW. Current controversies in anterior urethral stricture repair: free-graft versus pedicled skin flap reconstruction. World J Urol. 1998;16(3):175-80.
8. Devine PC, Horton CE, Devine CJ Sr, Devine CJ Jr, Crawford HH, Adamson JE. Use of full thickness skin grafts in repair of urethral strictures. J Urol. 1963;90: 67-71.
9. Barbagli G, Vallasciani S, Romano G, Fabbri F, Guazzoni G, Lazzeri M. Morbidity of oral mucosa graft harvesting from a single cheek. Eur Urol. 2010;58(1):33-41.
10. Markiewicz MR, Lukose MA, Margarone JE 3rd, Barbagli G, Miller KS, Chuang SK. The oral mucosa graft: a systematic review. J Urol. 2007;178(2):387-94.
11. Markiewicz MR, Margarone JE 3rd, Barbagli G, Scannapieco FA. Oral Mucosa Harvest: an Overview of Anatomic and Biologic Consideration. Eur Assoc Urol. 2007;5:179-87.
12. Converse JM, Uhlschmied GK, Ballantzne Jr DL. Plasmatic "circulation" in skin grafts. The phase of serum imbibition. Plastic Reconstr Surg. 1969;43(5):495-9.
13. Converse JM, Smahel J, Ballantyne DL Jr, Harper AD. Inosculation of vessels of skin graft on host bed; a fortuitous encounter. Br J Plast Surg. 1975;28(4):274-82.
14. Blackburn JH 2nd, Boemi L, Hall WW, Jeffords K, Hauck RM, Banducci DR, et al. (1998) Negative pressure dressings as a bolster for skin grafts. Ann Plast Surg. 1998;40(5):453-7.