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

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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, excision mediană ventrală a segmentului uretral stenozați și nu afectează vascularizația uretrală, al în urmărit un studiu prospectiv în care am urmărit rezultatele acestei tehnici.

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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
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.

Material 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 cicatricial, the penile skin is also deficient and cicatricial, 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 length 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 sutured 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 length 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 circumcision, after the excision of the excess skin which, if not removed, would represent a high risk of post-operative 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-operative 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...
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 millimeters 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
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 inflammation 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 distinguished 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 vascular support is necessary. 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 neourethra 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 insufficient 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 dissection and the mobilisation of the urethra are more aggressive.

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**

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