

## URETHRAL RECONSTRUCTION IN CASES WITH RE-DO AND/OR PRIMARY SEVERE URETHRAL DEFECTS: THE USE OF LOCAL SKIN FLAPS AND BUCCAL MUCOSA

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### ABSTRACT

**Introduction:** The difficulties of urethral reconstruction in adults with re-do and/or circumcised peno-scrotal hypospadias with chordee are well known by all urologists. For this reason, our aim was to discuss urethral reconstruction techniques used in our operations and the difficulties we encountered.

**Materials and Methods:** Thirty-two of 126 patients who applied urology clinics because of their urethral defects between the years 1994 and 2007 were adults with re-do and/or circumcised severe proximal hypospadias with chordee. For urethral reconstruction, we used local skin in 20 cases, buccal mucosa in 10, and local skin combined with buccal mucosa in 2. Mean follow up was 23 months (3-96 months).

**Results:** In the local skin group, urethral fistula occurred in 4 (4/20) patients. In the buccal mucosa group, 6 (6/10) patients developed anastomotic stenosis and 5 of them developed small fistulas. After internal urethrotomy and fistula repair, functional urethras with desired lengths and diameters were obtained. One (1/2) fistula developed in local skin combined with buccal mucosa group.

**Conclusion:** In order to provide a good penile orthoplasty and stricture prophylaxis, it is essential that the urethral bed is cleared of all of fibrotic tissues, and that the proximal urethral end be excised up to the level of best perfusion. Circular penile fasciocutaneous flaps rather than scrotal skin flaps should be used for anterior urethral reconstruction. The urethral plate should be secured as far as possible, and patch flaps rather than tube flaps should be used. Buccal mucosa may be a good choice in re-do and/or circumcised primary adult cases with severe proximal hypospadias with chordee that do not have adequate local skin.

**Key words:** Mouth mucosa, Penis, Urethra, Urethral stricture

### INTRODUCTION

The difficulties of urethral reconstruction especially in adults with re-do and/or circumcised scrotal hypospadias with chordee are well known<sup>1-3</sup>. While most patients who require urethral reconstruction are cases of primary or secondary hypospadias who have experienced unsuccessful repairs, a lesser number of patients have complex urethral strictures. If cases with primary hypospadias, which can be repaired with classical techniques, and cases with simple urethral strictures which can be treated with internal urethrotomy or dilatation are excluded, there remains a group of cases whose reconstructions are quite difficult.

We aimed to discuss the reconstruction techniques we performed for this group of patients and the problems we encountered.

### MATERIALS and METHODS

Hundred and twenty six adult males (12-56 years of age) applied urology clinics because of

their urethral defects between the years 1994 and 2007 were evaluated retrospectively. Ninety four were adults with simple urethral defects. These were repaired with classical techniques that were defined previously. Thirty-two were adults with re-do and/or circumcised severe proximal hypospadias with chordee (Figure 1). All operations were performed by the same senior surgeon (S.A.). These 32 severe cases were divided into three groups; Group 1: Local skin flaps cases (n=20), Group 2: Buccal mucosa cases (n=10), Group 3: Local skin combined with buccal mucosa (n=2).

**Group 1 (Usage of local skin flaps):** Urethral reconstruction was achieved with fasciocutaneous flaps (Figures 2 and 3). While scrotal skin was used as a patch in two cases, penile skin was used as a tube or patch in different configurations. Tissues to make up the new urethra were chosen out of fasciocutaneous tissues based on Buck's fascia and had good vascularisation. A new urethra

**Date of First Application:** 12.03.2008

**Accepted:** 14.06.2008

was formed after the fibrous tissues were delicately excised in both flap and urethral bed. PDS suture material (5/0-6/0) was used usually. Anastomosis and side suture lines were supported with neighboring tissues with good perfusion.



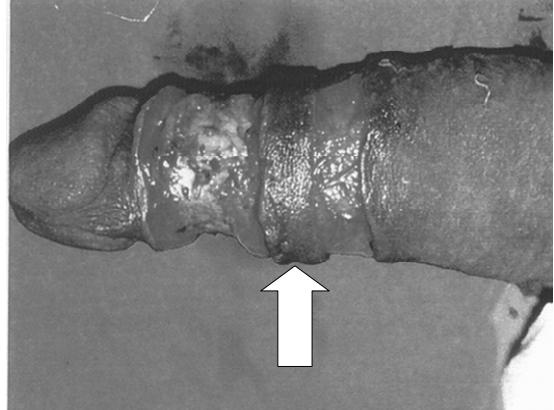
**Figure 1:** Circumcised severe proximal hypospadias with chordee



**Figure 2:** Fasciocutaneous flap; scrotal and penile skin can be used as a tube or patch in different configurations.

**Group 2 (Usage of Buccal Mucosa):** Patients in this group had a defective anterior urethra,

deficient local skin, too much fibrotic tissue on the ventral surface of their penis, and had experienced more than one unsuccessful hypospadias repair. Two cases were adults with re-do and/or circumcised severe proximal hypospadias with chordee. Buccal mucosa was used as tube graft in seven cases and patch graft in three cases (Figure 4).



**Figure 3:** Circular penile fasciocutaneous skin flap (white arrow).



**Figure 4:** Buccal mucosa can be used as tube and patch grafts

Reconstruction was carried out in five stages:

1. Preparation of the urethral bed and correction of the chordee.
2. Obtaining and preparation of the buccal mucosa from the interior surface of the lower lip, forming the tube or the patch.
3. Locating the new urethra into the urethral bed, making the anastomosis, fixation of the new urethra to the tunica albuginea and supporting it with well-vascularized tissues.

4. Closing the penile skin.
5. Urinary diversion and urethral stenting.

*Stage 1:* The penis is examined for curvature both in the flaccid and artificial erection state. The degree and level of angulation are determined. All the fibrotic and scarred tissues up to the healthy urethra are defined. With a circumferential incision at the subcoronal level, subcuticular tissues are dissected up to the proximal urethral end and the tunica albuginea is cleaned off all the fibrotic tissues on its ventral surface. The bright, white, circular collagen fibrils of the tunica albuginea should be visible and dissection should be continued down to this layer. Excisional dissection should also be continued until the healthy urethral end is reached.

*Stage 2:* This stage can be carried out by the same or another team. Formerly defined techniques were applied with some modifications<sup>4</sup>. After local cleaning with iodine solution, borders of a rectangular area as large as needed is drawn with a skin pen. Mucosa is dissected free from the lower lip so superficial as not to include the glandular elements beneath. Following hemostasis, a sponge with adrenalin is placed between the interior face of the lower lip and gingiva, and a compressive bandage is put on. Mucosa is cleaned of all the submucosal elements. It is placed around a Nelaton catheter with an appropriate diameter for the patient's urethra and is turned into a tube by suturing with 6/0 PDS. The diameter should be kept constant through out the whole length of the tube. If a patch repair is being executed, sufficient buccal mucosa is prepared to convert the urethral floor into a tube.

*Stage 3:* With either a tube or a patch graft, the diameter should be greater than that of the actual urethra at the level of anastomosis. This will help the partial narrowing which will develop at the level of anastomosis later on, and ensure the anastomosis will remain at a size which will not cause any stricture. The distal end of the tube may be passed either through the tunnel formed by excising spongy tissue from the glans or between the glans wings which will be formed on two sides. After placing the new urethra into the urethral bed, it should be fixed to the tunica albuginea at two or three points, and it should be supported with well-vascularized subcuticular tissues.

*Stage 4:* Adequate skin to surround the penis might not be available in patients who have experienced more than one unsuccessful hypospadias repair. This problem can be solved by sliding a rhomboid shaped fasciocutaneous island flap with its pedicle from the penoscrotal area toward the distal end of the penis on the ventral surface.

*Stage 5:* Diversion is made with percutaneous cystostomy.

In all cases, a urethral stent was left in place 1-2 cm proximal to the anastomosis. The penis was laid over the anterior abdominal wall after it is loosely bandaged. The bandage was opened and stent was removed after third postoperative day. Genital secretion is aspirated and taken out with a thin feeding catheter once daily after stent was removed. Patients were allowed to void after the tenth postoperative day. Patients were followed for an average of 23 months (3-96 months).

## RESULTS

**Group 1:** Out of 20 cases where fasciocutaneous tissues based on Buck's fascia were used, fistulas developed in four. Out of 2 cases where scrotal flaps were employed, two had fistulas. In the penile skin flaps group of 18 patients, two of whom tube repair had been used, had fistulas (Table 1).

**Table 1:** Hypospadias operation results according to the tissue used

	No complication	Fistula only	Stricture only	Fistula and Stricture
Group 1 (n=20)	16	3	-	1
Group 2 (n=10)	3	1	3	3
Group 3 (n=2)	1	1	-	-

**Group 2:** Out of 10 cases, six had strictures in proximal anastomosis and in three of these six cases fistulas also developed at the site of anastomosis. In one case there was a fistula without any stricture. In three cases, new urethras of desired length and diameter were obtained without any complication. Strictures were eliminated with internal urethrotomy. Self-dilatation was taught to patients that were apt to stricture recurrence in an early period; two patients did not require dilatation after one year. Stricture excision and re-anastomosis operation was performed in one case. Fistula

repair was performed in three cases with stricture and fistula 3 months after internal urethrotomy. No complication occurred in donor buccal mucosa site.

**Group 3:** We used a combination of local skin flaps with buccal mucosa in two cases. These were circumcised adults with scrotal hypospadias and chordee. One case developed fistula which was successfully repaired 3 months later (Table 1).

## DISCUSSION

Common characteristics of the 32 cases were as follows: They did not have any anterior urethra; all but two had experienced multiple unsuccessful operations; they had underdeveloped or poorly perfused spongy bodies due to fibrosis and local skin was defective in varying degrees. It is obvious that these are important disadvantages for urethral reconstruction.

The anterior urethra lies in the corpus spongiosum that is a well-perfused bed supplied by the bulbourethral artery and dorsal penile artery coming from proximal and distal parts of penis respectively. This vascular anatomy makes segmentary excision and end-to-end anastomosis possible. The blood supply to the anterior urethra is usually poor in complex strictures due to spongiofibrosis and in hypospadias because corpus spongiosum is disgenetic. Each unsuccessful operation will obviously reduce the possibility of success in the operation due to fibrosis. This is the reason for the difficulties in repair of the complex re-do cases (patients with defective urethras). In patients whose blood supply to the urethral bed is poor, fasciocutaneous flaps should be the first choice. The flap can be prepared in various configurations according to the local skin<sup>5</sup>.

In 18 of our cases, circular penile fasciocutaneous skin flaps were used (Figure 3). Eleven of them were tubes and seven were patches. Scrotal flap was used as tube + patch in two cases. While both of the two scrotal flaps developed fistulas, only two of the seven tube flaps of the 18 cases with penile fasciocutaneous flaps developed fistulas (Table 2). Success rate with flaps used in the anterior urethra where perfusion is worse seems to depend on where the flap was taken from. The results with circular penile fasciocutaneous flaps were better than that with scrotal flaps. This difference

might be related to possible stretching or twisting of the flap while translocating to the urethral groove. It is apparent that the risk for flaps that are translocated from farther sites is greater. Therefore, vascularized flaps instead of grafts should be preferred in anterior urethral reconstructions, and flaps should be prepared nearby if possible. We consider circular penile fasciocutaneous flaps ideal for this procedure.

**Table 2:** Hypospadias operation results of the Group 1 (scrotal or penile skin flap)

Group 1		Fistula	No complication
Scrotal flap (n=2)		2	-
Penile skin flap (n=18)	Tube (n=7)	2	5
	Patch (n=11)	0	11

Surgeons may feel more comfortable with defects that are more proximal since corpus spongiosum surrounding the bulbous urethra is thicker at this level, and it is less influenced by spongiofibrosis. While scrotal skin flaps can be translocated there, good results can be obtained with free tissue grafts<sup>2,5,6</sup>. In two cases we used scrotal fasciocutaneous flaps in order to close approximately 4 cm defects in anterior and bulbous urethra. Flaps were used as tubes in the distal part and patches in the proximal part of urethras. Single fistula developed in both of the patients. Desired results were obtained after fistula repairs were performed three months later due to reconstruction. Scrotal skin was used combined with buccal mucosa in two patients. These were circumcised adults with scrotal hypospadias with chordee. Since local skin was not available in these "generously circumcised" patients, urethral continuity was obtained by using scrotal skin as a patch at 1/3 part, and buccal mucosa as a tube at 2/3 distal part. Therefore, approximately 12 cm. of the urethra extending from the penoscrotal level to the external meatus was made from the scrotal flap and the buccal mucosal graft. A single fistula in one patient was closed 3 months later.

We had to use free grafts in 10 patients for anterior urethral reconstruction. Anastomotic strictures developed in 60% of patients when buccal mucosa was used as free grafts. Although the proximal anastomosis of the tube graft of buccal mucosa was rendered wide by spatulating, anasto-

motric strictures developed in approximately half of the cases. Furthermore, these strictures were found to have a tendency to recur in spite of internal urethrotomies. Strictures were segmentary and limited to the anastomosis line; however, they progressed to obliterate the lumen. Self-dilatation in three cases and stricture excision and re-anastomosis were carried out in one case. Strictures did not recur in two cases those ceased self-dilatation one year later. Undoubtedly, fibrosis can be reduced by excision of the proximal end up to the well-perfused tissue part, and by surrounding the anastomosis line with well-vascularized tissues. In spite of the fact that we paid attention to these issues, we encountered a high ratio (60%) of obstructive strictures, which occurred in a short period, and showed a tendency to recur after urethrotomies. This might be due to an interaction, which triggered fibrosis in the transition zone between the urethral and buccal mucosa. The fact that anastomosis to the skin of the glans lies on a well-perfused ground explains why no strictures of this size occur in the meatal end. The complication ratio in the other series in which buccal mucosa was used seems to be similar to that of ours<sup>7,8</sup>. However, this ratio is the sum of the ratios of fistula formation, meatal stenosis, and urethral strictures, and these complication rates are similar to each other<sup>7,8</sup>. Having no meatal stenosis but meaningfully high rates of proximal anastomotic strictures in our cases makes us think that we have to scrutinize our surgical technique.

There are studies which report that results are better in cases where buccal mucosa was used at segments that are more proximal and as a patch<sup>4,9</sup>. However, there are only a limited number of studies reporting the results of the buccal mucosa usage in anterior urethra where perfusion is worse<sup>8</sup>. It would be wrong to compare the results of buccal mucosa with vascularized fasciocutaneous flaps. It seems to be a good type of flap when compared with the others<sup>8,10</sup>. No graft other than buccal mucosa was used in our study. The advantages of using buccal mucosa can easily be found if the literature is reviewed. Tendency to diffuse strictures that is often seen with free skin grafts is not encountered with buccal mucosa. This might be because of the tissue burden of the free graft that would be fed by diffusion in the beginning. If buccal mucosa is eliminated from the

submucosal tissues, its adaptation to the recipient region will be better. Lamina propria of the buccal mucosa has been found to be evidently thinner than the lamina propria of the other tissues<sup>8</sup>. It also has an advantage on bladder mucosa because of its availability and the fact that it does not cause ballooning and meatal protrusions. Although some buccal donor region complications were reported in the literature, no donor region complication was seen in our study<sup>7,11</sup>.

## CONCLUSIONS

Our study that evaluates the results of the urethral reconstruction made with fasciocutaneous flaps and buccal mucosal grafts in adults who have large urethral defects after unsuccessful urethroplasties and in circumcised primary cases who have severe proximal hypospadias with chordee: The following conclusions have been made

1. Due to the paucity of skin in such cases, it is harder to obtain suitable tissue for both urethral reconstruction and covering of the penile shaft.
2. It is essential to have the urethral bed purified from all fibrotic tissues, and proximal urethral end excised up to the level of best perfusion in order to have a good penile orthoplasty and stricture prophylaxis.
3. If possible, local skin should be chosen, if not, free grafts should be used.
4. Circular penile fasciocutaneous flaps rather than scrotal skin flaps should be used for anterior urethral reconstruction.
5. The urethral plate should be secured as far as possible, and patch flaps rather than tube flaps should be used.
6. Repair with buccal mucosa can be employed as a first choice in circumcised primary adult cases who have severe proximal hypospadias with chordee.
7. Buccal mucosa does not have the reported important disadvantages of free skin and bladder mucosa. However, further studies should be done in order to explain the proximal anastomotic stricture in terms of tissue biology and to find out ways to avoid this phenomenon.
8. In cases who do not have enough healthy skin to cover the penile body, a rhomboid fascio-

cutaneous island can be slid distally and can be used to both support the new urethra and close the penile body.

Without suturing the interior surface of the lower lip, where the buccal mucosal graft is obtained, facilitates a fast and a complication-free recovery.

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