

Variations on the Transverse Ventral Preputial Island Flap Technique

S. HOFMANN-von KAP-HERR and Almut WÜRFEL

For one-stage operations to rebuild the urethra in hypospadias it is possible to use free skin grafts⁽⁴⁾ mucosa of the bladder⁽¹⁰⁾ or buccal mucosa, or an advancement plasty by Beck^(1,3) (modified by Engert). Short distances may be reconstructed by MAGPI⁽¹¹⁾ or Mathieu⁽⁹⁾ techniques.

However, for long gaps vascularized flaps (first introduced by Hodgson 1975⁽⁵⁾) are preferred. Duckett found that the blood supply of the dorsal preputial tissue is reliable and quite easy to delineate, so that the properly prepared flap of dorsal prepuce can be moved into the exact position necessary for reconstruction of the urethra, according to the type of hypospadias⁽²⁾. This is an important progress because it permits to fit island flaps individually, and the complication rate is much lower with well vascularized flaps. We therefore have been using the Duckett procedures for over 10 years and developed personal modifications since 1986 (6,7,8).

Material and Methods

In our technique we do not tunnel the glans but split the ventral part of the glans to prevent stenosis. We try to avoid extensive preparation of the skin around the penile shaft and attempt to include remnants of the original urethral tissue of the hypospadiac area into the new plasty, if there is enough material and a well-formed furrow. We do not split the vascularization when using a double-flap, depending on the type of abnormality. As recommended by Duckett, after preparing the ventral surface, removing the chordee and mobilizing the urethra, the dorsal foreskin is placed on tension by

holding sutures to outline the necessary inner and outer part of dorsal prepuce by a marking pencil.

Depending on the type of hypospadias or on the specific problems of the preoperated case, one can form an individual type of island flap:

I. Dorsal transverse island flap for reconstruction of the urethra (Fig. 1).

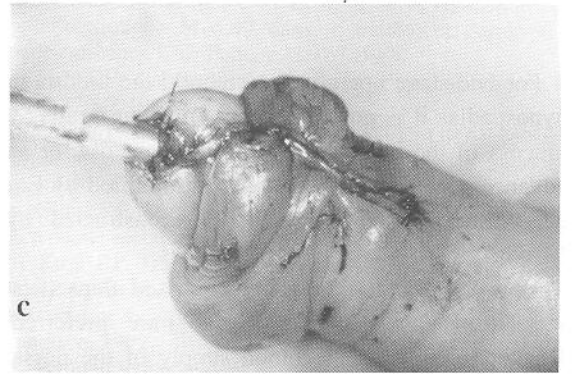
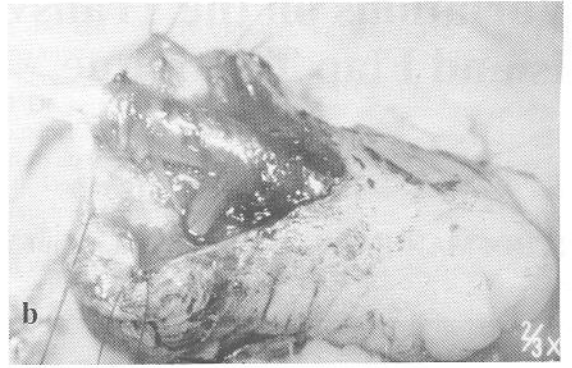
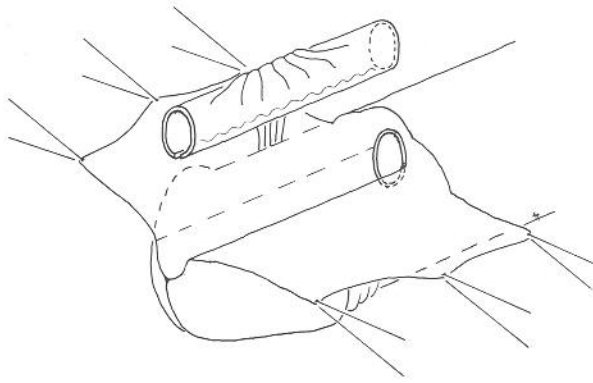
II. Double-flap using the inner layer for reconstruction of the urethra by using the outer layer of the double-flap to bridge the distance between the 2 parts of the splitted glans and between the ventral defect of penile shaft skin (Fig. 2)

III. Inner half-cylinder flap in case of sufficient original urethral tissue and a well-formed furrow in the glans (Fig. 3).

IV. Double-island-flap with inner half cylinder if there is sufficient original urethral tissue for the other half of the urethra and if it is necessary to bridge the distance of the two parts of the ventral splitted glans without any tension (Fig. 4).

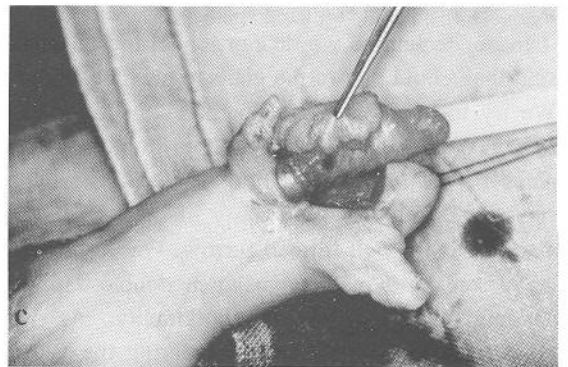
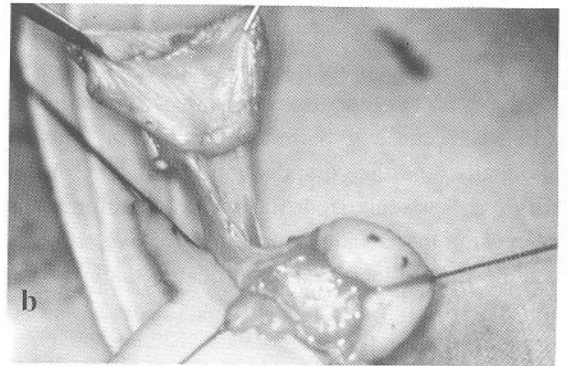
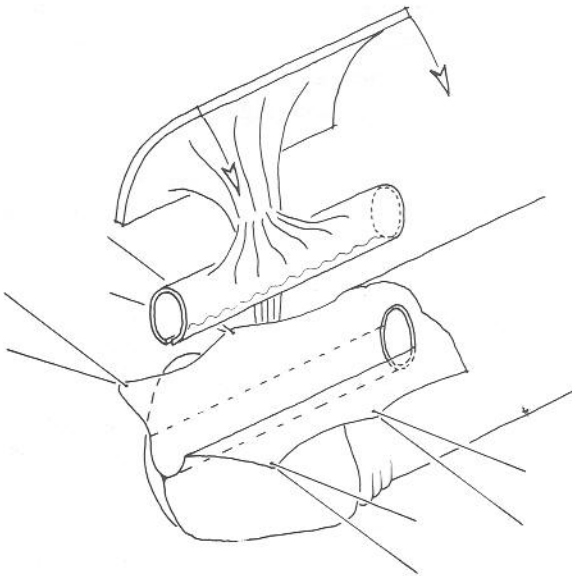
V. Double-flap with the inner part as interposition for prolonging the urethra in special (mostly preoperated) cases after scar or chordee dissection and the outer part of the double-flap for bridging the distance between the splitted parts of the glans (Fig. 5).

VI. Double-flap trim-plasty for reconstruction of parts of the urethra (after removal of chordee or scars) and in case of a well-built urethral furrow in the glans, as well as simultaneously bridging the gap of the divided glans (Fig. 6).



a

Figure 1 a) Dorsal transverse island flap urethral reconstruction, b) Reconstruction of urethra in a 3 year-old boy, c) after reconstruction of glans and prepuce.



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Figure 2 a) Double-island flap skin and urethral reconstruction, b) Preparation of double-island flap in a 4 year-old boy, c) after reconstruction of urethra.

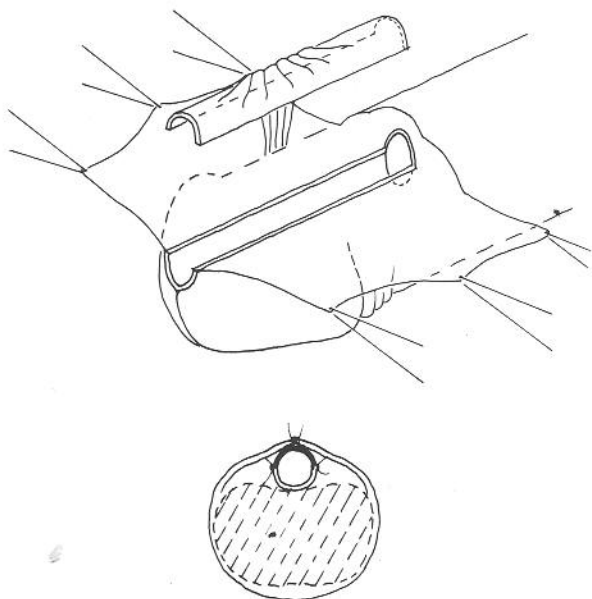


Figure 3 Inner half-cylinder plasty in cases with a well-formed urethral furrow.

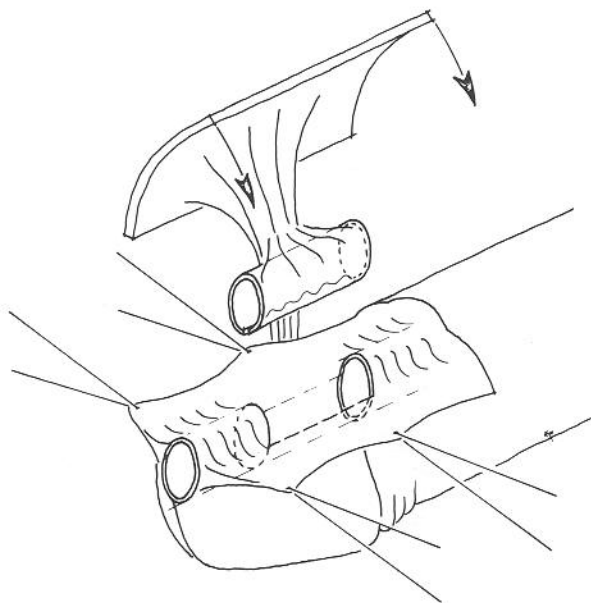


Figure 5. Double-island-flap plasty with urethral interposition cylinder.

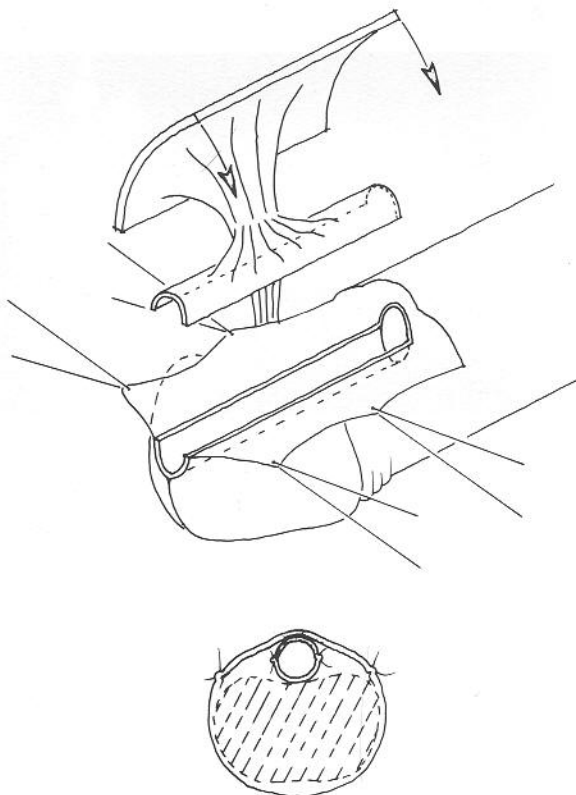


Figure 4 Double-island-flap plasty with inner half cylinder.

VII. Outer preputial island flap plasty to avoid tension after building up of the urethra by glans tissue (Fig. 7).

Following preparation of the preputial skin and to

avoid harm to vascularization, we tunnel the shaft skin to bring the flap directly on the ventral side of the penis. It is thus possible to include remnants of original urethral tissue of the hypospadiac area into the substitute. Splitting of vascularization is not necessary, when using a double flap.

The above modifications have been used since 8 years. Between 1986 and 1993 we operated on 30 cases when advancement plasty, MAGPI or Mathieu plasty were not indicated. Most boys were pre-operated cases of hypospadias with scars, stenosis, fistula, re-chordee and/or removed prepuce.

Table 1 shows the number of cases relative to the different modifications used. Complications (Table 2) are higher in such problematic cases. We had one case with two subsequent stenoses after double-flap-plasty; this boy had been operated twice before. Thus we had 7 fistulas in 6 patients (so only one has two fistulas). Among the virgin cases there was only one fistula. In all cases the result of the second or third operation (except for one) was excellent.

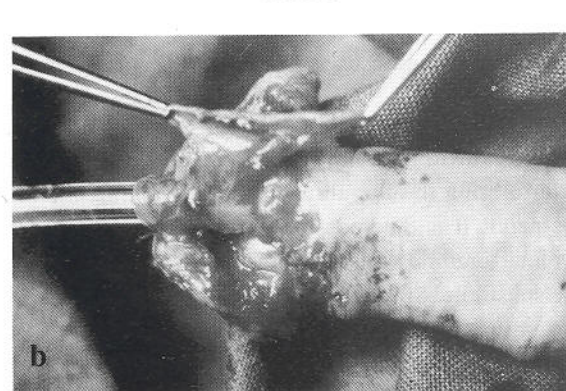
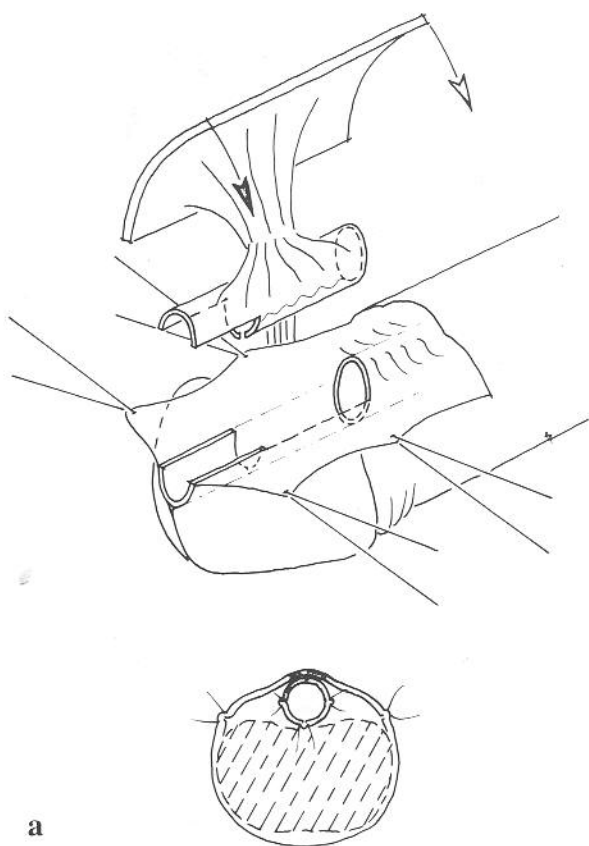


Figure 6 a) Double island trim-plasty, b) Operation situs after urethral reconstruction, before half cylinder plasty and skin closure in a 5 year-old boy.

Discussion

Thanks to the possibility to form, fit and prepare a well-vascularized foreskin flap, one is able to adapt this flap to every individual need. The success of this method depends on the technique demonstrated by Duckett. He used the finding of Quartey⁽¹²⁾, that the abundant subcutaneous tissue on the dorsum of the penis is vascularized in a longitudinal fashion. This tissue may be dissected free from the penis shaft, because the blood supply to the outer and

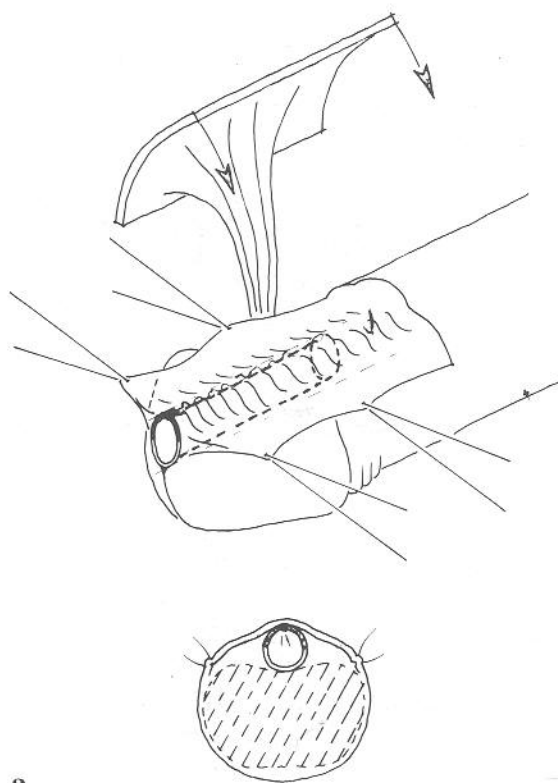


Figure 7 a) Outer preputial island flap plasty, b) Urethral reconstruction by glans tissue, prepared dorsal foreskin flap to close the glans defect in a 8 year-old boy.

Table I. Modified island flap procedure (Duckett)

Type	I	II	III	IV	V	VI	VII
No of cases	9	6	1	3	1	7	3

inner layer of the foreskin comes from its broad base and is not dependent on subcutaneous tissue. This fact permits to create very long and broad transverse flaps which are only limited by the size of the prepuce, no matter if a double faced flap is required or not.

Table 2. Modified island flap plasty complications

Case no	Complication	Cause	Operation	Result
1	fistula	7 preoperations (other hospital)	closure of fistula	excellent
2	2 stenosis	2 preoperations (other hospital)	2x double-flap-plasty type II	good
3	fistula	1 preoperation	closure of fistula	excellent
4	fistula	1 preoperation	closure of fistula	excellent
5	fistula	preoperation	double-flap-plasty type II	excellent
6	2 fistulas	unknown	a) closure of fistula b) double-flap-plasty type II	excellent
7	fistula	1 preoperation	double-flap trim-plasty, type VI	excellent

Every special case can therefore have an individual modelage of its island flap supply, and the defect can be closed without any tension. Since little or no tension is essential for excellent results without fistulas or stenoses, we try to avoid tension in any case; we do not tunnel the glans and prefer the double-faced flap, even if it could be necessary to remove a surplus of skin later on. However, we prepare a tunnel to bring the flap on the ventral side of the shaft.

We feel that the following conditions are essential for the good results of our modification of the Duckett procedure:

1. Exact orthoplasty of the penis shaft by rigorous removal of the chordee;
2. Inverted continuous sutures are a must;
3. Monofilament resorbable 6-7/0 sutures are indispensable;
4. Oblique anastomosis between urethra and neo-urethra to obtain a greater diameter for prevention of stenosis;
5. Use of a thick catheter with a minimum diameter of 12 Ch to keep the new urethra wide for the first 8 days after operation;
6. Absolute necessity to use magnifying glasses for a precise operation technique;
7. It is safer to use an additional suprapubic post-operative urinary diversion.

When observing these conditions Duckett's island flap technique and our modifications are a step forward in hypospadias repair, because the method is a one-stage procedure, the complication rate is very low, and the method permits formation of a glandular meatus. Furthermore, it is possible to operate on very young children of about 2-3 years of

age. Finally and above all these modifications are most successful in all problem patients and re-do cases.

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Prof. Dr. med. S. Hofmann-von Kap-herr
 Department of Pediatric Surgery
 Johannes Gutenberg University,
 Mainz