RECONSTRUCTIVE SURGERY OF THE ANTERIOR URETHRA

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Reconstructive surgery of the anterior urethra for hypospadias, fistulas or strictures, presents the surgeon with many problems. While the usual methods of repair may give good results, complications and failures still occur and a more reliably effective procedure would be welcome.

A study of the post-operative course in a series of cases, the results of which were published in 1964, revealed four major technical inadequacies in treatment which were responsible for the majority of the complications experienced with operations of the buried skin strip type: defective rearrangement of the skin, inadequate urinary drainage, insufficient vascularity of the skin and inadequate wound closure.

Defective Rearrangement of the Skin.—In the treatment of urethral fistulas or urethral strictures, the elasticity and mobility of the skin is generally adequate for the wound to be closed without tension. In hypospadias, however, there is a congenital insufficiency of skin on the urethral side of the penis which, together with the surplus of skin on the dorsal side and the oblique lateral raphes, is probably caused by a formation of folds in the ectoderm-covered borders of the urethral groove (van der Meulen, 1964, 1967).

Correction of this insufficiency of skin is essential and may be accomplished by redistributing the skin by the methods developed by the author (Figs. 3 and 5).

Inadequate Drainage.—Healing of the wound can easily be disturbed if adhesion between the skin and the underlying raw surface is prevented by the accumulation of blood or urine. This may be avoided in one of two ways:

(a) By preventing blood and urine reaching the bed of the wound by hemostasis, catheter drainage of the urine, and/or compression bandaging. In our experience, however, none of these is invariably reliable; hemostasis because capillary bleeding cannot always be controlled, drainage of urine because the catheter sometimes becomes clogged or leads to tenesmus, so that urine is forcefully driven along the catheter and fistula formation becomes inevitable, compression because even a circular bandage will not prevent urine from reaching the bed of the wound.

(b) By promoting drainage of blood and urine either through the new urethral channel or through the drainage incisions. It is with this form of drainage, in exceptional cases combined with a urethrostomy, that we have achieved the best results in recent years and to which, in our opinion, preference should be given. No adverse effects on the healing of the wound from the passage of the urine have been observed. On the contrary, the absence of an indwelling catheter or a circular bandage seems to eliminate an important source of infection, thus making the administration of antibiotics unnecessary.

Insufficient Vascularity of the Skin.—Careful planning is of course of cardinal importance, but because adequacy of the circulation is not always predictable, every effort is made to avoid any procedure which might diminish the circulation in the wound margins; therefore, knotted cutaneous sutures or circular bandages are never used.

Inadequate Wound Closure.—Drainage via the urethra would be of little value if the skin was not closed in such a way as to ensure impermeability, since an open connection between the urethra and the outside invariably leads to the formation of a fistula. This
can be avoided however, by making any skin suture line in the vicinity of the urethra impermeable by means of a continuous subcutaneous stitch (5/0 braided steel wire is used) (Fig. 1), and keeping any drainage incision well away from the urethra (Fig. 2).

Fig. 1—The chance of fistula formation is increasingly reduced by application of the indicated methods of suturing in the sequence A-D.

Fig. 2.—Drainage incisions can be made in the scrotum and on the dorsal side of the base of the penis.

**TECHNIQUE**

**Hypospadias.**—This anomaly always involves a congenital shortage of skin on the urethral side of the penis which must be supplemented at the expense of the surplus on the dorsal side. The amount of skin required for this purpose is dependent on the severity of the hypospadias and we therefore distinguish two types in evaluating our results. In Type I the expansion of the corpora cavernosa is not impeded by the hypoplasia of the urethra and straightening of the penis is contra-indicated; in Type II the expansion of the corpora cavernosa is impeded by the hypoplasia of the urethra and preliminary straightening of the penis is indicated.

**Type I.**—Included here are all cases in which a curvature of the penis is absent or restricted to a more or less acute angulation between the glans and the extended shaft. In the latter case, close observation has shown that this curvature must be considered apparent rather than real because it is caused not by the hypoplasia of the urethra distal to the dystopic meatus but by the ever present discrepancy between the surplus of skin on the dorsal side and the shortage on the urethral side. Retroposition of the meatus is often performed for this condition although I believe no real indication for it exists. This possibly somewhat heretical point of view has led me to abandon the straightening procedure in these patients; the reconstruction of the urethra can thus be performed primarily.
Operation is generally carried out before the child reaches school age. In the period from January 1965 to January 1969, the technique shown in Figure 3 was used in 65 patients of Type I hypospadias. In this group it was consistently found that any apparent curvature was entirely corrected by the adequate redistribution of skin made possible by this method (Fig. 4). In all cases use was made of subcutaneous metal sutures for closure of the defect. In no case was a catheter introduced or a urethrostomy established and a circular bandage was never applied. The results were invariably satisfactory and no fistula was observed.

Type II.—In this group reconstruction of the urethra is preceded by retroposition of the meatus. Operation is generally performed during the child’s second year. In the period between January 1965 and January 1969, there were seven cases in whom the technique shown in Figure 5 was used. With this method the amount of skin which can be shifted from the dorsal to the urethral side of the penis is appreciably greater than that of more conventional methods; more skin is therefore made available for the later reconstruction of the urethra.

Urethral reconstruction is generally performed before the child starts school. In the period between January 1965 and January 1969, it was carried out in seven cases as follows:

1. As a one-stage procedure by isolating a strip of skin and closing the resulting defect by advancement of the wound margins (three patients) (Fig. 6).
2. As a two-stage procedure by isolating a strip of skin distal to the meatus and closure of the resulting defect by advancement of the margins of the wound during one operation, followed by closure of the meatal area at a second (two patients). (Fig. 7).
3. Closure of the defect after isolation of a strip, by peno-scrotal fusion (Fischer, 1922) separated at a second stage (two patients) (Fig. 8).

The technique described for straightening the penis can abolish entirely the relative shortage of skin on the urethral side. Reconstruction of the urethra over a considerable distance by means of locally available skin, however, is inevitably accompanied by an absolute shortage of skin which increases the chance of complications. This shortage might be avoided by supplementing the penile skin with a free skin graft at the primary operation but so far we have not used it because, as the composition of our material clearly shows (65 Type I as against 7 Type II), it is relevant for only a very small group of patients and our results did not suggest any reason to apply it.
Correcting the chordee in Type II hypospadias. A. After resection of the fibrotic tissue and retrodisplacement of the meatus the integument is incised along the course of the two oblique raphes.
B. The two incisions are connected at the dorsal side to form two flaps, one based distally and the other proximally.
C. The proximally based flap is mobilised and divided into two flaps which are rotated into the defect at the urethral side of the penis and sutured together in the midline. D. Sutured result.


Fig. 6.—Modified Duplay procedure in one stage.
Fig. 7.—Modified Duplay procedure in two stages.
Fig. 8.—Fischer procedure in two stages.
Micturition occurred in all these cases via the reconstructed urethra and the drainage incisions. In the single case in which a fistula developed, these drainage incisions had not been made. In only a few cases was this form of drainage combined with urinary deviation by means of a catheter through a perineal urethrostomy.

**Fistulas.**—In the period from January 1965 to January 1969, 23 patients with urethral fistulas were treated. The skin defect developing after circumcision of the fistula and ample mobilisation of the skin could generally be closed without tension by advancement of the wound margins. When the wound could not be closed without tension, a rearrangement of the skin was performed. Just how extensive such rearrangement can be is illustrated by the following case history:

A 12-year-old boy was admitted with serious wounds in the right upper leg, right groin, pubic area and penis, resulting in large skin defects and a urethral fistula. Because of the very inadequate amount of skin available on the urethral side of the penis, it was decided to rotate the entire skin surface of the dorsal side to the urethral side in order to achieve healing without complications. Figure 9 shows the result after closure of the fistula.

An indwelling catheter or a perineal urethrostomy was not used in any of our cases and only occasionally, as in the patient described above, were incisions made in the dorsal side of the penis or in the scrotum to promote drainage. A circular bandage was never applied.

Although in a number of the 23 patients in this group attempts had previously been made to close the fistula (one patient had already undergone 10 operations without
success), the results of the method described here were completely satisfactory and all patients were discharged with a fully reconstructed urethra.

**Strictures of the Urethra.**—The treatment of urethral stricture by the establishment of a fistula at the level of the stricture was described by Russell (1914). Bengt-Johanson (1953) later supplemented and perfected this method by reconstructing the urethra following the creation of a fistula.

In the period January 1965 to January 1969 we applied the modified procedure in a limited number of patients who were also treated without the use of either an indwelling catheter or a circular bandage.

This method has the disadvantage that the repair of the urethra must be preceded by the formation of a fistula. It could therefore be expected that in the past attempts had been made to correct a stricture in a one-stage procedure. Presman (1953) and Devine *et al.* (1963) reconstructed the urethra by means of a free skin transplant, while Kishev (1960) used the tunica vaginalis.

The good results obtained by these authors with the methods described by them led us to perform the reconstruction of the urethra in one patient with a stricture by means of an island flap (Fig. 10). With this method, which is based on the principle of the biological flap introduced by Monks in 1898 and by Esser in 1918, the reconstruction could be performed in one operation. The results appeared initially to be highly satisfactory but after some time micturition difficulties recurred and a stricture of the urethra was again found to be present.

Although a later study of the literature revealed that Yaxley (1967) had obtained successful results with a one-stage procedure based on this principle, it is our opinion...
that until further studies have been done, preference should be given to the reliable method of Bengt-Johanson.

**SUMMARY**

Reconstruction of the anterior urethra is often followed by complications whose causes are rarely mentioned in the literature. The first part of this article is devoted to an analysis of these causes, on the basis of which some principles are formulated for the prevention of such complications. The second part concerns the author's experience with the application of these principles to the techniques of treatment in hypospadias, fistulas and strictures of the urethra.

**REFERENCES**


