Further Experiences With Hypospadias

Ormond S. Culp
FURTHER EXPERIENCES WITH HYPOSPADIAS

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This subject was chosen for sentimental as well as scientific reasons. Personal enthusiasm regarding hypospadias and associated anomalies was kindled at this institution in 1946. Dissatisfaction with results of operations then in vogue prompted resurrection of a simple straightening technique, first described by Duplay, and the initial modification of Cecil's two-stage urethroplasty.

Early products of this therapeutic scheme were presented first at one of the surgical staff meetings in the old amphitheater. Senior members of the current staff may recall that an impeccably dressed boy of 5 years dashed from the wings, announced that he could hold it no longer, mounted a footstool, and stole the show by micturating with a magnificent and well-directed stream. He had been cured and no one in the audience doubted it.

After 4 years of conservative experimentation and modification, results in 14 previously untreated patients and in 5 with complicated situations were presented at the meeting of the American Urological Association, in May 1950. This report was accepted at that time as a truly prolific series.

From August 1950 to September 1965, more than 70 linear feet of new watertight urethra have been constructed for hypospadiacs at the Mayo Clinic by employing ramifications of the same therapeutic principles. The 422 individuals involved required 1,071 operations in addition to 383 earlier procedures by other surgeons in 134 of these cases.

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When first seen, these patients conformed to 10 basic categories (Fig. 1) each of which required special consideration. Chordee had to be corrected in 68% of all cases. From one to six previous unsuccessful straightening operations had been performed on 10% of these patients.
Correction of chordee. a. Transverse incision distal to meatus is extended into hooded prepuce and, b, freed with blunt scissors. c. Urethra is freed from corpora with indwelling catheter as guide. d. Constricting tissue is excised after freeing penile skin laterally. Meatus gravitates to most convenient position without tension. e. Skin closed longitudinally with fine wire sutures. (From Spence, H. M., Culp, O. S., Glenn, J. F., Hinman, Frank, Jr., and Marshall, V. F.: Panel Discussion: Anomalies of External Genitalia in Infancy and Childhood. J. Urol. 93:1-23 [Jan.] 1965.)

Chordee continues to be corrected by the method evolved while I was here (Figure 2), provided the patient has not been circumcised. When the hooded prepuce has been excised, some form of Z-plasty is employed for closure of the skin. An Elastoplast dressing continues to be the best safeguard against disastrous edema. The catheter is left indwelling for only a day or so unless the original meatus was revised or compromised. Then it remains in situ until the dressing and 6-0 wire sutures are removed on or about the tenth postoperative day.

This type of straightening has been used successfully on patients from 1 to 45 years of age. The ideal age seems to be around 18 months. Residual chordee required repetition, 6 to 12 months later, in 4% of 285 patients managed in this fashion.
Fourteen untreated patients had typical chordee but the urethra was intact and the meatus was at the tip of the glans. In each instance the shortened urethra had to be divided as shown in Figure 3. The gap between urethral segments was bridged 6 to 12 months later.

Essentially the same method was employed for those unfortunates who had new urethra constructed elsewhere before all chordee had been corrected.

Nineteen untreated patients had chordee and 90° counterclockwise penile rotation. The urethral meatus was normally situated at the tip of the glans in two of these. The others had typical hypospadias.
HYPOSPADIAS

Torsion usually has been ignored in the past. Since some malrotation was created inadvertently in isolated instances, it was postulated and later proved that skin and fascia could be the etiologic factors, even in congenital cases.

Simple circumferential incision (Fig. 4), deep freeing at the penoscrotal juncture, appropriate counterrotation and reapproximation of tissues completely corrected all torsion in these 19 cases. But this should constitute an extra stage and should be deferred until at least 6 months after successful straightening.

After all chordee had been corrected, the urethral meatus was penile or penoscrotal in three fourths of the patients and scrotal or perineal in the others. Under no circumstances should additional urethra be constructed until the penis is truly straight, the displaced meatus is of adequate caliber, and at least 6 months have elapsed since the last operation. The ideal age for urethroplasty seems to be 4 or 5 years, depending on the growth of the phallus.
Modification I of Cecil urethroplasty. a. Location of incisions. b. New urethra constructed over 10 to 16 F indwelling catheter with continuous suture of 4-0 chromic catgut. c. New urethra buried in scrotum with interrupted 3-0 chromic sutures. c', Sutures are attached high on lateral aspect of corpora, and scrotal tissue is wrapped snugly against new urethra. d. Interrupted 4-0 chromic sutures reinforce approximation of glans and new meatus to scrotum. e. Skin closed with subcuticular suture of fine catgut. Original silk traction suture in glans helps anchor the indwelling catheter. (From Spence, H. M., Culp, O. S., Glenn, J. F., Hinman, Frank, Jr., and Marshall, V. F.: Panel Discussion: Anomalies of External Genitalia in Infancy and Childhood. J. Urol. 93:1-23 [Jan.] 1965.)

When the meatus is at or just distal to the penoscrotal juncture, the modified version of the Cecil operation shown in Figure 5 is employed. Penis and new urethra are freed from the scrotum after an interval of at least 2 months (Fig. 6).

If the meatus is on the penile shaft and well removed from the penoscrotal juncture (28% of all cases), a further modification of the Cecil principle is employed (Fig. 7). The penoscrotal portion is left unattached but it is imperative to bury at least 1 cm of intact urethra in the scrotum to avoid a fistula in the recess. The free penoscrotal angle greatly simplifies the second stage.

Deliberate termination of the urethra on the base of the glans poses no functional limitations. The urinary stream can be directed normally. Several patients in this
HYPOSPADIAS

Figure 6
Second stage. a. Incisions in scrotum are joined at the new meatus. b. With catheter or sound for orientation, urethra is freed from scrotum. c. Skin closed with silk, and drain left in independent portion of scrotum to avoid hematoma. (From Spence, H. M., Culp, O. S., Glenn, J. F., Hinman, Frank, Jr., and Marshall, V. F.: Panel Discussion: Anomalies of External Genitalia in Infancy and Childhood. J. Urol. 93:1-23 [Jan.] 1965.)

Figure 7
Modification II of Cecil urethroplasty. New urethra is constructed from pendulous meatus (a) over a catheter of suitable size (b) and a corresponding incision made in the scrotum. Some normal as well as new urethra (c) is buried in the scrotum in the manner described in Figure 5. (From Spence, H. M., Culp, O. S., Glenn, J. F., Hinman, Frank, Jr., and Marshall, V. F.: Panel Discussion: Anomalies of External Genitalia in Infancy and Childhood. J. Urol. 93:1-23 [Jan.] 1965.)
Modified Browne operation. a, Urine is diverted by perineal urethrostomy, and a central strip of skin is isolated. b, Mattress sutures of 4-0 nylon are placed around strips of 8 F rubber tubing, and skin edges are sutured with 4-0 chromic catgut. Top central insert shows resultant relationships of tissues. A through-and-through drain is inserted near penoscrota1 juncture for 3 days. c, Customary dorsal slit. (From Spence, H. M., Culp, O. S., Glenn, J. F., Hinman, Frank, Jr., and Marshall, V. F.: Panel Discussion: Anomalies of External Genitalia in Infancy and Childhood. J. Urol. 93:1-23 [Jan.] 1965.)

series are now proud fathers. Extending the urethra to the tip of the glans is fraught with hazards that more than offset any added cosmetic effect.

The two-stage Cecil-type operations have been preferred because they have eliminated persistent postoperative fistulas. If leakage occurs after removal of the catheter (1 week later), the long tract heals spontaneously. The second stage also affords an opportunity to add embellishments that otherwise might be ignored.

While on the staff of this hospital, I attempted to apply the Cecil principle to scrotal and perineal hypospadias by interposing a layer of deep scrotal tissue between new scrotal and new pendulous urethra. At first this was successful, but eventually urethrourethral fistulas prompted abandonment of this maneuver.

Attempts were then made to construct new scrotal urethra by the Thiersch-Duplay method at the time of straightening but, unfortunately, the meatus seldom stayed at the penoscrota1 juncture.
HYPOSPADIAS

Beginning early in 1951, the Denis Browne method was employed when the meatus was scrotal or perineal. The scrotal segment always healed but pendulous fistulas occurred in 30% of the cases.

By replacing the double-stop sutures with mattress ones of fine nylon placed around strips of 8 F rubber tubing, the incidence of persistent pendulous fistula was reduced to 15% (Fig. 8).

A through-and-through drain at the penoscrotal juncture for 2 or 3 days seemed to provide a better safety valve than did the original stab wounds.

Thirty-one patients required only meatotomy (Fig. 9). These had meatal stenosis, coronal hypospadias, and no chordee. Each had a distal opening or indentation which on probing communicated with a separate, vestigial, terminal urethra parallel to the one through which the urine passed. By crushing and dividing the intervening septum, the caliber of the meatus was increased bloodlessly without sacrificing any of the normal urethra.

Figure 9

a. Mild hypospadias with meatal stenosis but no chordee. b, Dimple on glans communicates with separate short channel parallel to normal urethra. c, Intervening septum crushed with mosquito clamp and (d) divided with scissors, thereby enlarging meatus (e) without sacrificing any urethra. (From Spence, H. M., Culp, O. S., Glenn, J. F., Hinman, Frank, Jr., and Marshall, V. F.: Panel Discussion: Anomalies of External Genitalia in Infancy and Childhood. J. Urol. 93:1-23 [Jan.] 1965.)
Table I
Status of 422 Hypospadiacs as of September 1, 1965

<table>
<thead>
<tr>
<th>Treatment completed</th>
<th>Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Successful urethroplasty</td>
<td>314</td>
</tr>
<tr>
<td>Required only meatotomy</td>
<td>31</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Treatment incomplete</th>
<th>Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Only chordee corrected</td>
<td>58</td>
</tr>
<tr>
<td>Too young for urethroplasty</td>
<td>17</td>
</tr>
<tr>
<td>Too soon for urethroplasty</td>
<td>8</td>
</tr>
<tr>
<td>Ready for urethroplasty</td>
<td>33</td>
</tr>
<tr>
<td>Urethra still buried in scrotum</td>
<td>11</td>
</tr>
<tr>
<td>Persistent complications</td>
<td>8</td>
</tr>
</tbody>
</table>

The present status of the 422 patients included in this review is summarized in Table I. Seventy-seven require further treatment for the reasons that are listed.

Although 314 have had successful urethroplasty, only 56% have not had further trouble (Table II). Twenty per cent had minor annoyances that were corrected without extra operations. Most of these were urinary fistulas that healed spontaneously or mild meatal strictures that were eliminated by simple dilatation.

Major complications necessitated additional surgical procedures in almost one fourth of all cases. But the magnitude of undesirable sequelae varied with the different basic techniques.

The new urethral meatus slipped posteriorly after 10% of the Cecil operations and after 17% of the Browne procedures. Any time the patient is unable to write

Table II
How New Urethra Was Constructed in 314 Cases

<table>
<thead>
<tr>
<th>Initial operation</th>
<th>Total</th>
<th>Initial operation</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cecil</td>
<td>Browne</td>
<td>Thiersch-Duplay</td>
</tr>
<tr>
<td></td>
<td>Modifi-</td>
<td>Modifi-</td>
<td>Usual</td>
</tr>
<tr>
<td></td>
<td>cation I</td>
<td>cation II</td>
<td></td>
</tr>
<tr>
<td>Number tried</td>
<td>314</td>
<td>144</td>
<td>80</td>
</tr>
<tr>
<td>No more treatment</td>
<td>175</td>
<td>81</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>(56%)</td>
<td>(56%)</td>
<td>(56%)</td>
</tr>
<tr>
<td>Minor trouble: no additional operations</td>
<td>65</td>
<td>32</td>
<td>20</td>
</tr>
<tr>
<td>Complications: additional operations</td>
<td>74</td>
<td>31</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>(24%)</td>
<td>(22%)</td>
<td>(19%)</td>
</tr>
</tbody>
</table>
HYPOSPADIAS

Figure 10

Revision of new meatus. When meatus retracts into scrotum (a) after first stage of Cecil-type urethroplasty, a new terminal segment (b) is constructed in conventional manner when penis is freed from scrotum. c. Skin usually is closed by the modified Browne method, scrotum is drained, and urine is diverted by perineal urethrostomy. (From Spence, H. M., Culp, O. S., Glenn, J. F., Hinman, Frank, Jr., and Marshall, V. F.: Panel Discussion: Anomalies of External Genitalia in Infancy and Childhood. J. Urol. 93:1-23 [Jan.] 1965.)

his name in the snow and have it legible, revision of the meatus is mandatory. This can be accomplished during the second stage of the Cecil plan (Fig. 10) but it requires an extra procedure after Browne operations.

Just about every conceivable type of fistula was created or was included in the 29 cases that were inherited in this condition. They varied from minute openings to multiple defects to loss of the entire pendulous segment. Variations and combinations of the modified Browne and Cecil principles were most dependable for closure of fistulas (Fig. 11).

Although fistulas became extinct after properly executed Cecil operations and more meticulous suturing around the new urethral meatus reduced the incidence of meatal retraction, meatal strictures became the counterpart in 15% of the patients. Once parents were supplied with plastic dilators and properly instructed regarding their use, the incidence of meatal stricture became negligible.

Sixteen patients had chronic strictures near the original meatus or at the new one when first seen. Most of these were complicated further by fistulas, sacculation,
Closure of fistulas. 

a. Defect is circumcised and adjacent skin freed. Incision is extended in both directions if necessary for adequate exposure. 
b. After perineal urethrostomy, deep tissues are closed with 4-0 catgut and (c) skin is closed with mattress sutures of nylon around strips of no. 8 rubber tubing. Larger fistulas are buried in scrotum. This may require attachment of mid-urethra (a'), proximal segment (b'), or distal portion (Fig. 7). (From Spence, H. M., Culp, O. S., Glenn, J. F., Hinman, Frank, Jr., and Marshall, V. F.: Panel Discussion: Anomalies of External Genitalia in Infancy and Childhood. J. Urol. 93:1-23 [Jan.] 1965.)

poor drainage, and persistent infection. Several pendulous segments of new urethra had to be sacrificed entirely. Construction of disproportionately large urethra, notably by the infamous Ombrédanne operation, required similar management. New urethra was constructed later in each of these cases.

Time precludes discussion of the numerous odd balls, ball-bearing females, and latest models of convertibles that were included in this series. Suffice it to say that 14% of the patients had at least one side of the "scrotum" empty and that orchiopexy was performed frequently during the straightening or the urethroplasty. The em-
HYPOSPADIAS

barrassing and tragic predicaments of yesteryear can be avoided today by buccal smears and allied studies on all genital enigmas soon after birth.

One pathetic and disheartening group will persist as long as surgeons digress from sound surgical principles and well-established procedures. Grotesque post-operative deformities produced by misconceived and maldirected efforts can be resolved only by excising offending tissues, trying to convert the hypospadias to some semblance of its original status, and starting anew with the type of repair that promises the most.

Admittedly, treatment of hypospadias and associated anomalies is challenging and demanding. At times it is frustrating and soul searching. But it also can be incomparably gratifying and rewarding, especially when a youngster beams with pride and announces in his own quaint way that he now can emulate his father in another important respect.

REFERENCE
