53 Single-Stage Versus Two-Stage Repair

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Abbreviations

CEDU	Chordee excision and distal urethroplasty
DYG	Double Y glanulomeatoplasty
LABO	Lateral based onlay flap
MAGPI	Meatal advancement and glanuloplasty technique
SLAM	Slit-like adjusted Mathieu
TIP	Tubularized incised plate

53.1 Introduction

In 1941 Higgins wrote, in a prophetic foreword:

> If, however, one could succeed in remodeling the urethra in one operation, the gain would be manifest (Humby 1941).

The first one-stage repair was performed "by mistake" by Russell of Melbourne in 1900 [1]. Humby (1941) [2], Broadbent et al. (1961) [3], Devine and Horton (1961) [4], and DesPrez et al. (1961) [5] were instrumental in popularizing the one-stage approach for the correction of hypospadias. Work by Asopa (1971) [6], Standoli (1979) [7], and Duckett (1980) [8], in which the preputial skin was used in a vascularized fashion for correction, further extended the use of one-stage repairs. By 1988, it was being suggested that all primary hypospadias should be repaired with a single-stage approach [9].

53.2 Aim of Hypospadias Surgery

The ultimate goal of hypospadias surgery is to have a *good-functioning and good-looking penis for 80 years of life and more*. It must be stressed that "good-functioning penis" is the first priority and means the ability to pass a normal straight stream of urine without straining or drippling or residual urine in bladder as well as normal sexual function with normal sensation, erection, and ejaculation. Ideally, the penis should look good, straight with a slit-like meatus at the tip of the glans and minimal scarring. It has become clear that achieving the ultimate goal is more important than the number of "planned operations" required to achieve this goal. How is this goal best achieved; in one stage, two, or three?

53.3 One-Stage Repair

One-stage procedures are undoubtedly attractive and desirable. They are associated with a shorter hospital stay and are more convenient for both patient and surgeon alike in the short term. This

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can be achieved in most distal forms of hypospadias with mild or no chordee. For glanular and distal hypospadias, the general concept is to perform a single-stage repair [10]. The most popular techniques are double Y glanulomeatoplasty (DYG, Chap. 19), advancement (Chap. 28), or meatal advancement and glanuloplasty technique (MAGPI, Chap. 20) for glanular hypospadias. For distal hypospadias, popular techniques include the slit-like adjusted Mathieu (SLAM, see Chap. 22), Thiersch (Chap. 24), and tubularized incised plate (TIP, Chap. 26). The lateral-based onlay flap (LABO, Chap. 30), tubularized incised plate (Chap. 26), and onlay island flaps (Chap. 31) are the common techniques used for proximal hypospadias without severe chordee.

Techniques that correct proximal hypospadias with severe chordee in one operation include the bilateral-based flap (BILAB, Chap. 32), Koyanagi (Chap. 36), and Yoke (Chap. 37).

53.4 Two-Stage Repair

Most surgeons nowadays favor two-stage repair for hypospadias with severe chordee more than 30°. They base their argument on several points:

Firstly, dorsal plication does not correct severe chordee adequately, and there is a high incidence of recurrence/persistence of chordee [11–14]. This necessitates division of the urethral plate and the use of two-stage grafts or flaps.

Also, one-stage methods have their technical limitations; thus, a specialized surgeon needs to master a number of unrelated repairs and has to be capable of the decision-making that goes with them. On the other hand, some two-stage procedures may be adapted for most deformities. Although this is true, most hypospadias surgeons agree that there is no place for the "occasional" hypospadias surgeon in the correction of so-called "minor" hypospadias. Surgeons should have a detailed understanding of the various concepts and surgical techniques and maintain a clinical workload that is sufficient to obtain consistently good results.

Other points of argument include the following: the circumferential meatus that results from some of the one-stage procedures is more liable to stenosis and puckering. Several centers reported unsatisfactory experience with the operative results in such patients managed with a one-stage repair [15–20]. Advocates of two-stage repair believe that the quality of the end results is better both psychologically and sexually than with one-stage procedures.

On the other hand, using a two-stage repair, in more than 500 cases, Durham Smith (1981) reduced his incidence of fistula formation to less than 3% [21]. Similarly, Greenfield and colleagues (1994) reported a urethral fistula rate of 2.5% with a two-stage modified Belt-Fuqua repair for severe hypospadias with chordee [17].

In conclusion, patients, with severe proximal hypospadias, chordee, and a small phallus will benefit from a two-stage procedure. In such children, a two-stage repair may offer a better cosmetic outcome and a lower complication rate than a one-stage repair with a free, vascularized, or composite graft.

The Thiersch-Duplay and the Denis Browne technique are described in the following section. Bracka's modification of the Nove-Josserand technique was described in Chap. 40.

53.5 Thiersch-Duplay Technique as Modified by Byars (1951) and Durham Smith (1981)

53.5.1 First Stage

In the first stage, a circumferential incision is made proximal to the coronal sulcus, the chordee is excised, and the penile shaft is degloved (Fig. 53.1). Failure to create a straight phallus is one of the avoidable complications of hypospadias surgery. Penile straightening and full removal of chordee must be confirmed by means of the artificial erection test. After securely placing an elastic band at the base of the penis, or using perineal compression, normal saline is injected with a 25-gauge butterfly needle placed in one corporeal body to fill the entire organ. This identifies any restraining fibrous bands that remain. Several tests may be necessary to ensure complete excision. If the penis remains bent despite resection of all chordee, an alternative

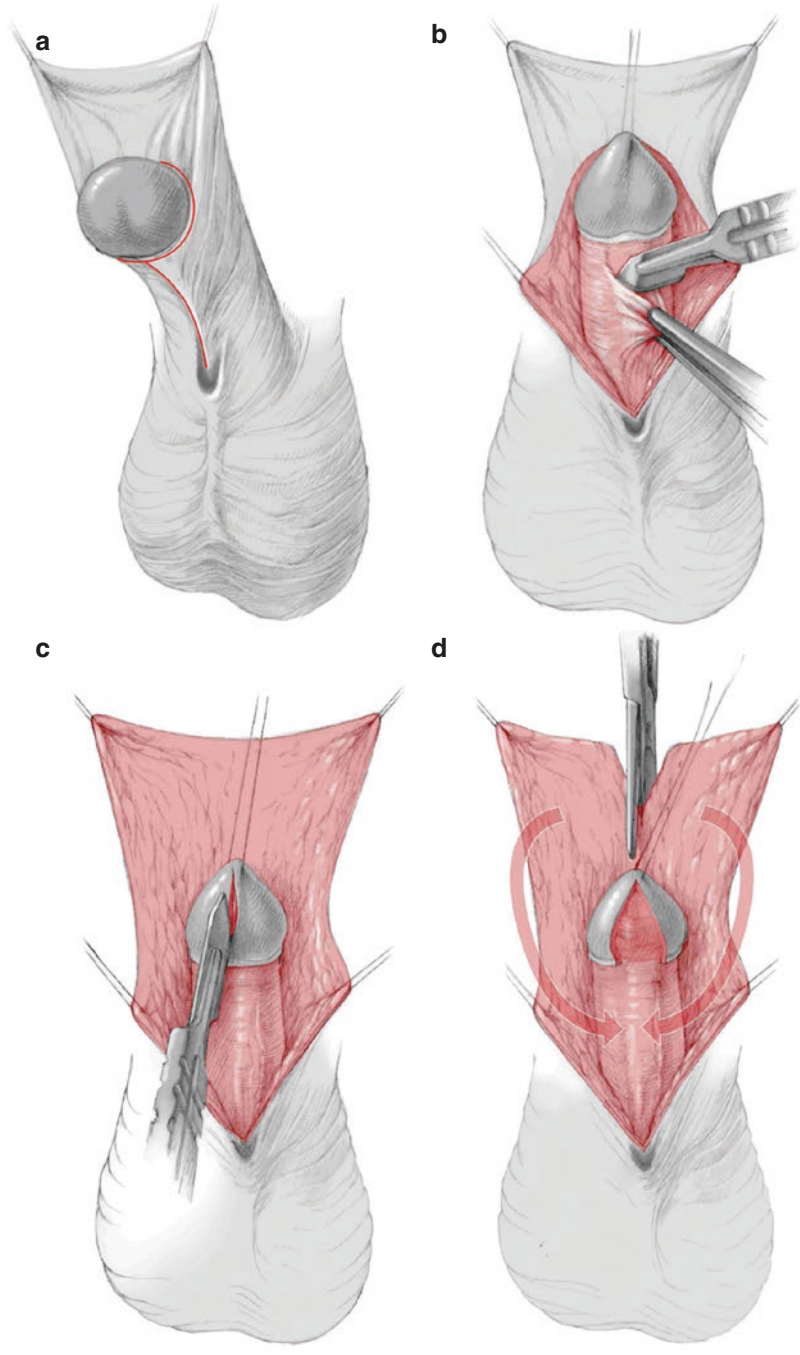

Fig. 53.1 (**a–k**). Thiersch-Duplay two-stage repair of hypospadias. (**a–e**) *First stage*: (**a**) A circumferential incision is made proximal to the coronal sulcus. (**b**) The chordee is excised, and the penile shaft is degloved. (**c**) The glans is divided deeply in the midline to the tip. (**d**) The dorsal foreskin is unfolded carefully and divided in the midline. (**e**) A midline closure is performed, and the midline sutures catch a small portion of Buck's fascia. (**f–k**) *Second stage*: (**f**) A 16-mm-diameter strip is measured, extending to the tip of the glans. (**g**) The strip is tubularized with a running subcuticular stitch of 6-0 Vicryl all the way to the tip of the glans. (**h**, **i**) A strip of skin (3–5 mm wide) is then de-epithelialized on one side to provide a raw surface of deep dermis. The medial edge of the shaved flap is brought across the buried urethroplasty and sutured to fascial tissue beneath the other flap (double breasting). (**j**, **k**) The skin closure is meticulously performed with nylon without strangulation to allow for the expected postoperative swelling

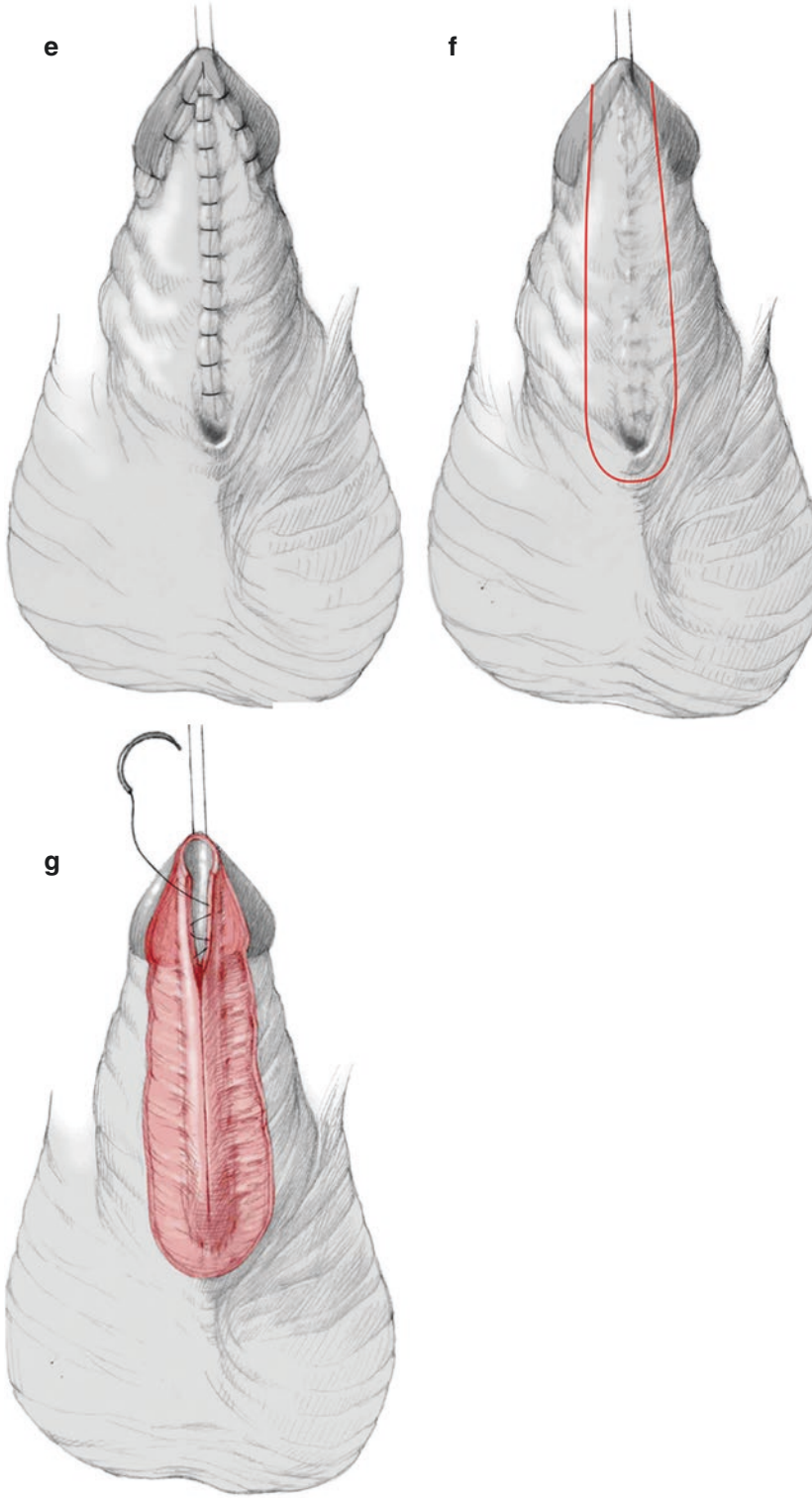

Fig. 53.1 (continued)

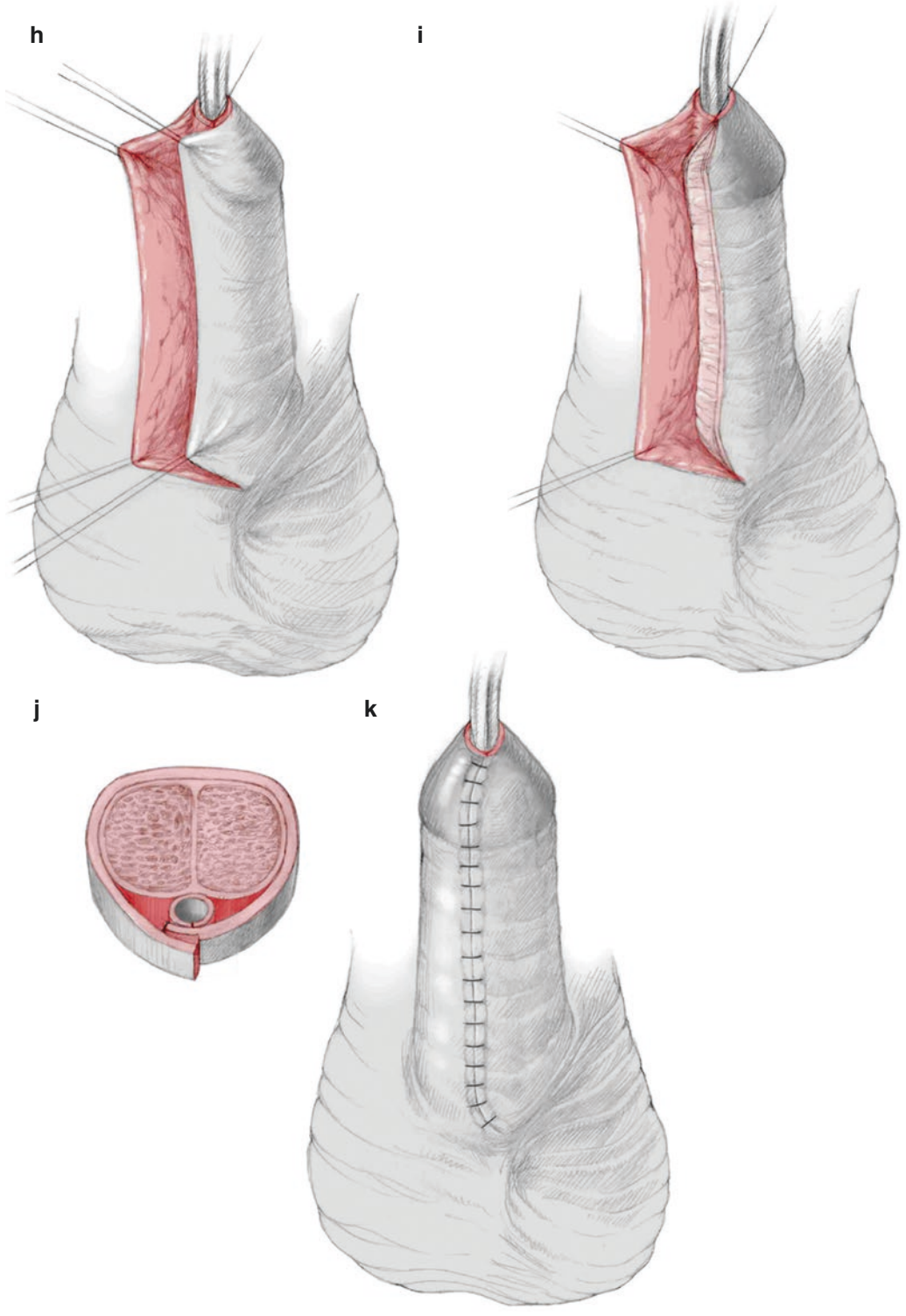

Fig. 53.1 (continued)

approach may be needed, such as insertion of a dermal or tunica vaginalis graft into the shaft or dorsal plication.

When it has been ascertained that the penis is straight, the glans is prepared. The glans is either divided deeply in the midline to the tip or, if the mucosal groove is deep, this is preserved and incisions are made just lateral to the groove on each side (Fig. 53.1c). The dorsal foreskin is unfolded carefully and divided in the midline (Fig. 53.1d). The most distal portion of the foreskin is rotated into the glanular cleft and sutured to the mucosa of the glans with interrupted sutures of 6-0 chromic catgut. A midline closure is performed, and the midline sutures catch a small portion of Buck's fascia. This eliminates dead space and helps to create a groove in preparation for the second stage (Fig. 53.1e). The bladder is drained with an F8 Silastic Foley catheter for approximately 5–7 days.

53.5.2 Second Stage

The second stage of the procedure is carried out 6–12 months later, when the tissues have usually softened sufficiently and healing is complete. The previously transferred preputial skin is used to reconstruct the glans and urethra. A 16-mm-diameter strip is measured, extending to the tip of the glans (Fig. 53.1f). The strip is tubularized with a running subcuticular stitch of 6-0 Vicryl all the way to the tip of the glans (Fig. 53.1g). Suture-line tension is reduced before closing this layer by generous mobilization and undermining of adjacent tissues.

A urine-tight anastomosis is made and inverted toward the lumen whenever possible. Eversion of suture lines increases periurethral reaction, which contributes to both urine leakage and potential fistula or diverticulum formation. The new urethra must be wide enough to avoid strictures.

53.5.3 Skin Closure

The lateral skin edges are mobilized, and the remaining tissue is closed over the repair in at least two layers. A strip of skin (3–5 mm wide) is then de-epithelialized on one side to provide a raw surface of deep dermis (Fig. 53.1h, i). This is achieved by cutting two or three fine longitudinal strips with a pair of small "curved-on" scissors. The medial edge of the shaved flap is brought across the buried urethroplasty and sutured to fascial tissue beneath the other flap (double breasting) (Fig. 53.1j, k). The skin closure is meticulously performed with nylon without strangulation to allow for the expected postoperative swelling. Penoscrotal transposition, if present, is usually repaired during this stage. A penile nerve block is used routinely.

53.5.4 Results

In 1994, Retik et al. reviewed their experience with two-stage hypospadias repair [15]. From 1986 to 1993, they treated 1437 children with hypospadias. Of those, 58 patients (4%) had scrotal or perineal hypospadias with severe chordee and a small phallus, often resistant to testosterone therapy, which was administered preoperatively as an ointment or parenterally. Those patients underwent a two-stage surgical repair. The use of added subcutaneous tissue or tunica vaginalis [22] over the neourethra in several instances achieved the goal of nonoverlapping suture lines and may have offered increased vascularity. The penile nerve block and transparent biomembrane dressing allowed for early postoperative mobilization. The authors reported excellent functional and cosmetic results. In their series, only 3 of 58 children (5%) developed a urethrocutaneous fistula. They believed that the final cosmetic outcome in these patients was superior to that in those who underwent a one-stage repair for less severe defects.

53.6 Denis Browne Technique

In the Denis Browne technique (Fig. 53.2), the first stage of surgery is as in the Thiersch-Duplay technique. The second stage is completed at about 4–5 years of age. At that time a perineal

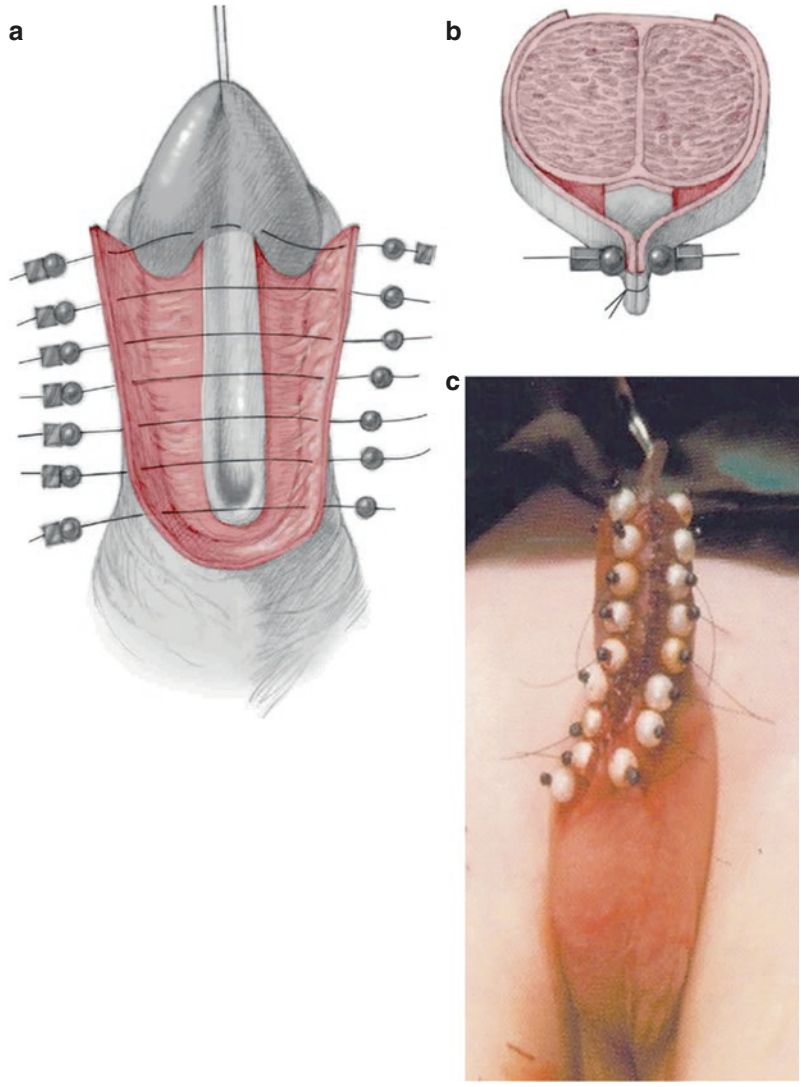

Fig. 53.2 (**a-c**) Denis Browne technique, second stage. Lateral skin flaps are approximated over the midline longitudinal strip of skin, which remains attached to the ventral surface of the penis. No catheter is placed over the buried strip of skin on the penis

urethrostomy is performed and a peripheral incision is made around a midline strip of skin on the ventral shaft of the penis, extending from the urethral meatus to the inferior portion of the glans. A small triangle of the ventral glans is denuded on each side of the midline. By combining wide undermining and a dorsal relaxing incision, lateral skin flaps can then be approximated over the midline longitudinal strip of skin, which remains attached to the ventral surface of the penis. No catheter is placed over the buried strip of skin on the penis. The perineal catheter is usually removed on the tenth postoperative day, thus allowing the perineal fistula to heal spontaneously.

Several points of surgical technique are important in this operation. First, an adequate urethral opening must be provided and the first-stage meatotomy is essential in most cases. Second, the dorsal longitudinal relaxing incision on the shaft

of the penis must not extend past the base of the penis onto the abdominal wall. Incisions on the shaft of the penis heal with wide, flat, pliable scar unless they encroach upon the abdominal wall. At this point, a hypertrophied, keloid-like scar will commonly occur and may cause a disappointing result. Third, the longitudinal strip of skin which is buried must be wide enough to allow circumferential growth of an adequate, new urethra. This may vary with the size of the patient but should never be less than 1 cm in width, even in a child. In an adult, this should measure 1.5 cm or more. Fourth, to prevent stenosis at this site during healing, the incision should extend well around the tube at the distal end of the normal urethra, leaving a circumferential cuff of normal skin measuring 4–6 mm in all directions. Fifth, the incisions made on the glans penis should extend distally as far as possible to elongate the urethra. This entire technique is simplified by bringing as much tissue as possible to the distal ventral surface of the penis and glans during the first stage of repair. Sixth, tension-relieving sutures should be used when the lateral flaps are brought over the buried strip of skin. Browne secured these sutures with glass beads and crimped metal sleeves so that if necessary the sutures could be loosened from time to time as edema occurred.

53.6.1 Results

The Denis Browne operation, while probably the most popular method to correct hypospadias in the 1950s and 1960s, was not perfect. Culp (1959) reported a series of complications requiring reoperation in 22–44% of all cases in which the Denis Browne technique had been used [23]. Most authors reported a 10–30% incidence of fistula formation. The usual complications of this operation consist of fistula formation, retrogression of the urethral meatus from the tip, and, occasionally, stricture formation. This technique is constructed on sound principles and will produce consistent results when meticulous technique is utilized. Sir Denis Browne considered any modification of his original procedure to be the cause of fistulae and failure. It is important that the relaxing sutures should not be left in place too long. The glass beads should allow at least 0.5 cm of suture free on each side at the time of application, and the beads should be broken and removed if edema begins to bury them in the skin. Culp (1959) modified this procedure by tying nylon mattress sutures over longitudinal bolsters of rubber tubing to cut down on necrosis of the skin caused by the small pressure points of the sutures [23]. All sutures should be removed in 7 days.

53.7 One and Half Stages Repair

Hadidi (2018) described the chordee excision and distal urethroplasty (CEDU) technique for perineal hypospadias with satisfactory results [24]. In this technique, he corrected the severe chordee, brought the foreskin ventrally from both sides, and reconstructed distal new urethra in one operation, leaving the original meatus in the perineum intact as a "natural perineal fistula." The perineal fistula is closed some 3–6 months later (Chap. 33).

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