Brazilian Journal of Urology
Official Journal of the Brazilian Society of Urology
Vol. 26 (3): 304-314, May - June, 2000

PENOSCROTAL HYPOSPADIAS

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ABSTRACT

Proximal hypospadias include proximal penile, penoscrotal, scrotal and perineal types in which the site of the urethral meatus is respectively the proximal third of the penis, root of penis, scrotum or between the genital swellings and below the genital swellings. Proximal hypospadias cause micturition problems besides limiting sexual intercourse and fertility, and require correction.

Newborn children with proximal hypospadias bearing ambiguous genitalia characteristics or associated with cryptorchidism must be better studied from the standpoint of sexual development prior to gender assignment and before the birth certificate is obtained. This evaluation should be multidisciplinary, consisting of tests such as sexual chromatin investigation, karyotype, stimulation test using chorionic gonadotrophin, pelvic sonographic screening and retrograde and urinary urethrocystography, and eventually biopsy of the gonad. In the remaining cases, parents should be assured of the neonate's gender, and the only medical concern while awaiting surgical repair is to make sure that no stricture of the urethral meatus exists that may cause micturition difficulties.

Optimal age for hypospadias repair is between eight and 12 months of age. At that stage, the size of the penis is almost equivalent to that of a three year old child, and the trophic conditions of the skin allow a high degree of safety during operation.

Multiple principles rule the techniques used in hypospadias correction. This article will describe these principles and the authors' experience with some techniques for penoscrotal hypospadias repair.

Key words: hypospadia, penoscrotal hypospadias, indications, surgical techniques
Braz J Urol, 26 (3): 304-314, 2000

INTRODUCTION

Male hypospadias is a congenital anomaly, which affect different structures of the penis and eventually the scrotum and perineum. A wide range of types of hypospadias can be observed according to the original site of the opening of the urethral meatus and to other associated deformities. They are found in varying configurations that range from an aspect of ambiguous genitalia to a well-formed penis with a superficial defect.

Hypospadias is a common congenital anomaly and its incidence in Brazil has been calculated as 1:565 live male birth (1).

Some penile anomalies, often associated with hypospadias, are related to cosmetic and functional aspects of the penis (2). When in erection it is considered a significant ventral curvature of the penis (chordee) a deflection angle of the shaft of the penis greater than 20 degrees (3). In proximal hypospadias, the ventral curvature is often caused by fibrous chordee. Chordee is formed by residual fibrous tissue of the corpus spongiosum and is located on the ventral urethra, distal to the urethral meatus, in close contact with the tunica albuginea. Other significant causes of the ventral curvature began to be better defined with the introduction of the artificial erection technique (3). The cutaneous chordee arising out of the asymmetric distribution of the skin around the penis can originate some degree of curvature both in distal and in proximal hypospadias. Also, there can be an asymmetry of the tunica albuginea, which accounts for the permanence of the curvature despite the excision of the entire fibrous chordee (4). Other

uncommon cause of penile curvature is the growth differential between the corpora cavernosa and the corpus spongiosum.

In proximal hypospadias, the prepuce is asymmetric, accumulating on the dorsum of the penis and being deficient on the ventral segment. The prepuce may be normal in distal hypospadias in up to 7% of cases. Urethral meatus stenosis is less frequent in proximal hypospadias, where it is observed in about 15% of cases. Axial kicking of the shaft of the penis occurs in 14% of patients, and is not dependent on the degree of hypospadias.

Proximal hypospadias are a less common occurrence and correspond to 20% of total hypospadias. Proximal hypospadias are usually associated with scrotal malformations, such as penoscrotal synaechia, hypoplasia, bifid scrotum and high scrotum implantation.

The most commonly used classification of hypospadias is Barcat's, and it is based on the location of the urethral meatus after correction of the associated curvature of the penis. Proximal hypospadias include proximal penile, penoscrotal, scrotal and perineal types in which the site of the urethral meatus is respectively the proximal third of the penis, root of penis, scrotum or between the genital swellings and below the genital swellings.

Proximal hypospadias cause micturition problems besides limiting sexual intercourse and fertility, and require correction. Moreover, non-treated hypospadias put the patients at risk emotionally, regarding acceptance of their own body image, through the transference of parents' anxiety or the acknowledgement of the condition by friends or a sexual partner, which leads to embarrassing situations (5).

PATIENT PREPARATION

Newborn children with proximal hypospadias bearing ambiguous genitalia characteristics or associated with cryptorchidism must be better studied from the standpoint of sexual development prior to gender assignment and before the birth certificate is obtained. This evaluation should be multidisciplinary, consisting of tests such as sexual chromatin investigation, karyotype, stimulation test using chorionic gonadotrophin, pelvic sonographic screening and retrograde and urinary urethrocystography, and eventually biopsy of the gonad.

In the remaining cases, parents should be assured of the neonate's gender, and the only medical concern while awaiting surgical repair is to make sure that no stricture of the urethral meatus exists that may cause micturition difficulties. Exceptionally, a meatotomy may be necessary.

Optimal age for hypospadias repair is between 8 and 12 months of age. At that stage, the size of the penis is almost equivalent to that of a 3 year old child, and the trophic conditions of the skin allow a high degree of safety during operation. Children at that age suffer much less emotionally during the postoperative period than do older children and, as a consequence, parents' anxiety is also alleviated (2). During that period children are still in diapers and have not been exposed to other people's observation. Still more important, in case of complications that require reintervention further correction can be carried out sometime before the second year. At about this time the genital awareness begins and the child becomes more prone to psychological problems.

POSTINFORMED CONSENT

Parents must be informed with regard to prospects of success, care and inconvenient that involve the postoperative period, occurrence of complications associated with the repair of hypospadias and its treatment. In countries where this is customary the information should be provided to parents in written and contain the respective signatures of consent.

PREOPERATIVE PREPARATION

Preoperative laboratory tests are the basic required for this type of surgery. An ultrasonographic screening of the urinary tract is essential to rule out associated anomalies.

Preparation of the skin is obtained by washing it extensively with an iodized germicide solution (1%

active iodine) and saline, from some centimeters above de umbilical scar to the knees, including the entire perineum. The germicide solution is removed with pads and the desinfection is concluded with the topical use of the same solution.

INSTRUMENTATION

The suture material employed should be atraumatic; monofilament sutures are preferable (PDS or Vycril 6-0). The surgical material consists of the delicate instruments used in plastic surgery. Often a loupe is utilized with magnification at 2.5 power and a large focal length, which offers a detailed field of vision during surgery. The glans is fixed with nylon 5-0 suture to facilitate presentation of the penis throughout surgery.

DESCRIPTION OF SURGICAL PROCEDURES

Multiple principles rule the techniques used in hypospadias correction. We will indicate some examples, since it is impossible to mention here all the techniques described. The first reports of hypospadias surgery date back to the second century. Techniques proposing neourethroplasty via a dermal graft, extending from the urethral meatus to the glans, date from 1836, when Dieffenbach, and, later, Duplay, with 2 lateral incisions brought together the edges of the urethral floor to form a new urethra. In spite of initial failures, for the first time valid principles of the hypospadias surgery were employed (6).

At that period the correction of the ventral curvature by excision of the fibrous chordee began to be recognized. The concept of treating the ventral curvature at an initial and isolated stage (orthophaloplasty) became a dogma for all degrees of hypospadias (7).

Smith (8), in 1973, modified Duplay's technique proposing the coverage of the neourethra with a de-epithelialized skin flap, thus considerably reducing the incidence of urethrocutaneous fistula (9).

Devine & Horton (6) used a preputial skin graft after release of the fibrous chordee in a single procedure and reported good results with one-stage repairs. Hodgson (3) and, later, Asopa & Asopa (11) utilized the prepuce in the construction of the neourethra and to bridge the cutaneous defect of the urethral ventrum. Although the graft of the mucosal surface had the shape of an island its pedicle was not dissected but was brought along with the cutaneous surface of the prepuce onto the urethral ventrum. The advantage of this technique over the technique previously described lies in that the blood supply to the same tissues does not suffer interruption.

Duckett (12) suggested the use of a preputial island flap, where the preputial mucosa used to form the new urethra has a well-individualized pedicle containing superficial dorsal penile vessels and, when dissected to a certain extent, allows the neourethra to be advanced to the urethral plate without traction of the pedicle (Figure-1). With this technique the cutaneous surface of the prepuce becomes less vascularized and the tailoring of the skin around the penis using the Blair-Byars technique is more difficult.

Asopa & Asopa (11) devised the double-faced preputial island flap which consists of an adjacent skin flap covering the mucosal flap which serves as the new urethra, both being maintained by the same pedicle. The cutaneous surface graft is thus very well vascularized and when advanced along with the neourethra to the urethral ventrum permits a uniform distribution of the skin around the penis.

Considering hypospadias globally, to the present more than 300 original techniques and their variations have been described for its correction. The ultimate goal of hypospadiology is to achieve a normal penis regarding both function and morphology.

In the 1980s distal hypospadias began to be repaired in one procedure. At a later period, one-stage techniques were adopted for the correction of more complex hypospadias (13). In 1984 we began to use the Double Preputial Island Flap procedure (DIF) in substitution to the Preputial Island Flap as this technique ensures a better vascularization of the skin flap employed in the coverage of the ventral raw surface and allows a more homogeneous skin distribution around the penis.

The utilization of one-stage techniques became more popular as surgeons gained experience

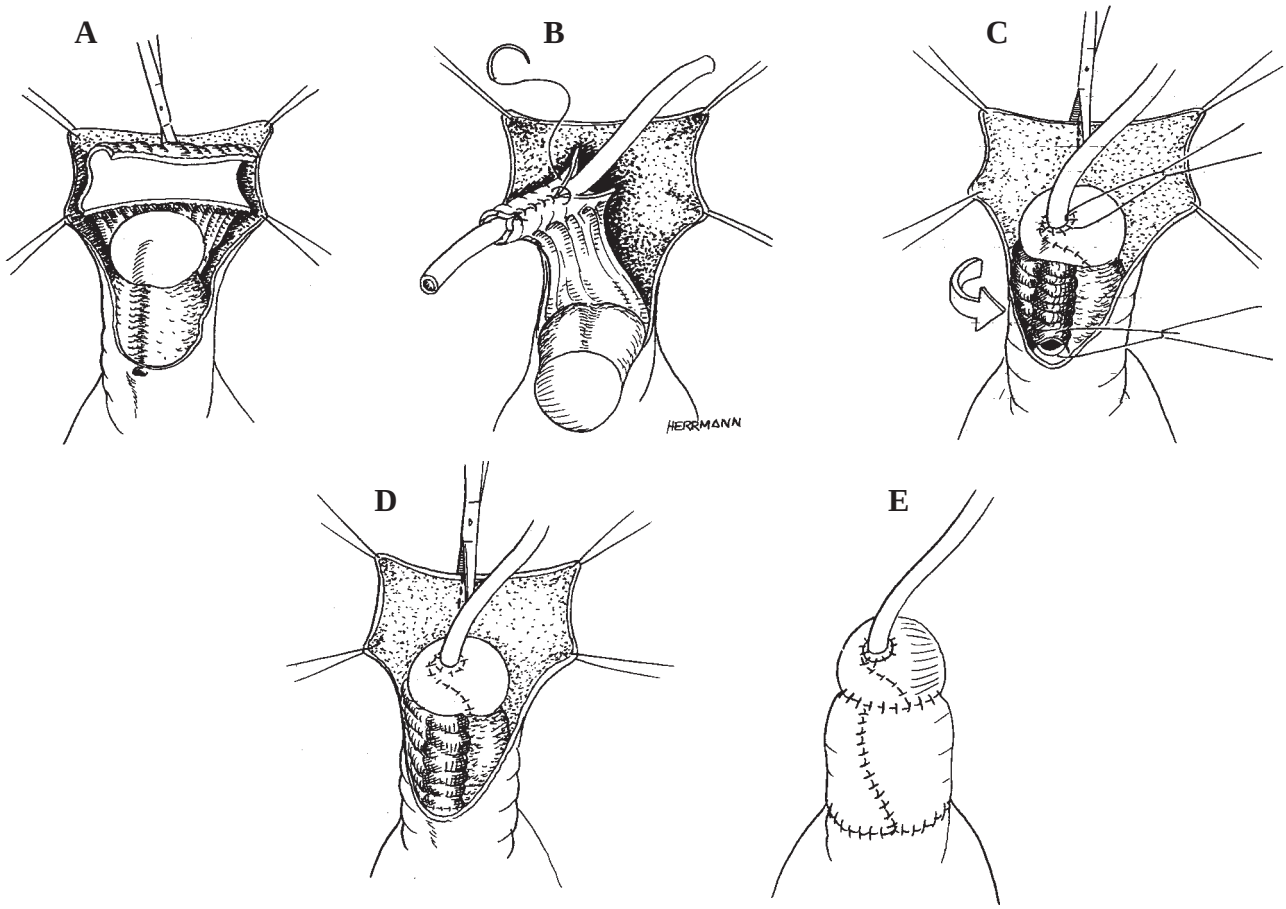

Figure 1 *- Schematic representation of island flap procedure.*

with these procedures, and the results obtained proved to be satisfactory. Familiarity with these methods represented an additional resource for electing the procedure that best applies in each individual case.

In March 1985 we began to perform on the cutaneous aspect of the preputial island double-flap (14,15), similar to the technique used by Smith (8), the de-epithelization of two rectangular strips close to the proximal and contralateral edges of the pedicle. Another tissue plane was created to offer a better protection against the formation of urethrocutaneous fistulas (Figure-2). With this method we were also able to avoid the depression that may occur between the neourethra and the corpus cavernous on the opposite side of the pedicle. Besides, it was possible to use the redundant skin from the cutaneous portion of the double island flap. After the modification introduced by us, this procedure is now called the Modified Preputial Island Double-Flap operation (MDIF). Later on, the application of the MDIF surgery was extended to include scrotal and perineal hypospadias, and the technique was further developed by adding to it the tubularization of the urethral plate up to the base of the penis, according to Duplay's technique (Figure-3).

More recently, due to the incidence of stenosis at the level of the anastomoses, and to the occurrence of urethrocutaneous fistulas, we have focused our attention on the preservation of the urethral plate. Despite the presence of 2 suture lines, the flaps are fixed to the spongiosum, which is a very well vascularized tissue and ensures a much lower incidence of fistulas. At the same time, circular sutures no longer exist at the level of the anastomoses, minimizing the risks of scar retraction and of meatal stenosis or proximal anastomotic strictures. Moreover,

the neourethra stands well rectified which makes easier an eventual catheterization.

The preservation of the urethral plate applies to hypospadias: 1)- without penile bend; 2)- with penile curvatures caused by cutaneous chordee; 3)- with mild penile curvatures by fibrous chordee which can be excised below the urethral plate; 4)- with moderate curvatures or residual bends caused by fibrous chordee or by asymmetry of the tunica albuginea where the contralateral plication does not significantly reduce the size of the penis. If necessary, the surgeon should not hesitate to discard the urethral plate in order not to shorten excessively the penis. Concerning this decision it is important to emphasize that performing the artificial erection is essential not only at the beginning of the procedure but especially during surgery.

Often, the tip of the hypospadic urethra is hypoplastic, which only conceals a more severe degree of hypospadia. Since this is a poorly vascularized tissue, not fitted for the anastomosis, it should be discarded and the urethra cut back to good spongiosum.

For more than one decade and a half we have being repairing all types of hypospadias, regardless of their degree in one operation. Techniques in 2 or 3 stages are reserved to patients previously submitted to surgery in whom the preputial hood is not available and that require us to adapt to existing conditions.

Operative Act for Correction of Proximal Hypospadias without Preservation of the Urethral Plate (Figures-2 and 3)

A circular incision is made distally to the urethral meatus, approximately 3-mm from the glans neck, and the fibrous chordee is excised on the urethral plate obtaining a progressive straightening of the penis. If a significant curvature still persists, by asymmetry of the tunica albuginea we proceed to plicate it on the dorsum of the penis, thus achieving the straightening of the organ. With the assistance of stitches, we present and outline with stain a horizontal rectangle on the mucosal surface of the prepuce which will constitute the neourethra with a length that will extend from the new position of the urethral meatus to the apex of the glans and whose caliber will equal that of the normal urethra. Superficial incisions are made following the previously drawn lines, deep enough to allow tubularization of the new urethra. The neourethra is created over a 6F plastic catheter. Several interrupted sutures are used on the edges of the neourethra; care must be taken to leave them spatulated. The neourethra is completed using a continuous suture. Afterwards, a rectangle is outlined on the cutaneous portion of the prepuce keeping the same direction as the coverage of the neourethra and raw surface of the urethral plate. As a reference we use the glans neck which represents the inferior side of the rectangular flap. After incising the skin, we proceed to dissect the pedicle responsible for the vascularization of the preputial island double-flap immediately below the superficial fascia, towards the base of the penis. The other dissection plane of the pedicle is right above de deep fascia of the penis, close to the tunica albuginea of the corpora cavernosa. The pedicle thus defined and which contains the penile superficial dorsal vessels is dissected to a sufficient extent permitting the preputial island double-flap to pass without any tension to the urethral plate, parallel to the shaft of the penis. Then the proximal anastomosis is made between the neourethra and the urethra, both espatulated, using interrupted sutures over a urethral catheter. Next, the distal anastomosis is made between the neourethra and the glans. The technique proposed by Devine & Horton is preferred; according to this method, 3 flaps are created originating from the V or Y-incision of the glans; the distal flap is incorporated to the distal end of the neourethra and the other 2, lateral, cover it. In the MDIF technique 2 strips of approximately 4 mm are outlined with stain on the inferior portion of the preputial island double-flap and on the margin contralateral to the passage of the pedicle relatively to the shaft of the penis. Both segments are de-epithelialized with a scalpel and/or iris scissors and then sutured laterally to the deeper fascia of the penis and proximally to the subcutaneous cellular tissue covering the anastomosis. Then the skin is closed and sutured to the mucosa of the glans neck at the correspondent points.

In patients with scrotal and perineal hypospadias, a Duplay-type neourethroplasty is

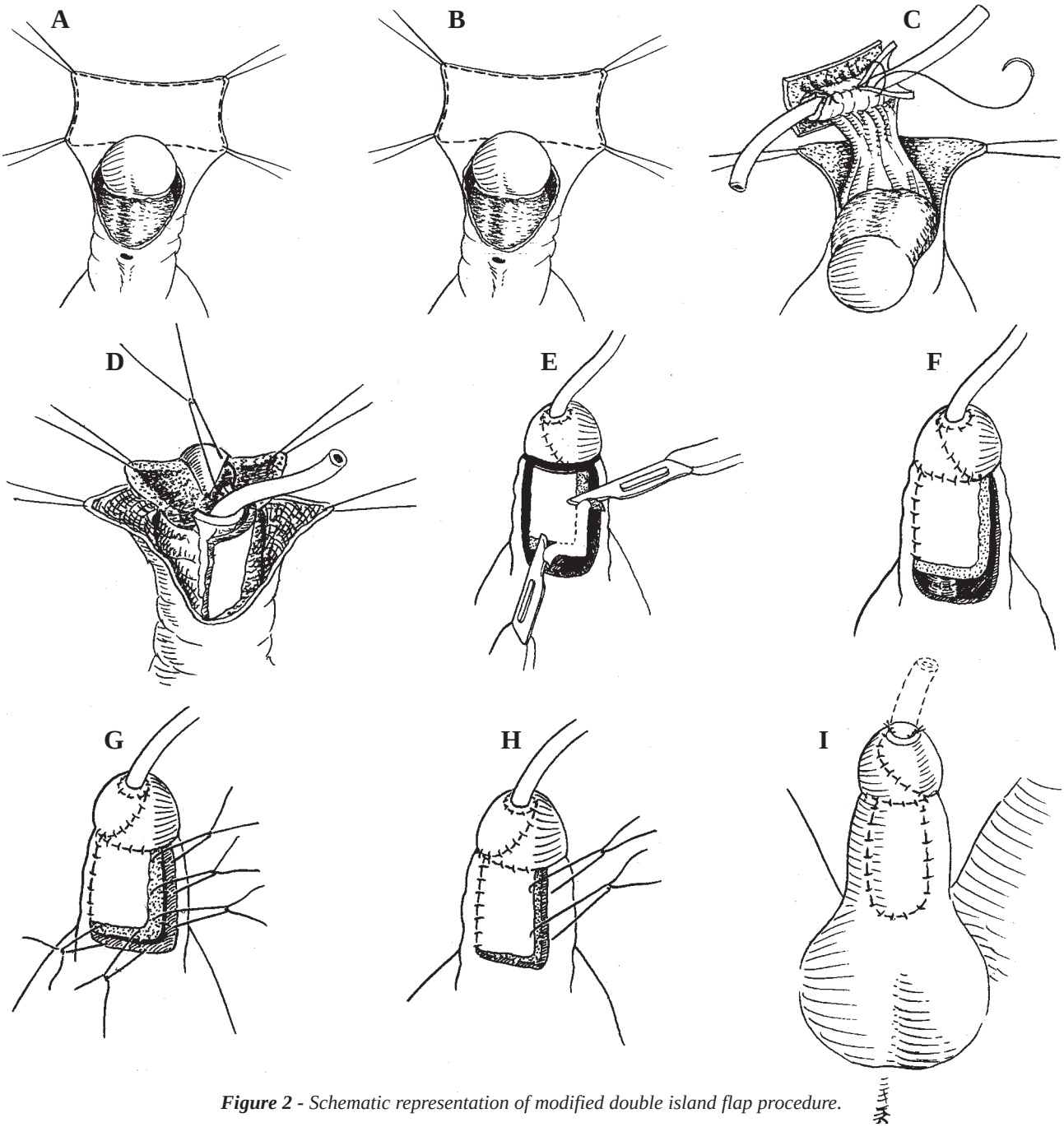

Figure 2 - *Schematic representation of modified double island flap procedure.*

performed, beginning at the urethral meatus and extending up to the base of the penis, thus allowing the neourethra made using the preputial mucosa graft to be sufficiently long to reach the tip of the glans. In these cases, the proximal anastomosis is made between two neourethras.

Operative Act with Preservation of the Urethral Plate (Figure-4)

We will point out only the aspects that distinguish this procedure from the method previously described.

The incision of the skin is circular and made on its dorsal and lateral aspects 3 mm from the glans neck. It is U-shaped on the urethral plate and surrounds the urethral floor. In order to avoid any accidental lesion to the urethra, next to the meatus, we recommend injection of normal saline using a fine needle (insulin needle) to achieve separation of adherent skin from the urethra. If exists a curvature caused by cutaneous chordee this is corrected after the incision of the skin. When the bend is moderate, regardless of the cause, it can be eliminated by plicating the dorsal tunica albuginea on each side relatively to the neurovascular bundle. When fibrous chordee is responsible for the curvature it can be excised laterally and inferiorly to the urethral plate. If a slight bend caused by fibrous chordee or asymmetry of the corpora cavernosa still persists the dorsal plication may be associated. However, when the remaining curvature is significant and due to the urethral plate, the latter should not be preserved and the technique previously described above is utilized.

Next, the preputial mucosal island flap is delimited and once it has been sutured to the mucosal plate it will form the neourethra. For this reason, it has the same length as the urethral plate but is narrower. The width of the flap associated with the width of the urethral plate should offer a neourethra whose diameter is the same as that of the normal urethra. The preputial skin island flap is delimited and the dissection of the pedicle is carried out as previously described.

After bringing the preputial island flaps to the urethral plate and placing the pedicle alongside the shaft of the penis, the mucosal flap is incorporated to the urethral plate with continuous sutures beginning at the urethral meatus and initially lying on the same side of the pedicle. The next steps are identical to what has been already described.

POSTOPERATIVE CARE

Postoperative care is mainly related to drainage of urine and to dressing.

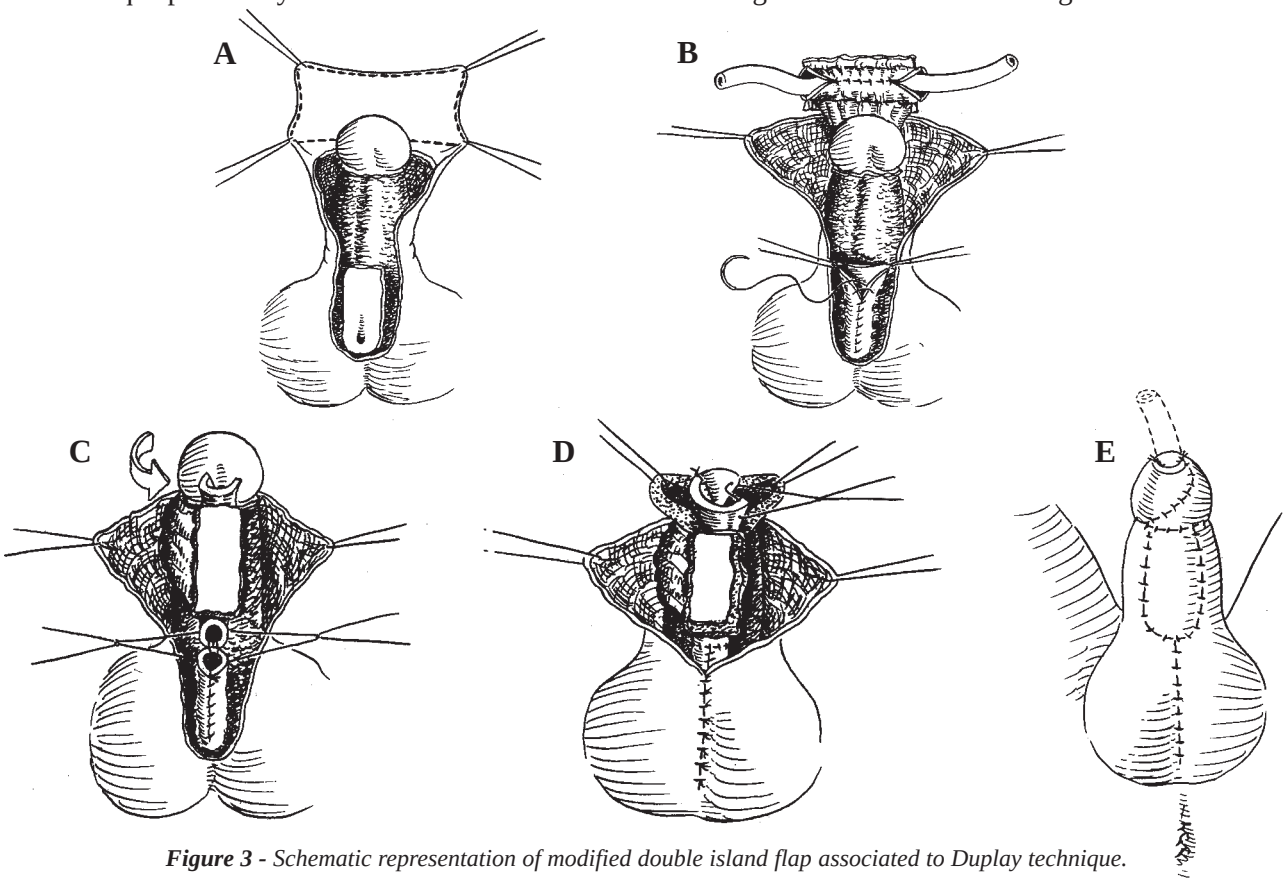

Figure 3 *- Schematic representation of modified double island flap associated to Duplay technique.*

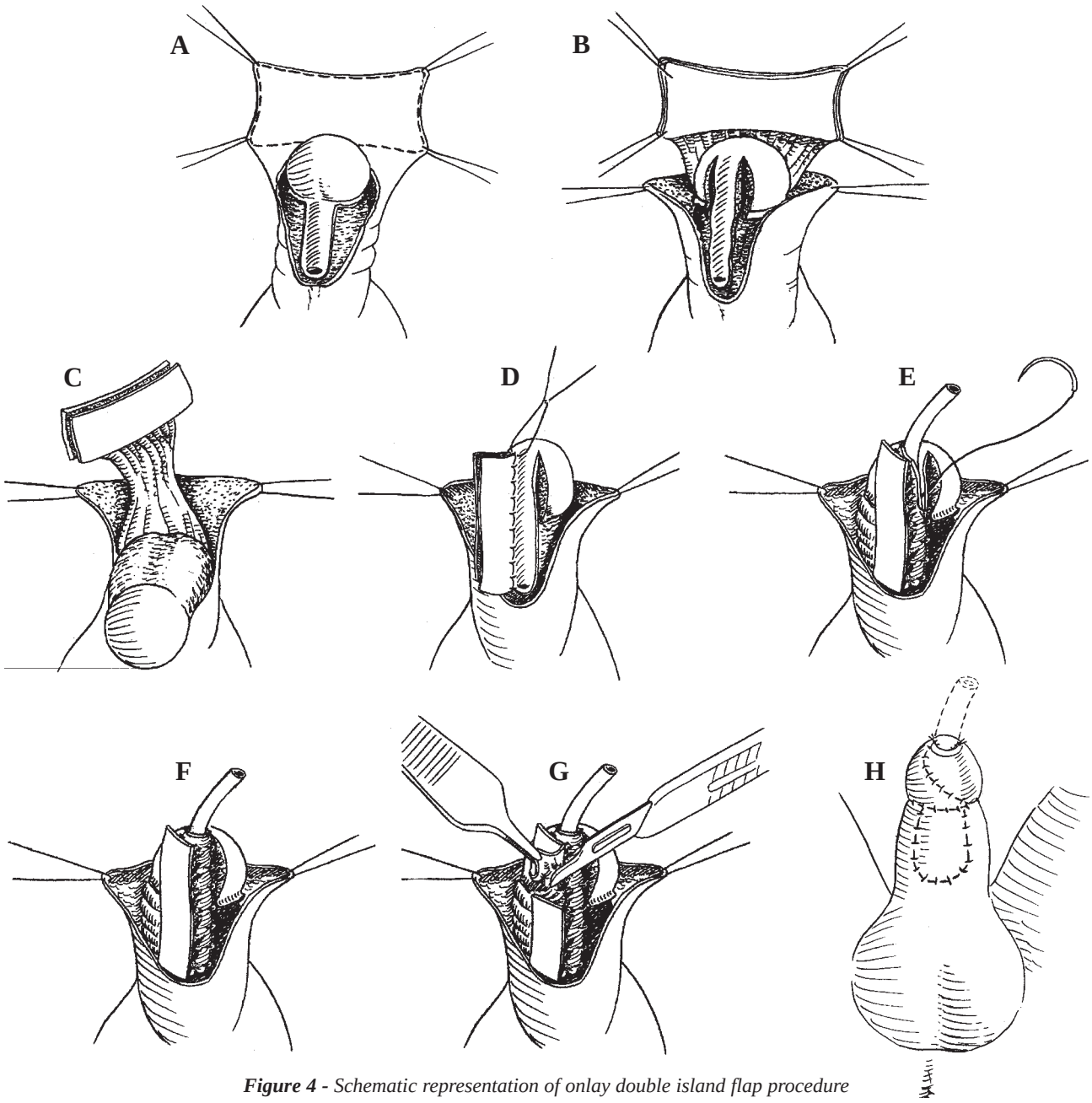

Figure 4 *- Schematic representation of onlay double island flap procedure*

In proximal hypospadias urinary drainage is necessary. The most commonly employed methods of urinary drainage are the urethral catheter, either continent or incontinent, and the suprapubic catheter (Figure-5).

In children still in diapers we prefer to leave the internal end of the urethral catheter in the bladder and to section the external end, fixing it to the glans. The urine drips continuously into the diaper. Another common alternative used by other surgeons is to leave the external end longer and allow it to drain between 2 diapers.

In older children, that no longer use diapers, the internal end can be left in the bulbous urethra in order to maintain the child continent, and the urine is eliminated through the catheter only during mictu-

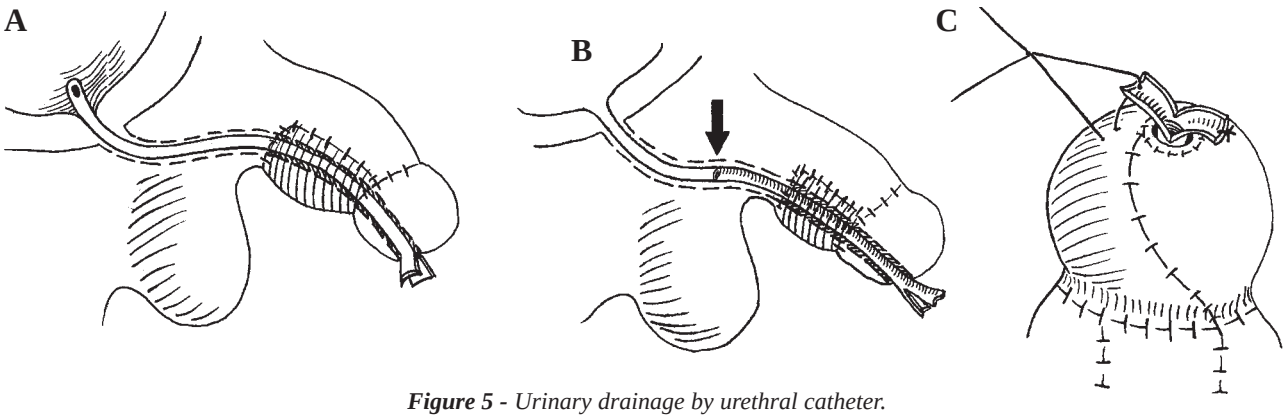

Figure 5 - *Urinary drainage by urethral catheter.*
A) *incontinent urinary drainage*
B) *continent urinary drainage*
C) *Both in continent and incontinent drainage, the end of the catheter is opened and fixed bilaterally to the glans with stitches*

rition. The urethral stenting avoids excess pressure inside the neourethra and ensures the drainage of eventual secretions.

The suprapubic catheter method is also often used and permits the introduction of larger caliber stents than it is possible via the urethra. However, with relative frequency it can cause spasms and undesirable urethral micturitions. In fact, the choice depends on the surgeon's preference.

Dressings should provide more immobilization than compression. If an incontinent urethral catheter is used, the best option is a bio-occlusive dressing that provides a good aeration but protects the surgical wound from permeation of bacteria or urine. This dressing is transparent and the surgical wound remains visible. With the suprapubic catheter a dressing with a layer of rayon or vaselinated gauze may be used with Coban (autostatic elastic dressing) to maintain it in position.

The surgical wound must be kept clean to prevent infections and gauze dressings should be changed every 2 to 4 days or simply be removed after a week in the case of a plastic dressing.

RESULTS

Cosmetic and functional results of one-stage repairs of proximal hypospadias are better than the results obtained with multistage corrections. Moreover, single-stage operations represent less physical and psychological discomfort for the patients who can have their problem solved with only one surgery. To parents it means fewer days of leave from work to accompany their child during the treatment. Consequently, costs of treatment are likely to be lower. Secondary procedures considered, we obtained good final plastic and functional results, in respectively 89.5 and 94.7% of patients with a surgery ratio of 1.7 per patient, using the DIF and MDIF techniques, either associated or not with a Duplay-type urethroplasty for the scrotal or perineal segments. The preservation of the urethral plate added to a significant improvement of results.

COMPLICATIONS

The incidence of complications of proximal hypospadias repair is far larger than with distal hypospadias. Perhaps for this reason proximal hypospadias should be corrected only by experienced surgeons in the treatment of hypospadias.

Generally, complication rates of penile, scrotal and perineal hypospadias correction have been similar. Therefore, the addition of the DIF or MDIF techniques for the penile segment to the Duplay-type urethroplasty for the scrotal and perineal segments did not contribute to an increase of complication rates. The incidence of urethrocutaneous fistulas and of stenosis of the anastomoses observed with the preservation of the urethral plate was considerably lower than with

tubular neourethras. In spite of the existence of two suture lines these are between well-vascularized tissues and a circular suture of the anastomoses is absent; the anastomoses, although left espatulated, tend to suffer scar retraction and stenosis.

Vascularization of the island flap was considered adequate in 92% of cases, and when considered inadequate in none of the cases the outcome was total necrosis of the island flap. However, it may occur and it is a most feared possibility as it eliminates the best source of tissue there is for the correction of hypospadias.

Necrosis of the dorsal and lateral skin occurred in 4% of cases and was probably due to the dissection of the superficial plane of the pedicle too close to the skin, compromising the intradermic vascularization and resulting in suffering of the blood supply.

Difference in results between the DIF and the MDIF methods was mainly the decrease in the incidence of urethrocutaneous fistulas by 50% (from 58 to 29%). Almost all urethrocutaneous fistulas could be repaired through fistulorrhaphy using the Smith-Belman technique, with insertion of a de-epithelialized cutaneous flap and creation of an intermediate plane, which minimizes the risk of fistula recurrence. The fistulorrhaphies were performed on an outpatient basis without necessity for postoperative bladder drainage.

Stenoses are a more serious complication than fistulas for depending on their degree they may affect the bladder and the upper urinary tract if their treatment is delayed. The incidence rate of stenosis of the anastomosis found with both the DIF and the MDIF methods was 9%. When possible, the stenosis may be treated by internal ureterotomy or using the Mickulicz technique (longitudinal incision and transversal suture). However, without a logical explanation, there was a 30% incidence of neomeatus stenosis with the MDIF technique against 9% for the DIF technique. Dilation of the urethral neomeatus can be initially tried but recurrence rates are high. The treatment we favor as a routine procedure is the meatoplasty, which can be distal and/or proximal. One should not hesitate when it comes to treatment of neomeatus stenosis because besides a larger incidence of urethrocutaneous fistulas it can cause dilation of the neourethra and allow its ballooning.

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Received: March 22, 2000
Accepted: April 22, 2000

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