

Lateral Based Flap with Dual Blood Supply: A Single Stage Repair for Proximal Hypospadias

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ABSTRACT

Objective: To describe a simple technique for proximal hypospadias repair in one stage. This technique combines the advantages of transverse preputial island flap and Mathieu techniques and has dual blood supply.

Patients and Methods: Over a 6 year period, 49 boys with proximal hypospadias underwent repair using the lateral based (LB) flap technique. Age ranged from one to three years. The new technique employed the use of skin lateral to the meatus and extends into the outer preputial skin. Thus the flap enjoys a dual blood supply from the base and also from the preputial blood supply. Y-Flap was employed for glanuloplasty to have a terminal wide apical meatus. A V was excised from the distal end of the tube to have a slit like meatus. The presence of chordee was not a contraindication, as the flap is taken lateral to the midline after chordee excision. Follow-up period ranged from 6 months to 6 years (mean 39 months).

Results: Satisfactory results were obtained in 43 patients (88%). Five patients developed fistulae. One patient suffered from distal glanular disruption but intact urethroplasty. Four fistulae responded to simple closure and the fifth required y-v glanuloplasty in addition for fistula closure. There were no incidence of proximal stenosis, diverticulum or urethral stricture.

Conclusion: The lateral based (LB) flap is a technique that permits single stage repair of proximal and severe forms of hypospadias with good success rate (88%). It has the advantage of providing a robust flap with double blood supply. The other advantage is to allow extensive excision of chordee in patients associated with severe chordee. Longer follow up is essential for final evaluation of the technique.

INTRODUCTION

Hypospadias is a common congenital anomaly. In the United States, it was reported as the most common anomaly among whites with an incidence of 33 per 10,000 live births [1]. Repair of severe hypospadias in one stage is among the most difficult challenges a reconstructive surgeon may face. Most procedures in the past relied on

several stages, each of which had its own complication risks [2]. More recent attempts have relied on multiple stages or combinations of other well-described repairs. However, repairs each designed for a specific purpose may not necessarily be easily combined. The combination of different techniques also often introduces another anastomosis to heal and another potential location for complications to occur.

In the attempt to solve this dilemma for patients with severe hypospadias, a repair with dual blood supply would offer many advantages. Two of the most common categories of hypospadias repairs are paramental-based flaps and transverse preputial island pedicle flaps. Each flap has a rich blood supply from the dorsal or ventral aspects of the root of the penis. Therefore, these two types of procedures seem to be an ideal combination of repairs to correct severe hypospadias. With these concepts in mind, the lateral based (LB) flap repair was conceived. This procedure combines meatal-based flap, and pedicle flap techniques into one procedure without the need for an intervening anastomosis. It also allows for extensive excision of ventral chordee and the urethral plate (if necessary) without damaging the flap.

Surgical technique:

The technique follows steps 1 to 10, summarized in Fig. 1.

Step (1): Stay suture, erection test and meatal dilatation or incision. A traction suture of 4/0 Nylon is placed through the tip of the glans. An artificial erection test is done. The native urethral meatus is dilated with a fine curved mosquito forceps or incised proximally (if very thin) to create a wide spatulated junction.

Step (2): Y shaped deep incision of the glans. A Y shaped incision is outlined on the glans. The centre of the Y is just below the tip of the glans and where the tip of the neo-meatus will be located. The upper two short limbs of the Y are 0.5 cm long and the angle between them is 60 degrees. The long vertical limb Y extends down the whole length of the glans penis to the coronary sulcus (similar to urethral plate incision or hinging). The Y shaped incision is made deep and results in 3 flaps, one small upper(Median) and two large lateral flaps.

The three flaps are elevated and a core of soft tissue is excised from the bed of each flap to create a space for the neo-urethra (Fig. 1- A, B).

Step (3): Chordectomy. Meticulous excision of any chordee or fibrous bands is carried out. This fibrous tissue is particularly heavy in the midline but may extend well laterally (Fig. 1- C).

Step (4): Outlining skin incision and mobilization. Two stay sutures are placed through the outer surface of the tip of the prepuce at least 1.5 cm apart. A rectangular skin strip is outlined extending proximally from the urethral meatus staying in the midline in the scrotum to avoid potentially hair-bearing skin. The skin strip is extended distally and laterally by curving it towards the prepuce where stays are taken. This allows for formation of a very long tube that can easily reach the tip of the glans whatever the position of hypospadias meatus (Fig 1-D).

The skin incision is carried completely around the meatus leaving a small cuff of skin (to wrap around the catheter). The meatus is freed proximally, using extreme care from any fibrous attachment. This area is very vascular and meticulous haemostasis is important. The adjacent penile skin is elevated (rather than the flap to preserve the vascular areolar tissue with the flap). This is carried out the same way as in transverse preputial island flap. This mobilization should continue into the dorsum of the penis and down to the root of the penis to avoid any degree of penile torsion.

Step (5): Formation of the neo-urethra. The skin strip and proximal cuff are tubed around a Nelaton catheter size 10 Fr inside the urethra. The author prefers to use Vicryl 6/0 on a cutting

needle. Suturing is carried out from proximal to distal in a subcuticular continuous manner. Several reinforcing interrupted stitches are usually taken to form water tight tube (Fig 1-E).

Step (6): Glanulo-meatoplasty. The neomeatus is then constructed by suturing the terminal end of the neourethra to the central V of the glans. A final slit like meatus is obtained by making another V at the neo-urethra. Then, the glanular wings are wrapped around the neourethra and approximated in the midline. On completion, a meatus of near normal width and appearance is created at the tip of a conical shaped glans. The long anastomotic contact between the neo-meatus and glans created by the Y glanuloplasty is of utmost importance to create large meatus thus avoiding post operative meatal stenosis (Fig. 1-F).

Step (7): Protective intermediate layer. The vascular areolar subcutaneous tissue layer is then used to provide a complete covering for the neourethra (Fig. 1-G).

Step (8): Skin closure. Byars flaps are then fashioned to provide ventral skin coverage. This is achieved by making a dorsal mid line incision. The skin is closed in the midline using 6/0 Vicryl in a continuous transverse mattress through and through manner. This helps to simulate the normal ventral median skin raphae (Fig. 1-H).

Step (9): Formation of penoscrotal angle. If needed, a z-plasty is formed at the penoscrotal junction. This helps to simulate the normal penoscrotal angle. Penoscrotal transposition if present can be corrected at this time by mobilizing and suturing the scrotal tissues ventral to the corpus spongiosum with Z plasty to perform the peno-scrotal junction.

Step (10): Insertion of a percutaneous supra-pubic cystocath. At this stage, the intra urethral Nelaton catheter is removed and urinary diversion is accomplished by means of a percutaneous supra pubic cystostomy catheter (10 Fr). The cystocath is usually left For 10-14 days. Tetracycline ointment is applied and haemostasis is achieved by compression dressing for 12-24 hours. Afterwards, the wound is left exposed.

Summary of Important Technical Points:

Deep Y- shaped incision of the Glans helps to obtain a terminal near normal looking glans

and meatus Subcuticular suturing of the neo-urethra allows for proper coaptation of the edges. Both ends of the neo-urethra are spatulated to avoid stricture formation. Careful dissection of the flap maintains dual blood supply. Proper mobilization of the flap and its dorsal subcutaneous pedicle is important to avoid penile shaft torsion.

The presence of protective intermediate layer (subcutaneous vascular areolar layer) minimizes complications. Z-plasty helps to simulate the normal penoscrotal angle. No catheter is left inside the urethra to decrease irritation and infection. Dressing is removed in less than 24 hours. Urinary diversion is maintained by a percutaneous suprapubic cystocath for 10-14 days.

PATIENTS AND METHODS

During the period from Jan. 1996 to March 2002, 49 boys with proximal hypospadias and chordee underwent single stage repair using the lateral based (LB) flap technique. Patient's age at the time of surgery ranged from one to three years (mean 18 months). In 6 patients, associated peno-scrotal transposition was present and it was corrected at the time of repair. None of the patients had previously undergone penile surgery. All operations were performed by one surgeon.

RESULTS

During a 6 year period, 49 patients with severe hypospadias underwent treatment using the LB flap technique. Follow up period ranged from 6 months to 6 years (mean 39 months). Results were considered satisfactory when the boy achieves a glanular meatus, single forward stream, unimpeded voiding, good cosmetic results and no need for secondary surgery. Satisfactory results were achieved in 88% (43 of 49 patients). Complications occurred in 6 patients. Five patients developed urethrocutaneous fistula occurring mostly at the coronal sulcus, four fistulae responded to simple closure and the fifth one was secondary to meatal stenosis and required Y-V glanuloplasty in addition for fistula closure. Distal glanular disruption occurred in one patient however the urethroplasty remained intact.

Minimal degree of rotation has occurred in three patients early in the course of this study. However, this did not require further surgery and was avoided later on by adequate mobilization of the vascular areolar flap. During this study and follow-up period, there were no incidence of urethral diverticulum, stricture, meatal retraction or breakdown of the neo-urethra.

The results are shown in Fig. 2.

Fig. (1): Steps of lateral based (LB) flap technique for single stage repair of proximal hypospadias.

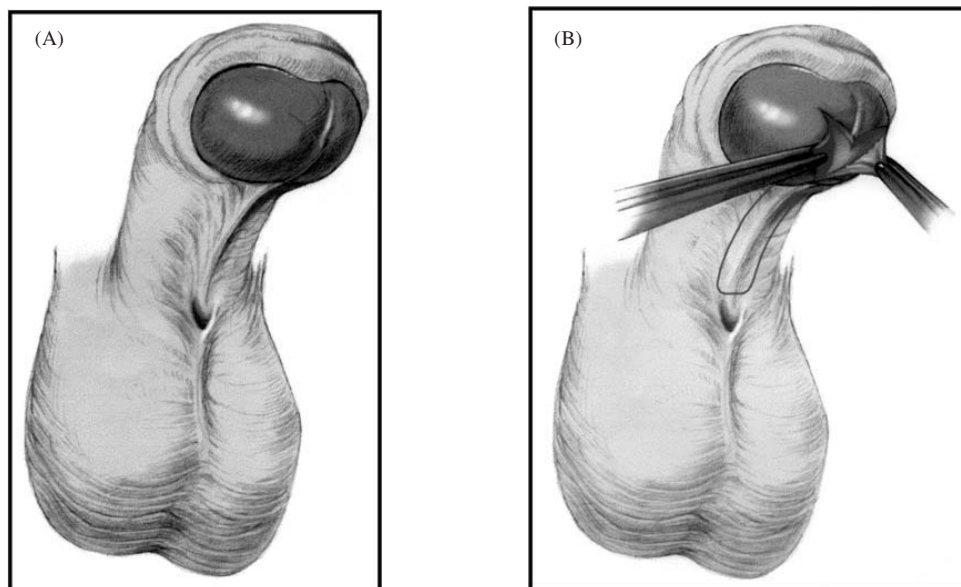


Fig. (1-A-B): Y shaped deep incision of the glans.

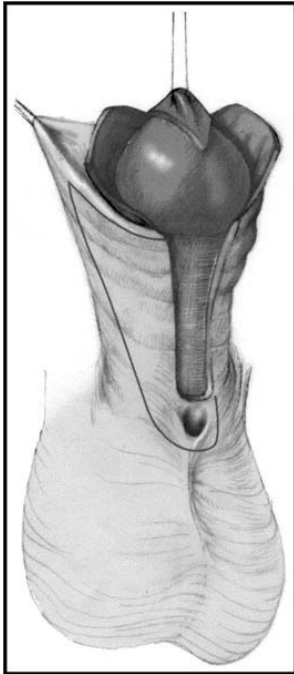


Fig. (1-C): Chordectomy.

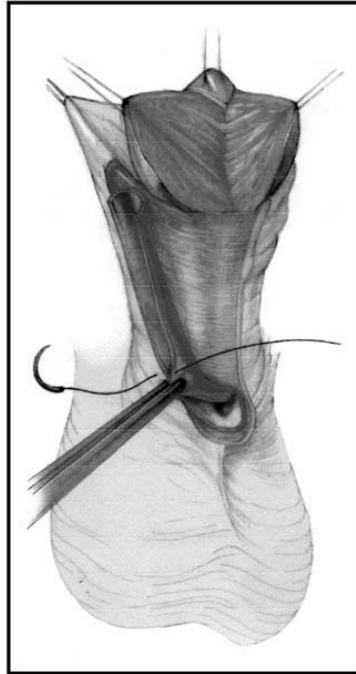


Fig. (1-D): Outline skin incision and flap mobilization.

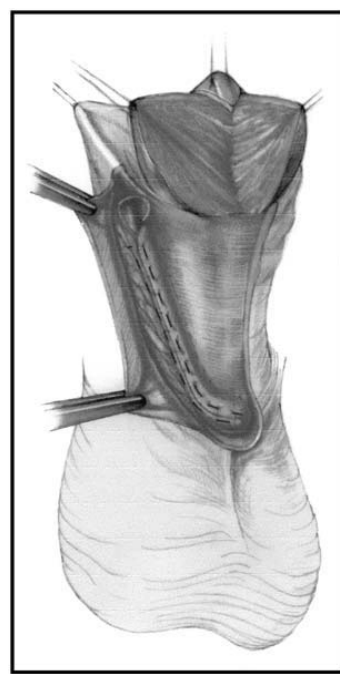


Fig. (1-E): Formation of the Neo-urethra.

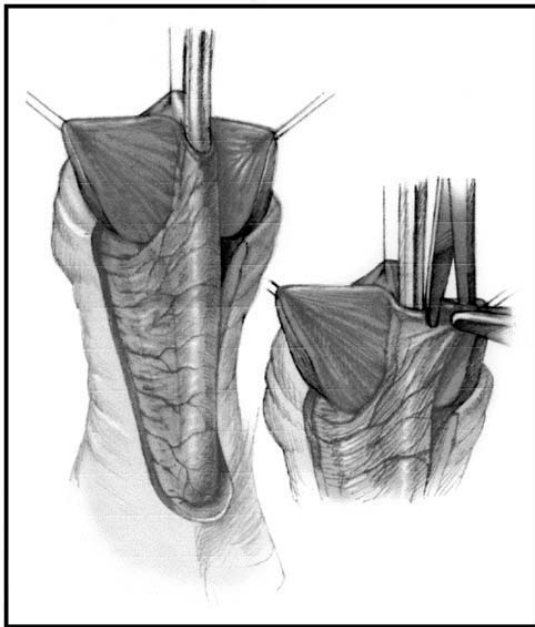


Fig. (1-F): Glanulomeatoplasty.

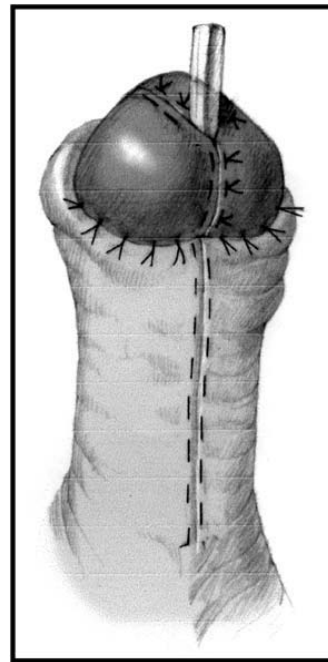


Fig. (1-G): Skin closure.

Fig. (2): Results of LB flap technique in a one year old boy.

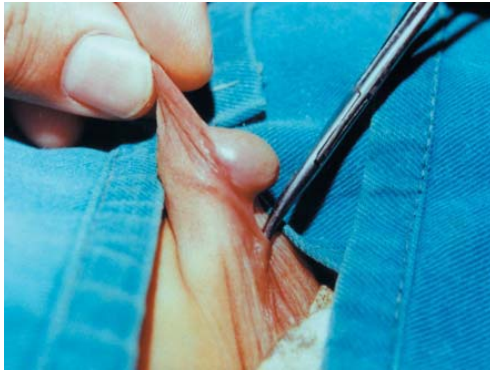


Fig. (2-A): Pre-operative.

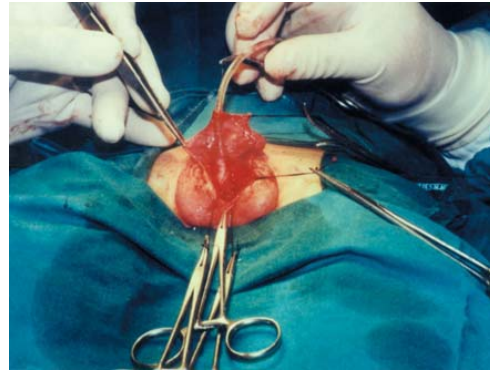


Fig. (2-B): After tubularisation of lateral based flap.



Fig. (2-C): At the end of operation.



Fig. (2-D): final appearance after healing.

DISCUSSION

Proximal types of hypospadias have always constituted a major challenge, they are very difficult to treat, more amenable for complications and have a higher incidence of failure. Unfortunately, these complications can not be treated conservatively. Instead, secondary surgery is almost always required. As a result, most surgeons in the past advised staged repair for correction of this difficult and challenging problem [3].

In the past two decades, however, great progress has been made both in the basic understanding of this deformity and in its surgical repair, which has culminated in the discipline aptly termed hypospadiology [4]. In 1941, Humby wrote, in a prophetic foreword: "If, however, one could succeed in remodeling the urethra in one operation, the gain would be manifest" [5].

This now seems to be a reality. Much of the current success is attributable to many factors including delicate tissue handling, adherence to basic principles of plastic surgery and excellent fine instruments.

The first preputial flap was described by Van Hook in 1896 [6]. However, vascularized pedicle flap repairs dominated in 1970s due to the works done by innovative hypospadiologists such as Hodgson's, Asopa, Duckett's and others. By time however pedicle flaps have a complication rate of 10-20% and neo-urethral stricture or urethral diverticulum have been repeatedly documented with these types of repair [7].

In 1983 Koyangi et al. innovated a technique for hypospadias repair, which used paramental-based flaps that extend distally around the distal shaft to incorporate the inner layer of the prepuce. Koyanagi's operation theoretically appeared to

provide an ideal treatment for severe proximal hypospadias [8]. However, in Koyanagi's largest and most series of 70 patients the complication rate was 47% requiring secondary surgery [9]. In 1998 a recent series of patients who underwent this technique reported by Glassberg et al., a secondary operation was required in 50% [10]. This high complication rate was attributed to inadequacy of blood supply to the neourethral flaps. This may be the result of excess mobilization of the skin flaps from their lateral and dorsal blood supply (thus the flap which is several centimeters long becomes dependent entirely on the blood supply coming from the region of the urethral meatus). Furthermore, the presence of two anastomoses (dorsal and ventral), increased the risk of fistula formation. In an attempt to improve the results of this technique many modifications have been made such as Yoke repair for hypospadias [2] and Emir et al. modification of Koyanagi's technique [11].

In the present study, a simple technique is reported that permits one stage repair of posterior and severe hypospadias with a low complication rate and satisfactory functional and cosmetic results. It is well known that the key to ensure successful hypospadias repair with minimal complication rate is to ensure a good blood supply to the flap used for urethraplasty. In the present study, this was achieved by designing a lateral meatal based skin flap which enjoys a dual blood supply coming from the preputial vascular pedicle and para-meatal tissue. The viability and good vascularity of the skin flap is confirmed by the fact that the neourethra has never broken down or stenosed in any of our patients.

One technical advantage in the present study is the presence of a single longitudinal suture line in the urethroplasty. This helps to minimize the incidence of complications and increases the success rate. Furthermore, this single suture line is covered with a second protective layer of well vascularized subcutaneous Dartos tissue.

Another point in this study which deserves a special comment, is the way by which the neomeatus is constructed. The use of Y glanuloplasty and creation of a long suture anastomotic connection between the urethral meatus and glans results in a large apical meatus. Also, the excision of a small V from the apex of the neomeatus, helps to achieve a terminal slit like

meatus. This decreases the risk of postoperative meatal stenosis that is usually a major contributing factor for anastomotic failure or repair break down.

The lateral based (LB) flap is not a totally new method of repair. It is based on and is a natural development of many well established procedures. Van Hook (1896) suggested the use of a "lateral oblique flap" from the side of the penis. Broadbent et al. [12], DesPrez et al. [13] and Hinderer [14], Koyanagi et al. [9], Snow and Cartwright [2] and Joseph [15] used the same principle in their techniques of repair.

Broadbent et al. in 1961 described a single stage repair by using a buried skin strip based on the parameatal tissue and its blood supply [1]. Desprez et al. [13] at the same year described a similar technique using a full thickness skin strip from the ventral shaft of the penis, extending it outward onto the inner surface of the prepuce. However, DesPrez et al. [13] in his study on 65 patients during 10 years period reported that one third of his patients developed fistula that necessitated a secondary procedure [2].

The results of the lateral meatal based flap have been satisfactory from the cosmetic and functional point of view. This technique may offer patients with proximal and severe forms of hypospadias a good chance of a single-stage operation with a high success rate (over 88%) and minimal complications. However, a longer follow-up period is necessary to reach a final conclusion.

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