

## Original Article

# The forked flap repair for hypospadias

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## ABSTRACT

**Context:** Despite the abundance of techniques for the repair of Hypospadias, its problems still persist and a satisfactory design to correct the penile curvature with the formation of neourethra from the native urethral tissue or genital or extragenital tissues, with minimal postoperative complications has yet to evolve. **Aim:** Persisting with such an endeavor, a new technique for the repair of distal and midpenile hypospadias is described. **Materials and Methods:** The study has been done in 70 cases over the past 11 years. The “Forked-Flap” repair is a single stage method for the repair of such Hypospadias with chordee. It takes advantage of the rich vascular communication at the corona and capitalizes on the established reliability of the meatal based flip-flap. The repair achieves straightening of the curvature of the penis by complete excision of chordee tissue from the ventral surface of the penis beneath the urethral plate. The urethra is reconstructed using the native plate with forked flap extensions and genital tissue relying on the concept of meatal based flaps. Water proofing by dartos tissue and reinforcement by Nesbit's prepuce tissue transfer completes the one stage procedure. **Statistical Analysis:** An analysis of 70 cases of this single stage technique of repair of penile hypospadias with chordee, operated at 3 to 5 years of age over the past 11 years is presented. **Results and Conclusion:** The Forked Flap gives comparable and replicable results; except for a urethrocutaneous fistula rate of 4% no other complications were observed.

## KEY WORDS

Chordee; fistula; forked flap; hypospadias; urethral plate

## INTRODUCTION

The vast number of “original” techniques published for the correction of hypospadias, are testimonies to the fact that the quest for a replicable, complication-free hypospadias repairs still continues; the

different techniques are also a tribute to the innovative thinking and methodology of many generations of reconstructive surgeons.

All hypospadias repair techniques have seen numerous modifications, except for the standard flip-flap repair for distal hypospadias, which, because of the excellent results achieved, has been used by us for over three decades without significant changes. The flip-flap repair is usually not complicated by fistula formation, which has been the single most troublesome complication of hypospadias surgery. In all probabilities, fistulas do not occur in the flip-flap repair as it incorporates two distinct features: (1) use of the vascular urethral plate for

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the dorsal wall of the neourethra and (2) the avoidance of a direct end-to-end anastomosis between two tubes.

Can the flip-flap technique be further modified and extended for more proximal hypospadias with chordee? The Forked Flap technique is an effort to explore the possibility of modifying a standard technique to give satisfying and replicable results for most varieties of distal and mid penile hypospadias with significant chordee.

## MATERIALS AND METHODS

Seventy cases of Hypospadias were operated by the Forked Flap technique in the past 11 years from January 1998 to January 2009. Informed consent was obtained from all the patients. The cases included in the study had distal and mid penile hypospadias with chordee. They were repaired with the 'Forked Flap' at 3-5 years of age, and the technique was assessed for its functional and cosmetic outcome and the incidence of post-operative complications. The skin used for the forked flap, and the flip-flap was hairless and the same as universally used in the standard flip-flap technique. The patients were followed up for a mean period of 6 years.

## TECHNIQUE

After stay sutures were taken on the glans, two parallel incision lines were marked on the lateral margins of the urethral plate, extending up to the tip of the glans.

The proximal limb of the marking adjacent to the ectopic meatus was extended proximal to the meatus in an angulated fashion for a length equal to one-third the distance of the meatus from the glans tip in distal and mid penile hypospadias (approximate maximum anticipated lengthening after chordee release) [Figure 1].

A plain catheter was introduced and after infiltration with 1:200,000 epinephrine in saline, the two forked flaps were raised. The width of each forked flap was designed to be a little more than half the size of native urethral plate, and the glans based urethral plate flap was completely elevated [Figure 2]. Complete excision of the chordee tissue facilitated the straightening of the penis. *It is important that the glans flaps are not raised beyond the corona to preserve the vascularity.* The artificial erection test confirmed the release of chordee.

The incision at the glans was deepened, and the lateral glanular wings were developed after incising the glans

on both sides. The forked flaps were transposed to the midline and sutured to each other at their medial margins, and the proximal margin fed into the meatus and sutured [Figure 3]. This midline tissue (the urethral plate and the forked flaps) were anchored to the corpora underneath. A midline meatal-based 'flip-flap' was marked from the meatus proximally; the length of the flap (a-b) was equal to the distance from the meatus (after correction of chordee) to the tip of the glans (c-d). This exactly proportioned midline meatal-based flip-flap, was raised from the hairless area of the penis, after infiltration with plain normal saline. The fascial tissue was incised about 0.5 cm away from the skin incision so that the flap had a wider dartos component [Figure 3].

This flap was turned over and subcuticular sutures (intermittent sutures with polyglactin) were taken with the forked flap, urethral plate and glans to complete the formation of the neourethra. The fascial tissue was sutured to the corpora on the sides of the neourethra with intermittent polyglactin sutures to reinforce the repair [Figure 4].

The prepuce tissue was transferred to the ventral penis by the Nesbit's method to provide tension-free closure with no sutures overlying the urethral repair [Figures 5 and 6]. The dog-ears were trimmed and minimized without hampering the vascularity of the prepuce flap. The urethral catheter served both for stenting the

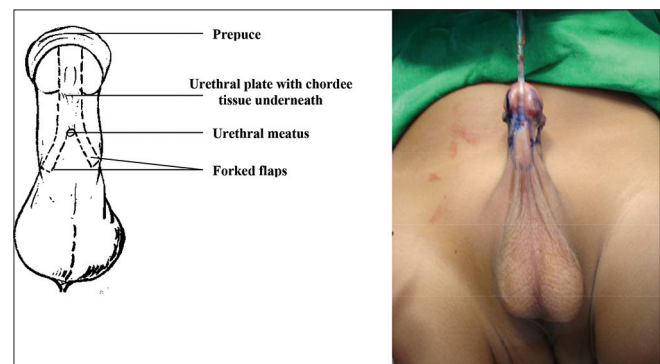


Figure 1: Preoperative marking for the forked flap repair

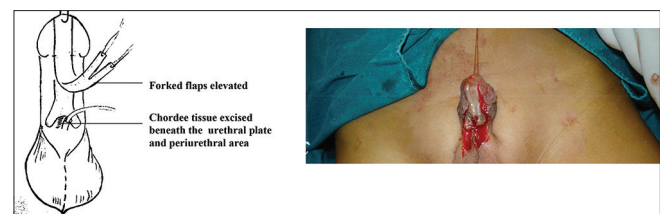


Figure 2: Elevation of forked flaps and urethral plate and excision of chordee tissue

neourethra and as a means for urinary diversion. The usual dressings and post-operative care for hypospadias were given. The catheter was removed on the 8<sup>th</sup> day. Antibiotics were administered for 5 days.

Results were evaluated for post-operative complications of Meatal stenosis, Urethrocutaneous fistula, Infection, Urethral diverticula, recurrent penile curvature, urethral stricture and repair breakdown. They were also assessed for micturition from the tip of the penis and urinary stream [Figure 7].

## RESULTS

### Complications

The patients had a mean follow-up of 6 years.

#### Early complications

None of the 70 patients developed meatal stenosis, Urethral diverticulum or significant infection. Urethrocutaneous fistula developed in three patients (about 4%) [Table 1-2].

#### Late complications

None of the patients developed any Urethral stricture or had any evidence of residual chordee or distortion of the penis.

## DISCUSSION

The forked flap repair is presented as an innovative new technique for the repair of penile hypospadias with chordee. The technique elevates and preserves the

urethral plate, ensures adequate chordee correction, bridging the gap produced after chordee correction with periurethral forked flaps. No dorsal plication<sup>[1,2]</sup> or ventral dermal grafts<sup>[3,4]</sup> are needed and the single-stage repair can be completed by the extension of the flip-flap technique. The vascularized dartos tissue is used to reinforce and waterproof the urethroplasty.<sup>[5]</sup>

Chordee correction is mandatory<sup>[6]</sup> for all forms of hypospadias repairs, and all repairs must ensure a total chordee correction prior to a formal urethroplasty. Excision of all chordee tissue from the ventral surface of the penis ensures an increase in length of the penis and, in all cases, the meatus moves proximally after chordee correction. Dorsal plication on the other hand, may shorten the penis or give it a “tuna-can” appearance (“is wider than it is long”).<sup>[5]</sup>

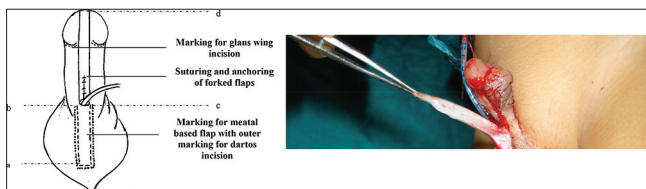
The forked flaps derive their vascularity from the rich vascular communications from the deep arteries of the

**Table 1: Types of hypospadias operated by the forked flap technique**

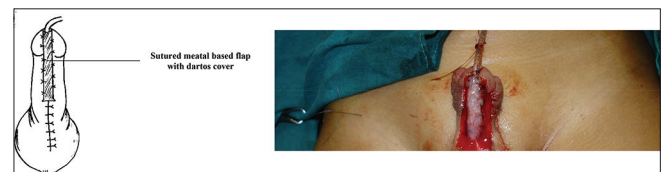
Type of hypospadias	No. of patients
Distal penile hypospadias with chordee	42
Mid penile Hypospadias with chordee	28
Total	70

**Table 2: Early complications**

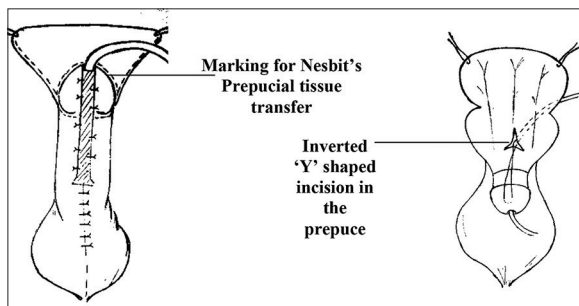
Complications	No. of patients	Percentage
Meatal stenosis	0	0
Urethrocutaneous fistula	3	4
Urethral diverticulum	0	0
Infection	0	0



**Figure 3:** Transposition of the forked flaps to the midline



**Figure 4:** Formation of the neourethra and coverage with dartos tissue



**Figure 5:** Nesbit's preputial tissue transfer



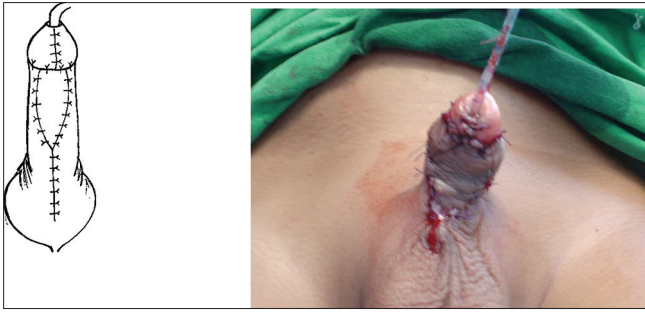


Figure 6: Final suture line



Figure 7: Photograph showing post-operative urinary stream and early result

penis at the corona.<sup>[7]</sup> and hence *care should be taken that these flaps should not be elevated beyond the corona of the penis.*

The vascular basis for the midline meatal-based flip-flaps is the same as that of the well-established meatal based flap of Mathieu. This flip-flap, used in the Forked Flap technique is thick and incorporates vascularized dartos tissue on its undersurface and sides. *The periurethral vessels can be seen to enter the base of the flap.*

Nesbits' preputial tissue transfer to the ventral side of the penis adds security to the repair and avoids any suture line on the urethroplasty, and compares well with split prepuce repairs<sup>[8,9]</sup>

In our unit, hypospadias repairs are done by a variety of techniques – single or multistage (Flip-Flap for distal hypospadias, Asopa's/Duckett's for mid and proximal hypospadias). All techniques, except the flip-flap Mathieu's repair have a high urethrocutaneous fistula rate of 18-20%. The standard flip-flap repair for distal hypospadias without significant chordee has given excellent results with three fistulas in 82 cases. Most large studies report a wide variation in the development of urethrocutaneous fistulas ranging from 2% to 20%,<sup>[6,7,10-16]</sup> [Table 3].

The results of the forked flap repair have been uniformly good in different hands, including our junior consultants. Besides, the results are comparable to the other published series of hypospadias repair.

Table 3: Rates of urethrocutaneous fistula as reported by various studies

Method of repair	Urethrocutaneous fistula rate %
Modified Snodgrass (for Distal hypospadias) <sup>[7]</sup>	1
Snodgrass (Proximal hypospadias) <sup>[7]</sup>	3
Horton & Devine <sup>[10]</sup>	30
Hodgson <sup>[11]</sup>	8
Duckett <sup>[12]</sup>	7.5 (secondary procedure)
Furness III <sup>[13]</sup>	2
Baskin, <i>et al.</i> <sup>[14]</sup>	6
TIP <sup>[15, 16]</sup>	5

With a fistula rate of 4% and with no other complications, this technique compares well to the Snodgrass tabularised incised plate (TIP) Urethroplasty,<sup>[16]</sup> having a fistula rate of 3%.

The advantages of forked flap repair are:

1. A complete excision and correction of chordee.
2. An elective dorsal meatotomy, if required.
3. Use of native urethral plate with forked flaps forming the dorsal wall of the neourethra.
4. A subcutaneous, pedicled flip-flap for the ventral wall of the neourethra.
5. Use of dartos tissue for vascularity and urethral repair reinforcement.
6. Nesbit's prepuce tissue transfer for the ventral penile resurfacing with no suture line on the urethroplasty.

## CONCLUSION

The Forked Flap technique is an easily replicable single stage method for the repair of distal and mid penile hypospadias with chordee and the outcome is comparable to other published series. With minimal modifications, it can be applied in all cases of Hypospadias with chordee.

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