

# Dorsal Island Penile Fasciocutaneous Flap for Fossa Navicularis and Meatal Strictures: Short and Intermediate Term Outcome in West African Men

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**Purpose:** The aim of this study was to evaluate the use of a dorsal island penile fasciocutaneous flap in the management of resistant fossa navicularis strictures in circumcised West African men.

**Materials and Methods:** From January 2004 to December 2013 there were twenty-one patients with fossa navicularis strictures (FNS) with or without meatal stenosis who underwent urethroplasty using a previously described technique and a dorsal island penile fasciocutaneous flap. The average patient follow-up was 25.9 months.

**Results:** Urethral catheterization was the most common cause of FNS. All of the patients had successful urethral function and acceptable cosmetic results. One patient had partial dorsolateral skin necrosis that healed with conservative measures. All patients, including the five patients with meatal stenosis, retained the natural shape of the external meatus and had a natural urine stream.

**Conclusion:** The penile cap technique uses a dorsal island fasciocutaneous flap and provides satisfactory functional and cosmetic outcomes in the management of fossa navicularis and meatal strictures.

**Keywords:** treatment outcome; urethra; surgery; urethral stricture; surgery; etiology; patient satisfaction; methods; Nigeria.

## INTRODUCTION

Fossa navicularis structures (FNS) are common in adult men. However, the management constitutes a special challenge because success is not determined by the re-establishment of function alone but rather also requires acceptable cosmetic appearance of the glans.<sup>(1)</sup> The treatment options for FNS include dilatation, urethrotomy, and urethroplasty. Urethrotomy for FNS is technically cumbersome and is palliative, similarly to dilatation.<sup>(2,3)</sup> Thus, surgical reconstruction has the highest probability of cure.<sup>(4)</sup> The choice of reconstruction depends on the etiology, the state of the urethral plate, and the surgical preference. There are several surgical techniques for reconstructing the fossa navicularis (FN) and each method has advantages and disadvantages. There is currently no universal consensus on the preferred reconstructive technique for FNS. In the presence of normal penile skin the techniques using local tissue transfer lead to a satisfactory functional outcome. However, the V-Y plasty techniques popularized by Blandy and colleagues<sup>(5)</sup> have been criticized for their poor cosmetic results. Additionally, splitting the glans and using a ventral island flap yields better cosmetic outcomes.<sup>(6)</sup> However, a ventrally raised flap compromises the vascularity of the skin covering the neo-urethra and may increase the risk of fistula formation. The use of a ventral flap in the penile cap approach is called penile cap urethroplasty (PCU) and was popularized by Armenakas and col-

leagues.<sup>(7)</sup> This surgical technique has gained popularity because it avoids an incision of the glans and is associated with the best cosmetic outcome. In this study, we report the results of using a dorsal island penile fasciocutaneous flap (DIPFF) and the PCU approach to repair FNS.

## MATERIALS AND METHODS

### Study Population

The patients in this study were treated with penile cap urethroplasty using a DIPFF for strictures involving the fossa navicularis and meatus. The surgeries were performed between January 2004 and December 2013. The preoperative diagnosis was based on patient history, physical examination, and the results of antegrade and/or retrograde urethrogram studies in all cases. Additional investigations were performed as necessary. The diagnosis was confirmed intraoperatively in all cases. This study included only intraoperatively confirmed cases of FNS (with or without meatal stenosis) with less than 0.5 cm of extension into the proximal urethra.

### Surgical Technique

The urethral reconstruction was performed using a combination of the PCU and a modified form of the Ventral Transverse Island Penile Fasciocutaneous Flap (VTIPF) as described by Jordan.<sup>(8)</sup> This modification involved degloving the penis, and a flap was then raised from the dorsum as a DIPFF.

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**Figure 1.** Incision about to be made on stenotic meatus (identified with the tip of artery forceps) in patient with fossa navicularis stricture and meatal stenosis.

The penis was degloved to the base after making a sub-coronal incision through the Dartos and Bucks Fascia and exposing the urethra. The glans was then dissected from the ventral surface of the urethra to expose the strictured segment using blunt and sharp dissection. A ventral incision was then created in the urethra and extended 0.5 cm proximally into the normal urethra. In patients with meatal stenosis a mosquito artery forceps was used to invert the tip of the meatus into the wound to assist visualization of the external meatus (**Figure 1**). The urethral incision was extended into the inverted external meatus using counter (distal) traction on the corona of the glans. In patients with meatal stenosis it



**Figure 2.** Wide incision into the meatus and part of fossa navicularis to be extended proximally into normal urethra in same patient above. Dorsally harvested skin flap will then be placed as a ventral onlay.

was easier to start the incision at the inverted external meatus because it could be incised generously and then be extended to the proximal urethra (**Figure 2**).

An appropriately sized fasciocutaneous flap was then raised from the dorsum or dorsolateral surface of the penis. The pedicle was dissected close to the base of the penis. The flap was then brought to the ventral surface and sutured as a ventral urethral onlay using synthetic absorbable 4-0 Vicryl sutures. The flap suturing was extended to the ventral margin of the inverted (and incised) meatus in patients with meatal stenosis. The second layer coverage was achieved using a Dartos flap harvested dorsolaterally. The retracted glans was then replaced into its normal position and the penile skin was closed with absorbable synthetic 4-0 Vicryl sutures. All patients received urethral stenting and had suprapubic drains placed. The urethral stent was removed after 3 weeks, and the suprapubic drainage was removed 1 week later if no problems occurred.

### Outcome Measures

The postoperative follow-up included observations of the following parameters: urinary pattern, calibration with a size 16 French (F) Foley catheter, uroflowmetry, post-void residual volume measurements using pelvic ultrasound, and evaluation of lower urinary tract symptoms. A successful outcome included the maintenance of normal glans shape, subjective and objective improvements in urinary flow, and a urethral lumen  $\geq 16F$ , requiring no further urethral instrumentation during follow-up. The first author was involved in the management of all cases under review.

### RESULTS

There were 21 cases of strictures involving the fossa navicularis repaired during the study period and these cases accounted for 7.8% of all urethroplasties performed. Urethral catheterization was caused in 13 cases, and endoscopy was caused in 3 cases. There were 2 cases of purulent urethritis and one case each of external trauma, previous hypospadias repair, and idiopathic cause. The duration of symptoms ranged from 8 months to 11 years (mean  $25.3 \pm 4$  months). The stricture lengths ranged from 1.2 cm to 3.1 cm (mean 2.0 cm). The stricture was limited to the glandular urethra (with or without meatal involvement) in 15 cases but extended proximally (by 0.5 cm or less) in 6 cases. The external meatus was involved in 5 cases, and all were associated with urethral catheterization. All patients were fully circumcised adults.

There were 16 (76.1%) patients previously treated with dilatation. There were 11 (52.4%) cases with a suprapubic cystostomy (either inserted at our center or by the referring hospital) to manage complications of acute urinary retention (4 cases), renal failure (3 cases), urethrocutaneous fistula (3 cases) and severe lower urinary symptoms (1 case) prior to surgery. The surgery achieved functional and cosmetic successes in all patients. One patient (4.8%) had partial dorsolateral skin necrosis that healed with conservative measures. There was mild splaying of the urinary stream in all patients after removal of the catheter. There were no patients that described the condition as worrisome. The duration of follow-up ranged from 11 -92 months (mean  $25.9 \pm 4.1$ ).



**Figure 3.** Pre-operative picture of same patient in Figure 1.

## DISCUSSION

Strictures of the FN and meatus are relatively uncommon in our region. There is no universally accepted surgical management for FNS. However, factors including etiology, stricture length, and state of the glans are important considerations when choosing a surgical technique. Although the one-stage flap techniques have consistently given excellent results, there are reports suggesting these techniques should be avoided in strictures caused by Balanitis Xerotica obliterans (BXO).<sup>(6,9)</sup> In this study, iatrogenic causes such as urethral catheterization accounted for most cases. While some studies<sup>(6,7)</sup> have reported BXO as the major cause of FN strictures, there were no cases in this study. BXO as a cause of urethral stricture is extremely rare in our environment and analysis of hospital records of over 2000 cases with urethral stricture disease in our facilities over the last 2 decades did not reveal a single BXO case. The routine infant (neonatal) circumcision practiced in our hospital may be the main factor responsible for this finding. There are only a few cases reporting external trauma as the cause of FN strictures. In this study, external trauma was uncommon and accounted for one case.

The use of local skin flaps has become the mainstay of treatment of FN strictures not caused by BXO.<sup>(4,7)</sup> Jordan<sup>(8)</sup> revolutionized the management of FN using a ventral fasciocutaneous onlay flap with glans splitting. Armenakas and colleagues<sup>(7)</sup> used the same flap with a glans cap technique and achieved better cosmetic results. In both procedures the dissection was limited to the ventral surface of the penis. In our technique, the penis is degloved (not necessarily to the base) and the flap is raised from the dorsal or dorsolateral aspect of the distal penile skin. The flap harvest technique has been described in greater detail elsewhere.<sup>(9)</sup> In this study, the penis was degloved in a manner similar to the transverse preputial island flap popularized by Duckets<sup>(10)</sup> for hypospadias repair. A greater retraction of the glans can be achieved using a circumferential incision because it allows direct visualization of the tip of the external meatus and extension of the ventral urethral incision to the external meatus. Although there were a limited number of meatal stenosis cases in this study, this step was possible in all patients. In patients with

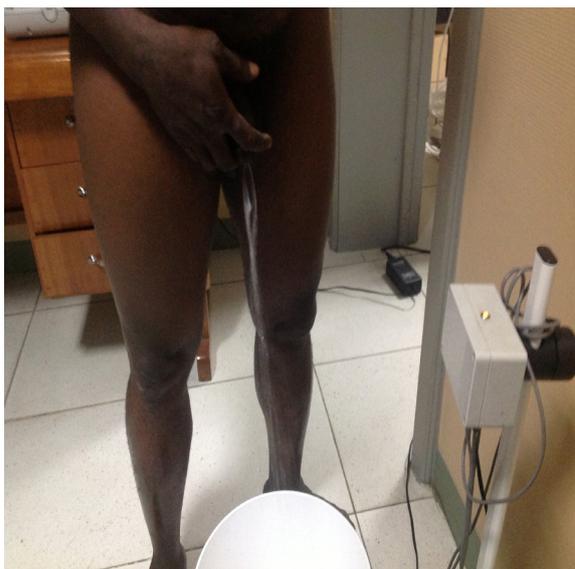
meatal stenosis both excising a generous core of the perimeatal glandular tissue and suturing the flap around the whole circumference of the meatus were important steps described by Armenakas and colleagues<sup>(7)</sup> and others.<sup>(12)</sup> However, this may not apply to all patients with associated meatal stenosis. A simple generous incision and a ventral onlay extending to the ventral margin of the meatus were satisfactory in all patients. The use of these steps may help preserve the natural shape of the external meatus (**Figures 3 and 4**) and prevent complications such as prolapse and retraction of the neo-urethra. These types of complications were absent in this series.

Significant urinary splaying after 3 months has been reported in most patients after PCU.<sup>(7,12)</sup> We have not noticed this issue in our patients. Compared with pictures in other studies<sup>(7)</sup>, there appears to be better preservation of the natural urine stream in our patients (**Figure 5**). We believe preserving the natural shape of the meatus in our patients may be responsible for this result.

Raising a flap from the side or the dorsum after degloving the penis may also offer some technical advantages over the VITPFF presently described in the literature. Using a Dartos flap to cover the neo-urethra is possible and the risk of devascularization of the ventral penile skin and the risk of fistula formation are negligible. This approach was particularly useful for the post-hypospadias repair patients. There was no fistula formation observed in this series. Armenakas and colleagues<sup>(7)</sup> also reported there was no fistula formation in his series. However, other studies have reported fistula as a complication of ventral flaps.<sup>(13)</sup> A previously unreported problem noted in this study was the presence of several seconds of temporary arrest of micturition occurring only when urinating during early morning full erections. This symptom was confined to 2 patients in their 20's and they typically felt the arrest at the distal end of the penile urethra. All of the postoperative parameters including imaging and urethroscopy were normal in these patients. In both patients the symptoms disappeared after 12 months. We wait 3 weeks before removing the urethral catheter because we do not routinely perform a pericatheter urethrogram because the patients could not afford this procedure. There have not been consequences as a result of this practice.



**Figure 4.** Post operative picture of same patient in Figure 1 at 3 months.



**Figure 5.** Same patient performing uroflowmetry at 3 months. Splaying is minimal.

The DIPFF has some disadvantages. The dissection is more extensive and has an increased surgical time. The procedure is completed in an average of 80 minutes, which is approximately twice the time reported by Onol and colleagues for VIPFF.<sup>(12)</sup> However, all the strictures reported by Onol and colleagues were less than 1.5 cm. There is also an associated circumferential sub-coronal scar, but this scar is not a problem for an average West African man because men are normally circumcised in infancy. In theory raising the flap from the dorsal rather than the ventral surface should increase the risk of penile torsion or chordee. However, while this problem is common after VIPFF techniques described in the literature there were no patients in the present study with these problems. The dissection of the flap pedicle close to the base of the penis in the DIPF may be responsible for this result.

This study had several limitations. First, the sample size of 21 cases is limited. Compared with other strictures, isolated FNS is uncommon in our region, and this is also the only study in sub-Saharan Africa examining the management of FNS. The virtual absence of BXO in our country may be the major reason for this result. The data collection was another study limitation because the data from several patients were collected retrospectively. Additionally, the average postoperative follow-up was approximately 2 years. The decision to commence the study was made in 2009, and data from 2004 - 2008 were collected retrospectively. The short average follow-up was paradoxically caused by the early cases in the series. At the beginning of the study, the local infrastructure for follow-up services in our region was limited.

## CONCLUSION

Our results suggest that DITPFF with a penile cap technique is associated with acceptable functional and cosmetic outcomes in patients with FN strictures.

## CONFLICT OF INTEREST

None declared.

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