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REVIEW ARTICLE

Modified double face onlay island preputial skin flap with augmented glanuloplasty for hypospadias repair

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KEYWORDS

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Abstract Objective: To present and evaluate our initial results with a modified double face onlay preputial flap (DOPF) for repair of different degrees of hypospadias.

Material and methods: From April 2004 to April 2009, 182 patients with different degrees of hypospadias (distal penile hypospadias = 122, mid penile hypospadias = 38, proximal penile hypospadias = 22) were included in our study. All patients were treated with a modified DOPF. Their age ranged from 6 months to 10 years (mean 3.03 years). Selection criteria were those cases with urethral plate < 8 mm with either flat or conical glans, and non-circumcised patients. The technique of repair was to use the distally tapered inner preputial mucosa as onlay to augment the narrow urethral plate, while the outer face was tapered distally to augment the closed proximal part of the glanular wings and as skin cover. Suitable urethral catheter was inserted for 3–5 days. Follow-up duration was 27–30 months (mean 24 months).

Results: Functional and cosmetic success was reported in 176 patients (96.6%). Six patients (3.29%) had developed complications that affected the success rate: 1 (0.5%) glanular disruption, 2 (1.09%) fistula, 1 (0.5%) urethral diverticulum and 2 (1.09%) lateral penile torsion. Three (1.6%) patients had developed minor complications with no effect on functional and cosmetic success in form of superficial epidermal loss.

Conclusion: Modified DOPF is a suitable technique for repair of different types of hypospadias as it results in satisfactory functioning and an acceptable cosmetic appearance.

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Introduction

Many techniques have been developed and reported for the repair of hypospadias but none of them are ideal for all degrees of hypospadias [1]. The aim of development of many

modifications to an already established technique for hypospadias repair is to improve the functional and cosmetic results. Problems in hypospadias repair begin when the urethral plate is less than 8 mm, as reported by Holland and Smith that all fistulas occurred in those patients with a

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urethral plate less than 8 mm [2]. Another study concluded that adequate urethral plate width >8 mm is essential for successful TIP [3]. Another modification to the repair of distal hypospadias using an inlay inner preputial graft with TIP was created to widen the small and narrow urethral plate [4]. Our modification of the double onlay preputial flap (DOPF) was created to avoid the complications of a narrow urethral plate (<8 mm) with conical or flat glans, which had been reported in the literature.

Material and methods

From April 2005 to April 2009, 182 patients with different degrees of anterior hypospadias (distal penile hypospadias = 122, mid penile hypospadias = 38, proximal penile hypospadias = 22) were treated using our modification. Their ages ranged from 6 months to 10 years (mean 3.03 years). Cases that had been selected were those with healthy penile skin, uncircumcised, with or without curvature, urethral plate (UP) < 8 mm, conical or flat glans, and with no previous urethroplasty. Those with UP > 8 mm or those with grooved glans were excluded.

Surgical technique

All patients had received prophylactic antibiotics in the form of 2nd generation cephalosporin (Cefuroxime 50–100 mg/kg). Anesthesia was by epidural anesthesia with sedation in all patients.

During surgery, traction suture with 4-0 Vicryl suture is placed at the glans dorsally. A U-shaped incision is created around the UP and meatus. Measurement of UP is done below the coronal sulcus with stretched UP edges. Circumcision incision is created 0.5 cm below the coronal sulcus. Penile degloving is created through a plane between the dartos fascia and superficial layer of Buck's fascia down to the penile root, leaving the UP attached to the glans. Correction of penile curvature was by degloving only in 133 patients and by degloving + modified Nesbit in 49 patients using 4-0 non-absorbable polypropylene suture. The prepuce is divided by a vertical incision into two transverse preputial segments with width ratio 2/3 and 1/3 (Fig. 1, A–C). The 2/3 of the prepuce is oriented vertically with its inner mucosal layer and outer skin layer; the inner mucosal layer is for augmentation of urethral plate while the outer skin layer is for penile skin covering. Width of UP is measured preoperatively & intraoperatively before and after creation of glanular wings with stretched penis. The inner preputial layer is marked and tailored according to the UP width and tapered proximally and distally. De-epithelialization of 0.5 cm around the desired inner preputial layer distally and laterally is performed (Fig. 1D).

Tourniquet is applied to the root of the penis and glanular wings are dissected. The inner preputial layer is sutured with 6-0 Vicryl on a suitable urethral catheter to the corresponding UP starting proximally from the meatus to the mid glans distally, with two layers of sutures; the 1st layer is through the subcutaneous tissue and the 2nd layer through the epidermis (Fig. 1E). Closure of the glanular wings distally

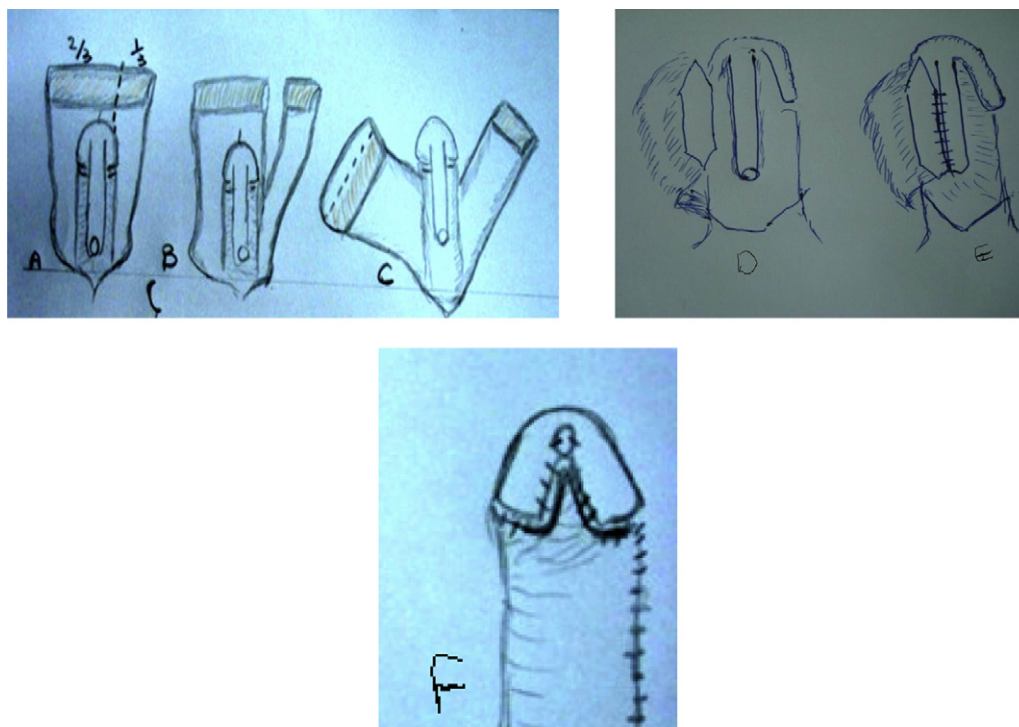


Figure 1 (A) dissection of the prepuce till the penile root, (B) vertical incision of the prepuce into 2/3 and 1/3 down to the penile root, (C) rotation of the 2/3 of the prepuce to the ventral penile aspect, (D) trimming of the inner preputial layer proximally and distally, (E) anastomosis of the inner face to urethral plate, (F) augmentation of the glanular wings with triangular skin from the outer face of the prepuce.

is through suturing the glanular wings to the neo-urethra laterally, and ventrally a single suture is taken through the glanular wings to approximate the glans, leaving proximally only about a 2-mm gap between the glanular wings which will be augmented with triangular skin (2–3 mm width) from the outer skin face. The triangular flap is sutured to the approximated glans distally and laterally to the corresponding glanular wings using interrupted 6-0 Vicryl sutures (Fig. 1F). The lateral edge of the outer face of preputial skin is sutured to the other 1/3 of the preputial skin flap.

Tourniquet is removed after closure of the glanular wings. Urethral catheter is replaced with a smaller one. Dressing is slightly compressing for 3–5 days in all patients.

Follow up

Range of follow-up duration was from 27 to 30 months (mean = 2.3 years) for all patients in this study (at the 1st month, 6th month, 1st year and 2nd year). Follow-up involved clinical examination (shape of urethral meatus, edema, penile torsion, fistula, glanular shape, ischemia of the covering skin) and scoring of family acceptance of the cosmetic appearance (Fig. 2). Uroflow rate was measured only in those patients aged over 4 years (73 patients). Ascending urethrogram was only indicated for cases with history of narrow urinary stream suggesting stricture.

Results

Operative time was 90–120 min (mean 110 min). Success was reported in 176 patients (96.6%), as regards urethral patency, acceptable cosmetic appearance and parent satisfaction. A scoring system was created to measure parent satisfaction with cosmetic appearance, formed of 3 parameters (satisfied, acceptable and not satisfied), which were each scored 1–3. This was completed on paper by parents 4 weeks postoperatively (Table 1). All 176 patients completed their follow up (2 years) without any complications.

All patients had developed edema of the covering penile skin after removal of the dressing. This resolved spontaneously in 181 patients, and in 1 patient the swelling was diagnosed as urethral diverticulum.

Nine patients developed different complications (Table 2): 3 (1.6%) patients had superficial epidermal loss without any effect on the repair and healed spontaneously; 1 patient



Figure 2 Postoperative appearance (6 months).

Table 1 Scoring system for family satisfaction.

Score	Satisfied	Acceptable	Not satisfied
1	—	—	—
2	19 parents	—	9 parents
3	143 parents	11 parents	—

(0.5%) with disruption of the glanular wings after 2 weeks was corrected after 3 months with simple closure of the glans; 2 patients (1.09%) had proximal penile fistula after 2 weeks at the anastomotic site which was corrected after 3 months with multilayer closure in one patient and healed spontaneously in the other; 1 patient (0.5%) with mid penile urethral diverticulum was repaired with trimming of the diverticulum after 3 months; and 2 patients (1.09%) with lateral penile torsion were repaired with simple degloving after 3 months. Flow rate of 73 patients was 15–22 ml/s. None of the patients had narrow urinary stream and so there were no candidates for ascending urethrogram.

Discussion

The first use of DOPF was by Asopa and Asopa, who used the prepuce as one unit to avoid devascularisation, as the inner preputial layer is not separable from the outer skin Ref. [5].

This new modification of the double face onlay preputial flap is to decrease incidence of fistula and glanular disruption, especially for those cases with conical or flat glans with UP < 8 mm.

Division of the prepuce longitudinally into two unequal parts 1/3 and 2/3 will not affect flap vascularity by using a magnifying loop to preserve its vascularity. Division of the prepuce unequally permits more length for the inner preputial segment, which will be oriented vertically to augment even proximally present hypospadias easily without torsion. The prepuce was rotated to the ventral aspect of the penis with its two faces. The inner mucosa of the prepuce was tapered distally and proximally to avoid diverticulum formation proximally and restore a vertically slit meatus distally, while the outer skin face was used to cover the penis, augment the onlayed urethra and augment the glans. Penile torsion is recorded in only 1.09% due to insufficient dissection of penile skin down to the penile root, which was repaired with simple degloving after 3 months. Sauvage et al. reported penile torsion in 60% of those patients repaired with tubularized preputial flaps [6].

Table 2 Complications according to the type of hypospadias.

Complications	DPH	MPH	PPH
Glanular disruption	0	1	0
Fistula	0	0	2
Diverticulum	0	1	0
Penile torsion	1	1	0
Epidermal loss	1	1	1

DPH = distal penile hypospadias, MPH = mid penile hypospadias, PPH = proximal penile hypospadias.

Table 3 Comparison between studies.

Complications	Gonzalez et al. [11], 18 patients	Barroso et al. [9], 48 patients	Wacksman [12], 37 patients	Present study, 182 patients
Fistula	0.18%	18%	5%	1.09%
Meatal stenosis	—	—	3%	—
Meatal receding	0.18%	4%	—	—
Diverticulum	—	9%	—	0.5%
Glans dehiscence	—	—	—	0.5%
Chordae	0.18%	4%	—	—
Bulky ventral skin	—	2%	—	—
Torsion	—	—	3%	1.09%
Anastomotic stricture	—	—	—	—
Epidermal necrosis	—	—	—	1.6%

Penile curvature was corrected by skin degloving = 133 and modified Nesbit = 49 with no residual chordee. Urethral plate was not resected in any case as it provides support, blood supply to the neourethra and decrease incidence of urethral fistula [7,8].

Two patients (1.09%) developed urethra-cutaneous fistula; one of them closed spontaneously and the other was repaired after 3 months with simple multilayer closure without the use of a urethral catheter. Redundant skin and dartos fascia ventrally make spontaneous healing of fistula or even its closure easy. Barroso and colleagues had reported urethrocutaneous fistula in 17% [9]. Tailoring of the inner preputial layer is mandatory in all cases to avoid urethral diverticulum. This was reported in 1 patient (0.5%) and diagnosed by urethral bulging ventrally during voiding postmicturition dribbling, and repaired after 3 months by simple trimming of the diverticular wall and multilayer closure without urethral catheter. Barroso and colleagues reported urethral diverticulum in 9% and meatal stenosis in 4% with the use of DOPF for hypospadias repair [9]. None of our patients had meatal stenosis and none were advised to use meatal dilatation. Penile edema occurred in 181 patients after removal of dressing and resolved spontaneously after 3 weeks due to penile skin elasticity and loose penile dartos under the skin. Barroso and colleagues reported ventral penile swelling in 1% (47 patients) due to lymphatic and venous impairment, which was corrected surgically for cosmetic appearance [9].

DOPF has two faces (the inner one for augmentation of the UP, the outer face to cover the ventral aspect of the penis), and its distal end was tapered as a triangular flap and sutured to the ventral aspect of the proximal non-approximated glanular wings, so that closure of the glanular wings was not under tension with preservation of the slit-like meatus due to approximation of the distal part of the glans. Glanuloplasty using ventral skin transposition was described first by Shaker and Ezzat; this technique was used in 11 patients with different types of hypospadias repair, and only 1 case was complicated by fistula and the remaining all had a good cosmetic appearance [10]. What recommends this technique is that preputial skin is a good urethral substitute as it has thin mucosa, a good blood supply, withstands exposure to urine and can be mobilized to any urethral segment [11].

As regards cosmetic appearance, only 9 patients were not satisfied due to the complications that had occurred. Table 3 shows the results of our study in comparison to other published studies using DOPF.

A limitation of this technique is for those cases with a more proximal meatus, as the preputial flap is not sufficient. Long-term follow up is needed.

Conclusion

The use of modified DOPF in repair of different types of hypospadias with small conical glans or flat glans and narrow urethral plate results in satisfactory functioning and an acceptable cosmetic success rate with low complications. Long-term study of this modified technique is deficient and another study will be prepared to evaluate these cases after 5 years.

Conflict of interest

I have no direct or indirect commercial financial incentive associated with publishing the article. No funding agreement limits my ability to complete and publish this research/study. I have full control of the primary data

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