

Onlay free preputial graft for mid and distal penile hypospadias

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ABSTRACT

Tubularized free preputial graft for hypospadias repair had been tried in the past and discarded due to high incidence of graft shrinkage causing stricture formation. We have tried to revive the technique using onlay method thus avoiding stricture formation. The technique was used in 33 subjects (Group A) and compared with 33 subjects in control group (Group B) in whom other techniques of urethroplasty were used. The study was a randomized controlled trial. The mean length of the free preputial graft was 22.06 ± 4.68 mm (16-35 mm) and breadth was 9.0 ± 1.32 mm (7-11 mm). Fistulae developed in 3 patients in group A out of which one healed spontaneously. In group B, 6 patients had fistula formation. Complications developed in 18% cases in group A and 50% cases in group B. There was significant difference between the cosmetic results ($p < 0.05$) with 58% excellent results in group A and 27% in group B. Free preputial graft onlay urethroplasty has better functional and cosmetic results.

KEY WORDS: Hypospadias, Free preputial graft, Onlay urethroplasty

Hypospadiology is an over expanding field as none of the current methods of urethroplasty have been proved superior over the others in terms of achieving the goal of excellent functional and cosmetic results. We have described our experience with free inner preputial full thickness onlay graft urethroplasty in mid and distal penile hypospadias and compared our results with currently used technique.

PATIENTS AND METHOD

The study was performed from September 2000 to September 2003 on sixty-six patients with distal penile and mid penile hypospadias without chordee or with minimal chordee who were divided randomly into two groups. In group A consisting of 33 cases, free preputial graft onlay full thickness urethroplasty was performed. Group B consisted of 33 cases forming the control group in whom other types of urethroplasty were performed including Mathieu's (5), Duckett's (10), Asopa's (14), Thiersch Duplay (2) and Snodgrass (2).

Operative Details [Figure 1]

The hypospadiac urethral meatus was catheterized with infant feeding tube number 6 Fr or 8 Fr. The glans was fixed with a stay suture for keeping the shaft taut. Length of the urethral tube to be formed was measured. The in-

ner preputial skin was marked with 4 stay silk sutures keeping the length 2 mm more than the desired length of the urethral tube. A U shaped incision was made around the urethral plate incorporating the urethral meatus. The minimal chordee was released by degloving of the penile shaft, lateral mobilization of the urethral plate and excision of fibrous tissue laterally. The preputial graft was harvested as a full thickness graft and placed over the

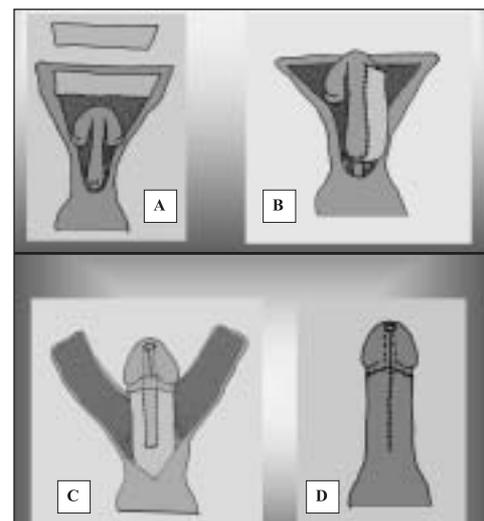


Figure 1: Operative steps of onlay free preputial graft urethroplasty A) Harvesting of graft B) Posterior layer anastomosed C) Urethral tube formed D) Urethroplasty completed

urethral plate ventrally as an onlay graft. It was sutured to the urethral plate and the urethral meatus around the catheter. The Glans was split into 3 components – 2 lateral wings were raised and brought around and approximated around the newly formed urethral tube. A second layer closure was done approximating the surrounding dartos tissue. Degloving of the penile skin was done and the outer preputial skin was used to cover the penile shaft after trimming the excess preputial skin.

The catheter was removed on the 10th postoperative day except in cases with pericatheter leak in which it was removed on the day of leak. Stitches were removed after 3 weeks and calibration was done at intervals of 15 days for 2-3 months to assess formation of any stricture. Cosmetic result was interpreted by the following parameters designed by us:

Bad: Wound healing by secondary intention or infection
 Fair: Meatus at glans tip
 Good: Meatus at glans tip, glans shape maintained
 Excellent: Meatus at glans tip, glans shape maintained, supple penile skin

RESULTS

The mean age of the patients was 5.98 ± 2.29 years (range: 3-12 years, median: 4-6 years). In group A, 23 patients had distal and 10 patients had mid penile hypospadias. In group B, 24 patients had distal and 9 had mid penile hypospadias. Minimal chordee was associated in 9 cases in group A and 10 cases in group B. The mean distance between the glans tip and urethra after chordee release was 20.18 ± 4.7 mm in group A and 21.30 ± 5.08 mm in group B. On comparing the difference between the two groups ($t = 0.92$, non significant). Hence both groups were comparable in terms of length of the urethra formed.

In group A, the length of the preputial graft ranged from 16 to 35 mm (mean 22.06 ± 4.68 mm) and breadth ranged from 7 to 11 mm (mean 9.0 ± 1.32 mm).

The early complications comprised of group A – pericatheter leak (7), postoperative oedema (4) and fistula (4) and group B – pericatheter leak (8), postoperative oedema (9), fistulae (7), diverticulum (1), and wound infection (2).

The cosmetic results were group A – bad (0), fair (3), good (11) and excellent (19) and group B – bad (2), fair (7), good (15) and excellent (9). Thus 57.57% (19/33) had excellent cosmetic results in group A and 27.28% (9/

33) had excellent results in group B. On comparison $z=2.491$ which was significant at $p<0.05$. In group A, 30 patients had good or excellent results (90.9%) while in group B, 24 patients had good or excellent results (72.72%). Out of the 4 fistulae in group A, one closed spontaneously and 3 required operative treatment while all the 7 fistulae in group B required operative intervention ($z=1.56$, not significant).

[Table 1] shows the overall complications. 4 patients in group B had more than one complication together. On analyzing the difference between the overall complications between the 2 groups statistically, $z=1.97$ (significant at $p<0.05$). Our follow up period ranged from 7 months to 36 months (mean 13.7 months).

DISCUSSION

Various studies have been conducted in the past to compare the results of the numerous techniques performed in the repair of a hypospadiac meatus. Onlay repairs have often been compared with tubularized repairs. In a series of 132 patients, it was concluded that onlay vascularized flaps had fewer complication rates than tubularized vascularized flaps in terms of fistula and diverticulum formation.^[1] However, the use of tubularized free graft as required in cases of posterior hypospadias has been reported to be complicated by stricture formation.^[2, 3, 4]

Kaplan GW used preputial free graft for neourethral construction in 21 patients of proximal hypospadias (17 as tubed graft and 4 as onlay graft) and reported few complications and found his method statistically better than the combined results of other reports ($\chi^2 = 5.38$, $p<0.05$).^[5]

Stock JA et al studied a total of 77 patients with proximal hypospadias who underwent a single stage hypospadias repair using a preputial free graft for neourethral construction and a preputial pedicle flap for ventral skin coverage of which 84% achieved excellent functional and cosmetic results with one procedure.^[6]

Ghali et al also had minimum complications with onlay urethroplasty and found that the complication rate was significantly ($p<0.05$) higher in patients with a proximal

Table 1: Overall complications

Complication	Group A (%)	Group B (%)	z-value
Fistula	4 (12.12)	7 (21.21)	0.991 (NS)
Diverticulum	0	1 (3.3)	1.008 (NS)
Infection	0	2 (6.6)	1.436 (NS)
Meatal stenosis	1 (3.3)	2 (6.6)	0.591 (NS)
Proximal stricture	0	4 (12.12)	2.064 ($p < 0.05$)
Total	5 (15.15)	16 (48.48)	1.97 ($p < 0.05$)

urethral meatus, with severe chordee or in repairs involving transaction of the urethral plate.^[7] In their study, all tubal abnormalities and almost all strictures occurred after Duckett's repair. The rate of urethrocutaneous fistula was significantly higher in Mathieu's (9%) than in onlay (2%).

Few authors have now modified Snodgrass technique with an added dorsal free graft over the raw area (following Snodgrass urethrotomy) to prevent meatal stenosis and stricture formation.^[8] However, an onlay free graft would be better as it has the added advantage of preservation of the urethral plate without any insult to its vascularity.

[Table 2] compares the complication rates of Onlay graft in various studies.^[4,9,10] Our results are better than others perhaps as we did the study in distal and mid penile hypospadias only.

The advantages of Free Preputial Graft Onlay Urethroplasty are:

1. Decreased rate of fistula formation attributed to

i. *Preservation of the urethral plate*

Urethral plate preservation has been reported to be associated with less number of complications^[11]. Every effort should be made to preserve the urethral plate during orthoplasty minimizing the need to use tubularized preputial island flaps and expanding the application of onlay procedures.^[12] Historically, preservation of the urethral plate was thought to contribute to ventral penile curvature that often complicates hypospadias surgery. However, Snodgrass et al, histologically, found the urethral plate to consist of well vascularized connective tissue comprised of healthy appearing, smooth muscle and collagen without any fibrous scar or dysplastic tissues^[13]. Preservation of the urethral plate, which is a fixed structure, prevents formation of a baggy urethra and helps in propulsion of the urine without diverticulum formation. These findings support reasonable efforts to preserve the urethral plate even in cases of mild to moderate penile curvature.

ii. *Second Layer Closure by Dartos*

Application of the Wrapping technique of the proximal anastomosed portion with corpus spongiosum tissue forming a 2-layer closure of the neourethra has

been found to prevent urethrocutaneous fistula formation.^[14]

2. Onlay repair involves easier dissection since the whole urethra need not be mobilized. Graft harvesting is often easier than dissecting out the vascular pedicle of a flap.^[4]
3. Placing a thin graft on the urethra produces less tissue bulk than a flap and there is no torsion of the repair as there may be with a flap. This aids in skin closure, glanular reapproximation and improved cosmesis.
4. A free graft allows for more flexibility in tailoring the graft than does a pedicle flap.
5. The histology of inner preputial graft is similar to that of urethra next only to bladder mucosal graft which is more time consuming and tedious with inferior results.^[2]
6. The importance of a normal aesthetic appearance, resembling a circumcised penis, and with the meatus at the tip of the glans has been emphasized time and again^[15] The cosmetic result with free onlay graft is excellent with meatus at tip, glans shape maintained and supple penile skin.

An excellent result has been described as a cosmetically and anatomically normal-looking penis able to direct a forceful urinary stream.^[7] A minor defect that would require no further management was considered a satisfactory outcome. A complication was an anatomical or a functional defect that required surgical intervention. The management was considered to have failed when there was a complication that required complete reconstruction. If the same criterion was applied to our study groups, results similar to single onlay flap were obtained in group A. The results in group B were similar to Duckett's double urethroplasty.

However, the existence of a learning curve has been well recognized in hypospadiac surgery.^[16] Also, cases of delayed presentation of complications following urethroplasty up to 22.9 months postoperatively have been re-

Table 2: Complication rates of Onlay graft in various studies

Study (year)	No. of Cases	Complications (%)				
		Overall	Fistula	Stricture	Meatal stenosis	Diverticulum
Present study (2003)	33	15	12	0	3	-
Powell et al (2000) ^[7]	34	27	21	3	6	3
Vyas et al (1987) ^[9]	4	39.4	-	-	-	-
Rober et al (1990) ^[10]	37	38	46	5.4	-	-

ported emphasizing the need for larger number of patients and longer follow up.^[4]

Hence, the future will decide the definite results of free preputial urethroplasty, with our study being just another stone in its foundation, yet yielding promising results.

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