Factors Predicting Success in Hypospadias Repair Using Preputial Flap With Limited Pedicle Mobilization (Asopa Procedure)

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OBJECTIVES To analyze the objective factors determining success in hypospadias repair by the Asopa technique of limited preputial pedicle mobilization.

METHODS This was a prospective study involving a cohort of 48 patients (age range 1-19 years) who underwent hypospadias repair in a tertiary care teaching institution, with a follow-up of 20-58 months. Patient inclusion criteria were absence of past history of any local surgery with urethral plate less than 6 mm and hooded prepuce.

RESULTS At a median follow-up of 33.5 months, the overall complication and fistula rates were 22.9% and 16.7%. Complication and fistula rates were 40% and 30% with tube repairs vs. 18.4% and 13.2% with onlay repairs.

CONCLUSIONS In patients unsuitable for Snodgrass repair, the Asopa technique of transverse preputial flap repair provides reasonably good results. Patients with proximal hypospadias, conical glans configuration, tube repairs, and more advanced age had higher complication rates with transverse preputial flap repair. UROLOGY 76: 92–96, 2010. © 2010 Elsevier Inc.

One-stage repair of hypospadias is favored currently. Commonly used options include Snodgrass repair with[1] or without graft,[2] Asopa repair,[3] Duckett procedure,[4] and double-faced preputial pedicled flap.[5] In patients with narrow plate or severe chordee, the preputial flap as an onlay or tube is the most preferred option for 1-stage repair. We prospectively analyzed results of inner preputial pedicled flap by the Asopa technique for hypospadias repair in 48 patients with narrow plate and/or severe chordee according to age of patients, site of meatus, configuration of glans, and type of procedure (onlay vs tube repair).

MATERIAL AND METHODS

This was a prospective study conducted in tertiary care teaching hospital from October 2003 to March 2009. Patient selection criteria for the procedure included patients with no past history of any local surgery with urethral plate less than 6 mm and hooded prepuce. Hypospadias was graded according to the position of the meatus and chordee categorized as mild (visible only on erection), moderate (demonstrable without erection), and severe (bent penis bringing tip of glans onto ventral surface). Patients were also divided on the basis of glans configuration, either conical or splayed.

We used a modified Nesbit technique of dorsal tunica albuginea plication (TAP),[6] and/or dermal graft[7] or urethral plate excision for the correction of penile curvature. The degree of curvature was evaluated by using McLaughlin technique.[8]

The technique of this repair has been well described previously by Asopa.[9] A transverse flap of appropriate length and width was mobilized from the mucosal layer of the prepuce. The width of flap used depended on the width of the plate. The 2 measurements in combination should total approximately 12-20 mm depending upon the age of the patient. It was safer to harvest more flap than necessary and to leave exact sizing until the actual reconstruction. Next the flap was dissected from the prepuce but was left well attached. The neourethra was left attached to the underneath surface of the foreskin. Therefore, the skin and the neourethra share a common blood supply. The preputial skin was cut obliquely with a bias. The right side of the prepuce can be rotated onto the ventral surface. Depending upon whether urethral plate is preserved or excised, the transverse preputial flap was used either for a ventral onlay procedure or a tube procedure. A urethral catheter of 6-14 Fr was used as stent for 10 days.

The glans was split in the midline. Two large glans flaps were developed, which were brought together in the midline and sutured in 2 layers over the neourethra. An inner layer of 6.0 Vicryl was followed by an outer layer of interrupted 6.0 chromic catgut for this closure. The distal end of the neourethra was sutured to the glans with interrupted 6.0 chromic catgut. The entire repair was covered ventrally with a large flap of foreskin and closed with a running 6.0 chromic catgut. The small flap of

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Table 1. Patient groups and complications

Patient Groups (no. of patients)	Complications % (ratio)			
	Fistula	Meatal Stenosis	Glans Dehiscence	Total
Total patients (48)	16.7% (8/48)	4.2% (2/48)	2% (1/48)	22.9% (11/48)
According to type of hypospadias				
Distal hypospadias (21) (distal 8, mid penile 13)	9.5% (2/21)	4.8% (1/21)	0% (0)	14.3% (3/21)
Proximal hypospadias (27) (proximal penile 9, scrotal 14, perineal 4)	22.2% (6/27)	3.7% (1/27)	3.7% (1/27)	29.6% (8/27)
According to type of repair				
Tube repairs (10)	30% (3/10)	10% (1/10)	0% (0)	40% (4/10)
Ventral onlay repairs (38)	13.2% (5/38)	2.6% (1/38)	2.6% (1/38)	18.4% (7/38)
Distal hypospadias (18)	11.1% (2/18)	5.6% (1/18)	0% (0)	16.7% (3/18)
Proximal hypospadias (20)	15% (3/20)	0% (0)	5% (1/20)	20% (4/20)
According to age				
1-3 y (16)	6.3% (1/16)	0% (0)	0% (0)	6.3% (1/16)
4-13 y (26)	15.4% (4/26)	7.7% (2/26)	3.8% (1/26)	26.9% (7/26)
14-19 y (6)	50% (3/6)	0% (0)	0% (0)	50% (3/6)
According to glans configuration				
Conical (23)	21.7% (5/23) (coronal 2)	8.7% (2/23)	0% (0)	30.4% (7/23)
Splayed (25)	12% (3/25) (coronal 0)	0% (0)	4% (1/25)	16% (4/25)

preputial skin is also rotated and closed laterally. This maneuver helps in decreasing penile torsion. To minimize ischemia and the tension over the urethra for preventing glans dehiscence, the glans dissection should be enough to develop adequate glans wings, and glans should be closed by 1 or 2 deep stitches followed by just approximating (not tight) superficial glans stitches.

We removed dressings and catheter on the 10th postoperative day. Patients were followed up at the end of first, third, sixth months and at 1 year after the operation and later on depending upon the presence of complications.

RESULTS

The patients ranged in age from 1 to 19 years (median age: 5 years, mean age: 7 years) with follow-up period of 20 to 58 months (median 33.5 months, mean 35.23 months). Chordee was present in 43 cases (90%), the degree being mild, moderate, and severe in 22, 11, and 10 patients, respectively. Ventral onlay procedure was done in 38 patients, and 10 patients required complete tubularization for the neourethra formation. Complete tubularization was required in cases in which the urethral plate was excised for severe chordee correction.

Of the 11 (22.9%) patients who had complications, 8 (16.7%) had fistula. The most common site of fistula was the penoscrotal region. One patient developed glans dehiscence in immediate post operative period which was repaired after 6 months of surgery. Two patients developed meatal narrowing which required meatal calibration up to 6 months. No patient had skin necrosis, stricture, diverticulum, or residual chordee in follow up period. Four patients had 5-10 degrees of penile torsion, and 5 patients had some bulky skin cover on the ventral surface of penis that was acceptable to the patients and parents. The complication rate (40%) was much higher with the complete tubularization procedure, and was higher in patients with proximal hypospadias (29.9%) compared with those with distal hypospadias (14.3%). In scrotal hypospadias group complication rate was 42.8% (6/14); 4 patients (28.6%) had fistula, 1 patient (7.1%) had meatal stenosis, and 1 patient (7.1%) had glans dehiscence. Of the 4 patients with perineal hypospadias repair, 1 patient (25%) had fistula. The complication rate was higher (3/6; 50%) among patients who underwent repair at an adolescent age. The details of complications in various patient groups are shown in Table 1.

In patients with conical and splayed glans configuration, the complication rates were 30.4% (7/23) and 16% (4/25) with fistula rates of 21.7% (5/23) and 12% (3/25), respectively. In patients with conical glans configuration, 2 patients had coronal fistula, in comparison with patients with splayed glans, of whom none had coronal fistula. Two patients (8.7%) with conical glans configuration had meatal stenosis. One patient (4%) with splayed glans configuration had glans dehiscence.

COMMENT

One-stage hypospadias repair claims ideal anatomic and functional urethral reconstruction with good aesthetic restoration of external genitalia, a low complication rate, minor psychological involvement and reduced social cost.

In this study of limited number of patients, we performed this procedure in patients unsuitable for Snodgrass repair and preserved the urethral plate as much as possible for an onlay island flap urethroplasty. Overall complication rate in our series was 22.9% and the most

common complication was fistula (16.7%). Other complications were glans dehiscence in 2% and meatal narrowing in 4.2% of patients. There was improvement in the results over time: the overall complication and fistula rates for onlay repairs were 21.4% (3/14) and 14.2% (2/14) in the first 2 years of study compared with 14.2% (2/14) and 7.1% (1/14) in the last 2 years of the study.

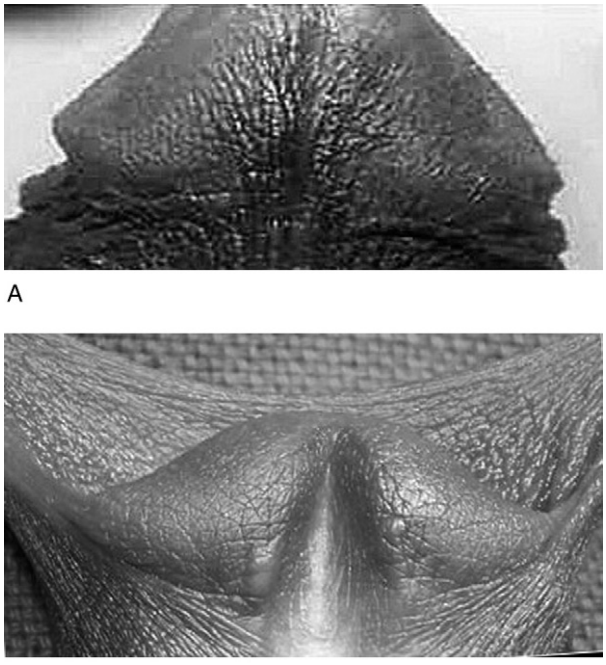
Overall complication and fistula rates in ventral onlay repair were significantly less compared with complete tubularization procedure (complication rate 18.4% vs 40% and fistula rate 13.2% vs 30%). Reported complication rates for the Duckett onlay patch are as follows: Piró Biosca et al, 12% complication rate; Dewan et al, 18% fistula rate; and Khattak et al, 33% complications rate with 17% fistula rate.[10-12]

Wiener et al reported a complication rate of 36% vs. 31% and fistula rates of 14% vs. 17% for tube vs. onlay repairs for proximal hypospdias.[13] Patel et al also reported a higher complication rate with island tube repairs compared with island onlay repairs.[14] Dewan et al reported 38% vs. 18% complications rate for the Duckett tube vs. onlay patch repair.[11,15] Several other authors have also noted fewer complications with onlay repair, which has led to an increasing preference for onlay over the tube repair.

Although 4 patients had some bulky skin cover on the ventral aspect of penis after this procedure, it did not cause much bother to patients and their parents in follow-up. This bulkiness could be avoided in most of the cases by extending the dorsal cut by bias incision across the midline beyond the pedicle. Penile torsion is said to be one criticism of the Asopa technique, but penile torsion can occur in the Duckett technique also if the procedure is not properly performed (ie, if the pedicle is not adequately mobilized up to the base of penis). The 5-10 degrees of torsion that we noted in 5 patients was well acceptable to patients and did not cause any significant penile disfigurement on erection. In the Asopa technique, torsion can be avoided by extended oblique cut and by rotating the entire skin cover circumferentially at its maximum. In our series, penile torsion was not a significant problem as long as the entire preputial unit (neourethra and overlying skin) was dissected back to the penopubic angle, which completely released the penis to allow it to remain straight.

Ghali, in a large series, also reported significantly higher complication rate in patients with proximal hypospadias, with severe chordee, or in repairs involving transection of urethral plate and Duckett tube repairs[16] Ozturk et al found severe chordee and middle and posterior hypospadias to be associated with higher complication rates.[17] Imamoğlu et al found that the presence of chordee and the proximally located meatus are among the leading factors that influence the rate of success in various types of hypospadias repairs.[18]

The complication rate was higher in patients with conical glans configuration in comparison with splayed glans. Patients with a conical glans typically have a narrow urethral plate with little distal extension, and patients with a splayed (well-clefted) glans tends to have a wider and healthier urethral plate with better distal projection (Fig. 1). This might be the reason for the higher rates of coronal fistula and meatal narrowing in patients with conical glans configuration.



A

B

Figure 1. (**A**) Conical glans. (**B**) Splayed glans.

There has been controversy regarding the impact of age on success of hypospadias repair. Ghali did not report any significant difference in complication rate in patients undergoing operation before or after 2 years of age in his series of various types of hypospadias repairs (Mathieu repair in 216 patients, Duckett repair in 148 patients, onlay preputial flaps in 42 patients, and Mustarde flap procedure in 12 patients).[16] Similarly, Ozturk et al did not find age to be a complication-deciding factor in their study including patients from 6 months to 13 years of age who underwent 1-stage hypospadias repairs.[17] Contrary to these, Imamoğlu et al found the age to be an influencing factor for success in various types of hypospadias repairs (meatal advancement, perimeatal flap, and preputial flap procedures).[18] In our series also, age at the operation influenced the fistula rate. The highest fistula rates were seen in adolescent patients irrespective of the type of procedure and site of hypospadias. Patients in 1- to 3-year age group had the best results.

There is no direct comparative study to prove the superiority of Asopa procedure over the Duckett procedure or vice versa. Both are associated with higher complications rate for complete tubularization (for Duckett tube: Dewan et al, 34.4% fistula rate and Elbakry, 42% complication rate, vs for modified Asopa/Hodgson XX: Ellsworth et al, 33% (4/12) complication rate, Wacks-

man, 8% (3/37) and Frey et al, 21% complication rate).[19-22] Asopa described 10.9% and 16.8% complication rates for patch and tube repairs respectively.[9]

Recently, the use of the Snodgrass technique has been extended to patients with narrower plates (≤8 mm), significant chordee and proximal hypospadias by mobilization of distal plate and proximal urethra.[23,24] Although short-term results have been encouraging, there are certain concerns. Urethral plate mobilization may hamper the vascularity of neourethra, leading to recurrent chordee on longer follow-up; this has been reported by Demirbilek et al in onlay repairs.[25] In their study, 2 of the 3 patients who underwent urethral plate mobilization during an onlay procedure developed recurrent chordee. Braga et al described better uroflow curves, fewer proximal fistulas, and significantly fewer ($P = .01$) major complications (eg, fistula and repair breakdown) with onlay island flap compared with TIP procedure for penoscrotal hypospadias repairs although urethral calibers and overall complication rates were similar in both.[26] In our series, we performed uroflowmetry in older patients (7 patients who were ≥13 years of age) at a follow-up of 25-42 months. Flow curve pattern was bell shaped in all of these patients. Maximum flow rates ($Q_{max.}$) ranged from 13.7 to 22.1 mL/s (mean 18.6 mL/s). Four of these patients had undergone tube repair and 3 had undergone onlay repair. Mean maximum flow rates were not significantly different between onlay and tube repairs (18.9 and 18.4 mL/s respectively). Further, Snodgrass et al reported the complications of proximal hypospadias repairs to be significantly higher (37%) than those of midshaft hypospadias repairs with TIP procedure.[27] Hence, extension of TIP to these situations will require long-term follow-up before this technique can be recommended.

Similarly, for the single-stage repair of severe hypospadias in which urethral plate cannot be preserved, the use of modified tubularized transverse preputial island flap with or without meatoplasty with V-incision suture has been described.[28-30] As these modifications are with Duckett procedure, whether these modifications can improve the results of the Asopa procedure is not known.

CONCLUSIONS

The Asopa transverse preputial flap which is a well-established technique that, when used in patients unsuitable for Snodgrass repair, resulted in higher complication rates in patients with penoscrotal and perineal hypospadias, preputial tube procedures, and patients with conical glans configuration. Younger patients (≤3 years of age) had optimal results with this technique. Mild ventral penile bulkiness and torsion seen in a few patients after this procedure were quite acceptable to the patients and their parents. A major advantage of the Asopa technique is its ability to maintain good vascularity to the neourethra as well as the skin cover, avoiding urethral or penile skin necrosis. In addition, most complications are well salvageable.

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