

Results of Onlay Flap Versus Durham Smith in Proximal Hypospadias

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How to cite this article:

Mohajerzadeh L, Khaleghnejad Tabri A, Noroozi H, Lotfollahzadeh S, Atqiaee Kh. Results of Onlay Flap Versus Durham Smith in Proximal Hypospadias. Iranian Journal of Pediatric Surgery 2017,3(1):33-38.

DOI: <http://dx.doi.org/10.22037/irjps.v3i1.17001>

Abstract

Introduction: Urethroplasty was originally used for the repair of hypospadias of the mid and distal portion of the penis but since complications of the two-stage Durham Smith technique such as mega urethra and proximal anastomotic strictures became apparent, the Onlay island flap technique has been increasingly used in more severe cases of proximal hypospadias. The aim of our study was to compare the outcome of these two techniques in the surgical treatment of hypospadias.

Materials and Methods: In this retrospective study, thirty-three patients underwent surgery for the treatment of hypospadias. The two-stage Durham Smith repair was used for 17 cases and the onlay island flap technique was carried out on 16 patients. Data was analyzed using SPSS software version 21 and complication rates of the two procedures were compared.

Results: Altogether, frequency of complications was higher in the Smith technique than the onlay flap procedure without any significant difference between the two techniques (47% for Smith technique and 19% for onlay repair, $P=0.141$). Fistula was the most frequent complication in the two techniques (41% for Smith technique and 13% for onlay repair, $P=0.117$). Meatoplasty was done for meatal stricture in the Smith group. Moreover, the Smith technique failed completely in one case who then underwent Tubularized Inside-Plate (TIP). There was a case of chordee recurrence in the Smith technique, for which a dorsal Nesbit plication was carried out. The mean days of hospitalization was more with the Smith technique (7.1 days vs 5.0, $P=0.016$). In addition, the mean cases which required reoperation was higher in the Smith group than the onlay flap (1.0 vs 0.2, $P=0.025$).

Conclusion: The results of this study showed that the onlay flap technique had lower complications and reoperation rates than the two-stage Smith technique. In addition, the onlay flap technique has fewer days of hospitalization than the Smith technique, resulting in lower costs to the health system and patients.

Keywords

- Onlay island flap
- Two-stage Durham Smith
- Proximal Hypospadias
- Complications

Introduction

Hypospadias describes a spectrum of congenital urologic anomalies in which the location of urethral meatus opening varies anywhere from glans to perineum at the ventral penile aspect.¹

The overall incidence is approximately 1 in 300 live births, consequently 6 thousands male neonates are diagnosed with hypospadias annually in the United States.²

The diagnosis of hypospadias is made in the newborn period during routine neonatal physical exam or just before performing a circumcision procedure. Nine percent of patients with hypospadias have coincidental anomalies, the most common of which is inguinal hernia.^(1,3)

The diagnosis of Hypospadias mandates surgical intervention. There are more than two hundred surgical techniques addressing this anomaly which have been introduced since 1950, reflecting the challenging field of this practice.⁴ Urethrocutaneous fistulae formation, a matter of the utmost importance, occurs as the most common complication following hypospadias surgery, demanding subsequent procedure(s) to re-establish urethral continuity 6-12 months after the index surgery. A couple of surgical techniques being widely applied in proximal hypospadias are one stage onlay flap and the two-stage Durham Smith technique.

Materials and Methods

In this retrospective study, all patients presenting with proximal hypospadias to Mofid Children Hospital, Tehran, were included. According to patients' file numbers they were randomized in to two groups. All data including demographic data, sign and symptoms during presentation and the degree of

chordee which might be less than 30 degree and correctable by dorsal plication, urethral and meatal stenosis, incontency, complete failure and number of subsequent procedures were collected in a prepared checklist. We analyzed data using SPSS software version 21.

Patients with proximal hypospadias defined as an ectopic urethral opening at the ventral aspect of the penis, from proximal third of the penile shaft to the perineum were studied. The classification was based on pre-operation physical exam, although the evaluation continued dynamically during the surgical procedure regarding the chordee, soft tissue status and the width of the distal urethra. We applied one stage transverse island preputial flap in the manner of a tube or onlay in one group and two stage Durham Smith technique in the other group. The onlay island flap technique for hypospadias repair is summarized as follows:

1. The procedure is initiated by making a U shaped incision around the urethral plate while attention is paid to preserve a dorsal urethral flap of 8 mm width.
 2. Bilateral glans wings are made and the skin and subcutaneous tissue is degloved and identification of the inner prepuce is carried out.
 3. In cases of penoscrotal hypospadias (extremely proximal hypospadias) preservation of the urethral plate is of great importance.
 4. The onlay island flap that was prepared by the inner prepuce, is sutured by a running 7.0 vicryl to the urethral plate. The mentioned flap should be wrapped around a 12 French bougie. Following urethral reconstruction, skin is sutured using a Byar flap.
- Two stage hypospadias repair: Correcting the penile



Figure 1: A-E The Transverse Island preputial flap technique. A: preoperative view. B: degloving the penis. C: neourethra made by the transverse preputial flap. D: creating neourethra. E: post operative view

chordee and covering the ventral aspect of the penis by dorsal foreskin, constitutes the first stage. The mentioned technique is also useful in extreme proximal hypospadias (scrotal hypospadias) with chordee and in penoscrotal hypospadias.

With the intention of correcting the penile axis,

removal of the compromised ventral urethral plate is carried out, alternatively, it could be preserved and splitting the dorsal skin and covering the ventrum could be applied. At least, a six months interval should be considered between the two stages of urethroplasty.

Inclusion criteria: All patients with proximal

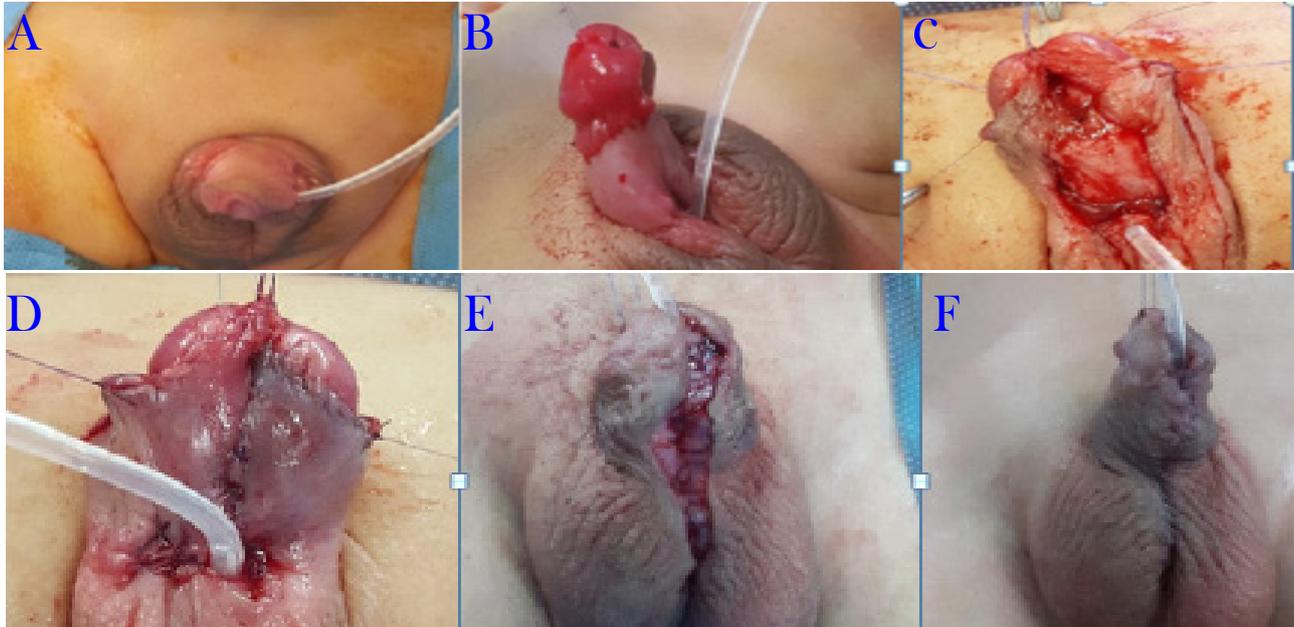


Figure 2: A-F, Two-staged hypospadias repair

A: preoperative view

B: correction of chordee

C: The dorsal skin is split and wrapped around the ventrum and urethral plate is preserved.

D: The first stage is complete.

E: Urethroplasty is carried out.

F: The second stage is completed.

hypospadias admitted to Mofid Children Hospital, Tehran, whose parents signed the informed consent were enrolled.

Exclusion criteria: We excluded those patients who did not accept participating in the study.

Results

Thirty-three pediatric patients with proximal hypospadias were enrolled. The study was designed to compare the aforementioned surgical technique outcomes in this population. Sixteen patients (48% of cases) were repaired using the onlay flap technique while two stage Durham Smith technique was applied to the remaining 17 patients. The mean age of our patients in each group was 25 +/- 21.7 months and

30.8 +/- 21.4 months respectively.

Four patients (23.5%) with proximal hypospadias, 12 patients (70.6%) with penoscrotal hypospadias and only one with scrotal hypospadias were treated with the two-stage smith technique. Six patients (37.5%) with proximal hypospadias and 10 patients (62.5% cases) with penoscrotal hypospadias were treated with the onlay flap technique.

Ten patients (58.8%) had accompanying anomalies along with hypospadias. The following table demonstrates the frequency (percentage) of anomalies among those who were treated by smith versus the onlay flap technique.

Table 1: Comparison of frequency of anomalies in the

	two groups					
	None	Uni-lateral UDT	Ambiguous Genitalia	Inguinal hernia	CAH	Bi Lateral UDT
smith	41%	29%	23%	17%	12%	6%
Onlay flap	81%	19%	0	0	0	0

Twelve patients (75% of cases) in smith group and 14 patients (87.5% of cases) in the onlay group also had a significant chordee respectively. Some kind of post-operative complication occurred in eight patients (47.1% of cases) of smith group and three patients (18.8% of cases) of Onlay flap and there were no

significant statistical difference. (P=0.141)

The study revealed that urethrocutaneous fistulae was the most common cause of post-operative morbidity in both groups, while it was more prevalent in those repaired by the smith method in comparison with the onlay flap technique (41% vs 13%) **Table 2**.

Table 2: comparison of complications between two techniques

	Meatal stenosis	UCF	Complete failure	chordee	Miscellaneous
Smith	6%	41%	6%	6%	53%
Onlay flap	6%	13%	0	0	81%

In our study only 2 patients, one in each group experienced meatal stenosis as a complication and underwent dilatation and meatoplasty. Smith repair failed in one patient (5% of cases) who underwent reconstruction by the TIP method. As mentioned earlier 7 patients (41% of cases) were complicated with urethro cutaneous fistulae after undergoing the smith reconstruction method, which was managed as follows: Multi-layer closure in two patients, multi-layer closure accompanied with super glues in one patient, TIPS in two patients, multi-layer closure followed by TIPS reconstruction technique in one patient and TIPS with fibrin glue in three patients. Furthermore, in 2 patients (13% of cases) in whom onlay flap technique was used, urethro cutaneous fistulae occurred which was managed by multi-layer closure and one patient underwent reconstruction by the PATIO method. Type of reconstruction technique did not influence the duration of hospital stay in our study. In patients who underwent the Smith technique, complications demanding reoperation was more common (P=0.025) as shown in **Table 3**.

Table 3: Frequency of reoperation in group 1 & 2

Onlay flap	smith	Re operation
13 (81%)	9 (53%)	0
3 (19%)	3 (17%)	1
0 (0%)	2 (12%)	2
0 (0%)	2 (12%)	3
0 (0%)	1 (6%)	4

Discussion

Surgical treatment of proximal hypospadias is one of the most challenging tasks in pediatric surgery. The most appropriate technique in regards to the least post-operative complication, the most favorable aesthetic criteria and functional status, should be applied. Several factors including the severity of chordee, adequate supporting tissue for neo urethra, the consistency of urethral plate and the surgeon

expertise should be considered. Furthermore the necessity of glanuloplasty and preputioplasty should be mentioned.⁶ The most common complications followed by hypospadias reconstructive surgery are fistulae formation and meatal stenosis. In a study by Demirbelik⁷, post-operative complications were reported in 33% of cases who underwent repair using the onlay flap technique while recurrent chordee was demonstrated in 2 patients out of 3 in whom the onlay flap was used. In a study by Holland AG et al, management of urethro cutaneous fistulae as the major complication of hypospadias repair was assessed in 1753 patients who underwent hypospadias repair during 1993-2003. The results showed that the incidence of UCF followed by hypospadias repair was 7%. The most common primary techniques in order of decrease were Two Stage Durham smith, Tubularized Incised Plate Urethroplasty and onlay flap. Twenty seven percent of patients experienced recurrent fistulae, which were managed by reoperation, but demands for a third stage reconstructive surgery was not reported. This study has the highest rate of recurrent UCF reported in posterior hypospadias.⁸ In a similar study by Castanon⁹ 42 patients underwent reconstruction surgery for proximal hypospadias by the Duckett technique while the remaining 38 patients were repaired by the onlay flap method. In both techniques urethro cutaneous fistulae formation was the most common reported complication without significant statistical differences. Furthermore, mega urethra was solely reported in the Duckett technique (4.7% of cases). The authors concluded that results concerning post-operative complications were comparable while proximal stenosis and mega urethra were more common following the Duckett technique. In one prospective study by Mohajerzadeh et al, the onlay flap technique in hypospadias cases who were

repaired with a plate shorter than 6 mm was assessed. The study was conducted for 1 year. The mentioned technique was applied for all types of hypospadias except subcoronal cases and the accompanied chordee was addressed by the Nesbit technique in cases of extreme small glans. Urethroplasty without glansplasty was also used.¹⁰

In a study by Javid L et al 60 patients with proximal and middle hypospadias who underwent reconstruction using the Tubularized Incised Plate surgery and the onlay island flap repair were compared. The study concluded that the urethroplasty technique resulted in better outcomes such as shorter surgery duration, lower post-operative complications and better cosmetic results.¹¹ In another study conducted by Kagantsov, evaluating 35 pediatric patients with proximal or middle type hypospadias, Tubularized Incised Plate and the onlay island flap technique were compared. The study showed lower postoperative complications and a decreased rate of redo surgery in those managed with TIP.¹² In a study by Singal AK¹³ onlay technique complications occurred in 16% of the studied patients and the most prevalent complication was fistulae formation. Only two patients out of 92 demanded a third stage repair. The study announced the onlay technique as the most reliable and effective method concerning cosmetic and functional status.

Chandrasekharan¹⁴ studied the outcomes of longitudinal island flap techniques including onlay and tubularized flap in 102 patients with proximal hypospadias accompanied by a mild chordee. The complication rate was 12% which was more common in tubularized technique in comparison with onlay flap (24% versus 5.9%). In another meta-analysis of six published researches up to 2014 by

Xiao D, the outcome of onlay flap technique and TIP urethroplasty was analyzed. Three hundred and nine patients underwent repair by TVIF technique while TIP method was applied in the remaining 262 patients. The meta-analysis concluded equivocal results regarding clinical aspects.¹⁵ Several studies have compared the results of single stage versus two-stage repair in proximal hypospadias, but we have compared the outcome of onlay flap versus two-stage Smith repair for the first time.

In the current study, the patients were followed for an average of 12 months (3 to 12 months).

Hospital stay period significantly decreased by applying onlay flap in comparison with the two-stage smith technique. Post-operative complications occurred 2.5 times more in two-stage smith repair versus the onlay flap method. The most common complication was urethro cutaneous fistulae, which was demonstrated 3.5 times more in the two-stage smith method in comparison with the onlay flap.

In one patient who underwent the two stage smith repair complete failure was reported in whom it was corrected by the TIPS technique. In approximately 81% of patients in whom we used onlay flap technique, further reconstructive surgery was not demanded, while 47% of those who underwent two stage Smith repair demanded reoperation. Maximal reoperation surgeries in two-stage smith repair was 4 times while only three patients in whom we used onlay flap technique demanded solely one more reconstructive surgery.

Conclusion

According to the current study, onlay flap technique resulted in fewer hospital stay days. The complication rate was less in onlay flap technique and demanding redo surgeries were less frequent.

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