



Cosmetic and functional outcomes of two-stage hypospadias repair: an objective scoring evaluation and uroflowmetry

İki aşamalı hipospadias onarımının kozmetik ve fonksiyonel sonuçları: objektif bir skrolama değerlendirmesi ve üroflowmetri

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ABSTRACT

Objective: The functional outcome following hypospadias repair is as important as the cosmetic outcome. Currently, structured scoring systems, patient questionnaires and evaluations of photographs and uroflowmetry are used to assess the results of hypospadias repair. In the present study, we assessed the outcomes of two-stage hypospadias repair using Hypospadias Objective Scoring Evaluation-HOSE and measures of uroflowmetry.

Material and methods: Over a period of eight years, from January 1997 to December 2004, 126 hypospadias patients were treated, 90 of these patients received two-stage repairs and 36 patients received single-stage repairs. HOSE questionnaire and uroflowmetry data were obtained to evaluate the long-term outcome of the two-stage hypospadias repairs.

Results: The age at the time of assessment ranged from 8 to 23 years-old, with a mean follow-up time of 39.78 months. Thirty-five patients had proximal hypospadias, and 20 had distal hypospadias. Of the 55 patients who received complete two-stage hypospadias repair and agreed to participate in the study, nineteen patients had acceptable HOSE scores and 36 patients had non-acceptable scores. The uroflow rates of 43 of the subjects were below the fifth percentile in three patients, equivocal (between the 5th and 25th percentile) in four patients and above the 25th percentile in 36 patients.

Conclusion: Two-stage repair is a suitable technique for all types of hypospadias with varying outcomes. HOSE and uroflowmetry are simple, easy, non-invasive and non-expensive tools for objectively assessing the long-term outcomes of hypospadias repair.

Key words: Objective assessment of hypospadias repair; two-stage hypospadias repair.

ÖZET

Amaç: Hipospadias onarımını takiben fonksiyonel sonuçlar kozmetik sonuçlar kadar önemlidir. Günümüzde, hipospadias onarımının sonuçlarını değerlendirmek için yapılandırılmış skrolama sistemleri, hasta anketleri ve üroflowmetrinin ve fotoğrafların değerlendirilmesi kullanılmaktadır. Bu çalışmada, hipospadias Objektif Skrolama Değerlendirmesi-HOSE ve üroflowmetri ölçümleri kullanarak iki aşamalı hipospadias onarımının sonuçlarını değerlendirdik.

Gereç ve yöntemler: Ocak 1997'den Aralık 2004'e kadar 8 yıllık bir dönem boyunca 126 hipospadias hastası tedavi edildi, bu hastaların 90'ında iki aşamalı onarım ve 36 hastada tek aşamalı onarım yapıldı. İki aşamalı hipospadias onarımının uzun dönem sonuçlarını değerlendirmek için HOSE anketi ve üroflowmetri verileri temin edildi.

Bulgular: Değerlendirme sırasındaki hastaların yaşı 8 ile 23 yıl aralığında idi, ortalama takip süresi 39,78 ay idi. Otuz beş hastada proksimal hipospadias ve 20'sinde distal hipospadias mevcuttu. Tam iki aşamalı hipospadias onarımı yapılan ve çalışmaya katılmayı kabul eden 55 hastanın on dokuzunun kabul edilebilir HOSE skorları ve 36 hastanın kabul edilemez skorları vardı. Kişilerin 43'ünün üroflow hızları üç hastada beşinci persentilin altında, dört hastada belirsiz (5. ve 25. persentil arasında) ve 36 hastada 25. persentilin üzerinde idi.

Sonuç: İki aşamalı onarım değişen sonuçlarla birlikte tüm hipospadias tipleri için uygun bir tekniktir. HOSE ve uroflowmetri; hipospadias onarımının uzun dönem sonuçlarını objektif olarak değerlendirmek için basit, kolay, invaziv olmayan ve pahalı olmayan araçlardır.

Anahtar sözcükler: Hipospadias onarımının objektif değerlendirilmesi; iki aşamalı hipospadias onarımı.

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Introduction

Hypospadias is a common congenital anomaly affecting the penis that, either treated or untreated, can have functional, cosmetic and psychosexual consequences extending into adulthood.^[1,2]

The techniques of hypospadias repair have been changing in recent years. Two-stage repair is now widely used for hypospadias repair, but excellent outcomes from single-stage repair have been recently reported.^[3]

The assessment of the results of hypospadias repair remains problematic, as published studies have shown that a significant differences might exist between the judgment of patients and operating surgeons.^[4]

Classically, the outcomes of hypospadias repair have been assessed by reoperation rate secondary to fistula, stenosis, diverticulum and residual penile curvature.^[5]

Several attempts have been made to objectively assess outcomes using structured scoring systems (Hypospadias Objective Scoring Evaluation-HOSE and Pediatric Penile Perception Scoring-PPPS), patient questionnaires, photographic evaluation and uroflowmetry to assess voiding.^[5-8]

In this study, we assessed the outcomes of two-stage hypospadias repair using the Hypospadias Objective Scoring Evaluation (HOSE) system and uroflowmetry. The HOSE is underused, although the use of such a system is recommended by others.^[6,9,10]

The HOSE is a validated scoring system that incorporates the evaluation of meatal location and shape, urinary stream, straightness of erection, presence and complexity of urethral fistula.^[6]

The minimum total score is 5, and the maximum total score is 16. The point score is graded as either acceptable or not. In the present study, a score of 14 to 16 was considered acceptable, and score a below 14 was considered not acceptable.

Material and methods

Over a period of eight years, from January 1997 to December 2004, a total of 126 referred patients underwent hypospadias repair in our surgical department. Ninety of them received two-stage repair, and 36 received single-stage repair.

After obtaining approval from the ethical committee of our university, either a phone call or an invitation letter was sent to 76 patients (84.4%) who had a completed two-stage hypo-

spadias repair and whose medical records contained relevant data needed for the study. However, only 55 children and their parents agreed to give their consent for participation in the study. Table 1a, b lists the demographic data of the subjects, including race, age at time of study, age when first seen in the specialized clinic, type of hypospadias, associated anomalies and operative notes.

Upon arrival at the outpatient clinic, each patient was supplied with a copious amount of diluted juice. At the same time, the patient and/or parents were interviewed, and at this stage, the subjects were examined based on the HOSE questionnaire (Table 2).

After an appropriate time, the patients (who did not have fistula and could void voluntarily) were asked to perform uroflowmetry in private (Urocap-11™) (Laborie medical technologie corp, Mississauga, Ontario L4V 1X1 Canada).

The parameters measured were the peak flow, voiding time, flow time, time to peak flow and voided volume. The peak flow (Q-max) and voided volume (vv) results were expressed as percentiles and interpreted according to a Kajbafzadeh nomogram (Figure 1).^[11]

Q-max and voided volume were considered to be normal if they were >25th percentile, equivocal if they were between the 5-25th percentile range and obstructed if they were <5th percentile.

Results

Fifty-three Malay patients, one Chinese patient and one Siamese patient with different types of hypospadias underwent 37 Bracka's and 18 Byars' procedures that were performed by three surgeons in a similar manner to the original descriptions. The mean follow-up period was 39.78 months (range of 8-80 months).^[12,13]

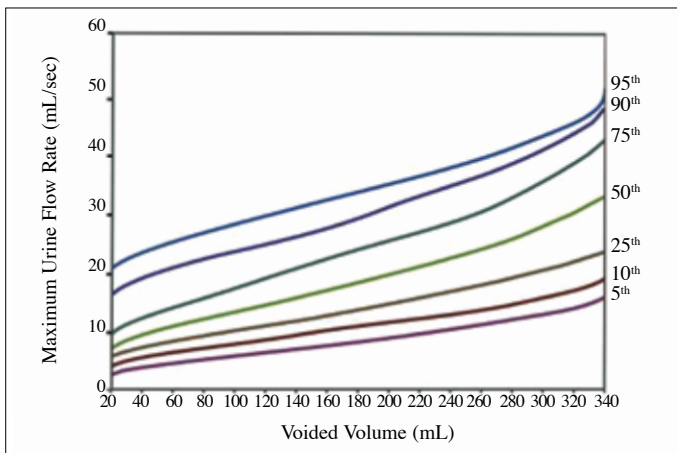
The mean age at the first repair stage was 10.12 years (range 3-17 years-old) and at the second stage was 11.36 years (range 4-18 year-old). The age at time of assessment ranged from 8 to 23 years-old.

The mean of the duration between the first and second repair stage was 14.55 months (range 7-29) months. Thirty-five patients had proximal hypospadias, and 20 patients had distal hypospadias.

Of the 55 patients who received complete two-stage hypospadias repair, 13 had single urethrocuteaneous fistula, 4 had multiple urethrocuteaneous fistula, two patients had meatal

Table 1a. Patient characteristics

Characteristics	Number/Mean	SD/%
Race		
Malay	53	96.4
Chinese	1	1.8
Siamese	z1	1.8
Age		
At the time of the study	14.89 years (8-23 years-old)	3.936
When first seen	9.165 years (1 month-17 years-old)	4.512
Type of hypospadias		
Distal hypospadias	20	36.4
Glanular	1	1.8
Subcoronal	7	12.7
Distal penile	12	21.8
Proximal hypospadias	35	63.6
Proximal penile	12	21.8
Penoscrotal	23	41.8
Previous unsuccessful repair or circumcision before correction		
Unsuccessful repair	3	5.5
Circumcised	4	7.3
Total associated anomalies		
Undescended testis	3	5.4
Retractile testis	1	1.8
Bifid scrotum	2	3.6
Inguinal hernia	3	5.4
Hydrocele	1	1.8

**Figure 1. Uroflowmetry nomogram for maximum urine flow rates in boys (7-14)****Table 1b. Operative data**

Data	Number/Mean (n=55)	%/SD
Operative technique		
Bracka's	37	67.3
Byars'	18	32.7
Post-operative urinary catheter		
Continuous bladder drainage	37	67.3
Suprapubic catheter/urethral stent	18	32.7
Length of urethral catheter/stent		
First-stage	5.75 (4-10 days)	1.336
Second-stage	6.15 (3-9 days)	1.508
Length of hospital stay		
First-stage	7.25 (5-29 days)	3.351
Second-stage	7.93 (4-18 days)	2.300
Age at time of repair		
First-stage	10.15 years (3-17 years-old)	3.768
Second-stage	11.36 years (4-18 years-old)	3.776
Duration of time bet. first and second-stage	14.55 months (7-29 months)	4.682
Redo (revision) surgery		
Re-do first and second-stage Bracka's repair (penoscrotal, wound breakdown with fistula)	1	1.8
Revision surgery (wide meatal opening at coronal)	1	1.8
Post-operative follow-up	39.78 months (8-80 months)	19.057

stenosis, one patient had urethral stricture and one patient had wide meatal opening.

The HOSE outcome data were obtained for all subjects (55), and 19 patients had an acceptable score and 36 had a non-acceptable score (Table 3). The uroflow rates were obtained for 43 subjects (78.2%) who either did not have primary fistula (38) or underwent successful fistula repair (6) and could void volitionally.

However, there was one 8-year-old patient who did not have any fistula but was not able to volitionally void.

Table 2. HOSE: Hypospadias objective scoring evaluation

1 Meatal location	Score
1.1 Distal glanular	4
1.2 Proximal glanular	3
1.3 Coronal	2
1.4 Penile shaft	1
2 Meatal shape	
2.1 Vertical slit	2
2.2 Circular	1
3 Urinary stream	
3.1 Single stream	2
3.2 Spray	1
4 Erection	
4.1 Straight	4
4.2 Mild angulation (<10)	3
4.3 Moderate angulation (>10 but <45)	2
4.4 Severe angulation (>45)	1
5 Fistula	
5.1 None	4
5.2 Single-subcoronal	3
5.3 Proximal-subcoronal	2
5.4 Multiple or complex	1
Total score	/16

Table 4a, b lists the characteristics of the uroflowmetry patterns in patients with distal and proximal hypospadias who completed two-stage repair. Three patients (7%) presented an obstructed pattern, 4 patients (9.3%) were equivocal and 36 patients (83.7%) were considered normal.

Of the obstructed patients, one had urethral stricture and two had meatal stenosis. Those with equivocal uroflowmetry required further workup to clarify the cause.

Discussion

Over the last decade, there has been an increasing incidence of hypospadias worldwide, demanding an accompanying increase in hypospadias surgery. Generally, Bracka's and Byars' operations are the most common operations performed in our departments, as both operations can be used to treat all types of hypospadias, from subcoronal to penoscrotal. This view is supported by other reports in the literature.^[14,15]

Currently, the repairs are performed during the first year of life, although some clinicians have advised an assessment throughout puberty, as pubertal growth can change the final cosmetic and functional aspect of the corrected penis.^[16]

In this retrospective study, the majority of our patients presented between 10 and 15 years-old, which is in agreement with other local studies where the age of the patient when first seen ranged from immediately post-birth to 26 years.^[15] Thus, the age at surgery mostly depended on the age when the patient was first seen at the surgical outpatient clinic. If the patients were referred early, the first-stage repair was performed at an age of 3 to 4 years, when the patients were toilet trained, not wearing diapers and the phallus was of acceptable size to make the surgery more feasible. This surgical pattern is in the agreement with the findings of Arshad.^[15]

The second-stage repair was usually performed after 6-12 months. Thus, the patients completed two-stage repair and any subsequent surgery before they were of school age. The published data indicate there are more than 300 surgical techniques to correct hypospadias. As a result, there are various outcome measures. The HOSE questionnaire is a validated, objective outcome assessment with a very low inter-observer error and good inter-observer correlation. Nineteen (34.5%) of our subjects had an acceptable HOSE outcome with a total score of 14 to 16, and 36 patients (65.5%) had an unacceptable outcome with a total score of thirteen or below. It is difficult to compare our HOSE scores with others, as the majority of published studies that have used this method to assess the outcome of anterior hypospadias repair.

The meatal location, shape and fistula are easy to objectively assess, but the main drawback of the HOSE in our study arose in relation to the necessity of objective evaluation of the straightness of the penis and urinary stream. Witnessing a child or adult voiding or inducing erection is beyond normal Asian cultural norms, especially in Malaysia. However, Holland et al.^[6] stated that erection can be gauged after an erection is witnessed by an assessor or can be based on parental evaluation.

There are few studies that have investigated the micturition of repaired urethral, and those few have not generally studied micturition after straightforward distal hypospadias repair.^[17] Urethral stricture is a well-recognized complication of urethral reconstruction with unknown long-term consequences of asymptomatic stenosis after hypospadias repair.^[18]

The measures available to assess the reconstructed urethra include direct observation of the urinary stream, voiding cystourethrogram and uroflowmetry.^[19]

Table 3. Outcome of hypospadias repair according to HOSE

HOSE variable	(HOSE) Score	Number of patients (%) (n=55)
Meatal location		
Tip of glans	4	17 (30.9)
Proximal glans	3	16 (29.1)
Coronal	2	20 (36.4)
Penile shaft	1	2 (3.6)
Meatal shape		
Vertical slit	2	12 (21.8)
Circular	1	43 (78.2)
Urinary stream		
Single stream	2	55 (90.9)
Spray	1	5 (9.1)
Erection		
Straight	4	20 (36.4)
Mild angulation	3	29 (52.7)
Moderate angulation	2	6 (10.9)
Severe angulation	1	0 (0)
Fistula		
None	4	44* (80)
Single proximal	3	2 (3.6)
Single distal	2	8 (14.5)
Multiple or complex	1	1 (1.8)

*Thirty-eight patients had no primary fistula, and 6 patients had successful fistula repair.

Rynja et al.^[16] demonstrated that there was a discrepancy between the subjective and objective parameters of urinary function, both in hypospadias patients and in controls. The average flow rate and Q max in hypospadias patients need to be interpreted using a nomogram, as these parameters increase with the age of patient and volume of the bladder.^[11]

Hypospadias surgery remains a demanding procedure. There are many factors that may influence the outcome of hypospadias repair, including the type of hypospadias, age at repair, duration of time between first and second stage, repair technique and personal experiences. These varying factors produce cumulative success rates ranging from 37% to 77%, with the rate rising to higher than 95% after the addition of a third repair stage.^[20,21]

Table 4a. Characteristics of the uroflowmetry pattern in patients with distal hypospadias who completed two-stage repair (15 patients)

Patients	Age (year)	Voided volume (mL)	Q-max (mL/s)	Percentile (result)
1	15	217	19	>25
2	18	248	21	>25
3	15	182	18	>25
4	10	119	11	>25
5	18	304	16	10-25(E)
6	15	219	21	>25
7	21	414	16	>25
8	19	327	25	>25
9	19	188	6	<5(O)
10	19	272	17	>25
11	14	167	17	>25
12	14	185	18	>25
13	22	278	9	<5(O)
14	12	130	14	>25
15	12	118	11	>25

N.B. (a) >25th percentile, normal flow; 5-25th percentile, equivocal obstruction (E); <5th percentile, obstructed flow (O)

The reported overall complication rate from hypospadias surgery is ranges between 5-40%. The complications include wound infection, hematuria, penile skin blister, and suprapubic catheter, all of which are minor and can be treated conservatively. Furthermore, fistula, meatal stenosis, wide meatal opening and urethral stricture have also been observed.^[21,22]

Overall 19 (34.5%) of our subjects had an acceptable HOSE score; 36 patients (83.7%) of our patients had a Q max more than the 25th percentile on a Kajbafzadeh nomogram, and three patients had a Q max below the 5th percentile (one case of urethral stricture and two cases of meatal stenosis). Our disappointing overall results and the small non-randomized sample size most likely reflect the learning curve associated with the severe type of hypospadias seen in our patients.

In conclusion, two-stage hypospadias repair is a suitable technique for all types of hypospadias and produces a variety of outcomes. HOSE and uroflowmetry are simple, non-invasive, non-expensive and easy methods to objectively assess the long-term outcomes of hypospadias repair.

Table 4b. Characteristics of the uroflowmetry pattern in patients with proximal hypospadias who completed two-stage repair (28 patients)

Patients	Age (year)	Voided volume (mL)	Q-max (mL/s)	Percentile (result)
1	15	192	19	>25
2	9	97	13	>25
3	8	82	11	>25
4	17	215	15	5-25(E)
5	9	106	12	>25
6	16	184	18	>25
7	16	225	14	5-25(E)
8	11	113	12	>25
9	9	94	11	>25
10	18	164	26	>25
11	11	106	12	>25
12	15	174	16	>25
13	18	236	20	>25
14	15	213	27	>25
15	15	186	17	>25
16	18	176	18	>25
17	9	98	12	>25
18	22	156	23	>25
19	23	179	7	<5(O)
20	17	259	30	>25
21	10	116	11	>25
22	14	131	15	>25
23	16	256	21	>25
24	13	164	15	>25
25	10	101	12	>25
26	12	133	11	5-25(E)
27	10	89	10	>25
28	10	114	13	>25

N.B.(a). >25th percentile, normal flow; 5-25th percentile, equivocal obstruction(E); <5th percentile; obstructed flow (O)

Conflict of Interest / Çıkar Çatışması

No conflict of interest was declared by the authors.

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