BJU Int 2025 doi:10.1111/bju.16857

BJUI
BJU International

Original Article

Sexual function in adolescence after childhood hypospadias repair: a patient-reported outcome study

Annaleena Anttila[1,2], Niklas Pakkasjärvi[1,3] and Seppo Taskinen[1]

[1]*Department of Pediatric Surgery, Section of Urology, Helsinki University Hospital, Helsinki,* [2]*Department of Pediatric Surgery, Tampere University Hospital, Tampere, and* [3]*Faculty of Medicine, University of Turku and Vaasa Central Hospital, Vaasa, Finland*

Objective

To present data on sexual function in post-pubertal patients after hypospadias surgery in childhood.

Patients and Methods

We assessed 169 (96 distal, 20 midshaft, 53 proximal) patients with hypospadias born between 1991 and 2003, who underwent surgery before the age of 5 years. At a median (interquartile range) follow-up age of 16.2 (16.0–16.8) years, participants completed a pre-mailed sexual function questionnaire, including the Erection Hardness Score (EHS) during the last control visit. Dorsal Nesbit-like plication was used for curvature correction in 62 patients. Previously published normative data served as controls.

Results

All patients reported having erections; 73% achieved EHS 4 (completely hard and fully rigid). In patients with distal hypospadias, EHS 4 was reported in 68% of cases, 85% of midshaft and 79% of proximal cases. Among those with and without curvature correction by Nesbit-like plication, EHS 4 was reported in 72% and 74%, respectively. The proportion reporting EHS 4 exceeded that of published controls ($P < 0.01$). Penile straightness during erection was reported by 95% of patients overall, with no significant differences across hypospadias subtypes or curvature correction status. Only one patient reported pain during ejaculation; none reported pain during erection. Ejaculation was reported by 95% of participants.

Conclusion

Adolescents who underwent early hypospadias repair reported favourable sexual function outcomes, including high rates of erectile rigidity and ejaculatory function. Neither hypospadias severity nor the need for curvature correction affected these outcomes. These findings support the long-term sexual well-being of patients undergoing surgery for hypospadias in childhood.

Keywords

hypospadias, outcome, sexual function, questionnaire, erection hardness score

Introduction

Hypospadias is a congenital malformation of the penis with varying degree of severity and is typically treated surgically in early childhood [1]. The severity of the anatomical defect strongly influences long-term surgical outcomes; however, postoperative complications are frequent even in milder hypospadias [2,3]. The primary goals of hypospadias repair are to achieve a normal urinary stream, a cosmetically normal appearance, a straight penis without curvature and normal sexual function, including normal erection and ejaculation [4]. One of the challenges in assessing the success of hypospadias surgery lies in the delayed manifestation of some outcomes, especially those related to sexual function, which may only become apparent during adolescence or adulthood [5–7].

The importance of patient-reported outcomes (PROs) following hypospadias surgery is increasingly recognised, and several studies have reported PROs encompassing physical, mental, social and quality-of-life domains. The use of PROs emphasises functional outcomes and patient satisfaction, while also highlighting concerns relevant from the patient's perspective [8]. Sexual function after hypospadias surgery has

been one of the key outcomes evaluated in these studies, with encouraging overall results [9,10]. However, some studies have reported dissatisfaction, especially with ejaculation and erection, despite the expectation that hypospadias surgery without major complications should not adversely affect erectile function and fertility [5,11]. Most studies assessing sexual function after hypospadias repair have used structured interviews and the International Index of Erectile Function (IIEF). Nonetheless, a significant proportion of these studies is limited by small numbers of patients and substantial non-response rates [12,13].

We have previously characterised the surgical outcomes of hypospadias repair, underscoring the high risk of complications and re-operations [3]. In the present study, we focus on PROs, specifically evaluating sexual function in adolescents who underwent surgery for hypospadias in childhood. Sexual outcomes were assessed using a structured, pre-mailed questionnaire that included the Erection Hardness Score (EHS), facilitating an independent and standardised evaluation of erectile function.

Patients and Methods

Our institutional review board (HUS/185/2018) approved this study. We systematically reviewed the patient files of all 274 paediatric patients. Patients were born between 1991 and 2003, and they underwent surgery for hypospadias at Helsinki University Hospital before the age of 5 years. All patients underwent a clinical examination during their final paediatric follow-up visit in adolescence; however, as this was a retrospective study, the clinical assessments were not standardised and thus not included in the present analysis. The study includes 169 patients who completed their final paediatric follow-up visit (the 'last control') in our hospital after age 15 years and responded to the pre-mailed sexual function questionnaire. Of the 105 patients who did not return the forms, 77 were under the age of 15 years at their last follow-up visit in our hospital, and 28 did not return the form despite reaching the age threshold. The surgical protocol and data collection process have been described previously [3].

During the primary surgeries, an artificial erection test was performed to visually assess the degree of penile curvature. If curvature exceeded 20 degrees after degloving, it was corrected using Nesbit-like tunical plication (Heineke–Mikulicz-type plication of the tunica albuginea). After the straightening procedure, a second artificial erection test was performed to confirm penile alignment. Nesbit-like plication was needed for correction of the curvature in 62 patients.

A structured, pre-mailed questionnaire was used to evaluate sexual function. The first item assessed the presence of erections (yes/no) and their frequency (how many times a week/every month/less frequently). The second question evaluated penile straightness during erection (straight/curvature). The third item inquired about ejaculation (yes/no), while the fourth question addressed penile pain (no/during erection/during urination/pain in other situations).

In addition to these items, sexual function was assessed using a Finnish translation of the EHS. The EHS is a validated tool, which investigates erectile function and satisfaction on a four-point scale (EHS 4 = penis is completely hard and fully rigid, EHS 3 = penis is hard enough for penetration, but not completely hard, EHS 2 = penis is hard, but not sufficient for penetration, EHS 1 = penis is enlarged, but not hard) [14]. The EHS results were compared with previously published normative data from Kimura et al. [15], including 6528 Japanese men not using phosphodiesterase type 5 inhibitors. A total of 1935 men in the age group 20–29 years constituted the control group for our study. To explore the effect of surgical re-intervention on sexual function, EHS outcomes were stratified by whether patients had undergone Nesbit-like plication for curvature correction or re-operation.

Statistical analyses were carried out using IBM® SPSS® Statistics 30.0.0. (IBM Corp., Armonk, N.Y., USA). Medians and interquartile ranges (IQRs) are used for continuous variables. Fisher's exact test was used for comparison of categorical variables between two groups. P values ≤ 0.05 were taken to indicate statistical significance.

Results

The median (IQR) age at primary surgery was 1.4 (1.1–1.9) years, and patients completed the questionnaires at the median age of 16.2 (16.0–16.8) years. Unfortunately, some patients did not respond to all questions; therefore, the number of respondents varies slightly among questions. All patients reported having erections, and 95% stated that the penis was straight during erection. This was consistent across all hypospadias subgroups, with 89/93 patients (96%) in the distal group, 19/20 (95%) in the midshaft group, and 48/51 (94%) in the proximal hypospadias group reporting a straight erection (Table 1).

Only five patients (3%) reported penile pain; one patient experienced pain during ejaculation, none reported pain during erection. Three patients described pain during micturition. Ejaculation occurred in 95% of patients (distal 96%, midshaft 100%, proximal 92%; Table 1). EHS 4, indicating fully rigid erections, was reported by 116 patients (73%). When stratified by hypospadias severity, EHS 4 was reported in 68% of patients with distal hypospadias, 85% with midshaft, and 79% with proximal hypospadias (Table 1). Interestingly, the overall proportion of patients reporting EHS 4 exceeded that of age-matched controls reported in the literature ($P < 0.01$). However, when considering satisfactory erections (EHS 3–4), a slightly higher proportion reported

Table 1 Satisfaction with erectile function and straightness of the penis, and occurrence of pain.

	Distal, *n* = 96		Midshaft, *n* = 20		Proximal, *n* = 53		Controls	
	n	%	*n*	%	*n*	%	%	*P*
Erection	96	100	20	100	53	100		
Straight in erection	89/93	96	19/20	95	48/51	94		
EHS								<0.01
4	61/90	68	17/20	85	38/48	79	57	
3	15/90	17	2/20	10	0/48	0	33	
2	5/90	6	1/20	5	7/48	15	6	
1	9/90	10	0/20	0	3/48	6	3	
Ejaculation	91/95	96	20/20	100	49/53	92		
Pain in penis								
No	94/96	98	19/20	95	51/53	96		
During erection	0/96	0	0/20	0	0/53	0		
During micturition	1/96	1	1/20	5	1/53	2		
During ejaculation	1/96	1	0/20	0	0/53	0		
Sensitive to clothing	0/96	0	0/20	0	1/53	2		

Erection Hardness Score (EHS) results were compared to controls previously published by Kimura et al. [15] (EHS 4 = penis is completely hard and fully rigid; EHS 3 = penis is hard enough for penetration, but not completely hard; EHS 2 = penis is hard, but not hard enough for penetration; EHS 1 = penis is larger, but not hard).

Table 2 Patients' opinion about straightness of the penis (*P* values nonsignificant).

	Straight after operation		Curvature after operation	
	n	%	*n*	%
No Nesbit-like plication	100/104	96	4/104	4
Nesbit-like plication	56/60	93	4/60	7
Re-curvature re-operation	8/9	88	1/9	11
Any complication operated*	78/84	93	6/84	7

**Fistula, glans dehiscence, stricture, cosmesis, urethral diverticulum, failed foreskin reconstruction, re-curvature.*

Table 3 Erection Hardness Score in patients without and with Nesbit-like plication.

	No Nesbit-like plication		Nesbit-like plication		Re-Nesbit-like plication	
	n	%	*n*	%	*n*	%
EHS 4	74/100	74	42/58	72	6/8	75
EHS 3	13/100	13	11/58	19	0/8	0
EHS 2	6/100	6	0/58	0	1/8	13
EHS 1	7/100	7	5/58	9	1/8	13

Erection Hardness Score (EHS): EHS 4 = penis is completely hard and fully rigid; EHS 3 = penis is hard enough for penetration, but not completely hard; EHS 2 = penis is hard, but not hard enough for penetration; EHS 1 = penis is larger, but not hard. P = 0.24.

these in the control group than in the hypospadias group (93.2% vs 84.2%; $P = 0.009$). Among hypospadias subgroups, the proportion reporting satisfactory erections was 84% in the distal, 95% in the midshaft, and 79% in the proximal subgroup, with no statistically significant difference between groups ($P = 0.52$). Five patients underwent primary two-stage procedures, all of whom reported fully rigid erections (EHS 4).

Among patients who had undergone Nesbit-like plications, 56/60 (93%) reported straight erections, compared to 100/104 (96%) without plications (Table 2). Among patients who underwent Nesbit-like plications for curvature correction, EHS 4 was reported in 72% (42/58), compared to 74% (74/100) who did not require plication. Of those who had undergone re-operation for curvature and required Nesbit-like plications, 75% reported EHS 4 (Table 3).

Discussion

We have previously highlighted the high complication and re-operation rates associated with hypospadias surgery during long-term follow-up [3]. In this study, we show that, despite the surgical complexity and frequency of complications, PROs regarding sexual function in adolescence remain favourable. Erectile function, as assessed using the EHS, was comparable or even superior to that of published controls. Notably, neither the severity of hypospadias nor the need for Nesbit-like plication or re-operation appeared to negatively affect these outcomes.

Long-term outcomes are essential when evaluating the effectiveness of hypospadias surgery performed in childhood [16]. In patients with distal hypospadias, the primary indication for surgery is often mostly cosmetic, whereas in more proximal forms, the focus shifts to creating both function and appearance [17]. Most patients present without voiding difficulties, and preservation of normal urinary function postoperatively is expected [18]. However, it is arguably in the domain of sexual function where surgery has the greatest potential impact [19]. Correction of penile curvature, achievement of an acceptable cosmetic result, and

preservation of normal erectile and ejaculatory function are all critical goals of successful hypospadias repair [20].

Our main priority was to investigate erectile function after hypospadias surgery. Selvi et al. [21] used the IIEF and the Male Sexual Health Questionnaire Ejaculation Dysfunction Short Form (MSHQ-EjD) to evaluate sexual function after puberty, with a median patient age of 20 years. Their findings indicated that patients who underwent graft-free hypospadias repair had better sexual outcomes than patients in whom hypospadias was corrected with graft. However, most patients were satisfied with sexual function in that study. No patients had severe or even moderate erectile dysfunction, and the incidence of ejaculation was similar in the two study groups [21]. Similarly, Bocchino et al. [22] evaluated long-term sexual outcomes 17–28 years after hypospadias surgery using the IIEF-5 in a telephone-based study. They found no significant difference in erectile function scores between patients who had undergone re-operations and those who had not [22]. In a study in Norway, Gulseth et al. [9,23] compared 16-year-old hypospadias patients with healthy controls using a structured interview that assessed erection, ejaculation, masturbation, orgasm and intercourse. They reported no significant differences in sexual satisfaction between the groups. Örtqvist et al. [24] also observed preserved erectile function in adult patients with a history of hypospadias repair. Collectively, these studies support our findings, suggesting that long-term erectile function after hypospadias repair is generally favourable, even in patients requiring re-operations.

Most studies evaluating sexual function in adolescence after prior hypospadias repair have used the IIEF as an outcome measure. While the IIEF covers aspects including sexual activity, sexual intercourse, sexual stimulation, ejaculation, and orgasm, the EHS offers a more focused and objective assessment of penile rigidity. Although our study is framed around the broader concept of sexual function, the domains assessed primarily pertain to erectile function, ejaculation, and penile straightness. We acknowledge that tools such as the IIEF and Sexual Health Inventory for Men (SHIM) provide a more comprehensive evaluation of sexual function, including aspects such as libido and intercourse satisfaction. However, given the developmental stage of our cohort, the EHS and related questions provided a focused, age-appropriate assessment of the most relevant domains. The EHS was selected for its simplicity and age-appropriate nature, particularly in adolescents who may not yet be sexually active. Although some EHS categories reference penetrative intercourse, the score is based on subjective perception of erection quality, not on actual sexual experience. Adolescents are typically able to judge and report erection firmness in relative terms (e.g. 'completely hard' vs 'not hard enough'), independently of whether they have engaged in penetrative sex. This is consistent with how the EHS has been applied in prior adolescent studies [25]. At the end of puberty, some questions in the IIEF may feel intrusive or irrelevant for patients who are not yet sexually active. In contrast, most adolescents are capable of describing their erections, making EHS a practical and informative tool in this age group [14,21].

Consistent with previous studies, we observed generally favourable sexual outcomes. All patients reported erections, and 95% had a straight penis in erection. Erection quality was good in almost all patients, with 73% of patients reporting EHS 4, a proportion exceeding that of the reference controls.

To our knowledge, the impact of Nesbit-like plication on erectile function in hypospadias patients has not been previously studied. Our findings suggest that, even among those requiring re-operations for recurrent curvature, erectile outcomes remained favourable, with over 70% achieving EHS 4 and 78% reporting satisfaction with penile straightness, even after re-curvature correction. Additional encouraging findings included the low incidence of pain, with only five patients reporting any penile pain and none with pain during erection, and a high rate of ejaculation, reported by 95% of patients. Importantly, 93% of patients who had undergone re-operations still reported a straight penis during erection.

A key strength of this study is the high participation rate and consistent follow-up, as all patients were both operated on and followed up at a single centre. However, we acknowledge several limitations. As with many long-term follow-up studies, changes in surgical methods over time limit our ability to evaluate outcomes associated with surgical procedures applied only nowadays. A considerable number of patients in this cohort were treated using older techniques that may differ from current standards. Another limitation is the absence of an age-matched control group, although reference data from published cohorts were used for comparison. EHS results in our study were compared with 1935 Japanese men aged 20–29 years published by Kimura et al. [15]. This large, web-based survey assessed erection hardness in relation to age, health, and sexual behaviour. While the control group was older than our study population, it served as a widely referenced normative dataset.

In conclusion, this study demonstrates that sexual function in adolescence following hypospadias surgery in childhood is generally favourable. Despite a high rate of complications and re-operations, most patients report satisfactory outcomes. These results have important clinical implications. They can be used to inform parents about the long-term prognosis after hypospadias repair in early childhood. Additionally, adult urologists managing patients with a history of childhood hypospadias surgery may find reassurance in these results as favourable outcomes were observed also in those treated with older techniques. Further studies are needed to investigate the impact of different surgical techniques on long-term sexual function in hypospadias.

Acknowledgement

Open access publishing facilitated by Helsingin yliopisto, as part of the Wiley - FinELib agreement.

Disclosure of Interests

The authors have no conflict of interest to disclose.

References

1 **Can Aydın AB, Aydin AB, Dönmez Mİ et al.** Impact of the age at distal hypospadias surgery on behavioral problems, somatic symptoms and irritability levels in children. *J Pediatr Surg* 2024; 59: 1163–9
2 **Sebastião YV, Brown CT, Cooper JN, McLeod DJ, DaJusta DG.** Risk of Re-operation after outpatient distal hypospadias repair in a large, Multistate Cohort. *J Pediatr Urol* 2019; 15: e1–471.e6
3 **Anttila A, Lahdes-Vasama T, Pakkasjärvi N, Taskinen S.** Cumulative Re-operation rates during follow-up after hypospadias repair. *BJU Int* 2024; 134: 960–6
4 **Baskin LS, Ebbers MB.** Hypospadias: anatomy, etiology, and technique. *J Pediatr Surg* 2006; 41: 463–72
5 **Ceccarelli PL, Lucaccioni L, Poluzzi F et al.** Hypospadias: clinical approach, surgical technique and long-term outcome. *BMC Pediatr* 2021; 21: 523
6 **Fraumann SA, Stephany HA, Clayton DB et al.** Long-term follow-up of children who underwent severe hypospadias repair using an online survey with validated questionnaires. *J Pediatr Urol* 2014; 10: 446–50
7 **Tack LJW, Springer A, Riedl S et al.** Psychosexual outcome, sexual function, and long-term satisfaction of adolescent and young adult men after childhood hypospadias repair. *J Sex Med* 2020; 17: 1665–75
8 **Sullivan KJ, Hunter Z, Andrioli V et al.** Assessing quality of life of patients with hypospadias: a systematic review of validated patient-reported outcome instruments. *J Pediatr Urol* 2017; 13: 19–27
9 **Gulseth E, Urdal A, Andersen MH et al.** Sexual well-being and penile appearance in adolescents operated for distal hypospadias in childhood. *J Pediatr Urol* 2023; 19: 293.e1–293.e8
10 **Gul M, Hildorf S, Silay MS.** Sexual functions and fertility outcomes after hypospadias repair. *Int J Impot Res* 2021; 33: 149–63
11 **Asklund C, Jensen TK, Main KM, Sobotka T, Skakkebæk NE, Jørgensen N.** Semen quality, reproductive hormones and fertility of men operated for hypospadias. *Int J Androl* 2010; 33: 80–7
12 **Bhatia VP, Hilliard ME, Austin PF, Mittal AG.** Evaluating quality of patient-reported outcome measures in patients with hypospadias. *J Pediatr Urol* 2021; 17: 50–8
13 **Aho MO, Tammela OK, Somppi EM, Tammela TL.** Sexual and social life of men operated in childhood for hypospadias and phimosis. A comparative study. *Eur Urol* 2000; 37: 95–100
14 **Mulhall JP, Goldstein I, Bushmakin AG, Cappelleri JC, Hvidsten K.** Validation of the erection hardness score. *J Sex Med* 2007; 4: 1626–34
15 **Kimura SS, Tai T et al.** A web-based survey of erection hardness score and its relationship to aging, sexual behavior, confidence, and risk factors in Japan. *Sex Med* 2013; 1: 76–86
16 **Snodgrass W, Bush N.** Do new complications develop during puberty after childhood hypospadias repair? *J Urol* 2022; 208: 696–701
17 **Baskin L.** What is hypospadias? *Clin Pediatr* 2017; 56: 409–18
18 **Andersson M, Sjöström S, Doroszkiewicz M et al.** Urological results and patient satisfaction in adolescents after surgery for proximal hypospadias in childhood. *J Pediatr Urol* 2020; 16: 660.e1–660.e8
19 **Gamidov S, Shatylko T, Gasanov N et al.** Sexual dysfunction in patients with late complications of hypospadias surgery. *Andrologia* 2022; 54: e14413
20 **Castagnetti M, El-Ghoneimi A.** Surgical Management of Primary Severe Hypospadias in children: an update focusing on penile curvature. *Nat Rev Urol* 2022; 19: 147–60
21 **Selvi I, Dönmez Mİ, Aydın AB, Oktar T, Ziylan O.** Adulthood cosmetic and sexual outcomes of the patients who underwent hypospadias repair in childhood. *Int J Impot Res* 2024; Aug 27, online ahead of print
22 **Bocchino AC, Cocci A, Pezzoli M et al.** Long-term functional, sexual, and cosmetic outcomes in adult patients who underwent hypospadias repair during childhood at a highly specialized Italian pediatric hospital. *Urol Res Pract* 2024; 50: 127–33
23 **Gulseth E, Urdal A, Andersen MH et al.** Mental health and health-related quality of life in adolescents surgically treated for hypospadias in childhood. *J Pediatr Urol* 2025; 21: 59–70
24 **Örtqvist L, Fossum M, Andersson M et al.** Sexuality and fertility in men with hypospadias; improved outcome. *Andrology* 2017; 5: 286–93
25 **Guevara CG, Suarez MC, Raymo A et al.** Small Intestinal Submucosa for corporeal body grafting in patients with proximal hypospadias and severe chordee: Long term follow-up assessing erectile function and genital self-perception. *J Pediatr Urol* 2022; 18: 758.e1–758.e7.

Correspondence: Annaleena Anttila, Elämänaukio 2, Tampere 33520, Finland.
e-mail: annaleena.anttila@pirha.fi

Abbreviations: EHS, Erection Hardness Score; IIEF, International Index of Erectile Function; PRO, patient-reported outcome.

