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Adolescent Satisfaction and Decisional Regret After Hypospadias Repair in Early Childhood

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A B S T R A C T

Objective: To evaluate adolescent satisfaction and decisional regret after hypospadias repair in childhood and to assess associations with anatomical severity, surgical complications, and reoperations.

Patients and Methods: Adolescents who underwent hypospadias repair in childhood completed a pre-mailed questionnaire before their final pediatric follow-up visit. Satisfaction was assessed using the validated Penile Perception Score (PPS), evaluating meatal location, glans shape, penile skin, and overall appearance. Additional items addressed satisfaction with penile length and straightness, perceived timing of surgery, and decisional regret. Reference data for age-matched healthy controls were derived from published normative material.

Results: In total, 176 patients (101 distal, 20 midshaft, and 55 proximal hypospadias) responded (response rate 64%); 51% had undergone at least 1 unplanned reoperation. Median age at primary surgery was 1.4 years and at follow-up, 16.3 years. Dissatisfaction with meatal location, glans, skin, and straightness did not differ between patients and controls. Dissatisfaction with penile length (18.6% vs 0%, $P < .01$) and overall appearance (11.8% vs 1.6%, $P = .03$) was more common among patients. PPS scores were generally higher after distal than proximal repair. Dissatisfaction with penile length was more frequent after a Nesbit procedure (26% vs 12%, $P = .03$). Most patients (89.8%) considered the timing of surgery appropriate; 2.9% reported decisional regret.

Conclusion: Most adolescents were satisfied with outcomes following early hypospadias repair. Dissatisfaction with penile length and appearance was more frequent among patients, especially after proximal repair. Decisional regret was rare, supporting early surgery combined with structured long-term follow-up and appropriate counseling.

Hypospadias involves incomplete development of the ventral penile structures and an ectopic urethral meatus.[1-4] A distinct proportion of patients also present with ventral penile curvature, which adds complexity to surgical correction and may affect long-term functional outcomes. While classification is traditionally based on meatal location, a broader view recognizes the underlying defect in ventral penile anatomy, which can range from mild distal to severe proximal forms. Consequently, the extent of operative intervention also varies, from straightforward single-stage procedures to complex multistage reconstructions that may extend over a prolonged period.

The widely accepted age for hypospadias surgery falls between 6 and 18 months, based on studies suggesting optimal tissue healing, minimal psychological impact, and ease of postoperative care during this developmental period.[5] In Finland, repair is typically undertaken between 12 and 18 months.[6] However, the optimal timing remains subject of ethical and clinical debate. Recent legislative changes in countries such as Germany have introduced restrictions on non-essential genital surgery in early childhood, particularly for conditions overlapping with differences of sex development, contributing to a trend toward delayed intervention and increased reliance on multidisciplinary decision making.[7]

It has been suggested that surgery be deferred until the patient is mature enough to participate in the decision. While this respects bodily autonomy, delayed surgery has been associated with increased psychosocial and psychosexual concerns in later childhood and adolescence, potentially by reinforcing awareness of anatomical differences during critical stages of body image development.[8] Based on our clinical experience, many adolescents treated in infancy seem unaware of having undergone surgery or of having had a congenital condition, which may indicate that early intervention helps minimize long-term psychological burden.

Despite the increasing emphasis on patient-centered care, there is limited evidence regarding how individuals who underwent early hypospadias surgery perceive that decision later in life. There is a dearth of data on the occurrence of patient-reported regret having undergone childhood hypospadias surgery. Potential contributing factors, including anatomical severity, postoperative complications, and later reoperations, also remain insufficiently explored.

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This study investigates patient-reported decisional regret in a large cohort of adolescents who underwent hypospadias repair in early childhood. We aimed to assess the overall prevalence of regret and hypothesized that decisional regret would be primarily associated with perceived long-term outcomes, rather than anatomical severity alone, although severity, postoperative complications, and reinterventions may indirectly influence patient perception through their impact on final outcome. These findings may help guide parental counseling and inform ongoing discussions regarding the timing and ethics of hypospadias surgery.

PATIENTS AND METHODS

Ethical Approval

The institutional review board approved this study (HUS/185/2018).

Study Population

We systematically reviewed the patient records of all 274 individuals born between 1991 and 2003 who underwent hypospadias repair before the age of 5 years at Helsinki University Hospital. Operative techniques and follow-up protocols have been described previously.[6] The operative strategy was individualized according to anatomical findings at surgery. Distal hypospadias were mainly managed with MAGPI or Mathieu repairs, whereas penile and penoscrotal cases commonly underwent island-flap onlay procedures. Proximal forms with significant curvature were treated using tubular island-flap or staged (Byars) approaches. The tubularized incised plate (TIP) technique was adopted later in the series. Ventral curvature was evaluated intraoperatively using artificial erection testing and corrected when necessary with dorsal tunical plication (Nesbit-type), with repeat testing to confirm straightening.

The present study includes 176 patients who completed their final pediatric follow-up visit after age 14 years and responded to the pre-mailed questionnaire assessing satisfaction and decisional regret. Questionnaires were administered between 2008 and 2020. Of the 98 patients who did not return the form, 64 were under the age of 14 years at their last follow-up visit in our hospital, and 34 did not respond despite reaching the age threshold. Of the total cohort, 101 patients had distal, 20 midshaft, and 55 proximal hypospadias. The median (interquartile range, IQR) age at primary surgery was 1.4 (1.1-1.9) years and at follow-up 16.3 (16.0-17.0) years.

Data Collection

Clinical data were extracted from patient records, including anatomical severity, type of operation, and any unplanned reoperations. Complications were defined as any unplanned surgical procedure related to the initial repair or its sequelae.

Questionnaire and Outcome Measures

Before their last outpatient follow-up visit, patients independently completed a pre-mailed questionnaires. The survey included the validated Penile Perception Score (PPS) assessing satisfaction with meatal location, glans shape, penile skin, and general appearance. Additional questions addressed satisfaction with penile length and straightness, perceived appropriateness of the timing of surgery, and decisional regret. Responses regarding age at surgery were categorized as *proper*, *too early*, or *too late, and should not have been done at all*. Reference data for same-aged healthy controls (16-17 years) were derived from a Norwegian population-based study.[9] Erectile quality was assessed with the validated Erection Hardness Score (EHS) on a 4-point scale translated to Finnish.[10]

Statistical Analysis

Continuous variables were summarized as medians with interquartile ranges (IQRs) and categorical variables as counts and percentages. Differences between hypospadias severity groups (distal, midshaft, proximal) and between patients and controls were analyzed using Fisher's exact test in the case of categorial variables and with ANOVA in comparison of continuous variables. Statview 5.0.1, SAS Institute Inc., was used for the analyses. P-value $< .05$ was considered significant.

RESULTS

Study Population

Altogether, 176 adolescents returned the questionnaire. Of these, 101 (57.4%) had distal, 20 (11.4%) midshaft, and 55 (31.3%) proximal hypospadias. Ninety patients (51.1%) had undergone at least 1 unplanned reoperation. The median age at primary repair was 1.4 years (IQR 1.1-1.9), and the median age at follow-up was 16.3 years (IQR 16.0-17.0). Thirty-four patients who had follow-up for more than 14 years did not return the questionnaire. The data for these patients and the respondents are summarized in Table 4.

Penile Perception and Satisfaction

According to the Penile Perception Score (PPS), dissatisfaction with the urethral meatus, glans, skin, and penile straightness did not differ significantly between patients and age-matched controls from the literature (all $P > .05$). However, dissatisfaction with penile length (18.6% vs 0%, $P < .01$) and general appearance (11.8% vs 1.6%, $P = .03$) was more frequent among patients than controls (Table 1).

When analyzed by anatomical severity, patients with distal hypospadias reported higher satisfaction across most PPS domains compared with those with proximal forms (meatus $P = .06$, glans $P < .01$, skin $P = .27$, appearance $P = .10$, length $P < .01$, and straightness $P = .02$). Dissatisfaction with penile length was significantly associated with having undergone a Nesbit procedure, ie, patients with more severe initial curvature (26% vs 12%, $P = .03$) (Table 2).

Satisfaction with Timing and Decisional Regret

Most patients (89.8%) considered the timing of their operation appropriate, 2.2% reported surgery as too early, and 1.7% as too late. Overall, 5 patients (2.9%) expressed decisional regret regarding having undergone surgery.

Among the 5 patients reporting regret, 3 (60%) cited the absence of prepuce as disturbing, and 2 (40%) were dissatisfied with penile length. Two of the 5 had undergone unplanned reoperations. All patients with regret had a straight penis on erection; 4 described full rigidity (EHS 4), and 1 reported slightly reduced rigidity (EHS 3).

In the full cohort, 157 patients lacked the prepuce, of whom 13 (8.3%) expressed dissatisfaction due to its absence. Dissatisfaction with the missing prepuce was not associated with the severity of hypospadias ($P = .45$) or the number of reoperations $P = .62$).

Table 1
Dissatisfaction among hypospadias patients and age-matched controls.[8]

Parameter	Patients (n = 176)	Controls (n = 61)	P-value
Meatus	1.8% (3/168)	0% (0/61)	.567
Glans	6.0% (10/167)	0% (0/61)	.066
Skin	4.8% (8/168)	6.6% (4/61)	.738
General appearance	11.8% (20/169)	1.6% (1/61)	.032
Penile length	18.6% (31/167)	0% (0/61)	< .001
Straightness	3.0% (5/169)	0% (0/61)	.329

Table 2
Penile perception score and satisfaction by severity of hypospadias.

Parameter	Distal	Midshaft	Proximal	*P*-value (Proximal vs Distal)
Meatus	2.33 +/- 0.50	2.30 +/- 0.47	2.17 +/- 0.47	.057
Glans	2.28 +/- 0.50	2.16 +/- 0.49	2.02 +/- 0.46	.004
Skin	2.21 +/- 0.50	2.15 +/- 0.49	2.12 +/- 0.47	.273
Appearance	2.14 +/- 0.58	2.00 +/- 0.65	1.98 +/- 0.54	.100
Penile length	2.10 +/- 0.57	2.00 +/- 0.75	1.69 +/- 0.64	< .001
Straightness	2.32 +/- 0.49	2.40 +/- 0.50	2.11 +/- 0.51	.018

Associations Between Regret, Severity, and Outcomes

Given the small number of patients reporting regret (n = 5), comparison should be interpreted descriptively. Decisional regret was distributed across anatomical severities and was not confined to patients with multiple reoperations. Mean PPS appearance scores were slightly lower among patients reporting regret and among those with penile length, although the study was not powered to detect differences within this subgroup (Table 3).

Comparisons of Responders and Non-responders

To assess potential response bias, baseline characteristics of the 34 eligible non-responders were compared with those of the responding cohort (Table 4). The distribution of hypospadias severity did not differ significantly between groups (distal 57.4% vs 52.9, midshaft 11.4% vs 8.8%, proximal 31.3% vs 38.2%; $P = .63$). Likewise, the proportion of patients undergoing unplanned reoperations was similar (51.5% vs 53%; $P = .91$). These findings do not suggest systematic differences between responders and non-responders; however, given the modest sample size of the non-responder group, unmeasured differences in patient perception cannot be entirely excluded.

DISCUSSION

In this long-term follow-up of adolescents who underwent hypospadias repair in early childhood, most were satisfied with both outcome and timing of surgery. Only 2.9% expressed decisional regret, and this was not associated with the anatomical severity of hypospadias, the number of reoperations, or age at primary repair. Dissatisfaction most commonly concerned penile length and overall appearance, particularly among patients with proximal hypospadias. Despite more frequent reoperations in this subgroup, overall satisfaction remained high, indicating that early surgical correction generally leads to enduring acceptance of the treatment decision.

Adolescents may be reluctant to express regret regarding a procedure performed in early childhood, particularly in a clinical setting.

Table 3
Comparison between patients with and without decisional regret.

Parameter	With Regret (n = 5)	Without Regret (n = 171)
Median age at primary repair (years)	1.2 (IQR 1.0-1.3)	1.4 (IQR 1.1-1.9)
Reoperations	40%	52%
Proximal hypospadias	40%	31%
Dissatisfied with penile length	40%	18%
Dissatisfied with absence of prepuce	60%	7%
Mean PPS appearance score (mean +/- SD)	2.00 +/- 0.45	2.12 +/- 0.58

PPS, Penile Perception Score; IQR, interquartile range; SD, standard deviation. No significant associations were observed between regret and hypospadias severity, reoperations, or individual PPS domains, though dissatisfaction with the absence of prepuce was more common among those expressing regret.

Prior psychosocial research suggests that decisional regret in childhood genital surgery is more often reported by caregivers than by patients themselves, raising the possibility of underreporting.[11,12] Questionnaires in the present study were, however, completed independently before the outpatient visit, which may reduce physician-related influence. In other surgical populations, decisional regret is typically reported in 9%-20% of patients, often associated with complications or unmet expectations.[13,14]

While hypospadias surgery is known to be complication-prone, previous analyses have shown that patient-reported outcomes remain favorable when complications are identified and managed in a structured manner. In our long-term cohort, nearly half of the patients required at least 1 unplanned reoperation during follow-up, reflecting the complex nature of the condition and its treatment.[6] However, when complications such as strictures or fistulae were addressed promptly, urinary, cosmetic, and sexual outcomes were generally good.[15,16] Adolescents reported high satisfaction with urinary function and minimal lower urinary tract symptoms, even among those who had undergone treatment for strictures. Similarly, erectile rigidity, penile straightness, and ejaculatory function were preserved regardless of the need for curvature correction or reoperation. These findings indicate that while the technical challenges of hypospadias repair are substantial, the long-term patient experience is largely positive, provided that complications are detected early and treated effectively through continued follow-up.

Absence of the prepuce was the most frequently cited concern among the few patients reporting regret; however, in the overall cohort, only 8.3% expressed dissatisfaction related to foreskin absence, and this did not translate into global regret regarding surgery. These findings suggest that while lack of prepuce may be a cosmetic concern for some adolescents, it rarely drives overall dissatisfaction with the treatment decision.

The ethical debate regarding the timing of hypospadias surgery has increasingly focused on patient autonomy and the right to participate in treatment decisions. Delaying surgery until adolescence has been suggested as a means of ensuring informed consent and reducing parental decisional conflict.[17-19] However, such delay may introduce unnecessary psychological burden by reinforcing awareness of genital difference during a sensitive developmental stage. Further, later surgery may be associated with higher levels of obsessive-compulsive symptoms and emotional distress.[20] Patient-reported outcome data indicate that regret is rare when outcomes are satisfactory, supporting the rationale for early intervention.[21] In our experience, most adolescents treated in infancy do not recall the operation or the condition itself, and decisional regret was uncommon. These observations suggest that early surgery, when combined with clear parental counseling and structured follow-up, remains a justifiable and ethically sound approach.

Previous studies have consistently demonstrated that long-term outcomes after childhood hypospadias repair are generally favorable, with high levels of patient satisfaction despite frequent complications.[15,16,22-24] In contrast, decisional regret has been explored mainly from the parental perspective. Moderate-to-severe regret has been reported in approx 20% of parents overall[19] and 8%-9% after distal repair in single-center analyses.[25] In a large UK multicentre survey, predictors of parental higher regret included a smaller glans, distal meatus, and

Table 4
Comparison between respondents and non-respondents.

	Distal n (%)	Midshaft n (%)	Proximal n (%)	Follow-up age y, median	Operation age y, median	Re-operation ≥1 n (%)
Respondents	101 (57.4)	20 (11.4)	55 (31.3)	16.3	1.4	90 (51.1%)
Non-respondents	18 (52.9)	3 (8.8)	13 (38.2)	15.7	1.9	18 (53.0%)

complications requiring reoperation.[26] Conversely, other cohorts have found that family and contextual factors, rather than surgical variables, were more closely associated with regret.[27] Additional studies highlight wide variation: regret was lower after post-neonatal circumcision[28] and highest among parents who declined hypospadias repair altogether.[29] Qualitative and provider-focused work further emphasizes the role of shared decision-making and decision aids in supporting families through treatment choices.[17,30] In contrast, data on patient-reported decisional regret after childhood hypospadias repair remain limited.

While our findings indicate that regret among adolescents treated in infancy is uncommon, these results must be interpreted with caution. Our study design inherently introduces selection bias, as responses may not reflect the views of those, who did not undergo surgery or who chose not to participate. Consequently, further research involving broader populations and untreated individuals is warranted.

We selected the PPS as the primary tool for assessing outcomes. The PPS has been validated for post-pubertal evaluation of genital appearance outcomes[31] and has demonstrated good reliability in both pediatric and adolescent settings.[32,33] Reference data from Gulseth et al. provide context for interpreting PPS results.[9] In a cohort of healthy 16- to 17-year-old males, overall satisfaction with genital appearance was high, although penile length was the most frequent concern. In a subsequent study of adolescents previously operated for hypospadias, proximal repairs were associated with lower satisfaction scores for appearance and length.[34] Similarly, in our cohort, dissatisfaction most often concerned penile length and overall appearance, particularly in patients with proximal hypospadias. The reference cohort was derived from a Norwegian population-based study. Although Finland and Norway share broadly similar healthcare systems and sociocultural contexts, cross-national differences in self-perception cannot be excluded. Incorporating validated PROMs is of benefit to capture nuanced aspects of satisfaction beyond surgical outcomes alone. However, as lower scores increase the risk of reduced self-esteem and mental health burden, follow-up strategies should also include tools for identifying patients at risk for psychosocial stress.[34]

The main limitations of this study relate to its retrospective design and the absence of an age-matched control group. As in many long-term follow-up studies, surgical techniques have evolved during the study period, which limits direct comparison with current practice. Regret and satisfaction were evaluated using self-reported questionnaires, which may be influenced by recall bias or social desirability. In addition, the reason for regret was not specifically inquired, and some patients expressing regret were unaware of the abnormality that had been corrected. Nevertheless, the high participation rate, single-center setting, and uniform follow-up protocol strengthen the validity of the findings and enable meaningful long-term assessment of patient perspectives after early hypospadias surgery.

Taken together, these results suggest that early hypospadias surgery, when followed by structured long-term follow-up and timely management of possible complications, yields high patient satisfaction and minimal decisional regret in adolescence. Parents should be counseled that complications are common but can usually be managed effectively when detected early through regular follow-up. Structured follow-up is also required to ensure that patients are appropriately informed about their condition[35] and to identify those at risk of less optimal functional and psychosocial outcomes.[34] These findings support the current practice of early repair within an ethically transparent framework, emphasizing informed parental counseling and individualized care.

CONCLUSION

This study evaluated adolescent satisfaction and decisional regret after early childhood hypospadias repair. A total of 176 patients completed validated questionnaires assessing cosmetic and functional outcomes. Most adolescents were satisfied with the surgical result and timing of the operation, while dissatisfaction was mainly related to penile length and overall appearance, particularly in proximal repairs. Despite frequent reoperations, decisional regret was rare and was not associated with anatomical severity, complications, or age at surgery. These findings suggest that early hypospadias repair, when combined with structured follow-up and timely management of complications, provides durable functional and cosmetic outcomes and is generally well accepted by patients in adolescence.

Ethical Declarations

Institutional Review Board approval was obtained before the study's initiation. Due to the retrospective nature of the study, written informed consent was waived.

Disclosures

The authors declare that they have no relevant financial interests.

CRediT Authorship Contribution Statement

Seppo Taskinen: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Annaleena Anttila:** Writing – review & editing, Visualization, Supervision, Software, Methodology, Formal analysis, Data curation. **Niklas Pakkasjärvi:** Writing – review & editing, Writing – original draft, Software, Methodology, Investigation, Formal analysis, Conceptualization.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Declaration of Generative AI and AI-Assisted Technologies in the Writing Process

The authors did not use generative AI or AI-assisted technologies in the development of this manuscript.

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