



Is glans penis width a risk factor for complications after hypospadias repair?

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Summary

Introduction

Recent studies have suggested that a smaller glans penis size may be associated with a higher likelihood of complications after hypospadias repair. Accurate identification of risk factors other than the well-understood variable of meatal location would allow development of better prognostic models and individualized risk stratification.

Objective

To test the hypothesis that a smaller width of the glans penis predicts adverse outcomes after hypospadias surgery.

Methods

Prospectively recorded clinical data were reviewed from a single-institution registry of primary hypospadias repairs performed between 2011 and 2014. Follow-up records were examined for occurrence of complications. Urethroplasty complications were defined to include meatal stenosis, dehiscence, urethrocutaneous fistula, urethral stricture, and/or urethral diverticulum. The subset of meatal stenosis and dehiscence were regarded as glanular complications. Regression analyses were performed to determine association between glans width and occurrence of complications. Because pre-operative androgen stimulation is known to increase glans penis size, separate subgroup analyses were

included of patients with and without pre-operative use of testosterone cream.

Results

A total of 159 patients met criteria for inclusion in the study cohort: 140 patients underwent a single-stage repair, while 19 patients had a two-stage repair. The median glans penis width was 15 mm (range 10–22). Eighty-four patients (53%) received testosterone cream pre-operatively and had a significantly wider glans penis than the 75 patients who did not (median 15.5 vs 14 mm; $P < 0.001$). Median clinical follow-up was 7 months (IQR 1–12), with a minimum time elapsed since surgery of 10 months at the time of chart review.

Twenty-four patients (15%) had one or more urethroplasty complications, including 11 (7%) with glanular complications. Overall, there was no statistically significant association between glans width and urethroplasty complications ($P = 0.26$) or glanular complications ($P = 0.90$) (Summary Table). Subgroup analyses of patients with and without pre-operative testosterone also revealed no significant associations between glans width and complications.

Conclusions

Glans penis width was not a risk factor for complications after hypospadias repair. This finding differs from the results of other recent studies and encourages further research into the value of measuring penile parameters in patients undergoing hypospadias repair.

Summary Table Association of glans width (mm) and complications after hypospadias repair, overall and stratified by pre-operative testosterone use.

	Odds ratio (95% CI) for all urethroplasty complications	Odds ratio (95% CI) for glanular complications
Overall ($n = 159$)	1.12 (0.92–1.35) $P = 0.26$	1.02 (0.78–1.33) $P = 0.90$
With pre-operative testosterone ($n = 84$)	1.03 (0.79–1.33) $P = 0.84$	1.03 (0.72–1.51) $P = 0.84$
Without pre-operative testosterone ($n = 75$)	1.14 (0.83–1.57) $P = 0.41$	0.88 (0.54–1.45) $P = 0.63$

Introduction

Proximal location of the urethral meatus is well understood to be an independent predictor of postoperative complications in boys undergoing primary hypospadias repair [1,2]. Efforts to develop prognostic models that incorporate additional patient-specific factors are ongoing. These models would potentially improve pre-operative risk stratification and counseling, intraoperative decision-making, and analysis of postoperative outcomes. It is therefore notable that two recent publications have suggested that a smaller glans penis size may also be associated with a higher likelihood of complications after hypospadias surgery [3,4].

The aim of the present study was to further test the hypothesis that a smaller width of the glans penis is predictive of adverse outcomes following hypospadias repair. Pre-operative administration of testosterone is known to increase glans penis size [5], although the impact of androgen stimulation on surgical results remains uncertain [6]. Therefore, a decision was made *a priori* to include subgroup analyses of patients with and without testosterone cream, which was used pre-operatively in some cases at the discretion of each attending surgeon.

Patients and methods

Since July 2011, pediatric urologists at the present institution (Ann & Robert H. Lurie Children's Hospital of Chicago) have had the opportunity to record penile characteristics and other data in a registry at the time of hypospadias surgery. The glans penis was measured without traction at its widest point (i.e. the corona) using calipers or a ruler. As of August 2014, the registry included 246 non-consecutive operations by eight different surgeons. Based on review of billing data, these represented approximately one-half of all hypospadias repairs performed at this institution from 2011 to 2014. All surgeons confirmed that no cases were omitted from the registry for any reason other than inconsistency in remembering to collect relevant data at the time of surgery.

After obtaining IRB approval, the institutional hypospadias registry was reviewed. Criteria for inclusion in this study cohort were: primary repair, either via a single procedure or in two stages; pre-pubertal age <10 years at the time of surgery; and recorded glans width. For patients who underwent two-stage procedures, data for this study were based on the second stage. Patients who received any form of androgen stimulation other than testosterone cream were excluded. The registry includes assessment of pre-operative meatal location as glanular, coronal, distal, mid-shaft, proximal, penoscrotal, or perineal; for this study, glanular, coronal, or distal meatal locations were re-categorized together as distal, while proximal, penoscrotal, or perineal locations were re-categorized together as proximal.

Clinical documentation from patients' follow-up visits was examined retrospectively. Urethroplasty complications were defined to include postoperative diagnosis of meatal stenosis, dehiscence, urethrocutaneous fistula, urethral stricture, and/or urethral diverticulum. The subset of

meatal stenosis and dehiscence were regarded as glanular complications.

The distal extent of urethral tubularization was determined by review of each patient's operative report, noting whether the glans wings had been closed proximal to the neo-meatus. If the operative report was unclear on this detail, follow-up records were examined to determine if a glanular location of the meatus had been documented.

Statistical analyses were performed using Stata 13.1 (StataCorp, College Station, TX), and significance was defined as $P < 0.05$. Interval data were routinely summarized by the median and interquartile range (IQR). The nonparametric Kruskal–Wallis rank test was used for comparison of interval variables. Linear regression was used to assess correlation between glans width and other continuous variables. Bivariate logistic regression analyses were used to determine association between glans width and occurrence of complications, both overall and with stratification by pre-operative testosterone use. The same regression analyses were also performed with exclusion of cases in which the extent of urethral tubularization was either proximal to the glans or unclear.

Results

Table 1 provides a summary of characteristics and surgical techniques used for the 159 patients included in this study. Eight surgeons contributed a median of 13.5 patients each to the cohort (IQR 6–26.5). The median glans width was 15 mm (IQR 14–17; range 10–22). Glans width did not correlate significantly with patient age ($R^2 = 0.01$; $P = 0.21$).

Eighty-four patients (53%) received pre-operative treatment with testosterone cream. The frequency of prescribing testosterone cream varied by surgeon, from 0 to 92% of their patients. Median glans width at the time of surgery in patients with pre-operative testosterone was 15.5 mm (IQR 15–17), compared with 14 mm (IQR 13–15) in the 75 patients without it ($P < 0.001$). There were no significant differences in glans width between patients with distal, mid-shaft, or proximal defects, either overall ($P = 0.60$), with testosterone ($P = 0.52$), or without testosterone ($P = 0.99$).

The most recent clinical follow-up visit occurred a median of 7 months postoperatively (IQR 1–12), and the minimum time elapsed since surgery at the time of chart review was 10 months (median 26; IQR 20–36). There was no significant correlation between glans width and either length of follow-up ($R^2 = 0.006$; $P = 0.34$) or time elapsed since surgery ($R^2 = 0.002$; $P = 0.59$).

Twenty-four patients (15%) had one or more urethroplasty complications, including 11 (7%) with glanular complications (meatal stenosis or dehiscence) (Table 2). There was no statistically significant association between glans width and urethroplasty complications overall (odds ratio (OR) 1.12; 95% confidence interval (CI) 0.92–1.35; $P = 0.26$) or in patients who did (OR 1.03; 95% CI 0.79–1.33; $P = 0.84$) or did not (OR 1.14; 95% CI 0.83–1.57; $P = 0.41$) receive pre-operative testosterone cream (Fig. 1A). There were also no significant associations between glans width and the subset of glanular complications (Fig. 1B).

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