





Factors affecting outcome of adult hypospadias single stage repair: A prospective observational study

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Cite this article as: Goel HK, Tirthraj CM, Kabra S, Gahlawat S, Sharma U, Sood R. Factors affecting outcome of adult hypospadias single stage repair: A prospective observational study. *Turk J Urol.* 2021; 47(5): 420-426

ABSTRACT

Objective: In our part of the world, many patients present with hypospadias in adult age, where results are often poor and associated with increased complications. This study was conducted to assess the factors affecting outcome of single stage hypospadias surgery in adults.

Material and methods: This study included patients (>12 years) undergoing hypospadias repair in single stage. Preoperative factors were assessed and outcome parameters including early complications (within 1 month) and late complications (after 1 month) were studied and statistically analyzed.

Results: Of the 31 patients included (mean age 20.8 ± 7.87 years), 38.7% had a history of previous surgery. Mean glans width was 17.54 ± 1.78 mm. Postoperatively, the median hospital stay was 5 days (range: 4-10 days), and the median catheter duration was 21 days (range: 7-21 days). Overall complication rate was 54.83% at 6-month follow-up. Early complications comprised of infection, skin necrosis, and dehiscence of suture line. Late complications included urethrocutaneous fistula, glans dehiscence, and urethral stricture. On performing univariate logistic regression, glans width, urethral plate width and shape, and history of previous surgery were significant risk factors of postsurgery complications. On multivariate logistic regression, glans width was an independent significant risk factor (odds ratio: 0.197).

Conclusion: Several factors are associated with significant complications in adult hypospadias single stage repair. Among the various risk factors, glans width is an independent significant risk factor affecting outcome.

Keywords: Adult hypospadias; complications; glans width; outcome.

Introduction

Hypospadias is a common congenital anomaly in a male child and is characterized by congenital penile abnormality consisting of abortive development of urethral spongiosum, deficient ventral prepuce (hooded prepuce), and chordee in severe cases. One out of every 250 male live births is affected by hypospadias.¹ Undoubtedly, patients with primary hypospadias should undergo repair between 6 and 12 months of age, as recommended by the American Academy of Pediatrics.² Nevertheless, in developing countries like India with such a high rate of illiteracy and ignorance, many patients seek attention in adult-

hood. Complications of hypospadias surgery are more in the later age than in children. Adult hypospadias repair is associated with longer healing time, higher risk of infections due to hair growth in the penile area, more pain, and bleeding due to night time erections.³

Understanding the risk factors associated with the complications of the hypospadias surgery among adults may help in achieving better outcomes. Patients undergoing single stage repair were only included in this study as with multiple staged repair, success rate improves. Thus, this study was conducted to evaluate the possible factors affecting the outcome and

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Submitted:
12.05.2021

Accepted:
28.07.2021

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complications among adults undergoing single stage hypospadias surgeries.

Material and Methods

Study Design

A prospective observational study was conducted at the Department of Urology & Renal Transplant of a tertiary care hospital from February 2018 to August 2019 after approval from the Institutional Ethical Committee [No. 262 (35/2018)]. All hypospadias patients >12 years of age were included in this study, and a written informed consent was obtained. Hypospadias cripples (>2 failed hypospadias surgeries), patients with previous unsuccessful repair in last 12 months, and those undergoing staged repair were excluded from this study. All patients were subjected to clinical examination and uniform set of investigations. None of the patients received hormonal therapy in any form. Genital preparation was done by hair clipping in the preoperative room just prior to the procedure, and all patients received prophylactic antibiotic 1 hour prior to surgery. All patients were operated by a single experienced surgeon, who had an experience of more than 100 hypospadias surgeries. The type of surgery to be performed was decided based on various factors like urethral plate width and degree of chordee, location of hypospadias, glans width, etc. All hypospadias surgeries such as tubularized incised plate urethroplasty (TIP), tubularized transverse preputial island flap urethroplasty (TPIF), or Mathieu flap repair were done as standard. Closure was done in multiple layers with tunica vaginalis or dartos used as a barrier layer in all cases.

Main Points

- This is a prospective observational study about hypospadias repair in adults, a rare entity in the modern world. Results of repair in adults are often poor and associated with increased complications. Surgical principles used in children should be rationalized in planning adult hypospadias repair.
- This study helps in assessing the factors affecting outcome of single stage hypospadias repair in adults. Understanding the risk factors associated with complications may help in achieving better surgical outcomes.
- Several factors such as small glans width, flat urethral plate, small urethral plate width, and history of previous failed repair are associated with significant complications in adult hypospadias single stage repair. Among these factors, glans width was found to be an independent significant risk factor affecting outcome.

Data Collection

Demographic data of each patient were collected. Relevant predictive factors such as history of previous hypospadias surgery and local examination findings, including the type of hypospadias, meatal caliber, glans width, the presence or absence of balanitis xerotica obliterans, chordee, urethral plate width, and stretched penile length, were obtained. Necessary investigations including uroflowmetry were done with optional studies such as Retrograde urethrogram (RGU)/Micturating Cystourethrogram (MCU) and cystoscopy when required. Appropriate surgery was performed for each patient, and intraoperative factors such as degree of chordee and spongiofibrosis were noted. Early (within 1 month) and late (after 1 month) complications were studied. Early complications were not considered for outcome measurement and analysis. Patients were assessed clinically at 1, 3, and 6 months postoperatively and with uroflowmetry. Successful surgery was defined as any patient having all three parameters at 6 months of follow-up: (a) cosmetic—meatal opening in the glans, (b) clinical—clinically satisfied patient voiding well, and (c) investigative—flow on uroflowmetry $\geq 12 \text{ mL s}^{-1}$.

Data Analysis

Categorical variables were presented as numbers and percentage (%), whereas continuous variables were represented as mean \pm SD. Quantitative variables were compared using Independent t test between the two groups, and qualitative variables using Chi-square test and Fisher's exact test. Univariate and multivariate logistic regressions were used to find out the significant risk factors for complications. A *P* value of <.05 was considered statistically significant. The data were entered in MS EXCEL spreadsheet and analyzed using Statistical Package for the Social Sciences (SPSS) version 21.0 (IBM SPSS Corp.; Armonk, NY, USA).

Results

Fifty patients with hypospadias (primary and secondary) were reported during the study period. Of these, 31 patients were enrolled in this study, while 19 patients were excluded (nine crippled hypospadias, seven underwent staged repair, and three refused surgery). The mean age at presentation was 20.8 ± 7.87 years, and all had normal pattern on uroflowmetry. Of the 31 patients enrolled, 12 (38.7%) patients had a history of previous hypospadias surgery, while 19 (61.29%) patients were naive.

In our cohort of 31 patients, one (3.22%) patient had subcoronal hypospadias, 15 (48.38%) had distal penile, nine (29.03%) had mid penile, and six (19.35%) had proximal penile hypospadias. The median meatal caliber was 14 Fr (12-14). All patients

Table 1. Distribution of Preoperative Parameters

| Preoperative Parameters | Frequency (%) |
|---|---------------|
| Mean age (years) | 20.8 + 7.87 |
| Uroflowmetry pattern | |
| Normal | 31 (100) |
| Type | |
| Subcoronal | 1 (3.22) |
| Distal penile | 15 (48.38) |
| Mid penile | 9 (29.03) |
| Proximal penile | 6 (19.35) |
| Median meatus and urethral caliber (Fr) | 14 (12-14) |
| Glans | |
| Cleft | 31 (100) |
| Flat | 0 |
| Mean glans width (mm) | 17.54 + 1.76 |
| Previous repair | |
| Yes | 12 (38.7) |
| No | 19 (61.29) |
| Urethral plate | |
| Grooved | 14 (45.16) |
| Flat | 17 (54.83) |
| Mean urethral plate width (mm) | 6.58 + 1.18 |
| Mean stretched penile length (cm) | 7.8 + 0.75 |

had incomplete prepuce with cleft glans. The mean glans width was 17.54 ± 1.76 mm.

Urethral plate was flat in 17 (54.83%) patients and grooved in 14 (45.16%) patients. Mean urethral plate width was 6.58 ± 1.18 mm (preoperative and confirmed intraoperative). The mean stretched penile length was 7.8 ± 0.75 cm (Table 1).

Intraoperatively, 25 (80.6%) patients had some degree of chordee; out of which, four (16%) had $>30-60^\circ$ chordee, and 21 (84%) had $<30^\circ$ chordee. A total of 19 (61.3%) patients had poorly developed spongiosum, 12 (38.7%) had moderately developed spongiosum, and none had well-developed spongiosum. Among the surgeries performed, 24 (77.41%) patients underwent TIP, six (19.35%) had TPIF, and one (3.22%) underwent Mathieu flap repair.

To prevent fistula formation, repair was done in multiple layers. In TPIF repair, tunica vaginalis was used as a barrier. Spongiosum and tunica vaginalis were the barrier in 14 (45.17%) patients, and dartos and tunica vaginalis in 11 (35.48%) patients.

Orthoplasty was done in 25 patients; of which, 11 (44%) patients were managed by penile degloving only, 12 (48%) required dorsal plication, and two (8%) required ventral corporotomies superficially.

Postoperatively, the median hospital stay was 5 (4-10) days, while the median catheter duration was 21 (7-21) days. Catheter removal was done after 3 weeks in every patient, irrespective of the type of surgery, except in one patient whose accidental removal was done on 7th day. Patient voided well with good flow on uroflowmetry, and hence, the catheter was not reinserted. Early complications comprised of infection in seven (22.58%) patients, skin necrosis in six (19.35%) patients, and dehiscence of suture line in one (3.23%) patient. At 6 month follow-up, urethrocutaneous fistula, glans dehiscence, and urethral stricture were present in eight (25.8%), five (16.12%), and four (14.89%) patients, respectively (Table 2).

Outcome was measured on the basis of complication rate at 6-month follow-up. Early complications were not considered for outcome measurements.

Patients were divided into two groups: Group A—patients with complications ($n = 17$) and Group B—patients without complications ($n = 14$).

Group A had less mean glans width (16.17 mm vs. 19.21 mm) and less mean urethral plate width (5.94 mm vs. 7.35 mm) compared to patients of Group B (statistically significant). There were more patients with poorly developed spongiosum (57.89% vs. 42.11%), history of previous surgery (83.33% vs. 16.67%), and flat urethral plate (76.47% vs. 23.53%) in Group A (statistically significant). The mean stretched penile length (7.88 cm vs. 8 cm), chordee, type of hypospadias, presence of penile torsion, presence of scrotal transposition, type of surgery, and barrier used were comparable between the two groups (Table 3).

On univariate logistic regression analysis, parameters comprising glans width ($P < .0001$), urethral plate shape ($P = .011$), urethral plate width ($P = .005$), and history of surgery ($P = .018$) were found to be significantly associated with postsurgery complications.

With an increase in glans width and urethral plate width by one unit, risk of postsurgery complications decreased by 98.9% and 77.5%, respectively. On the other hand, patients with a history of surgery and flat urethral plate had significantly higher chances of postsurgery complications with odds ratio of 8.571 and 8.125, respectively.

Table 2. Distribution of Intraoperative and Postsurgery Parameters

| Intraoperative and Postsurgery Parameters | Frequency (%) |
|--|---------------|
| Intraoperative parameters | |
| Chordee | |
| Yes | 25 (80.6) |
| No | 6 (19.4) |
| <30 | 21 (84) |
| 30-60 | 4 (16) |
| Spongiosum | |
| Poor | 19 (61.3) |
| Moderate | 12 (38.7) |
| Surgery | |
| Tubularized incised plate urethroplasty | 24 (77.41) |
| Tubularized transverse preputial island flap urethroplasty | 6 (19.35) |
| Mathieu flap | 1 (3.22) |
| Barrier layer | |
| Spongiosum + tunica vaginalis | 14 (45.17) |
| Dartos + tunica vaginalis | 11 (35.48) |
| Tunica vaginalis | 6 (19.35) |
| Orthoplasty (n = 25) | |
| Degloving | 11 (44) |
| Dorsal plication | 12 (48) |
| Ventral corporotomy | 2 (8) |
| Neomeatus | |
| Glans | 31 |
| Postsurgery parameters | |
| Median hospital stay (days) | 5 (4-10) |
| Median catheter duration (days) | 21 (7-21) |
| Early complications | |
| Infection | 7 (22.58) |
| Skin necrosis | 6 (19.35) |
| Dehiscence of suture line | 1 (3.23) |
| Late complications | |
| UCF | 8 (25.8) |
| Glans dehiscence | 5 (16.12) |
| Urethral stricture | 4 (14.89) |

Furthermore, on multivariate logistic regression analysis, glans width ($P < .0001$) was the only parameter found to be significantly associated with postsurgery complications. On increasing the glans width by one unit, risk of postsurgery

complications decreased by 80.3% with an adjusted odds ratio of 0.197 (Table 4).

Discussion

Many case series and cohorts comprising of primary and secondary hypospadias repair among adults have reported an average age of 16-22 years at presentation.²⁻⁵ The debate continues if the complication rates increase with the increasing age.

Patients more than 12 years of age (mean age 20.8 ± 7.87 years) were included in our study. There were six patients in the age group of 12-16 years, and all had achieved puberty. Ozman et al.⁶ found that age of the patient may increase the chances of fistula formation after surgery. In congruence, Huang et al.⁷ and Yildiz et al.⁸ also found that increased age was the risk factor for complication after hypospadias repair. The reason could be that erection occurs more frequently with increasing age leading to postoperative bleeding and dehiscence, hence affecting postoperative complications.⁹ Also, tissue compositions are quite different in adults as compared to children. Adults have more fibrous tissue with less pliability and vascularity, which might be the reason behind more complications as compared to children. With transition to adult, there is fibrosis of spongiosum. In many cases, the local spongiosum is too poor to do spongioplasty.

Distal penile hypospadias was the most common type of hypospadias similar to other studies.^{2,3,10} In the index study, among the surgical techniques, TIP was done in 74.18% of patients and TPIF in 19.35% of patients. In the study by Özman et al.,⁶ distal hypospadias was repaired by TIP in 79% of patients, and meatal advancement and glanuloplasty were incorporated (MAGPI) in 21% of patients, while all proximal hypospadias were repaired using TIP. However, Khan et al.¹¹ repaired majority of hypospadias patients (76.2%) in two stages (Bracka) and 20.8% with TIP repair.

Bhat et al.² found that outcome was significantly affected by severity or type of hypospadias as they reported complication rate of 40% with proximal hypospadias repair, 29% in midpenile, and 9% in distal penile hypospadias repair. Altaweel et al.⁴ reported 71% success rate in patients with primary hypospadias using TIP repair and 100% success with two stage repair. In secondary hypospadias, 50-57% success rate was achieved after one surgery, while in stage surgery, the success rate was 92-93% depending on the type of technique. They concluded that the overall success rate depended upon whether the patient had primary or secondary hypospadias. Also, stage repair was associated with better outcome irrespective of primary or secondary

Table 3. Univariate Analysis of Variable Between Group A (with Complications) and Group B (Without Complications)

| Outcome | Group A | Group B | P Value |
|--|-------------------|-------------------|---------|
| Mean glans width (mm) | 16.17 (SD = 0.72) | 19.21 (SD = 1.05) | <.0001 |
| Mean urethral plate width (mm) | 5.94 (SD = 0.65) | 7.35 (SD = 1.21) | .005 |
| Mean stretched penile length (cm) | 7.88 (SD = 0.99) | 8 (SD = 1.3) | .77 |
| Spongiosum | | | |
| Moderately developed | 6 (50%) | 6 (50%) | .041 |
| Poorly developed | 11 (57.89%) | 8 (42.11%) | |
| Chordee | | | |
| No chordee | 4 (66.7%) | 2 (33.3%) | .24 |
| <30 | 8 (38.1%) | 13 (61.9%) | |
| >30-60 | 3 (75%) | 1 (25%) | |
| Types of hypospadias | | | |
| Sub coronal | 1 (100%) | 0 (0%) | .61 |
| Proximal penile | 3 (50%) | 3 (50%) | |
| Mid penile | 6 (66.66%) | 3 (33.33%) | |
| Distal penile | 7 (46.66%) | 8 (53.34%) | |
| Previous repair | | | |
| Yes | 10 (83.33%) | 2 (16.67%) | .018 |
| No | 7 (36.84%) | 12 (63.16%) | |
| Urethral plate shape | | | |
| Grooved | 4 (28.57%) | 10 (71.43%) | .011 |
| Flat | 13 (76.47%) | 4 (23.53%) | |
| Type of surgery | | | |
| Tubularized incised plate urethroplasty | 14 (60.87%) | 9 (39.13%) | .32 |
| Tubularized transverse preputial island flap urethroplasty | 2 (33.33%) | 4 (66.67%) | |
| Mathieu flap repair | 0 (0%) | 1 (100%) | |
| Types of barrier | | | |
| Spongiosum + TV | 8 (57.14%) | 6 (42.86%) | .47 |
| Dartos + TV | 7 (63.63%) | 4 (36.37%) | |
| Tunica vaginalis (TV) | 2 (33.33%) | 4 (66.67%) | |

P < .05 is considered statistically significant

hypospadias. In the index study, we could not recapitulate significant association between type of hypospadias and complication rate (*P* value = 0.61), due to less number of cases and exclusion of patients with staged repair.

The reported rates of hypospadias repair complications range from 10.1% to 37.5% in adult patients undergoing a first-time repair, but it doubles to 27.5-63.6% in patients with at least one previous attempt to repair during childhood.⁹ Rashed et al.³ reported a complication rate of 26% in patients with primary hypospadias repair and 50% in secondary hypospadias repair. In the present study, 12 (38.7%) patients underwent secondary

hypospadias repair, while 19 (61.29%) patients were naïve. The complication rate for secondary hypospadias repair was 83.33%, while that for primary hypospadias repair was 36.84%. The observed difference in the complication rate between the two groups was statistically significant (*P* value = .018). However, on further application of multivariate logistic regression analysis to adjust for confounding factors, no significant difference in the complication rate (*P* value = .991) was found. We acknowledge the fact that history of previous surgery may affect the results of subsequent repair. Patients with primary hypospadias have virgin tissues and planes that make dissection, and eventually a repair easy. As tissues are pliable

Table 4. Multivariate Logistic Regression to Find Out Significant Risk Factors of Postsurgery Complications After Adjusting for Confounding Factors

| Multivariate | Beta Coefficient | Standard Error | P Value | Odds Ratio | 95% CI for Odds Ratio | |
|-----------------------------|------------------|----------------|---------|------------|-----------------------|---------|
| | | | | | Lower | Upper |
| Glans width (mm) | -1.623 | 0.641 | <.0001 | 0.197 | 0.008 | 0.519 |
| U plate width (mm) | -0.698 | 0.95 | .52 | 0.498 | 0.005 | 5.529 |
| Previous history of surgery | 0.03 | 2.134 | .991 | 1.03 | 0.001 | 7354.36 |
| Shape | | | | | | |
| Flat | | | | 1 | | |
| Grooved | 0.828 | 1.57 | .628 | 2.288 | 0.023 | 3229.33 |

and well vascularized, it is expected to heal better with lesser complications, and as rightly said, first chance is the best chance in reconstructive surgery.

Amid various parameters, data on urethral plate width, glans width, and penile length, and their association with surgical outcome are lacking in literature. Yet, Bhat et al.² clarified the importance of urethral plate width in his study and found 50% complication rate among patients with narrow urethral plate. In another study by Sheng et al.,¹² multivariate logistic regression revealed that urethral defect length and urethral operation history were the two independent risk factors of urethrocutaneous fistula.

In the index study, glans width and urethral plate width were the independent parameters affecting the surgical outcome. Also, the flat urethral plate was associated with worse surgical outcome ($P = .011$). However, there was no significant correlation between stretched penile length and complication rate. In our study, glans width, urethral plate width and shape, and history of previous surgery were the significant risk factors of postsurgery complications on univariate logistic regression analysis. However, on multivariate logistic regression analysis, glans width ($P < .0001$) was the only parameter found to be significantly associated with postsurgery complications. This could be because of the fact that glans width is an important determinant for successful glanuloplasty, and adults with sub-optimal glans width are reported to have a high failure rate.

We found that the median hospital stay and catheter duration were found to be 5 and 21 days, respectively. Our findings were consistent with Khan et al.,¹¹ who reported a mean hospital stay of 3 days and complication rate of 60%.

The complication rate at 6 month follow-up in our study was 54.83%, which is comparable to other studies. However, it is quite high as compared to children. History of multiple failed repair, fibrosed spongiosum, abnormal flat urethral plate,

inability to provide buttress by single barrier, large urethra to be created (14 Fr), erection, and poor hygiene are the poor factors for successful outcome.

Our study was limited by a small sample size and short-term follow-up of patients. This study being an observational study is prone for observer bias. A large multicenter study with ample cases is required for further assessment and opinion.

Several factors are associated with significant complications in adult hypospadias single stage repair. Small glans width, flat urethral plate, small urethral plate width, history of previous failed repair, and poorly developed spongiosum were found to be significant on univariate analysis, whereas glans width was the only significant factor on multivariate analysis.

Ethics Committee Approval: Ethical committee approval was received from the Guru Gobind Singh Indraprastha University, New Delhi (No. 262 (35/2018)).

Informed Consent: Written informed consent was obtained from all participants who participated in this study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept - H.K.G., C.M.T., S.K., S.G., U.S., R.S.; Design - H.K.G., C.M.T., S.K., S.G., U.S., R.S.; Supervision - H.K.G., C.M.T., S.K., S.G., U.S., R.S.; Resources - C.M.T.; Materials - C.M.T.; Data Collection and/or Processing - H.K.G., C.M.T., S.K., S.G., U.S., R.S.; Analysis and/or Interpretation - H.K.G., C.M.T., S.K., S.G., U.S., R.S.; Literature Search - H.K.G., C.M.T., S.K., S.G.; Writing Manuscript - H.K.G., C.M.T., S.K., S.G.; Critical Review - H.K.G., C.M.T., S.K., S.G., U.S., R.S.

Conflict of Interest: The authors have no conflicts of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

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