

FACTORS ASSOCIATED WITH URETHROCUTANEOUS FISTULA COMPLICATION IN HYPOSPADIAS PATIENT AFTER URETHROPLASTY IN FATMAWATI GENERAL HOSPITAL: A RETROSPECTIVE COHORT DESIGN

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ABSTRACT

Objective: This study compared several factors that are thought to contribute to the incidence of complications of urethroplasty fistula after urethroplasty, including meatus location, degree of chordee, surgical technique, and postoperative stent type. **Material & Methods:** This study is an analytical study with retrospective cohort design. After adjusting to the inclusion and exclusion criteria, 89 subjects with proximal hypospadias were subjected to urethroplasty at Fatmawati General Hospital, Jakarta from 2016 to 2019. An analysis of the relationship between several variables and the incidence of urethrocuteaneous fistula was analyzed. **Results:** There was no significant difference between the one-stage and two-stage urethroplasty technique on the incidence of urethrocuteaneous fistula ($p = 0.063$). There was no significant difference between the degree of chordee and complications of urethrocuteaneous fistula after urethroplasty ($p = 0.677$). The relationship between the use of silastic stent, catheter, or cystostomy type was also not significant in complications of urethrocuteaneous fistula ($p = 0.576$). The location of the urethral meatus also did not have a significant role in predicting the incidence of post-urethroplasty urethrocuteaneous fistula ($p = 0.169$). **Conclusion:** Surgical technique (one stage and two stages), type of stent, degree of chordee, and location of the urethral meatus, did not have a significant correlation with the incidence of urethrocuteaneous fistula in hypospadias patients after urethroplasty.

Keywords: Hypospadias, urethrocuteaneous fistula, urethroplasty.

ABSTRAK

Tujuan: Studi ini membandingkan beberapa faktor yang diduga berkontribusi pada kejadian komplikasi fistula uretrokutan pasca uretroplasti, meliputi lokasi meatus, derajat chordee, teknik operasi, dan jenis stent pasca operasi. **Bahan & Cara:** Penelitian ini bersifat analitik dengan menggunakan desain kohort retrospektif. Setelah disesuaikan dengan kriteria penerimaan dan penolakan, 89 subjek penelitian dengan hipospadia proksimal yang dilakukan tindakan uretroplasti di RSUP Fatmawati, Jakarta pada rentang tahun 2016 hingga 2019. Dilakukan analisis hubungan beberapa variabel dengan kejadian fistula uretrokutan. **Hasil:** Tidak terdapat perbedaan bermakna antara teknik uretroplasti satu tahap dengan dua tahap terhadap kejadian fistula uretrokutan ($p = 0.063$). Tidak terdapat perbedaan bermakna antara derajat chordee dengan komplikasi fistula uretrokutan pasca uretroplasti ($p = 0.677$). Hubungan penggunaan jenis stent silastik, kateter, ataupun sistostomi juga tidak berbeda bermakna pada komplikasi fistula uretrokutan ($p = 0.576$). Hubungan lokasi meatus atau muara uretra pada penis subjek penelitian juga tidak memiliki perbedaan yang bermakna dalam memprediksi kejadian fistula uretrokutan pasca uretroplasti ($p = 0.169$). **Simpulan:** Faktor-faktor yang diteliti seperti teknik operasi (satu tahap dan dua tahap), jenis stent, derajat chordee, dan lokasi muara uretra pada penis, tidak berhubungan secara bermakna terhadap kejadian komplikasi fistula uretrokutaneus pada pasien hipospadia pasca uretroplasti.

Kata Kunci: Hipospadia, fistula uretrokutan, uretroplasti.

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INTRODUCTION

Hypospadias is a condition where the urethra opens on the underside of the penis with

associated ventral penile curvature.¹ The etiology of hypospadias is still unknown. However, from several studies, it seems to be multifactorial with many genetic and environmental factors playing a role.²

Hypospadias is the second most common genital birth defect in boys, following cryptorchidism.³ In 2010, the global incidence of hypospadias was around 20.9 (95% CI: 19.2–22.6) per 10,000 births.⁴ In Indonesia, the prevalence of hypospadias has not been well recorded, however, there are case reports with varying numbers from various health facilities. RSUP Prof. Dr. R. D. Kandou Manado reported that there were 17 reports of hypospadias in January 2009–October 2010.⁵ In RSUP Sanglah, Denpasar, there were 53 hypospadias cases found in January 2009–April 2012.⁶ A total of 120 hypospadias cases were also reported in Central Java in the 2010–2012 period.⁷ This indicates that this disorder occurs quite frequently in Indonesia and is not related to a particular geographic location, or in other words, the incidence of hypospadias is evenly distributed.

Based on its location and severity, hypospadias is divided into 3 types, with the 2nd degree type being the most frequently reported in Indonesia.⁸ This type of hypospadias is described by the location of the urethral meatus in the subcoronal, distal, midshaft, and proximal areas of the penis.⁹ In Indonesia, the most common penile reconstruction technique is urethroplasty. These techniques include Meatal Advancement-Glanuloplasty (MAGPI), Glans Approximation Procedure (GAP), and Tubularization Incision of the Urethral Plate (TIP).^{9,10} Although penile reconstruction surgical techniques in hypospadias patients have developed rapidly, the results of hypospadias surgery are often unsatisfactory and the complication rate that occurs is still quite high, which is around 50% or more.¹¹⁻¹² The most common postoperative complications for hypospadias are urethrocutaneous fistula, meatal stenosis, urethral stricture, urethral diverticulum, glans dehiscence, and unsatisfactory cosmetic appearance hence it requires re-surgery.¹³

To date, there are not many studies that discuss the factors that contribute to complications of urethrocutaneous fistula in postoperative hypospadias patients, especially regarding the location of the urethral meatus in the penile shaft. This complication is a serious complication with consequences in the form of repeated surgery to close the fistula that forms along the curvature of the shaft of the penis. This study evaluated the risk factors for this complication in hypospadias patients. The risk factor in question is the location of the urethral estuary in hypospadias patients.

OBJECTIVE

This study compared several factors that are thought to contribute to the incidence of complications of urethroplasty fistula after urethroplasty, including meatus location, degree of chordee, surgical technique, and postoperative stent type.

MATERIAL & METHODS

This retrospective cohort study included 89 patients who had urethroplasty surgery at Fatmawati General Hospital, Jakarta from 2016 to 2019. The number of samples in this study was calculated using the sample size formula for a single proportion. The p-value as a previous prediction of the urethrocutaneous fistula with similar sample characteristics was 36%.¹⁴ Z_{α} is the value of the standard deviation constant (1.96). The value of the deviation accepted from the predicted prediction is d-value (0.1). Based on this formula, the minimal sample required for this study was 84 patients. Patients who formerly had similar surgery (urethroplasty) or having other diseases, were excluded from this study.

The data was obtained from the medical record at Fatmawati Hospital, Jakarta including demographic data, type of hypospadias, reconstruction techniques, duration of surgery, and the severity of chordee. The hypospadias was classified into 3 types, namely: 1) anterior (glandular, subcoronal, and distal to the shaft of the penis); 2) medial (midshaft and proximal shaft); and 3) posterior (penoscrotal, scrotal, and perineal).

Penile reconstruction was grouped based on the number of stages (one-stage and two-stage) and the technique type [Onlay Preputial Island Flap, TIP, Duckett (Transverse Preputial Island Flap), Koyanagi, Thiersch-Duplay, Mathieu, and Dorsal Inlay Preputial Graft TIP]. The severity of chordee was also classified into mild (< 30°), moderate (30°–45°), and severe (> 45°). Each patient was followed for at least 1 year to assess the incidence of urethrocutaneous fistula.

Comparative analysis of two unpaired groups was conducted. Categorical data were analyzed using the Chi-square test and/or the Fischer exact test. Continuous data were compared using unpaired-t or Mann-Whitney tests according to the data distribution. The normality of the data distribution was determined using the Kolmogorov-

Smirnov test. All statistical analysis in this study was performed using SPSS ver 20 software.

RESULTS

A total of 89 patients with a median age of 111.37 ± 59.96 months were enrolled in this study and followed up for a year. Of all hypospadias types, anterior hypospadias was the most common with 35 cases (33.7%). Twenty-five cases had severe Chordee (28.1%).

The one-stage urethroplasty technique was the most performed (77.5%), and postoperative Silastic stenting was the most frequently performed (78.7%). The duration of stenting varied from 3 to 21

Table 1. Demographic Data and Patient Characteristic

Variable	Frequency
Age, x \pm SD (month)	111.37 \pm 59.96
Meatus Location (%)	
Anterior	35 (33.7)
Medial	24 (27)
Posterior	30 (39.3)
Chordee severity (%)	
Non-Chordee	32 (36.0)
Mild	10 (11.2)
Moderate	22 (24.7)
Severe	25 (28.1)

days, however, 50.6% of the patients had a stent for 7 days. Postoperatively, urethrocuteaneous fistula complication was one of the most common complications, reported by 18 patients (20.2%).

Table 2. Clinical finding, Urethroplasty Technique and Post Operative Fistula Complication.

Variable	Frequency (n/%)
Operation Stage	
1 staged	69 (77.5)
2 staged	20 (22.5)
Type of Stent	
Silastic	70 (78.7)
Cath	17 (19.1)
Cystostomy	2 (2.2)
Length of Stent Usage (days)	
3	20 (22.5)
4	17 (19.1)
5	1 (1.1)
6	2 (2.2)
7	45 (50.6)
9	1 (1.1)
14	2 (2.2)
21	1 (1.1)
Fistula Complication	
Yes	18 (20.2)
No	71 (79.8)

Table 3. Variables Associated with Urethrocuteaneous Fistula.

Variables	Urethrocuteaneous Fistula		P- Value
	Yes	No	
Age (months) x \pm SD	122.72 \pm 52.58	108.42 \pm 61.75	0.371 ^a
Operation stage			0.063
1 staged	17	52	
2 staged	1	19	
Chordee Degree			0.677 ^b
Non-Chordee	6	26	
Mild	4	6	
Moderate	4	18	
Severe	4	21	
Type of Stent			0.576 ^b
Silastic	14	56	
Cath	4	13	
Cystoctomy	0	2	
Meatus Location			0.169 ^c
Posterior	5	25	
Medial	8	16	
Anterior	5	30	

a = Independent T-Test, b = Mann-whitney test, c = Pearson Chi-square.

The differences between each variable (number of stages, stent type, and stent duration) and the clinical outcome in the form of urethrocutaneous fistula incidence were analyzed using the chi-square test. This study found no significant difference between the 1-stage and 2-stage techniques on the incidence of urethrocutaneous fistula ($p = 0.063$). The incidence of urethrocutaneous fistula as urethroplasty complication was similar between each severity group ($p = 0.677$). The use of Silastic stents, catheters, or cystostomy also had similar results on the incidence of urethrocutaneous fistula ($p = 0.576$). The incidence of urethrocutaneous fistula was not affected by the type of hypospadias ($p = 0.169$).

DISCUSSION

Hypospadias is one of the most common congenital anomalies in males. The exact etiology of this disease is unknown, however, it is believed that genetic and environmental factors, including hormonal disorders, have been suggested.¹⁵ The prevalence of hypospadias in 2010 was 20.9 (95% CI: 19.2–22.6) per 10,000 births worldwide and various reconstructive techniques have been described to improve penile function and esthetic for the patients with hypospadias. To date, there are more than 300 different types of techniques had been developed.¹⁶

However, the development of penile reconstruction techniques in hypospadias still leaves some postoperative complications.¹⁷ Urethrocutaneous fistula is a common complication following hypospadias repair. An observational study conducted in 2015 in developing countries reported that urethrocutaneous fistula was the most frequent complication reported after urethroplasty compared to other complications (e.g. stenosis and meatal retraction).¹⁸ A cohort study involving 294 patients observed that the incidence of complications of urethrocutaneous fistula was up to 20%.¹⁹

In several studies, various factors that may contribute have been suggested. A study in China found that urethral length ($p = 0.034$) was associated with the incidence of urethrocutaneous fistula.¹² However, these data cannot be generalized or applied directly to postoperative patients in Indonesia, due to differences in the characteristics. Therefore, studies evaluating the risk factors of urethrocutaneous fistula following repair surgery are still needed in Indonesia. Theoretically, some factors

that might contribute to the complications include the location of the meatus, severity of chordee, surgical technique, and type of postoperative stent.

The location of the urethral meatus on the penis of hypospadias patient can be classified into 3 types: 1) anterior (glanular, subcoronal, and distal to the shaft of the penis); 2) medial (midshaft and proximal shaft); and 3) posterior (penoscrotal, scrotal, and perineal).²⁰ In this study, 35 patients (33.7%) had anterior hypospadias. A total of 24 patients (27%) and 30 patients (39.3%) had medial and posterior hypospadias, respectively.

Among all the locations of the meatus, medial hypospadias had the most urethrocutaneous fistulas, with a proportion of 50% of all hypospadias patients. Nevertheless, the location of the meatus did not differ significantly compared to the other location of the meatus on the incidence of urethrocutaneous fistula postoperatively ($p = 0.169$). On contrary, Lu et al. (2015) in their retrospective cohort study in Taiwan found that the location of the meatus was correlated with urethrocutaneous fistula ($p = 0.03$) and revealed that proximal meatus hypospadias had more risk for postoperative fistula than distal hypospadias.²¹

Another retrospective cohort study in South Korea, involving 294 patients, also revealed a significant correlation between meatus location and urethrocutaneous fistula.¹⁹ Yildiz et al. (2013) showed that patients with penile medial hypospadias had 1.7 times more likely to develop postoperative complications compared to distal hypospadias (18.4% vs 10.4%) and a 1.3-fold increase in fistula complications (7.8 vs 5.9%).²²

The absence of a significant association between the location of the urethral meatus in this study might be due to the low number of patients enrolled in this study. It should be noted that the medial hypospadias penis in this study had more fistula complications than the location of the meatus anterior to the penis, although this was not statistically significant. It is reasonable to assume that the farther the location of the meatus from the normal position, the more extensive tissue damage during the surgery. Reconstruction of a large defect implies a greater need for larger tissue and sufficient vascular.²³

The severity of hypospadias can also be assessed according to the abnormal curvature of the penis or chordee.²⁴ Based on the severity of the chordee, hypospadias can be classified into mild ($<30^\circ$); moderate (30° – 45°); and severe ($>45^\circ$).^{25–26}

This study found no significant relationship between the severity of the chordee and fistula complications ($p = 0.677$). This result was in line with the findings of Sheng et al (2018), who found the severity of the chordee was not associated with fistulas ($p = 0.737$).¹²

The type of stent also did not have a significant relationship with urethrocuteaneous fistula ($p = 0.576$). Similar results were also reported by Lee et al (2018) comparing Silastic and Koyle stents. Lee et al reported no significant stent types on complications of urethrocuteaneous fistula in postoperative hypospadias patients.²⁷ Karakaya et al. also reported that the use of stents did not produce significant clinical outcomes compared to patients who did not use stents. Using the HOSE score to assess the cosmetic outcome of urethroplasty surgery, they found no significant difference in the group of patients who did not use a stent compared to patients who had a stent.²⁸

The surgical procedure was also evaluated in this study. The procedure was classified into 2, namely one-stage and two-stage. The one-stage procedure consists of Tubularized Incised Urethroplasty (TIP) or various graft or flap-based techniques. The two-stage procedure also includes grafts or flaps, namely oral mucosal and preputial skin grafts.²⁵ To date, it is controversial which technique is the best for treating hypospadias.²⁹

The clinical (incidence of urethrocuteaneous fistula) outcome in this study was not different using either a one-stage or two-stage surgical technique ($p = 0.063$). The result of this study was supported by Zheng et al. (2015) who found the two techniques did not differ significantly in the incidence of early complications, including fistula, dehiscence, or infection. The overall complication also did not differ significantly between the one-stage versus two-stage technique. The patients having the one-stage technique had more complications (12/32 vs 9/34), although the number was not statistically significant ($p = 0.8892$).²⁹

The surgeons also need to consider the costs in determining the choice of technique (one or two stages). The two-stage technique is more costly and time consuming than one-stage. Initially, the two-stage technique was developed to obtain better urethral reconstruction outcome. A significant reduction of complications risk is one of the clinical outcomes expected from this technique. However, without the expected outcome, we would rather recommend using the one-stage technique in patients

with hypospadias.

Due to no significant difference between these two techniques, the cost efficiency, and the time to perform the surgery, we suggested that one-stage surgery should be considered earlier in hypospadias patients who are not indicated for two-stage surgery. However, the choice of surgical technique should be also based on the patient's hypospadias condition. Patients with severe chordee are indicated for 2 stage surgery.²⁹

This study had several limitations. First, the study design was a retrospective study. This design limited the amount of data that can be retrieved due to limited information recorded. Second, due to the design of this study, this study was not aimed to determine specific predictive/prognostic power. The results of data analysis suggested that a larger sample size would clarify the pre-and intraoperative factors that might play roles in the incidence of post-urethroplasty complications. Therefore, further studies using a larger number of patients are needed. Longer follow-up is also needed in assessing the quality of life postoperatively.

CONCLUSION

Surgical technique, type of stent, the severity of chordee, and location of the urethral meatus in the penis, were not significantly related to the incidence of urethrocuteaneous fistula as a complication in hypospadias patients after urethroplasty.

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