

Clinical Risk Factors of Post Operative Complications in Hypospadias Repair

Akmal Fawzi¹, Paksi Satyagraha¹, Besut Daryanto^{1*}

¹Department of Urology, Faculty of Medicine, Universitas Brawijaya, Saiful Anwar General Hospital, Malang, East Java, Indonesia, 65111

***Corresponding Author**

Besut Daryanto

Department of Urology, Faculty of Medicine, Universitas Brawijaya, Saiful Anwar General Hospital, Malang, East Java, Indonesia, 65111

Email: urobes.fk@ub.ac.id

Objectives. Failed hypospadias refers to any hypospadias repair that leads to complications or causes patient dissatisfaction. Many factors influence the occurrence of complications, therefore this study aims to determine what risk factors can cause complications after hypospadias surgery.

Methods. The study was conducted retrospectively by collecting 78 data of hypospadias patients who underwent surgery in Saiful Anwar General Hospital medical record from January 2015 until June 2019. age at the time of surgery, location of the external urethral meatus, degree of chordee, previous surgery history, type of urinary diversion, presence of Urinary Tract Infection (UTI), how many stages of surgery were performed, the surgical technique used at each stage and the complication recorded and analyzed.

Results. Hypospadias patients who underwent surgery were 78 patients. The mean patient age was 9.96 years SD \pm 6.959. Most of the ages were 11-18 years old with 28 patients. The location of the external urethral meatus was mostly found proximal to the penis of 40 patients. 44 patients were accompanied by mild chordee. 10 patients had previously undergone hypospadias surgery. 16 patients suffered from significant urinary tract infections but had no symptoms. 60 patients were inserted urethral catheter placement after hypospadias surgery. The most surgical technique used in stage 1 hypospadias surgery is Tubularized Incised Plate (TIP) Urethroplasty. While the technique used in 2 stage hypospadias surgery was Dorsal onlay preputial graft followed by TIP Urethroplasty. Complications that occurred in 1 stage hypospadias surgery were urethrocutan fistule in 9 patients and chordee in 1 patient. In 2 stage hypospadias surgery 3 patients obtained urethrocutan fistules, 2 patients with scrotal abscess and 1 patient obtained graft shrinkage. Age at surgery, location of Meatus Urethrae Externus (MUE), presence of UTI and also the choice of urinary diversion type correlated with the presence of complications. ($P=0,004$, $P=0,033$, $P=0,049$, $P=0,000$).

Conclusions. Our results suggest that the success of hypospadias surgery is associated with age at surgery, location of MUE, presence of UTI and also the choice of postoperative urinary diversion type.

Keywords: complications, hypospadias, risk factors

Introduction

Hypospadias is a congenital malformation that occurs in infants from birth with a prevalence in Asia, which states that 27 (0.41%) babies out of 6538 were born boys. The incidence increased from 2.85 per 1000 live births in 1999 to 6.89 per 1000 live births in 2005 [1]. In general, hypospadias surgery through several stages, namely, orthoplasty, urethroplasty, glansplasty, scrotoplasty and skin coverage. The procedure can be done in various

sorts of techniques depending on the patient and operator [2][3]. Postoperative complications also often occur, one of which is urethral fistula and requires repeat surgery. In addition, there can also be glans dehiscence, urethral stricture, meatal stenosis and residual chordee [4]. Many factors influence the occurrence of complications, therefore this study aims to determine what risk factors can cause complications after hypospadias surgery.

Materials and Methods

This type of research is retrospective analytic study. The samples used were all patients with a diagnosis of hypospadias who were treated at Dr. Saiful Anwar Malang. The inclusion criteria in this study were all patients who underwent hypospadias surgery and the exclusion criteria in this study were patients with incomplete demographic data and surgery reports.

Retrieval of data obtained from patient medical records at RSUD Dr. Saiful Anwar Malang and from the medical records of Urology Malang from January 2015 - June 2019. Data recording was in the form of patient identity consisting of name, age, location of the external urethral meatus, degree of chordee, previous surgery history, presence or absence of UTI, operation technique, type of urine diversion and complications.

After the data is collected, it will be processed and analyzed descriptively. In addition, statistical analysis was also carried out between complications and age at the time of surgery, location of the external urethral meatus, degree of chordee, previous surgery history, type of urinary diversion, presence of UTI, how many stages of surgery were performed and the surgical technique used at each stage were performed using tests. chi-square. All data were analyzed using SPSS version 25 and $p < 0.05$ was significant.

Results

Patient characteristics can be seen in Table 1. Hypospadias patients who underwent surgery were 78 patients. The mean patient age was 9.96 years $SD \pm 6.959$. The age of hypospadias surgery was obtained. From the research data, the youngest age was 1 year and the oldest was 38 years. Most of the ages were 11-18 years old with 28 patients. The location of the external urethral meatus was mostly found proximal to the penis of 40 patients. In this study, 44 patients were accompanied by mild chordee. A total of 10 patients had previously undergone hypospadias surgery. From the urine culture results, it was found that 16 patients suffered from significant urinary tract infections but had no symptoms. From the data obtained, 60 patients were inserted urethral catheter placement after hypospadias surgery.

In 1 stage hypospadias surgery complications occurred in 10 patients, while in 2 stage hypospadias surgery complications occurred in 6 patients.

Complications that occurred in 1 stage hypospadias surgery with TIP Urethroplasty

technique were urethrocutan fistule in 9 patients and chordee in 1 patient. Meanwhile, the onlay island flap technique did not show any complications. In 2 stage hypospadias surgery with Dorsal Onlay Preputial Graft technique followed by TIP Urethroplasty, 3 patients obtained urethrocutan fistule. For the Buccal Mucosa Graft (BMG) Urethroplasty technique followed by TIP Urethroplasty, 1 patient obtained graft shrinkage. Whereas in the technique Johansen I Procedure followed by TIP Urethroplasty, 2 patients obtained scrotal abscess (Table 2).

Table 1. Patients characteristic

Characteristic	Total	%
Age		
≤ 5 years	24	30,7%
6 – 10 years	21	27%
11 – 19 years	28	35,8%
≥ 20 years	5	6,5%
Site of hypospadias		
Distal	15	19,2%
Middle	23	29,5%
Proximal	40	51,3%
Chordee		
Without chordee	9	11,5%
Mild chordee	44	56,4%
Severe chordee	25	32,1%
History of Surgery		
Yes	10	12,8%
No	68	87,2%
UTI		
Yes	16	20,5%
No	62	79,5%
Urinary diversion		
Urethral catheter	60	76,9%
Cystostomy	17	21,8%
Both of them	1	1,3%
Stage of surgery		
1 stage	34	43,6%
2 stage	44	56,4%
One stage technique		
TIP Urethroplasty	30	88,2%
Onlay Island Flap	4	11,8%
Two stage technique		
Dorsal onlay preputial graft followed TIP Urethroplasty	35	79,5%
BMG Urethroplasty followed TIP Urethroplasty	2	4,5%
Johansen I Procedure followed TIP Urethroplasty	7	16%
Complication		
Yes	16	20,5%
No	62	79,5%

Table 2. Complications after different types of hypospadias repair

Type of operation	No. of patient	Complication				Total	%
		Urethrocutan fistule	Chordee	Scrotal Abscess	Graft shrinkage		
1 Stage							
TIP Urethroplasty	30	9	1	-	-	10	33%
Onlay Island Flap	4	-	-	-	-	-	0%
2 Stage							
Dorsal Onlay	35	3	-	-	-	3	8%
Preputial Graft followed TIP Urethroplasty	2	-	-	-	1	1	50%
BMG Urethroplasty followed TIP Urethroplasty		-	-	2	-	2	28%
Johansen I Procedure followed TIP Urethroplasty							

For the management of complications in patients who underwent 1 stage hypospadias surgery was fistula repair in 9 patients with urethrocutan fistula and the Nesbit procedure in 1 patient with residual chordee.

Whereas in patients who underwent 2 stage hypospadias surgery were fistula repair in 3 patients with urethrocutan fistulae, abscess drainage incision in 2 patients with scrotal abscess and BMG urethroplasty in 1 patient with graft shrinkage complication. (Table 3)

From the analysis of the relationship between age at surgery and the occurrence of complications, it was found that there was a significant relationship with a P value = 0.004 and the odds ratio was 13.3x higher with age. The location of external urethral meatus had a significant relationship with the occurrence of complications (P = 0.033) and the odds ratio was 4.5x higher at the external urethral meatus location which was located at the proximal point. The degree of chordee did not have a significant relationship with the occurrence of postoperative complications (P = 0.352 and P = 0.589). Complications also did not have a significant relationship with the presence or absence of previous surgery history which was feared to be one of the complications with P value = 0.102. (Table 4)

Meanwhile, the urine diversion selected after hypospadias surgery had a significant association with the occurrence of complications (P = 0.049) and the odd ratio was 6x higher with the use of urethral catheter. For the presence of UTI, there was a significant relationship with the incidence of complications (P = 0.000) and an odd ratio of 21x in patients who had a UTI. Meanwhile, the stage of the operation performed and the techniques used both at stage 1 and stage were not significantly associated with postoperative complications (Table 4).

Table 3. Management of complication

Complication	Total	Management
1 Stage		
Urethrocutan fistule	9	Fistula repair
Chordee	1	Nesbit Procedure
2 Stage		
Urethrocutan fistule	3	Fistula repair
Scrotal abscess	2	Abscess drainage
Graft Shrinkage	1	BMG Urethroplasty

Discussion

Age at surgery was mostly in adolescents 11-18 years with a total of 28 patients, then followed by a pre-school age of ≤ 5 years as many as 24 patients and children aged 6-10 years with 21 patients. From the data obtained, it turned out that there were 5 patients who underwent surgery at the age of 20 years. It was also reported from the Viseshsindh study in 2014, the most age at hypospadias surgery was > 2 years with 35 patients, 2-4 years with 28 patients, > 4 years with 15 patients and < 1 year with 2 patients [5]. Meanwhile, according to a report from Sarhan in 2010, the most age at hypospadias surgery was 2 years with 415 patients being inversely proportional to age < 2 years which only 85 patients [6]. Based on the 2020 EAU guideline on hypospadias, the appropriate age for surgery is 6-24 months [7]. Meanwhile, in this study there were still many patients who underwent surgery at 2 years of age.

Table 4. Results analysis of variable affecting surgery results

Factors	P-Value	Odd Ratio
Age	0,004	13,296
Site of hypospadias	0,033	4,532
Chordee	0,589	-
History of surgery	0,102	-
Urinary diversion	0,049	6,039
UTI	0,000	21,764
Stage of surgery	0,252	-
Single Stage technique	0,201	-
Two Stage technique	0,212	-

The location of the external urethral meatus in patients was mostly found at the proximal to the penis as many as 40 patients. Based on research from Chung in 2012, it was found that the most external urethral meatus locations were in the distal

penis, namely 184 different patients with this study [8]. Just like Chung et al.'s study, Sarhan et al also found that the most MUE locations were in the distal penis, namely 371 patients [6]. In contrast to the study of Chung et al and Sarhan et al., in the study of Viseshsindh 47 hypospadias patients with MUE locations were proximal, 18 patients were located in the middle and 15 patients were located distally [5]. In this study, 44 patients were accompanied by mild chordee, 25 patients with severe chordee and 9 patients without the presence of chordee. Sarhan et al. reported that there were 98 patients with hypospadias accompanied by chordee and 402 patients without chordee [6]. Based on a study by Germiyanoglu et al., there were 25 patients with hypospadias who were accompanied by chordee and 94 patients without chordee [9].

Ten patients had previously undergone hypospadias surgery. Reported from the study of Sarhan et al, 439 patients had never undergone hypospadias surgery and 61 had previously undergone surgery [6]. From this study, 16 patients suffered from significant urinary tract infections from urine culture but did not have any symptoms. From a study conducted by Feng et al, it was found that there were 13 signs of infection in hypospadias patients [10].

Urinary diversions are widely used in the repair of the hypospadias. Diversions are used to drain the newly formed urethra, decrease tissue reactions, and increase the success rate. From the data in this study, the selection of urinary diversion after hypospadias surgery found that 60 patients had urethral catheter insertion, 17 patients had cystostomy and only 1 patient had urethral catheter insertion and cystostomy. Based on a study by Germiyanoglu et al, 41 patients were only inserted a urethral catheter after hypospadias surgery and 35 patients had urethral catheter insertion and cystostomy using cystofix [9].

Hypospadias surgery can be performed as an either single or multi stage procedure with much debate regarding operation for repair. Generally, the factors affecting the choice of surgical technique are meatal location, the presence or absence of chordee and distal urethral hypoplasia, glans configuration, and the surgeon's experience. In this series, single stage repair was performed whenever plate preservation was possible using TIP urethroplasty or onlay island flap urethroplasty, while two stage repair was preferred when plate transection was necessary. In this study, the number of patients who underwent single stage and multi stage surgery was not much different in this study. The technique most often used in 1 stage surgery is TIP urethroplasty and in 2 stage surgery is Dorsal

onlay preputial graft followed by TIP Urethroplasty. In the research conducted by Moursy from June 2004 to January 2008, 155 patients underwent single stage hypospadias surgery and 41 patients underwent two stage hypospadias surgery. The first stage hypospadias technique used was TIP Urethroplasty in 96 patients and Onlay Island Flap in 57 patients but for the technique used in 41 patients who underwent second stage hypospadias surgery it was not further explained what technique was used [11]. In a study by Khan et al. from January 2007 to December 2011, 102 patients underwent single stage hypospadias surgery and 326 patients used two stage hypospadias surgery. The technique used in stage single hypospadias was TIP urethroplasty in 89 patients, Mathieu's repair in 2 patients and MAGPI in 11 patients. For the two stage hypospadias technique entirely using the Bracka technique in 326 patients [12].

The most common complication is a urethrocutan fistula. The incidence of urethrocuteaneous fistula after hypospadias repair ranges from 6.20 to 38.8%, mostly during 10–20% [13]. In this study, urethrocutan fistules occurred in 9 patients with single stage surgery and 3 patients with two stage surgery. In a study conducted by Moursy, the TIP urethroplasty technique resulted in complications in 13 patients out of a total of 96 patients. The complications that occurred were urethrocutan fistule in 8 patients, attachment of penile gland in 2 patients and meatal stenosis in 3 patients.

Whereas in the onlay island flap technique, complications were obtained as many as 8 patients from a total of 57 patients. The complications that occurred were urethrocutan fistules in 4 patients, broken sutures in 2 patients, attachment of the penile gland in 1 patient and meatal stenosis in 1 patient [11]. Based on research conducted by Chung et al, which was conducted to assess the risk factors for urethrocutan fistules after hypospadias surgery, there were a total of 26 patients using the TIP urethroplasty technique while using the onlay island flap technique, 16 patients were found [8].

From the analysis of the relationship of age during surgery with complications found a significant relationship with $P = 0.004$ and odds ratios with higher 13,3x with age. In a study conducted by Sarhan et al, there was no significant relationship between age at surgery and the outcome of surgery ($P = 0.058$) [6]. From the data in Viseshsindh's study, there was no significant relationship between age at surgery and the occurrence of complications with a P value of $= 0.903.5$ Based on EAU guidelines, the optimal age for surgery is 6-24 months. At that age, external

genital development has also been optimal and makes it easier to perform hypospadias surgery. In terms of ease of management post surgery is also more controlled at that age. At the advanced age (3-6 years), there are differences in the aesthetic appearance of the penis, causing the patient to be less satisfied after surgery. In adolescence, there are problems with wound healing and the ability to get an erection due to secondary sexual development which can affect the outcome of surgery and lead to complications [7].

Meanwhile, the urine diversion selected after hypospadias surgery had a significant association with the occurrence of complications ($P = 0.049$) and the odd ratio was 6x higher with urethral catheter use. In a study conducted by Gemiryanoglu et al, there was no significant relationship between the choice of urinary diversion type after hypospadias surgery [9]. From the study of Radwan et al, the use of suprapubic or cystostomy catheters as well as the use of urethral catheters simultaneously can increase the success rate of hypospadias surgery and reduce the rate of postoperative complications [14].

Urinary diversions are used to drain the newly formed urethra, decrease tissue reactions, and increase the success rate [13]. For better selection of urine diversion, it is necessary to conduct more in-depth studies on which types can increase the risk of developing UTI during the wound healing process. The location of external urethral meatus had a significant relationship with the occurrence of complications ($P = 0.033$) and the odds ratio was 4.5x higher at the external urethral meatus location which was located at the proximal point. In a study conducted by Sarhan et al., the location of MUE was also associated with complications. The more proximal the hypospadias type will increase the incidence of complications [6]. Based on data from Viseshsindh's study, it was found that the likelihood of complications after hypospadias surgery would increase at the external urethral meatus location which is located proximal to the penis [5]. In general, the risk of developing complications increases with the severity of the hypospadias. The presence of a narrow and shallow urethral plate has also been associated with an increased risk of complications, although this finding has not been confirmed in subsequent studies [6]. Moreover, the assessment of urethral plate characteristics seems to be somewhat subjective, with wide interobserver variability [15]. It is worth noting that some anatomical characteristics such as the presence of a short penis, which is relatively common in patients with proximal hypospadias can cause dissatisfaction in the absence of complications. It

can be very difficult to assess the effect of these characteristics on the success of repair [16].

Conclusion

The success of hypospadias surgery was influenced by age at surgery, location of MUE, presence of UTI and also the choice of postoperative urinary diversion type. It is necessary to do further research to assess other factors that also affect the success rate of hypospadias surgery with a larger sample and can also lead to postoperative complications. In addition, it is also necessary to conduct research regarding the quality of life after hypospadias surgery.

Acknowledgment

We thank the Department of Urology, Faculty of Medicine Universitas Brawijaya, Saiful Anwar General Hospital and all the stakeholders who made this publication possible.

Conflict of Interest

The authors declare that they have no conflict of interests.

References

- [1] Agrawal K, Misra A. Unfavourable results in hypospadias. *Indian Journal of Plastic Surgery : Official Publication of the Association of Plastic Surgeons of India*. 2013;46(2):419-427. doi:10.4103/0970-0358.118623.
- [2] Chung, J.-W., Choi, S. H., Kim, B. S., & Chung, S. K. Risk Factors for the Development of Urethrocutaneous Fistula after Hypospadias Repair: A Retrospective Study. 2012. *Korean Journal of Urology*, 53(10),711. doi:10.4111/kju.2012.53.10.711.
- [3] Cimador, M., Vallasciani, S., Manzoni, G., Rigamonti, W., De Grazia, E., & Castagnetti, M. 2013. Failed hypospadias in pediatric patients. *Nature Reviews Urology*, 10(11), 657–666. doi:10.1038/nrurol.2013.164
- [4] Dokter EMJ, Van Der Zanden LFM, De Gier RPE, Kortmann BBM, Ulrich DJO, Roeleveld N, Feitz WFJ, Van Rooij IALM. Prognostic factors for complications following primary hypospadias repair. *Eur Urol Suppl* 2016; 15(3); e590. DOI:

- [http://dx.doi.org/10.1016/S1569-9056\(16\)60592-4](http://dx.doi.org/10.1016/S1569-9056(16)60592-4).
- [5] Feng, J., Yang, Z., Tang, Y., Chen, W., Zhao, M., Ma, N., ... Li, Y. (2017) Risk Factors for Urethrocuteaneous Fistula Repair After Hypospadias Surgery. *Annals of Plastic Surgery*, 79(6), e41–e44. doi:10.1097/sap.0000000000001128
 - [6] Germiyanoglu, C., Nuhoglu, B., Ayyildiz, A., & Akgul, K. T. Investigation of factors affecting result of distal hypospadias repair: Comparison of two techniques. 2006. *Urology*, 68(1), 182–185. doi:10.1016/j.urology.2006.01.090
 - [7] Khan, M., Majeed, A., Hayat, W., Ullah, H., Naz, S., Shah, S. A., Tahir, M. Hypospadias Repair: A Single Centre Experience. *Plastic Surgery International*, 2014, 1–7. doi:10.1155/2014/453039
 - [8] Moursy, E. E. Outcome of proximal hypospadias repair using three different techniques. 2010. *Journal of Pediatric Urology*, 6(1), 45–53. doi:10.1016/j.jpuro.2009.04.013
 - [9] Radmayr C, Bogaert G, Dogan HS, Nijman JM, Silay MS, Stein R, Tekgul S. European Association of Urology Guideline. 2020. Available from: https://uroweb.org/guideline/paediatric-urology/#note_20824
 - [10] Radwan, M., Soliman, M. G., Tawfik, A., Abo-Elenen, M., & El-Benday, M. Does the type of urinary diversion affect the result of distal hypospadias repair? A prospective randomized trial. 2012. *Therapeutic Advances in Urology*, 4(4), 161–165. doi:10.1177/1756287212448111
 - [11] Rios LTM, Junior EA, Nardoza LMM, Rolo LC, Hatanaka AR, et al. 2012. Prenatal diagnosis of penoscrotal hypospadias in third trimester by two- and three-dimensional ultrasonography: a case report. *Case Report in Urology* 2012; volume 2012.
 - [12] Sarhan, O. M., El-Hefnawy, A. S., Hafez, A. T., Elsherbiny, M. T., Dawaba, M. E., Ghali, A. M. Factors affecting outcome of tubularized incised plate (TIP) urethroplasty: Single-center experience with 500 cases. 2010. *Journal of Pediatric Urology*, 5(5), 378–382.
 - [13] Sheng, X., Xu, D., Wu, Y., Yu, Y., Chen, J., & Qi, J. 2018. The risk factors of Urethrocuteaneous fistula after hypospadias surgery in the youth population. *BMC Urology*, 18(1). doi:10.1186/s12894-018-0366-z
 - [14] Snodgrass W, Grimsby G, Bush NC. Coronal fistula repair under the glans without reoperative hypospadias glansplasty or urinary diversion. *J Pediatr Urol* 2015; 11(1): 39.e1–39.e4.
 - [15] Snodgrass, W., Macedo, A., Hoebeke, P. & Mouriquand, P. D. 2011. Hypospadias dilemmas: a round table. *J. Pediatr. Urol.* 7, 145–157.
 - [16] Viseshsindh W. Factors Affecting Results of Hypospadias Repair: Single Technique and Surgeon. 2014. *Journal of the Medical Association of Thailand = Chotmaihet thangphaet* 97(7):694-8.