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The learning curve in hypospadias urethroplasty: Single-surgeon experience



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ABSTRACT

Introduction: Hypospadias is one of the most frequent urological congenital anomalies. Due to the high difficulty of the procedures, a surgeon must face a steep learning curve at the start of the practice and experiencing the procedure to achieve maximum results. This study would like to evaluate the effect of experiences from a single surgeon doing hypospadias urethroplasty with the clinical outcome in Harapan Kita Mother and Children Hospital.

Method: Retrospective cohort study was done from the period of 2016 until 2018 in Harapan Kita Mother and Children Hospital by reviewing the medical records of all patients that underwent hypospadias surgical treatment by a single pediatric urologist. All forms of hypospadias, age, and procedures were included. The operative techniques were done by the operational standard within the literatures. All data were presented as tables and learning curve line graph. Statistical Analysis was done using SPSS v.23 (IBM Statistics, New York).

Results: Total of 125 patients have undertaken urethroplasty by the surgeon. Most of the cases were new cases (96%) and dominant with 2-6 years group (57.6%). Proximal hypospadias (75%) followed by distal hypospadias (25%). Complications of fistula urethrocutan and stenosis neourethra were found to occur in 23% of the patients. Among the two most frequently done techniques, Onlay preputial island flap showed 10% occurrence of fistula urethrocutan and 1% occurrence of stenosis neourethra, as opposed to TPIF Duckett showing 13% and 20% respectively. There were trends of decrease in occurrences of fistula urethrocutan and stenosis neourethra following more experience in operating the surgery. All occurrences achieved 0% of occurring complication at the recent experiences of hypospadias urethroplasty.

Conclusion: More experience in performing hypospadias urethroplasty seemed to affect clinical outcome, as occurrences of fistula urethrocutan and stenosis mid urethra be decreasing with more experience in a single pediatric urology surgeon.

Keywords: hypospadias, experience, urethroplasty, a pediatric urologist

Cite This Article: Abdurrahman, Hutahean, A.Y.A. 2020. The learning curve in hypospadias urethroplasty: Single-surgeon experience. *Bali Medical Journal* 9(1): 408-412. DOI: [10.15562/bmj.v9i1.1747](https://doi.org/10.15562/bmj.v9i1.1747)

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INTRODUCTION

Hypospadias is one of the most frequent urological congenital anomalies, in which the urethra is located on the ventral side of the penis, proximal to the normal position.¹ The sites of these abnormally placed meatuses may vary ranging from the distal gland of the penis to the perineum.¹ This condition is usually associated with the presence of chordae and dorsal hood of the preputium.^{1,2} The finding suggests that failure of closure from the urethral groove in the embryonic phase may have underlain the condition.³

The incidence of hypospadias occurs more than 1 case in every 250 boys, which is still gradually increasing every year.⁴ The incidence of the cases varies based on the meatal position, occurring mostly (50%) in the distal part, and followed by 30% in the middle part and 20% in the proximal part of the urethra.⁴

The primary purpose of hypospadias repair is to achieve functional urination and reproduction, as well as excellent cosmetic presentation. A variety of technique for hypospadias urethroplasty are available and routinely done by surgeons worldwide. The

progression in optical magnification, better sutures material, better control for the penile glands, artificial erection, and testosterone stimulation, have made urethroplasty not only simplified as a single staged procedure but also made it possible to do in younger patients with lesser hospitalisation time.⁵⁻⁷ With this development, the operators may achieve better results in functional and cosmetic area.⁵

To achieve maximum results, a surgeon must face a steep learning curve at the start of the practice and experience of the procedure.⁷ This is due to the high difficulty of the procedures comprising of complexities that require accuracy and care.⁸ This study would like to evaluate the effect of experiences in doing the urethroplasty procedure with the clinical outcome of the surgical management for hypospadias cases in Harapan Kita Mother and Children Hospital.

METHOD

This retrospective cohort study was done in Harapan Kita Mother and Children Hospital, reviewing the medical records of all patients that

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underwent surgical treatment for hypospadias by a single pediatric urologist. The local ethic committee approved the study, and informed consent was approved by all patients for medical record utilisation and follow up. We reviewed the medical record of patients from the period of 2016 until 2018, and data such as age at the time of surgery, surgical date, the position of the meatus, techniques are done for the procedure, and occurrences of complications such as Fistula urethrocutan and stenosis neourethra were collected. All forms of hypospadias were included for all cases of proximal, midshaft, and distal hypospadias. Patients from all age group were included. This study excluded all cases without sufficient information from the follow-ups.

The operative techniques were done by the operational standard within the literature, consisting of Onlay preputial island flap, Buccal Mucosal Graft (BMG), Duckett, Tubularized Incised Plate (TIP), Meatal Advancement and Glanduloplasty (MAGPI), Thiersch-Duplay, and others. Chordae were all corrected completely, as all of the dorsal plication or excision of the urethral plate were only done in a severe degree of chordae. All patients were given Silastic 6F stent and were fixated to the penile glands, followed by penile coverage using gauze with compression. All cases were followed-up on both inpatient and outpatient basis, covering one-week inpatient care, followed by outpatient visits of two weeks and one month after the surgery. Uroflowmetry was done in one month following surgery, and stenosis neourethra was defined as

a flow rate of less than 5 mL/sec with abnormal uroflowmetry curve. Fistula urethrocutan was defined as any occurrences of leakage within the neo-urethra. Success was defined as a correctly placed meatus using anatomical standard, normal urinary stream, and appealing cosmetic presentation of the surgery.

All data were presented as tables and learning curve line graph. Statistical Analysis was done using SPSS v.23 (IBM Statistics, New York). The learning curve was made using a univariate linear model comparing the number of surgeons' experiences in doing urethroplasty with the number of complications occurrences in percentage (Fistula urethrocutan and stenosis neourethra).

RESULTS

Some 125 patients have undertaken urethroplasty by the surgeon (Table 1). Most of the cases were new cases (96%) and mostly on patients aged two and above (2-6 years group 57.6% and above six years group 40%). Cases were found to be distributed in the year 2016-2018. Most of the cases were proximal hypospadias (75%), followed by distal hypospadias (25%).

Among the hypospadias patients, the most prevalent case was hypospadias in the penoscrotal (30.4%), followed by scrotal (29.6%). Among the cases, the most frequently done technique by the surgeons was Onlay preputial island flap (52.8%) followed by Transverse preputial island flap (TPIF) Duckett (20%). From the database history, TPIF Duckett technique was more frequently done in the first 50 cases of urethroplasty done by the surgeon, and then the technique trend shifted to Onlay preputial island flap in the following surgical experiences. Among the cases, there are six secondary cases (redo-urethroplasty) that were consist of Onlay preputial island flap (3 cases; 50%) and TIP (3 cases; 50%). (Table 2)

Complications were found to occur in 23% of the patients, consisting of Fistula urethrocutan and stenosis neourethra (Table 3). Among the rarely done techniques, almost all are not presenting any complications (BMG, Thiersch-Dupley, Mathie). Among the two most frequently done techniques, Onlay preputial island flap showed 10% occurrence of Fistula urethrocutan and 1% occurrence of stenosis neourethra, and in comparison, TPIF Duckett showed 13% of Fistula urethrocutan occurrences and 20% of stenosis neourethra occurrences. MAGPI has the highest Fistula urethrocutan occurrences (50%); however, the technique was only done in two patients. Among the complications that occurred, most of the cases were in patients aged

Table 1 Patients Characteristics

	Number of Patients	
	N	%
Surgeons' Experience	125	100
Type of cases		
New cases	119	96
Secondary cases	6	4
Patients age		
< 2 years	3	2.4
2-6 years	72	57.6
> 6 years	50	40
Number of cases per year		
2016	40	32
2017	39	31
2018	46	37
Sites of Hypospadias		
Distal	31	25
Proximal	94	75

Table 2 Meatal type of Hypospadias and Urethroplasty Technique

Sites of hypospadias	Onlay preputial island flap (n=69)	BMG (n=1)	ASOPA (n=1)	TPIF Duckett (n=25)	TIP (n=24)	MAGPI (n=2)	Thiersch-Duplay (n=1)	Mathieu (n=2)	Total (n=125)
Coronal	0	0	0	0	8	2	0	0	10
Sub-coronal	0	0	0	0	3	0	0	2	5
Distal Shaft	0	0	0	0	3	0	0	0	3
Mid Shaft	5	0	1	1	4	0	0	0	11
Penoscrotal	33	0	0	2	2	0	1	0	38
Scrotal	26	0	0	9	1	0	0	0	36
Perineal	2	0	0	13	0	0	0	0	15
Failed Urethroplasty	3	1	0	0	3	0	0	0	7
Total	69	1	1	25	24	2	1	2	125

Table 3 Complications Based-on Operation technique

Complication	Onlay preputial island flap (n=69)	BMG (n=1)	ASOPA (n=1)	TPIF Duckett (n=25)	TIP (n=24)	MAGPI (n=2)	Thiersch-Duplay (n=1)	Mathieu (n=2)	Total (n=125)
Fistula urethrocutan	9 (13%)	0	0	4 (16%)	5 (20%)	1 (50%)	0	0	19 (15%)
Stenosis neourethra	2 (3%)	0	0	6 (24%)	2 (8%)	0	0	0	10 (8%)
Total	11 (15%)	0	0	10 (40%)	7 (29%)	1 (50%)	0	0	29 (23%)

Table 4 Complication Based-on age

Complication	Aged under 2 years (n=3)	Aged 2-6 years (n=72)	Aged above 6 years (n=50)
Fistula urethrocutan	0	12 (17%)	7 (14%)
Stenosis neourethra	0	3 (4%)	7 (14%)
Total	0	17 (21%)	14 (28%)

two years and older, precisely 21% in age 2-6 years old group and 28% in above six years old group (Table 4). Fistula urethrocutan occurred comparable in the two groups (17% and 14%, respectively). Cases of hypospadias in patients aged under two years old did not show any complication. However, only two cases in children aged under two years old were documented and reported in the analysis.

The learning curves for urethroplasty of the surgeon are presented in Figure 1 and 2. Figure 1 describes the surgeons' learning curve in Fistula urethrocutan occurrences. There was a trend of decrease in occurrences of Fistula urethrocutan following more experience in operating the surgery. The occurrence rate in started as 20% at the first 25 experiences of hypospadias urethroplasty, which had an increased to 28% in the first 50 cases. The occurrence of Fistula urethrocutan steadily decrease, thus reached 0% in the ultimate experience in the 125 cases. Figure 2 describes the surgeons' learning curve in stenosis neourethra occurrences. As opposed to the Fistula urethrocutan curve, the occurrences rate of stenosis neourethra were at its highest at the first 25 cases of hypospadias urethroplasty surgery at 17%. The occurrences of Fistula

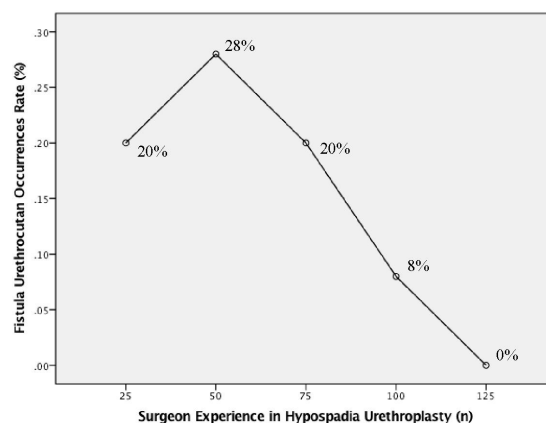


Figure 1 Surgeons' Learning Curve for Fistula urethrocutan

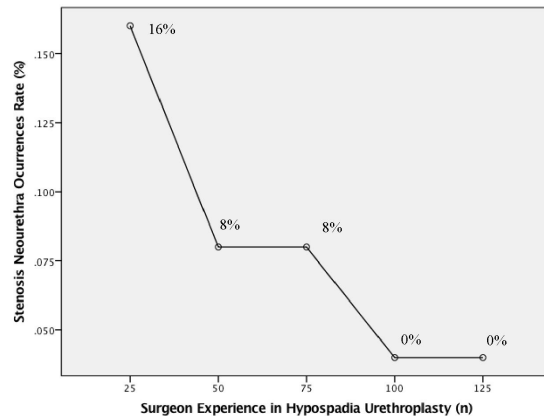


Figure 2 Surgeons' Learning Curve for Stenosis neourethra

urethrocutan then steadily decline and reached 0% in the last 125 cases of the patients.

DISCUSSION

The concept of procedural training in Urology consists of not only theoretical mastery but also the skills in doing the specific procedure.⁸ In order to develop skills, exposure towards the specific procedure plays an important factor. Hence experience and learning curve is necessary and will have significant effects on patients outcome.^{4,5,8} Management of hypospadias is one area which has been massively developing, consisting of a vast variety of opinion and approaches, making its field.⁴ More approaches of urethroplasty have been developed and perfected along the years, which are very complex and challenging, demanding operator skills, temperament, acquaintance with magnification, knowledge, surgical mastery and proper pre and intraoperative judgment in choosing the timing and the best technique.⁴

Our study suggests that experience has an impact on reducing the complication rate in urethroplasty. Two complications were being focused upon in this study, namely Fistula urethrocutan and stenosis neourethra. Occurrences of Fistula urethrocutan were shown to have decreased over time following more experience of urethroplasty done by the surgeon. Occurrences rate of Fistula were progressively decreasing with more procedures done by the surgeon. However, 50-75 cases of urethroplasty, an increased number of Fistula urethrocutan occurrences were noted. A possible explanation for this sudden incline would be the shift of surgical techniques done by the surgeon, from using TPIF Duckett more frequently in the past and Onlay preputial island flap in more recent times. Despite the incline, with more number of urethroplasty done, the rate of Fistula urethrocutan occurrences

decline overtime steadily and reached 4% in the last 125 cases. A similar decline was found in occurrences of stenosis neourethra. The stenosis neourethra rate stabilised at the 50-125 cases of urethroplasty and dropped to 0% at the 125 cases of urethroplasty. Learning and adaptations towards all necessary factors influencing the outcome of for the patients happen in these first 25 cases, resulting in the incline. However, with more exposure and experience surgeons would develop the art of hypospadias urethroplasty, and in turn resulting in fewer complications, just as presented by this study. This study is following the results of past studies on learning curves of urethroplasty, which showed steep decline at the first cases of urethroplasty that decreases overtime.^{1,2,5-7,10}

Onlay preputial island flap technique was the urethroplasty most frequently done technique by the surgeon, especially in the later time of the surgeons' practice. The Onlay preputial island flap technique was done mostly at the proximal part, namely penoscrotal and scrotal. The technique itself is associated with less complication, only 1% of stenosis neourethra and 10% of fistula urethrocutan overall, compared with the TPIF Duckett done by the surgeon, 20% of stenosis neourethra and 17% of Fistula urethrocutan overall. Regarding the outcome of a technique, it has been suggested that it is very operator dependent, which means a better outcome would be possible with techniques that the surgeon is more experienced and comfortable.^{4,7,10} This is following our study, as Onlay preputial island flap is the most common technique that the surgeon has done for hypospadias in comparison with other techniques.

Our study did not find any association between age of the patients being operated for urethroplasty and occurrences of complications, in accordance to a finding by Bush et al.¹¹ However, only a minimal number of patients under age of 2 years old were recorded, making future study with more samples on the specific age group relevant. Our study also was limited by the incomplete medical record and follow up data of the recruited patients due to the retrospective study design. A lot of the patients did not undergo follow up uroflowmetry making a significant number of excluded patients for this study.

CONCLUSION

With more experience in performing hypospadias urethroplasty, a single clinical outcome was shown to be positively affected, as occurrences of fistula urethrocutan and stenosis mid urethra have been reported to be decreasing with more experience.

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