



Uroflowmetry Parameter Evaluation of Post Urethroplasty Hypospadias Patients in Padang

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Authors' contributions

This work was carried out in collaboration among all authors. Author AR collected all data, managed the literature search, wrote the draft and performed the research. Author YZ performed the surgery, designed the study and supervised the work. Author EM performed the surgery and supervised the work. Author Erkadius designed statistical test and supervised the work. Authors Arry Rodjani and IW supervised the work. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JAMPS/2016/22574

Editor(s):

(1) Erich Cosmi, Department of Woman and Child Health, University of Padua, Italy.

Reviewers:

(1) Mohamed Galal Elsheikh, Cairo University, Egypt.

(2) Einar Arnbjörnsson, Lund University, Sweden.

Complete Peer review History: <http://sciencedomain.org/review-history/12532>

Original Research Article

**Received 12th October 2015
Accepted 16th November 2015
Published 2nd December 2015**

ABSTRACT

Introduction: Hypospadias is the result of an abnormal growth of penis in which the failure of the growth of urethral fold that resulted in the urethral meatus at ventral penis is located proximal from its normal position in glanular with or without chorde. The incidence of hypospadias is one per 250-300 birth of males. The management of this abnormality is urethroplasty, but this technique may cause short or long term complication. At the long term it is important to determine functional outcome of hypospadias urethroplasty since it has an impact in patient's life in the future. One of the modality that can be used to evaluate the functional outcome of the surgical correction is uroflowmetry.

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Methods: This observational analytic study with cross sectional design was performed in patients who underwent surgery for hypospadias correction with urethroplasty without fistula complication. The sampling technique that used was consecutive. The Q-max and Q-ave of those patients were measured using the uroflowmetry examination, and post-void residual urine was measured using ultrasound. The study was held in June-July 2015. Data presented descriptively, then analyzed using the T-test, and considered statistically significant $p < 0,05$.

Results: From 10 hypospadias patients that underwent urethroplasty and from 10 healthy controls comparable in general regarding gender, age, body weight and height, there were no significant difference in Q-max ($p = 0,316$), Q-ave ($p = 0,288$), and Post Void Residual Urine Volume ($p = 0,686$).

Conclusion: Post-urethroplasty hypospadias patients have no significant difference in uroflowmetry parameters with the control group.

Keywords: Hypospadias; urethroplasty; uroflowmetry.

1. INTRODUCTION

Hypospadias is the result of abnormal growth of penis in which the failure of the growth of urethral fold that give rise to the urethral meatus is located at the ventral penis proximal to its normal position in glanular with or without chorde [1-8].

The incidence of hypospadias is one per 250-300 birth of males [7,9]. Hypospadias incidence has increased twice in the last decade in the United States [9]. Increasing of incidence rate was also reported in Europe, such as Denmark, Norway and Sweden [9]. In Indonesia, incidence rate obtained from several general hospitals in Pekanbaru, Manado and Balikpapan is also showing the increase of hypospadias [10-12]. In Urology Division of M Djamil Hospital, the number of urethroplasty procedures increased each year with 15 cases in 2009-2011 to 65 cases in 2011-2014 [9,13].

The pathogenesis of hypospadias is uncertain, but there are several risk factors associated with the onset of hypospadias such as genetic, environmental and endocrine factors. Babies of young and older mothers and the low birth weight babies are at risk for the occurrence of hypospadias. A significant increase of the incidence of hypospadias in last 20 years shows the role of environmental factors such as hormonal and pesticides. Assisted labour, such as hormonal manipulations performed during and after the procedures is also associated with increasing risk of hypospadias [9].

Hypospadias is classified according to initial position of the meatus. Latest classification in 2003 divided it into glanular type, distal type and proximal type [14], in association with urethroplasty techniques. These techniques have developed rapidly with more than 200 types.

They are summarized into: meatal-based techniques, tubularisation of urethral plate, substitution of urethral plate with a skin flap, and substitution of urethral plate with grafts [7,9].

The complications of urethroplasty are bleeding and hematoma, meatal stenosis, urethrocutaneous fistula, infection, urethral diverticulum, xerotica balanitis obliterans, penile curvature recurrence, stricture, growing hair in the urethra and urethroplasty failure. Because of the complications, it is necessary to perform follow up after urethroplasty [1].

Hendren and Horton found that long-term follow-up is needed to assess the long-term outcome of the results of surgical corrections of hypospadias since urethroplasty may have negative effects on a person's life if good operating results were not achieved [15]. There are three important things in long-term follow-up of patients with hypospadias, namely cosmetic appearance of the penis, functional outcome (micturition, sexuality) and the quality of life and pshycosexual aspects [1,16].

Assessments of functional outcome were obtained from patient's complaints about stream of micturition and the results of uroflowmetry test after urethroplasty. Assessment includes micturition flow curve shape, maximum flow, micturition volume and post-void residual volume, and age-related flow rate nomograms [16].

Uroflowmetry examination in adult patients was first reported in 1970. The weak flow rate has contributed by stenosis, intravesical low pressure, rigidity and lack of elasticity of neourethra, pseudo-obstruction, and lack of corpus spongiosum [16].

Ahmed Anwar and friends in 2003 performed uroflowmetry to patients with urethroplasty surgery one stage with foreskin flap parametral techniques, and the results of urethral functioning were satisfying [17]. Waleed Eassa and friends in 2012 examined the spout of micturition in children after surgery without urethroplasty complications with tubularized plate technique incision. It showed asymptomatic urodynamic abnormalities [18].

Research conducted by Marlon and friends in 2012 about long-term urethral function in post-urethroplasty patients using uroflowmetry found that urinary flow rates was lower than the age matched control group, but still in normal values [19].

A journal review about urinary flow in patients after urethroplasty was conducted by Ricardo Gonzales and friends in 2011. They compared the outcomes of uroflowmetry in patients after urethroplasty with difference techniques. They reported that tubularized plate incision technique showed incidence rate of 24.6%, which met the criteria of obstruction. *In situ tubularization* technique without incision of the plate showed that the incidence rate of 20% also met the criteria of obstruction. Mathieu technique showed the incidence rate of 17.6%, which met the criteria of obstruction. MAGPI technique and Becks techniques had incidence rate of only 5% and 2%, respectively [20].

Because of the importance of long-term evaluation of post urethroplasty neourethra function and there has been no research on the subject in Dr. M. Djamil General Hospital and other hospitals in Padang, researchers were interested in evaluating uroflowmetry parameters in post urethroplasty hypospadias patients at Dr. M. Djamil General Hospital and other hospitals in Padang.

2. MATERIALS AND METHODS

This observational analytic study with cross sectional design was conducted in June to August 2015 at the Surgery Department of DR. M. Djamil General Hospital, Ropanasuri Hospital and other hospitals in Padang, which includes patients home visit.

The subjects were 10 patients diagnosed with hypospadias and underwent urethroplasty surgery protocol without any fistula complication, recorded in the medical record between January 2009 to December 2014, chosen using consecutive sampling technique. The Q-max (maximum speed of urine flow) and Q-ave (average speed of urine flow) of those patients were measured using the uroflowmeter (Dantec Urodyn® 1000 flow transducer uroflowmeter USA). Post-void residual volumes (ml) were measured using ultrasound with 5 MHz frequency. Estimation of post-void residual volume obtained by equation of height of the bladder x width of the bladder x depth of the bladder x 0,52. Patients were asked to urinate in standing position. Before urinating, patients were asked to drink fluid according to EBC (Expected Bladder Capacity) (age x 30 + 30) ml. Ultrasonod examination was performed five minutes after urinating. According to ICCS (International Children’s Continent Society), minimal voided volume was 50 ml for the interpretation. Data were analyzed using T-test, and considered statistically significant if p < 0,05.

All types of hypospadias patients underwent urethroplasty more than six month before the study was performed, and aged between 6 – 15 years old at the time of study. Control group consisted of generally healthy subjects with gender, age, body weight and height equivalent to the research subjects. Patients with complication of urethrocuteaneous fistula when the study was performed and those who refused to be involved were excluded.

3. RESULTS

Ten hypospadias patients that underwent urethroplasty were eligible and included in this study, with ten control subjects.

There was no significant difference between hypospadias and control subjects in term of age, height and weight (Table 1). There was also no significant difference was found between the groups in Q-max, Q-ave, and post-void residual urine volume (Table 2).

Table 1. Characteristics of subjects

	Hypospadias		Control		T-test	
	Mean	SD	Mean	SD	t	P
Age (year)	12,50	1,90	12,70	1,95	-0,232	0,819
Height (cm)	150,40	16,66	147,90	14,24	0,361	0,723
Weight (kg)	44,20	14,86	44,20	16,69	0,000	1,000

Table 2. Uroflowmetry parameters

	Hypospadias		Control		T-test	
	Mean	SD	Mean	SD	t	P
Q max (ml/sec)	21,07	8,49	24,80	7,67	-1,031	0,316
Q ave (ml/sec)	12,23	5,47	14,67	4,45	-1,094	0,288
Postvoid (ml)	6,88	13,31	4,46	12,93	0,411	0,686

4. DISCUSSION

Urethroplasty in hypospadias patients not only need immediate post surgical control, but also long-term follow up to evaluate the functional outcome of the urethra, [16] because the procedure that cannot achieve good outcome will bring negative effects in the patient's life in the future [15].

Uroflowmetry as one of the modality to measure functional outcome of the urethra can be widely used because it is easy to do, cheap and uninvative [21]. In children who underwent urethroplasty before toilet training, uroflowmetry test is necessary [20].

From ten patients of hypospadias that underwent urethroplasty, and ten healthy control with comparable gender, age, body weight and height, it was found that there were no significant difference in age, body height and body weight. It indicates that the data used were homogenous. There was also no significant difference between hypospadias patients and the control group in Q-max, in Q-ave and in post-void residual urine volume.

From the study conducted by Yoon et al. in 1998 [22], 34 hypospadias patients that underwent urethroplasty were compared to age dependent nomograms that indicate normal range of peak flows according to the voided volumes. They found there were no significant difference in peak flow.

The study conducted by Ahmed Anwar et al. in 2003 [17] found that uroflowmetry parameter values in hypospadias patients underwent urethroplasty with skin flap technique was normal.

Marlon et al. in 2012 [19] compared the parametric uroflowmetry value between hypospadias patients underwent urethroplasty and the age matched control group He found that there was significant difference value, but still in the normal range. It indicates that the

uroflowmetry parametric value of those patients is still in normal range.

Theoretically, decrease of flow rate in hypospadias patients with post urethroplasty was due to the caliber decreasing of the rigid neourethra which caused by reduced elasticity of urethral wall. However, Olsen et al. found that there was no relationship between abnormal flow and the caliber of the neourethra [20].

The theory also linked neourethra length with the reducing of flow rate in hypospadias with post urethroplasty patients. It was contradicted with the result from the study conducted by Idzenga, who made a neourethra model of the polyvinyl alcohol cyrogel. The study obtained that there was no effect of the length of neourethra against the flow rate, but the elasticity of the neourethral wall showed a significant effect [23]. From this study it can be said that the neourethra which formed in hypospadias patients with post-urethroplasty had a good enough functional outcome.

5. CONCLUSION

In conclusion, there was no significant difference in Q-max, Q-ave and post-void residual urine volume between hypospadias patients underwent urethroplasty and the healthy control subjects. Uroflowmetry as long term follow up should be considered at least one year after the surgery to assess the functional outcome.

CONSENT

All authors declare that written informed consent was obtained from approved parties (parents or caregivers) for publication of these data.

ETHICAL APPROVAL

All authors hereby declare that the study was approved by the appropriate ethics committee and was performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
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