

UROFLOWMETRIC EVALUATION OF PATIENTS WITH HYPOSPADIAS

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ABSTRACT

In this study we aimed to detect and draw attention to corresponding lower urinary tract obstructions in hypospadias patients by using uroflowmetry measurements. After obtaining written consents, totally 63 patients whom were performed hypospadias surgery and post op monitoring between January 2012 and January 2013, enrolled in our study. Pre and post op comparison of some uroflowmetry parameters including; mean urinary flow rates, duration to reach utmost urinary flow, urinary flow duration, duration of urinary discharge, post voiding residual volume and features of flow curves were conducted according to the literatural datas. We offer uroflowmetry examination as an easy to use, cost effective and non invasive test for revealing any corresponding lower urinary tract obstructions in hypospadias surgery performed patients. It also enables early diagnosis of such obstructions in mid term and long term follow up.

Keywords: Uroflowmetry, Hypospadias

Cite this article as: Baltrak YA, Karaman I, Karaman A. Uroflowmetric evaluation of patients with hypospadias. Medical Research Reports 2018; 1(1):11-14

INTRODUCTION

Hypospadias, which is a word originating from Greek, is a congenital deformity of the male external genital organs and means an opening on the ventral side of the penis. Hypospadias is defined as the opening of meatus not at the usual location on the head of the penis but on the lower ventral side of the penis shaft. In hypospadias, there are several degrees of defect depending on the meatal opening in corpus spongiosum, corpus cavernosum or prepuce (foreskin). This term was first used by Galenius in the 2nd century AD. Until today, more than 300 different surgical techniques with several modifications were described [1].

Incidence And Etiology of Hypospadias

The calculated incidence of hypospadias is 1 in 250-300 live male births. In average 6000 infants were born with hypospadias every year in the USA. There is no known cause of hypospadias. However, epidemiological studies have clearly shown that genetic factors play a role in the development of the hypospadias. Familial disposition indicates certain polygenic factors [2,3]. Unlike previous classifications, Barcat classification is not only based on the localization of meatus at diagnosis but also the new localization of meatus after the curvature repair [5,8]. The classification, which is recommended by Barcat in 1973, is currently most commonly referred classification. Barcat recommended a classification

according to the localization of meatus and the actual length of the urethral defect to be repaired determined after the orthoplasty [4-8]. A classification as anterior (distal), posterior (proximal) hypospadias is useful. Regarding all classifications, distal (anterior) hypospadias, which involves glanular, coronal and subcoronal hypospadias constitutes the majority (50 % - 70 %) of all cases [4,6,7]. Hypospadias is usually diagnosed during the first physical examination of the newborn. Typically, the abnormal appearance of the foreskin is noticed at first sight and further examination shows that the penile raphe is not on the midline and the glans penis is bent toward the ventral side (chordee). The meatus may be pinhole size and is usually not obstructed. The ventral bend of the penile shaft may be noticed during the erection. The main problem of the patients with hypospadias is the inability to pee at the standing position and to direct the urine forward. Furthermore, the urethral meatus may be narrow. Besides these, sexual dysfunction and infertility depending on the chordee are an important problem in adulthood [9,10]. Urethral stenosis is the second most common late complication of the hypospadias surgery. The stenosis tends to develop after the closure of the glans and on the suture line of the proximal anastomosis. The complication often emerges two months after the hypospadias repair and manifests itself with the impairment of the flow force, difficulty in voiding or urinary

system infection. The patient may also apply with the complaints of the split stream, urethral fistula and urinary retention [11]. Procedures, which involve the modeling of the new urethra forming a tunnel toward the glans penis, have the risk of meatal stenosis. Ischemia or inflammation may cause the risk of stenosis in cases of the tunneled flap [12].

Uroflowmetry is a simple method, which is considered as an invasive, easy-to-use and objectively interpretable analysis technique among the urodynamic tests. Uroflowmetry enables to measure the flow rate of the urine within the defined unit of time during the micturation and to visualize it in 2D graphics. The urine flow is visualized with a graphic of flow rate and time axes (mL/sec). The urine flow is a combined result of detrusor pressure, pressure on the bladder by the abdominal muscles, the resistance of the urethra and sphincter and other facilitating and obstructive factors [13-15]. In addition, as it is a non-invasive and inexpensive method and has no known side effects, it gained widespread usage.

The measurement of the urinary flow, residual urine volume with the help of the ultrasonographic examination and catheter and the evaluation of the micturation graphics are common practice in the pediatrics. Regarding the urodynamic studies, uroflowmetry and measurement of the residual volume of the micturation are usually sufficient for the evaluation [16]. Currently, residual urine is diagnosed with ultrasonographic examination following the uroflowmetry measurement. The normal residual urine volume is less than the 10 % of the minimum bladder capacity in adults. Studies have shown that the bladder is completely voided after the micturation in healthy children including infants and toddlers. In a few minutes after the voiding, a volume of five milliliters is detected in the bladder.

A residual urine volume more than 20 mL is considered as an inadequate voiding. In such cases, the measurement should be repeated. A residual volume more than 20 mL in repeated measurements is diagnosed as an incomplete voiding or abnormal voiding.

The residual volume is calculated with the multiplication of the result of the multiplication of the horizontal (D1), vertical (D2) and oblique (D3) dimensions of the bladder with 0.7. Most of the ultrasound devices provide the result of this formula [17].

METHODS

The patients with hypospadias, who applied to the outpatient department of the pediatric surgery in the Dr. Sami Ulus Women's Health and Pediatrics Training and Research Hospital between January 2012 and January 2013, were included in our study group. The study was approved by the Ethics Committee.

The urine flow of the patients was measured twice during the examination in the outpatient department before the operation and at least two months after the operation with uroflowmetry.

In the outpatient urodynamic room of the pediatric surgery department, the patients with bladder control, were asked to wait until a sensation of urgency. After waiting until the sensation of urgency, uroflowmetry measurements were performed. In patients with complaints, a physical examination was primarily carried out. The patients with clinical complaints were examined for the urinary tract infections.

1- Patients without bladder control due to the age or with micturation disorder,

2- Patients with a voided volume less than 100 ml,
3- Patients, who had a fistula in the postoperative period,

4- Patients with urinary tract infection (detected in the urine analysis),

were excluded from the study, because they might affect the flow parameters measured with uroflowmetry. 63 patients (76.8 %), who were at the age of bladder control and had their patient's consent for the participation, underwent uroflowmetry analysis and the urine flow rates were measured and the results were evaluated with the Siroky nomogram available in the urodynamic unit regarding the obstruction.

The patients were asked to take fluid in order to have a sensation of urgency. Patients, who stated that they had full urgency, underwent uroflowmetric measurement with the uroflowmetry device in the pediatric surgery urodynamic room.

Following the uroflowmetric measurements, the residual urine volume was measured with ultrasonography in the clinic of pediatric surgery. The estimated bladder capacity was calculated according to the age of the patients. The results were evaluated with the Siroky nomograms uploaded in the uroflowmetry device regarding the obstruction.

RESULTS

63 of the 82 patients (76.8 %) with hypospadias, who were diagnosed and treated in our clinic between January 2012 and January 2013, underwent uroflowmetric measurement before and after the operation and the results of urine flow rates were evaluated. The urine volume was over 100 ml in all uroflowmetric measurements. According to the Barcat classification, 54 of the patients (85.6 %) were evaluated as the distal group, 9 (14.4 %) middle and proximal group. The mean age of the patients was $6,9 \pm 2,4$ years (3-14). 18 patients (28.6 %) had also chordee. 13 patients (20.6 %) had clinical complaints like narrow urine stream and difficulty passing urine. The uroflowmetry results (maximum flow rate, time to maximum flow rate, total flow time, mean flow rate and residual urine volume) were compared and statistical analysis was performed. The evaluation of the uroflow curves of the patients after the surgery revealed that 44 patients (69.8 %) had a bell-shaped curve and 19 patients (30.2 %) had a plateau pattern. In the postoperative group, in 16 patients (25.4 %) it was smaller than -2SD according to the Siroky nomogram and obstruction might be considered. The comparison of the uroflow curve of the patients with a bell-shaped curve and of the patients with a plateau curve displayed that there was a significant difference between these groups in respect of maximum flow rate, time to maximum flow rate, mean flow rate and voiding time. The comparison of the preoperative and postoperative uroflowmetry results of the patient with a preoperative plateau-shaped curve showed there was no statistical difference between the groups regarding the time to maximum flow rate, flow time, voiding time, voided volume and residual urine volume.

DISCUSSION

Uroflowmetry is an easy-to-use and non-invasive test method, which can be used for the early diagnosis of a urethral stenosis emerging after the hypospadias surgery and for the evaluation of the concomitant lower urinary system obstructions [18,19].

As uroflowmetry can be performed under the conditions of an outpatient department, children do not easily express their sense of urgency and the impatience of the parents in finishing the examination procedures might be the causes why we were not able to measure the full bladder volume during our study in our clinic. Studies found in the literature showed that the rate of measurement of the full bladder volume in children with uroflowmetry was rather low [20-22].

The aim of the uroflowmetry measurement is not the evaluation of the bladder capacity. For the reliability of the uroflowmetric measurements and regarding the mean flow rate and micturation pattern, reaching the half of the estimated bladder volume according to the age at the time of full urgency provides important information. There are studies, that have demonstrated the significance of the voided urine volume (more than minimum 100 ml) in respect of the determination of the maximum flow rate independent from the age.

In the same study, it was shown that the maximum flow rate was lower and uroflow pattern and curve and the voiding time were longer in the patients with hypospadias compared to the healthy population [23].

It is well known that in the urethral stenosis, the maximum flow rate decreases and the bell-shaped uroflow pattern, which is expected in healthy subjects, is not observed. Urinary flow rates enable the co-evaluation of the urethral and vesical functions. If the bladder functions are normal after the hypospadias surgery, the decrease in the urinary flow rate and uroflow curve pattern are

important in respect of urethral stenosis [24-31]. Regarding several papers in the literature, the decrease in the maximum flow rate and nomogram under 5 percentile and 2SD were the most common parameters used for the diagnosis of the urethral stenosis. In the studies with large subject sizes, it is stated that a maximum flow rate below 10 ml/sec and nomogram below 2SD and 5 percentile might be indicative for the urethral stenosis[24-31].

In our study, the postoperative urethral obstruction rate was 20.6 % (13 of the 63 patients). Considering the studies with different rates in the literature, the development rate of the urethral stenosis is mostly comparable. Regarding the literature, maximum flow rate below 10 ml/sec, low mean flow rate, plateau-shaped uroflow curve and uroflow curve smaller than 5 percentile and 2 SD according to the nomograms in the uroflowmetry measurements are important for the urethral obstruction evaluation and the planning of the early-stage urethral dilatation [24-31].

As mentioned above, uroflowmetry is a non-invasive, easy-to-use and objective test method, that provides all of these data [32,33].

Acknowledgement: None

Conflict of Interest: No conflict of interest was declared by the authors.

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

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