

The Effect of Urethral Catheter Size on Meatal Stenosis Formation in Children Undergoing Tubularized Incised Plate Urethroplasty

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Purpose: Meatal stenosis is still a common problem in tubularized incised plate urethroplasty. In this study, we aimed to seek for a relationship between the size of urethral catheter and meatal stenosis formation in children undergoing tubularized incised plate urethroplasty.

Materials and Methods: We retrospectively reviewed 83 children who underwent tubularized incised plate urethroplasty for hypospadias. The whole group was classified into the groups A and B based on the catheter size. One group (group A) consisted of 44 patients (mean age, 4.82 ± 3.83 years) with tubularized neourethra over a 6 Fr catheter, while the other group (group B) included 39 patients (mean age, 5.19 ± 3.83 years) with tubularized neourethra over a 8 Fr catheter.

Results: There were no significant differences between the groups according to their age, location of urethral meatus, dehiscence and urethrocutaneous fistula formation. Meatal stenosis formation in group B was markedly higher than that in group A. Number of meatal dilatation was higher in group B compared to group A.

Conclusion: We suggest that the tubularization of urethral plate over a small-sized (6 Fr) catheter, regardless of the age of the patients, prevents meatal stenosis by reducing foreign body reaction and pressure injury and by hindering secondary healing.

Keywords: hypospadias; child; urethra; treatment outcome; urologic surgical procedures; urethral stricture.

INTRODUCTION

Tubularized incised plate (TIP) urethroplasty has become the most commonly used method in patients with distal and mid-shaft hypospadias in recent years. Although there have been modified techniques described in order to reduce meatal stenosis, it is still a common problem in TIP urethroplasty.⁽¹⁻³⁾ However, the size of the urethral catheter may be a factor to prevent meatal stenosis. To the best of our knowledge, it is the first reported study that seeks for a relationship between the size of urethral catheter and meatal stenosis formation in children undergoing TIP urethroplasty.

MATERIAL AND METHODS

We retrospectively reviewed 83 children who underwent TIP urethroplasty for hypospadias performed by the first author between May 2008 and March 2011 at Gaziantep Children Hospital, Turkey. The whole group was classified into the groups A and B based on the catheter size. One group (group A) consisted of 44 patients (mean age, 4.82 ± 3.83 years, range 1-16 years) with tubularized neourethra over a 6 French (Fr) catheter, while the other group (group B) included 39 patients (mean age, 5.19 ± 3.83 years, range 1-13 years) with tubularized neourethra over a 8 Fr catheter. Glanular hypospadias and secondary repair were excluded from this study.

Under general anesthesia, formal TIP urethroplasty operation was performed as briefly described in the following parts; a stay suture was placed through the glans for traction. Afterwards, the penis was degloved and two parallel incisions were made on the glans to form the glanular wings. One midline deep incision was carried out in the urethral plate as described by Snodgrass.⁽⁴⁾ Finally, the plate measured at least 13 mm in width. At first, incised urethral plate was tubularized over a 8 Fr catheter with 6-0 polyglactin suture and these patients were classified into group B. Afterwards, tubularization was made over a 6 Fr catheter in order to decrease meatal stenosis in group A. Neomeatus was given a slit-like shape in order to avoid stenosis. Mobilized divergent corpus spongiosum was approximated in

the midline to cover neourethra. The glans wings were re-approximated with no tension and the skin was closed. The catheters were removed 7 days after surgery.

Children in both groups were evaluated for 1 year (every fortnight for 1 month and then once a month and also whenever a specific problem appeared) in the postoperative period. Diagnosis of meatal stenosis was made according to the history given by parents (difficulty in urination, narrow and high flow of urinary stream, pain during urination, and the need to sit or stand back from the toilet bowl to urinate), inspection of meatus (circular, small and narrowed shape) and calibration of meatus. Under local anesthesia, urethral sounding was performed on the postoperative 15th day, 1st, 3rd and 6-month and 1st year. The caliber of the meatus smaller than the normal minimal size for a given age group was regarded as meatal stenosis.⁽⁵⁾ Under general anesthesia, dilatation was performed when meatal stenosis was determined. Twenty eight (63.6%) of the patients in group A and 23 (59.0%) of the patients in group B were not yet potty trained. So, we were not able to performed uroflowmetry in these patients and we did not use uroflowmetry as a diagnostic tool.

Data collected included age, the location of hypospadias, dehiscence, urethrocutaneous fistula formation, urethral meatal stenosis formation and number of meatal dilatation in each patient.

The statistical analyses were made using the statistical package for the social science (SPSS Inc, Chicago, Illinois, USA) version 11.5. The results were expressed as mean \pm standard deviation (SD). Mann-Whitney U and t tests were used for the statistical analysis. $P < .05$ was accepted as statistically significant.

RESULTS

Patients' characteristics and results are summarized in Table. There were no significant differences between the groups according to their age ($P = .489$). In group A, the location of hypospadias was distal penile in 34 patients (77.3%) and mid-shaft in 10 (22.7%). In group B, it was distal penile in 29 patients (74.4%) and mid-shaft in 10 (25.6%). There

were no significant differences between the groups according to the location of urethral meatus ($P = .758$).

In group A, urethrocutaneous fistula occurred in 2 (4.5%) of the patients and 3 (7.7%) of the patients in group B. There were no significant differences between the groups according to the urethrocutaneous fistula formation ($P = .550$). There was no dehiscence in either group.

Urethral meatal stenosis occurred in 1 (2.3%) of the patients in group A and 6 (15.4%) of the patients in group B. Meatal stenosis formation in group B was markedly higher than that in group A ($P = .033$). All the meatal stenosis were resolved after dilatation program at the end of the first year. The mean of meatal dilatation number was 0.046 ± 0.30 in group A and 0.44 ± 1.07 in group B, it was higher in group B compared to group A ($P = .030$).

DISCUSSION

TIP urethroplasty, as described by Snodgrass in 1994, is the method of choice for treating distal and mid-shaft hypospadias.⁽⁴⁾ The success rate has been reported to be 88 to 100%.^(6,7) The meatal stenosis formation rate has been reported between 1% and 17% after TIP urethroplasty.^(3,4,8) In TIP urethroplasty, some modifications such as the intactness of the anticipated dorsal lip of the neomeatus and creating a generous wide elliptical external meatus were reported in order to reduce the risk of fistula and meatal stenosis.^(1,3,9) Another possible reason for meatal stenosis may be the tension of glans wings approximation. It is generally acknowledged that distal urethroplasty must not be considered a separate procedure from glansoplasty. The size of the catheter determines the likelihood for meatal stenosis as it increases the tension exerted for glans approximation.

Although uroflowmetry is a simple and non-invasive way of evaluating the dynamics of micturition, the calibration of the meatus, the history given by parents and the physical examination of the meatus were sufficient in the diagnosis of meatal stenosis.⁽¹⁰⁾

In our study, there were no significant differences between the groups in terms of their ages. The urethral meatus corresponds generally with age. Since the urethral meatus is

Table. Summary of patients' characteristics and results.

	Group A	Group B
Number of patients	44	39
Mean age, years	4.82 ± 3.83	5.19 ± 3.83
Location of hypospadias, n (%)		
Distal	34 (77.3)	29 (74.4)
Mid-shaft	10 (22.7)	10 (25.6)
Urethrocutaneous fistula, n (%)	2 (4.5)	3 (7.7)
Dehiscence, n (%)	0 (0)	0 (0)
Urethral meatal stenosis, n (%)	1 (2.3)	6 (15.4)
Number of meatal dilatation	0.046 ± 0.30	0.44 ± 1.07

the narrowest part of urethra in boys, the catheter size in hypospadias repair should be chosen according to the width of the narrowest part of urethra for a given age group. Yang et al calibrated the size of the urethral meatus by sounding and reported that the normal minimal size of the urethral meatus is 10 Fr in 88 uncircumcised boys aged 0-14 years.⁽⁵⁾ Since the catheters used in both groups were smaller than 10 Fr, the selection of catheter size was made regardless of the age of the patients.

Inflammation, the first phase of the wound healing, is often accompanied by local interstitial fluid accumulation expressed as edema.⁽¹¹⁾ Also, re-epithelialization begins in 24 hours after surgery. Neourethra covers 8 Fr catheter more tightly than 6 Fr. Therefore, using a 6 Fr catheter could provide an adequate area for edema and an adherence of both raw sides of the wound. Increased need for regular dilatation after tubularization of incised urethral plate over a 8 Fr catheter can be explained by edema that caused a pressure injury on the urethral meatus and by hindered re-epithelialization. The critical period of healing after the TIP urethroplasty is the first few weeks and using a large-sized catheter can separate both raw sides of incised plate resulting in secondary healing. In secondary healing, centripetally directed contraction reduces the area of the wound. Over time, meatal stenosis occurs.

Delayed wound healing resulting from a foreign-body reaction to biomaterials have also been reported. Besides, bio-

materials increased early inflammation and fibrosis.^(12,13) Ritch and colleagues reported no meatal stenosis in 49 patients who underwent TIP urethroplasty with an overnight urethral stenting technique.⁽¹⁴⁾ It can be the result of limited foreign-body reaction. Using a large-sized catheter leads to a foreign body reaction more often than a biomaterial does, and it can bring about increased early inflammation, edema and fibrosis resulting in meatal stenosis.

CONCLUSION

We recommend the tubularization of urethral plate over a small-sized (6 Fr) catheter. Also, following the tubularization over a large-sized catheter, it can be altered by a small-sized one. Using a small-sized catheter, regardless of the age of the patients, prevents meatal stenosis by reducing foreign body reaction and pressure injury and by hindering secondary healing.

CONFLICT OF INTEREST

None declared.

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