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Original Research

Topical Steroid Treatment for Meatal Stenosis: Clinical Outcomes and Uroflowmetry Assessment of Treatment Success

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ABSTRACT

Objective: The aim of this study is to assess the efficacy of topical steroid use in meatal stenosis (MS), which is one of the most common complications of circumcision.

Methods: The medical records of children treated for MS between November 2022 and June 2024 were retrospectively analyzed. Demographic data, clinical information, and UF parameters were recorded. Maximal flow rate (Qmax)/voided volume (VV) ratios were calculated using data from uroflowmetry (UF). Group 1 comprised patients receiving topical steroids, whereas Group 2 consisted of patients necessitating meatotomy due to failure of steroid therapy.

Results: The study comprised 32 children with a mean age of 5.1±1.8 years at the time of admission. Of these, 16 (50.0%) belonged to Group 1, and 16 (50.0%) belonged to Group 2. No significant differences were observed between the groups regarding age at admission, age at circumcision, or Q max values before or after treatment ($p>0.05$ for all). The Q max / VV ratios post-treatment were higher in Group 1 compared to Group 2, despite no significant difference in Q max/VV between the groups pre-treatment ($p=0.006$ and $p>0.05$, respectively). Post-treatment Q max values and Q max/VV ratios were higher compared to pre-treatment in both groups ($p<0.001$ for both). The overall success rate of topical steroids was 50.0%.

Conclusion: Topical steroids appear to be an effective initial, non-invasive treatment for MS in selected patients only. UF can be used in MS as an objective test.

Keywords: meatal stenosis, meatotomy, steroid, uroflowmetry

INTRODUCTION

Circumcision in children and infants is among the most frequently performed surgical procedures worldwide. Globally, approximately 30% of men are circumcised, primarily for social, religious, and ritualistic reasons. The overall complication rate of circumcision varies from 0% to 16%, with a mean of 1.5%. The most common early and late complications include hemorrhage, glans trauma, infection, adhesion formation, excessive foreskin excision, secondary phimosis, and meatal stenosis (MS). MS is characterized by a change of the meatus from an elliptical to a circular shape due to scarring. Diagnosis is achieved via meatal examination, which demonstrates visual pinpoint narrowing of the urethral meatus. The frequency of MS varies between 5% and 20%, with a greater incidence noted in neonatal circumcision than in circumcision performed on older children [1,2].

MS may be asymptomatic or manifest as a thin stream, prolonged duration of urination, difficulty urinating, storage symptoms such as frequency and urgency, dysuria, interrupted voiding, and obstructive uropathy. Meatotomy is the most favored traditional therapeutic approach.

This study investigated the effectiveness of topical steroid use in treating MS.

MATERIAL AND METHODS

The medical records of children treated for MS between November 2022 and June 2024 were analyzed. The diagnosis of MS was confirmed through the observation of a prolonged, upward-directed urinary stream, characterized by a narrow caliber and pinpoint appearance of the urethral meatus. Uroflowmetry (UF) was performed on all patients before the beginning of treatment. Betamethasone 0.1% cream (Betnovate, Glaxosmithkline, Istanbul, Turkey) was administered to the external meatus twice per day for a duration of 21 days. The resolution of symptoms and improved urination were considered indicators of treatment success. All patients underwent assessment through physical examination and observation of the urinary stream during micturition. UF was conducted one month following the termination of steroid therapy. In the event of steroid therapy failure, a meatotomy was performed under general anesthesia. The procedure involved squashing the ventral aspect of the pinpoint meatus for approximately 3-5 millimeters for 10 seconds and then incising it. The mucosal margins were sutured with absorbable sutures to avoid renarrowing.

Urethral catheterization was not employed, and the procedure was performed on an outpatient basis. Patients were discharged following urination. UF was performed again one month subsequent to the meatotomy procedure.

Alongside clinical data and demographic information obtained from patient records, the maximal flow rate (Qmax) and flow patterns were documented from UF results. The Qmax/voided volume (VV) ratios were computed utilizing UF data. Group 1 comprised patients administered topical steroids, whereas Group 2 encompassed patients necessitating meatotomy due to the ineffectiveness of steroid treatment.

This study was approved by the Sancaktepe Sehit Prof Dr Ilhan Varank Training and Research Hospital Ethics Committee (approval number: 2024/243).

Statistical Analysis

The Statistical Package for Social Sciences (version 25.0) was used to perform the statistical analysis. A value of $p < 0.05$ was considered to indicate statistical significance. Continuous variables were expressed as the mean SDs, while categorical variables were expressed as numbers and frequencies. The normality of the numerical data was assessed using Shapiro-Wilk test. Homogeneity of variance was evaluated using Levene's test. In the analysis of normally distributed continuous variables, the Independent samples T test was used to compare two independent groups. The Mann-Whitney U test was employed to analyze numerical data that were not normally distributed and involved two groups. The Wilcoxon signed-rank test was used to evaluate numerical data before and after treatment in both groups. Categorical variables were analysed with the chi-square test and Yates continuity correction test.

Main Points

- This study investigated the efficacy of topical steroid use for the treatment of meatal stenosis in children.
- Although meatotomy remains the gold standard with a high success rate, topical steroid application may be an adequate treatment option in selected cases.
- Uroflowmetry is a non-invasive, objective diagnostic tool that can be utilized both for initial assessment and for evaluating treatment outcomes.

RESULTS

A total of 38 patients were diagnosed with MS at our institution. Six patients were excluded from the study due to missing data or discontinuation of treatment. A total of 32 children were included in the study: 16 in Group 1 and 16 in Group 2. The symptoms of patients are summarized in Table 1. Of six patients with storage symptoms, two patients were treated with steroids and urotherapy. Other 4 patients have needed meatotomy and also anticholinergics.

The mean age of patients was 11.1 ± 7.7 (range 3 - 9). Although the age at admission was higher in Group 1 compared to Group 2, no significant difference was found between the groups concerning age at circumcision (p= 0.043 and p = 0.926, respectively). There was no difference between groups in terms of Qmax values both before and after treatment. Qmax/VV ratios of post-treatment were higher in Group 1 than Gorup 2, while no significant difference was observed in pre-treatment values (p= 0.006 and p = 0.956, respectively). Of the patients, 30 (93.8%) exhibited a plateau-shaped curve in UF prior to treatment, whereas 28 (87.5%) displayed a bell-shaped curve post-treatment. The other patients exhibited a staccato pattern either prior to treatment or following treatment. Figure 1 illustrates sample UF images of the same patient obtained before and after treatment. Age and UF findings of the study groups are presented in Table 2. Both the Qmax and Qmax/VV values elevated in both groups post-treatment compared to pre-treatment values (Table 3).

The success rate of topical steroid in treating MS was found to be 50%. When patients were divided into two groups those who had circumcision performed under 1 year old and over 1 year old there was no significant difference in treatment response between Group 1 and Group 2 (p=0.273) (Figure 2).

The mean follow-up duration was 5.1 ± 1.8 months post-treatment, whether with steroids or meatotomy.

Table 1. Symptoms of patients

Symptoms	(n; %)
Deflected stream	2 (6.4)
Weak stream	12 (37.5)
Long duration of urination	4 (12.5)
Straining	8 (25.0)
Storage symptoms	6 (18.8)
Intermittency	2 (6.4)
Dysuria	2 (6.4)

Table 2. Age and UF findings of the study groups

	Group 1	Group 2	P
Age (years) (mean ± SD)	5.8 ± 1.9	4.4 ± 1.5	0.043[a]
Age at circumcision (months) (mean ± SD)	22.1 ± 27.0	21.8 ± 25.8	0.926[a]
Q max (ml/s) before treatment	4.84 ± 1.70	5.34 ± 1.34	0.956[b]
Q max / VV before treatment	0.09 ± 0.13	0.09 ± 0.04	0.706[a]
Q max (ml/s) after treatment	11.00 ± 2.22	10.24 ± 2.40	0.515[a]
Q max / VV after treatment	0.26 ± 0.30	0.10 ± 0.04	0.006[a]

SD: Standard deviation.

UF: Uroflowmetry.

[a] Mann-Whitney U test.

[b] Independent samples T test.

Table 3. UF findings before and after treatment

	Before the treatment		After completion of the treatment		P*
	Mean	SD	Mean	SD	
Q max (ml/s)	4.941	1.512	14.300	10.619	< 0.001
Q max / VV	0.066	0.097	0.981	0.181	< 0.001

SD: Standard deviation.

UF: Uroflowmetry.

* Wilcoxon signed rank test.

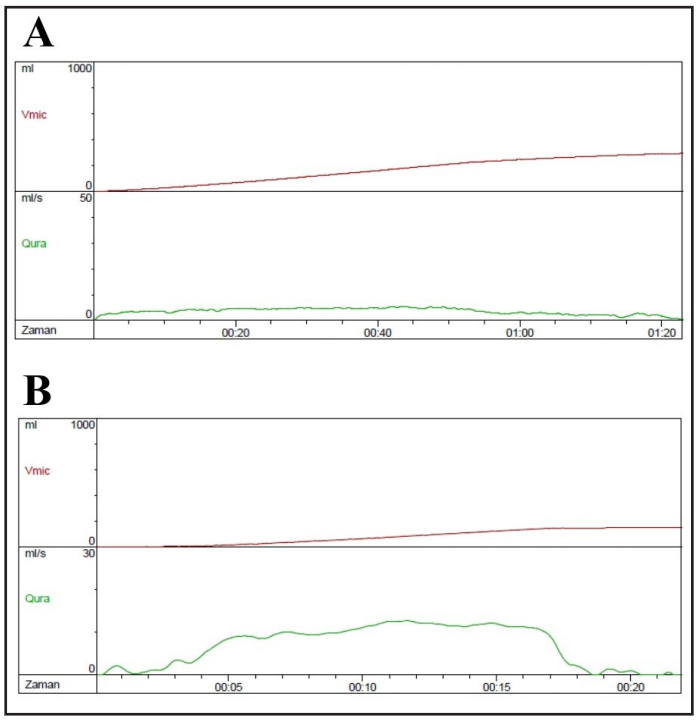

Figure 1. a. The UF of an 8-year-old child with MS initially exhibited a plateau pattern. **b.** Following treatment, the same patient exhibited a bell-shaped curve

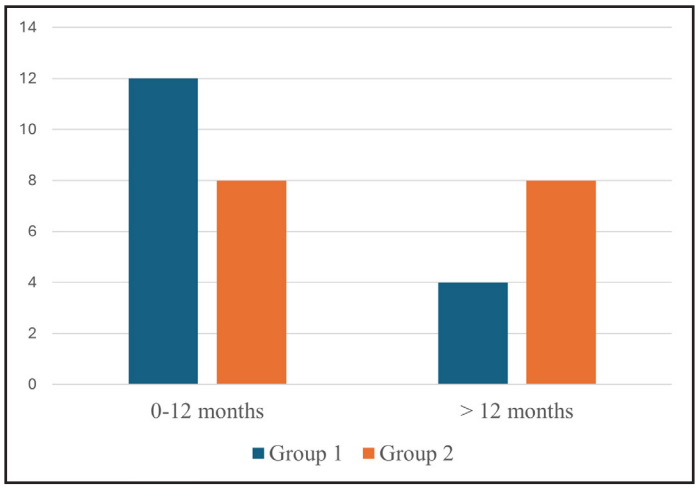

Figure 2. Number of patients who had circumcision performed younger and older than 12 months in groups

DISCUSSION

MS is more frequently observed in circumcised males. Possible causes encompass chemical irritation of the meatus subsequent to the removal of the natural protective barrier during circumcision, along with ligation of the frenular artery [2,3]. The incidence of MS is notably elevated in neonates and infants, where physiological phimosis is frequently present. Neonatal circumcision is specifically linked to a heightened risk of MS [4]. Another study indicated that the likelihood of MS escalates in individuals circumcised during infancy; nonetheless, no substantial differences were noted among circumcisions conducted at different ages within the initial months of life [5]. In this study, 62.5% of patients were circumcised in infancy, with one patient having received neonatal circumcision. Steroid treatment or the necessity for meatotomy was comparable between patients who had circumcision performed under and over 12 months of age.

The age of presentation for MS has been reported as 4.7 years and 6.4 years in the literature [4,6]. This study observed a similar age range at presentation, which may be attributed to the period of toilet training. Additionally, patients who required a meatotomy after failing steroid therapy were younger.

MS may present with various symptoms. The recent study indicated that the predominant symptoms of MS are a deflected and thin urinary stream. Storage symptoms were observed in 20.0% of their cases [7]. Our study identified a weak urinary stream and straining during voiding as the most prevalent symptoms. A similar percentage of storage symptoms was noted in our cohort. Among patients diagnosed with overactive bladder, two exhibited no symptoms other than urgency, frequency, or urge incontinence. These patients were identified during routine physical examinations at admission. They were treated with steroid therapy and did not require additional anticholinergic medications, apart from urotherapy. It is important to note that MS may present with storage symptoms without any other voiding-related symptoms being observed beforehand.

Meatotomy has traditionally been considered the gold standard for treating symptomatic MS. This procedure is typically short and associated with low rates of restenosis (approximately 0 – 1.8%). While it is considered a 'minor procedure' in pediatric urology practice, its impact is often described as 'major' [8]. However, it may be performed under general anesthesia. The use of topical betamethasone as an alternative treatment for MS was reported to have a success rate of 35% [6]. In the present study, the success rate was found to be 50.0%. We believe this difference may be attributed to the longer duration of betamethasone application in our study.

UF can identify potential obstructive flow patterns, such as a plateau-shaped curve, in patients with MS. Nevertheless, a

consensus is absent in the literature. Studies have reported abnormal flow patterns prior to treatment, with prevalence ranging from 53% to 86.4%. A bell-shaped curve was observed in 88% to 93.3% of patients following treatment in these studies [7,9]. In the current study, all patients displayed a plateau-shaped curve, indicative of obstruction, except for two patients who exhibited a staccato pattern. After treatment, 87.5% of patients exhibited a bell-shaped distribution, aligning with existing literature findings. We noted that Qmax values were elevated post-treatment compared to pre-treatment in both groups, in accordance with prior studies [7,9]. Furthermore, the Qmax/VV values in Group 1 exceeded those in Group 2 post-treatment, although no significant difference was noted in pre-treatment Qmax/VV values between the groups. Steroid therapy showed a more significant enhancement in Qmax/VV values compared to meatotomy, although Qmax values alone showed no difference.

Limitations

This study has several limitations, including its retrospective design and the comparatively small sample size. Furthermore, data from UF for long-term follow-up are lacking. Our study also omitted details regarding the circumcision technique, postoperative care after circumcision, and the preservation of the frenulum—elements that may influence the onset of MS.

CONCLUSIONS

Topical steroids seem to be an effective initial, non-invasive intervention for meatal stenosis in selected patients only. UF can be utilized in the diagnosis and management of meatal stenosis as a test that allows for objective measurement.

Informed Consent: Informed consent document was obtained from the study participants.

Conflict of interest: The author declares that they have no conflict of interest.

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Ethical Approval: The study was approved by the Sancaktepe Sehit Prof Dr Ilhan Varank Training and Research Hospital Ethics Committee (approval number: 2024/243).

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