Optimal clamping time in meatotomy procedure for children with meatal stenosis: Experience with 120 cases

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Summary
Objective: During meatotomy procedure for children with meatal stenosis (MS), a straight clamp used as a hemostat on the ventrum of the meatus before incised with scissors for clamping and holding bleeding from the site of operation. The aim of this study was to evaluate the optimal clamping time for meatotomy in children with MS.

Materials and methods: All the patients with MS between 2014 to 2019 were enrolled in this retrospective study. Patients with uncircumcised penis, traumatic catheterization, any kind of penile abnormality such as hypospadias or penile curvature, and active urinary tract infection (UTI) were excluded. The indication of meatotomy was a pinpoint meatus that develops with dorsal or lateral deflection of the urinary stream and high-velocity urine flow. During meatotomy procedure, clamping time was examined in different groups such as 2, 3, and 4 minutes. The main symptoms of presentation and ultrasonography (US) findings were recorded and compared between groups. To assess the optimum time clamping, postoperative bleeding was noted carefully in all groups. The success rate was recorded at one-month postoperative follow-up in the clinic.

Results: Of the 120 patients with MS who underwent a meatotomy procedure, there were 40 (33.3%) participants in each group. The main symptoms were painful urination and urine stream deviation that represented in 54 (46%) patients. Bladder wall thickness was the main pre-operation finding in the US which was observed in 67 (55.8%) patients. In comparison between the groups related to clamping time, bleeding was observed and required suturing when clamping was applied for 2 minutes in 4 (3.3%) patients (p = 0.016). With a minimum follow-up of 12 months, no recurrent meatal stenosis was reported.

Conclusions: Clamping time for more than 2 minutes may prevent bleeding during and after meatotomy.

Key words: Bleeding; Clamping time; Meatal stenosis; Meatotomy.

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Introduction
One of the most common complications after circumcision is meatal stenosis (MS) which occurs in approximately 9%-10% of patients (1). MS is defined as narrowing of the opening of the external urethral meatus less than 2 mm (2). Prolonged exposure of the delicate meatus to an irritating environment of the diaper (diaper dermatitis) is the common pathologic cause of this condition (3). Post circumcision meatal stenosis may also result from ischemia of the meatal mucosa secondary to damage to the frenular artery (2).

Patients with MS can present with symptoms of voiding difficulties, such as pinpoint meatus, difficulty to aim or an upward and forceful urinary stream, dysuria, urgency, frequent and prolonged urination. Therefore, untreated MS can lead to urinary tract infections and kidney problems (1). To confirm the diagnosis, detailed history and physical exam including observation of urination and examining the urethral opening are evaluated carefully (1). Regarding the methods of circumcision, it was hypothesized by Graves that MS is more common after a Plastibell circumcision (2).

Meatotomy is a simple common procedure for the treatment of MS that can be performed with minimal instrumentation and in this procedure, the ventrum of the meatus is crushed with a straight clamp and then the crushed ventral tissue is incised sharply with fine-tipped scissors (1). Side effects of meatotomy are bleeding during or after meatotomy, mild discomfort for the first day following the operation, recurrence, pain, dysuria, and dysuria induced urinary retention, infection, edema, and spraying of the urine stream as a consequence of edema for a while (2-4). Among all the complications mentioned above, bleeding could be a matter of utmost importance in which clamping time might have played a key role. The clamping times recommended in previous literature were between 60 seconds to 3 minutes (1, 4-7).

In these circumstances, we could not find any study that shows us if there is any correlation between clamping time and bleeding during and after meatotomy procedure. Therefore, we conducted a study to find out the optimal clamping time in meatotomy.

Materials and methods
Study design
The Ethics Committee of Shiraz University of Medical Sciences approved the protocol of the study (IR.SUMS.MED.REC). No conflict of interest declared.
When data were non-normally distributed, the non-parametric test was used. The Chi-square test was used to assess a probable statistically significant difference between qualitative variables for limitations on the observed frequency of Fisher’s exact test. ANOVA was applied to compare the difference of means between more than two different levels or the non-parametric Kruskal Wallis test was applied. The collected data were analyzed by SPSS version 20. A P-value less than 0.05 was considered statistically significant.

**RESULT**

The patient’s characteristics were summarized in Table 1. Of the 120 patients diagnosed with MS were enrolled in this study. The mean patient age was 50.88 ± 29.73 months. The time between circumcisions to meatotomy procedure was 49.5 ± 30.84 months. Skin eruption around meatus was found in 6 (5.0%) patients. All coagulation tests (PT, PTT, INR, and Platelet) were normal in all patients. Related to symptoms of MS, the main symptoms were painful urination and urine stream deviation which represented in 54 (46%) patients. Other symptoms were summarized in Table 2. Bladder wall thickness was the main pre-operation finding in US which represented in 67 (55.8%) patients. US finding were summarized in Table 2. Voiding quality at one month after operation excellent in 79 (65.8%) patients, improved in 38 (31.7%) patients, and partially improved in 3 (2.5%) of patients and at long term (12 months) follow-up remained without symptoms.

In comparison between the groups related to clamping time (40) timelapse (40) timelapse (40) 120

<table>
<thead>
<tr>
<th>Variables</th>
<th>0.031</th>
<th>0.0100</th>
<th>0.265</th>
<th>0.19</th>
<th>0.016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time (minutes)</td>
<td>60.07 ± 33.74</td>
<td>23.33 ± 33.7</td>
<td>21.42 ± 32.9</td>
<td>2.47 ± 2.35</td>
<td>0.00 (0)</td>
</tr>
<tr>
<td>Bladder wall thickness</td>
<td>49.85 ± 30.76</td>
<td>63.51 ± 5.67</td>
<td>3.39 ± 3.78</td>
<td>4.00 (0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Normal US finding</td>
<td>42.73 ± 23.39</td>
<td>6 (3.3)</td>
<td>6 (3.3)</td>
<td>4 (3.3)</td>
<td>6 (3.3)</td>
</tr>
<tr>
<td>Skin eruption around meatus</td>
<td>50.88 ± 29.73</td>
<td>6 (3.3)</td>
<td>6 (3.3)</td>
<td>4 (3.3)</td>
<td>6 (3.3)</td>
</tr>
</tbody>
</table>

**Table 2.**

**Statistical analysis**
The mean ± SD and median, Inter-Quartile Range (IQR), described the quantitative variables, and frequency (percent) was used for qualitative variables. We assessed the normality as the assumption of the variables in the study by the Kolmogorov-Smirnov test.
time, there was no statistically significant difference among the groups in terms of skin eruption around meatus, history of allergy, circumcision method, US finding, voiding quality after one month of operation, and meatal width. However, the mean age in 2 minutes group was younger than another group (p = 0.031).

Significant bleeding was observed and required suturing when clamping time was for 2 minutes in 4 (3.3%) patients (p = 0.016). Painful urination and urine stream deviation was the main symptoms in all groups (p = 0.010). Besides, with a minimum follow-up of 12 months, no recurrent MS was reported.

**Discussion**

The main cause of MS is circumcision. It is usually common in Jews and Muslims and this problem is highly detected in Israel, where most boys are ritually circumcised in early infancy (3).

Different methods are approved to perform neonatal circumcision but three techniques are used regularly: the Mogen clamp, the Gomco clamp, and the Plastibell Device. Previously published articles revealed that neonatal circumcision using Plastibell Device with intact frenulum technique decreases the rate of delayed MS (10), whatever in our study frequency of MS between the Sleeve and the Plastibell methods was not statically significant between groups.

Sever MS is a late complication that is mainly noticed 1-2 years after circumcision which is simply treated by meatomony. Meatomony is a simple common procedure for the treatment of MS that can be performed with minimal instrumentation and in this procedure, the ventrum of the meatus is crushed with a straight clamp and then the crushed ventral tissue is incised sharply with fine-tipped scissors (1). Side effects of meatomony are bleeding during or after the procedure, mild discomfort for the first day following the operation, recurrence, pain, dysuria, dysuria induced urinary retention, infection, edema, and spraying of the urine stream as a consequence of edema for a while (2-4). Among all the complications mentioned above, bleeding could be a matter of utmost importance in which clamping time might have played a key role.

James et al. recommended that clamping for three minutes reduces bleeding and facilitates placement of sutures (5). Our result was similar to the previous studies and showed significant bleeding was observed and required suturing when the clamping time was for 2 minutes.

Parisa and associates evaluated 87 children with MS and they concluded that decreased urine stream is a common symptom which was seen among 54% of patients with MS. Besides, increased bladder wall thickness was the most common finding in Ultrasonography (US) which was revealed in 82% of the patients (14). Our result was similar to the previous study.

David et al. assessed the quality of void at 24 hours and 1 month after meatomony (3). In agreement with this study, we also evaluated the quality of voiding one month after surgery, and in our opinion; this time was enough for the meatus to heal.

Local anesthesia was highly recommended in recent studies. However, it is important to mention that restlessness and anxiety, especially in the patient less than 4 years, is the main limitation for local anesthesia in meatomony procedure. Besides, meatoplasty under general anesthesia had a lower recurrence rate compared to meatomony under local anesthesia (0.2% vs 3.5%) (3, 6, 8).

Although in some parts of the world like our country (Iran) the cost of a meatomony under GA and meatomony under local anesthesia might be roughly the same (8). Mahmoudi et al. mentioned that US might not be necessary for every patient with MS after meatomony. However, it is recommended to perform the radiologic study in cases of specific symptom continuation. We agree with him and we also did not perform any US after meatomony procedure unless specific symptom was found in post-surgical follow-up (15).

The current study had some limitations. Firstly, the small size number of patients. Secondly, the lack of long-term follow-up. Thirdly, the surgeon's propensity to operate could be biased by their propensity to diagnosis MS and this could affect the rates cited.

Fourthly, it is hard to assess the quantity of bleeding by laboratory investigation and the amount of bleeding and the need for suturing was assessed by pediatric urologist. Finally, it was a retrospective analysis.

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**Table 3. Summary of published studies with clamping time, type of anesthesia and complications.**

<table>
<thead>
<tr>
<th>Study</th>
<th>Patients number</th>
<th>Type of anesthesia</th>
<th>Clamping Time (minutes)</th>
<th>Complication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nohman (9)</td>
<td>25</td>
<td>General</td>
<td>2</td>
<td>Mild meatal stenosis in 3 patients</td>
</tr>
<tr>
<td>Frimnza (8)</td>
<td>55</td>
<td>Topical</td>
<td>-</td>
<td>Repeated meatomony in 3 patients</td>
</tr>
<tr>
<td>Wang (1)</td>
<td>-</td>
<td>General</td>
<td>1</td>
<td>No complication</td>
</tr>
<tr>
<td>Pshykker (12)</td>
<td>48</td>
<td>Local</td>
<td>2-3</td>
<td>Penile numbness in 2 patients for 1 day</td>
</tr>
<tr>
<td>Ben-Meir (5)</td>
<td>76</td>
<td>General/Local</td>
<td>1</td>
<td>Bleeding in 3 patients, Laryngospasm in 2 patients</td>
</tr>
<tr>
<td>Lane (6)</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>No complication</td>
</tr>
<tr>
<td>Cabiller (11)</td>
<td>85</td>
<td>General</td>
<td>1</td>
<td>No complication</td>
</tr>
<tr>
<td>Roth (7)</td>
<td>100</td>
<td>Local</td>
<td>5</td>
<td>No complication</td>
</tr>
<tr>
<td>Elknahav (13)</td>
<td>86</td>
<td>General</td>
<td>1-2</td>
<td>No complication</td>
</tr>
</tbody>
</table>
CONCLUSIONS
The main symptoms of MS are painful urination and urine stream deviation. Additionally, clamping time for more than 2 minutes may prevent bleeding during and after meatotomy. However, this observation needs to be validated in a large number cohort study with long-term post-procedural follow-up.

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