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Meatal stenosis following circumcision with Plastibell device and conventional dissection Surgery; a prospective investigation

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ABSTRACT

Introduction: Meatal stenosis is a late complication of circumcision.
Objectives: This study was designed to determine its prevalence, its relationship with age of circumcision and its applied method.
Material and Methods: This prospective study was conducted between December 2006 and January 2012. A total of 2389 boys, equal to or less than 6 years were circumcised using the Plastibell device (PD) or conventional dissection surgery (CDS). They followed up 12 months after surgery. Signs and symptoms of meatal stenosis recorded and the meatus evaluated for stenosis.
Results: Meatal stenosis was diagnosed in 41 boys (1.7%). Twenty-five of patients were asymptomatic (61%). The difference between the mean age of circumcision in patients with meatal stenosis and the others were statistically significant. In newborns the prevalence of meatal stenosis was more than the other ages (15% versus 1.4%, $P<0.01$). Concerning the method of circumcision, a significant difference on the prevalence of meatal stenosis was detected too (0.8% in PD versus 3.6% in CDS; $P<0.001$). The mean interval between circumcision and diagnosis of meatal stenosis was 9.59 months.
Conclusion: Symptomatic presentation of meatal stenosis may be late and it needs long-term follow-up. Its prevalence is higher in younger boys. Thus, circumcision in younger boys, especially in neonates is not recommended. Using PD has lower rate of meatal stenosis in comparison to CDS. Hence, the result of this study showed, the PD is preferable in younger boys.

Implication for health policy/practice/research/medical education:
The study emphasizes the superiority of the Plastibell device in circumcision, because of its simplicity and lower complication risk.

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Introduction

Circumcision the oldest and most prevalent surgical procedures in boys, is performed throughout the world for ritual, traditional or medical reasons (1). Currently, one-sixth of world's male population approximately is circumcised (2). Comparable to all surgicaql procedures, circumcision have various complications. These adverse complications are categorized as early and late complications (3). One of the late complications is meatal stenosis (4) which is possibly due to of ligation of the frenular artery or from ammoniacal meatitis. It accounts for 26% of the late complications (5). Complication rates depend on various factors such as anatomic abnormalities, medical comorbidities, surgical techniques, and the age of circumcision (5).

Numerous studies have been published concerning

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post-circumcision meatal stenosis in different ages with inconsistent results (2,6-8). In addition, studies regarding the role of circumcision methods in meatal stenosis are scarce.

Objectives

We designed this study to evaluate the cases of meatal stenosis demonstrating its prevalence and its relation to the age of the child at the time of circumcision and the used method. Various procedures are used for circumcision. Conventional dissection surgery (CDS) and circumcision with the Plastibell device (PD) are two methods most commonly used (9) that compared in this study.

Patients and Methods

This prospective study was conducted in Semnan University of Medical Sciences. Study was conducted on 2526 boys aged 6 years or less, who were circumcised in an outpatient clinic between December 2006 to January 2012. The participants had not any history of urological anomaly. All of the procedures were done by a single surgeon.

Participants were circumcised by one of the two methods; the Plastibell method or CDS. We explained both methods to the parents and they chose the technique for their child. If they could not decide, we conducted circumcision with Plastibell in age less than 2 years and conventional method was conducted for age more than 2 years. Hence, the proportion of subjects in Plastibell method was more than that of conventional group.

All surgeries were performed under local anesthesia with penile ring block. In Plastibell technique, an initial dorsal slit was needed to allow the protective bell to be placed. Then foreskin was pulled up and an appropriately sized Plastibell placed over the glans and under the foreskin. A non-absorbable string was tightly tied around the device and the prepuce distally to it was excised. The bell would eventually fall off, after necrosis within few days.

In dissection technique, two circumferential incisions were made, one at the shaft skin around the coronal sulcus, and the other one at the mucosa just proximal to the coronal sulcus. Then the foreskin between the two incisions was excised and the wound was closed with a 0.4 plain catgut. Acetaminophen was used as an analgesic and no dressing was applied in both methods. Boys should undergo a sitz bath with water twice a day and gentamicin ophthalmic ointment was administered to use on the operative site for ten days. The boys were followed up and evaluated one week, then 3, 6 and 12 months after surgery for meatal stenosis. The criteria for diagnosis of meatal stenosis were based on the distortion of meatus from an ellipsoid to a pinpoint shape, and also inability to pass a 5 F lubricated feeding tube below age one year and 8 F feeding tube between 1-6 years (10).

Ethical issues

1) The research followed the tenets of the Declaration of Helsinki; 2) informed consent was obtained from the parents of children; and 3) This study was approved by the Ethics Committee of Semnan University of Medical Sciences, Semnan, Iran (#90/12751).

Statistical analysis

Data were analyzed by SPSS 22 (IBM SPSS Inc.). We used *t* test for comparing mean of quantitative variables and chi-square test (or Fisher's exact test when necessary) for evaluating association between qualitative ones. In all statistical tests, $P<0.05$ was considered as significant.

Results

Of 2526 boys, 137 participants did not return for following up. Thus we worked on 2389 boys. According to the Table 1, the mean age of the children was 22.79 months (range 12 days to 6 years). Sixty cases were neonates (2.5%). The circumcision was conducted on 66.5% of cases with PD and in the others through CDS. Mean age in the Plastibell group was 9.27 months and in the conventional group was 49.60 months ($P<0.001$).

Meatal stenosis was diagnosed in 41 boys (1.7%). Twenty-five of the patients were asymptomatic (61%). In symptomatic patients, the most common symptom was discomfort on voiding (pain, crying or burning) or dysuria. Decreased urinary caliber, urinary deviation and blood on meatus were the other symptoms was noted by the parents. Five patients (12.2%) had more than one symptom.

There was a correlation between age of circumcision and meatal stenosis (Table 2). The difference between the mean age of circumcision in the patients with meatal stenosis (12.88 months) and the other children (22.96 months) was statistically significant ($P=0.003$). In addition, in neonates, the prevalence of meatal stenosis was more than the other ages (15% versus 1.4%, $P<0.01$).

Table 1. Demographic characteristics of the subjects

Variable	Value
Circumcision with PD (%)	66.5
Mean age (months)	22.79
Neonates (%)	2.5
Prevalence of stenosis (%)	1.7
Mean interval between circumcision and diagnosis (months)	9.59

Table 2. Relationship of stenosis and age of circumcision

	With stenosis	Without stenosis	*P* value
Mean age (months)	12.88	22.96	0.003
Neonates (%)	15	85	<0.01
Non-neonates (%)	1.4	98.6	<0.01

With regard to the method of circumcision, we found a significant difference on the prevalence of meatal stenosis between two methods (0.8% in PD and 3.6% in CDS, $P<0.001$) (Table 3). The mean interval between circumcision and diagnosis of meatal stenosis was 9.59 months. This interval was not significantly different between two methods (10.50 months in PD versus 9.21 months in CDS, $P>0.05$).

Table 3. Relationship of stenosis and circumcision method

	CDS	PD	*P* value
Prevalence of stenosis (%)	3.6	0.8	<0.001
Mean interval between circumcision and diagnosis (months)	9.21	10.50	>0.05

Discussion

Meatal stenosis is an abnormal narrowing of the urethral meatus in men and is most commonly associated with circumcision (11). Studies have found meatal ulcerations in 8% to 31% of circumcised boys. Traumatic meatitis of the unprotected post circumcision urethral meatus and/or meatal ischemia following damage to the frenular artery at circumcision may lead to meatal stenosis (7). The prevalence of meatal stenosis following circumcision is unknown (12). It is reported to be the commonest complication of circumcision. On the other hand some major series analyzing the result of circumcision have even failed to recognize, meatal stenosis as a possible complication (8). In some reports, its range is between 2.9% to 11.1% (7). In the present study on 2389 circumcised children, meatal stenosis was diagnosed in 41 boys (1.7%). The wide variation in frequencies of adverse effect following circumcision is likely due to several factors such as age at circumcision, training and expertise of the provider (13). Higher rates of meatal stenosis may be seen in areas in which the procedure is done by nonqualified regional people (11,14). In our study all the procedures were conducted by an expert surgeon. It may be one of the major reasons for the low rate of meatal stenosis.

Furthermore, there is a variation in methodological issues such as duration of follow-up that can affect the estimated frequency of complications (13). Meatal stenosis is often missed because boys do not get long-term follow-up care after circumcision. Its symptoms often are mistaken for urinary tract infections and may be treated empirically by antibiotics (15). The symptoms of meatal stenosis are usually ignored for many months until parents detect the child's voiding habit (8).

We followed-up the patients 12 months after surgery for meatal stenosis. Twenty-five of the patients were asymptomatic (61%). In symptomatic patients, the most common symptom was dysuria. The mean interval between circumcision and diagnosis of meatal stenosis was 9.59 months. In the study by Persad et al, conducted on 12 cases of meatal stenosis following circumcision, the main symptoms were penile pain at the initiation of micturition, in 12 of 12 patients (8). In another study by Cartwright et al, dysuria was the most common symptom (16), which was consistent with our results. Furthermore Upadhyay et al detected that in 32% of their patients, the diagnosis of meatal stenosis were made incidentally. We have the higher rate of asymptomatic patients (61%). Also, the median age at presentation of symptomatic children was 48 months (range 3 months to 13 years) following circumcision in the study by Upadhyay et al (17), while in our study it was 9.59 months. We only followed the patients for 1 year but they followed up it for 12 years. It can be concluded that symptomatic presentation of meatal stenosis after circumcision can be very late and it needs long-term follow-up.

In our study, the age of circumcision was related to the incidence of meatal stenosis. The frequency of meatal stenosis was higher in younger boys, especially it was more considerable in neonatal period (15% in neonates versus 1.4% in other ages). This is in line with the study of Ceylan et al, which detected that meatal stenosis is more common in newborn circumcision (18). Machmouchi and Alkhotani compared the outcome of circumcisions conducted in early neonatal period and at 5 months age. Complications including meatal deformities, meatal stenosis, adhesions and infection were more frequent and more significant in the neonatal circumcision group (6). Van Howe found that neonatal circumcision increases the risk of penile inflammation particularly in boys younger than three years old (19). Accordingly in another study, the diagnosis of meatal stenosis was made in 24 of 329 circumcised boys. All of the boys with meatal stenosis were circumcised neonatally. Nearly all individuals required meatotomy to resolve their symptoms. The study concluded that meatal stenosis may be the most common complication following neonatal circumcision. They emphasized that the frequency of this complication and the need for surgical correction should be disclosed as part of the informed consent for neonatal circumcision (20). Hence, according to these studies and the results of the present study, it is better not to conduct circumcision in younger boys, especially in neonatal period.

Our study showed that using PD has lower rate of meatal stenosis in comparison to CDS (0.8% versus 3.6%). A recent study highlighted that different types of circumcision result in different degrees of meatal stenosis stating that the Plastibell results in more incidence of narrowed meatus (21). While in some other studies, the relation of circumcision methods and meatal stenosis are similar to our findings. As an example, in a study from Nigeria on 141 circumcised boys, the most common complications were minor including bleeding (9%) and meatal stenosis (3.5%). Complications were substantially more common when circumcision had been performed freehand rather than using the PD (22). Sörensen and

Sörensen recorded the late morbidity and complications in 43 patients circumcised with the PD during the mean observation period of 29 months. No serious complications were encountered. They detected, the Plastibell method leaves a varying amount of foreskin intact in comparison to classical dissection techniques. This could explain why meatal ulcers/stenosis are not seen when employing this method (23). In a study on 119 boys circumcised with the PD with a follow up of 120 days after surgery, only one patient had meatal stenosis while using diaper (24). Thus the result of above mentioned studies is consistent with the finding of our study regarding use of PD in comparison to CDS.

In addition, according to Clavien classification of surgical complications (25) this study can be classified as grade IIIb of surgical or procedure-related complications.

Conclusion

To conclude, symptomatic presentation of meatal stenosis after circumcision may be very late and it needs long-term follow-up. Its prevalence is related to the age of the child, and is higher in younger boys. Thus, circumcision in younger boys, especially in neonates is not recommended. Using PD has lower rate of meatal stenosis in comparison to CDS. Hence PD is preferable in younger boys.

Limitations of the study

This study was conducted on a limited proportion of patients and we suggest larger studies on this feature of circumcised individuals.

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Authors' contribution

SS, KG, DA, AA and HH conceived the study and performed the experiments. JATand RG contributed to methodology and analyzed the data. All authors read, revised, and approved the final manuscript.

Conflicts of interest

There were no points of conflicts.

Ethical considerations

Ethical issues (including plagiarism, data fabrication, double publication) have been completely observed by the authors.

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