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Original Article

Foreskin development before adolescence in 2149 schoolboys

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Background: We examined the external genitalia of 2149 elementary schoolboys in the suburban area of Taichung in Taiwan for an understanding of foreskin development before adolescence.
Methods: The study's subjects comprised 692 first-grade boys, 725 fourth-grade boys, and 732 seventh-grade boys. The foreskin's condition was classified as: type I (normal prepuce), type II (adhesion of prepuce), type III (partial phimosis), type IV (phimosis) and type V (circumcised foreskin). Other abnormalities of the genitalia also were recorded. All of the examinations were performed by the same urologist.
Results: The incidence of type I foreskin was 8.2% in first-grade boys, 21.0% in fourth-grade boys, and 58.1% in seventh-grade boys. The incidence of type IV foreskin was 17.1% in first-grade boys, 9.7% in fourth-grade boys, and 1.2% in seventh-grade boys. Only one boy had balanoposthitis. Other abnormalities included inguinal hernia ($n = 2$), hydrocele ($n = 12$), cryptorchitism ($n = 8$), varicocele ($n = 22$), and subcoronal-type hypospadia ($n = 1$).
Conclusions: Physiological phimosis declines with age. Most boys with phimosis in this study did not require treatment.

Key words development, foreskin, phimosis, prepuce, schoolboy.

Introduction

The foreskin is a simple fold of skin composed of an outer keratinized layer and an inner mucosal layer, lining a preputial sac.[1,2] The foreskin is thought to primarily protect the glans penis. It is invariably unretractable at birth, but this state is transient and resolves in nearly all boys.[3]

Neonatal circumcision is common in some western countries but is not common in eastern countries.[4–6] There are many uncircumcised boys in Taiwan and some of their parents are anxious about their unretractible foreskin. The anxiety of these parents becomes stronger when the boys are in school with circumcised classmates. Although many authors indicate that routine circumcision is not necessary,[7,8] no studies that focus on foreskin development in schoolboys have been published recently. In this study, we examined the foreskin and external genitalia of 2149 schoolboys to provide current information on foreskin development in this population.

Methods

Our institution annually provides primary health examination services for first grade, fourth grade, and seventh grade students in Dali and Tanzih, both suburbs of Taichung, Taiwan. When we provided this service in March and April, 2004, 2149 boys from six elementary schools and three junior high schools were eligible for this study. There were 692 first-grade boys, 725 fourth-grade boys, and 732 seventh-grade boys. Almost all first-grade boys were 7 years old, the fourth-grade boys were 10 years old, and the seventh-grade boys were 13 years old.

The foreskin was categorized into five types: type I (normal), the entire glans penis was visible after retraction of the foreskin; type II (adhesion of prepuce), the urethral meatus and part of the glans penis was visible after retraction of the foreskin; type III (partial phimosis), the urethral meatus was visible but not the glans penis after retraction of the foreskin; type IV (phimosis), the urethral meatus and glans penis were invisible after foreskin retraction; and type V (circumcised), circumcised foreskin. Types I–IV are illustrated in Figure 1. The external genitalia of all boys was observed by the same urologist (T. F. Hsieh). The type of foreskin and other abnormalities of the external genitalia were recorded.

The χ^2-test was used to analyze the foreskin distribution in the three groups. A P-value of < 0.01 was considered to be statistically significant.

Results

The incidence of type I foreskin was 8.2% in first-grade boys, 21.0% in fourth-grade boys, and 58.1% in seventh-grade boys. The incidence of type IV foreskin was 17.1% in first-grade boys, 9.7% in fourth-grade boys, and 1.2% in seventh-grade boys (Table 1). The P-value for foreskin distribution in these three groups was < 0.01.

Visible abnormalities among the 2149 boys included inguinal hernia, hydrocele, cryporchitism, operative scar in

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Table 1 Foreskin presentation in the schoolboys

Grade	Foreskin type (%)					Total
	Type I	Type II	Type III	Type IV	Type V	
1	8.2	39.5	32.8	17.1	2.5	692
4	21.0	40.7	25.1	9.7	3.6	725
7	58.1	28.9	6.8	1.2	5.1	732

$P < 0.001$. Type I (normal), the entire glans penis was visible after retraction of the foreskin; type II (adhesion of prepuce), the urethral meatus and part of the glans penis was visible after retraction of the foreskin; type III (partial phimosis), the urethral meatus was visible but not the glans penis after retraction of the foreskin; type IV (phimosis), the urethral meatus and glans penis were invisible after foreskin retraction; type V (circumcised), circumcised foreskin.

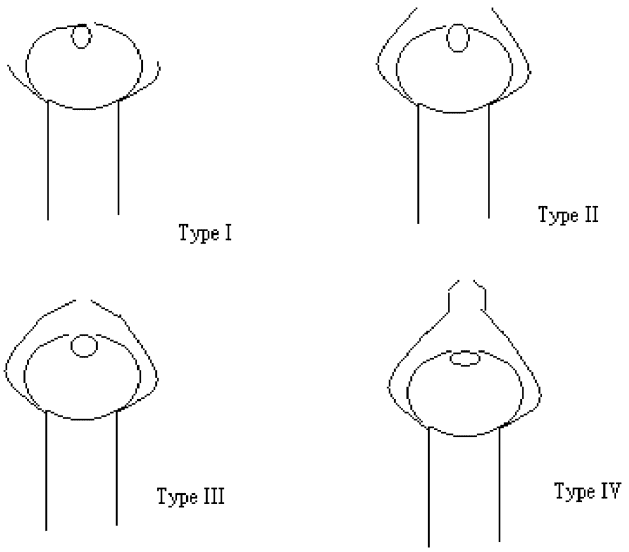

Fig. 1 Classification of the foreskin. Type I (normal), the entire glans penis was visible after retraction of the foreskin; type II (adhesion of prepuce), the urethral meatus and part of the glans penis was visible after retraction of the foreskin; type III (partial phimosis), the urethral meatus was visible but not the glans penis after retraction of the foreskin; type IV (phimosis), the urethral meatus and glans penis were invisible after foreskin retraction.

the inguinal area, balanoposthitis, varicocele and hypospadia (Table 2).

Discussion

There have been few studies of foreskin development in school-aged boys. We believe that our study provides detailed data that can be used to explain foreskin development clinically. We found that 49.9% of first graders, 34.8% of fourth graders, and 8.0% of seventh graders have unretractable foreskin (types III and IV). The decrease in the frequency of unretractable foreskin with increasing age indicates that the rate of physiological phimosis is very high among elementary schoolboys. The frequency of spontaneously resolved phimosis is high; therefore, caution should be taken when contemplating treatment for school-aged boys with phimosis.

Table 2 Other abnormalities found in the schoolboys

Condition	Grade 1	Grade 4	Grade 7	Total
Inguinal hernia	1	0	1	2
Hydrocele	3	5	4	12
Cryporchitism	7	1	0	8
Operative scar in inguinal area	9	11	2	22
Balanoposthitis	0	1	0	1
Varicocele	0	3	19	22
Hypospadia	0	0	1	1

Foreskin development was described by Gairdner after he examined 54 boys serially to the age of 5 years in 1949.[3] He reported that 90% of prepuces became retractable by the age of 3 years in those boys. Foreskin development also was described by Oster, who followed 173 boys annually from 6–17 years of age in 1968.[9] He found that the incidence of preputial adhesion decreased from 70% at ages 6–7 years to 5% at 16–17 years. The physiological phimosis rate reported in that study was high. In 1996, Kayaba *et al*. reported on the foreskin condition in 603 Japanese boys,[10] but only 33.3% of the boys were older than 5 years and only 5% of the boys were older than 11 years. The present study provides a larger number of schoolboys and more current data with a statistical analysis of foreskin development in schoolboys. All the boys were observed by the same observer with the same classification. Observational error was thus avoided.

The classification of foreskin used in this study was modified from that proposed by Kayaba *et al*.[10] In Kayaba's classification, forceful retraction of the foreskin might be necessary to classify the foreskin type, especially in cases with a tight prepuce. Although we initially planned to check the tightness of the foreskin in this study, we abandoned the idea because it was too difficult to perform by only one physician without the aid of the students' parents. The foreskin was examined by gentle retraction without attempting to identify the tightness of the prepuce in this study. Our classification simplified the observation of the foreskin.

In these 2149 boys, only one boy was found to have balanoposthitis. Balanoposthitis is unusual in schoolboys.[10] Kayaba *et al*. suggested that poor genital hygiene is more

responsible for balanoposthitis than unretractability of the foreskin.[10] Our study also supports this point. We found that the frequency of operative scars in the inguinal area decreased after the first year of junior high school, possibly because the scars were too fine to be identified. In fact, the observation in this study took place in a school, not in a hospital; therefore, some ambiguous abnormalities were not easy to identify.

Conclusions

This study provides further information about foreskin development before adolescence and can be applied in daily practise to treat and explain the foreskin's condition. Almost all boys' foreskin can be easily retracted to expose the urethra meatus in the first year of junior high school. Only a few boys have true pathological phimosis that requires treatment.

References

1 Parkash S, Jeyakumar S, Subramanyan K *et al.* Human subpreputial collection: its nature and formation. *J. Urol.* 1973; **110**: 211–12.
2 Cold CJ, Taylor JR. The prepuce. *BJU Int.* 1999; **83** (Suppl. 1): 34–44.
3 Gairdner D. The fate of the foreskin. *Br. Med. J.* 1949; **2**: 1433–7.
4 Lerman SE, Liao JC. Neonatal circumcision. *Pediatr. Clin. North Am.* 2001; **48**: 1539–57.
5 Laumann EO, Masi CM, Zuckerman EW. Circumcision in the United States: prevalence, prophylactic effects, and sexual practice. *JAMA* 1997; **277**: 1052–7.
6 Shannon FT, Horwood LJ, Fergusson DM. Infant circumcision. *N. Z. Med. J.* 1979; **90**: 283–4.
7 American Academy of Pediatrics. Report of the task force on circumcision. *Pediatrics* 1989; **84**: 388–91.
8 Poland RL. The question of routine neonatal circumcision. *N. Engl. J. Med.* 1990; **322**: 1312–15.
9 Oster J. Further fate of the foreskin. Incidence of preputial adhesions, phimosis, and smegma among Danish schoolboys. *Arch. Dis. Child.* 1968; **43**: 200–3.
10 Kayaba H, Tamura H, Kitajima S, Fujiwara Y, Kato T, Kato T. Analysis of shape and retractability of the prepuce in 603 Japanese boys. *J. Urol.* 1996; **156**: 1813–15.