Histopathological Changes of the Preputial Mucosa Due to Retained Smegma

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Abstract

Background: The smegma is cheese-like sebaceous matter which is a combination of shedded skin cells, skin oils and moistures. When the foreskin is not retractable, smegma can accumulate between the inner surface of the foreskin and the glans and looks like a yellowish-white, clearly defined, soft mass called smegma cyst which causes irritation. These chronic irritations may be injurious to cells and causes histological changes in preputial epithelium. This substance has been linked to penile cancer, although a clear etiology has not been established.

Purpose: To assess the histopathological changes of preputial mucosa due to presence of retained smegma in children.

Methods: This cross-sectional study was conducted at the Department of Paediatric Surgery, Bangladesh Medical University, Dhaka, Bangladesh, from March, 2021 to August, 2022. Samples were collected purposively. Proper clinical history, physical examination and initial investigation reports were recorded in a standard data sheet. Total 34 patients with smegmal cyst have been assessed by histopathological examination after circumcision. Histopathological reports were analyzed to asses the changes of preputial mucosa due to retained smegma. Data processing and analysis was performed by Statistical Package for the Social Sciences software.

Results: Out of 34 patients, 17 were in 5-8 years age group and mean age (±SD) was 5.27 ± 2.60 years. Highest 10 patients had retained smegma for 6 months, 8 patients for 5 months and 4 patients for 3 months with mean 4.73 ± 1.52 months. Overall histopathological change occurred in 25 patients and mean (±SD) was 5.40 ± 1.12. Among them cellular atrophy occurred in 22 patients and ulceration occurred in 3 patients. Duration of retained smegma in relation with histopathological changes had positive correlation. Overall changes occurred in 25 patients, mean was 5.40 ± 1.12. Cellular atrophy was present in 22 patients, mean of 5.50 ± 0.86. Ulceration was present in 3 patients, with a mean of 6.67 ± 0.58. Dysplasia was present in 1 patient, mean was 5.0. Koilocytic changes present in 2 patients, mean was 4.0 ± 2.83.

Conclusion: Retained smegma has an injurious effect at the cellular level. Majority of histopathological changes seen in cell cytoplasm. The changes are in the form of atrophy of cells, ulceration and koilocytic changes.

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Introduction

Penile cancer is a rare but devastating disease that primarily affects uncircumcised men, with a lifetime risk of 1 in 600 in the USA.[1] While the exact etiology of this cancer is not fully understood, accumulating evidence suggests that smegma, the cheese-like sebaceous matter that accumulates under the foreskin, may play a role. Smegma is composed of shed skin cells, skin oils, and moisture, and its production increases in puberty and remains high in adults.[2] It may aggregates to form a lump, smegma stone or smegma cyst. Smegma is known to harbor various pathogenic bacteria and its decomposition products may be carcinogenic. Chronic irritation from smegma accumulation can also cause histological changes in the preputial epithelium.[3] In this context, this research medical article aims to investigate the relationship between smegma and penile cancer and to assess the potential benefits of circumcision in reducing the risk of this disease. The article will review the current understanding of the pathophysiology of smegma-related penile cancer and discuss the evidence supporting the role of circumcision in its prevention. The findings of this study may have important implications for public health interventions aimed at reducing the incidence of penile cancer in high-risk populations.

Objective

To determine the morphological change of the preputial mucosa due to the presence of retained smegma in children.

Methods

This cross-sectional study was conducted from March 2021 to October 2022. Total 34 patients willing to do ritual circumcision were visited at the Paediatric Surgery Outpatient Department. In outpatient department, detailed history were taken and thorough clinical examinations were done. Then their findings were recorded in pretested data collection sheet. Pre-procedure evaluation was done by history, physical examination and investigations such as CBC, BT, CT, serum creatinine, urine R/M/E, Blood grouping, PT, APTT, chest X ray. Circumcision was be done as a day case surgery under general anaesthesia by the Guillotine method. Patients were discharged from recovery room on the same day. The obtained data were entered into Statistical Package for the Social Sciences software and were analyzed by descriptive statistics such as frequency distribution, percentage, mean and standard deviation.

Histopathology

Histopathology was performed by the same pathologist post-operatively. After circumcision, the resected prepuces were contained in 10% formalin and specimen was sent to the Department of Pathology for histopathological examination as early as possible. Specimens were stained with hematoxylin and eosin stain and examined under a microscope. Pathological changes such as changes in the cell wall, cytoplasm, or nucleus were noted.

Result

This study aimed to assess the histopathological changes in the preputial mucosa due to retained smegma. A total of 34 patients were included in the study, and their age range was between 1-12 years, with a mean age of 5.27±2.60 years.

The study found that histopathological changes occurred in 25 (73.5%) patients and did not occur in 9 (26.5%) patients. The most common histopathological change observed was cellular atrophy in 22 (64.7%) patients, followed by ulceration in 3 (8.8%) patients, koilocytic changes in 2 (5.9%) patients and dysplasia in 1 (2.9%) patient.

Table I: Distribution of the study subjects by histopathological changes (n=34)

Attributes	Frequency	Percentage (%)
Overall Histopathological changes		
Changed	25	73.5
Histopathological changes		
Cellular atrophy	22	64.7
Ulceration	3	8.8
Koilocytic changes	2	5.9
Dysplasia	1	2.9
Total	34	100.0

The duration of retained smegma was found to be related to histopathological changes, with a mean duration of 5.40 ± 1.12 months in patients with histopathological changes and 2.89 ± 0.78 months for patients without histopathological changes.

Table II: Duration of retained smegma in relation with frequency of patients (n=34)

Duration of retained smegma (months)	Frequency	Percentage (%)
2	4	11.76
3	4	11.76
4	5	14.71
5	8	23.53
6	10	29.41
7	3	8.82
Total	34	100.0

Table III: Duration of retained smegma relation with histopathological changes (n=34)

Histopathological changes	Number of patients	Duration of retained smegma relation (months)		p-value
		Mean	SD	
Overall changes				
Yes	25	5.40	1.12	<0.001*
No	9	2.89	0.78	
Cellular atrophy				
Present	22	5.50	0.86	<0.001*
Absent	12	3.33	1.50	
Ulceration				
Present	3	6.67	0.58	0.019*
Absent	31	4.55	1.46	
Dysplasia				
Present	1	5.0		0.863 ns
Absent	33	4.73	1.55	
Koilocytic changes				
Present	2	4.0	2.83	0.490ns
Absent	32	4.78	1.48	

p-value obtained by Unpaired t-test, *significant, ns= not significant

Table showing duration of retained smegma in relation to histopathological changes. Overall changes occurred in 25 patients, mean (±SD) was 5.40 ± 1.12, p-value <0.001 which was statistically significant. Cellular atrophy was present in 22 patients, with a mean of 5.50, standard deviation was 0.86, p-value <0.001, which was statistically significant. Ulceration was present in 3 patients; mean of 6.67, a standard deviation of 0.58, and a p-value was 0.019, which was statistically significant. Dysplasia was present in 1 patient, mean was 5.0, p-value 0.863, which was statistically not significant. koilocytic changes present in 2 patients, mean was 4.0, standard deviation was 2.83, p-value 0.490, which was statistically not significant (Table III).

Discussion

This cross-sectional study was carried out in the Department of Paediatric Surgery, Bangladesh Medical University, Dhaka, Bangladesh. The main aim of this study was to find out the histopathological changes of the preputial mucosa due to retained smegma.

Significant histopathological changes in preputial mucosa are expected to occur in retained smegma. Because long-standing retained smegma causes irritation to the cells.

In this study showed the age distribution of the study patients. A total of 34 subjects were included in this study. Out of 34 subjects, majority 50.0% was 17 in number in the age group of 5-8 years, then 38.2% was 13 in number in the age group of 1-4 years, then 11.8% was 4 in number in the age group of 9-12.

Present study revealed among 34 patients, preputial mucosal histopathology was normal in 26.5% patients and histopathological changes occurred in 73.5% population.

Pratt-Thomas et al., 1956 conducted an experimental project on mice by introducing smegma into their bodies, and the result showed pathological changes occurred in majority portion of mice due to smegma.[4]

In 1991 Brinton et al., published the results of potential risk factors for penile cancer in men in China. Using raw data, five cases had no smegma, 25 had smegma, and 15 were unreported. For the control men, 46 had no smegma, 21 had smegma, and two were unreported. Using the raw data, the association was significant. Likewise, the smegma association is more easily explained by the association of phimosis and penile cancer.[5]

In January 2006 RS Van Howe and FM Hodges published a review article, where they reviewed different studies conducted on animal and human subjects. They conclude that the carcinogenicity of smegma cannot be justified on scientific grounds.[6]

In this study showed the distribution of the study patients by histopathological changes in the form of cellular atrophy. Out of 34 patients, cellular atrophy occurred in 22 (64.7%) patients and no change occurred in 12 (35.3%) patients.

This study showed the histopathological changes in the form of ulceration. Out of 34 patients, ulceration occurred in 3(8.8%) patients and no change occurred in 31(91.20%) patients.

The present study revealed the distribution of the study patients by histopathological changes in the form of dysplasia. Out of 34 subjects, dysplasia occurred in 1(2.9%) patient and no change occurred in 33(97.4%) patients.

In this study showed the distribution of the study patients by histopathological changes in the form of koilocytic changes. Out of 34 subjects, koilocytic changes occurred in 2 (5.9%) of patients and no change occurred in 32 (94.1%) patients.

Okodo et al.,2020, revealed that koilocytic change is a cytopathological effect of particular high risk genotype of HPV which have very high oncogenic potential.[7]

Present study revealed the duration of retained smegma in relation with frequency of patients. Out of 34 patients, 4 (11.76%) patients had retained smegma for 2 months. 4 (11.76%) patients had retained smegma for 3 months. 5 (14.71%) patients had retained smegma for 4 months. 8 (23.53%) patients

had retained smegma for 5 months. 10 (29.41%) patients had retained smegma for 6 months. 3 (8.82%) patients had retained smegma for 7 months.

The present study revealed the relationship between the duration of retained smegma and histopathological changes of the preputial mucosa. Overall histopathological changes were significantly more common in patients with longer periods of smegma retention, indicating that chronic accumulation of smegma may play an important role in initiating mucosal injury. This finding supports the concept that prolonged exposure of the preputial epithelium to smegma can lead to persistent local irritation and inflammatory responses.

Cellular atrophy showed a statistically significant association with longer duration of retained smegma ($p < 0.001$). Patients with cellular atrophy had higher mean duration compared to those without atrophic changes. These findings imply that chronic retention may compromise mucosal integrity, possibly through persistent inflammation, local infection, or mechanical irritation, ultimately leading to atrophic and ulcerative changes. In this study, Ulceration observed in a small number of patients, was associated with the longest duration of smegma retention and showed a statistically significant association ($p < 0.019$), implying that it represents a more advanced stage of mucosal damage.

In contrast, dysplasia and koilocytic changes did not show a significant association with the duration of smegma retention, likely due to their low frequency and the involvement of additional etiological factors.

Overall, the findings suggest that prolonged smegma retention is significantly linked to inflammatory and degenerative changes of the preputial mucosa. These results highlight the importance of maintaining proper genital hygiene and early management of predisposing conditions to prevent progressive mucosal damage.

Present study revealed that retained smegma caused histopathological changes to preputial mucosa. Histopathological changes occurred in the form of cellular atrophy, ulceration, koilocytic change and dysplasia.

Conclusion

This study shows that retained smegma causes significant histopathological changes in the preputial mucosa, particularly cellular atrophy and ulceration supporting the rationale for effective management of smegma accumulation. Longer duration of smegma retention was significantly associated with these changes. Dysplasia and koilocytic changes were infrequent and not significantly related to duration, suggesting the involvement of additional factors. The findings underscore the importance of proper genital hygiene and indicating the need for appropriate management of smegma accumulation to prevent progressive mucosal damage. Public health education and clinical practice should therefore emphasize proper genital hygiene in children, especially those with non-retractile foreskins, to reduce the risk of epithelial injury. Understanding these cellular changes is crucial for appreciating the potential, even if indirect, pathways from smegma accumulation to adverse penile health outcomes .

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