



PHIMOSIS AS A RISK FACTOR FOR PENILE CARCINOMA: A CASE-CONTROL STUDY FROM A TERTIARY CARE CENTER IN WESTERN INDIA

Internal Medicine

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ABSTRACT

Background: Penile carcinoma is a rare but aggressive malignancy with higher prevalence in developing countries. Phimosis has been identified as one of the strongest risk factors for its development. **Aim:** To assess the association between phimosis and penile carcinoma in a hospital-based case-control study. **Methods:** A case-control study was conducted at Vedantaa Institute of Medical Sciences, Dahanu, Palghar, Maharashtra, India, from December 2023 to August 2025. Thirty participants were included, comprising 15 histologically confirmed penile carcinoma patients (cases) and 15 age-matched controls without malignancy. Data regarding phimosis, circumcision status, and hygiene practices were collected. Statistical analysis was performed using SPSS version 23, and odds ratios (OR) with 95% confidence intervals (CI) were calculated. **Results:** Phimosis was present in 12 of 15 cases (80%) compared to 3 of 15 controls (20%), demonstrating a significant association (OR: 16.0; 95% CI: 3.0–83.9; $p < 0.001$). Poor genital hygiene was observed in 73.3% of cases versus 33.3% of controls ($p = 0.04$). Early circumcision was protective, observed only among controls. **Conclusion:** Phimosis is a strong and independent risk factor for penile carcinoma. Early management of phimosis, promotion of circumcision, and good genital hygiene may reduce the incidence of this preventable malignancy.

KEYWORDS

penile carcinoma; phimosis; circumcision; genital hygiene; case-control study

BACKGROUND

Penile carcinoma is a rare malignancy in developed nations, accounting for less than 1% of male cancers. Still, it represents a significant health burden in many developing countries, including parts of India, Africa, and South America.[1] The disease is associated with substantial morbidity, psychological distress, and often delayed presentation, leading to poor outcomes. The etiology of penile carcinoma is multifactorial, with several well-recognized risk factors including poor genital hygiene, chronic inflammation, human papillomavirus (HPV) infection, absence of neonatal circumcision, and phimosis.[2,3]

Phimosis, defined as the inability to retract the prepuce over the glans penis, has been consistently identified as one of the strongest independent risk factors for penile cancer. It predisposes to smegma accumulation, chronic inflammation, and persistent infection, creating a carcinogenic microenvironment.[4] Epidemiological studies suggest that the risk of penile carcinoma is markedly reduced in populations where circumcision, particularly in early childhood, is routinely practiced.[5] In contrast, populations with higher prevalence of phimosis show a higher incidence of the disease.[6]

Although multiple international studies have demonstrated this association, there is limited Indian data exploring phimosis as a risk factor in penile carcinoma within a controlled study design. Given the higher prevalence of phimosis and poor genital hygiene in rural and resource-limited settings, understanding this relationship is crucial. Therefore, this study assessed the association of phimosis with penile carcinoma using a case-control design in a tertiary care hospital in western India.

MATERIALS AND METHODS

Study Design And Setting

This hospital-based case-control study was conducted in the Department of Urology, Vedantaa Institute of Medical Sciences, Dahanu, Palghar, Maharashtra, India. The study was conducted over five months, from December 2023 to August 2025. Ethical clearance was obtained from the Institutional Ethics Committee before commencement of the study. All participants provided written informed consent before enrollment.

Study Population

A total of 30 participants were included in the study. The case group

comprised 15 consecutive patients with histologically confirmed penile carcinoma diagnosed during the study period. The control group consisted of 15 age-matched men attending the urology outpatient clinic for non-malignant urological conditions such as hernia, hydrocele, or renal calculi, with no evidence of penile carcinoma or premalignant lesions.

Inclusion And Exclusion Criteria

Men aged 30 years and above were eligible for inclusion. Patients with biopsy-proven penile carcinoma were taken as cases, while controls were free of any malignant penile pathology. Exclusion criteria included patients who refused consent, men with incomplete clinical data, and those with a history of circumcision performed in adulthood after diagnosis of pre-malignant lesions.

Data Collection

Clinical and demographic data were collected using a structured proforma. Information recorded included age, residence, educational status, presence or absence of phimosis, circumcision status, personal hygiene practices, sexual history, and smoking habits. Genital examination was performed for both cases and controls to confirm the presence of phimosis. For cases, tumor characteristics were documented, and histological confirmation was obtained from biopsy or surgical specimens.

Outcome Measures

The primary outcome was the presence of phimosis in cases compared with controls, and the strength of association between phimosis and penile carcinoma. Secondary outcomes included the role of circumcision status and hygiene practices in modifying disease risk.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using SPSS version 23. Continuous variables such as age were expressed as mean $\pm$ standard deviation, and categorical variables such as presence of phimosis, circumcision, and hygiene practices were expressed as frequencies and percentages. The Chi-square test or Fisher's exact test was applied for categorical variables. Odds ratios (OR) with 95% confidence intervals (CI) were calculated to estimate the strength of association between phimosis and penile carcinoma. A p -value < 0.05 was considered statistically significant.

RESULTS

A total of 30 men were included in this study, comprising 15 patients

with histologically confirmed penile carcinoma (cases) and 15 age-matched men without penile carcinoma (controls). The findings are presented under demographics, phimosis prevalence, circumcision status, hygiene practices, and combined risk analysis.

Table 1. Demographic Characteristics Of Study Participants

Variable	Cases (n=15)	Controls (n=15)	p-value
Mean age (years ± SD)	57.2 ± 7.6	55.8 ± 8.2	0.62
Rural residence n (%)	9 (60.0)	8 (53.3)	0.72
Illiteracy n (%)	7 (46.7)	6 (40.0)	0.72

Table 2. Prevalence Of Phimosis Among Cases And Controls

Phimosis Status	Cases (n=15)	Controls (n=15)	Odds Ratio (95% CI)	p-value
Present	12 (80.0)	3 (20.0)	16.0 (3.0–83.9)	<0.001
Absent	3 (20.0)	12 (80.0)		

Table 3. Circumcision Status of Participants

Circumcision Status	Cases (n=15)	Controls (n=15)	p-value
Early childhood	0 (0.0)	2 (13.3)	0.14
No circumcision	15 (100.0)	13 (86.7)	

Table 4. Hygiene Practices and Penile Carcinoma Risk

Hygiene Status	Cases (n=15)	Controls (n=15)	Odds Ratio (95% CI)	p-value
Good	4 (26.7)	10 (66.7)	5.5 (1.2–25.4)	0.04
Poor	11 (73.3)	5 (33.3)		

Table 5. Combined Effect of Phimosis and Hygiene

Risk Factor Combination	Cases (n=15)	Controls (n=15)	Odds Ratio (95% CI)	p-value
Phimosis + Poor hygiene	9 (60.0)	2 (13.3)	9.0 (1.6–50.1)	0.01
Neither risk factor	2 (13.3)	9 (60.0)		

DISCUSSION

This case-control study demonstrated that phimosis was strongly associated with penile carcinoma, with 80% of carcinoma patients presenting with phimosis compared to only 20% of controls. The calculated odds ratio (16.0) indicates a significantly elevated risk, consistent with previous reports from both Indian and international studies. Daling et al. showed that men with phimosis had an increased risk of both in situ and invasive penile cancer.[7] Similarly, Maden et al. reported phimosis as the single strongest risk factor, increasing risk nearly 12-fold.[8] The biological plausibility lies in the chronic inflammation, smegma retention, and recurrent infections seen in patients with phimosis, which collectively create a carcinogenic environment.[9]

The protective effect of circumcision, particularly when performed in early childhood, was evident in this study, as none of the circumcised individuals developed carcinoma. This finding is in line with large epidemiological studies showing markedly reduced incidence of penile cancer in populations where neonatal circumcision is routinely practiced.[10,11] Morris et al. demonstrated that circumcision confers long-term protection by eliminating the foreskin, thereby reducing the risk of smegma accumulation and HPV infection.[12] Poor genital hygiene was also significantly associated with penile carcinoma in our study, reinforcing earlier findings by Christodoulidou et al. that poor hygiene acts as a cofactor, especially in uncircumcised men.[13]

Our findings highlight the importance of recognizing phimosis as an independent and modifiable risk factor for penile carcinoma. Early detection and treatment of phimosis through medical or surgical means may play a preventive role. The limitations of this study include its relatively small sample size and single-center design, which may restrict generalizability. However, the results add valuable evidence from a rural Indian setting, where awareness and preventive strategies are crucial. Larger multicenter studies incorporating molecular data such as HPV status may further strengthen the understanding of phimosis, hygiene, and carcinogenesis interactions.

CONCLUSION

Phimosis was strongly associated with penile carcinoma in this case-control study. Early circumcision and maintenance of genital hygiene appear protective. Public health measures focusing on early treatment of phimosis and awareness campaigns may help reduce the burden of penile carcinoma in India.

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