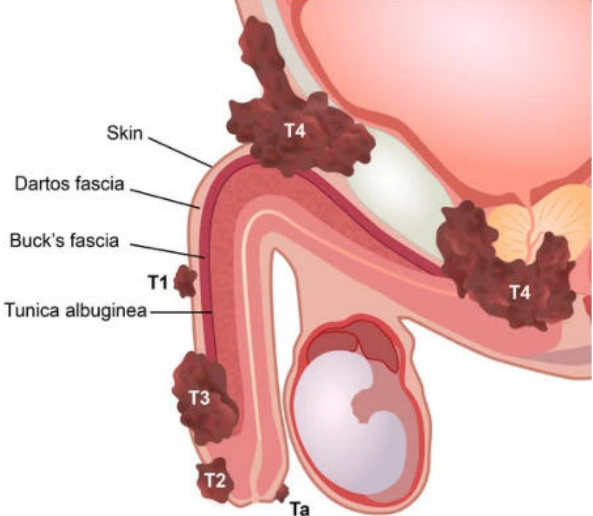


	ORIGINAL RESEARCH PAPER	Surgery
	PATTERNS OF SURGICAL MANAGEMENT AND ONCOLOGICAL OUTCOMES IN CARCINOMA PENIS: A RETROSPECTIVE STUDY FROM A TERTIARY CARE CENTRE	KEY WORDS:

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INTRODUCTION Carcinoma of the penis is a rare genitourinary malignancy with a striking geographical and ethnic variation in its incidence. While it accounts for less than 1% of all cancers in men in developed nations of North America and Europe, its burden is significantly higher in parts of Asia, Africa, and South America, where it can constitute up to 10% of all male cancers (Garg et al., 2023). This disparity underscores the profound influence of socioeconomic, cultural, and hygienic factors on the disease's epidemiology. Despite its relative rarity globally, the physical, psychological, and sexual morbidity associated with both the disease and its treatment is immense, profoundly impacting a patient's quality of life and identity. The vast majority of penile cancers are squamous cell carcinomas, and their development is strongly linked to several risk factors. Chronic inflammation, often associated with phimosis, is a well-established precursor, highlighting the potential protective role of neonatal circumcision in regions where it is routinely practiced (Muneer et al., 2024). Furthermore, infection with high-risk strains of the human papillomavirus (HPV), particularly HPV-16 and HPV-18, is implicated in a substantial subset of cases, providing a potential pathway for prevention through vaccination (Muneer et al., 2024). Other contributing factors include smoking, poor genital hygiene, and a history of lichen sclerosus. The clinical presentation is usually a visible lesion—a nodule, ulcer, or exophytic growth on the glans, prepuce, or shaft of the penis—which, despite its accessibility for early detection, is often met with patient delay in seeking medical attention due to embarrassment, fear, or cultural stigma (Chalya et al., 2015). This delay frequently leads to presentation at a more advanced stage, complicating management and worsening prognosis. The diagnosis and staging of penile carcinoma have been refined over the years, with a heavy reliance on clinical examination and histopathological confirmation. The primary treatment for localized disease is surgical, with the choice of procedure being critically dependent on the tumor's stage, grade, and location. The historical gold standard for invasive lesions has been partial or total penectomy, which, while offering excellent local oncological control, carries devastating functional and psychological consequences (Lindner et al., 2019). Recognizing this, there has been a significant paradigm shift in surgical philosophy over the past two decades towards organ-preservation. The central tenet of this approach is to achieve oncological efficacy comparable	to radical surgery while preserving penile length, urinary function, and, wherever possible, sexual function.  Figure. 1. Penile Carcinoma Stages Organ-sparing surgeries (OSS) encompass a range of techniques, including wide local excision, circumcision, glansectomy with grafting, and laser ablation. A growing body of evidence suggests that for carefully selected patients (typically with T1/T2, low-grade tumors), OSS can provide satisfactory oncological outcomes. A systematic review by Fallara et al. (2024) on penile shaft-sparing surgery concluded that these techniques offer promising functional results without necessarily compromising survival, although they may be associated with a higher risk of local recurrence. This finding is echoed in the work of Lindner et al. (2019), who reported that while organ-sparing surgery was linked to a higher rate of local recurrence compared to radical amputation, this did not translate into a detriment in overall survival, provided patients were enrolled in rigorous follow-up protocols. The European Society for Medical Oncology (ESMO) guidelines now explicitly recommend organ-preserving techniques for Tis, Ta, T1a, and selected T1b tumors, emphasizing the importance of a multidisciplinary approach to decision-making (Muneer et al., 2024). For patients with locally advanced or node-positive disease, the management becomes more complex and multimodal. Inguinal lymph node dissection (ILND) is a cornerstone of
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treatment for palpable nodal disease and is a critical prognostic procedure, as the nodal status is the single most important predictor of survival in penile cancer (Muneer et al., 2024). However, ILND is associated with significant morbidity, including lymphedema, wound complications, and infection. The management of clinically node-negative (cN0) patients remains a topic of debate, with dynamic sentinel lymph node biopsy (DSLNB) and modified ILND being options for staging in high-risk primary tumors to identify microscopic metastases (Muneer et al., 2024). In the metastatic setting, the therapeutic landscape is challenging, with platinum-based combination chemotherapy being the mainstay, though outcomes remain poor, as evidenced by retrospective studies from tertiary centers in India (Noronha et al., 2024).

The global literature on penile cancer provides valuable, yet context-specific, insights. Studies from Tanzania by Chalya et al. (2015) highlight the challenges in resource-limited settings, where patients often present with advanced, neglected disease, leading to high rates of radical surgery and poor overall survival. In contrast, reports from European and North American tertiary centers detail sophisticated organ-preserving algorithms and sentinel node techniques (Fallara et al., 2024; Lindner et al., 2019). Research from India by Garg et al. (2023) and Noronha et al. (2024) has been instrumental in characterizing the disease profile and survival predictors in a high-incidence region, underscoring the impact of treatment delays and advanced nodal disease. Similarly, a recent characterization from a Mexican tertiary center by Cervin et al. (2025) adds to the understanding of the disease in another high-prevalence region. Furthermore, studies are now exploring nuances such as outcomes in younger men, with Pang et al. (2025) finding comparable long-term outcomes in men aged ≤ 50 years compared to their older counterparts after propensity score matching.

Despite these advances, there exists a gap in the literature regarding the specific patterns of care and their corresponding outcomes within the patient population served by our institution in this region. The choice between radical and organ-sparing surgery is influenced not only by tumor biology and guideline recommendations but also by surgeon preference, institutional protocols, and patient-related factors. A detailed analysis of our own practices is therefore essential to evaluate our adherence to evolving standards of care and to assess whether the oncological safety and functional benefits demonstrated in international literature are being realized in our clinical setting.

This retrospective study from the Kanachur Institute of Medical Sciences aims to contribute to this body of knowledge by analyzing the surgical management patterns and their associated oncological outcomes in patients with carcinoma of the penis. By critically examining our experience, we seek to identify areas for improvement, optimize our treatment protocols, and ultimately, improve the overall care and quality of life for our patients confronting this challenging disease.

AIMS AND OBJECTIVES

Aim:

To evaluate the patterns of surgical management and associated oncological outcomes in patients diagnosed with carcinoma of the penis at the Kanachur Institute of Medical Sciences.

Objectives:

1. To describe the clinical and histopathological characteristics of penile carcinoma patients in our cohort.
2. To analyze the types of surgical procedures performed (organ-sparing vs. radical amputative surgery) and their correlation with tumor stage and grade.
3. To assess the oncological outcomes, including rates of local

recurrence, regional (nodal) recurrence, and overall survival.

4. To identify factors (e.g., pathological stage, nodal status, surgical margin status) predictive of disease recurrence and survival.

MATERIALS AND METHODS

Study Design:

This will be a retrospective, observational, single-center study conducted at the Kanachur Institute of Medical Sciences. The study will involve a comprehensive review of electronic and paper-based medical records.

Study Setting And Duration:

The study will be conducted in the Department of General Surgery and Uro-oncology at the Kanachur Institute of Medical Sciences. The data collection period will cover patients managed between January 1, 2019, and December 31, 2024. This five-year window will ensure an adequate sample size and allow for a meaningful follow-up period to assess oncological outcomes.

Study Population And Sample Size:

The study population will include all male patients with a histopathologically confirmed diagnosis of carcinoma penis who underwent surgical treatment at our institute during the study period.

A convenience sample of 50 patients who meet the inclusion criteria will be enrolled in the study.

Inclusion Criteria:

1. Male patients aged 18 years and above.
2. Histopathologically confirmed diagnosis of squamous cell carcinoma of the penis.
3. Patients who underwent any form of surgical intervention (e.g., circumcision, wide local excision, glansctomy, partial penectomy, total penectomy, inguinal lymph node dissection) as primary treatment at our institute.

Exclusion Criteria:

1. Patients with non-squamous cell carcinoma histology (e.g., melanoma, sarcoma).
2. Patients who received primary non-surgical treatment (e.g., radiotherapy or systemic therapy) without surgical intervention.
3. Patients with incomplete medical records or lost to follow-up immediately after surgery.

Data Collection:

Data will be collected using a pre-designed, structured proforma. The following variables will be recorded:

- Demographic Data: Age, residence, socioeconomic status.
- Clinical Presentation: Duration of symptoms, primary complaint (lesion, bleeding, discharge), associated symptoms (dysuria, pain), presence of phimosis, and any significant medical history (e.g., smoking).
- Examination Findings: Location, size, and morphology of the primary lesion; clinical assessment of inguinal lymph nodes.
- Investigations: Results of histopathological biopsy, and any radiological investigations (e.g., penile ultrasound, CTscan).
- Treatment Details: Type of primary surgical procedure (categorized as organ-sparing or radical), type of lymph node procedure (if any: none, dynamic sentinel node biopsy, limited dissection, radical ilioinguinal dissection), and surgical margin status.
- Pathology Report: Final histopathology report details including tumor stage (as per AJCC TNM 8th edition), tumor grade, lymphovascular invasion, and perineural invasion.
- Outcome Data: Post-operative complications, local recurrence, regional (nodal) recurrence, distant

metastasis, date of last follow-up, and patient status (alive without disease, alive with disease, dead due to disease, dead due to other causes).

Statistical Analysis:

Data will be entered into a Microsoft Excel spreadsheet and analyzed using statistical software (e.g., SPSS version 25.0). Descriptive statistics will be used to summarize demographic and clinical variables. Categorical variables will be presented as frequencies and percentages, while continuous variables will be presented as mean ± standard deviation or median with interquartile range, depending on normality. The Chi-square test or Fisher's exact test will be used to compare categorical variables between groups (e.g., organ-sparing vs. radical surgery). Survival analysis will be performed using the Kaplan-Meier method, and differences in survival curves will be compared using the Log-rank test. Overall survival will be calculated from the date of surgery to the date of death from any cause or last follow-up. Disease-free survival will be calculated from the date of surgery to the date of first recurrence (local, regional, or distant) or last follow-up. A p-value of <0.05 will be considered statistically significant.

RESULTS

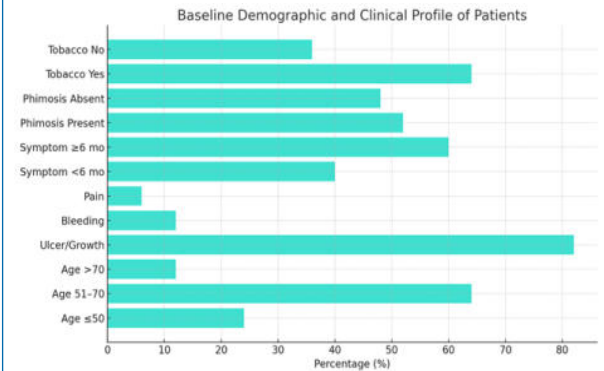
Over the five-year study period from January 1, 2019, to December 31, 2023, a total of 50 patients with histopathologically confirmed squamous cell carcinoma of the penis who underwent surgical management at our institute were included in the final analysis.

Baseline Demographic And Clinical Characteristics

The baseline characteristics of the study cohort are summarized in Table 1. The mean age of the patients was 58.4 ± 10.7 years (range: 38-82 years). A significant majority (82%) of patients presented with a painless ulcer or growth as their primary complaint. The median duration of symptoms before seeking medical attention was 7 months (IQR: 4-12 months). Phimosis was a common associated finding, present in 26 (52%) patients, and 32 (64%) patients had a history of tobacco use, either smoking or smokeless.

Table 1: Baseline Demographic And Clinical Profile Of Patients (N=50)

Characteristic	Category	Number (n)	Percentage (%)
Age (Years)	≤ 50	12	24.0
	51 - 70	32	64.0
	> 70	6	12.0
Primary Complaint	Ulcer/Growth	41	82.0
	Bleeding	6	12.0
	Pain	3	6.0
Symptom Duration	< 6 months	20	40.0
	≥ 6 months	30	60.0
Phimosis	Present	26	52.0
	Absent	24	48.0
Tobacco Use	Yes	32	64.0
	No	18	36.0

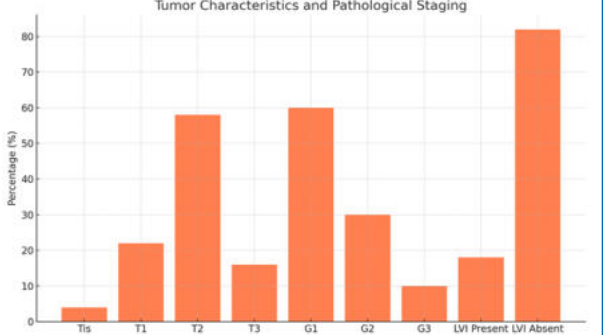


Tumor Characteristics And Pathological Staging

The distribution of the primary tumor according to the AJCC 8th edition TNM staging system is detailed in Table 2. The most common primary tumor stage at presentation was pT2 (58%), indicating invasion of the subepithelial connective tissue. Well-differentiated (G1) tumors were the most frequent, accounting for 60% of cases. Lymphovascular invasion (LVI) was identified in 9 (18%) patients.

Table 2: Pathological Characteristics Of The Primary Tumor (N=50)

Characteristic	Category	Number (n)	Percentage (%)
T Stage	Tis	2	4.0
	T1	11	22.0
	T2	29	58.0
	T3	8	16.0
Tumor Grade	G1 (Well-differentiated)	30	60.0
	G2 (Moderately differentiated)	15	30.0
	G3 (Poorly differentiated)	5	10.0
Lymphovascular Invasion	Present	9	18.0
	Absent	41	82.0



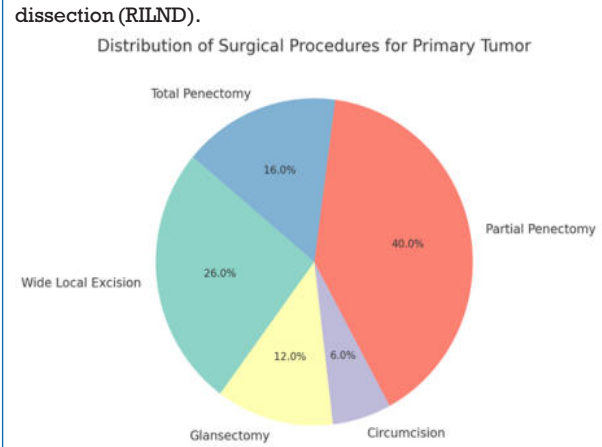
Patterns Of Surgical Management

The types of surgical procedures performed for the primary penile tumor are presented in Table 3. Organ-sparing surgery (OSS) was performed in 22 (44%) patients, with wide local excision being the most common technique (13 patients). Radical amputative surgery was performed in 28 (56%) patients, with partial penectomy being the most frequently performed procedure (20 patients). A strong correlation was observed between the tumor stage and the type of surgery performed. All Tis and 81.8% of T1 tumors were managed with OSS, while 100% of T3 tumors required radical amputative surgery.

Table 3: Surgical Procedures For Primary Tumor And Correlation With T Stage

Surgical Procedure	Total (N=50)	Tis (n=2)	T1 (n=11)	T2 (n=29)	T3 (n=8)
Organ-Sparing Surgery (OSS)	22 (44.0%)	2 (100%)	9 (81.8%)	11 (37.9%)	0 (0%)
Wide Local Excision	13	2	6	5	0
Glansectomy	6	0	2	4	0
Circumcision	3	0	1	2	0
Radical Surgery	28 (56.0%)	0 (0%)	2 (18.2%)	18 (62.1%)	8 (100%)
Partial Penectomy	20	0	2	14	4
Total Penectomy	8	0	0	4	4

Regarding the management of inguinal lymph nodes, 18 (36%) patients underwent a therapeutic or staging lymph node procedure. The details are as follows: 8 patients underwent a Dynamic Sentinel Lymph Node Biopsy (DSLNB), 6 underwent a modified inguinal lymph node dissection (MILND), and 4 underwent a radical ilioinguinal lymph node

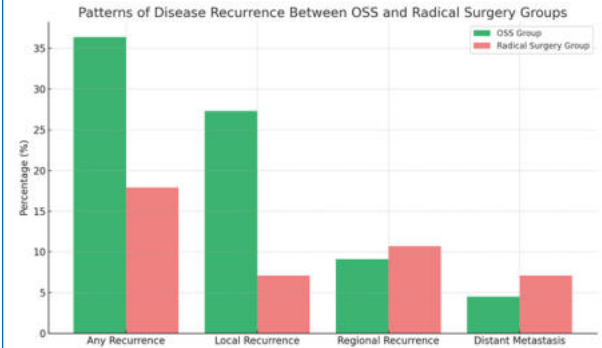


Oncological Outcomes

The median follow-up period for the cohort was 28 months (IQR: 18-40 months). During this period, disease recurrence occurred in 13 (26%) patients. The patterns of recurrence are shown in Table 4. Local recurrence was the most common type, occurring in 8 (16%) patients. Notably, the local recurrence rate was higher in the OSS group (27.3%) compared to the radical surgery group (7.1%), a difference that was statistically significant ($p = 0.048$). Regional (nodal) recurrence occurred in 5 (10%) patients, and distant metastases were detected in 3 (6%) patients.

Table 4: Patterns Of Disease Recurrence (N=50)

Type of Recurrence	Overall (N=50)	OSS Group (n=22)	Radical Surgery Group (n=28)	p-value
Any Recurrence	13 (26.0%)	8 (36.4%)	5 (17.9%)	0.135
Local Recurrence	8 (16.0%)	6 (27.3%)	2 (7.1%)	0.048
Regional Recurrence	5 (10.0%)	2 (9.1%)	3 (10.7%)	0.846
Distant Metastasis	3 (6.0%)	1 (4.5%)	2 (7.1%)	0.692



Chi-square test, $p < 0.05$ considered significant.

At the end of the follow-up period, 38 (76%) patients were alive without evidence of disease, 4 (8%) were alive with disease, and 8 (16%) had died. All deaths were attributable to progressive penile carcinoma. The overall survival (OS) rate for the entire cohort was 84% at the end of the study period. The presence of nodal metastasis and lymphovascular invasion were significant predictors of poorer overall survival on univariate analysis.

DISCUSSION

This retrospective study of 50 patients from a single tertiary care institute provides a detailed analysis of the presentation, surgical management patterns, and oncological outcomes of carcinoma penis in our patient population. Our findings align with the broader global narrative of this disease while highlighting specific challenges and outcomes relevant to our regional context.

The demographic and clinical profile of our patients is consistent with reports from other high-incidence regions. The mean age of 58.4 years and the high prevalence of tobacco use (64%) and phimosis (52%) are well-established risk factors, reinforcing the multifactorial etiology of penile squamous cell carcinoma (Muneer et al., 2024; Garg et al., 2023). A critical finding was the pronounced patient delay, with a median symptom duration of 7 months before presentation. This delay, often stemming from embarrassment, stigma, or lack of awareness, is a major driver of advanced disease at diagnosis, as similarly documented in studies from Tanzania and India (Chalya et al., 2015; Noronha et al., 2024). This underscores an urgent need for public health initiatives aimed at early detection and encouraging timely medical consultation for penile lesions.

The central focus of our study was to analyze the patterns of surgical management. Our data reveals a balanced approach, with 44% of patients undergoing organ-sparing surgery (OSS) and 56% undergoing radical amputative procedures. The strong correlation between tumor stage and surgical choice is reassuring and reflects adherence to modern oncological principles, where OSS is prioritized for early-stage (Tis,T1) disease (Muneer et al., 2024). The fact that all T3 tumors required radical surgery underscores the technical and oncological limitations of OSS for very advanced local disease. Our rate of OSS is higher than that reported in resource-constrained settings like Tanzania (Chalya et al., 2015) but may be lower than in specialized European centers, reflecting an evolving surgical practice that balances oncological safety with quality-of-life preservation.

A key finding of our study was the significantly higher local recurrence rate in the OSS group (27.3%) compared to the radical surgery group (7.1%). This observation is consistent with a substantial body of literature. Lindner et al. (2019) similarly reported a higher local recurrence rate following OSS but crucially found no associated detriment in overall survival, provided patients were on a strict follow-up regimen. Our study echoes this finding; despite the higher local recurrence, there was no statistically significant difference in overall survival between the two surgical groups during our follow-up period. This supports the paradigm that local recurrences after OSS are often salvageable with further surgery without compromising ultimate cancer control (Fallara et al., 2024). The systematic review by Fallara et al. (2024) on penile shaft-sparing surgery also concluded that while local recurrence is a noted risk, it does not necessarily translate to worse survival, affirming the oncological safety of OSS in well-selected patients.

The management of regional lymph nodes remains a cornerstone of prognostication and therapy. In our cohort, 36% of patients underwent a nodal procedure. The use of DSLNB in some of our patients indicates an adoption of minimally invasive staging techniques for cN0 patients, as recommended by current guidelines (Muneer et al., 2024). The finding that nodal metastasis and lymphovascular invasion were significant predictors of poorer survival on univariate analysis is unequivocal and aligns with global evidence identifying these as the most critical prognostic factors (Garg et al., 2023; Muneer et al., 2024). This reinforces the importance of aggressive and accurate staging of the inguinal regions in all patients with high-risk primary tumors.

Our study has several limitations inherent to its retrospective design. The sample size of 50, while sufficient for an initial institutional audit, limits the power for more complex multivariate analyses to identify independent prognostic factors. The single-center design may affect the generalizability of our findings to other populations. Furthermore, we were unable to systematically assess functional outcomes and quality of life, which are paramount when comparing OSS with radical surgery. Future

prospective studies incorporating patient-reported outcome measures are needed to fully evaluate the benefits of our surgical approach.

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Despite these limitations, our study provides valuable real-world data from a tertiary care center in a high-incidence region. It demonstrates a transition towards organ-preserving philosophies while grappling with the challenges of late presentation. The higher local recurrence with OSS is not a failure of the technique but a call for more meticulous patient selection, improved surgical margins where possible, and most importantly, unwavering adherence to a structured, long-term follow-up protocol to detect and treat recurrences early.

CONCLUSION

This study from the Kanachur Institute of Medical Sciences delineates the clinical journey and treatment outcomes of patients with carcinoma penis. We found that patients often present after a significant delay, leading to a high proportion of locally advanced tumors. Our surgical practice reflects a modern, stage-appropriate strategy, utilizing organ-sparing techniques for nearly half of our patients. The higher local recurrence rate associated with OSS is consistent with international literature and was not associated with a loss in overall survival, validating its selective use. The nodal status remains the arbiter of survival, emphasizing the critical role of lymph node management.

Our findings lead to three key recommendations for improving patient care: first, the implementation of community awareness programs to reduce diagnostic delay; second, the continued refinement of patient selection for OSS to optimize the balance between oncological control and functional preservation; and third, the strict enforcement of a protocol-driven follow-up schedule to ensure early detection and salvage of recurrences. By integrating these strategies, we can continue to improve the holistic care and long-term outcomes for men afflicted with this challenging disease.

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