

# Pedicled TFL flap for metastatic penile cancer reconstruction – a case series

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## Summary

**Background:** Penile cancer patients with advanced metastatic disease in the inguinal region present a therapeutic challenge. This study assesses the long-term viability of tensor fascia lata (TFL) flap for inguinal reconstruction after inguinal lymphadenectomy in metastatic penile cancer patients.

**Material and methods:** We herein report eight cases of advanced penile cancer utilizing a TFL flap for reconstructing defects in the inguinal region. Demographic characteristics, perioperative findings and outcome of the patients were evaluated. **Results:** Patients were followed up for 1–35 months. The mean age of patients included in this study was 58.75 years. Six out of eight patients had a favorable prognosis. The strong vascularity of the TFL flap enables excellent coverage, which can reduce the rate of ischemia and necrosis of the flap. No serious complications occurred in all cases during the perioperative period. One patient developed partial flap necrosis, which required debridement, whereas one patient underwent distal wound dehiscence which resolved with routine wound care. **Conclusions:** Our experience demonstrates the versatility and effectiveness of the TFL flap in addressing reconstruction of defects following inguinal lymph node dissection among patients with advanced penile cancer.

## Key words

advanced penile cancer – inguinal lymph node dissection – tensor fascia lata flap

Kawilarang B, Hariantana Hamid ARR, Putu Hendra Sanjaya IG. Pedicled TFL flap for metastatic penile cancer reconstruction – a case series. *Acta Chir Plast* 2024; 66(4): 172–177.

## Introduction

Penile cancer, a relatively rare malignancy, comprises less than 1% of all cancers diagnosed in men globally [1]. However, its prevalence is notably elevated in developing countries, such as Indonesia, where incidence rates are disproportionately high. Specifically, within Indonesia, Bali province has reported the highest age-standardized incidence rate of penile cancer compared to other regions [2]. Advanced-stage penile cancer with inguinopelvic lymph node (LNs) metastasis carries a particularly grim prognosis, with a 5-year overall survival (OS) rate of only 50%. It is noteworthy that up to 25% of individuals with impalpable LNs will exhibit micrometastasis, while palpable LNs cases tend to demonstrate higher metastatic rates. Therefore, the European Association of Urology recommends both the treat-

ment of primary lesion and lymphadenectomy to improve survival [3]. However, these interventions pose significant challenges due to resultant large and intricate defects. Various flap options exist for reconstruction following lymphadenectomy, with the pedicled tensor fascia latae (TFL) myocutaneous flap being the preferred choice in our center. Nonetheless, scant data exist concerning the long-term outcomes associated with TFL flap reconstruction. This study aims to assess the long-term viability of TFL flap reconstruction in defects following lymphadenectomy and analyze potential risk factors that may offer opportunities in mitigating postoperative morbidity.

## Description of case series

### Methods

A retrospective single-center study was conducted on patients with advanced

metastatic penile cancer who underwent groin wound reconstruction utilizing pedicled TFL flaps from 2019 to 2023. These patients were referred from the urology department to the plastic surgery department of RSUP IGNG Prof Ngoerah Denpasar, Indonesia. The case records of the patients were retrospectively reviewed, and data recorded onto an institutional database. Demographic characteristics, cancer histopathology, flap dimensions, duration of surgery from initial debridement to flap reconstruction, flap complications, donor site morbidity, and patient survival were evaluated. Complications were graded according to the Clavien-Dindo classification system to standardize reporting. All statistical analyses were performed using the SPSS software package version 25.0 (IBM Corporation, Armonk, New York, NY). The baseline characteristics

Tab. 1. Demographics and presentation of the patients.

Patient No.	Age (years)	Race	Cigarette smoking	Multiple sex partners	Foreskin status	Location of tumor
1	51	Balinese	yes	no	uncircumcised	glans, prepuce, distal half of shaft
2	77	Balinese	yes	no	uncircumcised	glans
3	58	Balinese	yes	yes	uncircumcised	glans
4	50	Balinese	yes	no	uncircumcised	glans
5	45	Balinese	yes	yes	uncircumcised	glans
6	72	Balinese	no	no	uncircumcised	prepuce
7	57	Balinese	yes	no	uncircumcised	glans, prepuce, distal half of shaft
8	60	Balinese	yes	no	uncircumcised	glans, prepuce, distal half of shaft

of the samples were analyzed descriptively. Continuous variables were presented as means with standard deviations, whereas categorical variables as numbers with percentages. The Shapiro-Wilk test was used to assess the normality of continuous variables. To determine the association between variables, the chi-square test with Fisher’s exact test as an alternative and independent sample t-test with the Mann-Whitney test as an alternative were used for categorical and numerical variables, respectively. Additionally, the Kaplan-Meier analysis was used to assess cancer-specific survival rates between both groups following intervention. The P-value of < 0.05 were considered statistically significant.

**Results**

During the study period, eight patients with advanced penile cancer underwent TFL flap reconstruction following inguinopelvic lymph node dissection (LND). The median of patients’ age was 58.5 years. The detailed demographics of the patients are summarized in Tab. 1.

According to histopathological types, 75% of cases were due to squamous cell carcinoma, the remaining were due to melanoma and mixed type carcinoma, with the majority of preoperative pathologic staging being T2. Six patients underwent unilateral inguinal LND, while two patients underwent bilateral in-

guinal LND. The follow-up period was 1–35 months (Tab. 2). Pedicled TFL flaps were performed in all patients with main vascular supply from the ascending branch of the lateral circumflex artery. The flap sizes ranged from 11.5 × 7 cm to 15 × 24 cm. The mean operative time for inguinal LND was 138 minutes and TFL flap reconstruction was performed in 170 minutes. In terms of perioperative complications, all donor sites were closed primarily with a minimal dog-ear deformity at the pivot point. One flap developed partial flap necrosis which required debridement, whereas one flap underwent distal wound dehiscence which was resolved with routine wound care (Fig. 1). The remaining patients had good prognosis and were eligible for adjuvant radiotherapy. Adjuvant radiotherapy plays a critical role in managing penile cancer by reducing the risk of local recurrence, particularly in cases with positive surgical margins or lymph node involvement. Its use is often adjusted based on the patient’s pathological findings and overall treatment plan. A total of three patients died in the first year due to aneurysm rupture, lung metastases, and sepsis, whereas five patients remained alive after 35 months of the follow-up. The comparison of the follow-up data was summarized in Tab. 3. As detailed in the tables, adjuvant therapy plays a crucial role in penile cancer

management, particularly in patients with positive surgical margins or lymph node involvement. Its advantages include effective local control and reduced recurrence rates; however, it may come with challenges such as skin toxicity, lymphedema, and delayed wound healing. Balancing these pros and cons is essential in tailoring treatment plans to individual patient needs. The disease-specific survival distributions for both groups in this study was statistically significant ( $\chi^2 = 7.65, P = 0.006, \text{log-rank}$ ) as documented in Graph 1.

**Discussion**

Patients with advanced penile cancer and widespread nodal disease have a poor prognosis and are difficult to manage due to the lack of appropriate therapy options. Defects in the inguinal region caused by metastatic penile cancer treatment provide a challenge to surgeons and result in significant morbidity [4]. Although this is a difficult group of patients to treat, we have shown in this case series that in patients with a reasonable performance status and disease that is surgically resectable, five out of eight patients had a positive outcome after inguinal LND and defect coverage with the TFL flap.

The regional femoral and iliac lymph nodes are known as the sites of penile cancer lymphatic metastasis. Because of

Tab. 2. Perioperative findings and outcomes of the patients

Patient No.	TNM stage	Histopathological type and grade	Chemotherapy	Treatment for primary tumor	Treatment for lymph nodes	Side	Defect dimensions	Reconstructive surgery	Postoperative complications		
									Clavien Dindo grade	Flap viability	Donor site morbidity
1	T4N3M1	mixed carcinoma, moderately differentiated	–	radical penectomy	bilateral inguinal LND	R	15 × 24 cm	ALT musculo-cutaneous flap	none	no complication	minimal dog ear deformity
						L	7 × 16 cm	TFL musculo-cutaneous flap			
2	T1aN3M1	SCC, moderately differentiated	–	radical penectomy	unilateral inguinal LND	L	13 × 7 cm	TFL musculo-cutaneous flap	none	no complication	minimal dog ear deformity
3	T1N2M0	SCC, moderately differentiated	TIP chemotherapy, 6 cycles	radical penectomy + perinostomy	salvage inguinal LND	R	11.5 × 7 cm	TFL musculo-cutaneous flap	none	no complication	minimal dog ear deformity
4	T2N2M1	SCC, moderately differentiated	TIP chemotherapy, 3 cycles	radical penectomy	radical inguinal LND	L	12.5 × 9 cm	TFL fascio-cutaneous propeller flap	none	no complication	minimal dog ear deformity
5	T3N3M1	SCC, poorly differentiated	TIP chemotherapy, 3 cycles	radical penectomy	extended inguino-pelvic LND	R	12 × 8 cm	TFL fascio-cutaneous propeller flap	grade IIIb	distal flap necrosis, wound dehiscence	minimal dog ear deformity
6	T4N2M1a	metastatic of malignant melanoma, poorly differentiated	–	partial penectomy	radical inguinal LND	R	20 × 15 cm	TFL musculo-cutaneous flap	grade IIIb	partial flap necrosis, wound dehiscence	no complication
7	T2N3M0	SCC, moderately differentiated	TIP chemotherapy, 3 cycles	radical penectomy	extended inguinal LND	L	15 × 12 cm abdomen 10 × 5 cm	TFL fascio-cutaneous propeller flap	grade IIIa	pseudo-aneurysm rupture, abdominal defect of STSG	dehiscence on donor site
8.	T1N3M1	SCC, poorly differentiated	TIP chemotherapy, 6 cycles	radical penectomy	bilateral radical inguinal LND	R	15 × 20 cm	ALT musculo-cutaneous flap	none	no complication	no complication
						L	9 × 6 cm	TFL musculo-cutaneous flap			

ALT – anterolateral thigh, L – left, LND – lymph node dissection, R – right, SCC – squamous cell carcinoma, STSG – split-thickness skin graft, TFL – tensor fascia lata, TIP – paclitaxel, ifosfamide, cisplatin

the advanced nature of the disease, metastatic resection in advanced penile cancer should include 3–4 cm of disease-free skin, resulting in complex defects

that must be repaired [5]. Because primary wound closure is typically not an option, soft-tissue flaps are required to close the defect without tension, fill in

the dead space, and include well-vascularized tissue, allowing for better healing and a reduction in local complications such as dehiscence and infection [4,6].



**Fig. 1. Complications of tensor fascia lata flap reconstruction following inguinal lymph node dissection: A) distal flap necrosis (patient No. 5); B) partial flap necrosis (patient No. 6).**

To date, several fasciocutaneous and myocutaneous flaps are employed to reconstruct wounds caused by extensive penile or lymph node resections. Several abdominal and thigh flaps can be transplanted to close the defect [4]. The most prevalent are the TFL myocutaneous flap, the ALT flap, and the vertical rectus abdominis myocutaneous (VRAM) flap [7]. In addition, flaps from the rectus femoris, gracilis, and sartorius muscles are potential choices for abnormalities with less skin loss. It is worth noting that each flap has perks and drawbacks. The TFL is a myofascial-cutaneous flap

identified by Wangenstein in 1934 and popularized by Nahai et al. in 1978 [8]. This flap is frequently used for groin reconstruction owing to its robust fascial layer as a pedicled flap, its reach to the groin and ease of elevation [9]. Free flaps, such as the ALT, radial forearm, or latissimus dorsi flaps, offer versatile options for complex defect reconstruction, providing ample, well-vascularized tissue suitable for irradiated or compromised areas. However, in penile cancer patients, the extensive microsurgery operative time, higher risk of flap failure, and significant surgical morbidity

may outweigh the benefits, particularly in those with advanced disease or poor overall health. As a result, simpler pedicled flaps such as TFL flaps are often preferred for these patients to balance efficacy with lower procedural risks.

In the present study, the TFL flap was harvested and rotated to the inguinal region, successfully covering the defect caused by inguinal LND of penile cancer metastases. According to our experience, we advocate TFL flap reconstruction in advanced penile cancer defects due to its ease of performance, which allows for dissection through the same

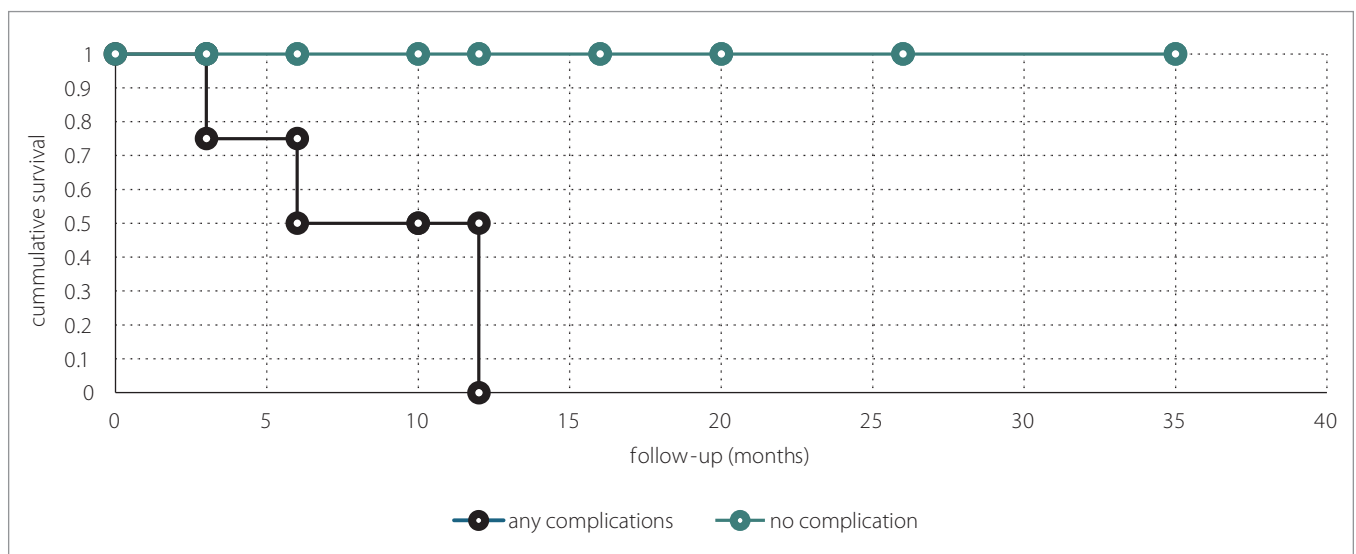
incision that joins the inguinal LND, the large amount of tissue that can be mobilized, the consistency of its vascular pedicle, and the ease with which the donor area can be repaired. In addition to its provision of a well-vascularized tissue composed of skin, subcutaneous tissue muscle, and fascia that can be used in an irradiated field, the TFL flap has decreased donor site morbidity and dispensability of the muscle itself [10]. Furthermore, its absence typically results in no significant functional impairment or knee instability. Despite this capability, TFL flaps are not exempt from complications. Our study shows that two out of eight patients (25%) experienced partial flap necrosis, which could be attributed to wounds that heal slowly and are frequently exposed to critical structures such as femoral vessels. As a result, one of them required debridement, while the other could be treated with standard wound care and dressings. It is worth noting that in locations where the TFL flap is rotated, care must be made to preserve the vascular pedicle from severe stretching or torsion. Additionally, harvesting the flap within safe limits and suturing it with minimal stress can help to reduce postoperative complications [11].

**Tab. 3. Follow-up data comparison of patients with advanced penile cancer.**

Variables	No complication (N = 5)	Any complication (N = 3)	P-value
Age, years, mean ± SD	59.2 ± 10.85	58 ± 13.53	0.894 <sup>a</sup>
Number of LND, n (%)			
unilateral	3 (37.5)	3 (37.5)	0.464 <sup>b</sup>
bilateral	2 (25.0)	0	
Adjuvant therapy, n (%)	1 (12.5)	0	1.000 <sup>b</sup>
Mortality, n (%)			
< 30 days after surgery	0	0	0.018 <sup>b</sup>
during hospitalization	0	3 (37.5)	
Clavien-Dindo, n (%)			
none	5 (62.5)	0	
I	0	0	
II	0	0	
IIIA	0	3 (37.5)	
IIIB	0	0	
IV	0	0	
V	0	0	
Follow-up, month, mean ± SD	21.4 ± 9.58	7.0 ± 4.58	0.054 <sup>a</sup>

<sup>a</sup> independent sample t-test, <sup>b</sup> Fisher's exact test, LND – lymph node dissection, SD – standard deviation

Although surgical intervention in most cases of advanced penile cancer is considered palliative, the remaining patients had a favorable prognosis for skin flap after surgery, and their quality of life improved significantly. With the benefits



**Graph 1. Kaplan-Meier survival estimates by complications. The red line represents the cumulative survival of three advanced penile cancer patients who experienced any complication following the surgery, whereas the blue line represents the cumulative survival for five advanced penile cancer patients who did not experience any complications**

of pedicled TFL flap, early wound healing can qualify patients with advanced penile cancer for adjuvant treatment; nonetheless, it is disheartening that just one patient in our study received adjuvant treatment following surgery. Oncological treatment strategies for penile cancer typically involve a multidisciplinary approach, combining surgery, radiotherapy, and chemotherapy depending on the stage of the disease. Early-stage disease is often managed with surgical resection alone, while advanced or metastatic cases require a combination of systemic therapies and radiation to address locoregional control and distant metastases. Timely integration of adjuvant treatments can significantly improve outcomes by targeting residual microscopic disease [11]. In this case series, during the follow-up period, there were three patients who died of aneurysm rupture, lung metastases, and infection, respectively.

We acknowledge the limitations of our study, such as its retrospective nature and small sample size. However, the rarity of penile cancer, combined with a shortage of instances requiring flap reconstruction, explains the retrospective design. As a result, we could not employ validated quality of life evaluation techniques to objectively evaluate any changes in this study. Furthermore, various aspects, such as operation time, blood loss, and postoperative pain, should be added to the procedure's morbidity and taken into account in this study.

## Conclusion

The current study demonstrates that the TFL flap is a versatile and effective approach for addressing advanced penile cancer defects following inguinal lymph node dissection. It provides reliability while taking less time to implement. The TFL flap offers various benefits, particularly for critically ill patients who are unable to tolerate prolonged procedure associated with greater morbidity rates. Its strong vascularity enables excellent coverage, even across irradiated tissues, in patients undergoing neoadjuvant or adjuvant chemotherapy. Furthermore, the donor site closure can be performed primarily, mitigating aesthetic concerns.

## Roles of authors

Bertha Kawilarang – investigation, writing, data curation; Agus Roy Rusly Hariantana Hamid – conceptualization, writing, data curation; I Gusti Putu Hendra Sanjaya – conceptualization, writing, data curation.

## Disclosures

The authors have no conflicts of interest to disclose. The authors declare that this study has received no financial support. All procedures performed in this study involving human participants were in accordance with ethical standards of the institutional and/or national research committee and with the Helsinki declaration and its later amendments or comparable ethical standards.

## References

1. Fu L., Tian T., Yao K., et al. Global pattern and trends in penile cancer incidence: population-based study. *JMIR Public Heal Surveill.* 2022, 8(7): e34874.
2. Lestari DPO., Riasa INP., Niramayah PKI., et al. The burden of penile cancer in Bali compared to

other provinces in Indonesia. *Open Access Maced J Med Sci.* 2021, 9(E): 1273–1278.

3. Hakenberg OW., Compérat EM., Minhas S., et al. EAU guidelines on penile cancer: 2014 update. *Eur Urol.* 2015, 67(1): 142–150.
4. Combs PD., Sousa JD., Louie O., et al. Comparison of vertical and oblique rectus abdominis myocutaneous flaps for pelvic, perineal, and groin reconstruction. *Plast Reconstr Surg.* 2014, 134(2): 315–323.
5. Heinlen JE., Bueth DD., Culkin DJ. Advanced penile cancer. *Int Urol Nephrol.* 2012, 44(1): 139–148.
6. Parrett BM., Winograd JM., Garfein ES., et al. The vertical and extended rectus abdominis myocutaneous flap for irradiated thigh and groin defects. *Plast Reconstr Surg.* 2008, 122(1): 171–177.
7. Murthy V., Gopinath KS. Reconstruction of groin defects following radical inguinal lymphadenectomy: an evidence based review. *Indian J Surg Oncol.* 2012, 3(2): 130–138.
8. Nahai F., Hill L., Hester TR. Experiences with the tensor fascia lata flap. *Plast Reconstr Surg.* 1979, 63(6): 788–799.
9. Agarwal AK., Gupta S., Bhattacharya N., et al. Tensor fascia lata flap reconstruction in groin malignancy. *Singapore Med J.* 2009, 50(8): 781–784.
10. Nirmal TJ., Gupta AK., Kumar S., et al. Tensor fascia lata flap reconstruction following groin dissection: is it worthwhile? *World J Urol.* 2011, 29(4): 555–559.
11. Akhtar MS., Khurram MF., Khan AH. Versatility of pedicled tensor fascia lata flap: a useful and reliable technique for reconstruction of different anatomical districts. *Plast Surg Int.* 2014, 2014: 846082.

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Submitted: 29. 7. 2024

Accepted: 3. 1. 2025