

## CASE REPORT

### CLINICAL CASE

# Metastatic Penile Squamous Cell Carcinoma



## Unmasked by an Acute Myocardial Infarction and Terminal Heart Failure

Franziska Tietz, MD,<sup>a</sup> Alexandra Weidel, MD,<sup>b</sup> Alexey Dashkevich, MD,<sup>a</sup> Michael Borger, MD, PhD,<sup>a</sup> Holger Thiele, MD,<sup>c</sup> Karl-Philipp Rommel, MD<sup>c</sup>

### ABSTRACT

A young patient, recently treated for squamous cell penile carcinoma, presented with acute myocardial infarction and severe heart failure. Despite repeatedly ruling out metastatic disease on imaging, surgery for a mechanical assist device revealed unexpected squamous cell metastasis in the pericardium. Consequently, palliative care was initiated. (J Am Coll Cardiol Case Rep 2024;29:102350) © 2024 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

### HISTORY OF PRESENTATION

A 43-year-old male patient initially presented with thoracic discomfort and shortness of breath persisting for 3 days. The electrocardiogram showed a right bundle branch block with subacute ST-segment elevations in leads I, aVL, and V<sub>1</sub> to V<sub>4</sub> (Figure 1). An

immediate coronary angiography revealed a thrombotic occlusion of the left anterior descending artery (LAD), which was treated with thrombectomy and stent implantation (Figure 2, Video 1). Due to a no-reflow phenomenon in the LAD, additional glycoprotein IIb/IIIa inhibitors were administered. However, in the follow-up angiography on the following day, the LAD continued to show no flow.

### LEARNING OBJECTIVES

- To appreciate that penile carcinoma can cause cardiac metastasis even after initial staging was negative, and in a relatively short period of time after treatment without obvious metastatic spread to other tissues.
- To understand that metastatic diseases should always be considered in any individual with new cardiac symptoms and known malignancy.

### PAST MEDICAL HISTORY

Significant comorbidities included a history of nicotine abuse, a positive family history of heart attacks in the father and brother before the age of 50 years, and a diagnosis of a 33 × 28 mm squamous cell carcinoma of the glans penis with infiltration of the corpus cavernosum 5 months earlier. Detailed staging, including computed tomography (CT) imaging of the abdomen and thorax as well as inguinal lymph node

From the <sup>a</sup>Department of Surgery, Heart Center Leipzig at University of Leipzig, Leipzig, Germany; <sup>b</sup>Pathology Practice of Drs Schneider/Schmidt, Leipzig, Germany; and the <sup>c</sup>Department of Cardiology, Heart Center Leipzig at University of Leipzig, Leipzig, Germany.

The authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit the [Author Center](#).

Manuscript received December 6, 2023; revised manuscript received March 11, 2024, accepted March 13, 2024.

**ABBREVIATIONS  
AND ACRONYMS****CT** = computed tomography**LAD** = left anterior descending artery**LV** = left ventricular**LVAD** = left ventricular assist device

dissection, had revealed no distant metastases. The chosen curative approach involved surgical resection of the penis (pT3, LO, VO, RO, and G3) and insertion of a permanent urinary catheter. There was no perceived need for adjuvant therapy, and the prognosis was considered favorable.

**DIFFERENTIAL DIAGNOSIS**

The mechanisms of no-reflow after percutaneous intervention for ST-segment elevation myocardial infarction were considered, including distal atherothrombotic embolization, reperfusion injury, and extensive myocardial necrosis, all of which ultimately lead to microvascular dysfunction. The level of suspicion for cardiac metastatic disease was minimal, given the absence of node metastases.

**INVESTIGATIONS**

In the days after the coronary revascularization attempt, left ventricular (LV) function was severely reduced in the patient. This included akinesia of the anterior wall, septum, and apex. In addition, an apical LV mass, interpreted as thrombus measuring  $27 \times 26 \times 20$  mm, was detected (Figure 3). Cardiac magnetic resonance imaging revealed a transmural myocardial scar in the anterior/anteroseptal, medial, and apical regions, accompanied by signs of

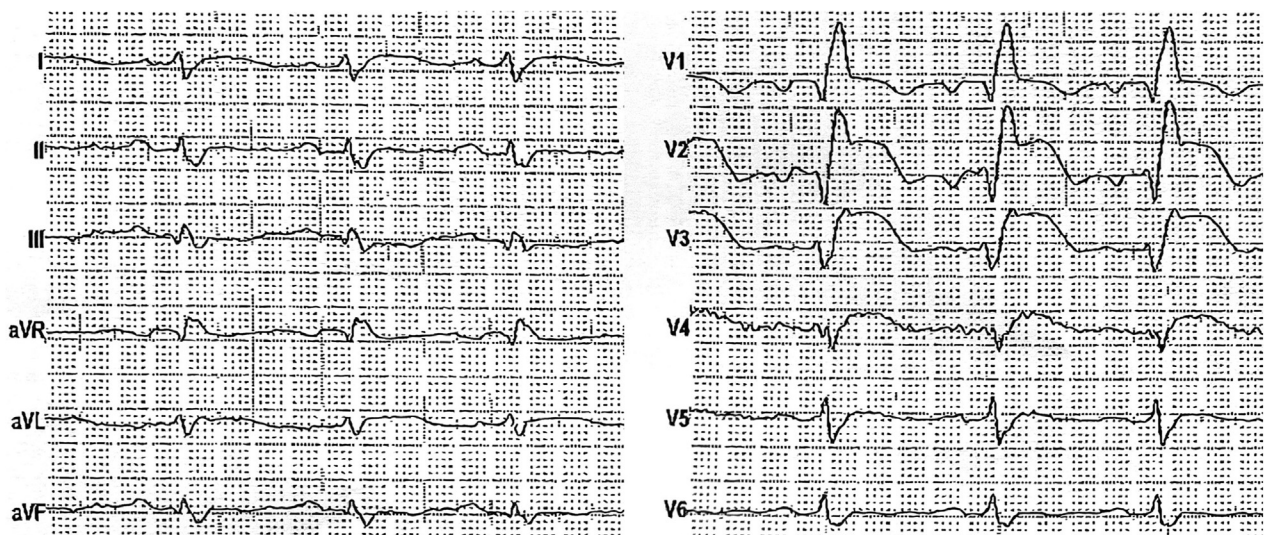
microvascular obstruction. In addition, significant gadolinium uptake in the pericardium was noted and interpreted as acute infarct-related pericarditis.

**MANAGEMENT**

Due to cardiogenic shock and severe cardiopulmonary decompensation, the patient received intensive care treatment, and maximal supportive medical therapy, including 2 administrations of levosimendan. Multiple pleural punctures were performed for effusion relief. Because conservative therapy measures proved unsuccessful, the patient was transferred to our center for evaluation of further therapeutic options.

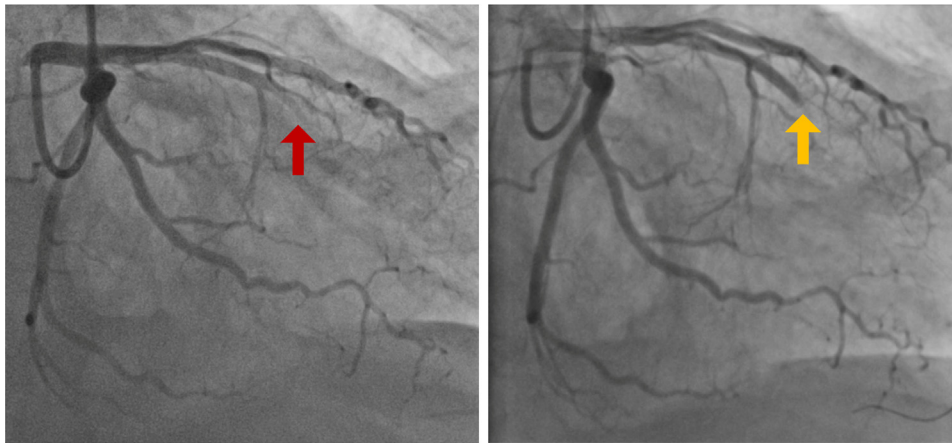
The patient was admitted 2 weeks after the initial presentation. Upon arrival, he was conscious, breathing spontaneously, and adequately responsive. The patient showed signs of a low-cardiac-output syndrome with lactatemia and reduced central venous oxygen saturation, which persisted despite escalating catecholamine therapy. Following an episode of emesis, hemodynamics further deteriorated, requiring urgent initiation of mechanical circulatory support (veno-arterial extracorporeal membrane oxygenation). The use of a transaortic microaxial pump for LV unloading was not feasible due to the presence of the ventricular mass.

Subsequent echocardiography revealed severely impaired biventricular function (Video 2), with

**FIGURE 1** Admission Electrocardiogram

The admission electrocardiogram showing sinus tachycardia (123 breaths/min), right bundle branch block, and subacute ST-segment elevations in I, aVL, and V<sub>1</sub> to V<sub>4</sub>.

**FIGURE 2** Coronary Angiogram



Coronary catheterization with occlusion of the mid left anterior descending artery (red arrow) and no-reflow after recanalization and stent implantation (orange arrow).

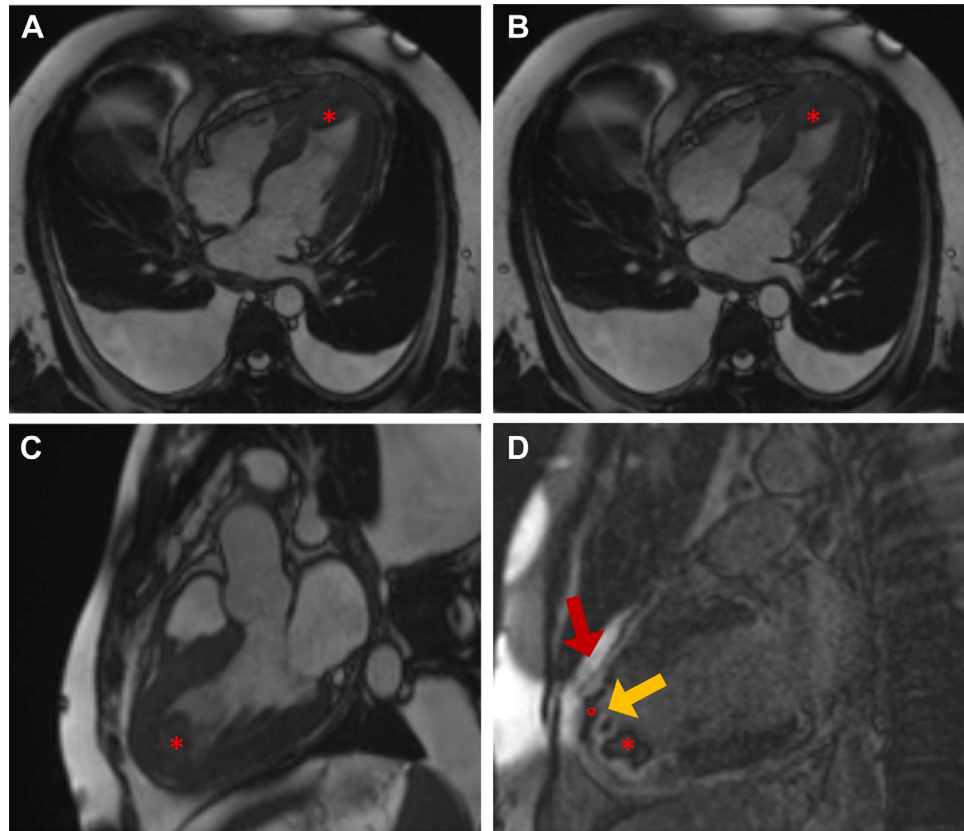
persisting complete dependence on mechanical circulatory support. This prompted consideration of surgically implanting an LV assist device (LVAD). Preoperatively, a thorax and abdomen CT scan was performed due to the known carcinoma, revealing hypodensities in the anterior-septal myocardium and pericardium. However, these findings were not interpreted as indicative of signs of distant metastasis (Figure 4, Video 3). Throughout the preoperative phase, the patient remained spontaneously breathing, awake, responsive, and oriented.

Three weeks after the initial admission, the initiation of surgery and sternotomy for LVAD implantation took place. Upon site opening, there was evidence of pericardial tissue overlay in the LAD territory, appearing macroscopically suspicious for malignancy. A sample was taken for rapid histologic diagnosis. The rapid diagnosis confirmed the histologic presence of a pericardial metastasis of squamous cell carcinoma (Figure 5), most likely related to the known penile carcinoma. Macroscopically, infiltration of the LAD territory was suspected, possibly contributing to myocardial ischemia by infiltrative tumor growth. Given the metastasized carcinoma and severe complications, a curative treatment approach was not feasible. Therefore, surgical management of the advanced heart failure with an LVAD was no longer an option. The operation was ceased, and the patient was transferred back to the intensive care unit for initiation of palliative care, ultimately resulting in the patient's death.

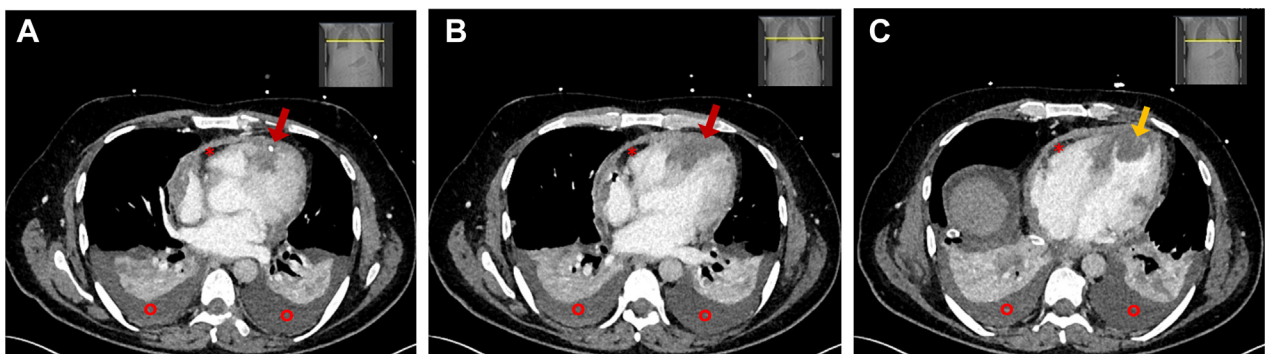
## DISCUSSION

Nearly all varieties of malignancy can metastasize to the heart, the most common being primary lung cancer, primary breast cancer, hematologic malignancies, and malignant melanoma.<sup>1-4</sup> We present here a case of a metastasized penile squamous cell carcinoma unmasked by severe terminal heart failure in the context of an anterior myocardial infarction with acute LAD occlusion. Penile cancer is a rare entity, accounting for <1% of male cancer cases in Western societies.<sup>5</sup> The great majority of penile cancers (95%) are made up of squamous cell carcinoma, and distant disease dissemination is rare, especially if there is no evidence of regional nodal metastases.<sup>6</sup> As such, this is the first report of a cardiac metastatic disease resulting from a penile squamous cell carcinoma.

Etiologic considerations for acute coronary syndromes in patients with cancer are complex and include a tumor-associated pro-inflammatory and pro-thrombotic milieu, complications of radiotherapy or chemotherapy, or mechanical complications.<sup>7</sup> The mechanisms of cardiac metastasis from squamous cell carcinoma are poorly understood. In our patient, we observed pericardial presence of metastatic tissue, verified histologically. This tissue extended macroscopically from the pericardium to the myocardium, also involving the LAD and possibly the right bundle branch, overall favoring the theory of a lymphatic spread and a partly mechanical contribution to the

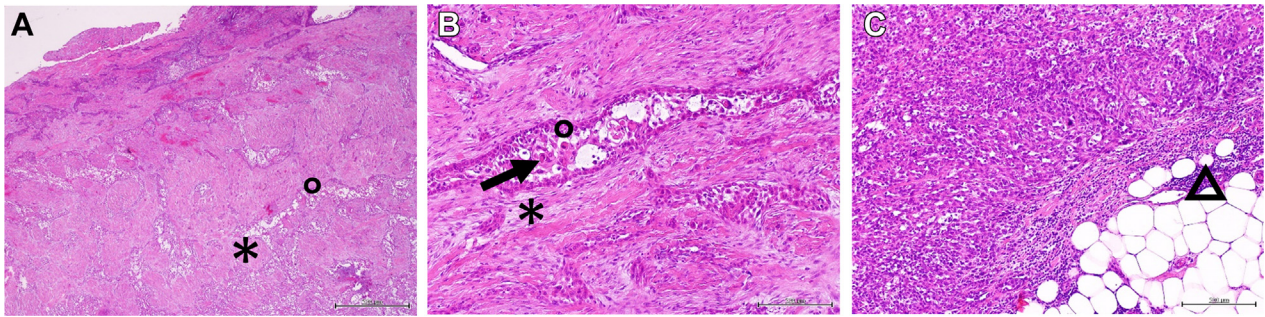
**FIGURE 3** Cardiac Magnetic Resonance

Four-chamber cine images of end-diastolic (A) and end-systolic phase (B) reveal a diminished left ventricular ejection fraction and anomalies in apical and anteroseptal wall motion, also evident in 2-chamber end-systolic cine image (C). In addition, an intraventricular mass (asterisk) and bilateral pleural effusions are evident. On scar imaging (D), late gadolinium enhancement (orange arrow) and microvascular obstruction (circle) are detected in the apical and anterior wall segments. Furthermore, contrast enhancement is observed in the pericardium (red arrow).

**FIGURE 4** Computed Tomography Imaging

Contrast-enhanced computed tomography imaging. Portal-venous phase with persisting presence of arterial contrast in the setting of low cardiac output showing bilateral pleural effusion (circle), small pericardial effusion (star), hypodense myocardium indicative of a previous myocardial infarction and left anterior descending artery stent (red arrow), and left ventricular mass interpreted as "apposition thrombus" (orange arrow). (A) mid-thoracic slice. (B) Low-thoracic slice. (C) Supradiaphragmal slice.

**FIGURE 5** Histology



Histologic examination of hematoxylin and eosin-stained intrasurgical frozen sections. (A) Pericardial section overview reveals exclusive tumor presence with cohesive cell growth (circle) interspersed with areas of desmoplastic fibrosis (star). Original magnification  $\times 4$ . (B) Close-up depicts squamous cell carcinoma cells (circle) and partially embedded dyskeratin (arrow) at the center, surrounded by tumor-induced fibrosis (star). Original magnification  $\times 10$ . (C) Detailed view of squamous cell carcinoma illustrates organ involvement by depicting epicardial fatty tissue (triangle). Original magnification  $\times 10$ .

acute LAD occlusion. In addition, severe, acute heart failure symptoms were present, with large akinetic LV areas, extending beyond the suspected LAD perfusion territory areas. This also favors a LV myocardial infiltration of metastatic tissues, impairing both myocardial baseline function and perfusion, which were further aggravated by the LAD occlusion and manifested as no-reflow phenomena. However, it remains speculative whether there indeed was myocardial tumor invasion, and whether the coronary lesion or intracardial mass, identified on imaging, corresponded to metastatic tissue or thrombus, as an autopsy was not conducted.

Reflecting on clinical decision-making in this case, one has to consider that metastatic spread in this particular clinical situation was thought to be uncommon. In fact, examinations for staging in this setting are not routinely performed. Despite this, repeated CT scans showed no distant diseases; in addition, the patient's prognosis was perceived to be favorable, particularly given his relatively young age and the recent curative cancer treatment. As such, we decided to proceed to a surgical advanced heart failure therapy as a bridge-to-decision/recovery despite the relatively acute setting and the advanced INTERMACS (Interagency Registry for Mechanically Assisted Circulatory Support) class. It was only during the open-heart surgery that the diagnosis of cardiac metastasis could be substantiated and the treatment strategy adapted. Retrospectively, one has to assume that the pericardial contrast uptake and possibly also

the extensive myocardial scarring on cardiac magnetic resonance imaging and the hypodensities on CT imaging might well be related to the metastatic diseases; this is especially true because the incidence of infarct-related pericarditis in the first few days after the infarction is low, increasing only between 1 and 8 weeks after the event.

## CONCLUSIONS

The current report illustrates a rare case of cardiac metastasis due to penile squamous cell carcinoma, which was unmasked by an acute myocardial infarction and terminal heart failure. This occurred despite initial negative staging and in a relative short period of time after treatment without obvious metastatic spread to other tissues. It underlines that metastatic diseases should always be considered in any individual with new cardiac symptoms and known malignancy.

## FUNDING SUPPORT AND AUTHOR DISCLOSURES

Dr Rommel is supported by a research grant from Else-Kröner-Fresenius Foundation. All other authors have reported that they have no relationships relevant to the contents of this paper to disclose.

**ADDRESS FOR CORRESPONDENCE:** Karl-Philipp Rommel, Department of Cardiology, Heart Center Leipzig at University of Leipzig, Leipzig Strümpellstr. 39, 04289 Leipzig, Germany. E-mail: [Karl-Philipp.Rommel@medizin.uni-leipzig.de](mailto:Karl-Philipp.Rommel@medizin.uni-leipzig.de).

---


**REFERENCES**

1. Reynen K. Metastases to the heart. *Ann Oncol*. 2004;15:375-381.
2. Bussani R, De-Giorgio F, Abbate A, Silvestri F. Cardiac metastases. *J Clin Pathol*. 2007;60:27-34.
3. Goldberg AD, Blankstein R, Padera RF. Tumors metastatic to the heart. *Circulation*. 2013;128:1790-1794.
4. Kaulen LD, Tietz F, Gradistanac T, Thiele H, Rommel KP. Cardiac melanoma metastases as a cause of sudden cardiac death. *Clin Res Cardiol*. 2019;108:716-718.
5. Siegel RL, Miller KD, Wagle NS, Jemal A. Cancer statistics, 2023. *CA Cancer J Clin*. 2023;73:17-48.
6. Ornellas AA, Kinchin EW, Nobrega BL, Wisnescky A, Koifman N, Quirino R. Surgical treatment of invasive squamous cell carcinoma of the penis: Brazilian National Cancer Institute long-term experience. *J Surg Oncol*. 2008;97:487-495.
7. Dewan K, Klug T, Ardestani A, Shires CB. Heart breaking diagnosis: cardiac metastases from mucosal head and neck squamous cell carcinoma. Case report and review of current literature. *Otolaryngol Case Rep*. 2020;17:100248.

---

**KEY WORDS** cardiac magnetic resonance imaging, cardiac metastases, cardio-oncology, cardiogenic shock, case report, heart failure, mechanical circulatory support, ST-segment elevation myocardial infarction, squamous cell carcinoma, STEMI

---

 **APPENDIX** For supplemental videos, please see the online version of this paper.