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Radiology

Case Report: Comprehensive Analysis of Metastatic Rhabdomyosarcoma of the Breast in an Adolescent

Ait Said Nouhaila[1]*, A. Belhaj[1], C. Ahmana[1], S. Ouassil[1], D. Basraoui[1], I. Zouita[1], H. Jalal[1]

[1]Radiology Department, Ibn Tofail Hospital

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***Corresponding author:** Ait Said Nouhaila
Radiology Department, Ibn Tofail Hospital

Abstract **Case Report**

Rhabdomyosarcoma (RMS) of the breast is an extremely rare and highly aggressive mesenchymal malignancy that poses significant diagnostic and therapeutic challenges in adolescents. Due to its potential to clinically mimic inflammatory breast disease or benign fibroadenomas, diagnosis is frequently delayed, often resulting in advanced disease at presentation. We report the case of a 15-year-old female patient presenting with a rapidly enlarging, firm right breast mass accompanied by extensive, disseminated subcutaneous metastases. This document provides a detailed investigation into the systemic metastatic kinetics, the indispensable role of comprehensive cross-sectional radiological staging, and the implementation of high-intensity, multimodal systemic chemotherapy protocols (MMT/IVADO). Through this analysis, we underscore the necessity for high clinical suspicion, rapid diagnostic confirmation, and integrated multidisciplinary management in the context of this high-risk oncological entity.

Keywords: Rhabdomyosarcoma, Breast mass, Subcutaneous metastases, Multimodal chemotherapy, Cross-sectional staging, Adolescent oncology.

INTRODUCTION

Rhabdomyosarcoma represents the most common soft-tissue sarcoma encountered in the pediatric and adolescent population. While the primary sites of origin are typically the head, neck, or genitourinary tract, primary mammary localization remains a rare clinical exceptionality. The biological behavior of this malignancy is characterized by an aggressive local infiltrative capacity coupled with high rates of early hematogenous and lymphatic metastatic spread.

Because of its rarity in the breast, it is frequently misdiagnosed in its nascent stages, leading to significant delays in the initiation of systemic therapy. This report serves to delineate the intricate clinical and systemic metastatic profile observed in a clinical service context, emphasizing the critical importance of early diagnostic vigilance and the immediate initiation of systemic staging to guide therapeutic strategy.

CASE PRESENTATION

Detailed Clinical Findings

A 15-year-old adolescent female patient presented to our service with a firm, immobile, and rapidly growing right breast mass measuring approximately 8x4 cm. The clinical assessment was notable for pathological violaceous skin changes covering the tumor site, a sign indicative of dermal lymphatic invasion. Beyond the local breast findings, physical examination identified a constellation of asymptomatic, disseminated subcutaneous nodules scattered across the cervical region, the dorsal area, and the right elbow, suggesting systemic tumor dissemination.

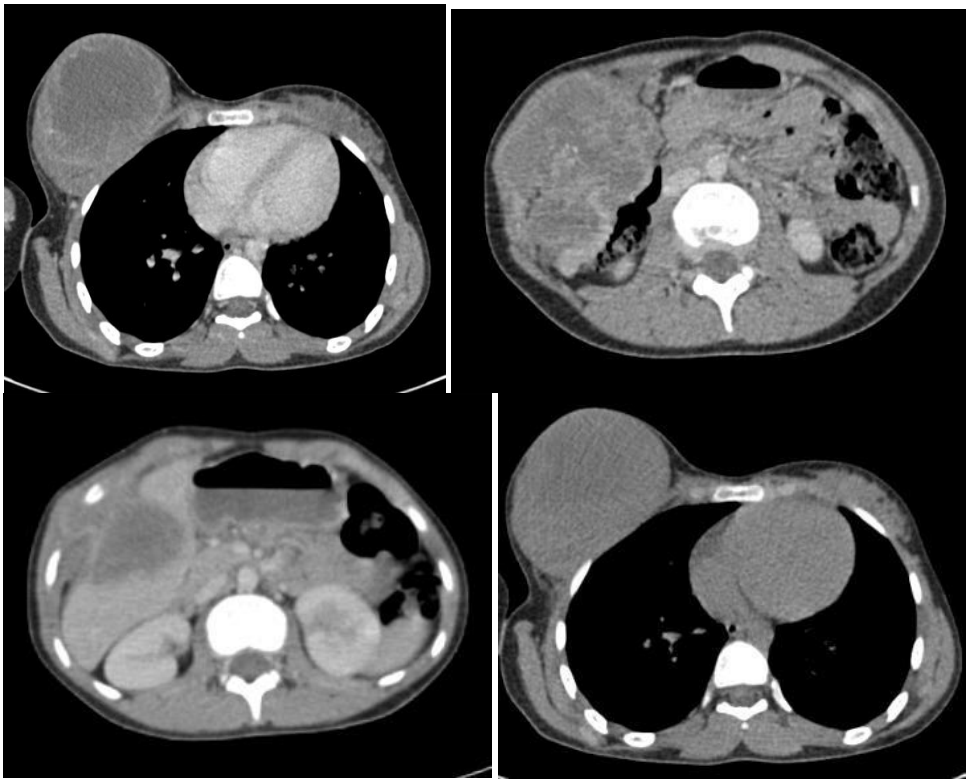
Comprehensive Radiological Staging (CT-TAP - 29/09/2025)

Anatomical Region	Detailed Radiological Description
Pelvic	Identification of a lobulated, large presacral mass (43x58x60 mm) demonstrating significant infiltration into the rectal wall, resulting in secondary luminal narrowing.
Abdominal	A large (9x7x10 cm) anterior abdominal necrotic mass showing direct infiltration into liver segments V and VI and extending into the anterior abdominal wall.

Thoracic	Voluminous infiltrative tissue noted in the anterior chest wall, with direct involvement of the right pectoralis major muscle and the right mammary gland.
Musculoskeletal	Detection of a distinct focal osteolytic lesion involving the left sacral wing, characteristic of metastatic bone involvement.

Pathological & Biological Profile

The diagnosis was confirmed via biopsy of the breast mass, which revealed a high-grade malignant mesenchymal proliferation consistent with rhabdomyosarcoma. Laboratory investigations for primary malignancy markers (including AFP, BHCG, CEA, and CA125) yielded negative results, effectively excluding primary epithelial or germ-cell carcinomas. Notably, serum lactate dehydrogenase (LDH) levels were significantly elevated at 1582 U/L, a marker reflecting high tumor turnover, rapid cellular proliferation, and the aggressive biological kinetic behavior of this disseminated systemic disease.



DISCUSSION

Diagnostic Complexity and Mimicry

The diagnostic complexity associated with mammary rhabdomyosarcoma arises primarily from its clinical mimicry of inflammatory breast disease, an entity far more common in older, epithelial-carcinoma-prone populations. In this case, the presence of violaceous cutaneous discoloration served as a crucial clinical sentinel, representing dermal lymphatic infiltration.

Unlike localized adult breast carcinomas that may be managed primarily with locoregional surgery, rhabdomyosarcoma presents as a profound systemic mesenchymal disease from the outset, mandating exhaustive, whole-body staging via CT-TAP scan to uncover occult visceral metastatic sites, particularly in the pelvic and hepatic regions, which were confirmed in this patient.

Therapeutic Management and Prognosis

Therapeutic strategy was immediately centered on the international high-risk gold standard: the MMT/IVADO (Ifosfamide, Vincristine, Actinomycin-D, Doxorubicin) intensive chemotherapy protocol. This multi-agent regimen is specifically designed to manage the aggressive kinetics of pediatric sarcomas. The prognosis in such high-risk presentations remains strictly correlated with the prompt initiation of systemic chemotherapy and the meticulous identification of the metastatic burden at initial staging. The radiological assessment is not merely confirmatory but acts as the fundamental guide for the subsequent intensivity of the treatment protocol, emphasizing that integrated care is the only viable path for potential local control and systemic remission.

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