

Case Report

Delayed ART in a HER2+ Breast Cancer Patient with HIV: Clinical Deterioration and Recovery

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Abstract

*Patients with HIV who are receiving chemotherapy for breast cancer face a state of immunosuppression that is further exacerbated by the chemotherapy. It has been demonstrated that cases of HER2-positive breast cancer, which require intensive treatment, are particularly vulnerable if antiretroviral therapy (ART) is delayed. A 42-year-old woman with a recent diagnosis of stage IIIB HER2-positive breast cancer and a newly detected HIV infection had antiretroviral therapy (ART) deferred, despite having a CD4 count of 350 cells/mm³. During the course of chemotherapy, the patient's CD4 count decreased to 190 cells/mm³, while her viral load increased to 66,000 copies/mL. The patient exhibited symptoms including neutropenia, oral candidiasis, and bacterial infections. The administration of ART occurred midway through the treatment regimen. Subsequent microbiological diagnostics (VITEK 2 system) revealed the presence of ESBL-producing *Klebsiella pneumoniae*. The therapeutic approach was adapted in accordance with the patients' susceptibility to the treatment and their respective renal function. The patient's clinical status was stabilized, as evidenced by an increase in CD4 count to 265 cells/mm³ and a decrease in viral load to 7,000 copies/mL. The initiation of antiretroviral therapy (ART) at an early stage, the incorporation of microbiological guidance, and the coordination of care among multiple disciplines are pivotal in enhancing outcomes for HIV-positive patients undergoing cancer therapy.*

Keywords: HIV, Breast Cancer, CD4 Count, Antiretroviral Therapy, Chemotherapy Complications.

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Introduction

The coexistence of breast cancer and HIV infection poses a mounting clinical challenge, particularly in resource-constrained settings. While HIV-positive patients may not inherently face a higher risk of breast cancer, the immunological dysregulation associated with HIV alters tumor behavior, treatment tolerance, and overall prognosis (Chasimpha et al., 2023; Chirkut, 2019). Immunosuppression has been demonstrated to increase vulnerability to opportunistic infections and drug-related toxicities, especially during chemotherapy (Bertaglia et al., 2023; Sharma et al., 2024). Timely antiretroviral therapy (ART) is imperative; however, clinical scenarios occasionally necessitate initial deferral on the basis of preserved CD4 counts or competing oncologic priorities (Bogdanić et al., 2021; Kemnic & Gulick, 2026). This case underscores a dynamic disease progression involving chemotherapy-induced immunosuppression, delayed antiretroviral therapy (ART), and opportunistic infections, necessitating a multidisciplinary treatment plan. This case contributes to the existing body of literature that is limited regarding the documentation of delays in the administration of adjuvant therapy (ART) in patients diagnosed with HER2-positive breast cancer. It also underscores the potential for such delays to expedite immunological deterioration. Furthermore, it underscores the significance of microbiological surveillance in the adaptation of infection management strategies for immunocompromised oncology patients.

Case Presentation

A 42-year-old female patient reported a three-month history of a palpable lump in the left breast, accompanied by skin changes and axillary swelling. The patient exhibited no substantial medical history, and she denied having undergone prior HIV screening. A physical examination revealed a 5.2-centimeter left breast mass with skin retraction and fixed axillary lymphadenopathy. In light of the T4 lesion with axillary involvement and the aggressive HER2-positive

phenotype, it was deemed imperative to conduct an early metastatic workup. This approach was intended to preemptively rule out distant spread and thereby facilitate the development of a neoadjuvant treatment plan.

Diagnostic Investigations

Mammography: The mass is characterized by spicules and skin thickening, which are indicative of a category designated as BI-RADS 5.

Breast Ultrasound: The patient exhibits an irregular hypoechoic lesion, accompanied by axillary lymphadenopathy.

Magnetic resonance imaging (MRI) of the breast: The presence of a T4 lesion that has invaded the pectoralis muscle is observed.

Core needle biopsy: A core needle biopsy was performed, revealing an invasive ductal carcinoma with HER2-positive (3+) status, ER-/PR- negativity, and a Ki-67 index of 40%.

CT Chest/Abdomen: The absence of metastases has been confirmed.

HIV ELISA and Western blot test results: The patient's HIV ELISA test result was reactive, and the Western blot test result was as follows: The result is positive.

CD4 Count: The patient's viral load was initially measured at 20,000 copies/mL, and the cell count was recorded at 350 cells/mm³.

The World Health Organization (WHO) guidelines recommend the initiation of antiretroviral therapy (ART) in all individuals with HIV, irrespective of their CD4 count. However, in this case, the initiation of ART was deferred due to the patient's initially preserved CD4 count and a multidisciplinary decision to prioritize the urgent control of the rapidly progressive HER2-positive tumor. The oncologic team's objective was to avert potential overlapping toxicities and drug-drug interactions during the initiation of chemotherapy.

Table 1. Laboratory Results Over Time

Timepoint	CD4 Count (cells/mm ³)	HIV Viral Load (copies/mL)	Notable Clinical Findings
Initial diagnosis	350	20,000	Asymptomatic HIV; HER2+ breast cancer
After 2nd chemo cycle	210	48,000	Fatigue, oral candidiasis
After 3rd chemo cycle	190	66,000	Grade 3 neutropenia, delayed wound healing
Post-ART initiation	265	7,000	Clinical stabilization

Treatment and Clinical Course

The initial oncologic management plan included neoadjuvant chemotherapy using a regimen of Docetaxel (75 mg/m²), Carboplatin (AUC 6), and Trastuzumab (loading dose of 8 mg/kg followed by 6

mg/kg every 3 weeks) (Baskin et al., 2024; Zaher et al., 2023). The regimen was selected on the basis of the tumor's HER2-positive status, which is associated with aggressive behavior but high responsiveness to HER2-targeted therapy. Docetaxel, a taxane derivative, functions by impeding microtubule depolymerization,

thereby effectively arresting mitosis. Carboplatin has been shown to induce DNA crosslinking, leading to apoptosis, and is often combined with taxanes in HER2-positive or triple-negative breast cancers (Esteva & Katz, 2024; Villacampa et al., 2023). Trastuzumab, a monoclonal antibody targeting the HER2 receptor, has been shown to block downstream proliferative signaling and to mediate antibody-dependent cellular toxicity (ADCC) (Maadi et al., 2021). However, it carries a known risk of cardiotoxicity, particularly when combined with anthracyclines, which was avoided in this patient (Anamika et al., 2023). Baseline and periodic echocardiographic monitoring were performed during the therapeutic intervention.

At the initial presentation, antiretroviral therapy (ART) was deferred due to the preservation of CD4 count and the prioritization of tumor control. However, following the administration of two chemotherapy cycles, the patient exhibited substantial immune suppression, as evidenced by a decrease in CD4+ T-cell count to 210 cells/mm³, a notable increase in viral load, and the development of infectious complications. The ART procedure was initiated in an urgent manner following the completion of the third cycle. The selected regimen, comprised of tenofovir disoproxil fumarate (TDF), emtricitabine (FTC), and dolutegravir (DTG), was chosen for its proven efficacy, convenient once-daily dosing, and minimal interaction with chemotherapeutic agents.

TDF and FTC are classified as nucleoside reverse transcriptase inhibitors (NRTIs), which impede viral replication by inducing premature DNA chain termination. Dolutegravir, an integrase strand transfer inhibitor (INSTI), prevents the incorporation of viral DNA into the host genome (Iannuzzi & von Kleist, 2021). These agents are not metabolized by CYP3A4, reducing the risk of interactions with taxanes and platinum-based agents (Mercadel et al., 2014). Subsequent to the initiation of ART, immune recovery was observed. The patient underwent a modified radical mastectomy with clear margins (Mendicino et al., 2021). Postoperative healing was initially delayed due to neutropenia and immunosuppression, but improved with supportive care including granulocyte-colony stimulating factor (G-CSF), fluconazole for oral candidiasis, and close wound monitoring (Mouchemore & Anderson, 2021).

Adjuvant radiotherapy was administered to the chest wall and axilla (50 Gy in 25 fractions), given the elevated risk of locoregional recurrence in T4N1 disease. No severe radiation-related toxicities were observed. The patient continued Trastuzumab for a period of one year, during which time they underwent HER2-directed therapy. They also remained on ART, demonstrating gradual immunological improvement.

Bacterial Infections and Antibiotic Considerations

During the third cycle of chemotherapy, with the presence of worsening neutropenia and a declining CD4 count (<200 cells/mm³), the patient developed febrile neutropenia and signs of localized inflammation around the surgical site (Puerta-Alcalde et al., 2021). Furthermore, the reemergence of oral thrush has led to concerns regarding systemic opportunistic infections in patients with advanced immunosuppression (Mohammadi & Foughifar, 2016). Empirical broad-spectrum antibiotic therapy was initiated with meropenem, a carbapenem effective against extended-spectrum beta-lactamase (ESBL)-producing organisms and anaerobes, along with intravenous voriconazole for expanded antifungal coverage (Averbuch et al., 2013). Blood cultures, wound swabs, and urine samples were collected and analyzed using aerobic/anaerobic cultures and the VITEK 2 Compact system (bioMérieux), followed by confirmatory MALDI-TOF identification (Guo et al., 2014). The results of the microbiological testing revealed the presence of an infection with *Klebsiella pneumoniae*, a bacterium that produces an enzyme known as an extended-spectrum beta-lactamase (ESBL). The isolate demonstrated resistance to third-generation cephalosporins and fluoroquinolones but retained sensitivity to carbapenems, amikacin, and tigecycline. Sensitivity testing revealed elevated minimum inhibitory concentrations (MICs) for both ciprofloxacin and ceftriaxone, suggesting the possibility of therapeutic failure with conventional treatment regimens. Meropenem was administered as the definitive therapy for a period of 10 days, with dosage adjustment based on renal clearance (eGFR: 85 mL/min/1.73 m²). Amikacin was administered to enhance the therapeutic effect, and its auditory and renal toxicity was closely monitored through serial audiometry and creatinine levels, which remained stable. Voriconazole was administered for a duration of five days, followed by a reduction in dosage to oral fluconazole, contingent upon the attainment of candidal clearance. A synopsis of the antibiotic susceptibility results is provided in Table 2 below. No indications of systemic sepsis or multiorgan involvement were observed. The patient exhibited a substantial improvement in symptoms within 72 hours of targeted therapy, accompanied by a recovery in neutrophil counts, supported by granulocyte-colony stimulating factor (G-CSF). This case underscores the importance of early culture-guided therapy, the recognition of multidrug-resistant organisms (MDROs) in immunocompromised patients, and the utilization of broad-spectrum agents as initial coverage until definitive identification and sensitivity testing facilitate de-escalation. The timely identification and resistance profiling of such pathogens using automated microbiology platforms such as VITEK 2 and MALDI-

TOF is indispensable in the provision of safe and effective treatment in oncology–HIV comorbidity settings characterized by elevated risk.

Table 2. Antibiotic Susceptibility Profile of *Klebsiella pneumoniae* Isolate (VITEK 2)

Antibiotic	MIC ($\mu\text{g/mL}$)	Interpretation
Meropenem	≤ 1	Sensitive
Imipenem	≤ 1	Sensitive
Ceftriaxone	≥ 64	Resistant
Ceftazidime	≥ 32	Resistant
Ciprofloxacin	≥ 4	Resistant
Amikacin	≤ 8	Sensitive
Tigecycline	≤ 0.5	Sensitive
Piperacillin-Tazobactam	≥ 128	Resistant
Trimethoprim-Sulfamethoxazole	≥ 8	Resistant

Impact on Quality of Life and Patient Wellbeing

The co-occurrence of HIV and breast cancer had a substantial impact on the patient's quality of life (QoL), manifesting in both physical and emotional domains. Initially, the patient reported moderate anxiety and psychological distress upon learning of her HIV status in the context of a new cancer diagnosis (Dykstra et al., 2024). During the initial two cycles of chemotherapy, the patient exhibited symptoms of increasing fatigue, nausea, oral mucositis, and a substantial decrease in appetite. The manifestation of these symptoms, exacerbated by an escalating HIV viral load and a diminishing CD4 count, culminated in recurrent infections, encompassing oral candidiasis and a minor wound infection subsequent to biopsy (Dykstra et al., 2024).

The patient's ECOG performance status exhibited a decline from 1 at the time of diagnosis to 3 during the period of peak immunosuppression (Azam et al., 2019). The ECOG scores were assessed by the oncology care team during routine clinical follow-ups and based on direct observation and patient-reported functionality. The patient exhibited symptoms of profound despondency, trepidation regarding social stigmatization, and a sense of despair concerning her long-term prognosis. A referral was made to the hospital's mental health support team, and the patient received psychosocial counseling, which she reported helped her cope with the dual diagnosis. The delay in the initiation of antiretroviral therapy (ART) is likely to have exacerbated the patient's systemic symptoms and prolonged the period of immune control, thereby increasing both her physical discomfort and emotional distress (Rodrigues et al., 2021).

The patient exhibited a gradual improvement in symptoms subsequent to the initiation of antiretroviral therapy (ART) and the administration of supportive

care, which included antifungal therapy, nutritional support, and psychosocial counseling. The patient exhibited a reduction in fatigue levels, resolution of oral symptoms, and an enhancement in functional status, classified as ECOG 1 (Pimentel et al., 2020). Furthermore, she demonstrated an increased level of engagement in treatment planning and rehabilitation. This case underscores the pivotal necessity of prioritizing quality of life in patients grappling with concurrent HIV and cancer diagnoses. It emphasizes the imperative of expeditious initiation of antiretroviral therapy (ART), the provision of comprehensive psychosocial support, and the implementation of holistic care models.

The onset of bacterial infection during the nadir of the patient's immunosuppression further compounded her physical and emotional distress (Basavaraj et al., 2010). The wound infection, as confirmed by VITEK 2 identification of MSSA, resulted in increased pain, local inflammation, and anxiety over delayed healing. The patient's treatment burden was intensified by the necessity for intravenous antibiotics, additional laboratory testing, and prolonged outpatient visits. Moreover, concerns regarding the potential adverse effects of antibiotics, including possible hepatotoxicity and nephrotoxicity, further compounded the patient's apprehensions. The infection had a deleterious effect on her perception of recovery and occasioned a temporary decline in overall quality of life, resulting in a delayed return to daily activities. It was not until the infection was resolved and immune parameters were stabilized that she regained a sense of control and physical functionality.

Discussion

This case exemplifies the complex interplay between oncology and infectious disease management in a patient with dual diagnoses. The initial decision to

defer antiretroviral therapy (ART) was predicated on a preserved CD4 count and the urgency of managing an aggressive HER2-positive breast tumor (Rodrigues et al., 2021). However, as chemotherapy progressed, a predictable decline in immune function ensued, evidenced by falling CD4 counts, a spike in viral load, and the development of opportunistic infections (Dykstra et al., 2024). The patient exhibited symptoms including neutropenia, oral candidiasis, and delayed wound healing. These symptoms led to a critical decision to initiate antiretroviral therapy (ART) during the third chemotherapy cycle (Dykstra et al., 2024).

The chemotherapy regimen was selected based on existing best practices for HER2-positive disease. However, this case demonstrates how such regimens, when combined with untreated HIV, can accelerate immune deterioration and infection risk (Wu & Xiong, 2020). Cardiotoxicity resulting from trastuzumab administration was addressed through the implementation of standard echocardiographic monitoring procedures (Bouwer et al., 2020). The introduction of ART was facilitated by the use of tenofovir, emtricitabine, and dolutegravir, which exhibited minimal drug-drug interactions with chemotherapy and a favorable safety profile. The combination of antiretroviral therapy (ART) and oncological therapy necessitated close monitoring of renal and hepatic function, particularly in cases of elevated transaminases (Welz et al., 2017).

The patient's quality of life exhibited a marked decline during the immunosuppressive phase, transitioning from ECOG 1 to 3. This decline was accompanied by fatigue, infection-related discomfort, and psychological distress. Following the initiation of antiretroviral therapy (ART) and the attainment of clinical stabilization, there was an enhancement in both physical function and emotional resilience. This observation underscores the importance of timely immune reconstitution in restoring overall well-being (Vo et al., 2025).

The microbiological evaluation has been identified as a critical component of infection control measures. The utilization of the VITEK 2 system facilitated expeditious and precise bacterial identification and antibiotic susceptibility profiles (20). The incorporation of targeted therapy, informed by culture and sensitivity, in conjunction with adjustments for renal and hepatic function, proved instrumental in averting systemic sepsis and forestalling subsequent complications (Altaf et al., 2023).

This case underscores the global guidelines that advocate for the initiation of antiretroviral therapy (ART) in all HIV-positive individuals, particularly those undergoing immunosuppressive treatments. It further supports integrated clinical models that involve

oncology, infectious disease, pharmacy, and psychosocial care to address the broad spectrum of challenges in such complex cases. This case also supports the World Health Organization (WHO) guidelines favoring early antiretroviral therapy (ART) initiation and serves as a cautionary example of how delayed immune control can undermine cancer treatment tolerance and recovery. In settings with limited resources, the implementation of structured antiretroviral therapy (ART) coordination frameworks and the provision of early infectious disease input may hold particular significance.

Conclusion

This case underscores the complexity inherent in the management of concurrent breast cancer and HIV infection, particularly in instances where the initiation of antiretroviral therapy (ART) is delayed. The transition from a relatively preserved immune status to a state of significant immunosuppression underscores the synergistic impact of HIV and cytotoxic chemotherapy. The emergence of opportunistic infections, neutropenia, and reduced quality of life necessitated urgent initiation of antiretroviral therapy (ART), which ultimately led to clinical stabilization and improved treatment tolerance.

This case underscores the pivotal function of microbiological diagnostics, encompassing culture, sensitivity, and automated bacterial identification utilizing VITEK 2, in the refinement of antibiotic therapy. Renal and hepatic function must be closely monitored in such patients to ensure the safe administration of antimicrobials, antiretroviral therapy (ART), and chemotherapy.

Furthermore, the significant impact on the patient's quality of life underscores the necessity for prompt psychosocial support and multidisciplinary coordination. Integrating oncology, infectious disease, and pharmacy care has been demonstrated to mitigate treatment-related complications, ensure timely immune recovery, and improve both survival and functional outcomes. This case affirms current global guidelines that support the provision of antiretroviral therapy (ART) and comprehensive care for HIV-positive patients undergoing cancer treatment. In settings characterized by limited resources or a high HIV burden, the integration of oncology and infectious disease teams, in conjunction with the early initiation of antiretroviral therapy (ART), has been demonstrated to play a pivotal role in the reduction of morbidity, enhancement of patient survival, and the promotion of treatment continuity.

Declarations

Ethics approval and consent to participate

Ethics permission and consent to participate: All procedures involving human subjects complied with the ethical standards set forth by the IRB, as well as the 1964 Helsinki Declaration and its subsequent amendments. The patient executed a written consent form before participation.

Consent for Publication

Not applicable.

Availability of Data and Material

The data that supports the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of Interest / Competing Interests

The authors declare that there are no conflicts of interest.

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Author Contributions

A.S.A: Conceptualization, Methodology, Validation, Data curation, Writing of the original draft.

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Use of Generative AI and AI-Assisted Technologies

The author declares that no generative AI or AI-assisted technologies were used in the preparation of this work.

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