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Comparative Study of Chemotherapy Tolerance and Immune Function Changes in Gynecological Malignancy Patients with HIV Positive and Negative Status

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Abstract

Objective: To compare and analyze the chemotherapy tolerance and immune function changes between gynecological malignancy patients with HIV-positive and HIV-negative status, providing evidence-based guidance for individualized chemotherapy regimens tailored to different HIV infection statuses. **Methods:** Clinical data of 57 gynecological malignancy patients who received chemotherapy at the Department of Obstetrics and Gynecology, Nanning Fourth People's Hospital from January 2022 to December 2025 were retrospectively collected. Based on HIV infection status, they were divided into an HIV-positive group (n = 44) and an HIV-negative group (n = 13). The baseline clinical characteristics, laboratory indicators (blood routine, immune function) before and after chemotherapy, and the occurrence of complications were compared between the two groups. Statistical analysis was performed using independent samples t-test, χ^2 test, or Fisher's exact test. **Results:** There were no statistically significant differences in baseline characteristics such as age, disease type (cervical cancer proportion 90.9% vs 92.3%), clinical stage (stage I-II proportion 70.5% vs 69.2%), and chemotherapy regimen (paclitaxel plus cisplatin proportion 75.0% vs 76.9%) between the two groups ($P > 0.05$). After chemotherapy, the white blood cell count decreased from $7.02 \pm 3.15 \times 10^9$/L to $5.13 \pm 2.76 \times 10^9$/L in the HIV-positive group and from $7.35 \pm 2.98 \times 10^9$/L to $5.42 \pm 2.51 \times 10^9$/L in the HIV-negative group, with no significant difference in the magnitude of decrease between groups ($P = 0.921$). In the HIV-positive group, CD4+ T-lymphocyte count decreased from 482 ± 295 cells/μL to 395 ± 241 cells/μL ($P < 0.05$), while the HIV-negative group showed no significant changes in immune indicators. The incidence of grade III-IV

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neutropenia was 13.6% (6/44) in the HIV-positive group vs 7.7% (1/13) in the HIV-negative group (P = 0.682); the incidence of gastrointestinal reactions was 84.1% (37/44) vs 84.6% (11/13) (P = 0.967); and the incidence of infectious complications was 9.1% (4/44) vs 7.7% (1/13) (P = 0.885). Among the HIV-positive patients, 3 cases (6.8%) had a viral load ≥50 copies/mL. Of these, 2 developed mild gastrointestinal reactions and 1 had grade I neutropenia, with no severe infections or chemotherapy interruptions reported. **Conclusion:** With standard antiretroviral therapy, the chemotherapy tolerance of HIV-positive gynecological malignancy patients is comparable to that of HIV-negative patients, without an increased risk of severe chemotherapy toxicity or infectious complications. However, attention should be paid to the decline in CD4+ T-lymphocyte count in HIV-positive patients after chemotherapy, necessitating enhanced immune function monitoring.

Keywords

HIV Infection, Gynecological Malignancies, Chemotherapy Tolerance, Immune Function, CD4+ T-Lymphocytes

1. Introduction

With the widespread use of highly active antiretroviral therapy (HAART), the life expectancy of people living with HIV has significantly increased. Gynecological malignancies, as an important category of non-AIDS-defining cancers (NADCs), show an increasing incidence in the HIV-infected population [1]. In clinical practice, whether HIV infection status affects chemotherapy tolerance in gynecological malignancy patients remains controversial: some studies suggest that HIV-related immunodeficiency may increase the risk of chemotherapy-related complications such as myelosuppression and infection [2], while recent studies indicate that standard HAART can improve chemotherapy tolerance in HIV-infected individuals [3].

Most current studies focus on chemotherapy outcomes in HIV-positive patients, lacking direct comparative data between HIV-positive and HIV-negative patients, and sample sizes are generally small (<30 cases) [4]. Based on complete clinical data from 57 cases (44 HIV-positive, 13 HIV-negative), this study aims to clarify the differences in chemotherapy tolerance between patients with different HIV infection statuses through direct comparative analysis, providing more precise reference for clinical decision-making [5].

2. Materials and Methods

2.1. Study Subjects

Fifty-seven gynecological malignancy patients who received chemotherapy at the Department of Obstetrics and Gynecology, Nanning Fourth People's Hospital from January 2022 to December 2025 were selected. **Inclusion Criteria:** 1) Pathologically confirmed diagnosis of gynecological malignancies such as cervical cancer, ovarian cancer; 2) Completion of at least one cycle of chemotherapy; 3) Com-

plete clinical data (including blood routine tests, liver and kidney function tests, HIV test results); 4) HIV-positive patients received standard HAART for ≥3 months [6]. **Grouping Method:** Patients were divided into an HIV-positive group (n = 44) and an HIV-negative group (n = 13) based on confirmed HIV infection status (laboratory HIV antibody / test results). The background color code in the data table (yellow for HIV-negative, white for HIV-positive) was only used for data management and not as a grouping basis.

2.2. Data Collection

The following data were collected via the hospital's electronic medical record system: age, disease type, clinical stage, chemotherapy regimen, number of chemotherapy cycles, duration of HIV infection (positive group), HAART regimen (positive group); white blood cell (WBC) count, neutrophil (NEUT) count, hemoglobin (Hb), platelet (PLT) count, CD4+ T-lymphocyte count (HIV-positive group) before and after chemotherapy; neutropenia (graded according to CTCAE 5.0), gastrointestinal reactions (nausea, vomiting, diarrhea), and infectious complications (pneumonia, urinary tract infection, etc.).

2.3. Statistical Methods

Data analysis was performed using SPSS 30.0 software. Continuous variables were expressed as mean ± standard deviation ($\overline{x} \pm s$). Inter-group comparisons were made using the independent samples t-test, and intra-group comparisons before and after chemotherapy were made using the paired t-test. Categorical variables were expressed as count (percentage), and comparisons were made using the χ^2 test or Fisher's exact test when expected frequencies were less than 5. A P-value < 0.05 was considered statistically significant.

3. Results

3.1. Comparison of Baseline Characteristics between Groups

There were no statistically significant differences in baseline characteristics such as age, disease distribution, clinical stage, and chemotherapy regimen between the two groups (P > 0.05), indicating comparability (**Table 1**). In the HIV-positive group, the average duration of infection was 5.2 ± 3.8 years, 93.2% (41/44) of patients had a viral load <50 copies/mL, and the main HAART regimens were zidovudine + lamivudine + nevirapine (34.1%) and efavirenz + tenofovir + lamivudine (27.3%).3 cases (6.8%) had a viral load ≥50 copies/mL, of which 2 developed mild gastrointestinal reactions and 1 had grade I neutropenia, with no severe infections or chemotherapy interruptions reported.

3.2. Comparison of Laboratory Indicators before and after Chemotherapy between Groups

3.2.1. Changes in Blood Routine Indicators

WBC, neutrophil, hemoglobin, and platelet counts decreased after chemotherapy

in both groups compared to pre-chemotherapy levels, but the magnitudes of decrease were not statistically significantly different between groups (P > 0.05). Details are shown in Table 2. The decrease in WBC was 1.89 ± 1.32 × 10^9/L in the HIV-positive group vs 1.93 ± 1.28 × 10^9/L in the HIV-negative group (P = 0.921); the decrease in neutrophil count was 1.76 ± 1.15 × 10^9/L vs 1.81 ± 1.09 × 10^9/L (P = 0.887); the decrease in hemoglobin was 15.8 ± 8.3 g/L vs 14.9 ± 7.6 g/L (P = 0.743); the decrease in platelet count was 27 ± 18 × 10^9/L vs 25 ± 16 × 10^9/L (P = 0.785).

Table 1. Comparison of baseline characteristics between groups.

Characteristic	HIV-Positive Group (n = 44)	HIV-Negative Group (n = 13)	χ^2/t value	P value
Age (years, $\bar{x} \pm s$)	46.2 ± 9.5	48.1 ± 8.7	0.723	0.526
Disease Type (n, %)				
Cervical Cancer	40 (90.9)	12 (92.3)	0.041	0.783
Ovarian Cancer	4 (9.1)	1 (7.7)		
Clinical Stage (n, %)				
Stage I-II	31 (70.5)	9 (69.2)	0.185	0.654
Stage III-IV	13 (29.5)	4 (30.8)		
Chemotherapy Regimen (n, %)				
Paclitaxel + Cisplatin	33 (75.0)	10 (76.9)	0.019	0.891
Other	11 (25.0)	3 (23.1)		
Chemotherapy Cycles (n, $\bar{x} \pm s$)	3.1 ± 1.2	3.3 ± 1.1	0.512	0.612

Table 2. Comparison of blood routine indicators before and after chemotherapy between groups ($\bar{x} \pm s$).

Indicator	Group	Pre-Chemotherapy	Post-Chemotherapy	Intra-group P value	Inter-group P value (Magnitude of Decrease)
White Blood Cells (×10^9/L)	HIV-Positive	7.02 ± 3.15	5.13 ± 2.76	<0.001	0.921
	HIV-Negative	7.35 ± 2.98	5.42 ± 2.51	0.003	
Neutrophils (×10^9/L)	HIV-Positive	5.05 ± 2.87	3.29 ± 2.01	<0.001	0.887
	HIV-Negative	5.23 ± 2.76	3.42 ± 1.95	0.004	
Hemoglobin (g/L)	HIV-Positive	108.3 ± 17.9	92.5 ± 15.6	<0.001	0.743
	HIV-Negative	112.5 ± 16.8	97.6 ± 14.9	0.002	
Platelets (×10^9/L)	HIV-Positive	276 ± 82	249 ± 75	0.001	0.785
	HIV-Negative	285 ± 79	260 ± 72	0.005	

3.2.2. Changes in Immune Function Indicators

In the HIV-positive group, the CD4+ T-lymphocyte count significantly decreased after chemotherapy (482 ± 295 vs 395 ± 241 cells/μL, t = 3.215, P = 0.002). 86.4% (38/44) of patients maintained a CD4+ count above 300 cells/μL. The HIV-negative group did not undergo CD4+ T-lymphocyte testing as it is not a routine clin-

ical indicator for immunocompetent individuals without HIV infection. Their total lymphocyte counts showed no significant change before and after chemotherapy (2.35 ± 0.87 vs 2.28 ± 0.81 × 109/L, P = 0.653), indicating no obvious systemic immune suppression induced by chemotherapy.

3.3. Comparison of Chemotherapy-Related Complications between Groups

There were no statistically significant differences in the incidence of chemotherapy-related complications between the two groups (P > 0.05). Details are shown in Table 3. The incidence of grade III-IV neutropenia was 13.6% (6/44) in the HIV-positive group vs 7.7% (1/13) in the HIV-negative group (P = 0.682). Gastrointestinal reactions were predominantly mild to moderate, with incidences of 84.1% (37/44) and 84.6% (11/13) respectively (P = 0.967). Infectious complications in the HIV-positive group included 2 cases of pneumonia and 2 cases of urinary tract infection; the HIV-negative group had 1 case of urinary tract infection (P = 0.885). Liver and kidney function abnormalities were mild in both groups, with an incidence of 11.4% (5/44) in the HIV-positive group vs 7.7% (1/13) in the HIV-negative group (P = 0.738).

Table 3. Comparison of Chemotherapy-Related complications between groups (n, %).

Complication Type	HIV-Positive Group (n = 44)	HIV-Negative Group (n = 13)	χ^2/Fisher value	P value
Neutropenia				
Grade I-II	32 (72.7)	10 (76.9)	0.168	0.682
Grade III-IV	6 (13.6)	1 (7.7)		
Gastrointestinal Reactions				
Mild	21 (47.7)	6 (46.2)		
Moderate	16 (36.4)	5 (38.5)	0.002	0.967
Severe	0 (0.0)	0 (0.0)		
Infectious Complications	4 (9.1)	1 (7.7)	0.025	0.885
Liver/Kidney Function Abnormalities	5 (11.4)	1 (7.7)	0.105	0.738

4. Discussion

Based on complete clinical data from 57 cases, this study is the first to compare the chemotherapy tolerance of HIV-positive and HIV-negative gynecological malignancy patients within the same medical center. The key findings are as follows:

4.1. Core Evidence That HIV Infection Status Does Not Affect Chemotherapy Tolerance

This study showed no significant differences between the two groups in the mag-

nitude of post-chemotherapy decreases in blood routine indicators or the incidence of grade III-IV toxicities, consistent with the results of a multicenter study by Huang *et al.* [7]. That study included 32 HIV-positive and 45 HIV-negative cervical cancer patients and found no significant differences in the incidence of grade III-IV neutropenia (12.5% vs 9.8%) or chemotherapy delay rates (15.6% vs 13.3%).

From a mechanistic perspective, standard HAART is crucial for HIV-positive patients to achieve good chemotherapy tolerance. In this study, 93.2% of HIV-positive patients had a viral load <50 copies/mL, and the baseline CD4+ count was 482 ± 295 cells/μL, approaching normal immune levels [8], laying the foundation for chemotherapy tolerance.

4.2. Focus of Immune Function Monitoring in HIV-Positive Patients

Despite the overall good chemotherapy tolerance in HIV-positive patients, the significant post-chemotherapy decrease in CD4+ count (average decrease of 87 cells/μL) highlights the need for enhanced immune function monitoring. Studies show that HIV-infected individuals with a CD4+ count <200 cells/μL have a significantly increased risk of chemotherapy-related infections [9]. Therefore, the following is recommended: monitor CD4+ count every 2 chemotherapy cycles; consider prophylactic use of cotrimoxazole if CD4+ count falls below 300 cells/μL; and avoid using chemotherapy regimens with strong bone marrow toxicity when CD4+ count is below 200 cells/μL.

4.3 Consideration of Statistical Power Limitation

It should be noted that the small sample size of the control group (n = 13) may lead to a risk of Type II error. Statistical power analysis indicated that the power of this study for the primary outcome (incidence of grade III-IV neutropenia) was approximately 65% ($\alpha = 0.05$), which is lower than the ideal level (80%). Thus, the conclusion of "no significant difference between groups" may be influenced by insufficient statistical power. Future studies with an expanded control group sample size are needed to further verify the reliability of the findings [10].

4.4. Delimitation of Immune Function Comparison Scope

The "comparison of immune function" in this study is strictly limited to general blood routine indicators (white blood cell, neutrophil, and lymphocyte counts). Since CD4+ T-lymphocyte count was not measured in the control group, targeted comparison of immune function subsets could not be performed. This limitation in the study scope should be clearly stated to avoid overinterpretation of the results.

5. Conclusion

With standard HAART, the chemotherapy tolerance of HIV-positive gynecological malignancy patients is comparable to that of HIV-negative patients [11].

There is no need to routinely reduce chemotherapy doses or adjust regimens solely based on HIV infection status, provided that patients have achieved effective viral suppression (viral load <50 copies/mL) and stable immune function (CD4+ T-lymphocyte count ≥300 cells/μL) through standard HAART In clinical practice, attention should be focused on the changes in CD4+ T-lymphocyte counts in HIV-positive patients after chemotherapy [12], with enhanced immune function monitoring [13], while maintaining chemotherapy intensity consistent with that for HIV-negative patients to ensure anti-tumor efficacy [14] [15].

6. Study Strengths and Limitations

Strengths: 1) Relatively large sample size (57 cases) with a reasonable ratio of HIV-positive to negative patients (3.4:1); 2) Data from the same medical center ensures uniformity in chemotherapy regimens and toxicity assessment criteria; 3) Complete collection of HAART information for HIV-positive patients controls for key confounding factors.

Limitations: 1) Retrospective study design carries inherent selection bias; 2) The HIV-negative group sample size is still relatively small (13 cases), limiting statistical power for some complications (e.g., infectious complications); 3) Lack of analysis of long-term survival outcomes precludes assessment of the impact of HIV infection on prognosis.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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