

Effect Analysis of Paclitaxel, Cyclophosphamide Combined with Albumin-paclitaxel in the Treatment of Breast Cancer

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Abstract

Objective: To evaluate the efficacy of epirubicin and cyclophosphamide combined with albumin-bound paclitaxel in the treatment of breast cancer. **Methods:** A total of 289 patients diagnosed with breast cancer (admitted between January 2022 and 2024) were enrolled as study subjects. Using a random number table, patients were divided into a control group (n=144) and an observation group (n=145). The control group received the chemotherapy regimen of epirubicin, cyclophosphamide, and docetaxel, while the observation group received the regimen of epirubicin, cyclophosphamide, and albumin-bound paclitaxel. The therapeutic outcomes and incidence of adverse reactions were compared between the two groups. **Results:** The observation group demonstrated a higher overall response rate and a lower overall incidence of adverse reactions compared to the control group (P<0.05). **Conclusion:** The chemotherapy regimen of epirubicin, cyclophosphamide, and albumin-bound paclitaxel enhances clinical efficacy and reduces the risk of adverse reactions in breast cancer patients.

Keywords

Daunorubicin; Cyclophosphamide; Albumin-bound paclitaxel; breast cancer; efficacy

Breast cancer, as one of the most common malignant tumors in women, poses a severe threat to women's health and quality of life [1]. Globally, its incidence has shown an annual upward trend, with cases increasingly occurring at younger ages [2]. Various treatment modalities are available for breast cancer, including surgery, radiotherapy, chemotherapy, endocrine therapy, and targeted therapy, among which chemotherapy plays a pivotal role in comprehensive breast cancer management. Although traditional chemotherapy regimens can partially control disease progression, they often face efficacy limitations and severe adverse effects, adversely impacting patients' survival duration and quality of life. Therefore, developing more efficient and less toxic chemotherapy regimens has become a critical clinical challenge. Epirubicin, an anthracycline-based chemotherapeutic agent, exhibits broad-spectrum antitumor activity by embedding between DNA base pairs, thereby interfering with DNA synthesis and function to exert its anticancer effects [3]. Cyclophosphamide, an alkylating agent, disrupts the DNA structure of tumor cells and inhibits their proliferation [4]. Albumin-bound paclitaxel utilizes advanced nanotechnology to encapsulate paclitaxel within albumin, enhancing drug solubility and tumor tissue uptake, thereby improving therapeutic efficacy [5]. The combined application of epirubicin, cyclophosphamide, and albumin-bound paclitaxel in breast cancer treatment theoretically synergizes anticancer effects through distinct mechanisms, amplifying tumor cell destruction while reducing the adverse reactions associated with high-dose monotherapy. This study aims to evaluate the therapeutic efficacy of

the epirubicin-cyclophosphamide-albumin-bound paclitaxel combination in breast cancer treatment. The findings are reported as follows.

1. Materials and Methods

1.1 General Data

A total of 289 patients diagnosed with breast cancer (admitted between January 2022 and 2024) were enrolled as study subjects. The patients were randomly assigned to either the control group (n=144) or the observation group (n=145) using a random number table. This study was approved by the hospital's Medical Ethics Committee. Both groups consisted of female patients. Summary of baseline characteristics revealed statistically comparable groups ($P>0.05$). Baseline characteristics for the control group were: unilateral/bilateral involvement: 108/36; age: 27-65 (mean 50.74 ± 4.37) years; proportion of TNM stage II/III: 61/83. For the observation group: unilateral/bilateral involvement: 110/35; age: 28-67 (mean 51.18 ± 4.25) years; proportion of TNM stage II/III: 64/81.

1.2 Inclusion and Exclusion Criteria

Inclusion criteria: Histologically confirmed breast cancer [6]; presence of at least one measurable lesion meeting the solid tumor response evaluation criteria (RECIST 1.1) [7]; good physical condition capable of tolerating chemotherapy; and availability of complete clinical case data.

Exclusion criteria: Patients who have received chemotherapy, radiotherapy, endocrine therapy, or targeted therapy; pregnant or lactating women; individuals with comorbid diabetes, kidney disease, cardiovascular disease, severe infection, or mental illness; and patients with an expected survival of less than 6 months.

1.3 Methods

Both groups of patients received 8 cycles of chemotherapy (each cycle lasting 21 days), with the first 4 cycles using the same regimen and the subsequent 4 cycles switching chemotherapy agents based on group assignment. The treatment regimen for the first 4 cycles was as follows: intravenous infusion of 90 mg/m² epirubicin hydrochloride injection [specification: 5 ml:10 mg; National Drug Approval Number H20093251; Manufacturer: Pfizer (Wuxi) Co., Ltd.]; intravenous infusion of 600 mg/m² cyclophosphamide for injection (specification: 0.2 g; National Drug Approval Number HJ20160467; Manufacturer: Baxter Oncology GmbH). The treatment regimen for the subsequent 4 cycles was as follows: the control group received 90 mg/m² docetaxel intravenous infusion (specification: 2.0 ml:80 mg; National Drug Approval Number H20030561; Manufacturer: Jiangsu Hengrui Pharmaceutical Co., Ltd.), while the observation group received 260 mg/m² albumin-bound paclitaxel intravenous infusion (specification: 100 mg; National Drug Approval Number H20183378; Manufacturer: Jiangsu Hengrui Pharmaceutical Co., Ltd.).

1.4 Observation Indicators

1.4.1 Clinical Efficacy

If tumor lesions in the patient's body are completely absent and the disappearance state remains stable for at least 4 weeks, it can be determined as achieving complete remission (CR); if the tumor area reduces by 50% or more compared to the initial state and this reduction persists stably for at least 4 weeks, it is classified as partial response (PR); if the tumor area reduction ranges between 25% and 50% and remains stable for at least 4 weeks, it is designated as stable disease (SD); if the tumor area not only fails to decrease but also enlarges or new tumor lesions appear, it is classified as disease progression (PD) [7]. Overall response rate = (number of cases with complete remission + number of cases with partial response) / total number of cases $\times 100\%$.

1.4.2 Adverse Reactions

Adverse reactions include coagulation disorders, skin lesions, nausea and vomiting, bone marrow suppression, alopecia, and abnormal liver or kidney function.

1.5 Statistical Analysis

Statistical analysis was performed using SPSS 26.0 software. Counting indicators (overall efficacy rate, incidence of adverse reactions) were expressed as case numbers/percentage (n/%) and analyzed by χ^2 test. Measurement indicators

were presented as mean \pm standard deviation ($\bar{x} \pm s$) and analyzed by t-test. A P-value <0.05 was considered statistically significant.

2. Results

2.1 Comparison of Clinical Efficacy Between the Two Groups

The overall efficacy rate in the observation group (92.41%) was significantly higher than that in the control group (83.33%) ($P < 0.05$), as shown in Table 1.

Table 1. Comparison of clinical efficacy between the two groups (n, %)

Group	n	CR (n)	PR (n)	SD (n)	PD (n)	Total effective rate (%)
Observation group	145	58	76	11	0	134 (92.41)
Control group	144	39	81	22	2	120 (83.33)
χ^2	-					5.597
<i>P</i>	-					0.018

2.2 Comparison of Adverse Reactions Between the Two Groups

The overall incidence rate of adverse reactions in the observation group (7.59%) was lower than that in the control group (15.28%) ($P < 0.05$), as shown in Table 2.

Table 2. Comparison of adverse reactions between the two groups (n, %)

Group	n	Disturbance of blood coagulation (n)	Skin lesion (n)	N and V (n)	Arrest of bone marrow (n)	Lip-sotrichia (n)	Abnormal liver and kidney function (n)	Overall incidence rate (%)
Observation group	145	1	2	2	1	3	2	11 (7.59)
Control group	144	3	4	4	2	6	3	22 (15.28)
χ^2	-							4.226
<i>P</i>	-							0.040

3. Discussion

Breast cancer, as one of the malignancies with a high incidence rate among women, directly impacts patient prognosis and quality of life through its diagnosis and treatment outcomes. With advancements in medical research, chemotherapy has gained increasing prominence in the comprehensive management of breast cancer, particularly in improving postoperative prognosis and controlling tumor progression. Although traditional chemotherapy regimens have demonstrated certain therapeutic efficacy, their prolonged treatment duration, numerous drug-related adverse effects, and potential impact on reproductive function in young women continue to limit their clinical application. In recent years, the chemotherapy regimen combining epirubicin, cyclophosphamide, and albumin-bound paclitaxel has garnered growing attention. This regimen optimizes drug combinations and administration methods to enhance therapeutic efficacy, shorten treatment duration, and reduce adverse effects, offering breast cancer patients a safer and more effective treatment option.

In this study, the total response rate in the observation group was significantly higher than that in the control group ($P < 0.05$). Paclitaxel inhibits breast cancer cell proliferation by interfering with DNA synthesis and transcription processes. It also intercalates into DNA double strands, suppressing DNA and RNA synthesis to exert cytotoxic effects. Cyclophosphamide disrupts DNA structure, inhibiting breast cancer cell replication and proliferation. After entering the body, it is metabolized by hepatic microsomal enzymes into highly alkylating chloroethyl phosphamide, which exerts cytotoxic effects on tumor cells. Albumin-bound paclitaxel promotes microtubule polymerization and inhibits

disassembly, causing cell cycle arrest at the G2/M phase to suppress tumor cell growth [8]. These three drugs target different stages of tumor cell proliferation. Their combination demonstrates synergistic effects, enhancing tumor cell killing efficacy and improving clinical outcomes. In this study, the overall incidence of adverse reactions was lower in the observation group compared to the control group ($P < 0.05$). Albumin binds to albumin receptors on tumor cell surfaces, facilitating drug delivery and improving targeting accuracy. This approach enhances therapeutic efficacy while minimizing damage to normal tissues and reducing adverse reaction risks [9]. Albumin-bound paclitaxel also exhibits relatively mild gastrointestinal side effects, effectively mitigating nausea and vomiting [10]. Additionally, the regimen demonstrates a lower incidence of adverse effects such as hepatic/renal dysfunction, cardiotoxicity, and neurotoxicity. Close monitoring and prompt intervention further reduce these risks.

In conclusion, the chemotherapy regimen for breast cancer patients involving epirubicin, cyclophosphamide, and albumin-bound paclitaxel can improve clinical efficacy and reduce the risk of adverse reactions.

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