Nursing Care of a Patient with Advanced Breast Cancer and Multiple Metastases During DS8201 Treatment: A Case Study

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Abstract

Objective: To summarize the therapeutic effects of symptomatic nursing interventions in a patient with advanced breast cancer and metastases to the ribs, lungs, and liver during treatment with DS8201 (ENHERTU). Methods: A patient with breast cancer and multiple metastases, admitted on January 4, 2021 due to "a right breast mass discovered for 2 months," was selected as the study subject. DS8201 was administered during the treatment period, and targeted nursing care was provided based on the patient's symptoms during medication. The Self-Rating Anxiety Scale (SAS) was used to evaluate the patient's psychological status. The Pittsburgh Sleep Quality Index (PSQI) and Insomnia Severity Index (ISI) were employed to assess sleep quality. Side effects during the medication process were also evaluated. Results: Before treatment, the SAS score was 22, PSQI was 19, and ISI score was 24. After treatment, the SAS score was 15, PSQI was 12, and ISI score was 11, indicating that both the patient's sleep quality and anxiety were alleviated. Follow-up examination results showed that the left breast nodule exhibited minimal change compared with the previous examination, and no metastases to other sites were detected. Follow-up until September 2023 revealed no obvious recurrence, after which the patient did not return for further outpatient visits. A telephone follow-up in October 2023 indicated that the patient reported no obvious discomfort, stable disease condition, and well-controlled indicators during the medication period. Conclusion: This study on the symptoms of patients with advanced breast cancer during DS8201 use and the corresponding nursing measures provides a nursing basis for future patients. It enhances clinicians' understanding and mastery of the clinical manifestations and imaging features of breast cancer metastasis to the ribs, lungs, and liver, and improves clinicians' diagnostic and therapeutic capabilities for this disease, though further verification with an expanded sample size is still required.

Full Text

Preamble

Title: Nursing Care During DS8201 Treatment in a Patient with Advanced Breast Cancer and Multiple Metastases

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Abstract

Objective: To summarize the therapeutic effects of symptomatic nursing interventions in a patient with advanced breast cancer involving rib, pulmonary, and hepatic metastases during DS8201 (ENHERTU) treatment.

Methods: A breast cancer patient with multiple metastases admitted on January 4, 2021, due to "right breast mass discovered for 2 months" was selected as the study subject. The patient received DS8201 treatment with targeted nursing care based on symptomatic manifestations during medication. The Hamilton Anxiety Scale (SAS) was used for psychological assessment, while the Pittsburgh Sleep Quality Index (PSQI) and Insomnia Severity Index (ISI) evaluated sleep quality. Treatment side effects were also assessed.

Results: Pre-treatment scores were SAS 22, PSQI 19, and ISI 24. Post-treatment scores improved to SAS 15, PSQI 12, and ISI 11, indicating alleviated anxiety and improved sleep quality. Follow-up examinations showed no significant changes in left breast nodules compared with previous results, with no new metastatic sites detected. Follow-up continued until September 2023 without obvious recurrence, after which the patient discontinued hospital visits. A telephone follow-up in October 2023 revealed the patient reported no significant discomfort, stable disease condition, and well-controlled indicators during treatment.

Conclusion: This study's analysis of symptomatic nursing measures for advanced breast cancer patients during DS8201 treatment provides a nursing reference framework for future patients. It enhances clinicians' understanding and mastery of the clinical manifestations and imaging characteristics of breast cancer with rib, pulmonary, and hepatic metastases, improving diagnostic and treatment capabilities. However, larger sample sizes are needed for further validation.

Keywords: Breast cancer; Multiple metastasis; ENHERTU; Symptomatic nursing

Introduction

Breast cancer is a common malignant tumor among women. The 2020 Global Cancer Burden data indicated 2.3 million new female breast cancer cases, with incidence rising annually to become the leading malignant tumor among women worldwide [1]. In China, new breast cancer cases reached 300,000 in 2015, representing a substantial disease burden that seriously threatens women's physical and mental health and quality of life [2]. Distant metastasis is the primary cause of death in breast cancer patients, with the most common target organs being lung, liver, and bone [3]. Treatment modalities encompass surgery, endocrine therapy, targeted therapy, chemotherapy, and radiotherapy, with chemotherapy and targeted therapy being particularly important [4].

DS-8201 (ENHERTU) is a second-generation antibody-drug conjugate composed of an anti-human epidermal growth factor receptor 2 (HER2) IgG1 monoclonal antibody conjugated via a linker to the topoisomerase I inhibitor Dxd [5]. DS-8201 selectively targets HER2-expressing tumors, releasing the topoisomerase inhibitor payload to induce cell death, while membrane-permeable free drugs attack neighboring cancer cells [6]. However, drug treatment readily induces a series of adverse reactions, and patients may develop varying degrees of negative emotions due to their condition, compromising overall treatment efficacy. Therefore, effective nursing interventions are needed to improve comprehensive care outcomes [7]. Conventional nursing models focus on managing drug adverse reactions but lack systematic guidance on patients' physical and mental status and nutrition, resulting in suboptimal recovery and poor quality-of-life improvement, necessitating alternative nursing approaches.

Given these considerations, this article analyzes the application value of personalized nursing care during DS8201 treatment in advanced breast cancer patients with multiple metastases, with details as follows.

Case Report

Patient Information

The patient was a 54-year-old female admitted on January 4, 2021, due to "right breast mass discovered for 2 months." Physical examination revealed peau d'orange changes in the right anterior chest skin, with a palpable hard mass approximately 3.0 cm × 5.0 cm, poorly defined borders, and limited mobility. Enlarged lymph nodes were palpable in the right axilla. The patient had undergone modified radical mastectomy for right breast cancer on February 18, 2016. Postoperative pathology showed invasive ductal carcinoma (Figure 1), grade 2, measuring 2.0 × 1.5 × 1.5 cm, with sentinel lymph node metastasis 3/5 and axillary lymph nodes 0/22. Immunohistochemistry showed ER (+++, 80%), PR (+++, 80%), HER2 (2+), FISH (-), Ki-67 (+, 50%). The chemotherapy regimen was AC3-T4 (epirubicin + cyclophosphamide + docetaxel) for 7 cycles. After 3 cycles of AC, the patient experienced palpitations and did not receive the 4th AC cycle. No postoperative radiotherapy was administered.

Endocrine therapy with tamoxifen was initiated and switched to letrozole on January 13, 2021.

Post-Recurrence Examination Data

Five years post-surgery, follow-up examination revealed multiple metastases to ribs, lung, and liver. Examination reports showed: (1) Abdominal ultrasound: A hypoechoic patch approximately 77 mm × 25 mm was visible under the liver capsule in segment S4, with ill-defined borders and relatively uniform echogenicity (Figure 2A). Color Doppler flow imaging (CDFI) detected linear blood flow signals within the lesion (Figure 2B). (2) Chest CT: Destruction of the right 4th rib with soft tissue shadow and increased metabolism, highly suggestive of malignant metastatic lesion (Figure 3A). Right chest wall puncture pathology showed ER 90% (strong positive, 95%), PR (-), HER2 (2+), Ki-67 (+, 60%). Pathological results indicated locally active tissue proliferation with local cancer cells arranged in papillary patterns invading the rib (Figure 3B). Pulmonary CT: Multiple small nodules and micronodules in both lungs, with a larger pure ground-glass nodule in the lingular segment of the left upper lobe, some newly emerged compared with previous imaging, considered metastatic (Figure 4A). Immunohistochemistry results: ER (moderate positive, 95%), PR (strong positive, 95%), HER-2 (3+), Ki-67 index 15%, AR (strong positive, 95%), CK5/6 (-), P53 (-), EGFR (-). Pathological images are shown in Figure 4B.

DS8201 Treatment and Nursing Care

Treatment Protocol Considering the patient's metastatic lesions and low HER2 expression in the primary tumor, DS-8201 cycle therapy was initiated on January 28, 2021. The standard recommended dose of DS8201 is 5.4 mg/kg administered intravenously every three weeks. The initial infusion time was controlled to over 90 minutes, with subsequent infusions over 30 minutes. If the patient experienced discomfort during infusion, the rate was reduced or infusion interrupted. If dosing was delayed or missed, treatment was arranged as soon as possible without waiting for the next cycle. DS8201 was first reconstituted with 5 ml of sterile water; during reconstitution, vigorous shaking was avoided, and gentle rotation was used until dissolution before diluting in glucose solution. The infusion line was flushed with 5% glucose before and after administration, and light protection was required during infusion using light-protected infusion sets. Anti-allergy medication was administered prophylactically.

Nursing Interventions

1. **Psychological Nursing**: A nurse-patient communication group was established to facilitate exchange of condition information among patients, mutual encouragement, joint overcoming of fear of the unknown, and enhanced confidence in conquering disease.

2. **Sleep-Promoting Environment**: (a) Maintained a quiet sleep environment, avoiding loud noise; (b) Closed doors and windows and drew curtains during patient rest, using wall lamps for nighttime sleep; (c) Maintained appropriate temperature and humidity in the ward with clean and tidy bed units.
3. **Sleep Care**: (a) Accommodated the patient's home sleep habits as much as possible; (b) Planned nursing activities systematically to minimize sleep interference; (c) Provided sleep-promoting measures including pain management and comfortable positioning, instructing patients in relaxation techniques such as slow deep breathing and whole-body muscle relaxation therapy.
4. **Cognitive Therapy**: Maintained reasonable sleep expectations, allowing natural sleep onset, avoiding excessive subjective intention to fall asleep, and reducing excessive focus on sleep.

Assessment Indicators

The Hamilton Anxiety Scale (SAS) was used for psychological assessment. Sleep quality was evaluated using the Pittsburgh Sleep Quality Index (PSQI) and Insomnia Severity Index (ISI). Medication evaluation: DS-8201 side effects include interstitial lung disease (ILD), myelosuppression, cardiac dysfunction, nausea, vomiting, constipation, diarrhea, indigestion, fatigue, and other toxicities. During treatment, the patient experienced nausea and vomiting, which were well controlled with prophylactic oral aprepitant, 5 mg intravenous tropisetron, and intramuscular diphenhydramine.

Outcome Evaluation

The initial SAS score was 22, indicating significant anxiety with severe symptoms requiring intervention and affecting daily life and activities. After multiple treatment cycles, with improving examination results and indicators, the patient's score decreased to 15, indicating persistent but less severe anxiety that did not affect daily life and activities. Pre-treatment PSQI was 19, decreasing to 12 post-treatment. ISI score decreased from 24 pre-treatment to 11 post-treatment, demonstrating improved sleep quality. Follow-up examination on August 9, 2022 showed no significant changes in left breast nodules compared with previous results, with no metastasis detected in other sites. Follow-up continued until September 2023 without obvious recurrence, after which the patient discontinued hospital visits. A telephone follow-up in October 2023 revealed the patient reported no significant discomfort, stable disease condition, and well-controlled indicators during treatment.

Studies show that breast cancer patients have poor sleep quality during chemotherapy [9], with approximately 65% experiencing sleep disturbances throughout the entire chemotherapy process [10]. High-dose oral dexamethasone is administered as pre-chemotherapy prophylaxis to reduce or eliminate

adverse reactions caused by taxane drugs, but it can induce sleep disorders [11]. Breast cancer patients with regional lymph node metastasis typically require additional treatments and surgeries, such as neoadjuvant chemotherapy, lymph node surgery, endocrine therapy, and radiotherapy [12], which can lead to more severe treatment-related toxicities, psychological and economic burdens, and consequently higher probability of sleep disorders. Patients receiving targeted therapy have a 2.135-fold higher probability of severe sleep disturbance compared with those not receiving targeted therapy [13].

Bone marrow metastasis is more common in tumor populations with high bone metastasis rates such as breast cancer. Early stages typically lack typical clinical manifestations, while later stages are often accompanied by progressive anemia and thrombocytopenia, seriously affecting patient prognosis [14]. Breast cancer bone marrow metastasis is closely related to bone metastasis, often occurring concurrently. Bone marrow metastasis can be diagnosed simultaneously with bone metastasis or after bone metastasis diagnosis [15], but their clinical manifestations and survival prognosis are distinctly different. Bone metastasis readily causes a series of bone-related adverse events including bone pain, pathological fractures, and spinal cord compression [16], whereas bone marrow metastasis lacks typical symptoms and signs, usually accompanied by multiple spinal metastases and easily combined with metastases in other organs [17], with poor prognosis and median overall survival of only 1 year, dropping to as low as 1 month for those not receiving chemotherapy. Over 90% of malignant tumor patients exhibit elevated LDH, particularly pronounced in those with high malignancy and advanced staging [18]. ALP elevation occurs when breast cancer develops bone and bone marrow metastasis [19]. When patients present with bone pain, fever, weight loss accompanied by abnormal blood counts (sudden unexplained anemia, thrombocytopenia), elevated ALP and LDH, decreased blood calcium, elevated tumor markers (CA125, CA199, CEA, CA724, CA153), and bone lesions detected by bone scan, bone marrow metastatic cancer should be suspected and bone marrow puncture biopsy performed promptly [20].

Regarding molecular subtype expression in breast cancer patients with bone marrow metastasis, Luminal B type is most common, accounting for approximately 65.2% [21]. Luminal type breast cancer patients with bone marrow metastasis may lose the opportunity for chemotherapy and even face life-threatening conditions if endocrine therapy is ineffective. The median overall survival time in the chemotherapy group for breast cancer bone marrow metastasis is superior to the non-chemotherapy group [22], and single-agent chemotherapy can prolong progression-free survival. For advanced breast cancer patients with breast cancer susceptibility gene mutations accompanied by pancytopenia, olaparib targeted therapy has achieved good clinical efficacy with low adverse reactions [23]. Therefore, for bone marrow metastasis patients with abnormal blood counts such as anemia and/or decreased platelets, it is recommended to provide symptomatic supportive treatment while administering single-agent chemotherapy or targeted therapy whenever possible.

Tumor cells can spread to the leptomeninges through multiple pathways including direct metastasis, hematogenous metastasis, neural metastasis, and lymphatic metastasis [24], with hematogenous metastasis being the most common route in breast cancer. Over 90% of brain metastasis patients have clinical symptoms and signs that vary depending on the invaded site and lack specificity. Common clinical manifestations include increased intracranial pressure (such as headache, nausea, vomiting), brain dysfunction (intellectual and gait disturbances), brain parenchymal involvement and meningeal irritation manifestations (headache, nausea, vomiting, nuchal rigidity, meningeal irritation signs, etc.), and cranial nerve lesions [25].

DS-8201 is a novel HER2-targeted ADC composed of a humanized anti-HER2 antibody, an enzymatically cleavable peptide linker, and a novel topoisomerase I inhibitor. Its anti-HER2 antibody is a human monoclonal IgG1 produced using the same amino acid sequence as trastuzumab [26]. TOPO I inhibitors exert cytotoxic activity by interfering with DNA replication and transcription through trapped TOPO I cleavage complexes [27]. Due to DS-8201's highly membrane-permeable payload, a bystander killing effect can be observed in cells neighboring HER2-positive cells, with minimal systemic toxicity [28]. Currently, few articles address DS-8201 in breast cancer with multiple metastases. Since patients undergoing chemotherapy face not only toxic side effects from drug stimulation and cancer pain but also bear high treatment costs while experiencing emotional, social, and spiritual pressures that readily generate negative emotions and lead to poor expected quality of life, this study treated a patient with advanced breast cancer and rib, pulmonary, and hepatic metastases using DS-8201 combined with symptomatic nursing care. Results showed reduced anxiety scores after treatment, with telephone follow-up revealing no significant discomfort and stable disease condition. However, as this study included only one patient, larger sample sizes are needed for multi-angle validation in the future.

Conclusion

In summary, advanced breast cancer patients with multiple metastases have short survival and poor prognosis without timely and effective active treatment. This study provides a detailed analysis of the patient's diagnosis and treatment process, enhancing clinicians' understanding and mastery of the clinical manifestations and imaging characteristics of breast cancer with rib, pulmonary, and hepatic metastases, and improving clinicians' diagnostic and treatment capabilities for this disease.

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Figure Legends

Figure 1: Pathological sections of breast cancer. A: Postoperative pathology of right breast cancer (HE, $\times$100); B: Right breast lymph node puncture smear (HE, $\times$200).

Figure 2: Abdominal ultrasound images of metastatic liver cancer. A: Two-dimensional ultrasound image; B: CDFI image.

Figure 3: CT images of rib metastatic cancer. A: Chest CT transverse section; B: Pathological section.

Figure 4: CT images of metastatic lung cancer. A: Lung window image; B: Pathological section.

Note: Figure translations are in progress. See original paper for figures.