Case Report

Nutritional Support Leading to the Accomplishment of Treatment Goal: A Case Report of Recurrent Locally Advanced Breast Cancer

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Abstract

A 56-year-old woman with recurrent locally advanced breast cancer (rcT1a N3a M0, Luminal B) underwent curative intent treatment. Oral nutritional support (ONS), which was an immune-nutrition formula, was implemented to optimize her nutritional status and support treatment tolerance. This case highlights the importance of nutritional support in improving treatment outcomes for patients with recurrent breast cancer.

Keywords: Recurrent breast cancer, Nutritional support, Oral nutritional support, Chemotherapy, Radiation therapy, Immunonutrition

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Introduction

Breast cancer is the most common malignancy affecting women worldwide. Despite advancements in treatment, many patients experience recurrence.[1] Nutritional deficiencies in cancer patients can negatively impact treatment tolerance and outcomes.[2] Nutritional support is crucial in managing these patients and improving their quality of life.[3]

Case report

An Asian woman presented with early left breast cancer in 2011 at the age of 46. She had no known underlying disease, and her Karnofsky performance status was 100 (ECOG PS 0). She had undergone lumpectomy followed by adjuvant radiation and then tamoxifen for five years, respectively. At that time, the tissue diagnosis was reported as invasive carcinoma of the left breast 1.6 x 1.6 x 1.0 cm, ER 75%, PR 7%, HER2 (1+) negative, no LVI or PNI, and high Ki67. TNM staging was pT1c pN0 M0. Unfortunately, four years after the discontinuation of tamoxifen, in 2018, she noticed left axillary lymph node enlargement but no palpable lumps in both her breasts. Mammography and ultrasonogram reported a 1.0-cm ill-defined, irregular-shaped hypoechoic lesion in the left breast at 12 o'clock and a 3 cm hypoechoic lesion at the left axillary region. The standard metastatic work-up, including chest, upper abdomen and bone computed tomography (CT) scans, were unremarkable. She was officially diagnosed with recurrent locally advanced invasive lobular carcinoma of the breast (rcT1a N3a M0, Luminal B). The plan was curative intent treatment for the recurrence of her disease. Her baseline multigated acquisition (MUGA) scan was done and reported her ejection fraction as 63%. Thus, neoadjuvant chemotherapy consisting of doxorubicin (Adriamycin) and cyclophosphamide was prescribed for four cycles (AC regimen). After the completion of chemotherapy over a 12-week period, a modified radical mastectomy was performed and played an essential role in decreasing the chance of further recurrence since this is recurrent breast cancer. Adjuvant radiation was also administered due to axillary lymph node positivity. To undergo intensive treatment, the patient was highly recommended to have nutritional intervention. Even with a previously well-nourished status, the cancer patient is at risk for cachexia or sarcopenia because of inflammatory processes, from the cancer's inflammatory cytokines as well as inflammation from the patient's immune system in response to cancer treatments.[4] For nutritional assessment, her body weight and height were 47 kg and 153 cm, with a BMI of 20.08 kg/m^2. She denied a history of weight loss or decline in food intake. Her nutritional status was identified as a well-nourished patient (SGA-A).[1] After surgery, weight should be maintained at a healthy weight with BMI 18.5-25 kg/m^2.[4] **The treatment goal** was completion of curative intent multidisciplinary-team treatments. The second aim was to reduce the complications of the treatment, such as neutropenia or febrile neutropenia, which could delay the treatment plan and lessen the efficacy of the treatment. While the patient was initially well-nourished, cancer treatment can rapidly deplete nutritional reserves. Our approach was preventative, aiming to maintain the patient's nutritional status throughout the rigorous treatment regimen rather than waiting for malnutrition to develop. **The nutritional intervention** was a regular meal plus oral impact®, which is immune-nutrition, including arginine, glutamine, ribonucleotide, and omega-3, given in one pack during chemotherapy. Average calorie intake was 1500-2000 kcal daily, and protein was 75-110 g daily to maintain her nutritional status. Oral impact® was increased to 2 packs daily for 7 days before surgery.[2]

The patient completed all multidisciplinary treatments. She has been disease-free for two years. She did not encounter anorexia or cachexia during the chemotherapy period. She did not experience febrile neutropenia nor more than grade 2 adverse events during treatment. Before treatment started, her body weight was 47 kg. At the completion of her treatment, she had gained 5 kg of weight (52 kg) with a BMI of 22.2 kg/m^2. Laboratory indicators followed were absolute neutrophil count (ANC) and albumin. The baseline ANC before the treatment was 1800/mm^3. Oral Impact® of 1-2 packs per day was introduced to the patient's diet. After the nutritional intervention had been initiated for one week, the ANC was increased to 4300/mm^3. Her hemoglobin was an average of 12 g/dL throughout the treatment. Her albumin was maintained at more than 4 g/dL. During the treatment, after the administration of the second cycle of chemotherapy, the ANC dropped to 1100/mm^3 (below

1500/mm^3) which contradicted the requirements for continuation of the third cycle. Therefore, the chemotherapy was delayed for one week. When the ANC rose to 3600/mm^3, chemotherapy continued. An additional intervention was also instituted, the prescription of granulocyte colony-stimulating factor (GCSF) for five days post-chemotherapy in each cycle afterward. Only this one event occurred, and the other cycles of chemotherapy were given without complication until the surgery took place. One week before the surgery (around week 14-15) the ONS intervention was intensified by prescribing an additional two packs of oral impact® per day. Her albumin, hemoglobin, and ANC were at a satisfactory level. We also noticed that her lymphedema was only grade 1 post-op, which was encouraging because a second surgery can often lead to more adverse events even with very well-experienced surgeons. The patient was advised to exercise properly and wear an arm sleeve. Radiation was started four weeks after the total mastectomy. She was started on hormonal treatment, letrozole, which is continued for 5 years. The most concerning side effect from 5-years of letrozole is bone mineral loss or osteoporosis (secondary to the lower estrogen level). Supplementary vitamin D and calcium will be prescribed for her if the baseline bone mineral density poses a risk for osteoporosis.

Table 1 Demonstrates the patient's bioinformatics after ONS intervention.

Week	**1**	**3**	**6**	**9**	**12**		**15**	**18**	**21**	**24**
Treatment	Chemotherapy					Surgery	Radiation			
Body weight (kg)	47	49	50	50	50		50	51	52	52
Hemoglobin (g/dL)	11.9	12.1	12.1	12.4	13.1		12.7	12.4	13.1	13.6
ANC(/mm^3)	4300	2900	1100	3600	2200		3600	3100	1900	3100
Albumin(g/dL)	4.45	4.67	4.59	4.11	4.23		4.37	4.3	4.29	4.33

Discussion

This case report demonstrates the successful integration of nutritional support into the treatment plan for a patient with recurrent breast cancer. ONS helped the patient maintain a healthy weight and optimal nutritional status, potentially contributing to improved treatment tolerance and reduced complications. Additionally, the immunonutrition components in the ONS formula might have enhanced her immune function and response to therapy.[5] In the management of recurrent breast cancer, a comprehensive approach that integrates nutritional support with standard oncological treatments may offer improved outcomes. Cancer-related inflammation puts these patients at risk for cachexia and sarcopenia, underscoring the importance of early intervention. Implementing oral nutritional support (ONS) can help optimize nutritional status and enhance treatment tolerance. Immunonutrition supplements, such as those containing arginine, glutamine, ribonucleotide, and omega-3 fatty acids, may be particularly beneficial. Throughout the treatment course, close monitoring of key parameters such as body weight, BMI, absolute neutrophil count (ANC), hemoglobin, and albumin is essential. These indicators can guide necessary adjustments to treatment schedules, particularly in timing chemotherapy based on ANC levels. Intensifying ONS before surgery, such as doubling the daily dose of immune-nutrition supplements for a week pre-operation, may help optimize the patient's condition. Lymphedema management is another crucial aspect of care, potentially benefiting from the anti-inflammatory effects of immune-nutrition. One of the pathophysiology of lymphedema is inflammation.[7] Hypothetically, the lymphedema could be improved through a pathway targeting inflammation and lowering the blood pressure of the arm. Arginine, contained in Oral Impact®, is a substrate of nitric oxide synthesis. Nitric oxide has benefits of increasing blood flow and reducing blood pressure via vasodilatation.[8] Furthermore, supplementation of synbiotics together with a low-calorie diet (LCD) in overweight and obese breast cancer patients can decrease the degree of lymphedema.[3,6] The study conducted by Saneei et al. showed that some in

flammatory markers were changed after synbiotic supplementation along with an LCD.[6] Post-treatment care should include ongoing monitoring of nutritional status and body weight. While this case study suggests potential benefits from nutritional support in recurrent breast cancer treatment, it's important to note that stronger evidence is needed to establish a clear causal relationship between nutritional interventions and treatment outcomes. Based on the case report provided, here are the key testable hypotheses:

1. Immuno-nutrition and Treatment Tolerance: The use of immune-nutrition supplements (such as Oral Impact®) in breast cancer patients undergoing intensive treatment improves treatment tolerance and reduces the incidence of treatment delays due to neutropenia. This hypothesis is based on the observation that the patient maintained relatively stable blood counts and experienced only one instance of treatment delay due to low ANC. A controlled study could compare patients receiving standard nutrition versus those receiving immunonutrition supplements, measuring outcomes such as treatment delays, neutropenia incidence, and overall treatment completion rates.

2. Nutritional Support and Weight Maintenance: Proactive nutritional support, including ONS, helps breast cancer patients maintain or gain weight during intensive treatment regimens. The patient in this case gained weight during treatment, which is often challenging for cancer patients. A comparative study could assess weight changes in patients receiving standard care versus those on a structured nutritional support program.

3. Immunonutrition and Lymphedema: Immunonutrition supplementation reduces the severity of post-surgical lymphedema in breast cancer patients. The case report noted only grade 1 lymphedema despite multiple surgeries, hypothesizing that the anti-inflammatory effects of immunonutrition might play a role. A randomized controlled trial could evaluate lymphedema severity in patients receiving immunonutrition versus standard care.

4. Intensified Pre-surgical Nutrition and Outcomes: Intensifying nutritional support (e.g., doubling Oral Impact dosage) in the week prior to surgery improves post-surgical outcomes in breast cancer patients.

5. Nutritional Support and Treatment Completion: Comprehensive nutritional support increases the likelihood of breast cancer patients completing their full planned course of multidisciplinary treatment without significant delays or dose reductions.

6. Immunonutrition and Inflammatory Markers: Regular use of immune-nutrition supplements during breast cancer treatment leads to a reduction in systemic inflammatory markers. While not directly measured in this case, the potential anti-inflammatory effects of the supplements was discussed. A study could be undertaken to measure inflammatory markers (e.g., C-reactive protein, interleukin-6) in patients receiving immune-nutrition versus standard care.

These hypotheses provide a framework for future research to evaluate the potential benefits of nutritional interventions more rigorously in breast cancer treatment. Such studies would need to include larger sample sizes, control groups, and more objective outcome measures to provide stronger evidence for or against these proposed effects. Future research should focus on more objective measurements and larger sample sizes to validate these observations and further refine best practices in the care of breast cancer patients.

Conclusion

Nutritional support, especially immune-nutrition plays a vital role in optimizing treatment outcomes for patients with recurrent breast cancer. This case report emphasizes the importance of a comprehensive approach to cancer care that includes nutritional assessment, intervention, and monitoring.

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Compliance with Ethics Requirements

This case report adheres to ethical guidelines for patient privacy and confidentiality.

Conflict of Interest

The authors declare no conflicts of interest.

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Author Contributions

PE conceptualized, wrote the original draft, and edited. KC collected data, reviewed, and edited the manuscript. All authors approved the final version of the manuscript.

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