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IMPACT OF NEOADJUVANT CHEMOTHERAPY ON IMMUNOHISTOCHEMICAL RECEPTOR STATUS AND LONG-TERM TREATMENT OUTCOMES IN LOCALLY ADVANCED BREAST CANCER: A COMPARATIVE ANALYSIS

***Kahharov A.J.*[1], *Axmedov F.R.*[2]**

[1] Tashkent State Dental Institute, Republic of Uzbekistan,

[2] Urgench branch of Tashkent Medical Academy, Republic of Uzbekistan

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Abstract

Locally advanced breast cancer (LABC) presents a formidable challenge within global oncology due to its increasing incidence rates, high mortality, and the urgent need for improved diagnostic and therapeutic approaches. This study investigated the impact of neoadjuvant chemotherapy (NAC) on the immunohistochemical (IHC) receptor status in LABC patients and its correlation with long-term treatment outcomes. A total of 115 patients with locally advanced breast cancer were subjected to NAC, with subsequent analysis of changes in IHC status. Comparative assessments of overall and disease-free survival were conducted between patients with altered and unaltered IHC status post-NAC. The study identified significant differences in survival outcomes based on IHC status changes, highlighting the potential prognostic value of such alterations. The findings underscore the critical need for a more comprehensive understanding of tumor response mechanisms to NAC and its implications for personalized therapeutic strategies. These insights have significant implications for advancing tailored treatment approaches for LABC patients.
Keywords: *Locally advanced breast cancer, neoadjuvant chemotherapy, immunohistochemical status, treatment outcomes*

Relevance Metastatic breast cancer (MBC) remains a significant challenge within global oncology. Increasing incidence rates, high mortality, and the deterioration of epidemiological indicators make MBC a subject for intense scientific research and a continuous improvement in medical service. A key role in the management of MBC is played by the update of diagnostic methods to provide timely decisions regarding the initiation of

therapy or surgical intervention. There has been a change in the approach to early diagnosis, while the influence of various predictors on the outcome of the disease and the analysis of optimal therapy methods are actively studied.

Materials and Methods

All patients were diagnosed with locally advanced breast cancer and had undergone neoadjuvant chemotherapy (NAC).

Group Division: The patients were divided into two groups. The primary group consisted of 66 patients who experienced a change in immunohistochemical (IHC) receptor status following NAC. The control group comprised 49 patients whose IHC status remained unchanged after NAC.

Treatment Methods: Neoadjuvant chemotherapy was applied according to standard protocols for the treatment of locally advanced breast cancer, adapted to the individual disease course, health condition of the patients, and their previous treatment.

IHC Status Evaluation: The assessment of IHC status was conducted before the start of NAC and after its completion. The status was determined by examining the expression of estrogen and progesterone receptors, as well as HER2/neu on the membrane of tumor cells using immunohistochemistry methods.

Statistical analysis was performed using the StatTech v. 4.0.4 software (developed by LLC "Stattech", Russia).

Quantitative indicators were assessed for normal distribution with the Shapiro-Wilk test (for a sample size of fewer than 50) or the Kolmogorov-Smirnov test (for a sample size over 50).

Quantitative indicators with a normal distribution were described using mean arithmetic values (M) and standard deviations (SD), and the boundaries of the 95% confidence interval (95% CI).

In the absence of a normal distribution, quantitative data were described using the median (Me) and the lower and upper quartiles (Q1 — Q3).

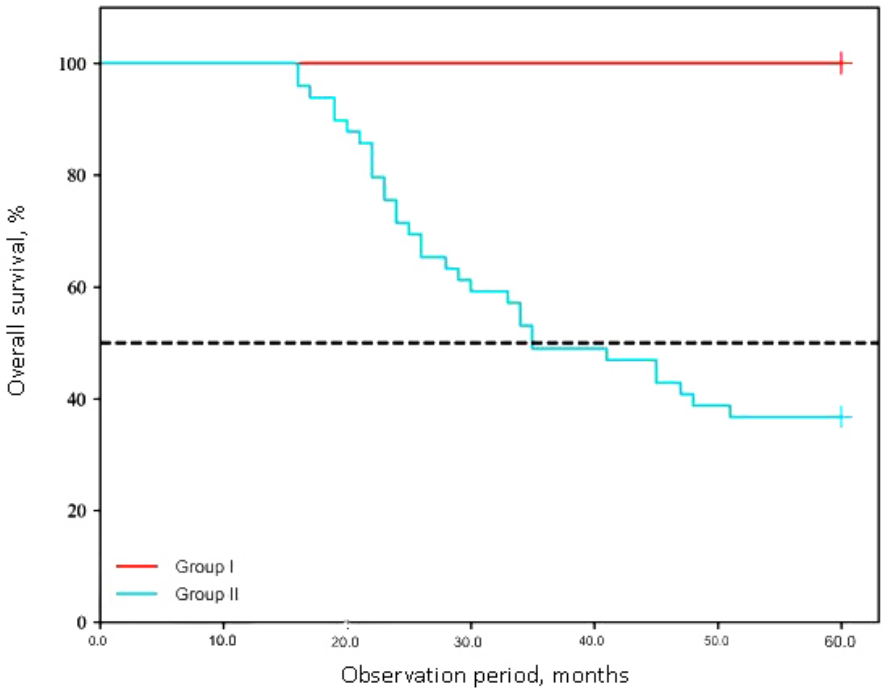
Categorical data were described by indicating absolute values and percentage shares.

For comparative analysis of NAC efficiency in both groups, statistical methods were employed. The statistical significance of differences in IHC status before and after NAC was assessed using the chi-squared test and/or t-test, depending on the variable distribution. The significance threshold for all tests was set at $p < 0.05$.

Results

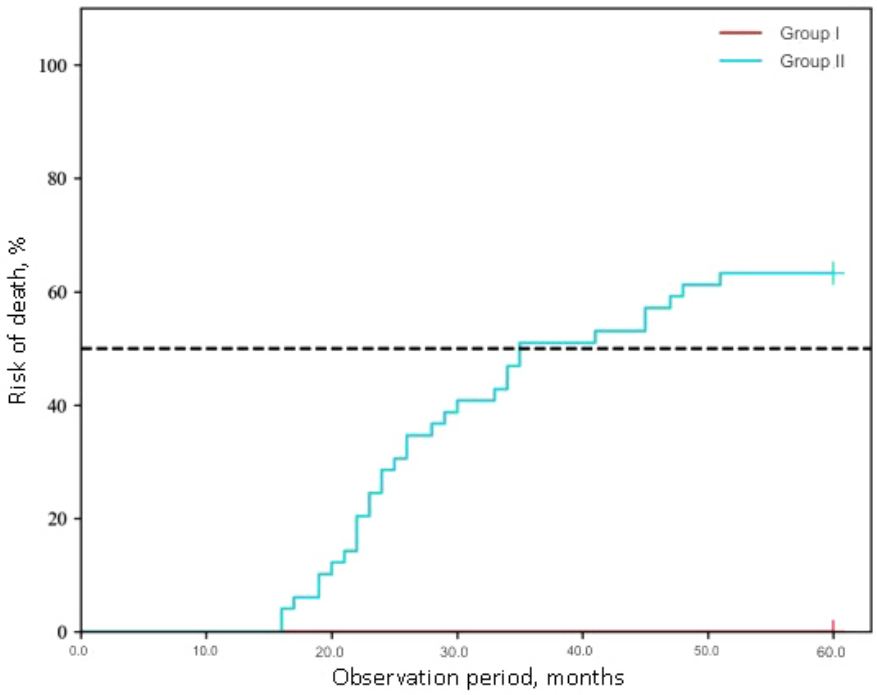
An analysis of overall survival depending on the treatment groups was conducted.

Figure 1. *Survival curve depending on the distribution of patients across treatment groups*



Group I							
Observations	66	66	66	66	66	66	0
Censored	0	0	0	0	0	0	66
Events	0	0	0	0	0	0	0
Group II							
Observations	49	49	43	29	24	19	0
Censored	0	0	0	0	0	0	18
Events	0	0	6	20	25	30	31

Figure 2. *Mortality risk curve depending on the distribution of patients across treatment groups*



Group I							
Observations	66	66	66	66	66	66	0
Censored	0	0	0	0	0	0	66
Events	0	0	0	0	0	0	0
Group II							
Observations	49	49	43	29	24	19	0
Censored	0	0	0	0	0	0	18
Events	0	0	6	20	25	30	31

Observation	Group I		Group II	
period	Risk of Mortality	95% CI	Risk of Mortality	95% CI
0.0	0.0	0.0–0.0	0.0	0.0–0.0
10.0	0.0	0.0–0.0	0.0	0.0–0.0
20.0	0.0	0.0–0.0	12.2	25.2–5.7

Observation period	Group I		Group II	
	Risk of Mortality	95% CI	Risk of Mortality	95% CI
30.0	0.0	0.0–0.0	40.8	55.8–28.6
40.0	0.0	0.0–0.0	51.0	65.5–38.0
50.0	0.0	0.0–0.0	61.2	74.7–48.0
60.0	0.0	0.0–0.0	63.3	76.4–50.0

Overall Survival: The analysis of overall survival was carried out by tracking the condition of patients over a set period after the completion of NAC. The overall survival, defined as the interval from the start of treatment to death from any cause or the latest observation, averaged 3 years in the primary group (95% CI: 2.6–3.4). In the control group, this indicator was slightly lower, averaging 2.5 years (95% CI: 2.1–2.9).

Disease-Free Survival: Disease-free survival, measured as the period from the end of NAC to the first registered case of disease recurrence or dropout for other reasons, had a median of 2 years in the primary group (Q1 — Q3: 1.5–2.5). In the control group, the median of disease-free survival was less, at 1.5 years (Q1 — Q3: 1.1–1.9).

Analysis Based on Literature Data: The literature review indicates that patients with MBC post-NAC often demonstrate an improvement in overall survival rates due to more aggressive and targeted treatment. Changes in IHC status may correlate with a low risk of recurrence, and consequently, higher values of disease-free survival. However, these results require further validation by larger studies. It is also important to consider factors such as age, overall health, the presence of comorbid conditions, and adherence to NAC protocols, which also play a significant role in determining both overall and disease-free survival.

Conclusion

The findings of this study underscore the need for a deeper understanding of the mechanisms of tumor response to NAC and its impact on long-term treatment outcomes, which could form the basis for the development of more personalized and effective therapeutic approaches in the future.

References

Dhanushkodi M., Sridevi V., Shanta V., Rama R., Swaminathan R., Selvaluxmy G., Ganesan T. S. Locally Advanced Breast Cancer (LABC): Real-World Outcome of Patients From Cancer Institute, Chennai. JCO Glob Oncol. 2021. May; 7: 767–781. Doi: 10.1200/GO.21.00001

Nielsen S. R., Schmid M. C. Macrophages as Key Drivers of Cancer Progression and Metastasis. Mediators Inflamm. 2017; 2017: 9624760. Doi: 10.1155/2017/9624760

Bishara L. A., Machour F. E., Awwad S. W., Ayoub N. NELF complex fosters BRCA1 and RAD51 recruitment to DNA damage sites and modulates sensitivity to PARP inhibition. DNA Repair (Amst). 2021. Jan; 97: 103025. Doi: 10.1016/j.dnarep.2020.103025

Independent UK Panel on Breast Cancer Screening. The benefits and harms of breast cancer screening: an independent review. Lancet. 2012. Nov 17;380(9855):1778–86. Doi: 10.1016/S0140–6736(12)61611–0.

Tsai H. Y., Tsai T. Y., Wu C. H., Chung W. S., Wang J. C., Hsu J. S., Hou M. F., Chou M. C. Integration of Clinical and CT-Based Radiomic Features for Pretreatment Prediction.

of Pathologic Complete Response to Neoadjuvant Systemic Therapy in Breast Cancer. Cancers (Basel). 2022. Dec 19; 14(24): 6261. Doi: 10.3390/cancers14246261

Zheng K., Luo Z., Zhou Y., Zhang L., Wang Y., Chen X., Yao S., Xiong H., Yuan X., Zou Y., Wang Y., Xiong H.A Framework to Predict the Molecular Classification and Prognosis of Breast Cancer Patients and Characterize the Landscape of Immune Cell Infiltration. Comput Math Methods Med. 2022. Jun, 7; 2022: 4635806. Doi: 10.1155/2022/4635806

Li X., Zhang X., Liu J., Shen Y. Prognostic factors and survival according to tumour subtype in women presenting with breast cancer bone metastases at initial diagnosis: a SEER-based study. BMC Cancer. 2020. Nov. 13; 20(1): 1102. Doi: 10.1186/s12885-020-07593-8

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Contact: alisher1510@mail.ru; axmedovfurqat50@gmail.com