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Assessment of heterogeneous response of primary tumor and nodal disease to neoadjuvant therapy in invasive breast cancer



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OBJECTIVE:

To assess the heterogeneous pathological responses of primary tumor and nodal disease following neoadjuvant therapy (NAT) in invasive breast carcinoma and to identify clinicopathological factors associated with variable response.

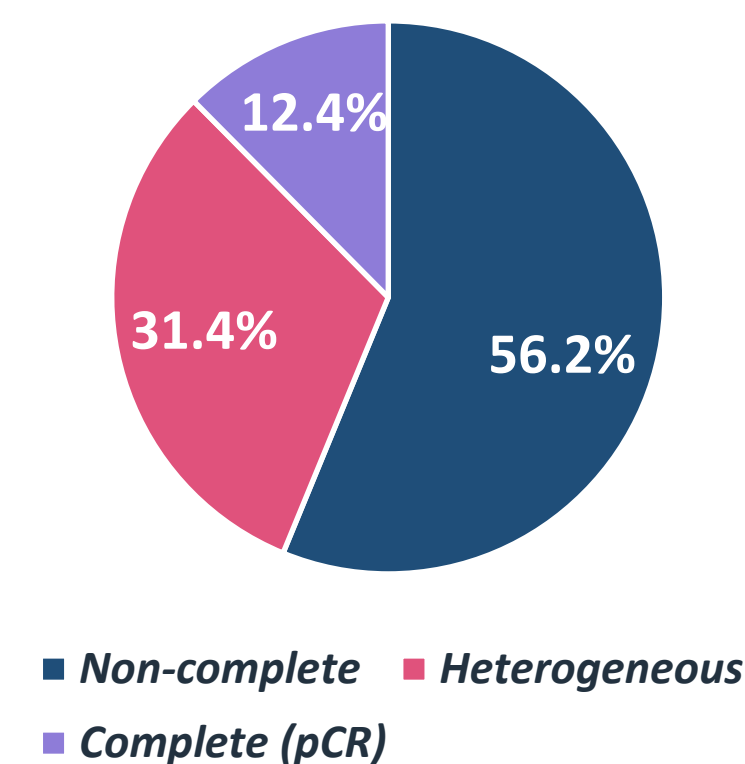
METHODS:

In this cross-sectional study, node positive non-metastatic patients of invasive breast cancer who received NAT and subsequently underwent definitive surgery between 16th October 2024 to June 2025 were included. Tumor and nodal response were evaluated on post-operative histopathology. Pathologic response was divided into complete (pCR), heterogeneous and non-complete groups to identify discordance. Demographics, biological/clinical characteristics and pathological responses were tabulated. Associations between clinicopathological characteristics and response patterns were assessed using univariate analysis while multinomial logistic regression was used to examine independent predictors.

RESULTS:

Among 169 patients, heterogeneous response was recorded in **53 (31.4%)**, non-complete in **95 (56.2%)** and **21 (12.4%)** patients achieved pCR. In the heterogeneous group, **24 (45.3%)** had breast pCR with nodal disease and **29 (54.7%)** demonstrated nodal pCR with residual breast tumor. A statistically significant association was observed between tumor and nodal response (Pearson chi-square, $p < 0.001$). Tumor Grade (III = 50.9%, $p = 0.017$), receptor status (Triple Negative = 41.5%, $p = < 0.001$) and type of NAT ($p = 0.032$) were significantly associated with heterogeneous response. Residual tumor ($p = 0.010$), ductal carcinoma insitu ($p = 0.007$), lympho-vascular invasion ($p = 0.023$) and extra-nodal extension ($p = < 0.001$) independently predicted tumor and nodal response but not heterogeneous response.

PATHOLOGICAL RESPONSE (N = 169)



CONCLUSION:

In conclusion, our study highlights the heterogeneous behavior of responses to neoadjuvant therapy between primary tumor and nodal disease in breast cancer. Recognizing these patterns are crucial for individualized surgical planning and optimization of post-neoadjuvant treatment.

Keywords: Neoadjuvant therapy, heterogeneous response, pathologic complete response.