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EXTERNALLY VALIDATED PREDICTIVE NOMOGRAM FOR BRAIN METASTASIS IN EARLY-STAGE BREAST CANCER

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BACKGROUND: Brain metastasis presents a significant concern for early-stage breast cancer (ESBC) patients, impacting their survival and overall well-being. Constructing a predictive nomogram based on primary tumor characteristics offers a way to anticipate the likelihood of brain metastasis. The objective is to create tools aiding in the identification of high-risk patients, enriching clinical trial cohorts to prevent or delay brain metastasis onset early in the disease. METHODS: We reviewed 40,290 ESBC cases (stages I-III) at the University of Texas MD Anderson Cancer Center, Houston, spanning January 1, 1997, to May 8, 2020. Validated the model with Institut Jules Bordet, Belgium, patient data for accuracy and reproducibility analyzing 1,644 cases with the same inclusion criteria. Statistical models considered patient age, tumor features (grade, hormone receptor, HER2 status), and treatments (chemotherapy, endocrine therapy). Using these, our multivariate model predicted brain metastasis occurrence over 1, 2, and 5 years, evaluated through Receiver Operating Characteristic (ROC) analysis. RESULT: Key predictors for brain metastasis included younger age, high estrogen and progesterone receptor percentage, higher tumor size; use of aromatase inhibitor therapy, and use of selective estrogen receptor modulator therapy were associated with a decreased risk of brain metastasis. Higher grade, Ki-67 levels, HER2-positive status, lymphovascular invasion, and the use of chemotherapy was associated with an increased risk. The AUC values for the prediction of brain metastasis at various time intervals in the test cohort were 0.81 at 4 years, 0.80 at 5 years, and 0.77 at 10 years. In the validation cohort, the AUCs were 0.81 at 4 and 5 years, decreasing to 0.70 at the 10-year mark. CONCLUSIONS: This tool offers valuable support to clinicians in personalized patient care decisions regarding brain metastasis risk. Continuous validation and research will enhance these models, bolstering reliability and applicability in clinical and research settings.