3400 – Predicting Pathological Response to Neoadjuvant Therapy in HER2-Positive Breast Cancer by Using ^{68}Ga-HER2 PET/CT: A Prospective Study

Yunjiang Liu ; Sinuo Gao ; Xinming Zhao ; Xiangmei Zhang The Fourth Hospital of Hebei Medical University and Hebei Provincial Tumor Hospital

Abstract

To evaluate the utility of ^{68}Ga-HER2 PET/CT in predicting pathological response to neoadjuvant therapy (NAT) in HER2-positive breast cancer.

^{68}Ga-HER2 PET/CT enables assessment of early alterations in tracer uptake during NAT in HER2-positive breast cancer and demonstrates predictive value for pCR. The ability to predict pathologic response at both early treatment cycle and preoperative stages highlights its potential as a clinical tool for guiding individualized treatment strategies.

Keywords: HER2-positive breast cancer, ^{68}Ga-HER2, PET/CT, neoadjuvant therapy, pCR

Clinical trial registration number: ChiCTR2400092565 (Chinese Clinical Trial Registry)

Methods and Materials

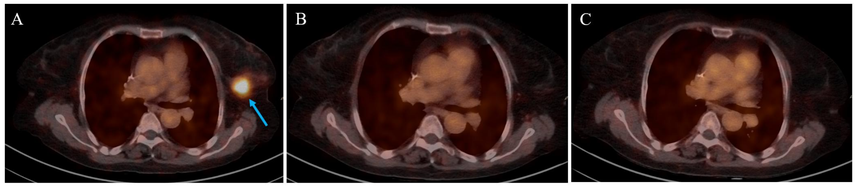
This prospective study included 45 newly diagnosed **HER2-positive breast cancer** patients requiring NAT. Patients underwent at least 4 cycles of NAT with trastuzumab plus pertuzumab or pyrrolizidine alkaloids. Post-NAT surgery was performed. Eligibility required age ≥18 years, stage II–IIIC HER2-positive breast cancer. Exclusion criteria included pregnancy or lactation, presence of severe comorbidities, inability to tolerate systemic therapy or surgery, and distant metastatic disease. **68Ga-HER2 PET/CT** scans were obtained pre-NAT (**PET1**), at the end of cycle 2 (**PET2**), and pre-surgery (**PET3**). Standardized uptake values (SUVmax) were measured for the primary tumor and involved lymph nodes. The calculation of ΔSUVmax was performed according to the following formula:

ΔSUVmax1 = (PET2 SUVmax-PET1 SUVmax)/(PET1 SUVmax)×100%

ΔSUVmax2 = (PET3 SUVmax-PET1 SUVmax)/(PET1 SUVmax)×100%

Pathological response following NAT was assessed using both the Miller & Payne system and the RCB system. Receiver operating characteristic (ROC) curves were generated to estimate diagnostic performance, and the area under the curve (AUC) was calculated. The Youden index was applied to identify the optimal cutoff value.

Representative Images



The figure presents sequential ^{68}Ga-HER2 PET/CT scans of a HER2-positive breast cancer patient obtained pre-NAT, at the end of cycle 2, and pre-surgery.

Figure A: Baseline scan demonstrated a soft tissue lesion measuring approximately 2.3 × 2.2 cm in the left breast, with marked radiotracer uptake and a maximum SUV of 10.1.

Figure B: At the end of the second cycle, imaging revealed a residual lesion of approximately 2.2 × 1.0 cm in the same region, without abnormal radiotracer accumulation.

Figure C: Preoperative imaging demonstrated a further reduction in lesion size to approximately 2.0 × 0.6 cm, with no abnormal tracer uptake detected.

Results

One patient was excluded from analysis due to the subsequent discovery of liver metastasis. 44 patients were included in the final analysis. 70.45% patients (31/44) achieved pathological complete response (pCR), while 29.55% were qualified non-pCR level. No significant differences in pCR rates were observed across age at diagnosis, menstrual status, clinical stage, ER expression, PR expression, Ki67 index, neoadjuvant regimen, type of breast surgery, or lymph node procedure. In contrast, HER2 status demonstrated a statistically significant association with pCR(*P*=0.025). Although no significant difference in primary tumor SUVmax values between the pCR and non-pCR groups at PET1 (3.76±1.97 vs 3.79±2.71, *P*=0.349), primary tumor SUVmax values at PET2 and PET3 were significantly lower in the pCR group compared to the non-pCR group (PET2: 0.45±0.71 vs 2.01±2.36, *P*=0.008; PET3: 0.12±0.39 vs 1.67±2.94, *P*=0.014). Optimal cutoff values for predicting pCR were: primary tumor SUVmax ≤1.15 at PET2 (AUC=0.738), ≤0.50 at PET3 (AUC=0.735); absolute ΔSUVmax≥61.14% at PET2 (AUC=0.742), and ≥71.63% at PET3 (AUC=0.743). Using the PET2 SUVmax and ΔSUVmax cutoff values, patients identified as NAT-sensitive at the end of cycle 2 had an 84.62% pCR rate, which was 14.17% higher compared to the overall pCR rate without the use of this imaging modality.

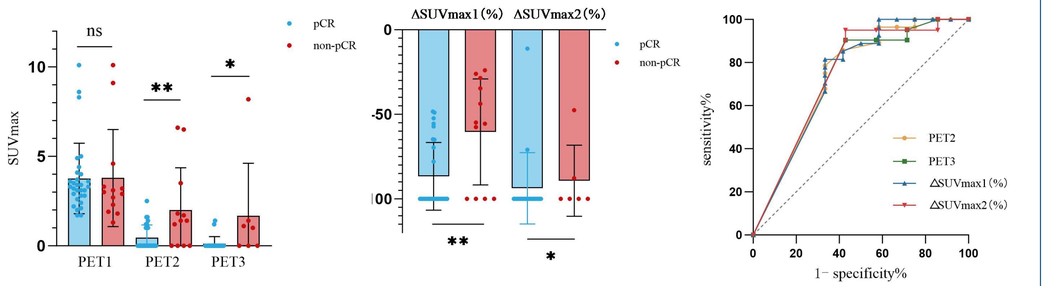


Figure 1. 2. Comparison of SUVmax and ΔSUVmax in breast primary lesions between pCR and non-pCR groups

Figure 3. ROC curves for predicting pCR using SUVmax and ΔSUVmax of breast primary lesions

Conclusions

Our data indicate that ^{68}Ga-HER2 PET/CT assessment of early ^{68}Ga-HER2 uptake changes may predict the NAT efficacy in patients with HER2-positive breast cancer, demonstrating a potential evaluation stratergy for early and late treatment response.

Contact

Yunjiang Liu
Department of Breast Center, The Fourth Hospital of Hebei Medical University and Hebei Provincial Tumor Hospital
Email: lyj818326@outlook.com
Website: https://www.hbydsy.com/info/1581/1345.htm
Phone: +86-311-8609-5820

References

1. Bray F, Laversanne M, Sung H, Ferlay J, Siegel RL, Soerjomataram I, et al. Global cancer statistics 2022: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin. 2024;74(3):229 ~ 63.
2. Symmans WF, Wei C, Gould R, Yu X, Zhang Y, Liu M, et al. Long-term prognostic risk after neoadjuvant chemotherapy associated with residual cancer burden and breast cancer subtype. J Clin Oncol. 2017;35(10):1049 ~ 60.
3. Cortazar P, Zhang L, Untch M, Mehta K, Costantino JP, Wolmark N, et al. Pathological complete response and long-term clinical benefit in breast cancer: The CTNeoBC pooled analysis. Lancet. 2014;384(9938):164 ~ 72.
4. Mattingly AE, Mooney B, Lin HY, Kiluk JV, Khakpour N, Hoover SJ, et al. Magnetic Resonance Imaging for Axillary Breast Cancer Metastasis in the Neoadjuvant Setting: A Prospective Study. Clin Breast Cancer. 2017;17(3):180 ~ 7.
5. Wang H, Mao X. Evaluation of the Efficacy of Neoadjuvant Chemotherapy for Breast Cancer. Drug Des Devel Ther. 2020;14:2423 ~ 33.

This presentation is the intellectual property of the author/presenter. Contact them at lyj818326@outlook.com for permission to reprint and/or distribute.

© Poster Template by Genigraphics® 1.800.790.4001 www.genigraphics.com