

A window of opportunity

Early evaluation of a therapeutic efficacy will help the breast-cancer physician to individualize a patient’s treatment: A baseline (pre-treatment) PET image will be taken, then, after a short regimen of a targeted therapy, a post-therapy PET scan will be used to evaluate responses to treatment, and thus will be used to guide selection of post-surgery adjuvant therapy during the window of opportunity between diagnosis and surgery (Fig. 1).

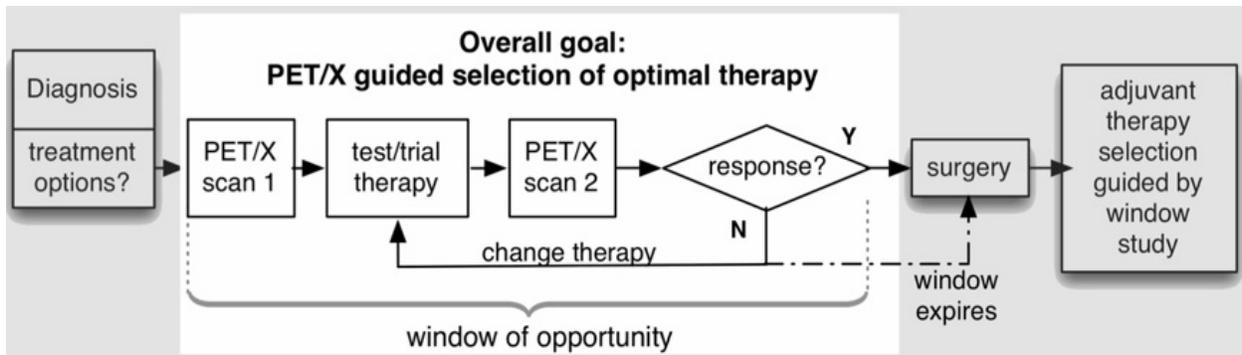


Fig 1. The role of PET/X in patient-specific assessment of response to breast cancer therapy

This window of opportunity paradigm is being investigated for breast cancer (e.g. [1,2]) as well as other cancers. The advantage of PET imaging is the *quantitative* measure of tracer uptake. However, this advantage is lost when imaging small objects (< 2cm) in a standard whole-body PET scanner due to limited resolution, and lesions 2 cm or less in size are the most prevalent at breast cancer diagnosis. A cost-effective high-resolution PET scanner that integrates with the existing workflow of mammography clinics is needed to enable patient-specific optimization of therapy in early-stage breast cancer.

[1] Linden HM, Stekhova SA, Link JM, et al., “Quantitative Fluoroestradiol Positron Emission Tomography Imaging Predicts Response to Endocrine Treatment.” *J Clin Oncol* **24**(18), pp. 2793–2799, 2006. PMID: 16682724.

[2] Dehdashti F, Mortimer JE, Trinkaus K, et al., “PET-based estradiol challenge as a predictive biomarker of response to endocrine therapy in women with estrogen-receptor-positive breast cancer.” *Breast Cancer Res Treat* **113**, pp. 509–517, 2009; PMID: 18327670.

[3] G. Gebhart, et al., “18F-FDG PET/CT for early prediction of response to neoadjuvant lapatinib, trastuzumab, and their combination in HER2-positive breast cancer: results from Neo-ALTTO.” *J Nucl Med*, Vol. **54**(11), pp. 1862–1868, Nov. 2013. PMID: 24092940.

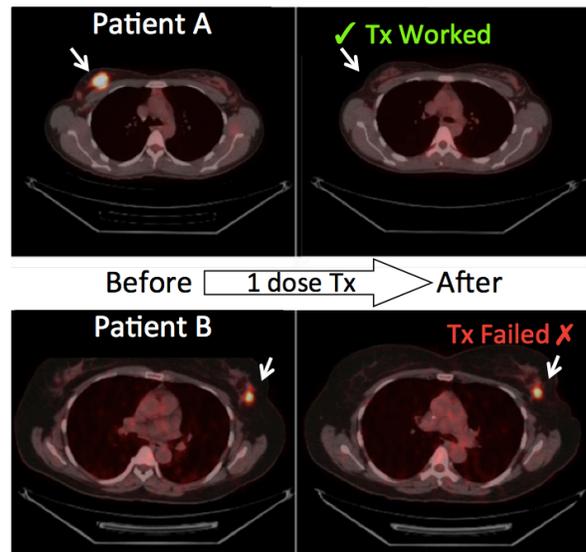


Fig.2: FDG-PET/CT images of a two breast cancer patients in the Neo-ALTTO trial. For each, the Right is a Baseline study showing tumor (arrow). To the Left, after 2 weeks of anti-HER2 treatment showing metabolic response. Patient A later had pathologic complete response, while patient B did not. These examples are for large tumor size (>3cm), which can be imaged on a whole-body PET scanner [3].