World Academy of Science, Engineering and Technology
International Journal of Mathematical and Computational Sciences
Vol:14, No:12, 2020

Comparison of 18F-FDG and 11C-Methionine PET-CT for Assessment of Response to Neoadjuvant Chemotherapy in Locally Advanced Breast Carcinoma

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Abstract : Background: Neo-adjuvant chemotherapy plays an important role in treatment of breast cancer by decreasing the tumour load and it offers an opportunity to evaluate response of primary tumour to chemotherapy. Standard anatomical imaging modalities are unable to accurately reflect the response to chemotherapy until several cycles of drug treatment have been completed. Metabolic imaging using tracers like 18F-fluorodeoxyglucose (FDG) as a marker of glucose metabolism or amino acid tracers like L-methyl-11C methionine (MET) have potential role for the measurement of treatment response. In this study, our objective was to compare these two PET tracers for assessment of response to neoadjuvant chemotherapy, in locally advanced breast carcinoma. Methods: In our prospective study, 20 female patients with histology proven locally advanced breast carcinoma underwent PET-CT imaging using FDG and MET before and after three cycles of neoadjuvant chemotherapy (CAF regimen). Thereafter, all patients were taken for MRM and the resected specimen was sent for histo-pathological analysis. Tumour response to the neoadjuvant chemotherapy was evaluated by PET-CT imaging using PERCIST criteria and correlated with histological results. Responses calculated were compared for statistical significance using paired t- test. Results: Mean SUVmax for primary lesion in FDG PET and MET PET was 15.88±11.12 and 5.01±2.14 respectively ($p<0.001$) and for axillary lymph nodes was 7.61±7.31 and 2.75±2.27 respectively ($p=0.001$). Statistically significant response in primary tumour and axilla was noted on both FDG and MET PET after three cycles of NAC. Complete response in primary tumour was seen in only 1 patient in FDG and 7 patients in MET PET ($p=0.001$) whereas there was no histological complete resolution of tumor in any patient. Response to therapy in axillary nodes noted on both PET scans were similar ($p=0.45$) and correlated well with histological findings. Conclusions: For the primary breast tumour, FDG PET has a higher sensitivity and accuracy than MET PET and for axilla both have comparable sensitivity and specificity. FDG PET shows higher target to background ratios so response is better predicted for primary breast tumour and axilla. Also, FDG-PET is widely available and has the advantage of a whole body evaluation in one study.

Keywords : 11C-methionine, 18F-FDG, breast carcinoma, neoadjuvant chemotherapy
Conference Title : ICSRD 2020 : International Conference on Scientific Research and Development
Conference Location : Chicago, United States
Conference Dates : December 12-13, 2020

Open Science Index, Mathematical and Computational Sciences Vol:14, No:12, 2020 publications.waset.org/abstracts/1987/pdf