# A Case Study on Utility of 18FDG-PET/CT Scan in Identifying Active Extra Lymph Nodes and Staging of Breast Cancer

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**Abstract :** Breast cancer is the most frequently diagnosed cancer worldwide, and a common cause of death among women. Various conventional anatomical imaging tools are utilized for diagnosis, histological assessment and TNM (Tumor, Node, Metastases) staging of breast cancer. Biopsy of sentinel lymph node is becoming an alternative to the axillary lymph node dissection. Advances in 18-Fluoro-Deoxi-Glucose Positron Emission Tomography/Computed Tomography (18FDG-PET/CT) imaging have facilitated breast cancer diagnosis utilizing biological trapping of 18FDG inside lesion cells, expressed as Standardized Uptake Value (SUVmax). Objective: To present the utility of 18FDG uptake PET/CT scans in detecting active extra lymph nodes and distant occult metastases for breast cancer staging. Subjects and Methods: Four female patients were presented with initially classified TNM stages of breast cancer based on conventional anatomical diagnostic techniques. 18FDG-PET/CT scans were performed one hour post 18FDG intra-venous injection of (300-370) MBq, and (7-8) bed/130sec. Transverse, sagittal, and coronal views; fused PET/CT and MIP modality were reconstructed for each patient. Results: A total of twenty four lesions in breast, extended lesions to lung, liver, bone and active extra lymph nodes were detected among patients. The initial TNM stage was significantly changed post 18FDG-PET/CT scan for each patient, as follows: Patient-1: Initial TNM-stage: T1N1M0-(stage I). Finding: Two lesions in right breast (3.2cm2, SUVmax=10.2), (1.8cm2, SUVmax=6.7), associated with metastases to two right axillary lymph nodes. Final TNM-stage: T1N2M0-(stage II). Patient-2: Initial TNM-stage: T2N2M0-(stage III). Finding: Right breast lesion (6.1cm2, SUVmax=15.2), associated with metastases to right internal mammary lymph node, two right axillary lymph nodes, and sclerotic lesions in right scapula. Final TNM-stage: T2N3M1-(stage IV). Patient-3: Initial TNM-stage: T2N0M1-(stage III). Finding: Left breast lesion (11.1cm2, SUVmax=18.8), associated with metastases to two lymph nodes in left hilum, and three lesions in both lungs. Final TNM-stage: T2N2M1-(stage IV). Patient-4: Initial TNM-stage: T4N1M1-(stage III). Finding: Four lesions in upper outer quadrant area of right breast (largest: 12.7cm2, SUVmax=18.6), in addition to one lesion in left breast (4.8cm2, SUVmax=7.1), associated with metastases to multiple lesions in liver (largest: 11.4cm2, SUV=8.0), and two bony-lytic lesions in left scapula and cervicle-1. No evidence of regional or distant lymph node involvement. Final TNM-stage: T4N0M2-(stage IV). Conclusions: Our results demonstrated that 18FDG-PET/CT scans had significantly changed the TNM stages of breast cancer patients. While the T factor was unchanged, N and M factors showed significant variations. A single session of PET/CT scan was effective in detecting active extra lymph nodes and distant occult metastases, which were not identified by conventional diagnostic techniques, and might advantageously replace bone scan, and contrast enhanced CT of chest, abdomen and pelvis. Applying 18FDG-PET/CT scan early in the investigation, might shorten diagnosis time, helps deciding adequate treatment protocol, and could improve patients' quality of life and survival. Trapping of 18FDG in malignant lesion cells, after a PET/CT scan, increases the retention index (RI%) for a considerable time, which might help localize sentinel lymph node for biopsy using a hand held gamma probe detector. Future work is required to demonstrate its utility.
**Keywords :** axillary lymph nodes, breast cancer staging, fluorodeoxyglucose positron emission tomography/computed tomography, lymph nodes