

Mini-Review

The Role of ^{18}F -FDG-Positron Emission Tomography/Computed Tomography in Staging Primary Breast Cancer

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Abstract

Despite Medicare approving the use of positron emission tomography/computed tomography (PET/CT) in staging primary breast cancer, little evidence is available to support the use of ^{18}F -FDG-PET/CT for the detection of distant metastases in the initial staging of breast cancer. In this review of the literature listed in MEDLINE, we examine whether ^{18}F -FDG-PET/CT may play a role in the initial staging of breast cancer. We discuss studies comparing PET/CT with conventional imaging for diagnosing distant metastases and axillary and extra-axillary lymph node metastases.

Key words: PET/CT, breast cancer, primary staging, distant metastases

Introduction

Despite Medicare approving the use of positron emission tomography/computed tomography (PET/CT) in staging primary breast cancer, little evidence is available to support the use of ^{18}F -FDG-PET/CT for the detection of distant metastases in the initial staging of breast cancer. The National Comprehensive Cancer Network recommends the following types of imaging for staging locally advanced breast cancer at the time of clinical diagnosis: bilateral mammography, breast ultrasonography as necessary, and chest imaging if patients had no symptoms or other abnormal staging studies, and breast magnetic resonance imaging (MRI), skeletal scintigraphy (SS), and abdominal and/or pelvic computed tomography (CT), ultrasonography, or MRI if patients had symptoms or other abnormal staging studies.¹ Breast cancer patients with large tumors (stage T3 or greater) have an 8.3% to 15.1% risk of distant metastases.²⁻⁴ Because locally advanced breast cancer has a very high rate of relapse,⁵ it is possible

that the conventional imaging modalities noted above may fail to detect a substantial number of metastases.⁶ In this review, we examine whether ^{18}F -FDG-PET/CT may play a role in the initial staging of breast cancer.

Detecting Distant Metastases

Many practicing investigators speculate that PET/CT might be more accurate than conventional imaging techniques for detecting distant metastases; Table 1 summarizes studies that have addressed this issue. Fuster et al., in a study of 60 primary breast cancer patients with large tumors, reported that 5 of the 8 cases of distant metastatic lesions were unsuspected before PET/CT was performed.⁷ Carkaci et al. reported that among 41 patients with inflammatory breast cancer, 7 of the 20 cases of distant metastases were unsuspected before PET/CT examination.⁸ Alberini et al. reported that among 62 patients with inflammatory breast cancer, 6 of 18 cases of distant metastases were unsuspected before PET/CT was per-

formed.⁹ Heusner et al. reported that among 40 patients with breast cancer, 3 of 10 cases of distant metastases were unsuspected before PET/CT was performed.¹⁰ Groheux et al. reported that among 39 patients with clinical stage II and III breast cancer, all 4 cases of distant metastases were unsuspected before PET/CT was performed.¹¹ On the basis of their results, both Carkaci et al. and Alberini et al. recommended the use of PET/CT in the initial staging of inflammatory breast cancer.^{8,9}

In summary, although PET/CT has an estimated specificity and sensitivity of 95% and 99%, not enough data are available to recommend the routine use of PET/CT in breast cancer staging because the studies mentioned above all had small numbers of patients. Further, the ability of PET/CT to detect distant metastases has never been tested prospectively in a large group of patients.

Detecting Axillary and Extra-Axillary Lymph Node Metastases

Another possible role of PET/CT may be its use in detecting local lymph node metastases from breast cancer. PET/CT provides more detailed anatomical information than PET alone about axillary and extra-axillary lymph nodes.^{7,8} Fuster et al. reported that PET/CT was able to reveal previously unsuspected infiltration of axillary lymph nodes in 10 of 60 patients and infiltration of extra-axillary lymph nodes in 3 of 60 patients.⁷ Carkaci et al. reported that among 41 inflammatory breast cancer patients, PET/CT detected metastases in the axillary lymph nodes of 37 (90%), subpectoral lymph nodes of 19 (46%), supraclavicular lymph nodes of 10 (24%), and internal

mammary lymph nodes of 9 (22%).⁸ In the same study, 6 false-negative findings did not show hypermetabolism on PET/CT but showed malignancy on sonography-guided fine-needle aspiration biopsy. Ueda et al. reported that the diagnostic sensitivity and specificity of ¹⁸F-FDG-PET/CT were nearly equal to those of ultrasonography, 58% and 95%, respectively, compared with 54% and 99% in ultrasonography.¹²

Conclusion

Although the studies listed above reported some false-positive findings in both the lymph nodes and distant sites,^{7,8} PET/CT resulted in fewer false-positive findings than did PET alone.^{7,8} However, not every distant metastatic site detected by PET/CT was confirmed by histopathological analysis in these studies. Diagnostic biopsy of the metastatic site is the gold standard for diagnosing metastatic lesions, and if PET/CT reveals suspected distant metastases, a biopsy must be performed to confirm those findings.

In summary, the use of PET/CT in the initial staging of primary breast cancer is not yet well defined and not recommended at present because there is limited evidence to support its use. However, because studies have shown that PET/CT may enable accurate detection of local lymph node metastases and distant metastases, PET/CT offers another option for use in primary breast cancer staging. For cases in which conventional imaging techniques (i.e. ultrasonography, CT, MRI, SS) do not provide adequate information, PET/CT could be used to obtain more detailed anatomical information.

Table 1 Summary of studies assessing distant metastasis detected by conventional imaging with PET/CT in patients with primary breast cancer.

| First author | Type of study | Patient population | No. patients | Patients with distant metastases detected by conventional imaging No. (%) | Patients with distant metastases detected by PET/CT No. (%) |
|-------------------------|---------------|-------------------------|--------------|---|---|
| Fuster D ⁷ | Prospective | Primary tumor >3 cm | 60 | 3 (5) | 8 (13) |
| Carkaci S ⁸ | Retrospective | Primary IBC | 41 | 13 (32) | 20 (49) |
| Alberini J ⁹ | Prospective | Primary IBC | 62 | 12 (19) | 18 (29) |
| Heusner T ¹⁰ | Retrospective | Suspected breast cancer | 40 | 7 (18) | 10 (25) |
| Groheux D ¹¹ | Retrospective | Stage II and III | 39 | 0 | 4 (10) |

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Conflict of Interest

The authors have declared that no conflict of interest exists.

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