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Title **A Systematic Review of Positron Emission Tomography (PET) and Positron Emission Tomography/Computed Tomography (PET/CT) for the Diagnosis of Breast Cancer Recurrence**

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Aim

To review the accuracy of PET and PET/CT in diagnosing breast cancer (BC) recurrence by assessing their value compared to current practice and compared with each other.

Conclusions and results

Of the 28 studies included in the review, 25 presented patient-based data and 7 presented lesion-based data for PET, and 5 presented patient-based data and 1 presented patient- and lesion-based data for PET/CT; 16 studies conducted direct comparisons with 12 comparing the accuracy of PET or PET/CT with conventional diagnostic tests and 4 with MRI. For patient-based data (direct comparison) PET had significantly higher sensitivity (89%, 95% confidence interval [CI] 83% to 93% vs 79%, 95% CI 72% to 85%, relative sensitivity 1.12, 95% CI 1.04 to 1.21, p=0.005) and significantly higher specificity (93%, 95% CI 83% to 97% vs 83%, 95% CI 67% to 92%, relative specificity 1.12, 95% CI 1.01 to 1.24, p=0.036) compared with conventional imaging tests (CITs) – test performance did not appear to vary according to the type of CIT tested. For patient-based data (direct comparison) PET/CT had significantly higher sensitivity compared with CT (95%, 95% CI 88% to 98% vs 80%, 95% CI 65% to 90%, relative sensitivity 1.19, 95% CI 1.03 to 1.37, p=0.015), but the increase in specificity was not significant (89%, 95% CI 69% to 97% vs 77%, 95% CI 50% to 92%, relative specificity 1.15, 95% CI 0.95 to 1.41, p=0.157). For patient-based data (direct comparison) PET/CT had significantly higher sensitivity compared with PET (96%, 95% CI 90% to 98% vs 85%, 95% CI 77% to 91%, relative sensitivity 1.11, 95% CI 1.03 to 1.18, p=0.006), but the increase in specificity was not significant (89%, 95% CI 74% to 96% vs 82%, 95% CI 64% to 92%, relative specificity 1.08, 95% CI 0.94 to 1.20, p=0.267). For patient-based data, we found no significant differences in the sensitivity or specificity of PET when compared with MRI. In the one lesion-based study, there was no significant difference in the sensitivity or specificity of PET/CT when compared with MRI. Available evidence suggests that for the detection of BC recurrence PET, in addition to conventional imaging techniques, may generally offer improved diagnostic accuracy compared with current standard practice. However, uncertainty remains around its use as a replacement for, rather than an add-on to, existing imaging technologies. In addition, PET/CT appeared to show clear advantage over CT and PET alone in diagnosing BC recurrence.

Recommendations

See Executive Summary link www.hta.ac.uk/project/2051.asp.

Methods

The systematic review included a search for primary studies (no language restrictions) in MEDLINE (Ovid) and EMBASE (Ovid) from database inception to May 2009. Studies of PET or PET/CT in patients with history of BC and suspected recurrence were selected for inclusion. Studies were excluded if: 1) investigations were conducted for screening or staging of primary BC; 2) nonstandard PET or PET/CT technology was used; 3) the reference standard was inadequate or undefined; 4) or raw data were unavailable to calculate diagnostic accuracy. Both comparative and noncomparative studies were included. Two reviewers independently extracted data and assessed quality. Any disagreements were resolved by consensus. Direct and indirect comparisons were made between PET and PET/CT and between these technologies and methods of conventional imaging. A meta-analysis was performed using a bivariate random effects model. Patient- and lesion-based data were analyzed separately. Subgroup analysis was conducted to investigate variation in the accuracy of PET in certain populations or contexts. Sensitivity analysis was used to examine the reliability of primary outcome measures.

Further research/reviews required

See Executive Summary link www.hta.ac.uk/project/2051.asp.

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