FDG positron emission tomography for evaluating breast cancer
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Authors' objectives
To assess the diagnostic performance of the glucose analogue, 2-[fluorine-18]-fluoro-2-deoxy-D-glucose (FDG) positron emission tomography (PET) in the initial diagnosis of breast cancer, staging of axillary lymph nodes, detection of loco regional or distant recurrence or metastases, and in evaluating response to treatment. A secondary objective was to model the effect of FDG PET on health outcomes.

Searching
MEDLINE (from January 1966 to March 2001), Cancerlit, Current Contents and the reference lists of key articles were searched; the search terms were reported. Only English language studies published or accepted for publication in a peer-reviewed journal were eligible for inclusion.

Study selection
Study designs of evaluations included in the review
Prospective studies with at least 10 participants were eligible for inclusion.

Specific interventions included in the review
Studies of FDG PET imaging were eligible for inclusion if they performed tomographic, not planar, imaging with FDG as the radio tracer.

Reference standard test against which the new test was compared
The authors included studies that reported the correlation between FDG PET findings and data from an appropriate reference standard for people with and without breast cancer. The authors did not report the pre-specification of an appropriate reference standard. It appeared that most studies used a histological comparator.

Participants included in the review
Studies of people undergoing screening for breast cancer were eligible for inclusion if they did not mix the results of people with breast cancer with those of patients with other tumour types. The authors did not report participant characteristics such as age and ethnicity.

Outcomes assessed in the review
Studies were eligible for inclusion if they contained data which allowed the authors to calculate the sensitivity and specificity of FDG PET imaging.

How were decisions on the relevance of primary studies made?
The authors did not state how the studies were selected for the review, or how many reviewers performed the selection.

Assessment of study quality
Each study was rated using pre-specified criteria based on the guidelines of the Cochrane Methods Working Group on Systematic Review of Screening and Diagnostic Tests. Key components of the assessment included use of a valid reference standard, blinded interpretation of the tests, avoidance of verification bias, a clear description of population characteristics and disease spectrum, and prospective design. The authors did not state how many reviewers performed the validity assessment.

Data extraction
The authors did not state how the data were extracted for the review, or how many reviewers performed the data extraction.
Methods of synthesis
How were the studies combined?
The authors reported the findings narratively, combined data using random-effects models, and constructed summary receiver operating characteristic (ROC) curves.

How were differences between studies investigated?
The authors did not report a formal method for assessing differences between the studies. They described and tabulated some of the characteristics of the individual studies.

Results of the review
The review included 32 prospective studies. The authors did not report the total number of participants, but it appeared that at least 1,108 people were included in the analyses.

Initial diagnosis.
Thirteen studies (n=606) assessed the diagnostic performance of FDG PET prior to breast biopsy. Sensitivity estimates ranged from 79 to 100% and specificity estimates from 50 to 100%. The pooled estimates of sensitivity and specificity were 88% (95% confidence interval, CI: 83, 92) and 79% (95% CI: 71, 85), respectively. Average performance on the summary ROC curve was 89% sensitivity and 80% specificity.

The authors found limited evidence to assess the diagnostic performance of FDG PET in people with small non-palpable lesions, abnormal mammograms, palpable masses but indeterminate mammograms, and populations with a disease prevalence lower than 50%. They found that among populations with higher disease prevalence, the risk of false negatives may be too high relative to the benefits of avoiding biopsy for a benign lesion.

The authors identified no studies in people referred for short interval mammographic follow-up due to low suspicion mammogram findings.

Staging axillary lymph nodes.
Four studies (n=203) reported on the staging of axillary lymph node metastases in people with non-palpable axillary lymph nodes. The pooled sensitivity estimate for FDG PET was 80% (95% CI: 46, 95) and the pooled specificity estimate was 89% (95% CI: 83, 94).

Loco regional recurrence or distance metastases or recurrence.
Two studies (n=85) focused on detecting loco regional recurrence. The authors stated that there was insufficient evidence to draw conclusions about the effects of FDG PET in this context.

The review included 2 studies (n=109) on the detection of distant recurrence or metastases to bone (one of the studies also looked at loco regional recurrence as outlined above) and 3 studies on recurrence or metastases in sites other than bone, all with fewer than 10 participants with metastases. The authors concluded that there was insufficient information to draw conclusions about using FDG PET for detecting recurrence or metastases in bone, lung, liver, or other distant sites.

Evaluating response to treatment. The authors identified 4 studies (n=103) on whether the use of FDG PET early during treatment predicted treatment response. They concluded that there was insufficient high-quality information on this topic.

Authors’ conclusions
In populations with a higher prevalence of malignancy, the risk of a false negative with FDG PET prior to biopsy may outweigh the benefit of avoiding unnecessary biopsy of a benign lesion. There was insufficient evidence about the effects of FDG PET prior to biopsy for people at lower risk of malignancy, and for staging axillary lymph nodes.
detecting loco regional or distant recurrence or metastases, and evaluating response to treatment.

**CRD commentary**
This review focused on a defined research question. The search strategy and most of the inclusion criteria were described and appeared appropriate.

The authors excluded abstracts but provided an appropriate rationale for doing so: inadequate data to assess methodological quality and allow meta-analysis. They did not provide a rationale for excluding unpublished studies or those published in journals that are not peer-reviewed. Only studies in English were eligible; this may mean that some language or publication bias may be evident, or that some relevant studies have been omitted from the review. The authors stated that only studies with more than 10 participants were eligible, but they reported the findings of cohorts with metastases other than bone metastases with fewer than 10 participants. These might have been subsets of larger studies, but this was not clear. Any inconsistencies in the application of the inclusion and exclusion criteria may impact on the validity of the review.

The authors described the criteria used to assess validity, but they did not describe the process by which validity was assessed, how studies were selected for the review, how and by whom the data were extracted, how decisions on the data analysis (random-effects versus fixed-effect model) were made, or whether methodological quality was taken into account when interpreting the findings. They did not report an analysis of heterogeneity, which makes it difficult to judge whether the meta-analyses were appropriate.

The authors clearly reported findings in each of their four main topic areas. Overall, the authors' conclusions appear appropriate based on the data presented.

**Implications of the review for practice and research**
The authors did not state any implications for practice or further research. They pointed out that there was insufficient evidence to draw conclusions about the diagnostic accuracy or health outcomes of FDG PET in people with breast cancer.

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**Bibliographic details**
Samson D, Redding Flamm C, Aronson N. FDG positron emission tomography for evaluating breast cancer. Chicago, IL, USA: Blue Cross and Blue Shield Association, Technology Evaluation Center. 2001

**Other publications of related interest**
Samson DJ, Redding Flamm C, Pisano ED, Aronson N. Should FDG PET be used to decide whether a patient with an abnormal mammogram or breast finding at physical examination should undergo biopsy? Acad Radiol 2002;9:773-83.

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This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.