Accuracy of whole-body PET and PET-CT in initial M staging of head and neck cancer: a meta-analysis

Xu GZ, Zhu XD, Li MY

CRD summary
This review reported that whole-body positron emission tomography (PET) and PET-computed tomography (CT) had good diagnostic performance in the initial diagnosis of head and neck cancer; PET-CT tended to have higher accuracy than PET. The limitations of the review and the analyses suggest that the findings may not be reliable.

Authors' objectives
To evaluate the accuracy of whole-body positron emission tomography (PET) and PET-computed tomography (CT) for the initial staging of head and neck cancer.

Searching
MEDLINE, EMBASE, and the Cochrane Database of Systematic Reviews were searched from 2000 to September 2009. Only full papers of studies published in English were included in the review. Search terms were reported. Reference lists of retrieved studies were scanned for further studies.

Study selection
Studies of whole-body PET or PET-CT to detect distant metastasis and secondary primary cancer in M staging of head and neck cancer (including oral cancer, hypopharynx, larynx, cancer and nasopharyngeal cancer) were eligible for inclusion. Studies had to include at least 10 patients and use histopathologic analysis and/or clinical imaging follow-up as the gold standard. There had to be sufficient data to create a 2x2 table of test performance.

Included studies were carried out in the USA, Taiwan, Germany, Korea, Singapore, Netherlands and Japan. The age of included patients ranged from 16 to 94 years; 68 to 100% were men. Secondary primary cancer or distant metastases were present in 6.1 to 25% of included patients.

Two reviewers independently selected the studies for inclusion; disagreements were resolved through consensus.

Assessment of study quality
The methodological quality of the studies was assessed using the QUADAS (Quality Assessment of Diagnostic Accuracy Studies) tool.

The authors did not report how many reviewers performed the quality assessment.

Data extraction
Two reviewers independently extracted the study data on a per patient basis; disagreements were resolved through consensus. Data were extracted to create a 2x2 table and used to calculate sensitivity, specificity, diagnostic odds ratio, positive and negative likelihood ratios for whole-body PET and PET-CT.

Methods of synthesis
Pooled sensitivity, specificity, diagnostic odds ratio, positive likelihood ratio and negative likelihood ratio for whole-body PET and PET-CT were calculated using a fixed-effect model. Heterogeneity was assessed using the $X^2$ statistic. If significant heterogeneity was detected, a random-effects model was used. Summary receiver operating characteristic curves were plotted using the Moses-Littenberg model and Q* index calculated; differences between the PET and PET-CT Q* index values were tested for statistical significance using the Z test.

Results of the review
Twelve articles (1,445 participants, range 12 to 349) were included in the review; there were eight PET studies and seven PET-CT studies. All studies were cross-sectional studies. Four PET and four PET-CT were prospective studies. Seven PET and seven PET-CT studies responded 'yes' to 12 of the 14 QUADAS criteria; the remaining PET study...
responded ‘yes’ to 11 of the 14 criteria. Follow-up for histopathologic analysis or dose clinical imaging (gold standard) ranged from six months to 24 months.

For initial M staging of head and neck cancer, the pooled sensitivity estimates for PET were 84.8% (95% CI 77.6% to 90.5%) and 87.5% (95% CI 78.7% to 93.6%) for PET-CT. The pooled specificity estimates were 95.2% (95% CI 93.3% to 96.7%) for PET and 95.0% (95% CI 93.1% to 96.4%) for PET-CT.

For PET, the pooled positive likelihood ratio was 17.401 (95% CI 12.161 to 24.899) and the pooled negative likelihood ratio was 0.170 (95% CI 0.116 to 0.249). For PET-CT, the pooled positive likelihood ratio was 16.653 (95% CI 11.996 to 23.117) and the pooled negative likelihood ratio was 0.141 (95% CI 0.083 to 0.238).

The Q* index estimates for PET-CT (0.9409) were not significantly higher than for PET (0.9154; p>0.05).

**Authors’ conclusions**

Whole-body PET and PET-CT had good diagnostic performance in the initial M staging of head and neck cancer; PET-CT tended to have higher accuracy than PET.

**CRD commentary**

This review assessed a clearly defined research question. A number of relevant databases were searched, but only studies fully published in English were included in the review, so there was a risk of publication and language bias (as acknowledged by the authors). Attempts were made to reduce the risk of reviewer error and bias when selecting studies and extracting the study data; it was unclear whether similar precautions were taken to reduce the risk of reviewer error and bias when assessing the quality of studies.

The methodological quality of the studies was assessed using a relevant tool; the quality appeared to be good. Relevant analyses were performed. Key statistical parameters reported. The studies varied in their clinical characteristics, which suggested that the pooled values may not have been reliable. More robust models were available than those used by the authors for estimating sensitivity and specificity from the Summary receiver operating characteristic analysis. Statistical heterogeneity was detected. A number of limitations were reported by the authors.

Overall, the reported data appeared to support the authors’ conclusions, but the limitations of the review and analyses suggest that the findings may not be reliable.

**Implications of the review for practice and research**

**Practice**: The authors stated that a negative examination result of PET or PET-CT could not be used alone to rule out distant metastases or a secondary primary cancer.

**Research**: The authors did not state any implications for further research.

**Funding**

Not reported.

**Bibliographic details**

Xu GZ, Zhu XD, Li MY. Accuracy of whole-body PET and PET-CT in initial M staging of head and neck cancer: a meta-analysis. Head and Neck 2011; 33(1): 87-94

**PubMedID**

20848421

**DOI**

10.1002/hed.21400

**Original Paper URL**


**Other publications of related interest**

Indexing Status
Subject indexing assigned by NLM

MeSH
Female; Head and Neck Neoplasms /pathology /radiography /radionuclide imaging; Humans; Male; Neoplasm Staging /methods; Positron-Emission Tomography /methods; Radiographic Image Enhancement; Radiopharmaceuticals; Sensitivity and Specificity; Tomography, X-Ray Computed /methods; Whole Body Imaging

AccessionNumber
12011001101

Date bibliographic record published
08/06/2011

Date abstract record published
08/02/2012

Record Status
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.