

## CAT Assignment (Critically Appraised Topic)

Title: Thoracic Staging in Lung Cancer: Prospective Comparison of 18F-FDG PET/MR Imaging and 18F-FDG PET/CT

Author(s): Philipp Heusch, Christian Buchbender, Jens Köhler, Felix Nensa, Thomas Gauler, Benedikt Gomez, Henning Reis, Georgios Stamatias, Hilmar Köhl, Verena Hartung and Till A. Heusner

1. Clinical Question: Will 18F-FDG PET/MR Imaging provide a higher diagnostic value compared to 18F-FDG PET/CT for thoracic T and N staging of non-small cell lung cancer (NSCLC)?

PICO Parts:

P: Patients with non-small cell lung cancer (NSCLC)

I: PET/CT with 18F-FDG

C: PET/MRI with 18F-FDG

O: Better diagnostic value for thoracic T and N staging in NSCLC patients

2. Search Strategy: Lung Neoplasms [MeSH] AND diagnosis with limits, English, humans, and clinical trial

a. Database(s) searched: Ovid MedLine

b. Keyword Search Terms used: Diagnosis

c. MeSH Search Terms used: Lung Neoplasms

3. Methods Description (setting, population, sample size, study design):

Setting: Department of Diagnostic and Interventional Radiology; Dusseldorf, Germany  
Study took place in 2013; was published in 2014.

Population: Patients with histopathologically confirmed non-small cell lung cancer (NSCLC)

Sample Size: 22 consecutive patients (12 men, 10 women; mean age +/- SD 65.1 +/- 9.1 years. No patients were excluded because patients all had histologically confirmed NSCLC.

Study Design: Prospective Comparison

4. Methods Interpretation (Validity):

- a. Was there an independent “blind” comparison with a reference standard?
- b. Did the sample include an appropriate spectrum of patients to whom the diagnostic/screening test will be applied in clinical practice?
- c. Did the results of the diagnostic/screening test being evaluated influence the decision to perform the reference standard?
- d. Were the methods for performing the diagnostic/screening test described in sufficient detail to permit replication?

a. The study included PET/CT with 18F-FDG as the gold/reference standard of diagnostic care.

-Control group was not blinded

b. No, the purpose of the study was to compare the diagnostic qualities of CT and MRI scanning. The sample included appropriate demographic ages and gender. However, it was a small sample size and not enough demographic factors were taken into account such as socioeconomic status, race, employment, health, education, etc.

c. No, the results of the diagnostic test did not influence the decision to perform PET/CT with 18F-FDG. The study provides a basis for expanded studies to explore the potential advantages of MR Imaging, so PET/CT is still used as reference of choice.

-Several biases are present, such as selection bias, in which there was a small sample size of patients with unknown demographic factors. There is also measurement bias in that the readers of the PET/CT and MRI results were not blind to the diagnosis of the patients.

-Authors state that they will improve selection bias with a larger sample size

d. Yes, the methods were indeed described in sufficient detail to permit replication. The article properly described how to replicate the study for future experiments, going so far as to describe the blood glucose level of the patients, the standardized procedure for the preparation of the patients for their scans, and a specific description of details such as the flow rate of contrast administration and the slice thickness of the scan. Their interpretation was done by statistical analysis, correcting for possible image distortion due to attenuation-correction.

5. Results:

18-F-FDG PET/MR imaging as compared to 18F-FDG PET/CT does not provide advantages in thoracic staging in NSCLC patients, because there were no differences in the two methods of diagnostic care. To elaborate, Figure 1 shows that the tumor mass found by MR was identical to the one found by CT. Likewise, Figure 2 shows that the supra hilar lymph nodes found by MR were identical to the one found by CT.

6. Translational applications (How does this study apply to your patients?):

The results are applicable to the patients in the clinical question because they were performed on patients with NSCLC.

The results would not change the method of diagnostic care in clinical practice when treating patients with NSCLC.

Based on the results of the study, it does not appear that 18-F-FDG PET/MR imaging will provide added benefit to the patients as compared to 18F-FDG PET/CT.

7. Reference:

Heusch P, Buchbender C, Köhler J, et al. Thoracic staging in lung cancer: prospective comparison of <sup>18</sup>F-FDG PET/MR imaging and <sup>18</sup>F-FDG PET/CT. *J Nucl Med.* 2014;55:373–378.