Reviewer's report

Title: Semi-Automated Analysis of Standard Uptake Values in Serial PET/CT Studies in Patients with Lung Cancer and Lymphoma

Version: 1 Date: 7 December 2011

Reviewer: Irene Burger

Reviewer's report:

Revision for
Semi-Automated Analysis of Standard Uptake Values in Serial PET/CT Studies in Patients with Lung Cancer and Lymphoma

The authors developed and analyzed a semi-automatic method to measure and compare SUVmax in serial PET/CT studies. In sixteen patients manual assessment was compared to a semi-automatic approach including: alignment of the PET data according to CT images, manual selection of target lesion and propagation of this lesion to other scans.

Overall well written and an interesting topic. The increasing demand in nuclear medicine to give accurate treatment response assessments is a very time consuming challenge. Software based, semi-automatic response assessment could significantly optimize work flow and reliability of results.

Suggestions:

1) Abstract:
Include in the methods part that 3 readers were analyzing the data visually and semi-authomatic, and were compared with each other for lesion characterization with SUVmax and that time for analysis. The sentences: Patients with abnormal lesions showing sharp contrast to surrounding areas and with no formation of a large conglomerate mass were selected.

However does not seem to be essential for the abstract.

2) Introduction:
Might consider including Ref: Fox et al, Practical Approach for Comparative Analysis of Multilesion Molecular Imaging Using a Semiautomated Program for PET/CT, J Nucl Med 2011 52:1727-1732

Using a similar approach in prostate cancer.

3) Result:
As discretionary suggestion:
Emerging results show that, although the interobserver reproducibility is very high for SUVmax the repeatability of SUVmax is very low due to statistical variance due to the variability in nuclear decay.

It therefore would be of great interest if your semi-automatic analysis also results in an as good or might even better reproducibility for averaged SUV than manual reading (SUVmean, or SUV hottest 10 or 20 pixels). This however is looking into another topic and could be considered in a second study using your new segmentation tool.

4) Discussion:

a) The choice of performing the segmentation in the PET is because the patient material had both lowdose and diagnostic CT. Low-dose CT provides a lower resolution of the CT scan, which would most likely result in poorer segmentation quality.

This part is misleading: in an unenhanced CT segmentation of a lesion (unless lung) is inaccurate. Since Lymphoma was included and this was most likely not in the lung – CT-segmentation is not really an option and the Low versus High dose aspect is of secondary importance. Furthermore by being able to segment in PET this method can be used in a wider range of disease (hepatic metastasis…). This should be emphasized instead.

b) SUVmax was chosen over SUVmean due to clinical praxis at our hospital when assessing PET/CT examinations.

Since SUVmax is still the most commonly used value, this is certainly reasonable. However, SUVmax seems to be overestimated since it’s obviously in the same scan always the same value – however it seems to be lacking a reasonable reproducibility.

c) Last line on page 10) there is an issue with reference 5 – please check.

5) Conclusion:

Good agreement was shown in absolute SUVmax measurements and but there was a significant difference in the mean difference in SUVmax between studies when comparing both methods.

Needs to be rewritten: There was no significant difference in SUVmax when comparing both methods?

Also include the significant time reduction into the conclusion with the semi-automatic method.

6) Minor essential revision:

Figure 1 is the flow chart in the text.

Figure 2 (regression analysis is wrongly entitled Figure 1)

**Level of interest:** An article whose findings are important to those with closely related research interests
Quality of written English: Acceptable

Statistical review: No, the manuscript does not need to be seen by a statistician.

Declaration of competing interests:

'I declare that I have no competing interests'