Reviewer's report

Title: Diagnostic value of retrospective PET-MRI fusion in head-and-neck cancer

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Reviewer: Bryan Yoo

Reviewer's report:

In this manuscript, the authors assessed the diagnostic value of retrospective PET-MRI fusion in tumor and nodal staging of head and neck cancer. They retrospectively analyzed MRI, PET, side by side and retrospective PET-MRI fusion, and found no statistically significant differences between the investigated modalities, although there was a trend towards improved diagnostic accuracy with multimodal analysis versus single modality. There was no difference between side-by-side analysis and retrospective fusion, however. They conclude that while multimodal analysis may be useful in some cases, the use of added time and complexity of retrospective fusion is not justified.

While the paper is generally well written and the data analysis and interpretation sound, the level of interest in this study may be limited, given there was no statistically significant differences in diagnostic performance seen across the investigated modalities. The authors claim in certain cases, for example, in recurrent tumor in previous surgery, there may be benefit of multimodal techniques, however, this is based on single examples presented by the authors. Prior studies have evaluated retrospective MRI–PET fusion compared to signal modality analysis; some of these studies have suggested improved diagnostic performance of PET/MR fusion compared to single modality analysis, in particular with recurrent lesions. The unique contribution of this paper to the literature is the comparison of retrospective MRI-PET fusion to side-by-side analysis, which appears not to have been specifically examined previously.

Minor essential revisions:

1. Was the study IRB approved?
2. Paragraph 1 (patient population), “woman” should be replaced with “women”
3. Further details regarding retrospective PET/MR fusion process. For example, the authors describe “image registration was semi-automatically processed, after an initial orientational manual alignment”. What was the basis for initial manual alignment? Also, general information regarding the software fusion algorithm would be useful, i.e., does the software use intensity based registration?
4. There should be more discussion regarding the limitations of the study.
5. It is unclear to me the exact role of the 2 observers for the study. Did both observers review each study and modality independently? If so, were inter-observer statistics measured, and how were discrepancies in scoring resolved? Or did the observers evaluate each study concurrently, coming to a
consensus score? Please clarify.

6. The authors describe semi-quantitative analysis was performed by using SUVs in the methods section, however, there is no analysis of SUV values was used in the results. How was SUV quantitation used in the study?

**Level of interest:** An article of limited interest

**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