Reviewer’s report

Title: Quantitative margin assessment of radiofrequency ablation of a solitary colorectal hepatic metastasis using MIRADA RTx on CT scans: a feasibility study

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Reviewer: Evelyne M. Loyer

Reviewer’s report:

In this manuscript the authors evaluate the feasibility and reproducibility of CT-CT co-registration using the commercially available MIRADA RTx software to assess the minimal thickness of the ablative margins after RFA for colorectal metastases.

29 patients with a solitary metastasis measuring an average of 2.1 cm were included. Co-registration was considered good enough for analysis in 18 cases (61%).

Strength of the manuscript: important subject and potential simple method to assess ablative margin in clinical practice. The need for an adjunct to visual methods is evident and a simple approach ideal. The authors show that this may be possible with Mirada RTx.

Weakness: Insufficient information on the use of the software, how co-registration was performed and reason for failure, the relative value of visual versus quantitative assessment is not presented objectively, discrepancy between visual and co registration in this series needs to be reevaluated, superior accuracy of 3D images only without the co-registration could be explored.

Interesting subject but needs serious revisions.

Background:

Line 21: The need for 3-5 mm margin is supported by the literature.


Nakazawa T., AJR 2007; 188:480-488


Sotirchos V., Radiology 2016 Vol 280, No 3

Shady W., Radiology 2015 Vol 278, No 2
Assessment with co-registration is superior to qualitative visual assessment. It all depends of what type of visual assessment one is talking about as shown in Ref 5 and in 7. In ref 7 co-registration was not superior for experienced reader.

Material and Methods:

A description of the process of co-registration beyond saying Mirada was used, would be good. Was co-registration only manually done, was there any automatic phase? What are the evidence of the performance of the software in the liver? Describe what you did so that anyone with access to Mirada can do the same.

Completeness of ablation was judged on eyeballing? Doing what? Judging the centering of the defect in relation to the tumor? Looking only for enhancing or non-enhancing residual tumor at margins? What was the definition of completeness? No visible tumor at margin regardless of the centering of the defect?

Results:

Would put the tumor size here not just in the S1.

Would also be interesting to impact of long delay between diagnostic scan and RFA, especially for those with a month delay.

Scoring:

Need for more details on the reasons why co-registration was insufficient in 48% of cases. You mentioned patient positioning in the discussion, was it the only reason? Bolus quality? Artifacts? Etc..

Need to define complete incomplete ablation. You say the extension of the tumor beyond the ablation zone was measured so it was visually accessible?

Local recurrence rate:

Incomplete ablation could not be diagnosed visually in this series however you measured the tumor extension beyond the ablation zone that is a visual observation. I am also puzzled by the assumption that all RFA were complete and suspect that a more accurate way of visually judging quality of RFA would be to assess how well the defect was centered over the target. My inclination is to believe that co-registration helps but not that visual assessment is that unreliable that co-registration is needed to diagnose incomplete ablation. RFA defect could be classified as
optimal (visually large margin) versus suboptimal (insufficient margin) rather than complete versus incomplete.

Discussion:

The distinction between low risk and high risk of recurrence can be done visually at restaging as reported in the literature. In this series the immediate post procedure scan is used and the conclusion that co-registration is the only way to recognized incomplete ablation is not convincing for the following reasons:

- the apparent weakness of the post procedure "eye balling". Residual tumour may not be visualized but centring of the defect is possible on immediate post RFA scan.

- Kim et al The difference in accuracy to measure ablation margin has nothing to do with fusion but with the 3D data, there are more data points than with 2D images and consequently the accuracy is increased. I would suggest to review the 3D images to assess the ablation margin visually and see when the fusion is the key to accuracy or if the 3D is, fusion makes it easier but is probably not the key.

- Park et al do not conclude inaccuracy of visual assessment but that the visual accuracy is related to experience. Fusion being better for inexperienced readers.

The gain of fusion compared to visual evaluation is probably in the simplification of the process, faster evaluation and adjunct for inexperienced readers. The major gain in term of accuracy, I suspect, is the availability of 3D analysis of the ablative margin.

Conclusion: ok

Illustration: Would like to see an illustration of measurement.

Are the methods appropriate and well described?
If not, please specify what is required in your comments to the authors.

No

Does the work include the necessary controls?
If not, please specify which controls are required in your comments to the authors.

Unable to assess

Are the conclusions drawn adequately supported by the data shown?
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Yes
Are you able to assess any statistics in the manuscript or would you recommend an additional statistical review?

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