Reviewer's report

Title: Radiofrequency Ablation of Liver Lesions: Quantitative Assessment of Treatment Completeness through CT Image Processing.

Version: 3 Date: 31 July 2012

Reviewer: Christof M Sommer

Reviewer's report:

I had the pleasure to re-review the manuscript entitled “Radiofrequency Ablation of Liver Lesions: Quantitative Assessment of Treatment Completeness through CT Imaging Processing“ re-submitted to BMC Medical Imaging.

After detailed point-to-point-reply and implementations according to the reviewers, the work significantly improved. I thank the authors for their work.

Two major concerns remain from my point-of-view:

(I) tissue shrinkage occurring during thermal ablation was not adequately addressed (tissue shrinkage can be up to 30% in liver, which is relevant! (Brace CL, Diaz TA, Hinshaw JL, et al. (2010) Tissue contraction caused by radiofrequency and microwave ablation: a laboratory study in liver and lung. J Vasc Interv Radiol 21: 1280-1286) - the statement on P9 is not adequate, and needs revision with more detailed discussion: “coagulative local deformations were expected to be negligible“)

(II) since your analysis identified incomplete tumor coverage by the RF ablation zones in almost all cases, and since (I), oncological follow-up imaging is mandatory (with potential identification of tumor growth) to confirm your results

(I) and (II) are major limitations.

Further limitations:

Title: “Treatment Completeness” might be not the perfect expression - consider “Tumor coverage”

Abstract and Background: good

Methods: Please explain more detailed according to which criteria the RFA cases of this study were selected; please give numbers for RFA expertise (e.g. cases per year) and period for RFA cases used of this study; P7, “The number of …” – please give references, and comment – Do radiologists identify 7 different tissues on a liver CT image?; nomenclature: consider “tumor” and “coagulation” and “residual tumor” instead of “original lesion” and “Post-RFA lesion”, and use the identical terminology throughout the entire manuscript; P7, “Lesions look rather compact …” – ok for metastases, however in my clinical routine HCCs in arterial phase CT scans (at least for your size range) look either very homogeneous, or
inhomogeneous not following vanishing concentric rings; I am not sure on the clinical importance of the O.I. – most tumors might be classified as spherical (at least in your size range) making the orientation of the needle tract for thermal ablation procedures irrelevant (and consequently coagulation orientation which strongly correlates to the needle tract);

Results: P15 “As HCC is nourished … reduction of thermal impedance … heat diffusion …” – first, please give reference for the thermal impedance point, and second comment on “portal blood flow”; P15 “Thus, in this RFA-technique, our own hypothesis” – it is well-known that encapsulated tumors, like smaller HCCs and renal cell carcinomas (but not liver metastases), undergo the so-called “oven-effect” – this means you just need to bring enough energy (heat) into the oven, and then the tumor undergoes necrosis (irrelevant of needle configuration within the tumor (e.g. in case of multiple needle approaches)), this results in a coagulation zone almost identical with the extent of the original tumor, please delete “our own hypothesis”, and discuss this issue (citations might be beneficial)

Figures: Figure 2 and 3: language correction necessary