Title: Quantitative EASL: An Improved Way to Assess Tumor Response after Transcatheter Arterial Chemoembolization (TACE)

Abstract:
Purpose:
Multi-phasic contrast-enhanced MRI is the gold standard to assess liver tumor treatment response. EASL criteria is used to evaluate response based on tumor enhancement changes. EASL limitations are: 1) used on a single axial tumor slice. A different slice selection can yield a different response assessment, and 2) assessment is grouped into quartiles. If the response is at the threshold between quartiles, assessment will be inaccurate. We propose to improve the criteria by: 1) determining enhancement for the entire tumor volume, and 2) reporting an exact tumor viability measurement (as a % of enhancing tumor volume). We propose this as quantitative EASL (qEASL).

Method and materials:
qEASL was calculated as follows: 1) Semi-automatic 3D tumor segmentation was performed on the 20-sec scan. 2) Pre-contrast scan was subtracted from the 20-sec scan. 3) 3D segmented volume from #1 was applied on #2. 4) From #2, statistics were calculated in ROIs representing normal liver parenchyma. 5) Viable tumor was defined as areas in #3 where enhancement was > normal parenchyma from #4. 6) Viable tumor amount was defined as a % of total tumor volume. qEASL was performed on 4 hepatocellular carcinoma patient cases before and 1 month after drug-eluting beads transcatheter arterial chemoembolization.

Results:
For all pre-TACE cases, a significant % of the tumor volume enhanced > healthy liver tissue. qEASL pre-TACE was 76.1±19.3% and 24.2±14.9% post-TACE. qEASL was able to measure the enhancement for the entire tumor volume and provide a quantitative result.

Conclusion:
The benefits are: 1) a specific value of tumor enhancement is reported rather than quartiles, 2) quantification results represent the entire tumor volume rather than a single axial slice, and 3) tumor viability can be visualized on a regional level as color map. qEASL eliminates subjectivity in assessing tumor enhancement. This information can help the clinician in more accurately determining the response from treatment.