

Technical quality of liver fat/iron MR quantification studies: Can we do better?

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1. Introduction

- Liver fat (non-alcoholic fatty liver) and iron overload can lead to cirrhosis requiring early detection.^{1,2}
- Magnetic resonance (MR) imaging utilizing chemical-shift-encoded (CSE) sequences and multi-time-of-echo (TE) single-voxel spectroscopy (SVS) are frequently used for assessment.^{3,4}
- Purpose: to assess various quality factors of technical acceptability and any deficiencies in technologist performance in these fat/iron MR quantification studies.

2. Methods

- Review of 87 fat/iron MR studies performed between July 1, 2021, and December 31, 2021
- Technical acceptability/suboptimality for CSE sequences (q-Dixon and IDEAL-IQ) measures: data handling errors (missing maps including water only, fat fraction, and R2*), liver field coverage, fat/water swap, motion, or other artifacts.
- SVS technical acceptability measures: data handling (missing table/spectroscopy), curve-fit, fat and water peaks separation, and water-peak sharpness.

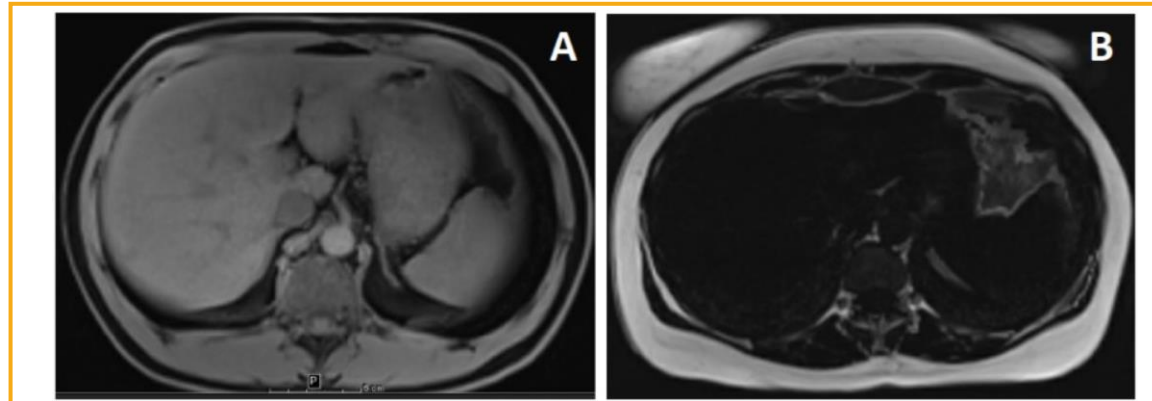


Figure 1. Fat/water swap example from water-only 3D CSE acquisitions; A: no fat/water swap (acceptable), B: global fat/water swap.

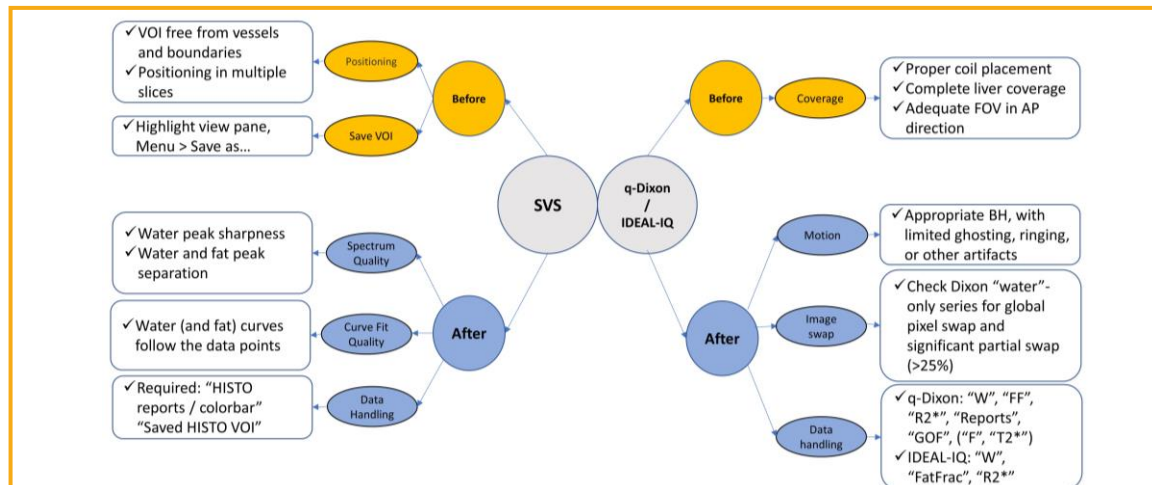


Figure 2. Proposed check list for quality control of liver quantification acquisitions. W: water, FF (for q-Dixon): fat fraction, GOF: goodness of fit, FatFrac (for IDEAL-IQ): fat fraction, BH: breath hold, ROI: region of interest.

3. Results

- Data handling errors: in 11% (10/87) of studies with missing maps (6 cases of CSE) or entire sequence (three missed SVS and one missed CSE).
- Technically suboptimal CSE: 27% (23/86) [incomplete liver-field (39%), other artifacts (35%), significant/severe motion (18%), global fat/water swap (4%) **[Figure 1]**, and multiple reasons (4%)].
- 28% (21/75) of SVS sequences were suboptimal [water-peak broadness (67%), poor curve-fit (19%) overlapping fat and water peaks (5%), and multiple reasons (9%)].

4. Conclusions

- There is a high rate of preventable errors in fat/iron MR quantification studies.
- Routine quality control and evaluation of technologist performance and technical deficiencies is required.
- Designing a checklist for technologists to use during exam acquisition could be helpful. **[Figure 2]**

References:

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