

Differences between T_1 and cT_1 cannot be attributed to iron-correction only

Dear Editor,

We read with interest the article by Dillman et al. published on 14th May 2020 in Pediatric Radiology [1], in which the authors report hepatic T_1 mapping results in children with autoimmune hepatitis. The topic of this paper is timely as the prevalence of liver disease is rising in children [2,3] who particularly need non-invasive diagnostic and monitoring methods. The effort of the authors to perform quantitative liver tissue characterization of this particular disease in a pediatric population is commendable.

T_1 mapping is still an emerging technique in the field of quantitative liver imaging, in part due to a number of confounding factors, some of which have already been described [4-6], while others may still remain unexplored given the multitude of metabolic tasks carried out by the liver. In addition, liver T_1 varies with field strength [7], being longer at 3 T than at 1.5 T. In this context, standardization and reproducibility of T_1 measurements are crucial.

Unfortunately, Dillman et al. have not appreciated that while their measurements were made at 1.5 T, the cT_1 values reported by Perspectum (formerly Perspectum Diagnostics) not only include a correction of iron-mediated effects [4], but are also normalized to a different field strength, namely 3 T [8].

By definition [4], iron correction does not alter measured native T_1 values of patients with normal liver iron concentration, which was also demonstrated in Dillman et al.'s reference 6. However, cT_1 does not only involve iron correction: from the cT_1 product description on Perspectum's website (<https://perspectum.com/products/livermultiscan>) it is clear that cT_1 is standardized across field strengths. Bachtiar et al. also specify that human T_1 values – irrespective of the field strengths they were acquired at – are standardized to a Siemens Prisma 3 T scanner [8]. This standardization from 1.5 T to 3 T explains the main reason Dillman et al. observe differences between native T_1 and cT_1 in this pediatric AIH cohort with normal hepatic iron content.

This also explains why the cT_1 values observed by Dillman et al. are similar to cT_1 values reported at 3 T [9,10]. The cT_1 values reported by Dennis et al. and Jayaswal et al. are similar to their

corresponding native T_1 values because in these works, the original T_1 measurements were acquired at 3 T.

The analysis presented by Dillman et al. therefore does not, as their title implies, compare the performance of native T_1 at 1.5 T and iron-corrected T_1 at 1.5 T. It is a comparison between measured MOLLI T_1 at 1.5 T and iron-corrected, standardised-to-3 T cT_1 .

The authors correctly recognize the value in defining normative values in the discussion. An advantage of standardizing all measurements to a single field strength and manufacturer is that this makes normative values available when they might otherwise not be. However, as this study highlights, it can also cause confusion when the measured native T_1 values and the iron-, field-strength- and manufacturer-normalized cT_1 results are compared.

With kind regards,

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