Why is FerriSmart Superior to Other Tests in the Estimation of Body Iron Loading?

Features of FerriSmart®

- FerriSmart® is used to non-invasively measure liver iron concentration (LIC) from specially acquired MRI images;
- FerriSmart works with all major scanner manufacturers (GE, Siemens, Philips);
- FerriSmart® measures across the full range of iron loading seen in clinical practice. This range is larger than that which is achievable using any other published MRI-based method;
- FerriSmart® has regulatory clearances from the FDA, TGA, and CE Mark;
- Every part of the FerriSmart® process is standardised globally, from image acquisition to analysis and report generation across all major makes and models of 1.5T MRI scanners;
- FerriSmart® also has companion diagnostic FDA clearance for use with deferasirox.

Advantages of FerriSmart® over serum ferritin (SF)

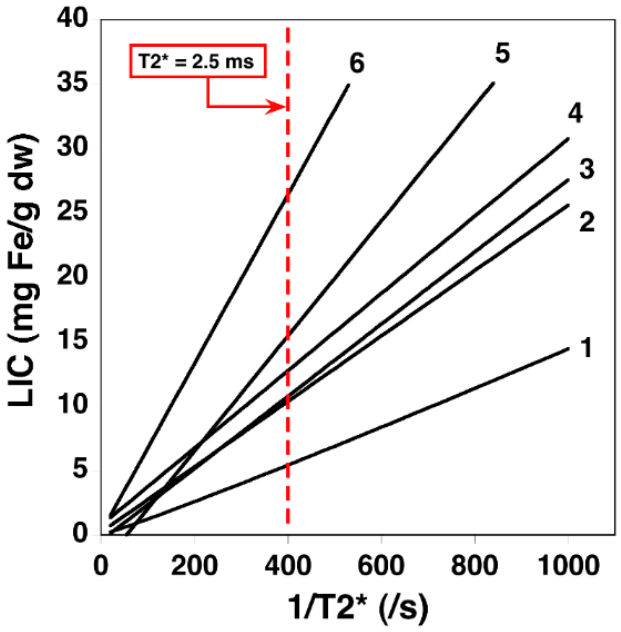
- Other factors present in patients with iron overload such as infection, inflammation, fever, cancer, metabolic disease, or liver damage may result in significant elevation of serum ferritin concentrations in the absence of iron overload;
- SF has poor accuracy for measuring body iron loading in patients with thalassaemia major[1];
- SF levels in patients with thalassaemia intermedia are significantly lower than in patients with thalassaemia major despite them having comparable Liver Iron Concentration levels (as determined by biopsy), suggesting that SF significantly underestimates iron loading in patients with thalassaemia Intermedia[2];
- Increased serum ferritin concentrations may indicate iron overload, but are not a quantitative measure of iron burden. Additionally, once SF becomes saturated, there is poor correlation between SF and iron levels;
- SF is an imprecise and potentially misleading parameter on which to base clinical management decision in patients with sickle cell disease (SCD)[3];
- SF has significant limitations in assessment of iron burden in children with SCD, whose liver iron assessment is critical for optimal management;
- The relationship between total body iron stores and SF in patients with hereditary haemochromatosis is very weak[4, 5].

Advantages of FerriSmart® over liver biopsy

- Non-invasive;
- Painless;
- No risk of bleeding or infection;
- Cost is significantly lower than biopsy
- FerriSmart measures iron in a volume of liver that is thousands of times greater than liver biopsy and therefore potentially has a much smaller sampling error;
- Sample size of the biopsy specimen only represents 1/50,000th of the total mass of the liver, therefore the sampling error is potentially large - the location where the biopsy is taken from will affect the result, and

What are the limitations of Liver T2* (MRI)

- There are a number of liver T2* techniques and these are not standardised. Non standardisation means that it is very difficult to compare results. See Graph 1 below;
- The liver T2* techniques are not regulatory cleared;
- As a patient's LIC starts to climb, the liver T2* techniques become more unreliable and eventually fail at higher iron levels. This can occur from 15 mg/g dry weight (depending on method of acquisition and analysis);
- The liver T2* methods do not report across the full range of iron loading seen in clinical practice. (Published liver T2* methods measured LICs up to 23.6, 27.67 and 32.98 mg/g dry tissue, respectively.)
- The liver T2* techniques can be influenced by the presence of liver fat and fibrosis;
- A review of the literature shows that, unlike FerriSmart® R2-MRI, liver T2* methods generate data that are scanner and method dependent and hence are not sufficiently standardised to enable reliable liver iron concentration measurements using calibration curves published from other centres;
- Liver T2* to LIC conversion is dependent on a number of factors including various scanning profiles, various methods of analysis, and which calibration curve is used. The variance in several T2* techniques can be seen in the tables below. For the purposes of comparison, the LIC result derived from a calculated liver T2* value of 2.5ms will vary widely depending on which calibration curve has been used for conversion (see red line on Graph 1 below).



Graph 1 showing various Liver T2*calibration conversions to LIC.

Number on Graph	Published reference	LIC (mg/g dw)
1	Anderson et al, 2001	5.4
2	Wood et al, 2005	10.4
3	Hankins et al, 2009	10.7
4	Garbowski et al, 2009	12.7
5	Chan et al, 2010	15.4
6	Christoforidis et al, 2009	26.4

References

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