Myocardial Iron Overload (Siderosis)

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Indications and Purpose of the Scan:

- The presence of myocardial iron overload is rare but without treatment can be associated with significant risk of death and heart failure.
- CMR T2* imaging can be used to detect and quantify the burden of myocardial iron overload.
- CMR T2* imaging can be used to risk stratify patients with known or suspected myocardial iron overload.
- T2* relaxation times can be used to guide iron chelation therapy in patients with myocardial iron overload.

Description:

- During a single, short, breath-hold, a series of images are acquired at increasing echo times (TE).
- The signal intensity of the mid-ventricular septum is determined for each of the images. The signal intensity is plotted against the echo time and the T2* relaxation time is calculated. This is typically done using special software.

Why CMR (specific advantages):

- Myocardial iron overload can be very difficult to detect with commonly used tests such as serum ferritin levels, electrocardiography, or echocardiography. However, CMR T2* imaging is considered the reference standard for detecting and quantifying myocardial iron overload.
- Abnormalities in CMR T2* can occur prior to the development of systolic or diastolic dysfunction.
- CMR T2* imaging can be used to guide iron chelation therapy to prevent heart failure in patients with myocardial iron overload.

Evidence:

- Leonardi et al. JACC Cardiovascular Imaging 2008. In transfusion dependent thalassemia, echocardiographic diastolic function parameters correlated poorly with EF and myocardial T2* and were thus not well-suited for risk stratification. Myocardial T2* had a strong relationship with EF and appears to be a promising approach for predicting the development of heart failure and for iron chelator dose adjustment.
- Kirk et al. Circulation 2009. Cardiac T2* magnetic resonance identifies patients at high risk of heart failure and arrhythmia from myocardial siderosis in thalassemia major and is superior to serum ferritin and liver iron. Using cardiac T2* for the early identification and treatment of patients at risk is a logical means of reducing the high burden of cardiac mortality in myocardial siderosis.
- Modell et al. Journal of Cardiovascular Magnetic Resonance 2008. Since 1999, there has been a marked improvement in survival in thalassaemia major in the UK, which has been mainly driven by a reduction in deaths due to cardiac iron overload. The most likely causes for this include the introduction of T2* CMR to identify myocardial siderosis and appropriate intensification of iron chelation treatment, alongside other improvements in clinical care.
References:


