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Technologist presentation

Spoiled Gradient Echo T2* iron-loading measurements of the liver and myocardium in 12 year old male with severely reduced cardiac function from Thalassemia Major

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Introduction

Beta-Thalassemia Major affects 60.000 births per annum world-wide, and a further 94 million carriers. Mutations in the β-globin gene results in severe anaemia, leaving patients dependent on blood transfusions throughout their life. Excessive absorption combined with transfusional haemosiderosis cause iron-overload in the myocardium and liver. There is a 50% mortality rate in Beta-Talassemia Major patients before the age of 35 due to iron overload, with cardiac failure being the main cause of death.

Purpose

We report a 12 year old male with beta-Thalassemia Major, who was . Patient was treated with desferrioxamine chelation, . The patient hadbut with poor chelation compliance history, and therefore required urgent iron assessment of liver and myocardium.

Methods

Cardiovascular Magnetic Resonance (CMR) scan including True-FISP volume measurements of cardiac function was performed on a 1.5T Siemens Symphony scanner. Iron-loading was assessed by using Spoiled Gradient Echo T2* sequence with high bandwidth of 810 Hz/pixel, TR 100ms and TE of 2.6-16.74ms (cardiac) and 0.93-16ms (hepatic).

The iron loading is measured by measuring the signal intensity for each image using a purpose-designed software programme (Thalassemia Tools) which subtracts the background noise from the myocardial/hepatic signal intensity, and plotting the signal intensitythe net value against the echo time to form an exponential decay curve. To derive T2*, an exponential trend-line is fitted with the following equation:

$$Y = Ke^{-TE/T2^*}$$

K represents a constant, TE= Echo Time and Y =image signal intensity. The later low signal to noise ratio (SNR) data points were discarded to address issues of noise and artefacts.

Results

T2* measurements of liver demonstrated severe hepatic iron loading of 1.3ms, T2* measurements of myocardium demonstrated moderate cardiac iron loading of 15.2ms and volumetric measurements on True-FISP cine sequences concluded severely dilated left ventricle with severe systolic dysfunction and left ventricular ejection fraction of 28%.

Conclusions

T2* MRI can be successfully used along with CMR for assessment of cardiac function along with myocardial and hepatic iron loading in patients with Thalassemia. The

high bandwidth used with the spoiled gradient echo sequence allows very short acquisition times, reducing motion artefacts and allowing the image acquisition to be completed in a single breath-hold. This makes this a suitable imaging tool for paediatrics, allowing regular follow-up scans to monitor patients that require blood transfusions.