# R2* Magnetic Resonance in the Evaluation of Cardiac Iron

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TARGET AUDIENCE: Clinicians and scientists interested in emerging cardiac MRI techniques and related applications.

PURPOSE: The purpose of this educational exhibit is to describe the basic principles of R2* magnetic resonance techniques in the quantification of cardiac iron, illustrate the appearance of iron overload syndromes in magnetic resonance imaging, and review the current evidence related to the clinical application and significance of R2* magnetic resonance in monitoring cardiac iron stores.

OUTLINE OF CONTENT:

1. Iron Overload Cardiomyopathy
    a. Epidemiology and significance
    b. Pathophysiology of iron metabolism
    c. Relationship to iron in other organs
    d. Diagnosis and Treatment
2. Evaluation of cardiac iron stores – alternative methods and limitations
    a. Endomyocardial biopsy
    b. Biomarkers: serum ferritin, hepatic iron (poor correlation with cardiac iron)
    c. Echocardiography
3. Magnetic resonance techniques and imaging appearance in cardiac iron overload
    a. R2*/T2*, primary method
    b. Other methods: T2 and T1
4. Our institutional experience
5. Review current evidence and remaining challenges
    a. Myocardial T2* values and clinical outcome.
    b. Exponential decay curve (noise algorithm, model selection, curve fitting)
    c. 1.5T vs. 3.0T
    d. Motion artifacts with necessary breath hold sequence
    e. Macroscopic susceptibility and correction
    f. Flow and cardiac motion artifacts

SUMMARY: Accurate measurement of cardiac iron stores is critical to the early detection of iron overload in patients at risk of siderotic cardiomyopathy and heart failure. Cardiac R2-star/T2-star (R2*/T2*) magnetic resonance has become a reliable, noninvasive, and reproducible method for the quantification of myocardial iron.

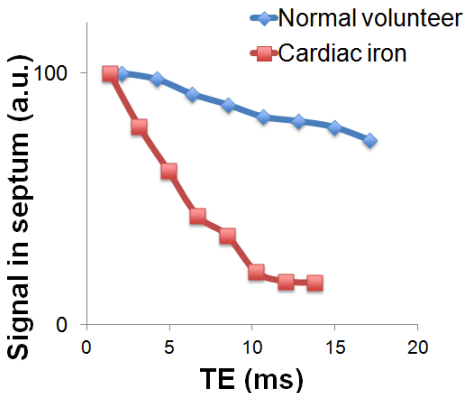


**Figure 1:** Example signal decay curves in a normal volunteer and patient with cardiac iron overload.

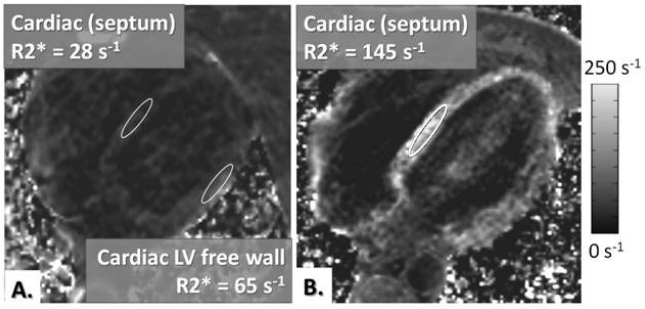


**Figure 2:** [A] Axial R2* map demonstrating normal R2* value in the septum but apparent elevation of R2* value at the lateral left ventricular wall, caused by susceptibility effects from the adjacent lung. We will discuss strategies to minimize these effects. [B] Axial R2* maps through the mid interventricular septum demonstrating elevated R2* in a patient with cardiac iron overload.