

Cardiac MRI in the Diagnosis and Monitoring of Myocarditis: Current Approaches and Limitations

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ABSTRACT

Myocarditis is an inflammatory disease of the heart muscle, and its diagnosis and monitoring can often be challenging. Although endomyocardial biopsy remains the gold standard, cardiac magnetic resonance imaging (CMR) is increasingly preferred as a non-invasive, non-deleterious, and repeatable method. CMR contributes significantly to the diagnosis of myocarditis, tissue characterization, functional assessment, and prognostic prediction. However, challenges such as variability in sensitivity and specificity, access inequities, and protocol deficiencies persist in CMR applications. This article addresses the role of CMR in the diagnosis and monitoring of myocarditis, the current limitations, future development areas, and provides recommendations for clinical practice.

Keywords: Myocarditis, Cardiac Magnetic Resonance Imaging, Non-invasive Diagnosis

Kardiyak MRG ile Miyokardit Tanı ve Takibi: Güncel Yaklaşımlar ve Sınırlamalar

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ÖZ

Miyokardit, kalp kasının iltihabi bir hastalığı olup, tanı ve takibi genellikle zorlu olabilmektedir. Endomyokardiyal biyopsi altın standart olsa da, kardiyak manyetik rezonans görüntüleme (MRG), invaziv olmayan, güvenli ve tekrarlanabilir bir yöntem olarak giderek daha fazla tercih edilmektedir. Kardiyak MRG, miyokardit tanısında doku karakterizasyonu, fonksiyonel değerlendirme ve prognoz tahmininde önemli katkılar sağlamaktadır. Ancak, Kardiyak MRG uygulamalarında duyarlılık ve özgüllük değişkenliği, erişim eşitsizliği ve protokol eksiklikleri gibi zorluklar devam etmektedir. Bu yazı, miyokardit tanı ve izleminde, Kardiyak MRG'nin rolünü, mevcut sınırlamaları ve gelecekteki gelişim alanlarını ele almakta, ayrıca klinik pratiğe yönelik öneriler sunmaktadır.

Anahtar Kelimeler: Miyokardit, Kardiyak Manyetik Rezonans Görüntüleme, Non-invaziv tanı

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Myocarditis is an increasingly prevalent condition worldwide. In recent years, the growing preference for cardiac magnetic resonance imaging (CMRI) in the diagnosis of myocarditis has marked a significant advance in the accurate and early detection of the disease.

Myocarditis is an inflammatory disease of the heart muscle that presents clinically with increasingly variable patterns. Although endomyocardial biopsy, which provides histopathological confirmation, remains the reference standard, its routine use in clinical practice is challenging due to limitations such as invasiveness, sampling bias (focal lesions), and low sensitivity. In this context, CMRI has become indispensable for the diagnosis and monitoring of myocarditis, owing to its non-invasive, safe, and repeatable nature.^{1,2}

CMRI can detect changes in the heart muscle, such as edema, inflammation, fibrosis, necrosis, or scarring, using techniques such as T2-weighted imaging, T1/T2 mapping, and early- and late-gadolinium enhancement (LGE).^{1,3} Additionally, CMRI can provide a comprehensive analysis of parameters such as chamber sizes, wall thickness, ventricular dimensions, and function (ejection fraction).^{4,5} Findings from CMRI (e.g., global or regional function, strain/feature-tracking values, LGE extent) can guide long-term risk stratification and prognosis.⁶ Repeated CMRI evaluations can be helpful, particularly for determining whether scar tissue persists or ongoing fibrosis persists, even in the presence of symptomatic improvement.^{1,7} Biological variability in CMRI findings may make it difficult to confirm the diagnosis in a single evaluation.^{1,3}

The 2025 European Society of Cardiology (ESC) guidelines recommend performing cardiac magnetic resonance imaging (CMRI) within the first two weeks following the onset of symptoms. The primary rationale for this timing is that myocardial edema, a hallmark of myocarditis, typically begins to resolve four weeks after symptom onset. Furthermore, the ESC guidelines recommend a follow-up CMRI within the first 6 months.⁸ Not all centers worldwide have access to cardiac MRI; additionally, the lack of mapping techniques, LGE analyses, and reliance on experienced radiologist interpretation remain significant limiting factors.⁹

In conclusion, cardiac MRI is one of the most valuable tools in the diagnosis and management of myocarditis, offering versatile tissue characterization, functional assessment, noninvasive imaging, and repeatability. However, issues such as access, standardization, and the lack of protocols persist. In particular, the development of multi-center, guideline-based protocols, the widespread use of mapping techniques, the clarification of follow-up strategies, and the integration of CMRI findings into clinical decision-making processes will enhance the quality and consistency of myocarditis management.

Declarations

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