DOES CARDIAC MRI OFFER DIAGNOSTIC AND THERAPEUTIC BENEFIT OVER ECHO IN PATIENTS WITH HEART FAILURE?

UNIVERSITY OF BIRMINGHAM

Suren Yogamoorthy BSc (hons) BMS, PG Dip PA, MSc PA

George Eliot Hospital NHS Trust, University of Birmingham

NHS George Eliot Hospital NHS Trust

Abstract

Background: Heart failure (HF) remains a major public health concern despite advancement in management. Echocardiography (Echo) is used as primary imaging modality; however, cardiac magnetic resonance (CMR) imaging has emerged when Echo is limited.

Aim: Compare the diagnostic yield of Echo and CMR to assess the additive impact CMR has over the Echo in the diagnosis and management of HF.

Method: Data collected from 50 patients who underwent both Echo and CMR as part of their HF assessment. Data collection focused on clinical parameters, diagnosis and management plans post Echo and CMR.

Results: CMR showed superior image quality, lead to change in diagnosis in 62% of the patients and impacted clinical management decisions in 86% of the patients.

Conclusion: CMR makes a substantial additive clinical impact on both the diagnosis and management of HF over and above routine Echocardiography.

Introduction

HF is a multi-pathological diagnosis as many different conditions can lead to HF with possible overlap, many of which are treatable and potentially reversible.[1] Accounts for about 2-5% of all NHS hospitalisations and carries high morbidity and 5-year mortality rate of about 50%.[1] Echo is currently used as the primary imaging modality,[2] with great advantages such as cost-effectiveness and wide availability.[3]

CMR is an emerging tool for comprehensive assessment of HF aetiologies when Echo is limited. It is considered the gold standard for assessing ventricular ejection fraction (LVEF) and is highly reproducible.[3] Although cardiac imaging provides great insight, the ability to distinguish between the overlapping phenotypes of HF remains a challenge. Currently, there is a paucity of comparative trials on optimal imaging techniques for the diagnosis of HF.

Objectives

To evaluate the overall impact of Echo and CMR to find the optimal imaging technique for the diagnosis and management of HF.

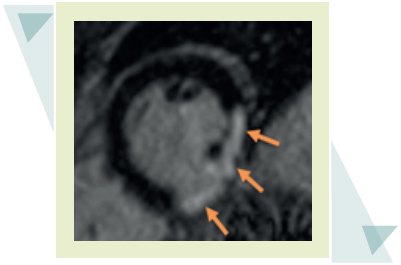

Figure 1. *CMR image of a patient in this study post LGE. White area = dead myocardium while black area = healthy myocardium.*

Method

A single-centred, retrospective observational study of 50 patients who underwent both Echo and CMR as part of their HF assessment at a district general hospital in England. Dictated imaging platforms and electronic medical records were reviewed to collect data as follows:

- **Patient characteristics** – age, gender and co-morbidities
- **Clinical parameters** – cardiac rhythm, image quality and indication for Echo and CMR.
- **Change in diagnosis** was defined as CMR's ability to identify underlying cardiac abnormalities that were not suspected on Echo or suspected on clinical grounds but were unable to be confirmed on Echo.
- **Change in management** was recorded when CMR influenced clinical decision making as illustrated in table 1.

Results

Patient characteristics showed male dominance (n=32) with mean age of 66. CMR demonstrated better image quality (88%) compared to Echo (40%). Assessment of HF aetiology was the most common indication for CMR (70%), followed by cardiac viability (16%).

CMR lead to change in diagnosis in 62% with a significant impact on the classification of cardiomyopathies, assessment of LVEF, ability to identify thrombus and infiltrative heart diseases. CMR also impacted management plans in 86% of the patients (table 1).

Late gadolinium enhancement (LGE) by CMR aided tissue characterisation and myocardial viability status to aid decisions for revascularisation and device insertion (figure 1).

Table 1

CMR impact on diagnosis and management

CMRI impact	N = 50
Change in diagnosis	31 (62%)
Enhanced diagnosis	4 (8%)
Change in management plan	43 (86%)
Overall Impact on device therapy (e.g. ICD, CRT-D, CRT-P)	21 (42%)
- Proceeded	18 (36%)
- Avoided	3(6%)
Overall Impact on medication therapy	23 (46%)
- Initiated (e.g. Entresto, empagliflozin, ACE inhibitor)	11 (22%)
- Optimised	9 (18%)
- Stopped (e.g. anticoagulation, amiodarone, clopidogrel)	3 (6%)
Impact on angiography	
- Performed	7 (14%)
- Avoided	1 (2%)
Impact on revascularisation (e.g. PCI)	
- Performed	0
- Avoided	1(2%)
Non-invasive investigations (e.g. HRCT, Holter monitor, CTCA)	3 (6%)
Referral to Tertiary cardiac centre / other specialities	4 (8%)
Discharged from HF clinic	6 (12%)
Change in diagnosis and management	31 (62%)

Conclusion

Overall, CMR had a substantial impact on the diagnosis and management of the HF patients despite the use of prior Echo. CMR's superior image quality, accurate assessment of LVEF, and ability to identify myocardial scar as well as viability status were some of the additive impacts seen in this study.

Given its ready availability, low cost and portability, the author believe that the Echo remains a crucial first-line investigation of choice. However, there is a need for larger, multi-centre studies to evaluate CMR's clinical impact. CMR without a doubt will continue to play a key role in diagnosis and management of patients with HF in the years ahead.

Acknowledgement

Ms Kate Straughton
(Educational supervisor at the University of Birmingham)

Dr Ashok Venkatraman
(Consultant cardiologists at the George Eliot Hospital NHS trust)

References

1. National Institute for Health and Care Excellence [NICE]. (2018). Chronic heart failure in adults: diagnosis and management.

2. Theresa AM, Marco M, Marianna A, et al. 2021 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure. European Heart Journal. 2021; 42(36): 3599–3726

3. Peterzanm MA, Rider OJ, Anderson LJ. The role of cardiovascular magnetic resonance imaging in heart failure. Cardiac Failure Review. 2016; 2(2):115-122