Int J Cardiovasc Imaging (2010) 26:537–540
DOI 10.1007/s10554-010-9629-9

EDITORIAL COMMENT

Echocardiography in takotsubo cardiomyopathy; a useful approach?

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Received: 30 March 2010 / Accepted: 2 April 2010 / Published online: 14 April 2010

Over the past years, echocardiography has been shown to play a pivotal role in the accurate evaluation of left ventricular function particularly in patients with ischemic heart disease and various manifestations of cardiomyopathy [1]. The ability to rapidly perform bedside echocardiography with Echo-Doppler imaging places this modality in the heart of clinical research to understand cardiac function and to quantify various associated abnormalities. Echocardiography has found a major niche in visualizing left ventricular function in diverse manifestions of cardiomyopathies. For instance, widespread use of echocardiography has contributed to more frequent recognition of takotsubo stress cardiomyopathy [1–3]. Takotsubo cardiomyopathy has recently been recognized in patients with typical signs of acute myocardial infarction mostly due to emotional stress [4]. The disease may mimic an acute coronary syndrome and the acute course can be complicated by heart failure, arrhythmias, dynamic left ventricular outflow tract obstruction, hypotension and death [5]. In these patients the coronary arteries appear normal but they show reversible wall motion abnormalities [6, 7].

In the current issue of the *International Journal of Cardiovascular Imaging,* Chockaligam et al. [8] nicely reviewed the clinical presentation of takotsubo stress cardiomyopathy and proposed a unified diagnostic algorithm for cardiologists acutely managing this cardiac emergency. Also the pivotal role of echocardiography was emphasized and the nuances of this peculiar acute cardiomyopathy from an echocardiographers' perspective were put forward. Accurate evaluation by echocardiography may assist in refining the diagnosis of takotsubo cardiomyopathy and to unravel its pathophysiological mechanism. The diagnosis of stress cardiomyopathy appears appropriate when angiography reveals no culprit lesions and left ventricular apical ballooning is typically seen. For example, at first sight, stress cardiomyopathy appears like an evolving left anterior descending infarction with akinesia of the apex, apical anterior wall and septum. At a closer view of the two-dimensional images from the apical four- and two chamber views, typical stress cardiomyopathy manifests as symmetrical regional wall motion abnormalities extending equally into the apical inferior and lateral walls. However, the definitive diagnosis of stress cardiomyopathy is confirmed when echocardiography repeated after few days to weeks shows complete normalization of regional wall motion abnormalities and left ventricular ejection fraction. Interestingly, the authors also revealed that about 25% of patients

Editorial comment on to the article of Chockaligam et al. (doi: 10.1007/s10554-010-9590-7).

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with stress cardiomyopathy very likely manifest left ventricular outflow tract obstruction. Loading conditions may significantly alter the severity of left ventricular outflow tract obstruction which may be a transient phenomenon. Left ventricular outflow tract obstruction can be precipitated when a small left ventricle develops hypercontractility, especially in the basal segments. This may lead to acute systolic subendocardial wall stress. This left ventricular strain consisting of both the systolic blood pressure and increased wall stress may result in myocardial stunning and cause the acute ballooning syndrome. Also advanced echocardiographic techniques such as tissue Doppler imaging, regional strain imaging and time-volume curves from three-dimensional echo image modeling may offer visually better demonstration of the regional wall motion abnormalities of stress cardiomyopathy with higher diagnostic sensitivity. Lastly, transesophageal echocardiography may provide anatomic details that may direct repair or replacement of the mitral apparatus when significant MR persists after stress cardiomyopathy and left ventricular outflow tract obstruction have resolved.

As also mentioned by the authors, magnetic resonance imaging (MRI) has become an important imaging modality in patients with a broad spectrum of cardiomyopathies [2, 9–56], in particular in patients with takotsubo cardiomyopathy [57–61]. In a recent study, the value of MRI has been shown by using its capability of myocardial tissue characterization [57]. At coronary angiography all patients showed normal coronary arteries; four patients had apical ballooning and four patients had midwall- or basal ballooning. MRI was performed at hospital admission and the images were analyzed with commercially available software (QMASS MR Version 6.2.1, Medis, Leiden, the Netherlands). A T2-weighted imaging technique was used and it was found that T2-signal intensity was significantly higher in the dysfunctional segments, potentially indicating the presence of myocardial edema in the affected areas that showed ballooning. In the five patients who had a 2–3 week follow-up MRI scan, there was normalization of the wall motion abnormalities associated with a significant reduction in T2 signal intensity. As a result, it might be of great interest to know the pathophysiological condition of the affected myocardial tissue in the setting of the acute myocardial infarction in patients with stress cardiomyopathy. Both echocardiography- and MRI-derived parameters may therefore be of great significance in the follow-up of these patients as they may show spontaneous recovery of the cardiac abnormalities.

To summarize, both echocardiography and MRI have their own specific value in the evaluation of patients with takotsubo cardiomyopathy. Of course, echocardiography, by virtue of its versatility and accessibility, wlll remain the first imaging modality of choice in routine clinical practice.

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