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Important Echocardiographic Features of Takotsubo or Stress-Induced Cardiomyopathy That Can Aid Early Diagnosis

In regards to the recently published paper by Hurst et al. (1), I would like to emphasize some of the classic echocardiographic features that are useful for early diagnosis of stress cardiomyopathy (2). In the classic case, the most important feature is apical ballooning involving all left ventricular (LV) walls with a hyperdynamic base, not limited to any single coronary territory (Fig. 1). The diagnosis of apical ballooning syndrome should be strongly considered based on this echocardiographic feature in conjunction with clinical data. In selected cases, it is reasonable to defer coronary angiography and wait for full recovery of LV function in a few days or weeks by repeating echocardiography. The second most important feature is involvement of the right ventricular apex in the same manner as the LV apical involvement. This feature occurs in approximately one-fourth of the patients (2–5), and if present, makes the diagnosis of apical ballooning syndrome almost certain (Fig. 2). In reverse or inverted cases, echocardiography is also very helpful for early diagnosis of this disease by showing reverse involvement of wall motion abnormalities. Akinesia of basal segments of all LV walls with hyperdynamic apical walls, also not limited to any single coronary territory, can be easily recognized during echocardiographic examination (5–7). We believe that echocardiography is an indispensable tool for the early diagnosis of this disease, and in selected cases, could prevent unnecessary coronary angiograms.

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Figure 1. Classic Echocardiographic Feature of Apical Ballooning

As can be seen in systole and diastole by echocardiography **(upper panel)**, apical ballooning involving all left ventricular walls not limited to any single coronary territory, confirmed by ventriculography with normal angiogram **(lower panel)**.

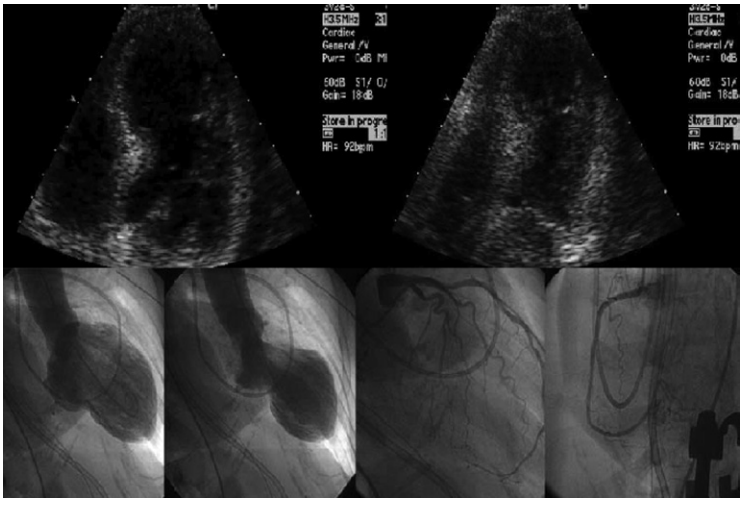
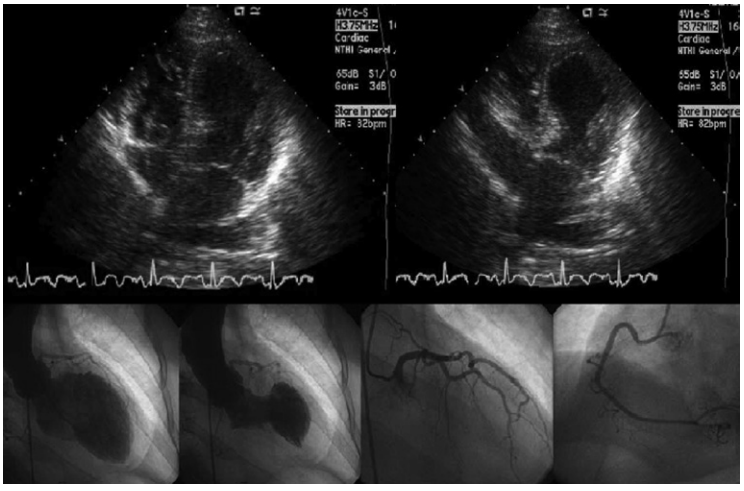


Figure 2. Diagnosis of Stress Cardiomyopathy

Involvement of the right ventricular apex in conjunction with left ventricular ballooning makes the diagnosis of stress cardiomyopathy almost certain.



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REPLY

We would like to thank Dr. Movahed for his interest in our paper (1), and welcome the opportunity to respond to his comments.

We agree that echocardiography is a valuable tool in the evaluation of patients who present with signs and symptoms suggestive of an acute coronary syndrome, a situation in which takotsubo cardiomyopathy is an important differential diagnosis. We also agree that there are several clinical and echocardiographic characteristics that are highly suggestive of the diagnosis of takotsubo cardiomyopathy. There are specific situations where the presentation is compelling enough that coronary angiography may be reasonably deferred in the presence of significant comorbidities that would increase the risk of cardiac catheterization. However, the pattern of regional wall motion abnormality of the left ventricle in many patients with an acute coronary syndrome, especially when due to ischemia in the left anterior descending coronary artery territory, can mimic takotsubo cardiomyopathy. Moreover, in occasional patients with takotsubo cardiomyopathy, the pattern of regional wall motion abnormality may not involve multiple coronary distributions. Thus, given the typically low risk of performing coronary angiography in most patients and the potential adverse consequences of an incorrect diagnosis with respect to an acute coronary syndrome, we advocate that urgent or emergent coronary angiography be performed in the absence of absolute contraindications, to exclude occlusive coronary artery disease. Indeed, takotsubo cardiomyopathy can, in rare circumstances, coexist with occlusive coronary artery disease, as highlighted in the modified Mayo Clinic diagnostic criteria (2). Ultimately, clinical judgment is required to differentiate takotsubo cardiomyopathy from other etiologies of acute coronary syndrome.

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Radiation Exposure From Cardiac Computed Tomography

We read with interest the article by Ho et al. (1) in the recent edition of *iJACC*. Computed tomography (CT) myocardial perfusion imaging (MPI) offers a new, noninvasive functional assessment of myocardial ischemia. When combined with CT coronary angiography, it may offer the strong negative predictive value of an anatomical test and the specificity of functional testing in a "1-stop shop."

CT MPI accuracy and radiation dose has been compared with nuclear MPI as a reference.

The effective radiation dose from a medical exposure is measured in mSv. This value takes into account the different radiation sources and the potential biological harm from exposure to a particular organ. Tissues with a high susceptibility to harm from ionizing radiation are allocated a higher weighting in the calculation of effective dose—a higher tissue weighting factor. In 2007, the International Commission on Radiological Protection (ICRP) updated the tissue weighting factors in light of further epidemiological studies; of importance is the increase in the breast-tissue weighting factor from 0.05 to 0.12 (2).

There is now increasing evidence that previously published chest conversion factors (when applied to cardiac CT) significantly underestimate the effective dose to the patient. This is due to 2 factors: 1) the change in the ICRP tissue weighting factors mentioned earlier; and 2) the marked difference in scan volume between cardiac and whole-chest CT scans. Cardiac CT scans only irradiate the lower chest and upper abdomen, a scan field that involves irradiating the breast tissue for the majority of the scan volume, rather than including the relatively radio-insensitive tissues of the upper chest.

Work in our institution (3) using computer-based anthropomorphic phantoms has demonstrated that the conversion factor for cardiac CT is at least double that previously reported; this has been confirmed by other groups (4–6).

We suggest a conversion factor of 0.028 (3) for prospectively gated cardiac CT—which would result in a doubling of the reported dose to 36.5 mSv for the stress and rest examination in the paper by Ho et al. (1). With increasing evidence of the risk of ionizing radiation from medical exposure (7), further dose reduction strategies will be needed before CT MPI becomes the primary choice for functional imaging over established techniques such as stress echocardiography and cardiac magnetic resonance.

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