

**ECHO ROUNDS Section Editor: Edmund Kenneth Kerut, M.D.** \_\_\_\_\_

## Apical Ballooning “Tako-Tsubo” Syndrome Associated with Transient Left Ventricular Outflow Tract Obstruction

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A 72-year-old female without prior cardiovascular history presented with intermittent crushing chest pain associated with diaphoresis and weakness for 2 days prior to admission. An electrocardiogram (EKG) revealed ST segment elevation across the anterior precordial leads (Fig. 1). On initial examination, the patient was hypotensive (88/40 mmHg) and tachycardic (110 bpm) with a grade III/VI harsh systolic murmur along the left sternal border. An initial troponin level of 0.36 ng/dL (reference range of 0.0–0.1 ng/dL) was noted.

Transthoracic echocardiography (TTE) revealed a dilated and akinetic left ventricular (LV) apex. Compensatory hyperkinesis of basal LV segments with associated systolic anterior motion (SAM) of the mitral valve was noted (Fig. 2 and Video Clip). A dynamic LV outflow tract (LVOT) gradient by continuous wave Doppler (CW) was 90 mmHg.

The patient was taken emergently to the cardiac catheterization laboratory where coronary arteriography revealed minimal luminal irregularities. Left ventriculography was not performed. Based on TTE findings along with the absence of significant epicardial coronary disease, a diagnosis of apical ballooning “tako-tsubo” syndrome (ABS) was made.

The patient was treated with fluids and beta blockers; and within 24 hours the murmur re-

solved, and EKG abnormalities began to normalize. Repeat TTE revealed resolution of SAM and its associated dynamic LVOT obstruction. LV segmental wall motion abnormalities also resolved. On day 3, the patient was discharged home on beta blocker therapy.

ABS was initially described in the Japanese literature in 1990 by Sato et al., and named “tako-tsubo” cardiomyopathy, after noting a resemblance of the heart to a uniquely shaped pot used by Japanese fishermen to capture octopi.<sup>1</sup> It subsequently was not described in the English literature until 2001.<sup>2</sup> The syndrome is typically characterized by transient wall-motion abnormalities involving the left ventricular apex and mid-ventricle in the absence of flow-limiting epicardial coronary disease.<sup>3</sup>

Clinically, patients often have chest pain with associated ischemic EKG findings (ST segment depression or elevation) and minimal cardiac biomarker elevation. ABS has been noted to more commonly occur in postmenopausal women and typically after an emotional or physically stressful event.<sup>3</sup> This patient was postmenopausal, but she denied any specific recent emotional stress.

This case was further complicated by dynamic LVOT obstruction, a recognized complication of ABS.<sup>4–7</sup> Once LVOT obstruction is noted, therapy should focus on relief of the obstruction with volume resuscitation and negative inotrope therapy. Long-term treatment includes therapy with high-dose negative inotropes such as  $\beta$ -blockers and calcium channel blockers.<sup>8,9</sup>

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**Figure 1.** An admission 12-lead EKG revealed ST segment elevation in the anterior leads (V2-V5) consistent with acute myocardial injury.

Bybee, et.al proposed diagnostic criteria that may be used to assist with the diagnosis of this relatively rare syndrome (Table I). Treatment for patients is supportive, as in this patient.

Typical is an extreme rapid resolution after a sudden onset despite markedly reduced LV systolic function.<sup>10</sup>

In conclusion, ABS is a rather uncommon finding, and associated dynamic LVOT obstruction is even less often found. It is important for



**Figure 2.** End-systolic apical 4-chamber view revealed systolic anterior motion (SAM) of the anterior mitral valve leaflet. The left ventricular (LV) apex was dilated and akinetic. LA, left atrium.

**Table I**

Proposed Mayo Criteria for the Clinical Diagnosis of Apical Ballooning Syndrome—All Four Criteria Must Be Met (from reference 8)

1. Transient akinesis or dyskinesis of the left ventricular apical and mid-ventricular segments with regional wall-motion abnormalities extending beyond a single epicardial vascular distribution
2. Absence of obstructive coronary disease or angiographic evidence of acute plaque rupture
3. New electrocardiographic abnormalities (either ST-segment elevation or T-wave inversion)
4. Absence of:
  - a. Recent significant head trauma
  - b. Intracranial bleeding
  - c. Pheochromocytoma
  - d. Obstructive epicardial coronary artery disease
  - e. Myocarditis
  - f. Hypertrophic cardiomyopathy

the echocardiographer to be aware of this recently described syndrome. Cardiac catheterization and TTE are invaluable for diagnosis.

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### Supplementary material

**Video Clip** End-systolic apical 4-chamber view revealed systolic anterior motion (SAM) of the anterior mitral valve leaflet. The left ventricular (LV) apex was dilated and akinetic. Within the right atrium a prominent eustachian valve is noted.