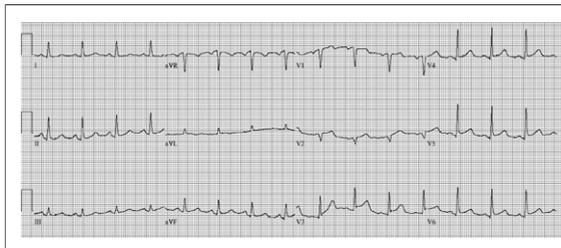


## Echocardiographic Guidance in Treatment of Cardiogenic Shock Complicating Transient Left Ventricular Apical Ballooning Syndrome

Christopher W. Good, DO, C. Randall Hubbard, MD, Thomas A. Harrison, MD, Anwer Qureshi, MD

**TRANSIENT LEFT VENTRICULAR APICAL BALLOONING (TLVAB) SYNDROME** can rarely present with cardiogenic shock (1). While a cardiogenic shock like picture is likely due to left ventricular systolic dysfunction, dynamic midventricular or left ventricular outflow tract (LVOT) obstruction can occur and might influence treatment options. Echocardiography can delineate pathophysiology and more importantly guide treatment strategies. The following images (Figs. 1 to 4) show such an experience in a patient with TLVAB and demonstrate a possible detrimental effect of intra-aortic balloon pump in this condition.

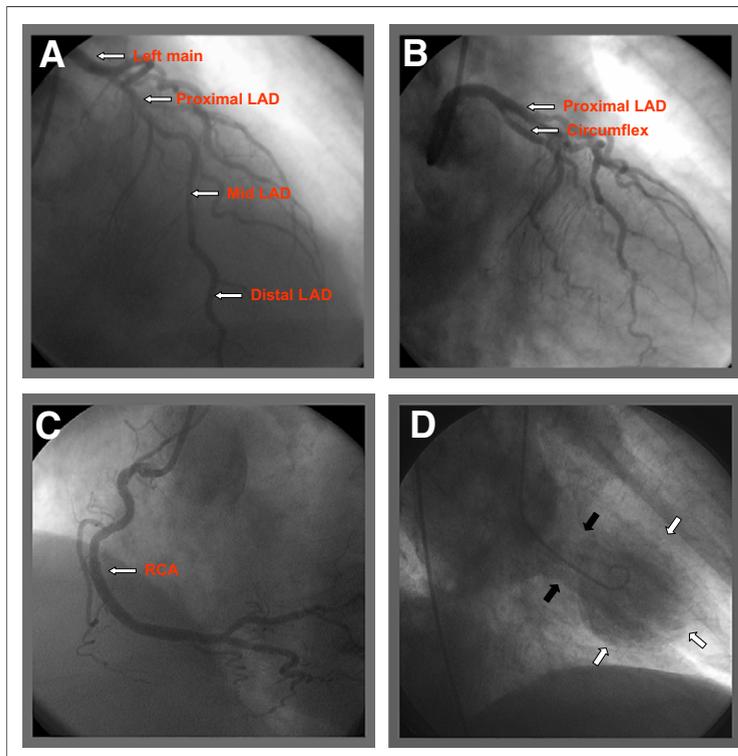


**Figure 1. 12 lead electrocardiogram**

Images from a 71-year-old woman with chest pain, ST-segment elevation and cardiogenic shock due to transient left ventricular apical ballooning.

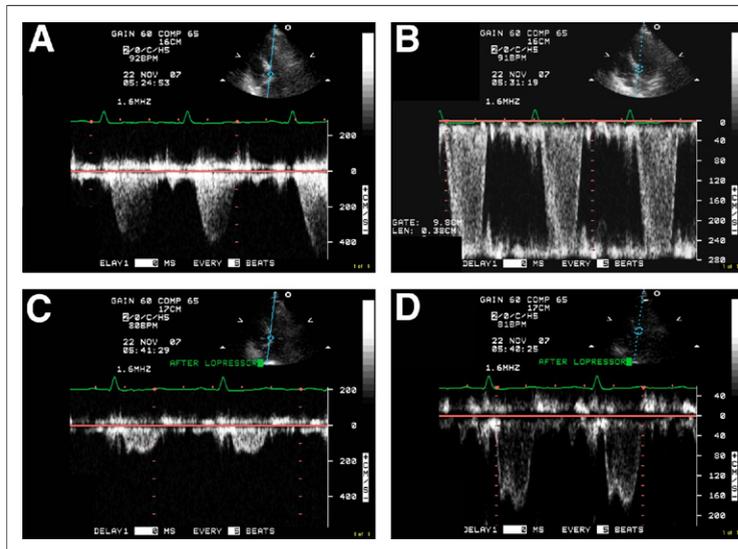
From the Department of Cardiology, Geisinger Medical Center, Danville, Pennsylvania.

**Address for correspondence:** Dr. Anwer Qureshi, Department of Cardiology, Geisinger Medical Center, 100 North Academy Avenue, Danville, Pennsylvania 17822. *E-mail:* [aqureshi@geisinger.edu](mailto:aqureshi@geisinger.edu).



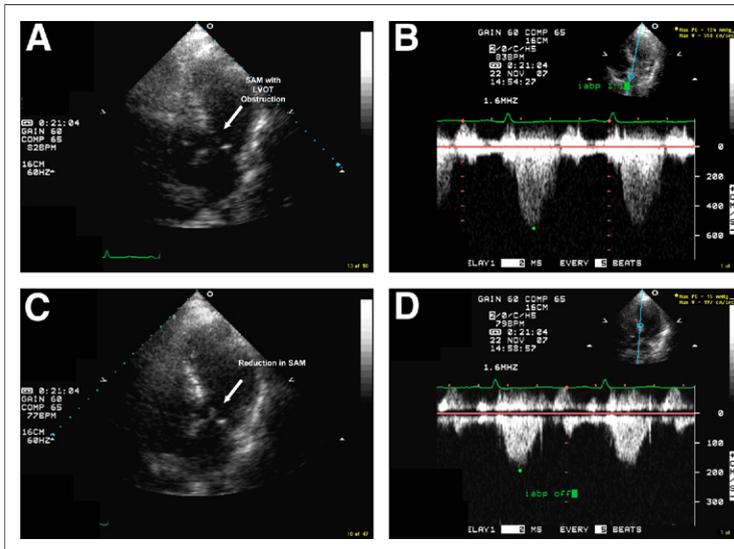
**Figure 2. Left and Right Coronary Angiography and Left Ventricular Cineangiography**

Emergent coronary angiography demonstrated nonobstructive coronary artery disease (A to C). On left ventricular cineangiogram (systolic frame) there was preservation of contractility of the basal left ventricular segments (black arrow) with akinesia and expansion of the mid and apical segments (white arrow). This contractile pattern is consistent with the diagnosis of transient left ventricular apical ballooning syndrome (D). LAD = left anterior descending artery; RCA = right coronary artery.



**Figure 3. Demonstration of Left Ventricular Outflow Tract Obstruction by Doppler and Improvement Following Intravenous Metoprolol**

Dopamine and intra-aortic balloon pump (IABP) did not stabilize the patient. An emergent bedside transthoracic echocardiogram showed severe left ventricular systolic dysfunction (ejection fraction of 25%) and hypercontractility of the basal left ventricular segments resulting in systolic anterior motion of the mitral apparatus and left ventricular outflow tract (LVOT) obstruction. Peak flow velocity in excess of 4 m/s was observed along the LVOT (A and B). Phenylephrine did not improve pressure or LVOT obstruction. However, intravenous metoprolol decreased the LVOT obstruction (C and D) with improved systolic blood pressure (from 80 to 130 mm Hg) and increased ejection fraction (to 35%).



**Figure 4. Negative Hemodynamic Effect of IABP Support**

A few hours later, the patient again became hypotensive and did not respond to fluids and more beta blockade. Echo was repeated due to concern about the effect of continued afterload reduction with IABP. Negative hemodynamic effect of IABP was confirmed—there was a peak velocity of  $>5$  m/s along the LVOT (A and B). Discontinuing IABP markedly reduced LVOT obstruction and improved hemodynamics (C and D) without a significant change in ejection fraction. The IABP was therefore removed. The patient continued to improve clinically and had normalized left ventricular systolic function by day 7. This case illustrates the complexity of treating cardiogenic shock in patients with transient left ventricular apical ballooning syndrome. Appropriate supportive treatment, based on using imaging to identify the predominant pathophysiology, is often useful. Abbreviations as in Figure 3.

## REFERENCE

1. Bybee KA, Kara T, Prasad A, *et al.* Systematic review: transient left ventricular apical ballooning: a syndrome that mimics ST-segment elevation myocardial infarction. *Ann Intern Med* 2004;141:858–65.