Augmentation of Coronary Blood Flow With Intra-Aortic Balloon Pump Counter-Pulsation

Elizabeth W. Ryan, MBBS; Elyse Foster, MD

A 78-year-old woman with reduced left ventricular contractile function underwent coronary artery bypass graft surgery (3 saphenous vein grafts and an internal mammary artery graft) and mitral valve repair. Inotropic support and intra-aortic balloon pump (IABP) counterpulsation were required for weaning from cardiopulmonary bypass. The intra-aortic pressure and ECG tracings (Figure 1) on day 2 after surgery are shown. During continuous atrioventricular sequential pacing and 2:1 IABP counterpulsation, enhanced early diastolic aortic pressure (arrows) and reduced aortic end-diastolic pressure during every second cardiac cycle are demonstrated.

Figure 2 is a transesophageal echocardiographic image and schematic diagram demonstrating a postoperative pericardial collection and diastolic flow in an epicardial vessel (arrow), representing the saphenous vein graft anastomosed to an obtuse marginal artery. A Doppler signal of this vessel demonstrates increased flow velocity with alternative cardiac cycles (Figure 3). This phenomenon is absent without IABP inflations. Similar Doppler findings of augmented flow velocity with IABP counterpulsation were also noted proximally in the native left anterior descending coronary artery (not shown).

Figure 1. ECG (top) showing atrioventricular sequential paced rhythm. Aortic pressure trace (bottom) in mm Hg showing augmentation of aortic pressure by an IABP in the descending aorta and synchronized to inflate during alternate cardiac cycles, denoted by arrows.

Figure 2. Transesophageal echocardiographic 2D image with color Doppler and (inset) schematic diagram. Pericardial effusion (PE) surrounds left ventricle (LV). Color Doppler shows epicardial diastolic flow (arrow).
Figure 3. Spectral Doppler recordings of epicardial vessel shown in Figure 2. Augmented diastolic velocity is noted with alternate cardiac cycles (top) during 2:1 IABP counterpulsation. This phenomenon is absent without IABP inflations (bottom).
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