Cardiac hemodynamics in PCI: effects of ischemia, reperfusion and mechanical support

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Citation for published version (APA):

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Demonstrating LV unloading on echocardiography during high-risk PCI with a left ventricular assist device

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Acute Card Care 2007;9:125-126
Case report

A 79-year old woman with diabetes was admitted to our institution with clinically overt heart failure and chest pain. She had a negative history of cardiovascular disease. Transthoracic echocardiography (TTE) revealed a poor left ventricular function with an ejection fraction of 20% and moderate mitral valve regurgitation. Furthermore, she had progressive and severe renal failure. Coronary angiography showed significant left main coronary artery (LM) disease, a subtotal stenosis of the left descending artery (LAD) and moderate lesions of the circumflex and right coronary artery. The patient was considered a poor candidate for coronary artery bypass grafting because of old age, poor left ventricular function and comorbidities (Euroscore 16). We therefore decided to perform a high risk ‘unprotected’ left main PCI with procedural support of the Impella® Recover®LP 2.5 device. This micro-axial rotary blood pump is able to deliver an output of 2.5 L/min. It is inserted through a femoral approach and positioned across the aortic valve into the left ventricle using fluoroscopy (Figure 1A, B). Successful revascularisation of the LM and LAD followed (Figure 1C). The procedure was performed without haemodynamic compromise. The mean arterial pressure remained stable (± 100 mm Hg) throughout the procedure, the wedge pressure decreased (21 to 13 mm Hg) and the cardiac output increased (5.05 to 5.45 L/min) as compared to baseline measurements without support. During balloon inflation in the LM mean arterial pressure shortly dropped to a plateau of 84 mm Hg, exerting only minimal chest discomfort. Per-procedural TTE to assess aortic regurgitation during Impella operation was performed. No signs of aortic regurgitation were present. However, an impressive triangular shaped turbulence at the in- and outlet of the Impella was seen, reflecting its unloading capability (Figure 1C, D, video clips 1 and 2, available as online supplementary data). After weaning from Impella the further clinical course was uncomplicated.
Figure 1  A. Ascending aorta angiogram, right anterior oblique view; Impella in situ (asterisk), inlet in left ventricle (LV) and outlet in ascending aorta (AO). B. Coronary angiogram, ‘spider’ view. C. Coronary angiogram, cranial view; final angiographic result. D. (video clip 1). Transthoracic echocardiography, apical five-chamber view; Impella in situ; Turbulence visible at in- and outlet (asterisks); AO aorta, LV left ventricle. E. (video clip 2). Impella operating in vitro delivering an output of approximately 2.5 L/min; Turbulence visualized by blue ink; scale in litres; arrows at in- and outlet of Impella. F. Impella® Recover® LP 2.5 device (13Fr) next to a 6 Fr catheter. Movie-clip files to be found online.