Cardiovascular Medicine

Images in cardiovascular medicine | Published 21 February 2020 | doi:10.4414/cvm.2020.02090
Cite this as: Cardiovasc Med. 2020;23:w02090

Benefit of upstream Impella insertion in cardiogenic shock

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Significant progress in the treatment of cardiovascular disease has been achieved in the past decades. However, the prognosis of patients in cardiogenic shock has evolved little. The advent of percutaneous ventricular assist devices such as the Impella CP® (Abiomed, Massachusetts, USA) may favourably alter outcomes in patients with cardiogenic shock. We present a case of early identification of evolving cardiogenic shock and early installation of ventricular assistance with an Impella CP®.

A 75-year-old male with a history of diabetes, left ventricle ejection fraction of 25%, prior implantable converter defibrillator with resynchronisation therapy had undergone complex angioplasty of the left main (LM), left anterior descending (LAD) and circumflex (CX) arteries 4 months previously. He presented to a community hospital with a non-ST elevation myocardial infarction (NSTEMI). His vital status rapidly deteriorated with onset of hypotension and signs of hypoperfusion requiring vasopressor support. The patient was transferred to our institution for urgent cardiac catheterisation. The clinical picture suggested that the recently angioplastied left main artery was compromised and immediate upstream installation of an Impella CP® was planned.

Upon arrival, the patient was confused and agitated, had clammy extremities and systolic blood pressure of 70 mm Hg on vasopressor support. Systemic lactates were 6 mmol/l. We immediately proceeded to the insertion of an Impella CP® via right femoral access (fig. 1A). Angiography confirmed restenosis and filling defects compatible with thrombus in the LM extending into the LAD, CX and obtus marginalis1 (OM1) (fig. 1B).

We then proceeded to successfully angioplasty the LM, LAD, CX and OM1 using a double kiss crush technique in both the CX-OM1 and LM-CX; three new drug-eluting stents were installed (fig. 1C and D).

Following angioplasty the patient was transferred to our intensive care unit. Ventricular support was maintained for 24 hours. Vital signs, mental status and systemic lactates (1.1 mmol/l) normalised within hours. The Impella CP® was extracted the following day. No vascular complications were observed after a 30-minute manual compression. After an uneventful 5-day hospital stay the patient was discharged home.

Physiologically, Impella-mediated left ventricular unloading reduces end-diastolic wall stress, improves diastolic compliance, increases aortic and intracoronary pressure and coronary flow velocity reserve, and stimulates a decrease in coronary microvascular resistance.

Although the Impella has been approved for years, no randomised study data exist. In 2008, the ISAR-SHOCK trial randomised patients in cardiogenic shock to Impella 2.5 (n = 12) support or to intra-aortic balloon pump (IABP) (n = 13) support over 28 months in only two hospitals. There was no difference in mortality at 30 days – 46% in each group [1]. A recent meta-analysis by Wernly et al. suggested that the Impella was not associated with improved survival but with a higher rate of vascular complications compared with IABP or medical therapy [2]. Recently, O'Neill et al published the outcomes of 15,259 patients with acute myocardial infarction and secondary cardiogenic shock supported with Impella (US registry of cardiogenic shock with Impella). The survival improved from 52 to 59%with the use of Impella CP® before percutaneous coronary intervention as compared with IABP and vasopressors ($p < 0.001$) [3]. It is clear that the scientific literature lacks robust data regarding this pathology.

Early identification of cardiogenic shock and rapid use of ventricular assistance as demonstrated in our case presentation may improve the deleterious evolution of cardiogenic shock. In cases of evolving cardiogenic shock, delay in the installation of ventricular assistance after coronary angiography or after observing vasopressor response may be unnecessary and may contributes to the negative outcomes of cardiogenic shock.

Urgent randomised controlled trials are needed in order to better manage this entity and its fatal course. Until then support devices will be used according to physicians' discretion and guidelines recommendations.

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Disclosure statement
No financial support and no other potential conflict of interest relevant to this article was reported.

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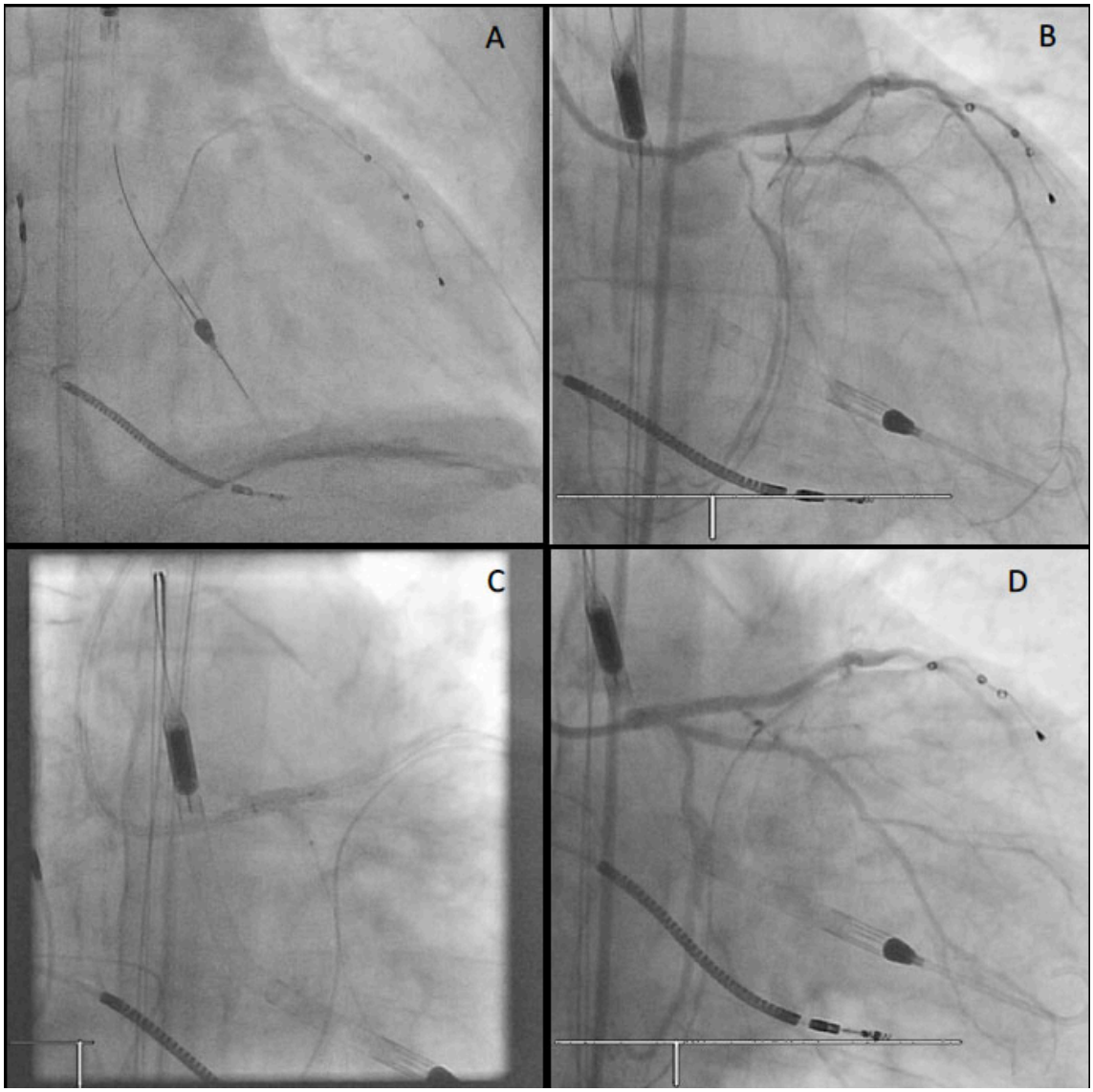
Figure 1: (A) Upstream Impella CP® insertion. (B) Coronary angiography showed restenosis and filling defects compatible with thrombus in the LM extending into the LAD, CX and OM1. (C and D) Successfully angioplasty of the LM, LAD, CX and OM1 using a double kiss crush technique in both the CX-OM1 and LM-CX. Three new drug eluting stents were installed.



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