Use of the Impella™ ventricular assist device in a young adult with cardiogenic shock secondary to spontaneous coronary dissection

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DOI of original article: http://dx.doi.org/10.1016/j.rbci.2017.09.001

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Peer review under the responsibility of Sociedade Brasileira de Hemodinâmica e Cardiologia Intervencionista.

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Case report

A 33-year-old female patient was admitted on December 9, 2013 at the emergency unit of a cardiac hospital in Aparecida de Goiânia (GO, Brazil), with a complaint of oppressive chest pain, without irradiation, which started after mild exertion, approximately 20 minutes before arrival. The electrocardiogram showed abnormal ventricular repolarization in anteroseptal leads. Biochemical markers of myocardial necrosis were negative. A chest X-ray showed no significant alterations. After admission, she had two cardiorespiratory arrests in ventricular fibrillation, which were promptly reversed with defibrillation and resuscitation maneuvers. She was admitted to the intensive care unit under mechanical ventilation with severe hypotension; central venous access, invasive blood pressure catheter, and intravenous noradrenaline administration were performed. Echocardiogram at the bedside showed ejection fraction of 29% and akinesia of the apical region, in addition to akinesia of the middle region of the anteroseptal, inferoseptal, and anterior left ventricle walls.

She was referred to an emergency coronary angiography, which revealed a subocclusive lesion, suggesting a spontaneous dissection in the left main coronary artery, with minimal flow in the left anterior descending and left circumflex arteries (Fig. 1A). She immediately underwent primary percutaneous coronary intervention with implantation of a bare-metal stent in the left main coronary artery (Fig. 1B and 1C). During the procedure, she had five episodes of pulseless electrical activity cardiac arrest, promptly reversed.

On the following morning, in the presence of refractory cardiogenic shock, with maximum doses of noradrenaline and dobutamine, the use of a circulatory assist device was considered, and the Impella® device, 2.5 liters/minute, was installed approximately 18 hours after admission, through the left femoral artery (Fig. 2). The hemodynamic instability was reversed, and the patient was successfully extubated on the fourth day of hospitalization without any neurological deficit. She subsequently developed hemolysis, hemoglobinuria, and worsening renal function without the need for hemodialysis. The Impella® device had its parameters gradually reduced, followed by withdrawal 5 days after its installation, maintaining hemodynamic stability with cardiogenic shock resolution.

A new echocardiogram performed after Impella® device withdrawal demonstrated an improvement in left ventricular ejection fraction (46%), akinesia of the apical region, akinesia of the middle region of the left ventricular anteroseptal wall, and hypokinesia of the middle region of the anterior and inferoseptal walls of the left ventricle.

The patient was asymptomatic on discharge from the hospital 15 days after admission.

Discussion

Temporary ventricular assist devices, such as Impella® 2.5, are often used as circulatory rescue therapy in the face of refractory hemodynamic conditions that may induce systemic-organ failure resulting from tissue hypoperfusion.4 Cardiac output must be quickly reestablished in these patients, in order to maintain systemic perfusion. For this purpose, vasoactive and inotropic drugs are regularly used and, in the presence of persistent hemodynamic instability, the use of devices such as Impella® 2.5 is effective, reducing ventricular load and providing the necessary circulatory support to allow myocardial recovery.5,6

Impella® 2.5 is a centrifugal-flow pump, embedded in a tube, which aspirates blood from the left ventricle through an inflow area, near the tip, and expels the blood from the catheter to the ascending

Figure 1. (A) Lesion showing the aspect of spontaneously dissection in the left main coronary artery (LMCA), with minimal flow in the left anterior descending artery (LAD) and left circumflex (LCx) artery. (B) Percutaneous coronary intervention with implantation of a bare-metal stent in the LMCA. (C) Outcome after percutaneous coronary intervention.

Figure 2. (A) Impella® ventricular assist device 2.5. (B) Impella® ventricular assist device 2.5 after being installed.
mortality was similar (39.7% vs. 41.3%),

The device can be inserted in a standard catheterization proce-
dure through the femoral artery, ascending aorta, aortic valve, and
positioned in the left ventricle. It can be implanted quickly, is easy to
maintain in intensive care units, and promotes immediate hemody-
namic condition improvement.7

Another study carried out with 26 patients with cardiogenic
shock sought to compare the use of Impella™ 2.5 and the intra-aor-
tic balloon pump (IABP), investigating hemodynamic outcomes
(pre- and 30 minutes after installation), lactic acidosis, hemolysis,
and mortality. Better hemodynamic support was observed in the
group of patients treated with Impella™ 2.5 compared to IABP, with
higher values of cardiac index, cardiac output, and mean arterial
pressure 30 minutes after its installation. No significant differences
were observed regarding the other assessed parameters, and mor-
tality was similar between the groups (46%).5

It is worth mentioning the role of percutaneous coronary interven-
tion with stent implantation in cardiogenic shock, with a funda-
mental objective of reestablishing Thrombolyis in Myocardial
Infarction (TIMI) III flow and myocardial perfusion, followed by he-
modynamic support with circulatory assist devices when necessary,
in selected cases (early use in refractory cases, in young patients,
and in those without organ dysfunction, among others).

Therefore, the authors conclude that the use of the Impella™ de-
vice allowed rapid improvement in the patient’s hemodynamic con-
dition, preserving vital functions until the myocardium could fully
resume its contractile function. Mechanical ventricular assist devic-
es should be considered as an alternative in similar cases.

Funding

None declared.

Conflicts of interest

The authors declare no conflicts of interest.

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