

Supplemental Material

Institutional Mechanical Circulatory Support Protocol (Excerpt)

Aims

- Rapid identification of patients with acute myocardial infarction complicated by cardiogenic shock
- Provide a guide for early initiation of appropriate mechanical circulatory support (MCS) for eligible patients
- Standardisation of patient selection for MCS device implantation prior to revascularisation
- Standardisation of patient care in the coronary care unit (CCU) after implantation of the Impella catheter-based ventricular assist device (cVAD)
- Decision-making guide for weaning of Impella cVAD ('Bridge to recovery')

Indications

Age <65 years **AND one of following clinical scenarios**

1. Acute myocardial infarction complicated by cardiogenic shock
 - Definition
 - Diagnosis of acute myocardial infarction (AMI)
 - Ischaemic symptoms of AMI
 - ECG and/or biomarker evidence of AMI (STEMI/ NSTEMI)
 - **AND** cardiogenic shock
 - Systolic blood pressure (SBP) ≤ 90 mmHg at baseline or requiring inotropes/ vasopressors to maintain SBP ≥ 90 mmHg and
 - Evidence of end-organ hypoperfusion (cool extremities, oliguria, lactic acidosis)
2. Performance of high-risk complex PCI
 - Criteria include, but not limited to
 - Severe left ventricular (LV) systolic dysfunction with possible coronary flow interruption in a major branch
 - High risk of no-reflow (eg. vein graft intervention, rotablation, orbital atherectomy)
 - Chronic total occlusion (CTO) with retrograde approach
 - Last remaining major vessel
3. Myocarditis with anticipated recovery or bridge to definitive management

Contra-indications

- Evidence of anoxic brain injury
- Unwitnessed out of hospital cardiac arrest or any cardiac arrest in which return of spontaneous circulation (ROSC) is not achieved in 30 mins
- Septic, anaphylactic, hemorrhagic, and neurologic causes of shock
- Other causes of shock/hypotension outside the eligible clinical scenarios (pulmonary embolism, pneumothorax, pericardial tamponade)
- Active bleeding
- Mechanical complications of AMI (ventricular septal defect, acute papillary muscle rupture)
- Known LV thrombus
- Mechanical aortic prosthetic valve
- Presence of severe aortic stenosis
- Presence of moderate to severe aortic regurgitation

- Known history of severe peripheral vascular disease
- Contraindication to intravenous systemic anticoagulation

Right Heart Catheterisation

- Complete right heart catheterization to be performed, to obtain following parameters
 - Right atrial pressure
 - Right ventricular (RV) pressure
 - Pulmonary artery pressure
 - Pulmonary capillary wedge pressure (PCWP)
 - Left ventricular end-diastolic pressure (LVEDP) if unable to obtain PCWP
 - Mixed venous oxygen saturation (from pulmonary artery)
 - Cardiac output/ cardiac index (using Fick method)
- Calculate cardiac power output and pulmonary artery pulsatility index
 - Cardiac Power Output (CPO)
 - $[\text{Mean Arterial Pressure (MAP)} \times \text{Cardiac Output (CO)}] / 451$
 - Pulmonary Artery Pulsatility Index (PAPi)
 - $[\text{Pulmonary Artery Systolic Pressure (PASP)} - \text{Pulmonary Artery Diastolic Pressure (PADP)}] / [\text{Right Atrial Pressure (RAP)}]$
- Leave pulmonary artery catheter in-place

Selection of Mechanical Circulatory Support

- Place Impella® device for isolated LV failure and cardiogenic shock prior to performing primary PCI
 - Cardiac index $< 2.2 \text{ L/min/m}^2$ **AND**
 - PCWP (LVEDP if unable to obtain PCWP) $> 15 \text{ mmHg}$ **AND**
 - PAPi > 0.9
- Consider veno-arterial extra-corporeal membrane oxygenation (VA-ECMO) if bi-ventricular failure
 - Cardiac index $< 2.2 \text{ L/min/m}^2$ **AND**
 - PCWP (LVEDP if unable to obtain PCWP) $> 15 \text{ mmHg}$ **AND**
 - PAPi < 0.9
- IABP may be considered as adjunct support if selection criteria for Impella® and VA-ECMO are unmet

Coronary Angiogram and Coronary Intervention

- Perform coronary angiogram and intervene on culprit lesion
 - On maximum Impella® support (P8 support)
- Interventional cardiologist to decide on the intervention of other incidental lesions

Emergency CABG

- If coronary lesions are not amenable to PCI and patient has on-going myocardial ischemia
 - On maximum Impella® support (P8 support)
- Discussion with cardiothoracic surgeon on Impella support intra-operatively and post-CABG management