**Table 2.** Characteristics of short-term mechanical circulatory supports (MCS). Percutaneous MCS can be characterized by one of four circuit configurations: 1. intra-aortic devices (IABP), 2. transvalvular aortic (Impella) 3. LA to systemic artery (TandemHeart); 4. RA to systemic artery (V-A ECMO).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | IABP | Impella (2.5, CP, 5.0) | Tandem-Heart | VA-ECMO |
| Insertion | Femoral artery to AO | LV-AO | Venous cannula: LA  Arterial cannula: AO | Venous cannula: RA/femoral vein  Arterial cannula: femoral artery/AO |
| Mechanism | ECG triggered(R-wave)  Diastolic augmentation of AO pressure and augments LV performance via systolic balloon deflation (decrease in afterload). | Expels blood from LV to AO | Aspirates oxygenated blood  from LA and returns to AO | Drainage of deoxygenated venous blood, via an extracorporeal centrifugal pump over a membrane oxygenator and pumped back oxygenated blood to aorta/femoral artery |
| LV unloading | (+) | ++ | ++ | -LV overloading in peripheral cannulation  Only RV unloading |
| Technical characteristics | -Cannula size 7-8 F  -CO -  -pulsatile flow | -Cannula size 12-14F for CP and 21 F for Impella 5.0  -CO:2,5-5,0 L/min\*  -continuous flow via axial pump; maximum pump speed 51000rpm | - Cannula size 21F venous and 12-19F arterial  -CO: 4L/min  -continuous flow via centrifugal pump; maximum pump speed 7500rpm | - Cannula size 19-25 F venous  and 15-19F arterial  -CO: up to 7 L/min  -continuous flow via centrifugal pump; maximum pump speed 5000rpm |
| Duration |  | 10 days for Impella 2.5 and CP and 3 weeks for Impella 5.0 | 2-3 weeks | 3-4 weeks |
| Advantages | Easy insertion, easy to adjust, Cath lab not mandatory, no extracorporeal blood; increase coronary and cerebral flow | ECG and pulse independent,  relatively easy insertion in Cath lab\*, no extracorporeal blood | Rhythm independent, less artificial surface than ECMO;  Can be used in patients with Ao stenosis/prosthetic Ao valve; Can be used even in left ventricular thrombus | Rhythm independent, No cath lab requirement, rapid insertion, full circulatory support even in resuscitation situations or during malignant arrhythmia, providing combined support of the RV and LV, rapid improvement in oxygenation and the possibility of rapid application, complete cardiopulmonary bypass |
| Disadvantages | -ECG/pulse dependent (mostly inefficient in tachycardia and irregular rhythms)  - Limb ischemia, hemolysis, thrombocytopenia, bleeding | Limb ischemia, hemolysis, bleeding | Limb ischemia; Bleeding  Complex implantation requiring transseptal puncture; | - Hemolysis, thromboembolic complications (large artificial surface), renal failure, limb ischemia/amputation and bleeding  -LV overloading- Peripheral cannulation is associated with an increase in LV afterload, which produces LV distension and pulmonary congestion and may impair myocardial recovery (103, 144). LV decompression strategies include additional procedures, such as septostomy, IABP, Impella, and hybrid circuit configuration  - Harlequin syndrome (upper body hypoxia from incomplete retrograde filling and oxygenation), in which deoxygenated cerebral blood flow occurs during retrograde perfusion with peripheral cannulation. The veno-arterio-venous configuration with triple cannulation avoids upper body hypoxia. |
| Contraindications | -Moderate to severe aortic valve regurgitation  -Severe aortic disease | -Severe aortic stenosis -Prosthetic aortic valve  -LV thrombus  -Ventricular septal  defect  -Peripheral vascular  disease | Severe aortic insufficiency  - Aortic dissection  -Peripheral vascular  disease  -RV failure  -Ventricular septal  Defect  -Inability to tolerate  systemic anticoagulation | Severe aortic insufficiency  -Aortic dissection  -Inability to tolerate  systemic anticoagulation |

* For Impella 5.0 surgical cut-down for cannulation is mandatory

***Abbreviations****: AO=aorta;CO=cardiac output;IABP=intra-aotic baloon pump;LA=left atrium;LV=left ventricle; PA=pulmonary artery;RA=right atrium; RV=right ventricle;VA-ECMO=veno arterial extracorporeal membrane oxygenation.*