Editorial

Mechanical Circulatory Assist Devices: Time for More Attention by Iranian Cardiologists

Haleh Ashraf, MD[1,2], Sepideh Taghavi, MD[2], Hossein Navid, MD[3]

[1]*Cardiac Primary Prevention Research Center (CPPRC), Cardiovascular Disease Research Institute, Tehran University of Medical Sciences, Tehran, Iran.*
[2]*Heart Valve Disease Research Center, Rajaie Cardiovascular Medical and Research Center, Iran University of Medical Sciences, Tehran, Iran.*
[3]*Tehran Heart Center, Cardiovascular Disease Research Institute, Tehran University of Medical Sciences, Tehran, Iran.*

Received 21 May 2022; Accepted 28 June 2022

Heart failure currently affects millions of the world's population, causing substantial morbidity and mortality and imposing a heavy burden on public health care.[1]

Mechanical circulatory support (MCS) devices help treat medically refractory end-stage heart failure and improve hemodynamics and tissue perfusion. They serve as a bridge to a) recovery to give the native heart a chance to recover in such cases as fulminant myocarditis and myocardial infarction, b) transplantation given the dearth of organ donors and long waiting times for heart transplantation, c) decision-making regarding patients' eligibility for cardiac transplantation, and d) a more suitable device implantation (eg, a biventricular assist device to a left ventricular assist device [LVAD]). MCS devices are also durable, viable alternatives to transplantation in patients ineligible for heart transplantation as a destination therapy to support cardiac function for the remainder of life. They can restore circulation to tissues in the short term to see patients through high-risk procedures to recovery or to allow time to assess prognosis and guide definitive treatment or long-term applications.[1-3] While MCS devices can help support the left or right ventricle or both, LVADs are the most common support devices. Table 1 presents devices available for short and long-term MCS. Determining patient support strategies requires the consideration of device availability, expense, and coverage, as well as operator expertise and technical challenges.

Recent years have seen a rise in the availability of MCS devices in Iran, where intra-aortic balloon pumps, the iVAC 2L (PulseCath, Amsterdam, the Netherlands), and extracorporeal membrane oxygenation devices are the most commonly used devices for short-term support, and the HeartMate III (St Jude Medical, Inc, St Paul, MN) LVAD is the most frequently employed device for the long term (Figure 1).

Accurate assessment of patient comorbidities and

J Teh Univ Heart Ctr 2022;17(3):88-90

This paper should be cited as: Ashraf H, Taghavi S, Navid H. Mechanical Circulatory Assist Devices: Time for More Attention by Iranian Cardiologists. J Teh Univ Heart Ctr 2022;17(3):88-90.

Keywords: *Mechanical circulatory assist devices; Heart failure*

[*]**Corresponding Author:** ***Haleh Ashraf,*** *Assistant Professor of Cardiology, Tehran Heart Center, North Kargar Street, Tehran, Iran. 1411713138. Tel: +98 21 88029256. Fax: +98 21 88029256. E-mail: hasgraf@sina.tums.ac.ir.*

Table 1. Devices approved by the FDA are available for short and long-term MCS (ref 3)

Short-term MCS			Long-term MCS		
Device	Mechanism	Duration	Device	Mechanism	Indications
IABP	Counterpulsation	Days	Thoratec PVAD	Pulsatile	BTT, BTR
ECMO	CPB	Days-weeks	Novacor	Pulsatile	BTT, DT
BVS5000, AB5000	Pulsatile	Weeks	Heartmate XVE	Pulsatile	BTT, DT
Thoratec PVAD	Pulsatile	Weeks	Heartmate II	Axial flow	BTT, DT
CentriMag	Centrifugal	Weeks	Abiomed TAH	Pulsatile	BTT
TandemHeart	Centrifugal	Days	CardioWest TAH	Pulsatile	BTT
Impella	Axial flow	Days	Berlin EXOR Pediatric	Pulsatile/pneumatic	BTT
			DeBakey Child	Axial-Flow	BTT, BTR
			HeartMate 3™	Centrifugal	BTT, DT

MCS, Mechanical circulatory support; VAD, Ventricular assist device; BTR, Bridge to recovery; BTT, Bridge to transplantation; DT, Destination therapy; ECMO, Extracorporeal membrane oxygenation; IABP, Intra-aortic balloon pump; TAH, Total artificial heart; PVAD, Paracorporeal VAD

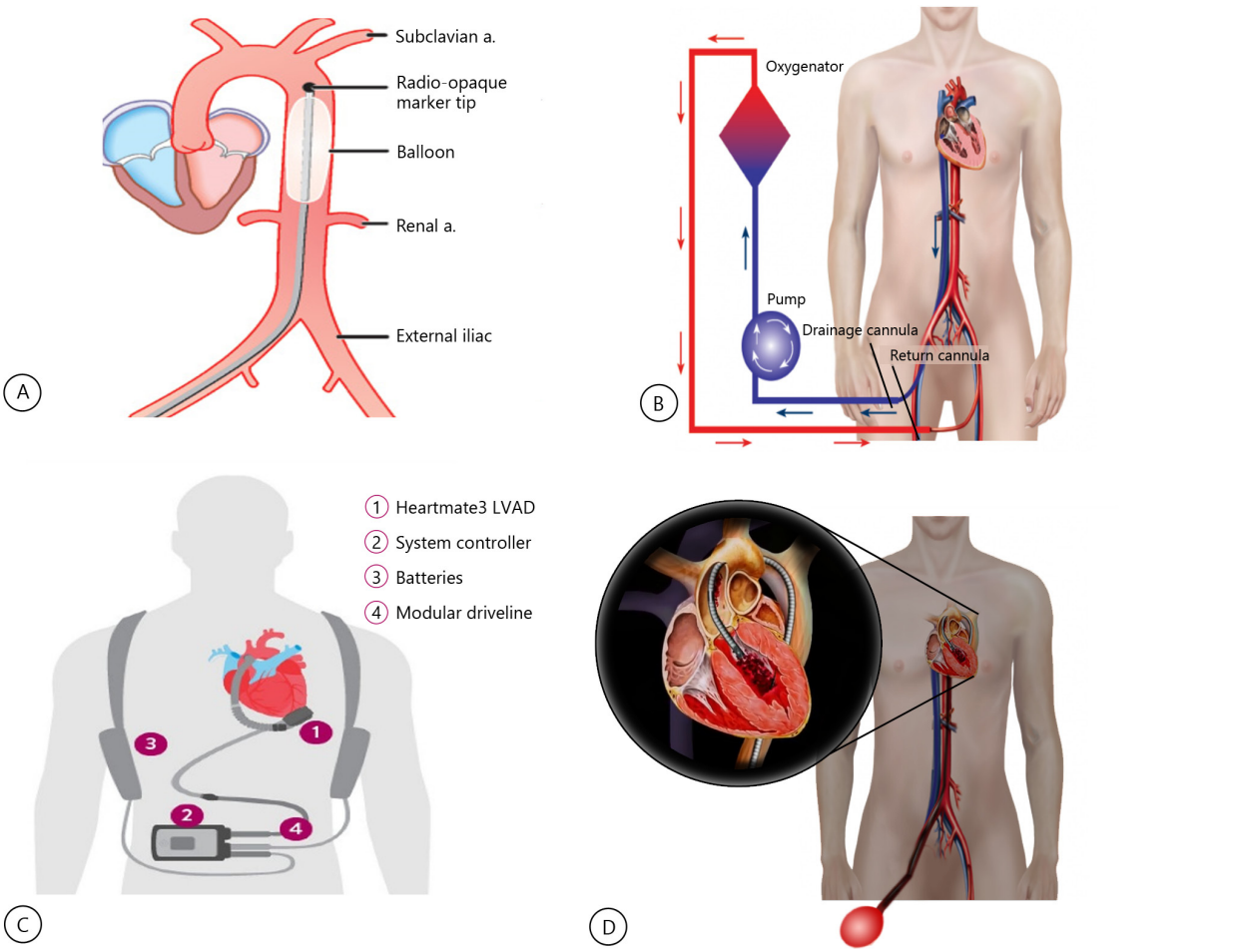

Figure 1. A) The images depict an intra-aortic balloon pump, B) Venoarterial extracorporeal membrane oxygenation device (VA-ECMO), C) HeartMate III left ventricular assist device (LVAD), D) Percutaneous PulseCath iVAC 2L left ventricular assist device.

the time frame needed for support are essential when considering appropriate device selection for each patient to minimize risks and maximize outcomes. MCS initiation before right heart failure and systemic organ failure can confer the lowest mortality and morbidity. In general, patient evaluation for MCS is similar to that for heart transplantation but less restrictive, and reversible organ deterioration and comorbidities are usually accepted. The Interagency for Mechanically Assisted Circulatory Support (INTERMACS) profile categorizes patients into 7 clinical profiles[2]: level I: cardiogenic shock; level II: unstable on inotropic support; level III: stable on inotropic support; levels IV and V: severely limited; and levels VI and VII: significant heart failure necessitating constant surveillance. Patients in levels I to III need MCS sooner, and the results are significantly better when a semi-elective or stable patient receives the device. The overall 2-year survival after MCS exceeds 60%.[2]

The technological advances in MCS devices over the last 2 decades have been staggering. The future focus of MCS will be on implantation before organ failure and reduction in device size, thromboembolic and bleeding complications, and infection. In the meantime, however, to cope with the increase in MCS device implantation, health care providers need further education concerning different device types, clinical presentations of patients experiencing complications, and symptom and complication management. There is also a need for concerted efforts to improve data reporting methods and advocate MCS use in health policies in the Middle East, which will indubitably require international collaboration.

References

1. Crespo-Leiro MG, Metra M, Lund LH, Milicic D, Costanzo MR, Filippatos G, Gustafsson F, Tsui S, Barge-Caballero E, De Jonge N, Frigerio M, Hamdan R, Hasin T, Hülsmann M, Nalbantgil S, Potena L, Bauersachs J, Gkouziouta A, Ruhparwar A, Ristic AD, Straburzynska-Migaj E, McDonagh T, Seferovic P, Ruschitzka F. Advanced heart failure: a position statement of the Heart Failure Association of the European Society of Cardiology. Eur J Heart Fail 2018;20:1505-1535.
2. Molina EJ, Shah P, Kiernan MS, Cornwell WK 3rd, Copeland H, Takeda K, Fernandez FG, Badhwar V, Habib RH, Jacobs JP, Koehl D, Kirklin JK, Pagani FD, Cowger JA. The Society of Thoracic Surgeons Intermacs 2020 Annual Report. Ann Thorac Surg 2021;111:778-792.
3. Vieira JL, Ventura HO, Mehra MR. Mechanical circulatory support devices in advanced heart failure: 2020 and beyond. Prog Cardiovasc Dis 2020;63:630-639.