Understanding options and indications for mechanical circulatory support

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Disclosures

- Nothing to disclose

Temporary MCS

Temporary Mechanical Circulatory Support

- Intra-aortic balloon pump
- Temporary Left Ventricular Assist Device
- Extracorporeal Membrane Oxygenation (ECMO)
  - Venoarterial
  - Venovenous (Not technically “circulatory” support)

Indications for temporary MCS

- Acute MI
- Malignant arrhythmia (VF/VT)
- Mechanical complications of MI
  - LV free wall rupture
  - Post-infarct VSD
  - Acute MR
- Post-cardiotomy low cardiac output syndrome
- Acute decompensated heart failure (for any reason)
- High risk PCI

Goals of temporary MCS

- Stabilize hemodynamics
- Preserve end organ function (especially renal)
- Preserve CNS perfusion
- Allow myocardial recovery

What is ECMO

- Mechanical pump for oxygenating and pressurizing blood
- Cardiopulmonary bypass (without the reservoir)
- Can be instituted (relatively) quickly, centrally or peripherally
- Stabilizes hemodynamics and preserves end organ function
- Factors affecting utilization
  - Staff
  - Equipment
  - Referrals

Examples of temporary LVADs

- TandemHeart
- Impella

Durable MCS

Durable Mechanical Circulatory Support

- Left Ventricular Assist Device
  - Axial flow devices
  - Centrifugal flow devices

Guide to timing for durable MCS

- INTERMACS SCALE:
  - 1: Hemodynamically unstable, with end organ dysfunction
  - 2: Hemodynamically stable, but with end organ dysfunction, requiring inotropes
  - 3: Hemodynamically stable, with preserved end organ function, requiring inotropes
  - 4: Hemodynamically stable, with preserved end organ function, not requiring inotropes

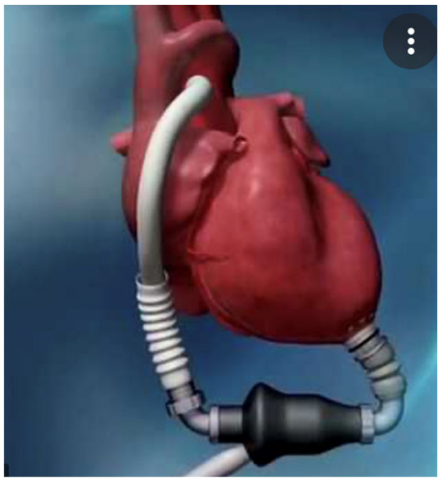
Goals of durable MCS

- Provide improved quality of life
- Enable return to work and normal activity
- Prevent hospitalizations for heart failure and related conditions
- Bridge to transplant

Biomechanics of LVADs

- Pneumatic Flow Pumps
  - Heartmate 1
- Axial Flow Pumps
  - Heartmate 2
- Centrifugal Flow Pumps
  - Heartmate 3

Axial vs Centrifugal Pumps



Momentum Trial

Two-Year Outcomes with a Magnetically Levitated Cardiac Pump in Heart Failure

M.R. Mehra, D.J. Goldstein, N. Uriel, J.C. Cleveland, Jr., M. Yuzefpolskaya, C. Salerno, M.N. Walsh, C.A. Milano, C.B. Patel, G.A. Ewald, A. Itoh, D. Dean, A. Krishnamoorthy, W.G. Cotts, A.J. Tatooles, U.P. Jorde, B.A. Bruckner, J.D. Estep, V. Jeevanandam, G. Sayer, D. Horstmanshof, J.W. Long, S. Gulati, E.R. Skipper, J.B. O'Connell, G. Heatley, P. Sood, and Y. Naka, for the MOMENTUM 3 Investigators*

Momentum Trial

- Centrifugal vs axial flow pump
- 366 Patients: 190 Centrifugal, 176 Axial
- Centrifugal group was superior
  - Better two year survival (79.5% vs 60.2%)
  - Fewer reoperations
  - Fewer strokes

Other benefits of centrifugal pumps

- Smaller, more power efficient
- Driveline repairability
- Improved hemocompatibility
- Intrapericardial implantation

Conclusion

- There are options for temporary and durable mechanical circulatory support
- Durable LVADs have evolved significantly
- Best current evidence is for centrifugal durable LVADs, which have demonstrated improved survival

Literature

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2. Gilotra NA, Stevens GR. Temporary mechanical circulatory support: A review of the options, indications, and outcomes. Clinical Medicine Insights. Cardiology. 2014;2014(S1):75-85. https://www.airitilibrary.com/Publication/alDetailedMesh?DocID=P20160614002-201412-201606150031-201606150031-75-85. doi: 10.4137/CMC.S15718.
3. Stevenson LW, Pagani FD, Young JB, Jessup M, Miller L, Kormos RL, Naftel DC, Ulisney K, Desvigne-Nickens P, Kirklin JK. INTERMACS profiles of advanced heart failure: the current picture. J Heart Lung Transplant. 2009 Jun;28(6):535-41. doi: 10.1016/j.healun.2009.02.015. PMID: 19481012.