Left Ventricular Assist Devices for Non-Cardiac Surgery

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• I have no relevant financial disclosures

Outline

• Case Presentation
  • Heart Failure
  • Overview of LVAD's
  • Monitoring
  • Taking care of patients with LVADs

Case Presentation

• 63 y/o
• HPI: Acute GI bleed
• PMHx:
  • ischemic cardiomyopathy
  • chronic renal insufficiency
  • prolonged respiratory failure
  • sudden cardiac arrest
  • s/p Heart Mate II 7 months ago

INTERMACS (2006)

6,561 LVADS

4,644 Bridge to Transplant
1,834 Destination Therapy

INTERMACS (2012)

• 44% LVADs destination therapy
• Since 2010 all devices are continuous flow
• Survival:
  • 1 year 80%
  • 2 year 70%
  • 3 year 59% [1 year survival for a Whipple around 30%]
  • 4 year 47%
Typical Patient?

• Heart Failure
• One in five Americans over age of 40
  - [Circulation 2012; 125:e2-e220]
• Nearly 50% are dead in 5 years
  - [JAMA 2004; 292:344-350]

Not run of the mill heart failure

• In its 2001 guidelines the American College of Cardiology/American Heart Association working group introduced four stages of heart failure.[30]
• Stage A: Patients at high risk for developing HF in the future but no functional or structural heart disorder.
• Stage B: a structural heart disorder but no symptoms at any stage.
• Stage C: previous or current symptoms of heart failure in the context of an underlying structural heart problem, but managed with medical treatment.
• Stage D: advanced disease requiring hospital-based support, a heart transplant or palliative care.

INTERMACS

• Interagency Registry for Mechanically Assisted Circulatory Support
• North American Registry
• Established in 2005
• Data points
  • 1 week, 1 month, 3 months, 6 months and every 6 months after

Patients with VAD’s get better

• Complete renal recovery occurs in 30% of patients (Ann Thorac Surg 2009;87:1072–8)
• 6 minute walk test improved by 200 meters
  • Average 42 meters pre-implant
  • Average 292 meters post-implant
• Liver function/injury improves
• Quality of life improves (n engl j med 357;9)
• They live so you can care for them...
Two Major indications

• Bridge to heart transplant
  • Two major devices on market
    • Heart Mate III
    • Heart Ware

Heart Mate II

Physical exam

• Monitors
  • EKG
  • Defibrillator hands free pads
    • Most have AICD
  • Pulse ox usually worthless
  • But you have something really nice...
• Blood pressure (recommendation)
  • Can be monitored non-invasively with a doppler
  • I would always put an arterial line in
    • You will need an ultrasound
  • Blood pressure
  • ABC monitoring, remember pulse ox doesn’t work

Pulsatility index

• Magnitude of PI
  • Inversely related to assistance provided by pump
  • PI increases
    • Increase in LV contractility
    • Increase in volume status (?)
  • PI decreased
    • Pump support is increasing
    • Hypovolemic (?)
• Some people rely on it to tell them about volume status
• Measurement by the pump averaged over 15 sec’s
Pump Flow

- Flow and power at a given speed are closely related
- Power is directly measured
- Under normal conditions reflect cardiac output of the pump
  - Divide by BSA you have CI
- Reported flow
  - An estimated value determined from power and pump speed
  - Not accurate if under 3L/min

Pump speed

- Usually 8,600 to 9,800
- Can be adjusted on the display
- Ideal speed
  - Determined by a ramped study
  - LV Size within normal range
  - No rightward or leftward shift of septum

How to monitor?

- Arterial line
- Always...
- Full plug in monitor
  - Continuous battery source
  - Large screen monitor
- CVP?
- PA catheter?
- TEE?
- Someone there that can adjust the pump
  - VAD coordinator

Trans esophageal Echo

- TEE
- Looking for RV function
- Will help you interpret the PI
  - Is the low PI from Volume?
  - Is the low PI from right heart failure?

Summary

- Heart failure is extremely common
- Surgical Treatment for heart failure works
- Patients with LVADs have a high risk of GI bleeding
- Best treatment of right heart dysfunction
- Always place an arterial line
- Make sure you have adequate back-up
  - CT Surgery
  - VAD coordinator
- Avoid right heart dysfunction
- First rule of fight club...
  - You don’t talk about fight club