Heartmate II
Left Ventricular Assist Device
Implanted Heartmate II Device

(A) Patients can be fully mobile

- Left ventricular assist device (LVAD) connected to heart
- Battery
  - A cable connects the external control unit and internal LVAD through a small hole in the abdomen
- Control unit

(B) LVAD pumps blood into the aorta (to the body)
- Blood from the left ventricle enters the LVAD

Heart is shown in cross-section
Heartmate II

The Heartmate II is a left ventricular assist device (LVAD) that is implanted alongside the patient’s native heart with the purpose of pumping for the heart’s left ventricle.
Components of Heartmate II

- Implanted Blood Pump
- Inflow Conduit
- Outflow Graph
- Percutaneous lead
Heartmate II

The Heartmate II is surgically implanted just below the diaphragm in the abdomen. It acts as a conduit by attaching to the left ventricle and then to the aorta, leaving natural circulation in place.
Heartmate II

• Assists in providing energy to propel blood throughout the body as a healthy left ventricle would do

• FDA approved to use as a bridge to transplant or as destination therapy when the patient is not a transplant candidate
Surgical Implantation
Instruments For Implantation

- Cardiac Basic Tray
- Cardiac Sternal Saw
- Internal Defibrillator Paddles
- Maltais Specials
- Favaloro Morris Retractor
- Titanium Round Suture Ring
- General Lap Pan II
- Heartmate II Instrument Pan
- Repeat Sternotomy Saw if patient has had a previous sternotomy
- Mayo Stand Basin
- Sterile tie gun
Supplies For Implantation

• Sterile OR Supplies:
  – See Doctor’s Preference Card (DPC)

• Thoratec Heartmate II supplies for sterile field:
  – Pump kit
  – Large blue basin
Surgical Checklist

• Perfusion will use sterile technique to assemble pump on back table prior to incision
Assembly

- LVAD is correctly assembled and all joints are tight
- LVAD is primed with sterile injectable normal saline
- Pump remains on back table until time to implant

Turn locking screw ring clockwise until clicking sound, then continue until tight and clicking stops

Arrow indicates correct orientation of inflow versus outflow conduits
Assembly

Attach the thread protector with the leur-lock cap to the pump outflow elbow.

Open leur-lock cap to let air escape.

Hold upright and fill with sterile normal saline until it flows out of the cap-then close cap.
Assembly and Set-up

Gently tap the side of the pump and observe for air bubbles rising to the surface.

Add saline and tap until pump appears full and no air bubbles can be observed.

Apply finger cot to prevent loss of priming fluid.
Surgical Implant Procedure

- Perform median sternotomy, extending incision 2-3cm below xiphoid process
Before Heparin Is Given

• Prepare device pocket
  – Long cautery tip; set bovie at 70; Richardson retractor for exposure

• Externalize percutaneous lead through exit site in RUQ of abdomen using tunneler

• Place pump in pocket
  – Cover with antibiotic soaked laps
Measure Graft

• Give Heparin
• Proceed with standard cannulation for bypass
• Places a vent in ascending aorta
  – CMB needle
• Stretches outflow graft to measure and cuts to right length
  – Uses ruler to measure
Aortic Anastomosis

• Ensures bend relief is on the sealed outflow graft
  – Graft is clamped with angled debakey for anastomosis

• Graft is anastomosed to ascending aorta after partial cross clamping (clamp without wings)
  – Suture: 4-0 Prolene RB-1
Complete Anastomosis

- Removes partial cross clamp
- Outflow graft is de-aired, back filled, and clamped with debakey clamp
- Takes the slack out of anastomosis with a hook to reinforce suture line
  - 2 more felted 4-0 Prolene sutures to reinforce
  - Applies Evicel
Creating Core

• Initiate bypass, complete dissection if needed
  – Redo

• Places 3-4 warm laps behind the heart to expose apex
  – Marks with pen the LAD and the acute margin of the heart
  – Will put a 0-Silk P.O. suture to mark coring center
Creating Core

• Places the patient in trendelenberg position

• Removes the apical core from left ventricle using coring knife
  – Remove all plastic and pass only the coring knife and debakey
  – Remove thrombi and trabeculate if present
Attaching Apical Sewing Ring

- Places suture ring and 4 towels. Will need pen and prepared ring felt to place apical stitches
  - 2-0 Ethibond MH with pledgets (need 12)
  - Places a mosquito on 4 corner stitches
- Moisten sewing ring and apply mineral oil to centering tool
  - Eases removal later
Apical Sewing Ring

• Will wrap around sewing ring securing sutures around inflow and mark center with tourniquet

• Sutures are placed in sewing ring
  – Cuts needles sequentially and identifies 4 corner stitches with mosquitos
Remove Centering Tool

- Will tie down all sutures and inflow into position
- Evicel is applied to the anastomosis
- Centering tool is removed
Inserting In-Flow Conduit

• Remove glove tip from sealed inlet conduit

• Insert through apical sewing ring
  – Orient toward mitral valve

• Vent the Heartmate II using provided side port if needed
Inlet Conduit

• Will secure inlet conduit into apical sewing ring using attached non-absorbable suture and will apply two tie tapes to reinforce
Attach In-Flow Conduit

• Attach sealed outflow graft to outflow elbow of pump ring
  – Screw ring only to advance cannula into outflow elbow
  – Ensure connection is tight with no twist in outflow graft
De-airing the LVAD

- Unclamps the graft after placing de-airing needle (18”) in outflow graft (highest point)
- Partially clamps the outflow graft before coming off CPB

Ventilate and weans CPB slowly until 0.5 L
  – look for air in the CMB needle
System Status

• Start HMII at 6000 RPM
  – Watch air on tee
  – Unclamp outflow graft and after filling the heart, wean completely from CPB

• Ramps up RPM from 8800 to 9200
  – Watch for RV overload/failure
Initiating Pump Operation

• When venting is adequate and CPB weaned, repairs vent needle site with 4-0 Prolene RB-1 pledgeted suture

• Slide bend relief over the metal fitting toward the locking screw ring until it snaps in place
Closure

- Achieve and maintain hemodynamics by adjusting fixed speed of LVAD and treating patient with appropriate inotropes
- Closes surgical wound and places drains per appropriate routine
Percutaneous Lead

- Internalize velour on percutaneous lead
- Fix lead using standard chest tube suture (0 Silk CT-1 needle)
- Close skin with 4-0 Monocryl PS-1 around drive line
Dressings

- Dress percutaneous lead exit site with sterile bandage and immobilize with stabilization belt or binder.
Charged Batteries

• Prior to transferring patient out of the OR, insert 2 fully charged batteries into the battery clips
• Unplug one system controller power lead from the PM cable, attach to battery clip; repeat with second power lead
Alarm Silence for Transport

- Press the silence alarm button on the system controller to override the extended alarm reset
• #4 Silk ties
• 0 Silk CT-1 X 2 per chest tube (6 to start)
• 0 Silk PO Multipack for tacking
• 2-0 Silk PO (18) secure pacing wires
Cannulation Suture for LVAD

- 3-0 Prolene SH X 4
  - 2 AO
  - 1 Venous
  - 1 Vent
- 4-0 Prolene SH X 2 Inflow graft
- 4-0 Prolene RB-1 X 3 have available
- 5-0 Prolene C-1
Suture for LVAD

• 2-0 Ethibond MH X 12
  – Outflow site
• #6 Sternal wires X 3 packages
  – usually puts in 10
Closure Suture for LVAD

- 1 PDS CT-1 X 1
- O Vicryl PO CT-1 X 2
- 2-0 Vicryl CT-1 X 2
- 3-0 Vicryl CT-1 X 3
- 4-0 Monocryl PS-1 X 3
- Uses bone wax at beginning and end of case
Additional Information

• Web Site:
  • WWW.THORATEC.COM

• Customer Service:
  • (800) 456-1477