EXCORV.A.D.
By Berlin Heart

Presented by: Neali Farahvash, Colin Cameron, Cael Boettinger
Excor V.A.D.

Developed in Berlin, Germany

Used to Prevent

  Cardiomyopathy
  Myocarditis

European Conformity (CE)

  Stationary unit in 1996

  Mobile unit in 1999

Excor VAD by Berlin Heart
In Children

First device available for children

Supported by the Texas Children’s Heart Center

First implantation in a child in 2003

1000+ Child Implants to date

Brandi Burch and Dr Charles D. Fraser, pre-op.
Classification

VAD or BiVAD

Pulsatile, pneumatic compressor diaphragm

Paracorporeal
**EXCOR Blood Pump**

**Range:**

- Systolic Pressure 60 to 350 mmHg
- Diastolic Pressure 0 to -100 mmHg
- Rate 30 to 150 bpm

**Connection:**

- Inflow cannula to right atrium and outflow cannula to pulmonary artery
- Inflow cannula to apex and outflow to the aorta ascendens
EXCORE Cannulas

Inflow Cannula:

Atrial

Apex

Outflow Cannula:

Arterial

Made of silicon, polyester velour and metal

Cannula heads: 1) Atrial cannula, 2) apex cannula, 3) arterial cannula
Driving Unit Ikus

Internal pneumatic system:

- Compressor
- Pressure and sucking limiter
- Pressure and vacuum cylinder
- Control valves
- Control electronics
• Germany 2003
• Berlin Heart
• In use in Europe
• Clinical Trials in USA
• Bridge to Transplantation/Therapy
CLASSIFICATION

- LVAD
- Implantable
- Axial Pump
- Non-Pulsatile

SMART SOFTWARE - PULSATILITY CONTROL (PC)
IN CASE OF LOW PULSATILITY
AUTOMATIC SPEED REDUCTION
TECHNICAL CHARACTERISTICS

• 200 g and 30 mm outer diameter

• Active magnetic axial rotor bearings

• Batteries and control unit fit in shoulder bag

• Low noise
Ooraide LVAD

Eman Abdul-Kader and Saakshi Sutarwala
How it works

- product of USA
- left ventricular assist device, currently in clinical trials
- centrifugal pump working to pump more blood with less work
- both internal and external
Advantages/Disadvantages

Advantages

○ good biocompatibility, reliability, effective system performance

○ nonthrombogenic, nonhemolytic

○ easy to implant for surgeon

○ small size

• Disadvantages

○ external components (battery pack etc.)

○ surgical risks (internal bleeding, infection, blood clots etc.)
http://www.mylvad.com/content/what-lvad-how-does-it-work


http://abcnews.go.com/Health/HeartFailureTreatment/story?id=5229317

http://www.medicinenet.com/left_ventricular_assist_device_lvad/article.htm

http://www.biology-online.org/kb/print.php?aid=526 (figure)
Thoratec HeartMate IP LVAS

Texas Heart Institute (THI)

Presented by: Omar Al-Salti, Troy D’angelo, Chayyon Thayaparan
Date Presented: Feb 22, 2015
Background

- The Thoratec HeartMate IP LVAS was made during January 1986 in the THI
- FDA approval was granted in 1998
- Main function Thoratec HeartMate IP LVAS Is used as a bridge to heart transplant patients
- Results provided by the Thoratec HeartMate IP LVAS Improvements by the Thoratec HeartMate IP LVAS
Components
Pump

- Function
  - Pneumatic Ventricular Assist
- Materials
  - Titanium Alloy Cage
  - Porcine Vale with Dacron-Fabric Graft
  - Polyurethane Diaphragm
- Physiological Values
  - SV = 83 mL
  - Max bpm = 140
  - Q = 12 L/min
HEART MATE (IP LVAS)
Console

- Display
  - Pump Rate
  - Stroke Volume
  - Total Blood Flow
- Operation Modes:
  - Automatic mode
  - Fixed rate mode
  - External mode
- Cables and communication lines
- Drive console
Questions
References


Images:

- http://square.umin.ac.jp/jscvs/jpn/graphic/figure/V_2_figure1.jpg
Developed by SynCardia Systems Inc. in Tucson, Arizona.

- First tested on humans between 1988 and 1990
- First implanted in 1993
- First and only FDA-approved TAH (2004)
Classification

- **Total Artificial Heart**
  - Bi-ventricular implantable device
- **Bridge to heart transplant**
  - 79% of TAH patients were bridged to a donor heart after a mean wait time of 79 days.

- Provides blood flow to both lungs and body
  - Restores kidney and liver function because normal blood flow is restored
- Pneumatically powered pulsatile flow
  - 9.5 L/min
  - Pulse of air pressure applied to the opposite side of diaphragm

- Portability – In Hospital
  - Hospital Cart – Good support for early recovery
  - Driver Caddy – Greater mobility for within hospital

- Portability – Out of hospital
  - Freedom Portable Driver
  - 6 kg, including 2 batteries
  - Housed in a backpack or shoulder bag

- 2 models
  - 70 cc – in use
  - 50 cc – under development

- As of April, 2013: 128 patients worldwide
References


Axial Blood Pumps: Hemopump

Salomon Gonzalez
Joshua Proud
Sundar Siva
Context

Nimbus Medical Inc., CA

Introduced in 1988

No longer in use

Short term treatment

Texas Heart Institute
Classification

Temporary left ventricular assist device
Provides temporary heart stimulation
Small axial flow pump
Continuous non-pulsatile flow
Intracorporeal
Technical Characteristics

- Pump driven via flexible steel cable from an electric motor
- External 24V power source
- Max pump speed is 25000 rpm (290-470 rpm)
- 3.5 l/min
References


Jarvik 2000

Presented by:
Francis Lefebvre   Sofia Benitez   Tessa Clarke
Overview

- Left Ventricular Assist Device (LVAD)
- Jarvik Heart Inc., New York, NY, USA
- In 2000, Ms. Lois Spiller receives first Jarvik 2000 device
- Treated over 200 patients in the US, Europe, and Asia
- Approved by FDA for Clinical Trials for Destination Therapy in the US
- Earned CE Mark certification for both bridge-to-transplant and lifetime use in Europe
How it Works

- Non-pulsatile, electric axial flow pump works in tandem with heart beats
- Implanted in the left ventricle and outflows to the aorta
- Controlled by patient using external controller
- Max Speed 12 000 RPM (5-7 L/min)
- Power cable exits body through abdominal wall or behind ear
- Portable light Battery Pack powers the pump for 8-10 hours
- Total Controls and battery pack weigh 3 lbs
Advantages - Disadvantages

- Small
- Single Moving Part
- Silent
- Portable

- Infection
- Clots & Stroke
- Requires a Battery Power Supply
- Extracorporeal Components
Jarvik 2000

Jarvik 2000 flow maker:
- 90 gr
- 25cc
PDMS
Hydrogel
Endothelial cells

Replicate of microcirculation network

Valve open

Valve closed

% Oxygen controlled
In gas chambers
Novacor LVAS

Nemanja Babic

Slim El Kamel

Jasmine Gauthier
Context

- **Problem**: Large need for heart transplant
- **Solution**: Stabilize the patient before they have access to a donor heart

- Novacor LVAS device

- In 1979, Novacor Medical Corporation was first to commercialize the device

- Pump lasts up to **4 years**

- Has been in clinical use of over 20 years ( >1700 patients)

- No longer commercially available

- No deaths attributed to device failure

- Can be used for short-term and long-term
Classification

- Left ventricular assist device (LVAD)
  - Bridge to transplant
  - Destination therapy
  - Bridge to recovery
- Pulsatile Flow
- Both internal and external components
Technical characteristics

-Pulsatile flow pump, electromagnetically driven

-Battery Powered

-Loud hollow clicking sound
Conclusion
References

http://www.wikinvest.com/stock/World_Heart_(WHRT)/Novacor_Lvas

http://perfusioneducationonline.com/vad/novacor.htm


https://vimeo.com/41514591

Medtronic Bio-Pump

Brandon Tran
Alex Thibodeau
Michael Abdelmalek
Context

- Developed by Medtronics
- Ireland in 1995
- In use and commercially sold
- For cardiopulmonary bypass or short circulatory support
- Short term assist device
Classification

- Supports one or both ventricles
- Non-pulsatile
- Extracorporeal, centrifugal device
- Can be implanted in a broad range of patients
Technical Characteristic

- Two disposable models
  - Priming volume: 80 mL model for adults
  - Priming volume: 48 mL model for children
- Battery powered (lasts for 45 mins)
- Inlet/Oulet inner diameter of 3/8"
References

The MEDOS HIA/VAD system

By: Valérie Hébert, Camille Gauthier-Kwan, Antonia Szeto
Device origins

- Design was initiated in 1982 by the Helmholtz Institute Aachen (HIA) in Germany.
- In 1994, device was introduced in a clinical trial after a series animal experiments had been performed at the University of Groningen, Netherlands.
- Since Feb until the end of 1997, device has been used on 217 patients, and more than 500 operations have been performed in about 80 centers.
- One of the leading systems in Europe.
- Short to midterm use for circulation assistance for patients with myocardial failure of circulation and failure in conventional therapy.
- Can be used to stabilize a patient during heart failure or can be used as a bridge to transplantation.
What is it?

- Extracorporeal, pulsatile, displacement pump
- Pediatric VAD
- Used for left, right or both ventricular failure
- Central cannulation
- Anticoagulation required
- Adjustment of pulse rate, drive pressure, and percentage systole to optimize hemodynamics
How does it work?

- Pneumatic pulsatile pump draws blood by alternating negative and positive air pressure
- Multilayer polyurethane ventricles are delivered in four versions
- Electronic control system used as integrated driving system
- Trileaflet polyurethane valves to straighten blood flow
- ECG asynchronous or synchronous mode
- Used to stabilize a patient during heart failure or can be used as a bridge to transplantation.
Thank you
Questions?
Sources

https://books.google.ca/books?id=gszuCAAAQBAJ&pg=PA137&lgp=PA137&dq=Medos+HIA-VAD+system&source=bl&ots=75fI4z8jIT&sig=Sl_8VgSfnvQo1uv79cDFml5sC9k&hl=en&sa=X&ved=0ahUKEwit3-yIzPrKAhVGuIMKHX_iDUEQ6AEILDA#v=onepage&q=medos&f=false

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https://books.google.ca/books?id=TW4UIIRG_CAC&pg=PA154&lgp=PA154&dq=Medos+HIA-VAD+system&source=bl&ots=usrO0JiFzl&sig=S9ii-pqlR_0txLM4zwi3A-CJ7Pc&hl=en&sa=X&ved=0ahUKEwjMtNWW2PrKAhWiu4MKHX33B_IQ6AEIRjAI#v=onepage&q=medos&f=false

Thoratec VAD

University of Ottawa

February 22, 2016

Majid S.         Mohammad W.         Bryson W.
Introduction

- Intermediate to chronic VAD
- For late stage heart failure patients who potentially need a long term support
  - Is either a bridge to transplant or destination therapy
- Restores hemodynamic function
Function

- Device takes over the function of the ventricle that cannot perform its task
  - Bridge to transplant or reduce stress post-cardiotomy
- Pre-implantation hemodynamic conditions are irregular
  - Loss of energy
  - Impaired organ function
- VAD aims to replace the ventricle’s function
Parts and Materials

- Wireless Tablet *(optional)*
- Internal Pump with polyurethane chamber
- External battery
- External pump controller
- Percutaneous cable
Design

- Single moving part (the rotor/impeller)
- Pump impeller is tubular
  - Reduction in: noise and shear stresses on blood
  - Impeller is not driven by a motor, impeller acts as rotor
- Tube connects ventricle to aorta
- Can supply anatomical blood flows (up to 10L/min)
- Uses external controller and batteries
- 60% smaller, only 400g
Results

- Used in 1,376 patients since May 2000
- Used as bridge to surgery in 828 cases
- Used for postcardiotomy support for rest
- Device has been implanted for up to 515 days
- Post implantation survival rate: 86%
## Advantages

1. FAA Approved
2. Long term support possible
3. Quiet Design
4. Low risk (through proven reliability)
5. Improved hemodynamic properties
   - i. Low risk of hemolysis and thrombosis
   - ii. Lower requirements for anticoagulants

## Disadvantages

1. Limited battery life
2. External components are distracting
3. Percutaneous cable causes discomfort
4. No test data on pediatric population
5. Not a full replacement
Conclusion

• The Thoratec is an innovative device due to its impeller design
• HeartMate II and III have good hemodynamic properties
• Overall great solution for people waiting for transplant
References

