A Physiological, Pulsatile Driver for Continuous Flow Left Ventricular Assist Device (LVAD): Innovation Using an Implantable Ultra-compact Controller with a Wireless Graphical User Interface

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Disclosure:

Both authors are patent holders
Left Ventricular Assist Devices (LVADs)
Continuous Flow

GI Bleeding (AV Malformation)

Aortic Incompetence

Diastolic Hypertension

Neurological Events ???
A Totally Implantable LVAD

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Portable FREE-D

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Physiological Controller for LVADs
UMC-Physio
Modes of Operation

- Continuous

- Pulsatile
Smart Platform
Graphical User Interface
Pulsatile Mode 1

High Speed during Diastole

LVAD Speed (1000rpm)

Time(s)

Systole
Diastole
Pulsatile Mode 2

High Speed during Systole

LVAD Speed (1000rpm)

Time(s)

Systole

Diastole
Control Algorithms

- Flow Estimation Algorithm:
  - Pump speed
  - Power
  - Blood viscosity

- Ventricular Suction Detection Algorithms

- Applicable to centrifugal and axial LVADs
In-vitro (two week of HMII)
In-vitro (two week of HVAD)
In-vivo
Conclusion

• A physiological controller that mimics human pulse is possible to run the conventional continuous flow pumps.

• A small foot print allows no additional implantable burden.

• These are few of the first steps towards making the next generation of totally implantable LVADs
Thank you