



**Total artificial heart devices:
the next generation is here**



LVAD

- rotary pumps
- less invasive
- less thromboembolic events
- high clinical experience



TAH

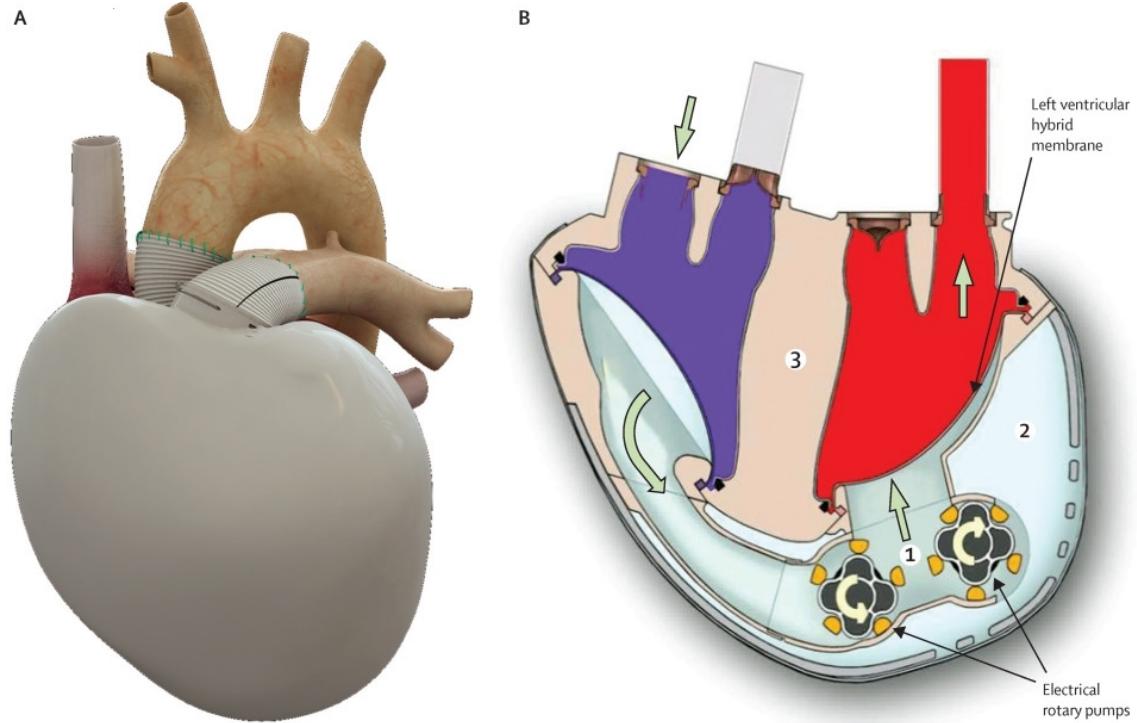
- biventricular solution
- pulsatile flow
- maximally invasive
- complex machines – failure modes

- Carmat
- Realheart
- Bivacor
- Heartmate 6



Carmat

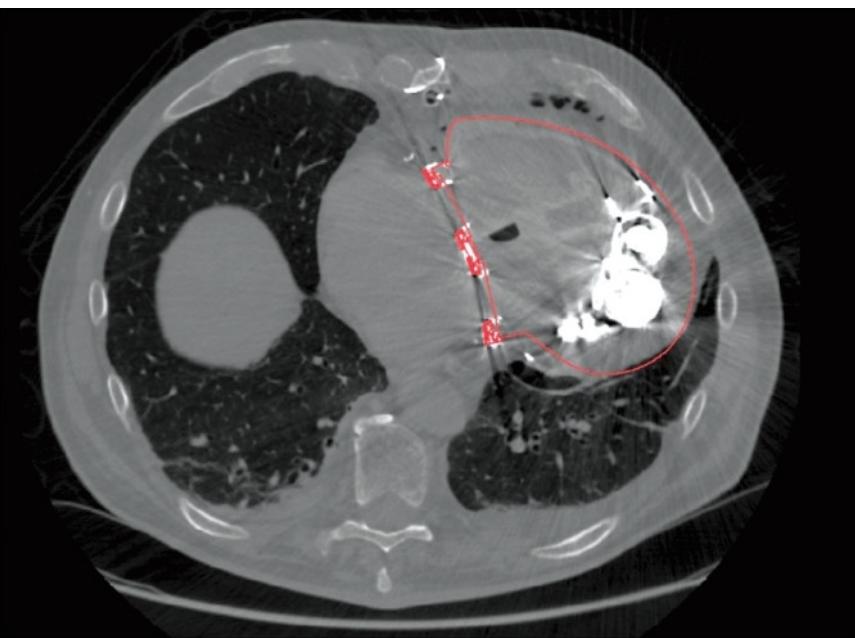
Carmat



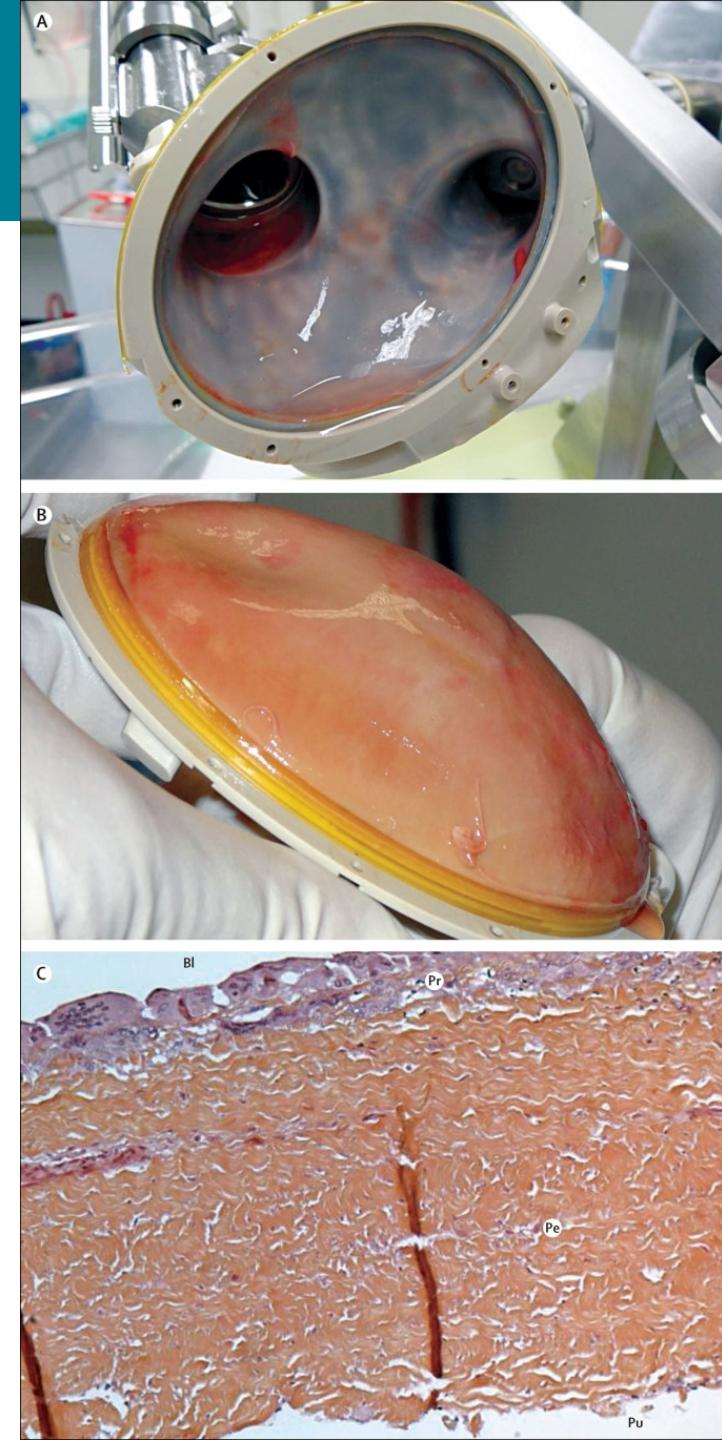
- Pulsatile
- Autoregulated
- Biocompatible surface
- First implant 31/12/2013 C. Latremouille

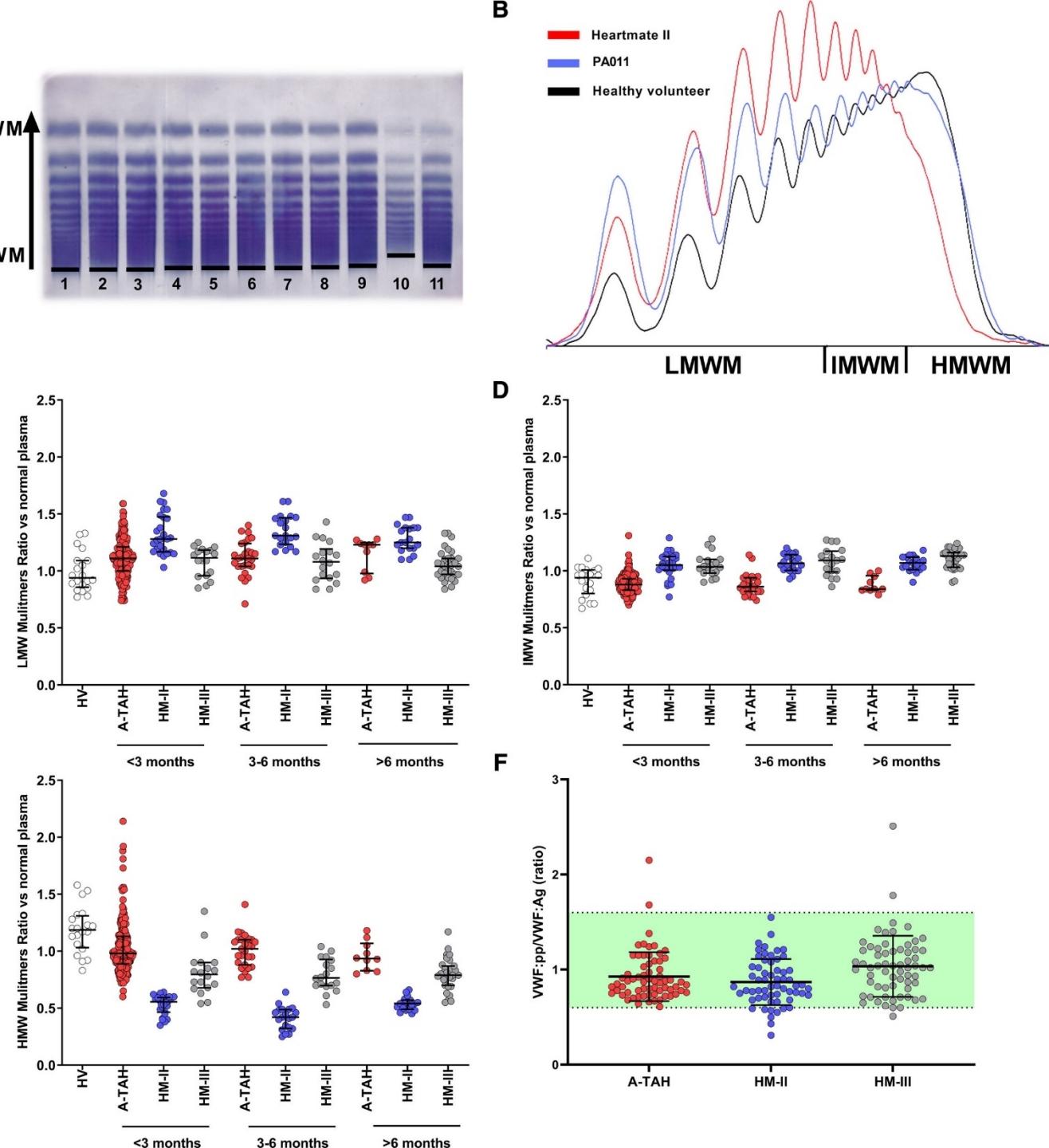
Carpentier et al. First Clinical use of a bioprosthetic TAH: report of two cases. Lancet 2015

SpO₂ 100 PA 159/59 (84) Pulse 94



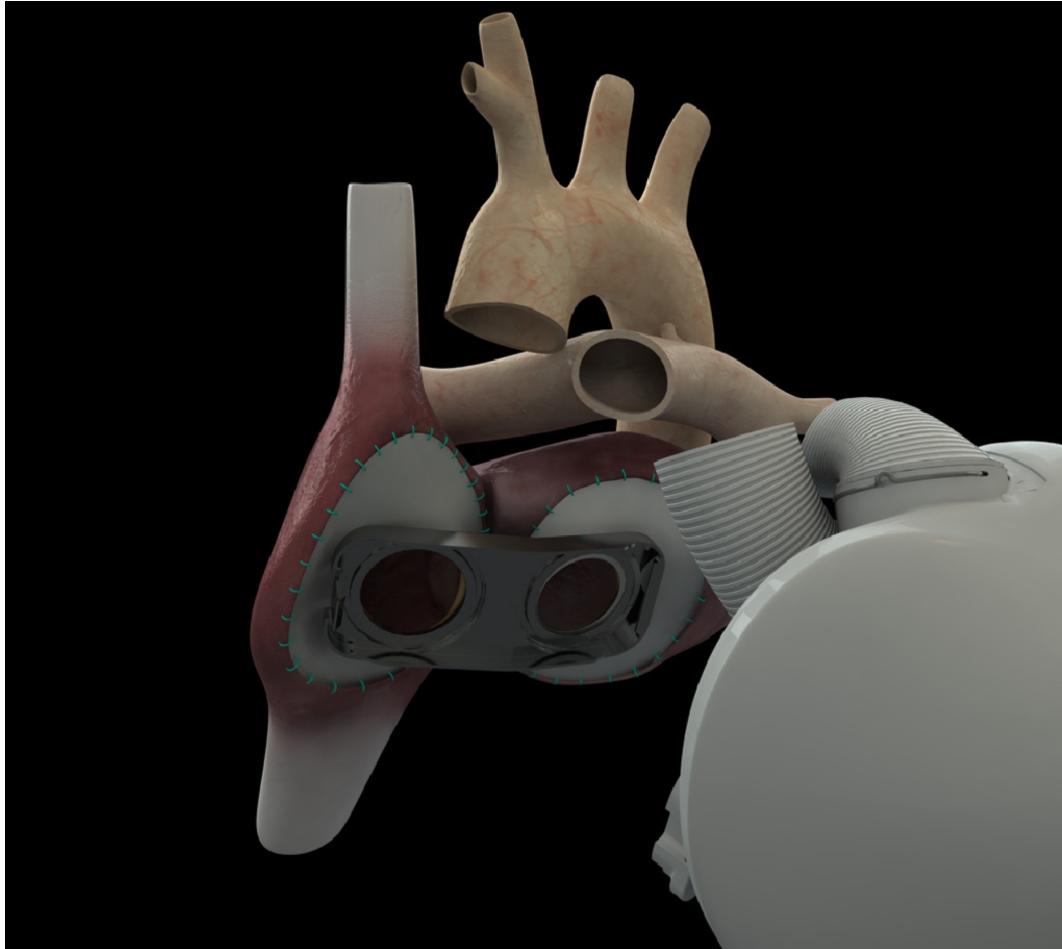
- 19 implants
- CE mark for BTT





- No impact on VWF
- No hemolysis

Poitier et al. Bioprosthetic TAH in Autoregulated mode is biologically hemocompatible. Arterioscler Thromb Vasc Biol 2022

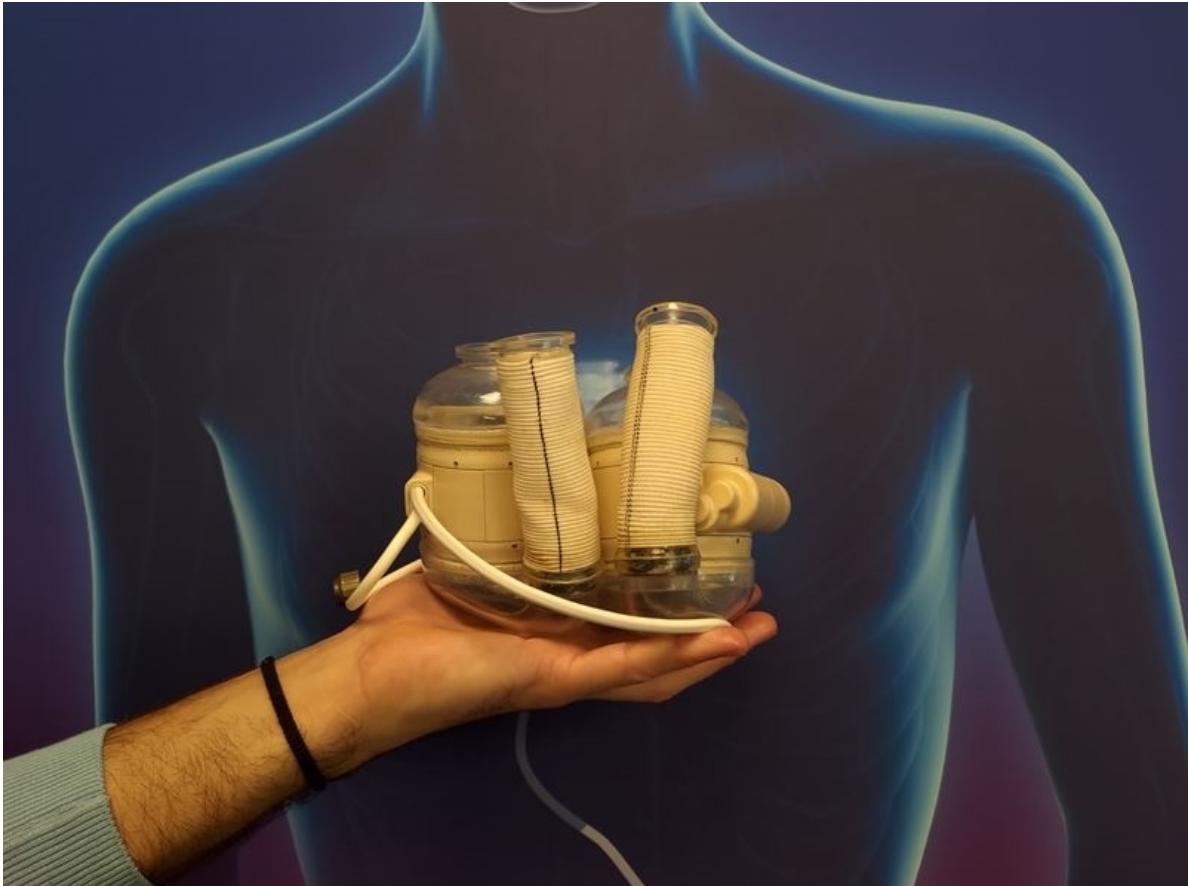


- N=7
- Preop CT scan:
 - 9 of 12 screened compatible
- No thrombosis, stroke, hemolysis or GI bleeding
- 5 survived
- Hemodynamic status > LVAD
- Implants stopped in March 2022



Realheart

Realheart

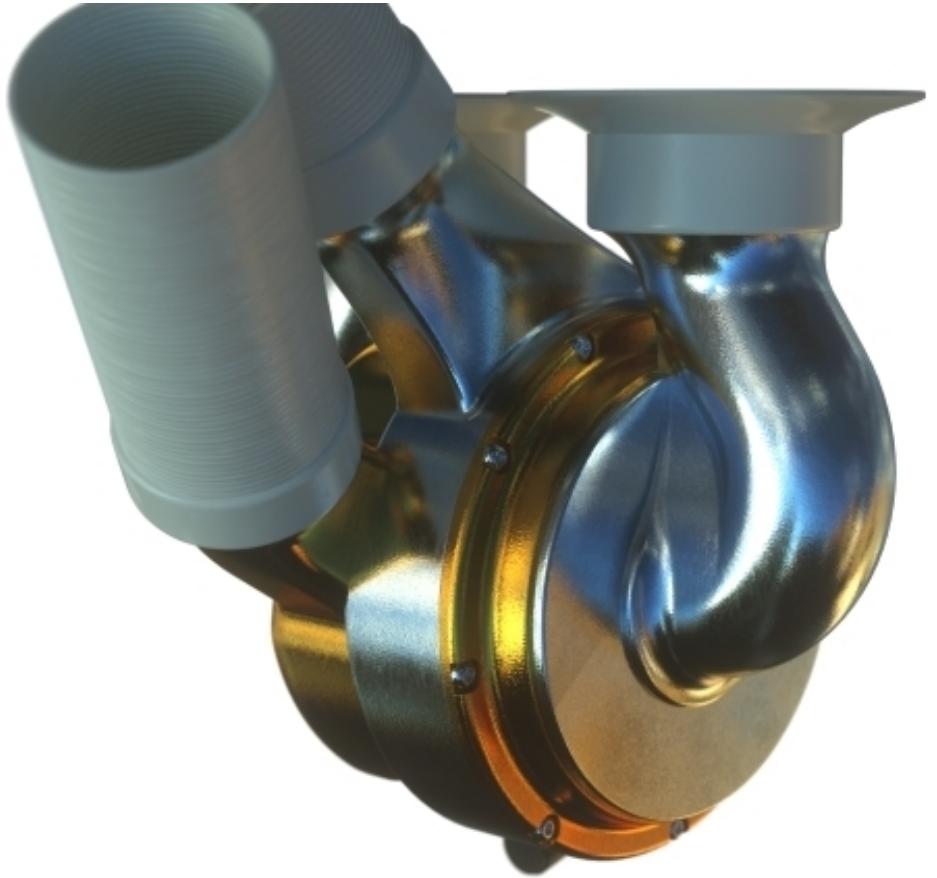


- 2 separate chambers
- Actuator moves a mechanical valve
- Pulsatile flow
- Controlled by inflow pressure
- Ongoing animal trials
- Big size

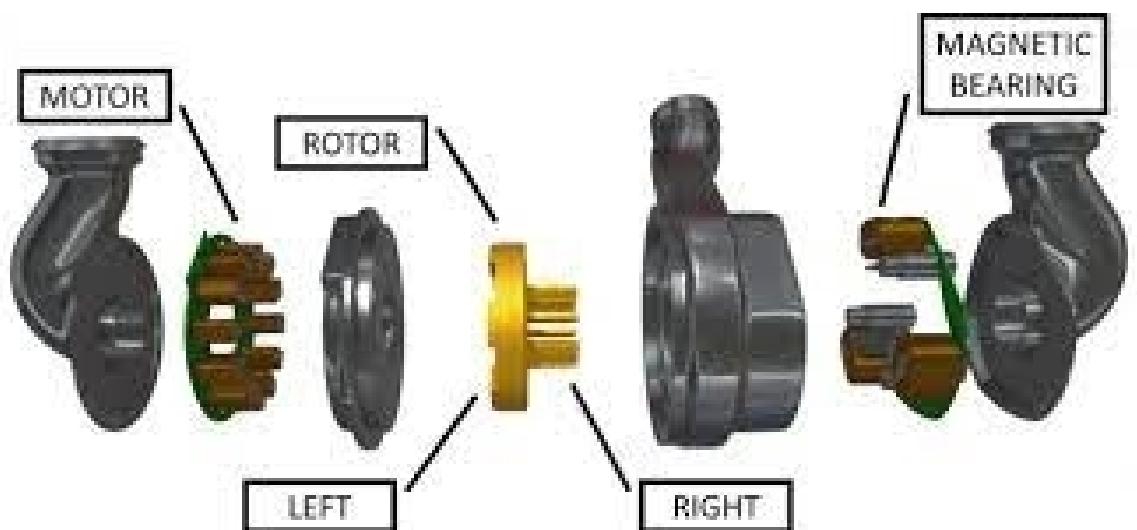


Bivacor

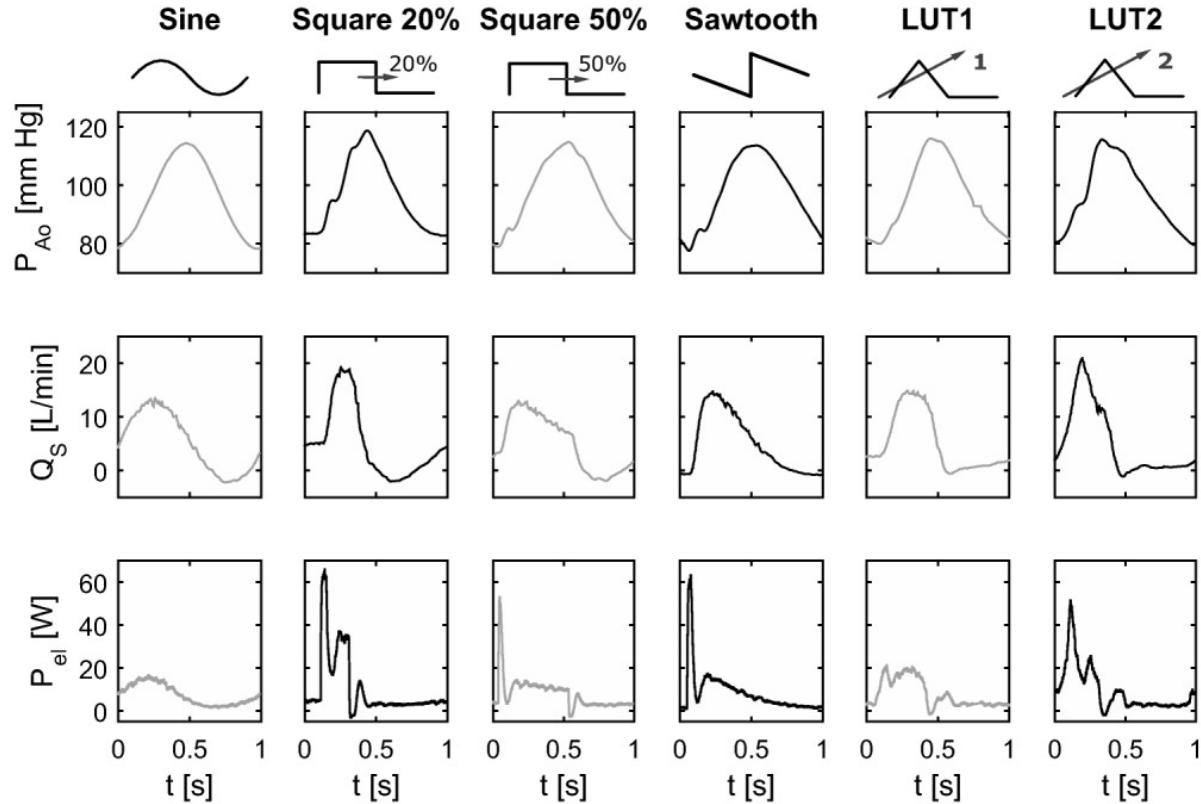
Bivacor



- Single rotor for left and right
- Magnetically suspended
- Controlled by inflow pressure
- Ongoing animal trials
- Smaller



Rapid Speed Modulation of a Rotary Total Artificial Heart Impeller

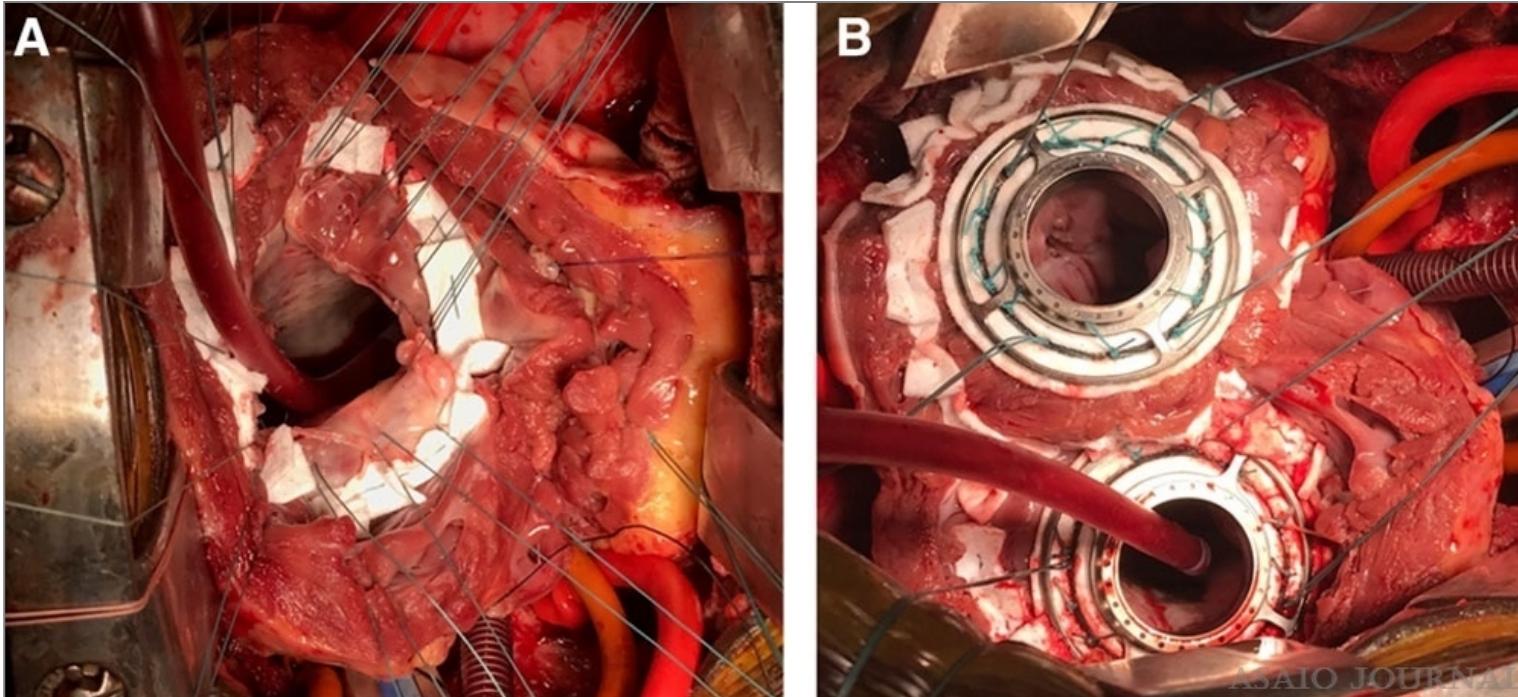


- Pulse pressure of 35 mmHg
- Different wave forms to obtain most physiologic pulse pressure and flow



Heartmate 6

Heartmate 6



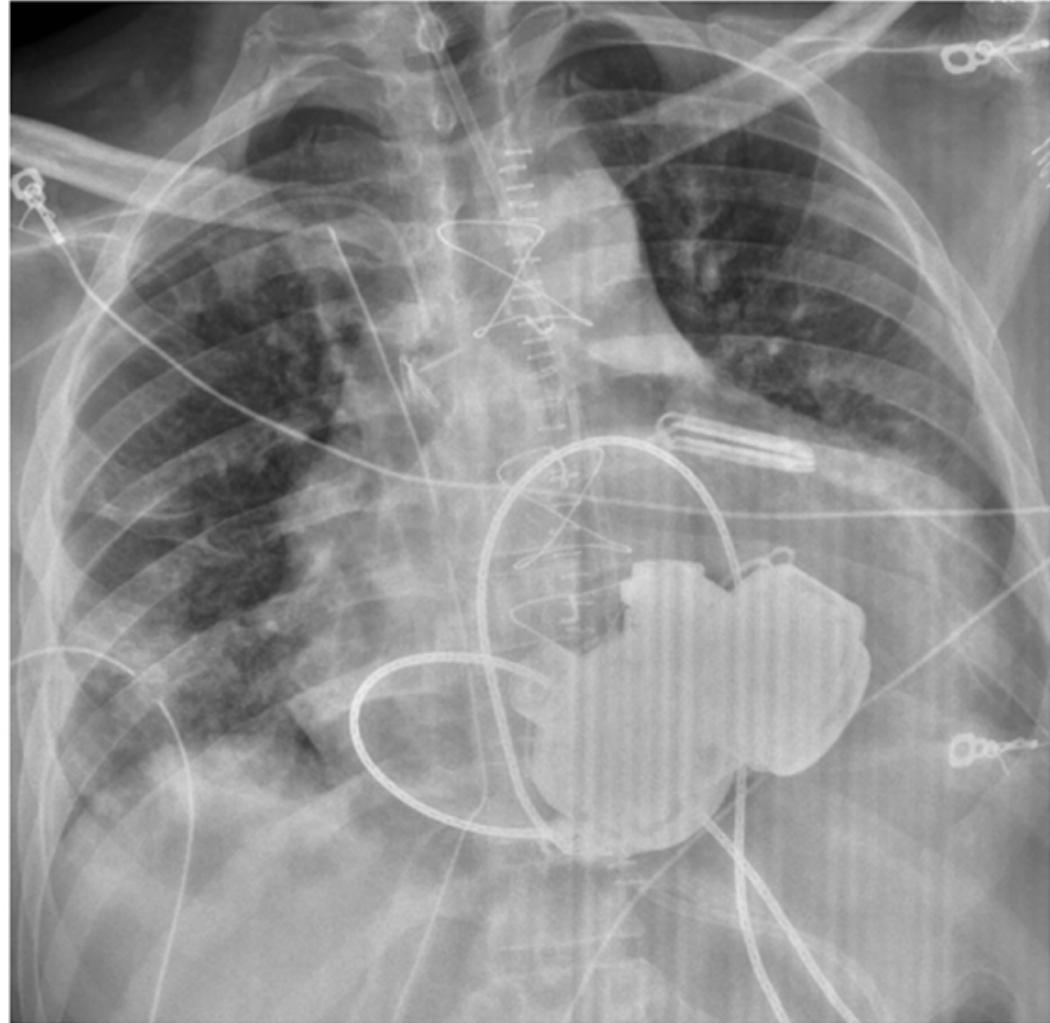
Intraoperative image demonstrating final positioning of pledges (A) and the sewing rings (B) before pump attachment.

The HeartMate 6

Daneshmand, Mani A.; Bishawi, Muath;
Milano, Carmelo A.; Schroder, Jacob N.
ASAIO Journal 66(3):e46-e49, March 2020.

Duke University

Heartmate 6



- 37y old with myocarditis on HVAD support
- mediastinal infection
- right heart failure
- bridged to HTX after 30 days

Summary Total Artificial Heart

1. Superior in hemodynamics

Pulsatile

Biventricular

Adaptation to exercise

2. Rotary pumps (Bivacor and Heartmate 6)

smaller

more simple

3. Clinical experience to develop in coming years