Nature Reviews Cardiology **12**, 561 (2015); published online 18 August 2015; doi:10.1038/nrcardio.2015.125

DEVICE THERAPY

Artificical heart uses bioprosthetics to avoid thromboembolic complications

A new design of total artificial heart (TAH) has been implanted in two patients with end-stage heart disease. This TAH has bioprosthetic surfaces to reduce the risk of thromboembolic and haemorrhagic complications, for long-term tolerability.

Mechanical heart substitutes have been in clinical use for >45 years, enabling temporary bridging before transplantation. However, the goal of an effective therapeutic device for patients with biventricular failure has been hindered by the risk of thrombus formation, and the negative effects on quality of life of noisy, bulky devices.

Bioprosthetic heart valves are well tolerated, and the new TAH has a combination of polymeric membranes and treated bovine pericardial tissue. Evidence suggests that this tissue forms a thromboresistant layer as it becomes coated with endogenous protein on long-term exposure to blood. The biventricular TAH is shaped to fit within the pericardial sac, replacing the patient's ventricles. Blood from the atria fills the TAH ventricles and is pumped out by displacement of the ventricular membranes by the back-and-forth movement of silicone oil in an adjacent, sealed compartment. The electrohydraulic pumps are quiet and can adjust heart rate and stroke volume, giving physiological pressure curves.

TAH implants supported one patient for 74 days (including 50 days without anticoagulants) and another for 270 days. Both patients died after device failure resulting from defective electronics, which have now been identified and corrected. The performance of the devices before failure was encouraging for future studies.

Robert Phillips

Original article Carpentier, A. *et al*. First clinical use of a bioprosthetic total artificial heart: report of two cases. *Lancet* doi:10.1016/S0140-6736(15)60511-6