

## Introduction

Heart transplantation remains the gold standard treatment for end-stage heart failure. The Total Artificial Heart (TAH) is the only Food and Drug Administration (FDA) approved artificial heart used for bridging patients to transplantation. Outcomes in patients who undergo implantation of the TAH at experienced centers have been good and reproducible.

## History

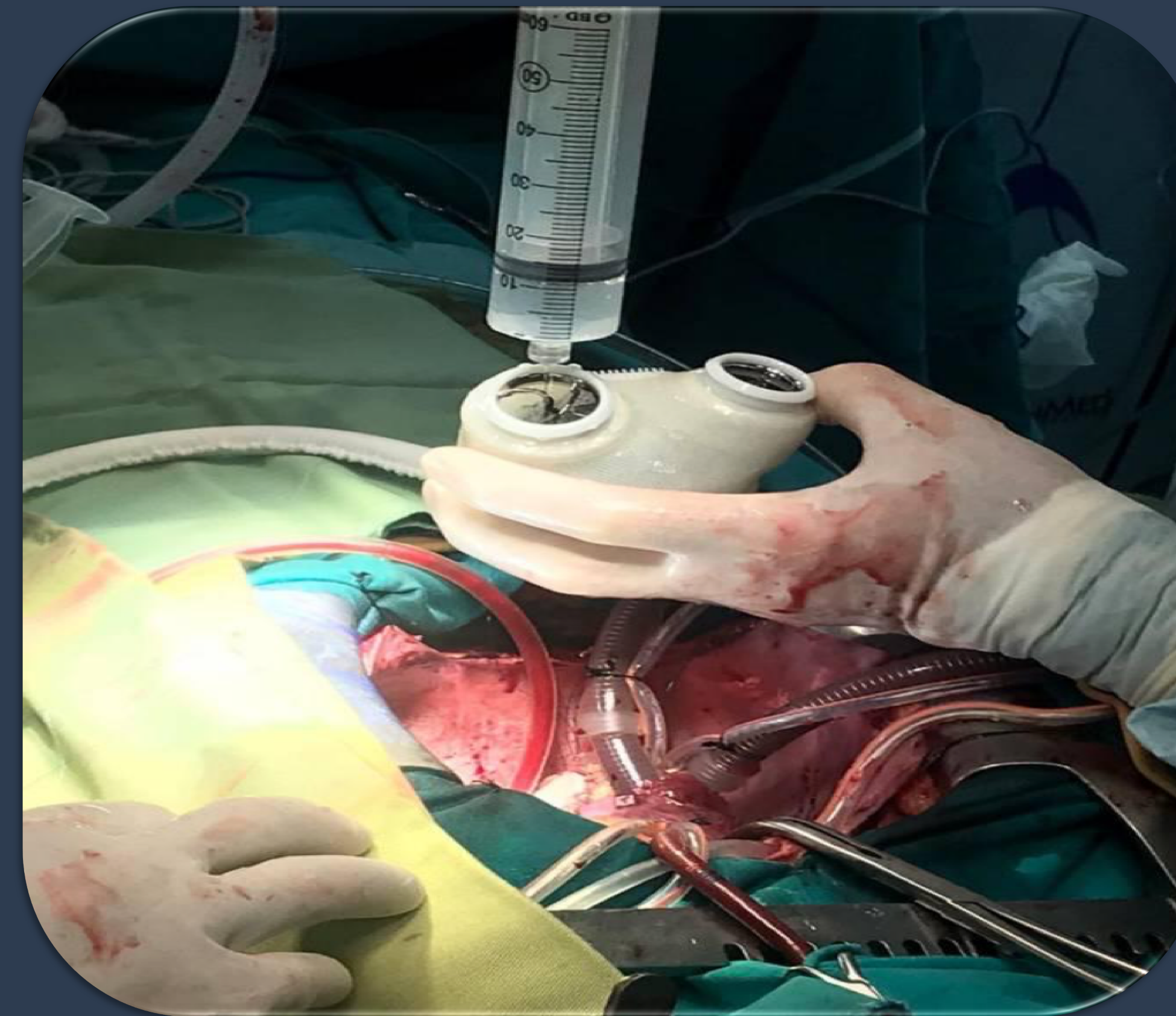
In 1969, Denton Cooley and Domingo Liotta performed the first human TAH implant using the Liotta Heart (an experimental device designed by Dr. Liotta, a former trainee of Dr. Kolff). It seemed fine at first; however, the patient's renal function started to decline and hemolysis started. A donor had to be located for a human heart transplant 64 h after the initial surgery and patient went on to die 32 h after the human heart transplant due to pneumonia. The first successful implant was implanted in 2010, using the portable freedom driver.

## How does it work?

The TAH replaces the lower chambers of the heart, called ventricles. Tubes connect the TAH to a power source that is outside the body. The TAH then pumps blood through the heart's major artery to the lungs and the rest of the body. The TAH beats 140 times a minute, restoring normal blood pressure and allowing organs to recover.

## Costs

Estimates of the cost of the artificial heart include charges for the surgical procedure, device and console, and continuing medical surveillance. These estimates range from a low of \$100,000 to a high of \$300,000 per patient in the initial year.



## What are the benefits of a TAH?

The TAH offers several benefits relative to present continuous flow left ventricular assist devices (LVADs), including higher 'quality' flow rates, reduced afterload and preload sensitivity, reduced thrombosis and stroke rates, and freedom from device-induced bleeding.

## Summary

Severe end-stage biventricular function is a complicated problem for clinicians. The TAH is the only FDA approved artificial heart available. Although these patients are often critically ill, there has been good success in bridging patients to transplantation with the current TAH. The future is bright for mechanical circulatory support as new artificial hearts are being created with the continuing advances in technology.

## What are the risks of implanting a TAH?

- Surgery to fit an artificial heart can lead to bleeding and infection.
- Artificial hearts don't work as healthy as natural ones-parts could wear out or the electrical motor could fail.
- Blood flow doesn't flow through artificial hearts as smoothly, which can cause blood clots and lead to strokes.
- The patient has to take drugs to thin their blood, or problems with bleeding will occur.

## References

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