

DEVELOPMENT OF HUMAN MODEL OF THE MOVING-ACTUATOR TYPE TOTAL ARTIFICIAL HEART

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A two-year project for the development of the moving-actuator type total artificial heart (TAH) has begun in June 1991. The goal of this project was to develop a human model of the moving-actuator type TAH for clinical application. KORTAH I is the actuator and blood pump model of the first phase and has been completed last July.

The structural features of KORTAH I include small size, more anatomical port position and orientation for better fit, and S-shape wiring system to solve wire fatigue problem. The overall size of the implanted pump system is: 12cm in length, 6.5cm in height, and 9 cm in width. This size is expected to be easily implanted inside 50-60kg recipient's thoracic cavity. Fitting trials were performed in dogs and sheep after ventricular assist device experiments and KORTAH I fitted well with 50-60kg animals. Maximum output of 6.5 L/min was achieved in mock circulation test with a heart rate of 110 BPM and 100 mmHg of afterload. A unique balancing mechanism without a compliance chamber was also shown to be very effective in compensating the left and right ventricular output difference. After about 3 months test on the mock circulation, S-shape wiring system was examined to investigate the degree of wire fatigue. There existed no sign of mechanical damage on the wire. A separate special wire fatigue tester has been running without single failure for almost 2 years. A series of animal implantation using sheep is scheduled to be started from October of this year. After animal experiments where the *in vivo* performance of KORTAH I will be evaluated, it will be upgraded to be our final human model, KORTAH II through the design optimization.