

Pump design could give heart patients new hope

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A new counter-flow heart pump being developed by Queensland University of Technology has the potential to revolutionize future designs of the mechanical heart.

Lead researcher Associate Professor Andy Tan said the heart pump's innovative design was based on a double-output centrifugal model that pushed the blood in a counter direction to ensure correct flow through both sides of the heart, and is the subject of a patent application.

"The counter-flow pump is a bi-ventricular assist device (BVAD), meaning it supports both the left and right sides of the heart simultaneously," he said.

"But what's so groundbreaking is that it is the first device to combine the function of two pumps into one unit.

Professor Tan said current double heart pump technology was too bulky because it required the implant of two pumps that worked independently.

"The problem with two pumps is that it requires different controllers and can potentially lead to an uneven blood flow.

"The concept of the counter-flow pump is that it has two independent impellers to simulate two pumps to augment the operations of the left and right ventricles but is essential only one.

"Using independent impellers, the blood is able to flow at a higher delivery pressure as required by the left chamber of the heart, and a slower pressure as required by the right chamber of the heart."

Professor Tan said a shortage of heart donors and high rates of cardiovascular disease were driving scientists across the globe to develop the technology for a replacement heart.

"Each year in Australia, 44 per cent of all deaths are related to heart disease," Professor Tan said.

"In fact heart failure, stroke and vascular disease kill more Australians than any other disease group. To reduce the number of deaths, treatment is now focused on medical devices that can assist or totally replicate the function of the heart."

He said a heart pump capable of supporting both chambers would dramatically increase patients' chance of survival.

"Clinical studies around the world have found that patients who received a permanent left heart pump (left ventricular assist device) reduced their risk of dying within one year by 47 per cent," Professor Tan said.

"Unfortunately 25 per cent of these patients went on to develop right heart failure syndrome, infection and multi-organ failure. We have developed the design, and computer modelling has shown that it works."

Professor Tan, who has pioneered artificial heart research at QUT, is a member QUT's Institute of Health and Biomedical Innovation. He established the QUT/Prince Charles Hospital (TPCH) research team which utilises the expertise of the hospital's cardiologists and heart surgeons. The group has produced a number of pump designs.

Source: Research Australia

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