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Growing living-tissue heart valves a reality in 3-5 years: study  
[Agence France-Presse English Wire]

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by Marlowe Hood

PARIS, Sept 2, 2007 (AFP) - Surgeons will soon be able to literally mend a broken heart using live tissue grown from a patient's very own stem cells, top cardiologists said Monday.

The whole procedure -- harvesting cells from bone marrow, growing tissue, and surgically implanting the heart muscle or valve -- could take as little as six weeks and could become routine within three-to-five years, they reported.

Their findings were published in a special issue of the Philosophical Transactions of The Royal Society B in Britain.

One reason heart attacks are so debilitating, even when they are not fatal, is because the human heart -- a massive muscle surrounding four valves controlling the body's blood flow -- does not regenerate. Damaged tissue stays damaged.

Most problems occur with age, when the old ticker simply begins to wear out.

"But the highest medical need for tissue-engineered heart valves is in the treatment of congenital heart malformation," which affects nearly one percent of all newborns, Simon Hoerstrup, lead author of one of the studies, told AFP.

Artificial heart valves currently available must be periodically replaced as

children grow, leading to great suffering and higher death rates than in adults.

Bio-engineered heart muscle that could be grafted onto a patient's living tissue without fear of rejection by the immune system has long been a holy grail of cardiovascular medicine.

Artificial replacements "do the job and save people's lives," said celebrated heart surgeon Magdi Yacoub, who coordinated the 20-odd studies.

"But they cannot match the elegant, sophisticated functions of living tissues."

While durable, mechanical hardware increases the risk of bacterial infection in the heart's inner lining, as well as abnormalities in blood flow. Recipients must also take medication to prevent blood clots, boosting the chances of internal bleeding and

embolisms.

Cardiovascular disease, the number one killer worldwide, claimed some 17.5 million lives in 2005, according to the World Health Organisation. Many of these deaths might have been avoided by timely surgery to implant replacement valves and heart muscle.

There are currently two broad techniques for making bio-prosthetic heart valves, and both have serious drawbacks.

Animal grafts, especially from pigs, are readily available, but differ in structure and tend to wear out. Human valves from donors work much better, but are in chronically short supply and can easily provoke immune reactions.

In the tissue engineering approach favored by Yacoub and Hoerstrup, the patient's own stem cells -- taken from bone marrow -- are isolated and expanded in the laboratory using standard cell culture techniques.

They are then "seeded" onto a special matrix in the shape of a heart valve that is positioned in a device called a "bioreactor" that tricks the cells into growing in the right shape.

Once mature, the living-tissue heart valves can be implanted in the patient. The whole process unfolds in a matter of weeks.

This procedure has already been extensively tested in sheep, but several years of follow up are required before it can be deemed effective and safe, said Hoerstrup.

Another hurdle, he said, is that the capacity of some patients to yield suitable stem cells may be compromised by diseases such as diabetes.

mh/ss

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