Lifevalve – GROW YOUR OWN – THE “LIVING” HEART VALVE REPLACEMENT

It is high on the list of every expectant parent’s anxieties. Of every 100 newborn babies, one is born with a congenital heart defect. Of these, half will need open-heart surgery to replace a heart valve. It is a traumatic and life-threatening operation.

Even if this operation is successful, the problems are far from over. Replacement heart valves risk rejection by the body, require permanent medication, and are prone to wearing out or breaking.

Most importantly of all, perhaps, they are not capable of growing with the baby’s body. Eventually, they have to be replaced to keep pace with the growing heart.

So babies born with heart problems face not just one traumatic operation, but potentially a lifetime of them – each one a new risk to survival. For many families in this situation, it must feel like an almost endless game of Russian roulette.

All that could be about to change. As a result of an EU-funded research project known as “Lifevalve”, two breakthrough technologies are being combined to provide a solution.

A “living” heart valve, made from the baby’s own tissue and able to grow with the baby, could now be just a few years away. Moreover, doctors would be able to perform the valve implant without the need for open-heart surgery.

“The aim of our project is to create living heart valves made of the patient’s own cells,” says Simon Hoerstrup, Director of the Swiss Centre of Regenerative Medicine at the University Hospital in Zurich.

The key to this is a new technology called “tissue engineering”. Cells taken from the baby by means of a minor biopsy are cultivated and multiplied in the laboratory. These cells are then “seeded” onto a 3D model of a heart valve, on which they continue to grow.

As Professor Hoerstrup explains: “We take the cells of the baby, we put them onto a material that has the shape of a heart valve, and then it grows in and forms a new heart valve, a living heart valve.”

Eventually, the framework which supports the cells at the start of the process biodegrades, leaving only the living tissue heart valve.

The second pioneering technology concerns the way the new valve is inserted into the patient. Instead of a major operation, as now, which involves cutting through the breastbone and actually stopping the heart, the Lifevalve project has developed “minimally invasive” technology. Using a catheter, the new valve can be inserted into a blood vessel in the patient’s leg, for example, and then simply pushed up into position in the heart.

Funded by a grant of 9.9 million euros from the EU’s programme to assist innovation in the health arena, Lifevalve brought together eight partners from all over Europe. With each of those eight contributing different aspects of the technology, Professor Hoerstrup says the EU
involvement was crucial. “I think it’s only with such a combination that you can really go forward quickly,” he says.

The first “living valve” could be implanted into a patient as soon as 2014.

63 years after the first ever replacement operation in 1951, medical science is on the brink of a radical transformation which promises an end to the tragic loss of young lives, and the repeated trauma, caused by heart valve surgery.

For the parents of that one baby in every 100, that must seem nothing short of miraculous.

Coordinator
Universitaet Zuerich, Zuerich, Switzerland

Other partners from
Hungary, Netherlands, Switzerland, Germany, Austria

Quick references
WEB www.remedi.uzh.ch/lifevalve.html

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