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Breakthrough in Heart Surgery: Artificial Blood Vessels Exhibit Normal Growth

An animal model-based study published in *Nature Communications* has shown that 'off-the-self' vascular grafts grown from donor fibroblasts are capable of somatic growth. The development of these artificial blood vessels has the potential to prevent repeated heart surgeries in children with certain congenital defects and also significantly reduce the financial burden.

Biomedical engineering is advanced to the point that artificial organs are now being developed in the laboratory. However, the fact that they are artificial means they do not grow with the recipient and later need to be replaced. Thus, children with certain congenital heart defects often need to undergo repeated heart surgeries until adulthood. Syedain and colleagues, from the University of Minnesota, have successfully created artificial blood vessels that grow and expand like normal blood vessels.

Acellular allografts were characterised, stored and then implanted into three lambs of an average age 8 weeks, tracked longitudinally with ultrasound, and subsequently explanted after the lambs reached adult size, at the age of 50 weeks, for mechanical, biochemical and histological characterization.

The results showed that the tissue-engineered vascular grafts implanted in a lamb model exhibited somatic growth and normal physiological function for nearly 1 year. All animals showed normal weight gain and normal heart rate at 30 and 50 weeks, while no complications, e.g. bruising and bleeding, occurred.

While the grafts were implanted as straight tubes, curvature around the aorta was observed at 8 weeks after implantation. Furthermore, graft length and diameter increased to the same degree as seen in the adjacent pulmonary artery. All three grafts were recellularised with organized collagen and elastin deposition. Importantly, there was no evidence of calcification or aneurysm.

The findings of the report provide hope for children who need cardiac vessel repair, reconstruction and replacement. The next step is trials in human patients.

Source: Nature Communications

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