LEIDEN UNIVERSITY MEDICAL CENTER

Collaboration partner sought:

a new technique for the generation of vascular grafts in vivo

Market Sector: Tissue engineering, Vascular grafts

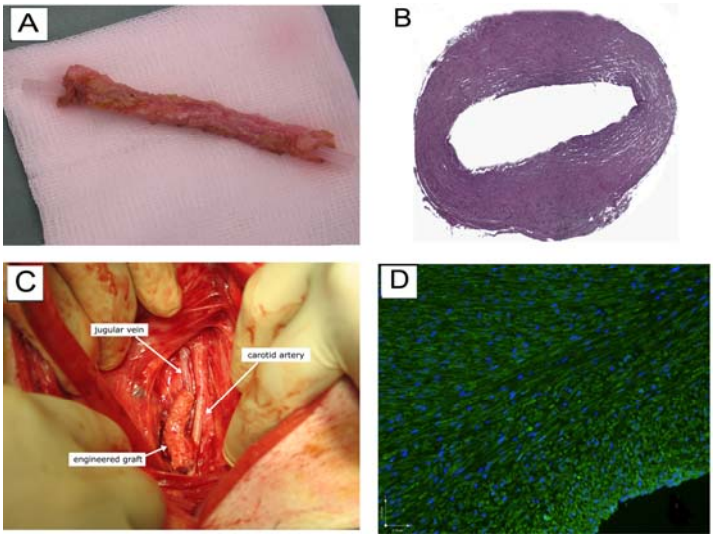

Fig. 1 A. Tissue capsule formed around a polymer rod, 2 weeks after subcutaneous insertion. B. H&E stained-section of tissue before implantation as arteriovenous graft. C: Arteriovenous implantation of tissue engineered vascular graft. D: Immuno-stained section of grafted tissue showing prominent expression of α-actin, a marker of myofibroblasts.

In the US, more than 1.4 million arterial bypass operations are performed each year. During these surgical procedures vascular grafts are transplanted in the patients. These grafts are also implanted in patients to achieve adequate vascular access for chronic hemodialysis. Currently there is a limited availability of biological vascular grafts as adequate tissue is lacking in many patients. To overcome this problem prosthetic grafts are often used instead. However, as the durability of these grafts is very limited there is a considerable clinical need for alternative methods to produce biological vascular grafts.

Scientists at the Leiden University Medical Center have now developed a new in vivo technique for the creation of autologous blood vessels. This invention, providing for the design of Tissue Engineered Blood Vessels (TEBV), offers a potential alternative to fulfil the urgent clinical need.

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The in vivo tissue engineering approach utilizes the human body itself as a bioreactor. The ultimate goal of this approach is that patients grow their own arteries within their own body. The rationale for this method stems from the observation that implantation of prosthetic materials in the human body initiates an inflammatory response that culminates in the formation of an autologous fibrocellular capsule. Once the foreign body is removed and the remaining tissue capsule is grafted into the vasculature, the tissue capsule transdifferentiates into a functional artery.

This method offers the ability to generate TEBVs within 2-3 weeks. Therefore, this method favours over previous in vitro methods for vascular tissue engineering which require laborious and time-consuming procedures to grow vital and sterile blood vessels. The invention might also be more broadly applicable for other myofibroblast-rich tissues such as ureters.

Keywords

Tissue engineering, Vascular grafts, Ureters

R&D status

Successful experiment performed in 12 pigs

Key Benefits

- Provides for production of autologous blood vessels
- Generation within 2-3 weeks
- Sufficient strength for arterial implantation

Future studies

- Long-term follow up study in pigs to assess patency rates and tissue differentiation
- Clinical study
- Optimization of polymer rod
- Development of a biodegradable elastic sheet that can be used as drug delivery platform

Applications

- Use in surgical procedures
- Treatment of therosclerotic vascular diseases
- Use in chronic hemodialysis

Commercial Partner Sought

Biotechnology and/or pharmaceutical partner with expertise in tissue engineering for the joint development of this invention and to perform future studies

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Leiden University Medical Center (LUMC) is strongly committed to the advancement of health care, through research and innovation. In particular, the focus is on translational research, with the overall aim to accelerate transfer of findings from the laboratory to clinical application, and to the market. LUMC has a reputation as a pioneering institute in its field, both nationally and internationally.