to be an ideal matrix for the seeding with vascular cells, its poor biomechanical properties have imitated their use. In our present study we evaluate a novel technique for the engineering of fibrin-based bioartificial vascular segments and report on first in vivo results.

Methods: The manufacturing process is based on the use of a custom-made rotating casting mould and the Vivostat-system for the separation and application of a fibrin precipitation from blood or plasma. Using this technique from 100 mL of blood 10 cm long tubular fibrin segments with an inner diameter of 5 mm were generated. With the optimized process generation of tubular fibrin segments was done immediately prior to implantation. To achieve antithrombogenicity the segments were seeded during the manufacturing process with endothelial and smooth muscle cells, which were isolated from the recipient's blood 4 weeks before and expanded in vitro. 6—8 cm long segments of the carotid artery of sheep were replaced by bioartificial vascular segments ($n = 6$), which were explanted after 1 and 6 months, respectively.

Results: The centrifugal force resulting from the rotation of the mould enhanced the cross-linking of thereby compacted fibrin fibrils and resulted in an up to 10-fold increase of the stability of the fibrin matrix. Using the optimized setting, autologous bioartificial vascular segments were generated within 1 hour prior to implantation. Whereas one segment ruptured immediately after implantation, after 1 month 3 of the remaining 5 segments were patent, 2 were closed due to dissection. 1 of the 3 patent segments was explanted at 1 month and the other 2 at 6 months after implantation. Subjected to the body's remodelling mechanisms in vivo, the segments showed an increasing at least high structural similarity to a native artery after explantation at 6 months.

Conclusion: Although a further optimization regarding biomechanical stability and antithrombogenicity is needed, the results of this study confirm that with the developed technique bioartificial small calibre vascular segments can be generated on demand immediately prior to implantation.

Electrospun Produced Small Diameter Vascular Grafts: Modification of Physical Properties and Assessment of Biocompatibility

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Introduction: Arteries more than 6 mm are efficiently replaced by allo- auto- xeno- or synthetic grafts whereas available grafts of small diameter arteries are obstructed by aneurisms or stenosis. The scaffolds produced by electrospinning represent convenient material for small diameter vascular grafts engineering but increasing flexural strength, kinked resistance, resistance to dishevel and suture retention as well as modification of the porosity, filling grafts with adequate cells are the limitations which should be overcome.

Methods: 3D matrixes (18 × 3 mm) or vascular grafts (i.d. 2 mm) were electrospun produced (EP) using NF-103 setup from polycaprolactone (PCL), nylon 6, polylactic-co-glicolic acid 50:50 (PLGA) and their mixtures with BSA or gelatin in 1,1,1,3,3,3-hexafluoroisopropanol. 2 MeV ILU-6 electron accelerator was used for 3D matrixes electron beam irradiation in doses 25 ÷ 150 kGy. Mechanical strength/structure were tested using Zwick/Roell Z100 testing machine/JSM-6460 LV scanning electron microscopy (SEM), porosity was tested as described in ISO 7198-98. Human primary endothelial cells (HUVEC) and gingival fibroblasts (HGF) were used to check in vitro biocompatibility by means of Axiovert 200 fluorescent microscopy (FM). Vascular grafts were implanted in Wistar rat's abdominal aorta; intravital MRI using BioSpec 117/16USR, histochemical or survey light/fluorescent microscopy (Discovery V12) were used to evaluate grafts functioning.

Results: 3D matrixes/vascular grafts from synthetic polymers or protein/polymer mix were EP. Supplementation of 5% gelatin into PCL increase proportional limit (PL) up to 60%, Young modulus to 50% and yield stress up to 45%. Irradiation increase PL of PCL twice in depend from the irradiation dosage, decrease stability of PLGA-matrix and the efficacy of protein release from mixed matrixes.

Especially produced 5—10 micron inner layer decrease permeability of the vascular grafts from ~19 ± 3 ml to 0,5 ml. The data of SEM/FM demonstrate that irradiation does not interfere with adherence, viability and efficacy of proliferation of both HGF and HUVEC on 3D matrixes. Intravital functioning of vascular grafts using MRI, histochemical and survey light/fluorescent microscopy demonstrate normal functioning of the grafts in vivo.

Conclusion: Irradiation of electrospun produced matrixes was show to be a useful instrument to increase mechanic/chemical properties of the vascular grafts including introduction of stiffening elements (electron beam do not penetrate through less than one mm of steel) and/or their sterilization. In vitro and in vivo study demonstrates that the vascular grafts represent an efficient vascular prosthesis for reconstitution of small diameter blood vessels.

Wall Shear Stress Distribution in the Thoracic Aorta Using 4D MR Imaging: Potential Implications for Aneurysm Formation in Type B Dissection

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Introduction: Mechanical shear forces induced by blood flow play an important role in the process of vascular remodeling. Altered flow characteristics with regionally varying wall shear stress (WSS) have been demonstrated to correlate with the development of aneurysm formation using magnetic resonance (MR) imaging. The aim of this