Human EC were seeded onto the luminal surface of the prostheses without additional pre-coating. Cell attachment and expression patterns of the endothelial adhesion molecules E-Selectin, ICAM-1, and VCAM-1 were studied using an immunogold labeling technique, scanning electron microscopy, and energy dispersive X-ray analysis (EDX). Mechanical properties of the prostheses were characterized by suture force measurement.

Vascular prostheses with an inner diameter of 2 mm, a uniform wall thickness of 0.1 mm and fiber diameters ranging from 500 to 2500 nm were fabricated. Electrospun polyurethane grafts showed a two-fold higher resistance to suture forces compared to native arteries. EC attachment was easily achieved without pre-coating the fiber matrix. Stimulation of EC with interleukin-1beta led to a significant upregulation of the adhesion molecules investigated. EDX quantitation showed no differences in the stimulatory responses of EC cultured on electrospun polyurethane in comparison to cells grown on tissue culture-treated coverslips.

We have shown that proper adjustment of the electrospinning parameters allows for the production of small diameter polyurethane grafts which are suitable for spontaneous EC attachment. The underlying synthetic graft surface did not impair the endothelial response toward IL-1 stimulation or adversely affect the regulation of adhesion molecules known to be crucially involved in endothelial-leukocyte interactions.

(OP 103) Endothelial Progenitor Cell Dysfunction in Patients with Progressive Chronic Renal Failure

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Patients suffering from end-stage renal failure are plagued by vascular complications such as thrombus formation of the hemodialysis shunt. Regenerative medicine aims to relieve these vascular symptoms by amongst others tissue engineering of autologous vascular shunts, combining endothelial cells and biodegradable materials. Autologous endothelial cells can be isolated from progenitor cells in the circulation from two distinct cell populations; the rare CD34-positive endothelial progenitor cell (EPC) and the more common CD14-positive EPC. However, vascular diseases often appear to associate with impaired EPC function. We hypothesize that patients with chronic renal failure (CRF) also have impaired EPC function. We therefore assessed the EPC numbers in the circulation of CRF patients during disease progression and dialysis treatment. Furthermore, we assessed angiogenic differentiation and endothelial cell function of these patient-derived EPC after culture on biodegradable diureidopyrimidinone polycaprolactone (PCLdiUPy). The frequency of circulating CD14-positive EPC in the circulation of CRF patients did not differ from healthy controls. In contract, CD34-positive EPC numbers decreased in all patient groups. *In vitro*, EPC of CRF patients showed a strongly reduced adherence to PCLdiUPy and a strongly reduced capacity for angiogenic differentiation. This was observed for all stages of CRF. Noticeably, the antithrombogenic behavior from EPC-derived endothelial cells did not differ between CRF-patients and healthy controls. In conclusion, autologous EPC from CRF patients are inappropriate for tissue engineering of hemodialysis shunts. Further research should reveal the causes of reduced adherence and aim at the development of 'smart' biomaterials that augment adhesion and differentiation.

(OP 104) Engineered Cartilage Generated by Nasal Chondrocytes is Responsive to Physical Forces Resembling Joint Loading

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We tested whether Engineered Cartilage generated by Nasal chondrocytes (ECN) is responsive to different regimes of loading, associated with joint kinematics and previously shown to be stimulatory of Engineered Cartilage generated by Articular chondrocytes (ECA).

Human nasal and articular chondrocytes, harvested from 5 individuals, were expanded and cultured for 2 weeks into porous polymeric scaffolds. The resulting ECN and ECA were then maintained under static conditions or exposed to the following loading regimes. Regime1: Single application of cyclic deformation for 30 minutes. Regime2: Intermittent application of cyclic deformation for a total of 10 days, followed by static culture for 2 weeks. Regime3: Application of surface motion for a total of 10 days.

Prior to loading, ECN constructs contained significantly higher amounts of glycosaminoglycans (GAG) (1.7-fold) and type-II collagen (1.7-fold) than ECA. ECN responded to Regime 1 by increasing collagen (1.4-fold) and proteoglycan synthesis (1.4-fold), to Regime 2 by increasing the accumulation of GAG (1.5-fold) and type-II collagen (1.6-fold), as well as the dynamic modulus (1.3-fold), and to Regime 3 by increasing the expression of superficial zone protein, at the mRNA (32.9-fold) and protein level (1.4-fold), as well as the release of hyaluronan (1.4-fold). ECA constructs were overall less responsive to all loading regimes, likely due to the lower extracellular matrix content.

Human ECN is responsive to physical forces resembling joint loading and can upregulate molecules typically involved in joint lubrication. The findings prompt for *in vivo* studies exploring the possibility of using nasal chondrocytes as a cell source for articular cartilage repair.