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Titel des Beitrags:
In Vitro Comparison of Novel Polyurethane Aortic Valves and Homografts After Seeding and Conditioning

Abstract:
The aim of the study was to compare the behavior of seeded cells on synthetic and natural aortic valve scaffolds during a low-flow conditioning period. Polyurethane (group A) and aortic homograft valves (group B) were consecutively seeded with human fibroblasts (FB), and endothelial cells (EC) using a rotating seeding device. Each seeding procedure was followed by an exposure to low pulsatile flow in a dynamic bioreactor for 5 days. For further analysis, samples were taken before and after conditioning. Scanning electron microscopy showed confluent cell layers in both groups. Immunohistochemical analysis showed the presence of EC and FB before and after conditioning as well as the establishment of an extracellular matrix (ECM) during conditioning. A higher expression of ECM was observed on the scaffolds’ inner surface. Real-time polymerase chain reaction showed higher inflammatory response during the conditioning of homografts. Endothelialization caused a decrease in inflammatory gene expression. The efficient colonization, the establishment of an ECM, and the comparable inflammatory cell reaction to the scaffolds in both groups proved the biocompatibility of the synthetic scaffold. The newly developed bioreactor permits conditioning and cell adaption to shear stress. Therefore, polyurethane valve scaffolds may offer a new option for aortic valve replacement.