Title: Engineering precision medicines for HVA complications

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Abstract:

Hemodialysis is an efficient treatment for kidney failure; the access is a surgically created vein used to remove and return blood during hemodialysis. There are two types of vascular access designed for long-term use, namely the AVF and the AVG. However, the AV shunt, either by AVF or AVG, would also result in disturbed flow at the AV junction region which causes endothelial cell (EC) dysfunction and smooth muscle cell (SMC) hyperplasia resulting in hemodialysis vascular access dysfunction which is a major cause of morbidity and mortality in hemodialysis patients. Thus, our study aims investigate the hemodynamic properties (i.e., disturbed flow and wall shear stress) in/near AV shunt by using computational fluid dynamics (CFD) simulations based on computerized tomographic angiography (CTA) images, design and optimize the structure of 3D-printed AV shunt for reducing disturbed flow resulting in pathophysiological events lead to neointimal hyperplasia and thrombosis, and ultimately vascular stenosis. Instead of ePTFE graft, the designated 3D-printed arteriovenous graft based on the CFD simulations using biocompatible polymers had been implanted into pig successfully, which is the first animal model study in Taiwan.

Biography:

Dr. Ming-Chia Li received his Ph.D. degree from the Department of Chemical Engineering, National Tsing Hua University (Taiwan). He then spent one year at Nagoya University (Japan) with Prof. Eiji Yashima for studying chirality transfer. Currently, he is an assistant professor in the Department of Biological Science and Technology, NYCU (Taiwan). His main research focuses molecular probe, molecular self-assembly, and engineering precision medicines.