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Titre de la thèse	« Personalized Mechano-Bio-faithful Radio-Cephalic Arteriovenous Fistula preoperative model (PerMeBio-RCAVF model) creation: application in vascular hemodialysis treatment »
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Composition du Jury

Civilité	Nom	Prénom	Grade / Qualité	Rôle
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Résumé

End-stage renal disease (ESRD) is one of the leading chronic diseases in the world, with a high incidence and extensive damage. For patients with ESRD, timely and effective dialysis treatment is the most well-discussed way to sustain their lives. Dialysis Vascular Access (VA) should be reliable and simple access that allows blood to be introduced and returned quickly and correctly. It is necessary to connect the artery and the superficial vein to build a VA that meets the demands of dialysis called arteriovenous fistula (AVF). The AVF uses native vessels and is developed to adapt to the anatomical and physiological characteristics of the patient. Due to the change in vascular geometry, the hemodynamics of AVF changes. The arterial flow will continue to increase. To accommodate the high flow and high blood pressure, the vein must reshape and increase the wall thickness to protect the vein. This process of change is called fistula maturation and usually lasts about a month. Typically, surgeons rely on their clinical experiences to design RCAVF configurations. Due to the lack of understanding of hemodynamics in RCAVF, unreasonable anastomosis design will lead to variable and irregular flow patterns. The resulting low-wall shear stress (WSS) and oscillating WSS negatively stimulate the vessel wall, affecting the maturation and permeability of the AVF. In this Ph.D., we focused on radio-cephalic arteriovenous fistula (RCAVF), the first and most common choice of AVF. The RCAVF setup has been optimized both mechanically (reduce energy loss in RCAVF) and biologically (minimize low, oscillating WSS on the vessel wall to slow the development of strictures). Finally, we designed a mechano-bio-faithful personal preoperative RCAVF model (PerMeBiO-RCAVF model) to provide patient-specific assistance to the preoperative planning process of the RCAVF setup to increase the rate of RCAVF maturation and reduce complications.