MSc-project

Title: Development of an anatomical realistic carotid artery phantom

Description:
Cardiovascular diseases (CVD) are the leading cause of death globally and were the cause of 1/3 of all deaths in developed countries. Alterations of blood flow and dynamics are seen for almost all CVD; thus, blood flow estimation is essential in the assessment. Being able to observe flow properties as blood flow velocity, volume flow rates, and pressure gradients in 3D *in vivo* will provide new insights. To evaluate emerging techniques for 3D *in vivo* imaging it is necessary to perform measurements on a realistic phantom of a blood vessel and compare these to a precise and accurate simulation model. The phantom will provide a well-controlled setup for validation and verification of new ultrasound-based imaging techniques. Currently we have 3D image data available for 9 different carotid arteries obtained from healthy volunteers and we wish to develop anatomical realistic phantom models of these. This means that the phantoms should contain a representation of the arterial lumen with a surrounding wall and soft tissue. This requires that a clever setup for the molding of the phantoms is devised, and this can be done by 3D printing the parts needed to construct the mold. The phantom behavior should be compared to the expected outcome from a finite element model.

Required qualifications: This project comprises elements of fluid mechanics, structural mechanics, 3D printing, and construction of CAD models. The student(s) should have experience with Matlab, Comsol Multiphysics, and SolidWorks. The courses 31529 Tissue and Movement Biomechanics and/or 31545 Medical Imaging Systems can be an advantage.

Responsible institution: DTU Elektro

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Allowed no of students per report: 1-2

DTU supervisor: Marie Sand Traberg