



Institut für Biomechanik
Vorstand: Universitätsprofessor
Dipl.-Ing. Dr.techn. Gerhard A. Holzapfel

AORTIC DISSECTION

MECHANICS - MODELING - SIMULATION

Univ.-Prof. Dipl.-Ing. Dr.techn.

Gerhard A. Holzapfel

Technische Universität Graz

Stremayrgasse 16/II

A-8010 Graz

E-mail: holzapfel@TUGraz.at

Tel.: ++43 316 873 35500

Fax: ++43 316 873 35502

URL www.biomech.tugraz.at

Invitation to a Lecture on

Nonlinear Dynamics of Human Aortas for Material Characterization

Professor Dr. **Marco Amabili**
Professor and Canada Research Chair
McGill University, Montreal, Canada

Evaluating the nonlinear dynamics of human descending thoracic aortas is essential for building the next generation of vascular prostheses. This study characterizes the nonlinear dynamics, viscoelastic material properties and fluid-structure interaction of eleven ex-vivo human descending thoracic aortas in the full range of physiological heart rates. The aortic segments were harvested from heart beating donors screened for transplants. A mock circulatory loop was developed to reproduce physiological pulsatile pressure and flow. The results showed cyclic axisymmetric diameter changes, which were satisfactorily compared to in-vivo measurements at a resting pulse rate of 60 bpm, with an additional bending vibration. An increase of the dynamic stiffness (i.e. storage modulus) with age was also observed. This was accompanied by a strong reduction with age of the cyclic diameter change during the heart pulsation at 60 bpm and by a significant reduction of the loss factor (i.e. damping). Large dissipation was observed at higher pulse rates due to the combined effects of fluid-structure interaction and viscoelasticity of the aortic wall. This study presents data necessary for developing innovative grafts that better mimic the dynamics of the aorta.

Date: Thursday, March 5, 2020, 4:00 pm

Place: Stremayrgasse 16/III, Room BMT03094