Biofluid, tissue and solid mechanics for medical applications

Patrick Segers

Benedict Verhegghe

Pascal Verdonck

North Sea

NETHERLANDS

Zeebrugge

Oostende

Antwerp

Brugge

F L A N D E R S

Gent

Mechelen

GER.

Kortrijk

Aalst

Leuven

BRUSSELS

Botrange

Mons Charleroi

Liège

Namur

W A L L O N I A

A R D E N N E S

Bastogne

RANCE

LUX.

Canon 40D F22 iso100 10mm hdr Grijsfilter ND8 grad

Raym`s Fotosite

Gravensteen in Gent

UNIVERSITEIT GENT

bioMMeda

University Hospital Ghent

IBiTech

IbiTech-bioMMeda

Ghent University: 28.000 students

- Faculty of Engineering:
  - Civil Engineering: IBiTech-bioMMeda

    Biofluid, Tissue and Solid Mechanics for Medical Applications

  - Electrical Engineering: IBiTech-Medisip

    Medical Image and Signal Processing

  - …

BioMMeda

- 3 Professors (2 fulltime, 1 parttime)
- 26 researchers

Research Tools

- Computer simulations
  - Computional Fluid Dynamics: Fluent
  - Finite Element Analysis: Abaqus
  - Pre-, postprocessing & geometrical modelling: pyFormex
  - Fluid Structure Interaction
  - Ultrasound Simulation: matlab
- Own HPC cluster (36 nodes, 140 CPUs)

Research Tools…

- Experimental:
  - Hydraulic work bench: arterial tree
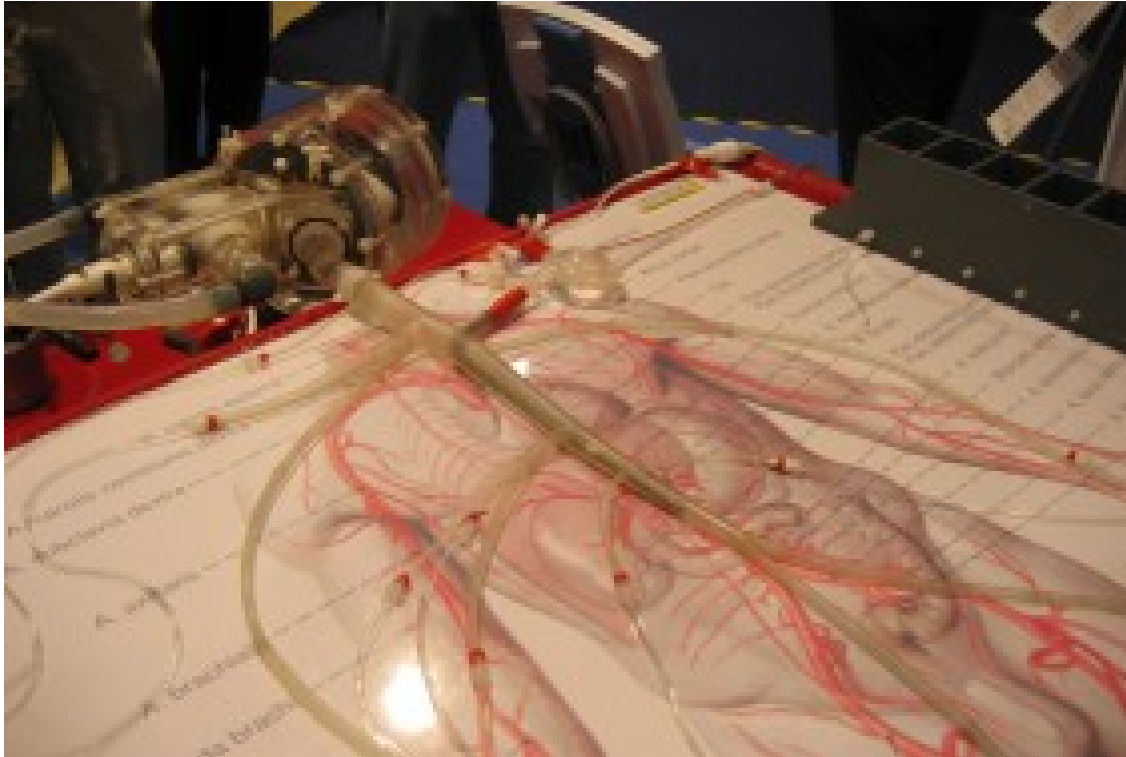
Research Tools...

- Experimental:
  - Hydraulic work bench: arterial tree
  - Particle Image Velocimetry (PIV)
  - Rapid Prototyping
- Imaging (UZGent, UGCT, Infinity)
  - (micro-)CT
  - MRI
  - UltraSound

Research Topics

Functioning, diagnosis and treatment

- Heart
- Arterial system
- Other organs
- Skeletal

- Experimental models for the study of the cardiac valvular mechanics.

Literature → CAD → RPT → Experiment
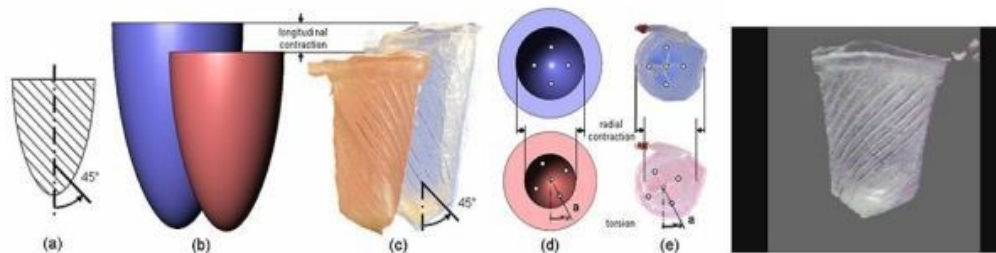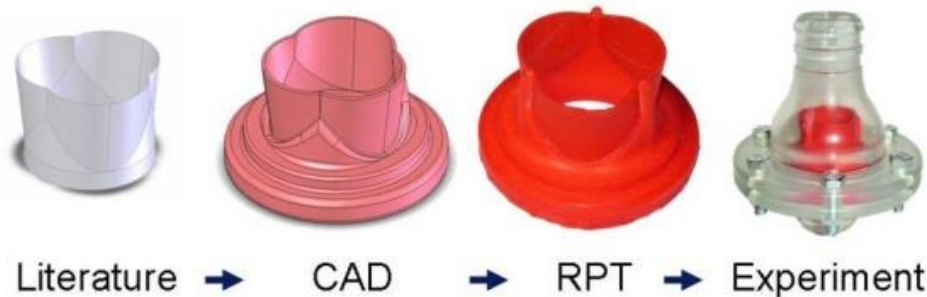
Research Topics

- Left ventrical function assessment using echocardiography
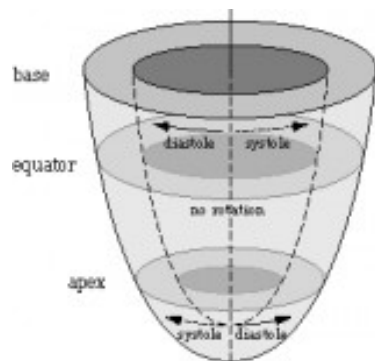
ventricular rotation
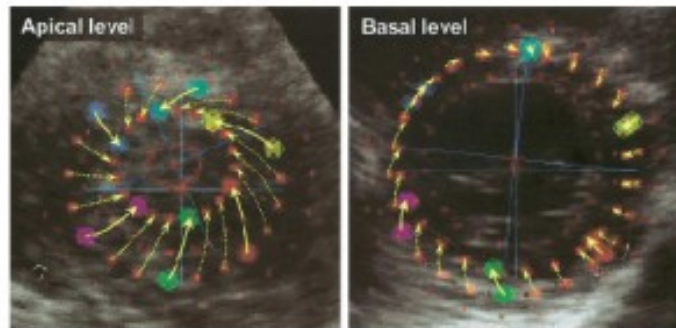
estimation of ventricular torsion using speckle tracking imaging

- Fluid structure interaction of a bileaflet mechanical heart valve
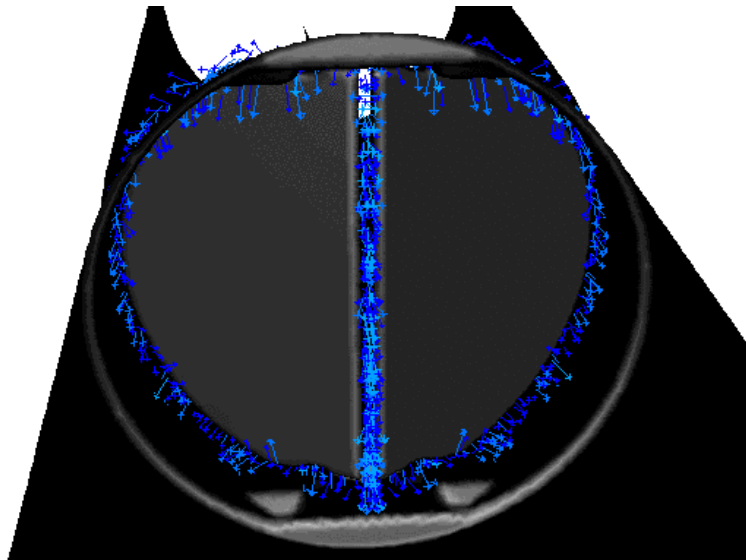
Research Topics

- Aneurysm formation and treatment
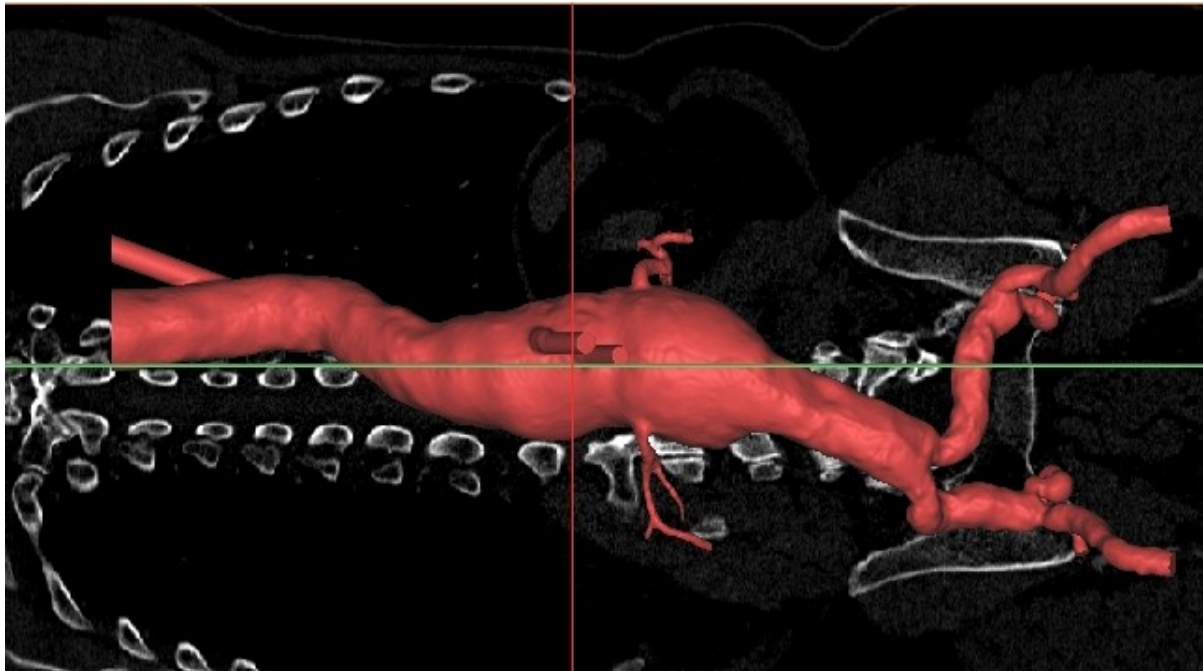
Research Topics

- AAA formation in small animals
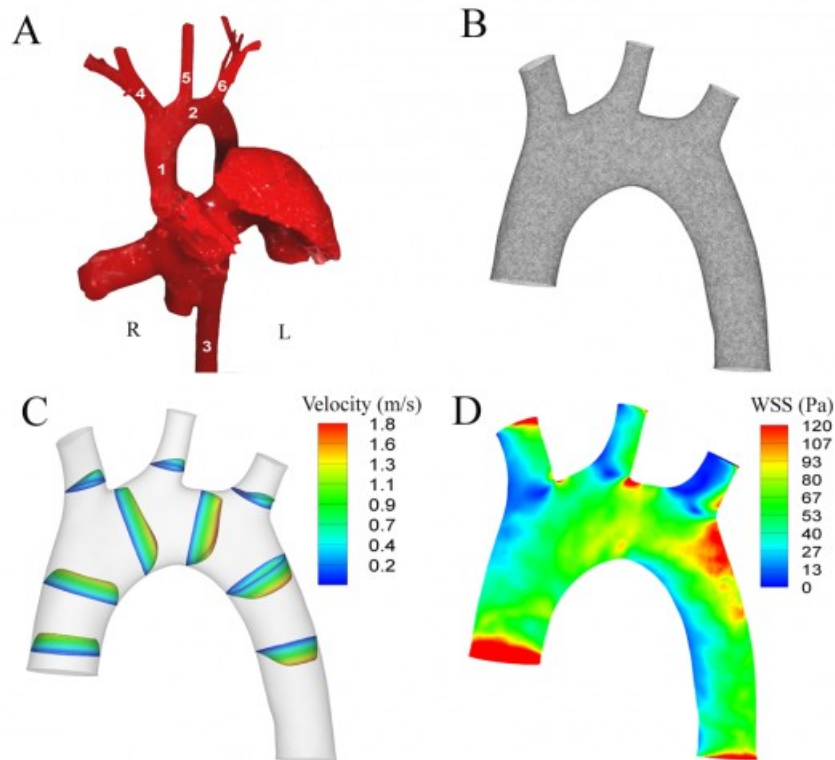
Research Topics

- ## Non-invasive diagnostics
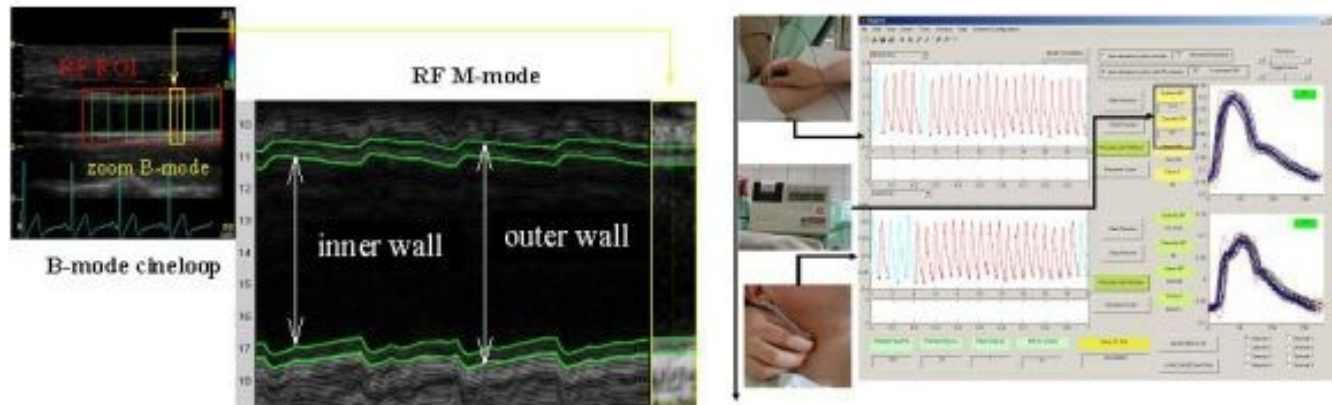
Research Topics

- Multiphysics modelling
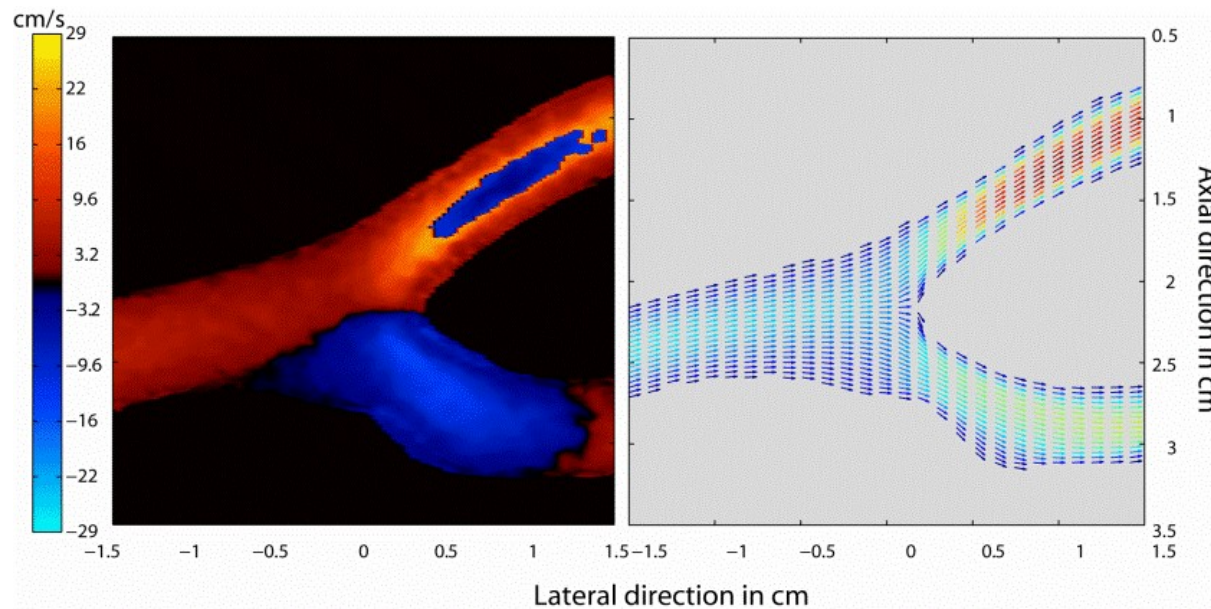
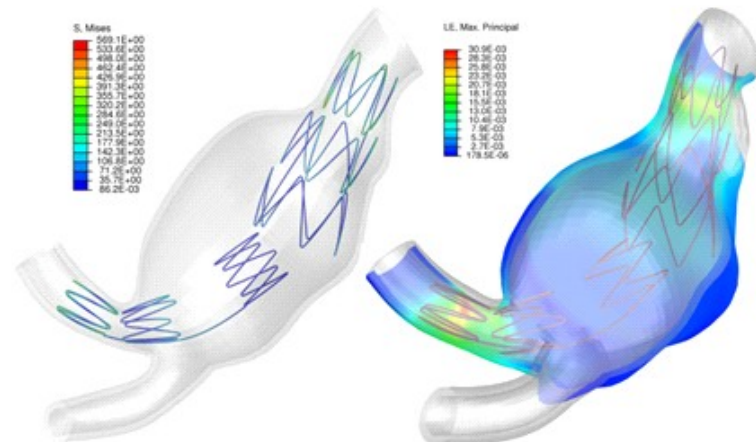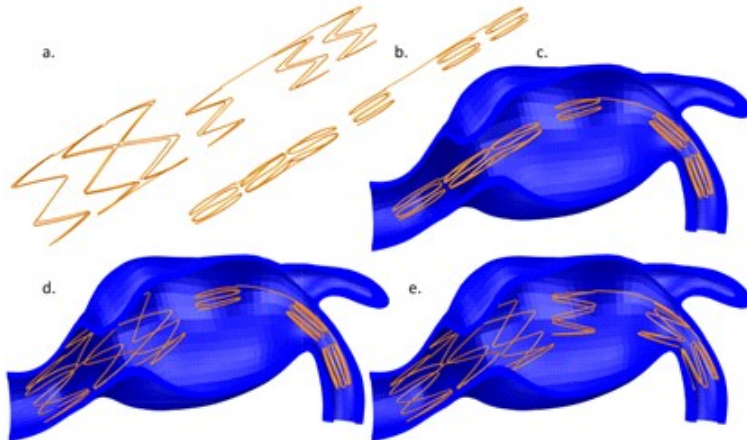- Validated simulation of self- and balloon exandable devices
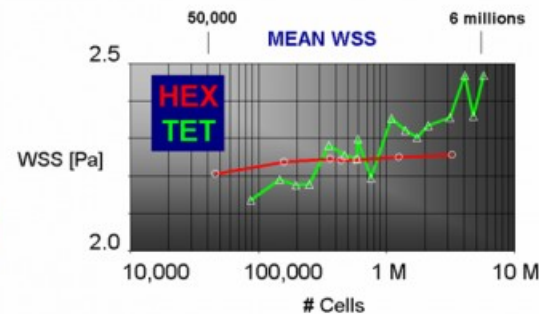
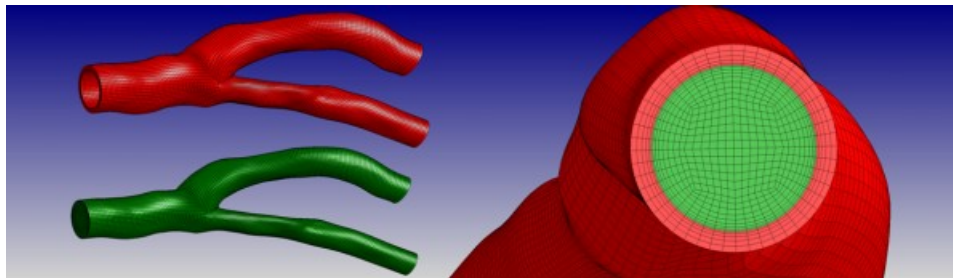- Simulation of stent deployment

A   B
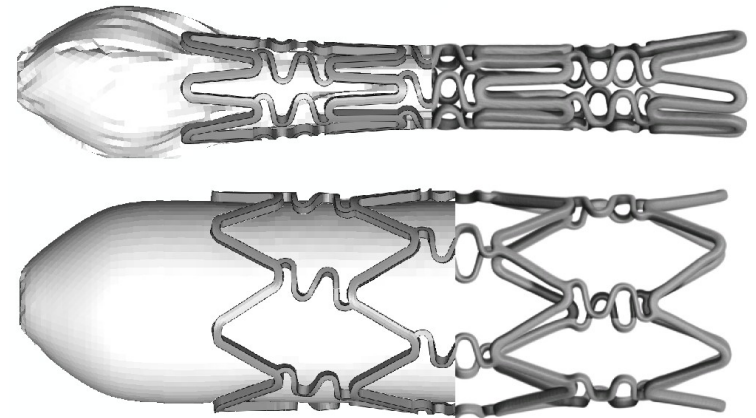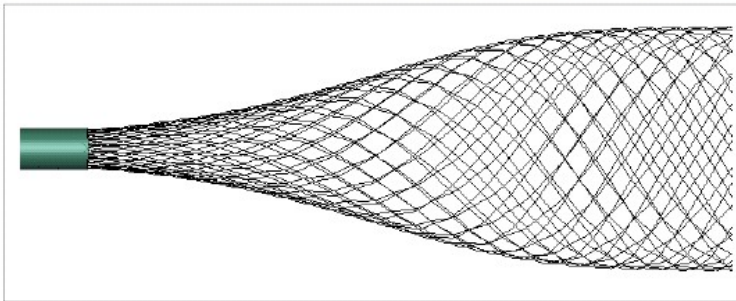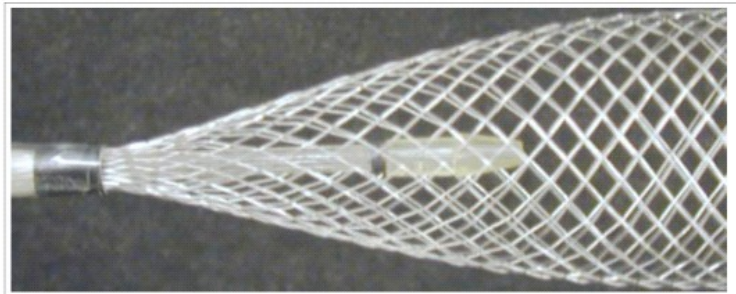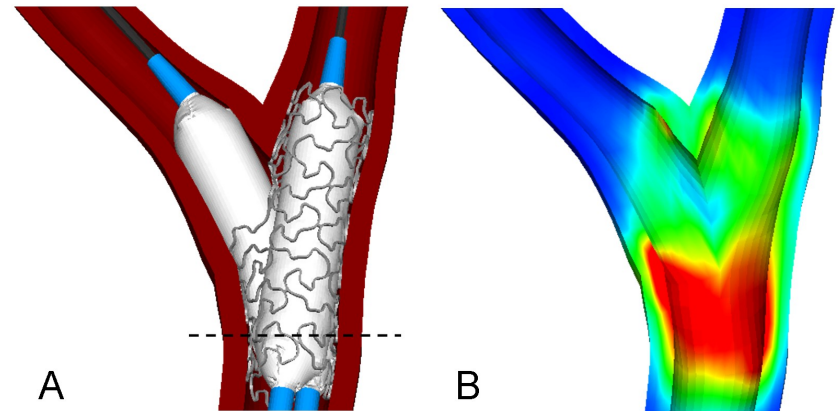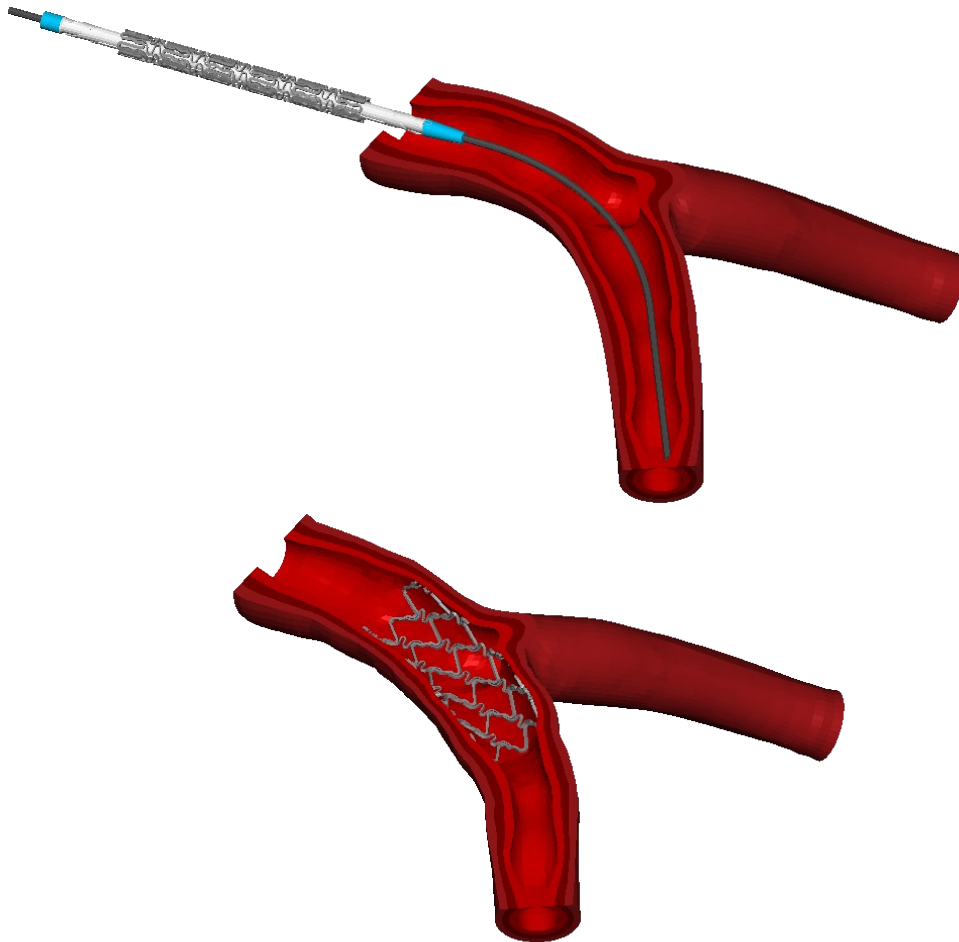
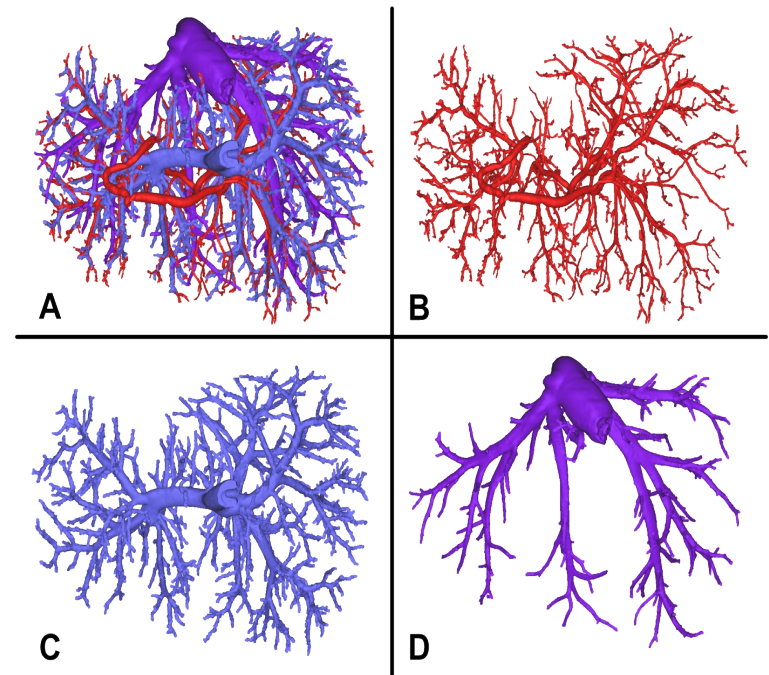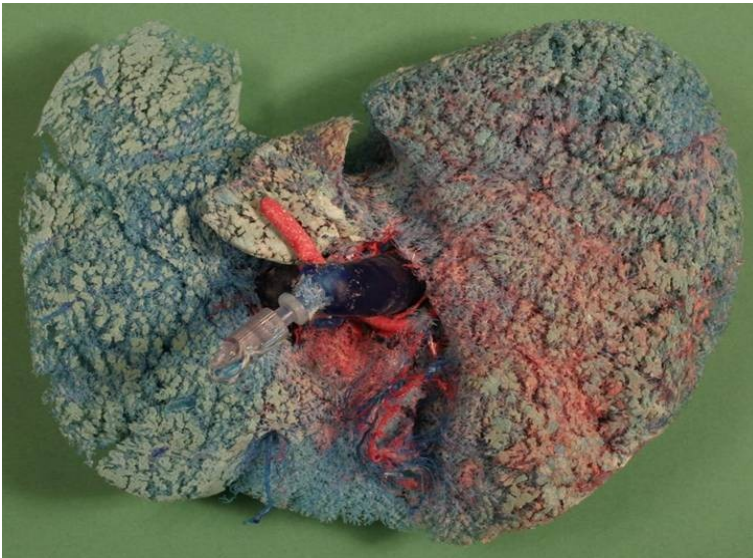# Research Topics

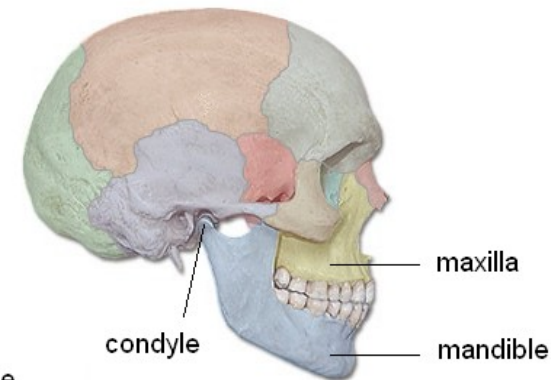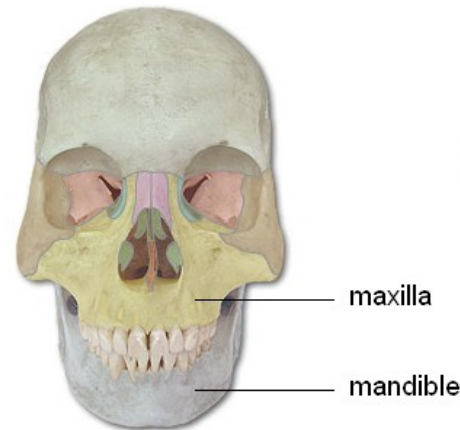- Simulation of AAA stent-graft deployment
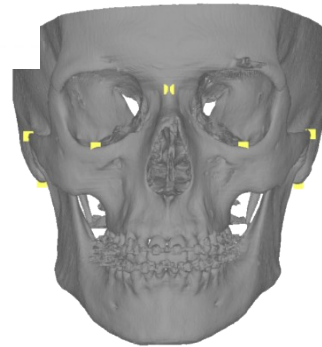
Research Topics

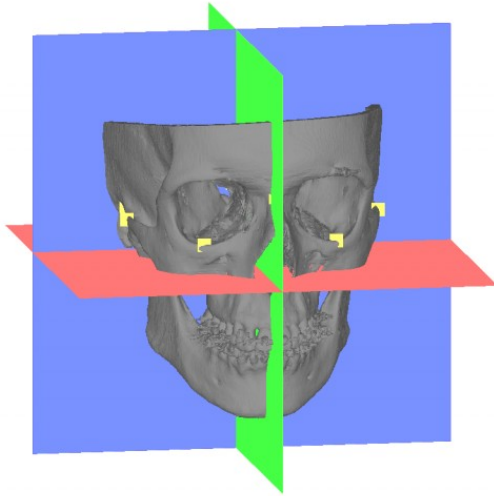- Patient specific hexahedral meshing

Research Topics

- Modelling liver perfusion

Research Topics: skeletal system

- Virtual planning of osteotomy: automated landmark identification

maxilla

mandible

maxilla

condyle

mandible

Research Topics: skeletal system
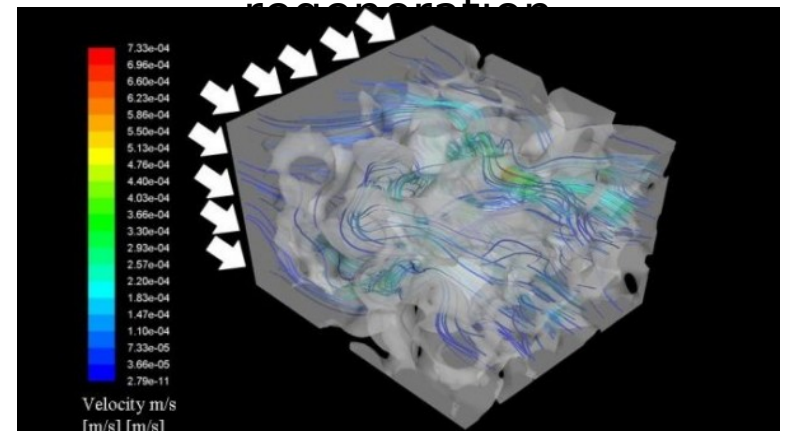
- Virtual morphotyping
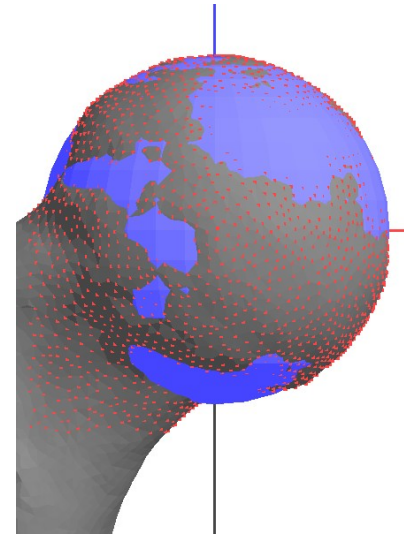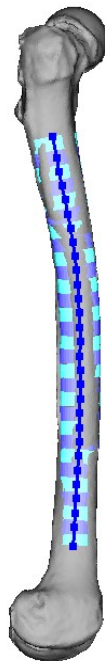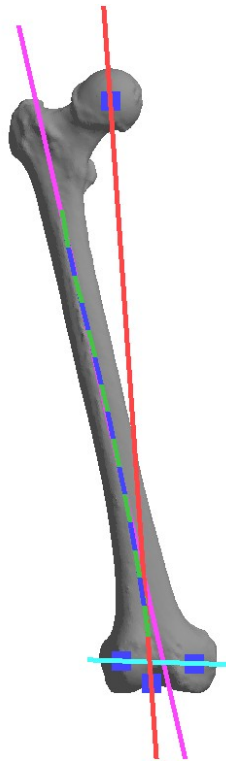
biomechanics of the skeletal system

Biomechanics of the seahorse tail

Scaffolds for bone regeneration

Links

- www.biommeda.ugent.be
- www.ibitech.ugent.be
- www.ugent.be/ea/bme/en