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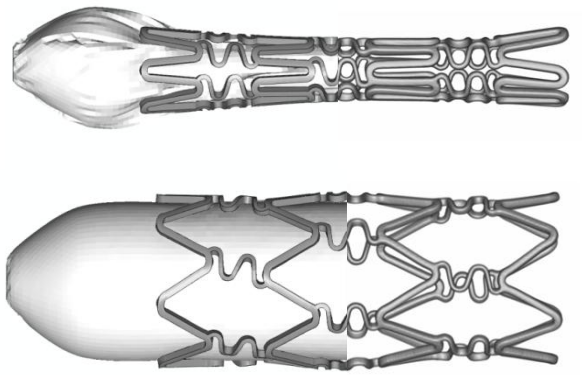

Experimental validation of the simulated expansion of a balloon-expandable coronary stent (microCT experiment – right side; simulation – left side)

Customer Profile

IBiTech-bioMMeda, Ghent University is a research group that studies biofluid, tissue, and solid mechanics for medical applications.

Application

bioMMeda combines Abaqus with the in-house developed open-source pyFormex design software to facilitate virtual product development and bench testing of minimally invasive devices such as balloon- and self-expandable cardiovascular stents, stent-grafts, transcatheter valves, etc.

Benefits

This approach enables the development and optimization of novel designs and reduces costs and time to market. In addition, it provides additional insights into minimally invasive procedures.

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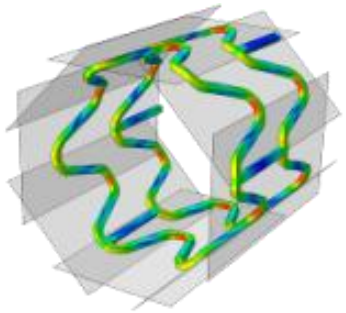
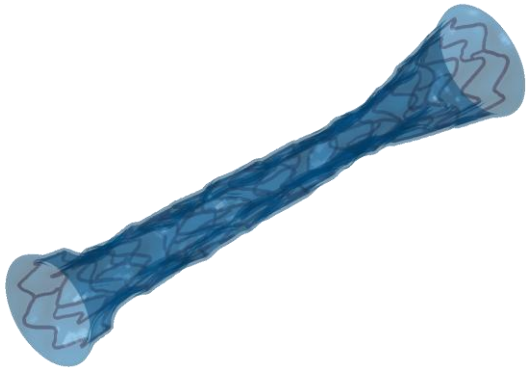


Displacement driven virtual radial strength test according to crimphead closing mechanism



Pressure driven virtual radial compression test of stent implanted into a Poly Urethane tube

Application

bioMMeda uses both Abaqus/Standard and Explicit to evaluate the radial strength of stents in accordance with various experimental setups.

The simulations consist of three steps:

- Hexahedral mesh generation of the stent based on 2D CAD (.dxf) or 3D microCT (.stl) with pyFormex
- Crimping and expansion of the stent
- Displacement driven crimphead closing or pressure loading on the outer surface of the Poly Urethane tube in order to assess the radial strength of the stent.

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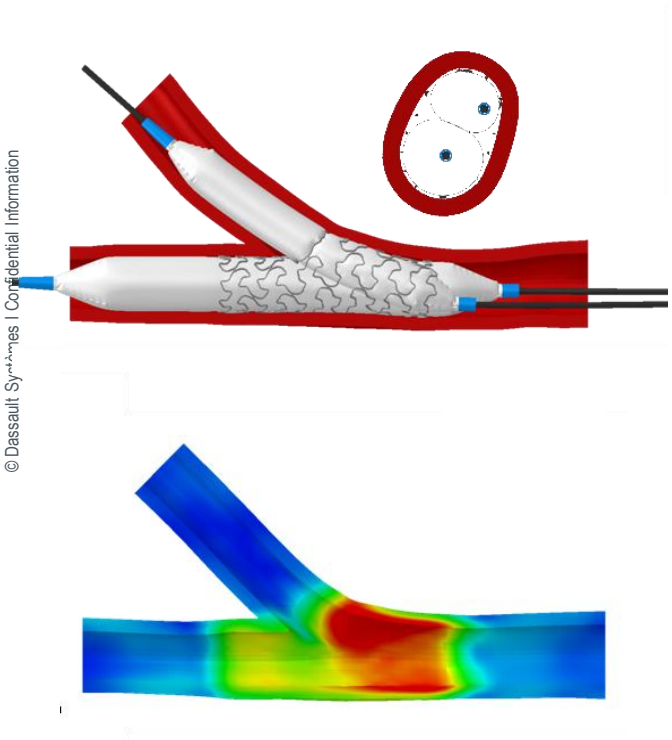
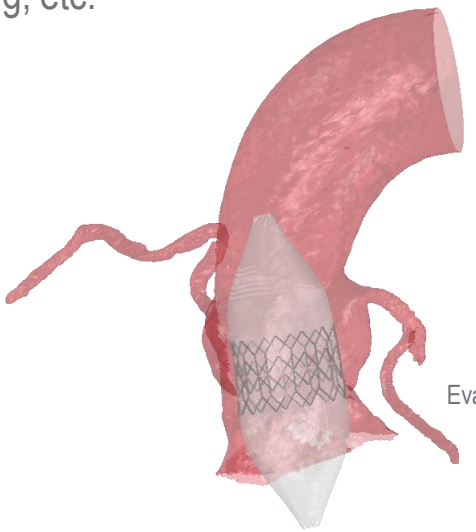


Virtual evaluation of kissing balloon postdilatation of a coronary bifurcation. This optimizes the scaffolding of the bifurcated anatomy but leads to high stresses where the balloons overlap

Why Abaqus?

Abaqus in combination with pyFormex has proven to be very efficient, accurate, and robust to study stent design characteristics such as radial compression, bending, torsion and interaction with patient-based models.

Additionally the developed virtual framework allows engineers to evaluate other important design characteristics such as flexibility, radial strength, fatigue resistance, foreshortening, recoil, vessel scaffolding, etc.



Evaluation of a transcatheter valve in a patient-based model

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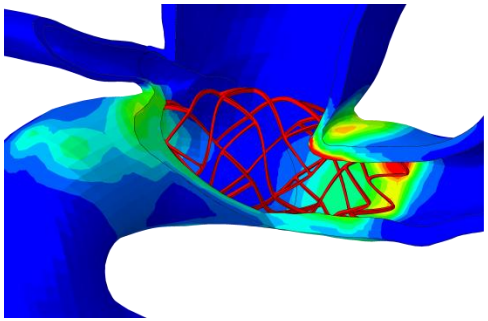
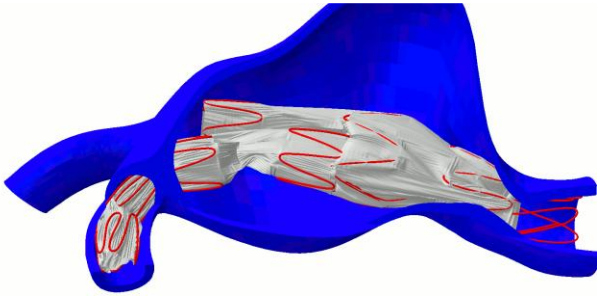


Cerebral aneurysm stenting

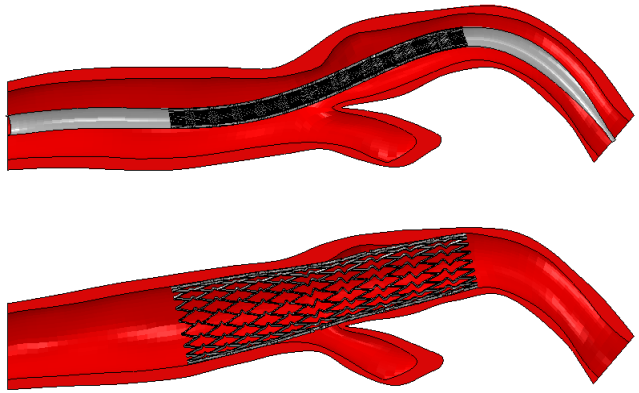


AAA stentgraft placement

Benefits

Using simulation for the development of minimally invasive devices helps to save money and time by eliminating the need for a trial-and-error approach and provides valuable insights into the mechanical aspects of the minimally invasieve procedure.

Simulations allow to fully assess the product's performance and (bio)mechanical requirements and are useful to examine and compare existing devices.



Carotid artery stenting