CADFEM®

ANSYS

Competence Center FEM

Simulation is more than Software.

SCHUESSLER ADMEDES

Simulation on demand for ADMEDES Schuessler

Simulation of an aortic valve and its stent
Fluid structure interaction with ANSYS Multiphysics

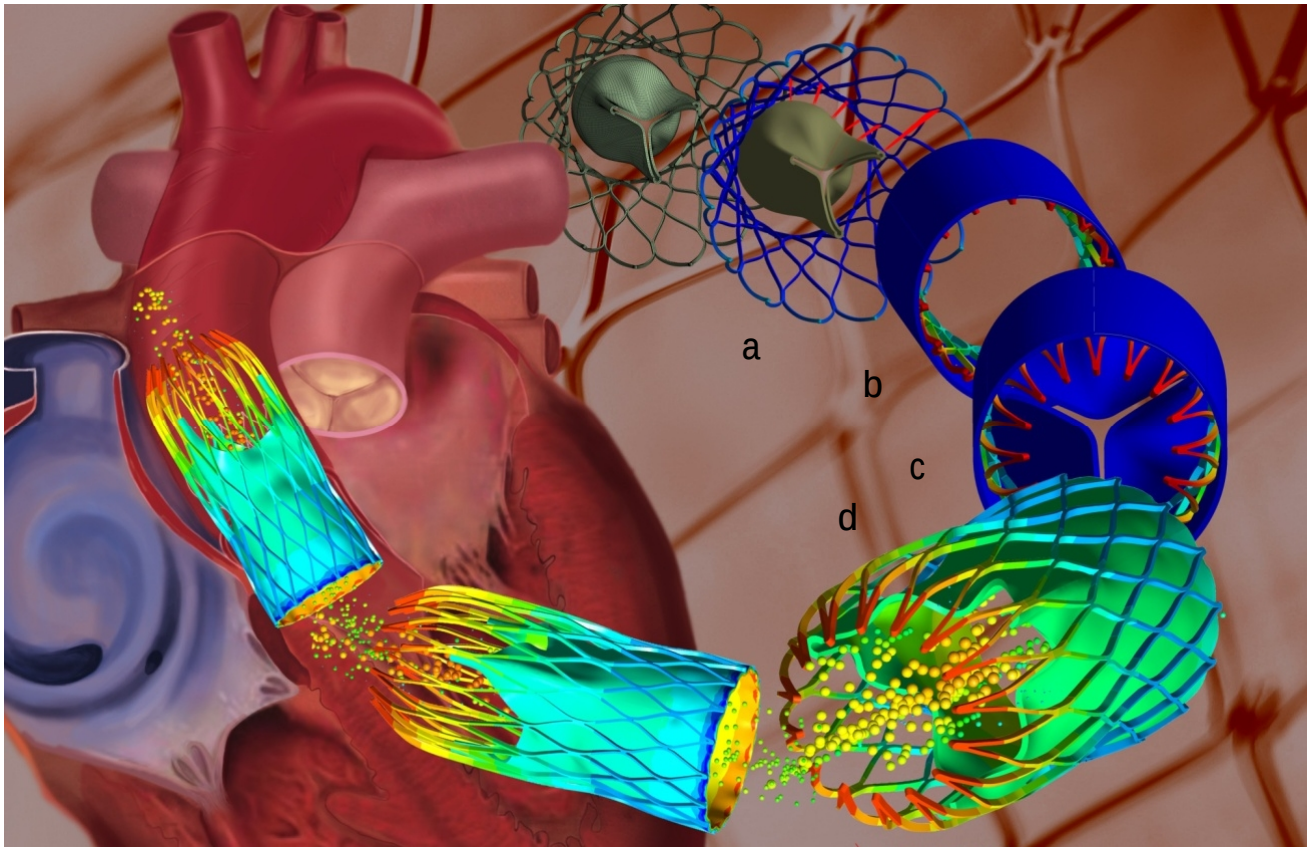

Fig. 1: Representation of the simulation steps; expanded (a), crimping (b), binding with valve (c), fluid structure interaction over time (d).

Task

The company ADMEDES Schuessler is a leading global provider of finished Nitinol self expandable implants (Fig. 2). In order to maintain a cutting edge knowledge about the interaction between stents and pericardium valve during a blood pulse, a modeling procedure had to be developed in order to take into account fluid and structure transient interactions and their effects on working conditions, integrity and lifetime of the device.

Contact:
Joël Grognuz
Phone +41 (0) 21 - 614 80 - 44
joel.grognuz@cadfem.ch

CADFEM

ANSYS Competence Center FEM

Simulation on demand for ADMEDES Schuessler

Simulation of an aortic valve and its stent
Fluid structure interaction with ANSYS Multiphysics

Solution

A process was developed using the ANSYS Multiphysics platform. Starting from an expanded stent (Fig. 1a), a first structural analysis delivered its stress and deformation state after crimping and positioning against the aorta wall (Fig. 1b). The pre-stressed structure was then connected to the pericardium valve leaflets (Fig. 1c). During a transient fluid structure interaction analysis stent and aorta wall were then taken into account and the pressure forces transferred from blood to valve leaflets (Fig. 1d). The evolution of stresses in the Nitinol were obtained over a complete systolic blood pulse (Fig. 3).

The pericardium anisotropic material properties were considered as well as a shape memory alloy material model for Nitinol and a non-Newtonian viscosity model for blood.

Fig. 2: A real expanded stent on which pericardium leaflets will be mounted.

Customer Benefit

This pilot project delivered:

- unprecedented insights on the evolution of forces and stresses during a systolic pulse,
- a proof of stent stability and robustness under the simulated conditions,
- in depth information not accessible with experimental measurements,
- a customized modeling process ready for the prediction of stent stability and lifetime under miscellaneous working conditions.

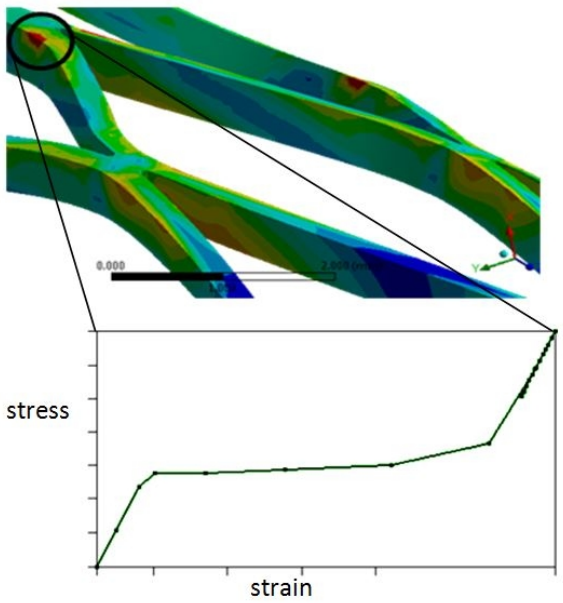

Fig. 3: Stent stress strain cycle at one location.

About CADFEM

Founded in 1985, CADFEM provides everything that is required for the success of the simulation from a single source: First-class software and complete, ready-to-use systems; comprehensive services; the latest knowledge. CADFEM is the ANSYS Competence Center FEM in Central Europe.