VTK use in Aneurist project showcase

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aneurIST
Integrated biomedical informatics for the management of cerebral aneurysms
Natural history of ICA

Etiology

Prevalence 1-5% F>M

Initiation

Growth

0.2-1.0%/yr

Ruptured

Mortality ↑ 33%

vasospasm clotting

Morbidity ↑ 33%

Normal 33%

ISUIA (Mayo) size/location

Treat!

Coil vs clip

Treat?

Unruptured [99% silent]

Degenerative

Treat!

ISAT (Oxford)
@neurIST

@neuRisk

Improve decision making processes in the management of unruptured aneurysms by providing a score that integrates all the available information for identifying at-risk patients and reducing current over treatment.

@neuEndo

Support computational design processes towards a next generation of smart flow-correcting implants to treat ruptured aneurysms and reduce current treatment costs, side effects and recurrence.

@neuLink

Support the knowledge discovery for linking genetics to disease, vasospasm and blood clotting after cerebral hemorrhage.

@neuFuse

Support the integration of modeling, simulation and visualization of multimodal data.

@neuCompute/Info

Support integration of data and computing resources.

IT Support Suites

Enabling IT
Segmentation

- Multimodal implementation
- No threshold
- Semi-automatic tool => reduced inter-operator variability
- Time consuming: 20’

Mesh Sculpting

Modification of a mesh by manual removal/insertion of elements.
- Holes filling incl. smoothing
- Manual deletion of mesh’s cells
- *Bridging* technique to eliminate *oversegmentation* problems
- Clip/Split of mesh along vessels’ axes or by another user defined plane
- Vessel extrusion -with “circleification” of the opening
- Local smoothing
Mesh Filtering

Modification of a mesh by involving the mesh as a whole.
- Connectivity
- Triangulation/Mesh cleaning
- Decimation/Subdivision
- Laplacian Smoothing
- Taubin Smoothing
- Optimized Laplacian – no shrinking effect
- Remeshing – Poisson reconstruction filter

J. Kohout¹, A. Chiarini, G. J. Clapworthy, G. Klajnšek
Identification of the Aneurysm by Analysis of the Skeleton of Blood Vessels, submitted to
Computer Methods and Programs in Biomedicine
Virtual Stenting

Solving flow equations

Ansys™ CFX™ or Abstract Problem Definition (APD) File
Computation times can range from minutes (steady flow) to hours (transient flow).

A solution! not “The solution”
- Converged
- Stable across mesh sizes
- May show very slight differences between runs
Results
Results

Pressure + Streamlines = WSS