V14

Visualization of CFD during aneurysm sugery

C. Doenitz[1], *D. Deuter*[1], *A. Brawanski*[1]
[1]University of Regenburg, Neurosurgery, Regensburg, Germany

Objective: Computational fluid dynamics (CFD) is a powerful tool to simulate flow and related forces like wall shear stress, pressure and impingement forces in cerebral aneurysms. This allows to predict regions of thin wall and high pressure prone to rupture within the aneurysm. We were interested in the value of intraoperative visualization of these informations to the surgeon during aneurysm surgery potentially leading to a different aneurysm approach or changing the way of aneurysm dissection.

Methods: In eligible patients with incidental aneurysms preoperative 3D mesh-models were built using 3D rotational angiography slices. Amira (Visualization Sciences Group, USA) software package v. 5.6. and 'ANSYS' software was used for CFD with a non-Newtonian blood model with shear-dependent dynamic viscosity and pulsatory flow. We investigated flow velocity, wall pressure, impingement point (IP) and wall shear stress (WSS). Informations were visualized with Amira, coregistered with a 3D MRI scan (MPRage) and then transferred it into our navigation system (Kolibri, Brainlab, München).

Results: Intraoperative visualization of CFD revealed to be a useful tool in aneurysm clipping of incidental aneurysms. Surgeons tried to avoid the regions of low wall shear stress and high pressure during the initial part of dissection appreciating the information of the CFD. As previously reported, regions of low wall shear stress were confirmed to show a thin and delicate wall.

Conclusion: We present a novel assistance tool for aneurysm surgery. Visualization of CFD during operation helps the surgeon to recognize regions of low wall shear stress and high pressure prone to rupture. An CFD-adjusted approach and dissection of the aneurysm can potentially help to prevent intraoperative rupture.