

Analyzing unilluminated Abdominal Aortic Aneurysms

An Abdominal aortic aneurysm is a localized bulging of the aorta due to the weakening of a vessel. The rupture of an aneurysm is life threatening as large amounts of blood spill into the abdominal cavity and can lead to death within minutes. As an AAA grows in diameter, the risk of rupture increases.

At the AMC, a AAA is diagnosed with 3D CT angiographic imaging. During this procedure an ionized contrast medium is administered to enhance the lumen in these images. The 3D CTA image is useful in preoperative planning because it details the anatomy and possibility for endovascular repair. Figure 1 shows a volume rendering image of a AAA. The most accurate measurements are performed perpendicular to the running of a vessel making use of the determination of the center lumen line of the aorta and stretching this line.

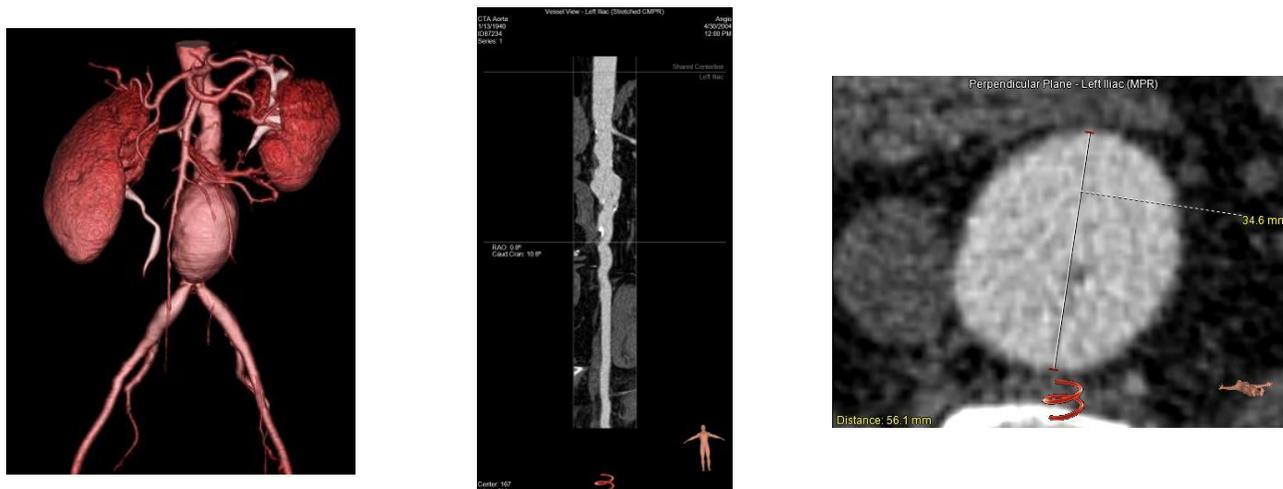


Figure 1: Analyses of a contrast-enhanced CTA displaying a AAA. The left image shows a volume rendering image of the arteries including an aneurism in the abdominal aorta. The middle figure depicts the whole vessel in a single overview obtained with by stretching the center lumen line. The right picture is the rendering of the vessel perpendicular to the centerline.

After repair, the growth of an aneurism is monitored by analyzing follow-up scans every 6 months. These scans are performed **without** admission of contrast medium. The analyses of these images is more difficult than the CTA images in which the lumen is illuminated by the administration of contrast.

This internship is concerned with image knowledge transfer to study to what extend a CTA-based information can be used to help the analysis of a non-enhanced blank CT. Potential solutions are the 3D scan registration, perturbation analysis of the lumen center line, and physical modeling of aneurism growth.

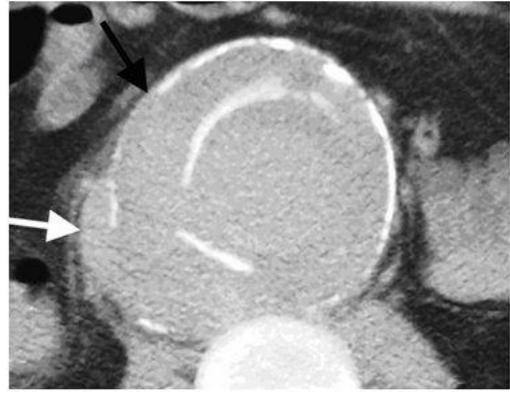
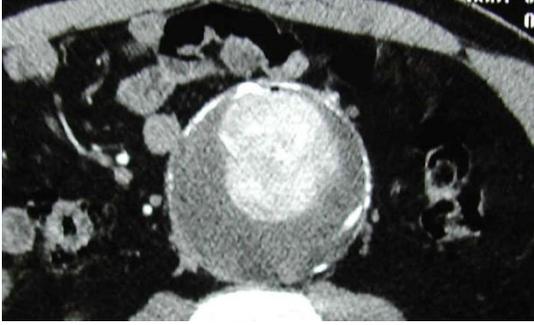


Figure 2: Enhanced (left) versus Non-enhanced imaging of a AAA. In the left image, the lumen is clearly distinguishable from the thrombus in the vessel wall. This distinction is difficult to visualize in the non-contrast follow up image on the right.

This assignment shall be carried out in cooperation of the AMC department Biomedical Engineering and Physics and the department vascular surgery and 3Mensio, a company specialized in GPU based medical imaging.

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