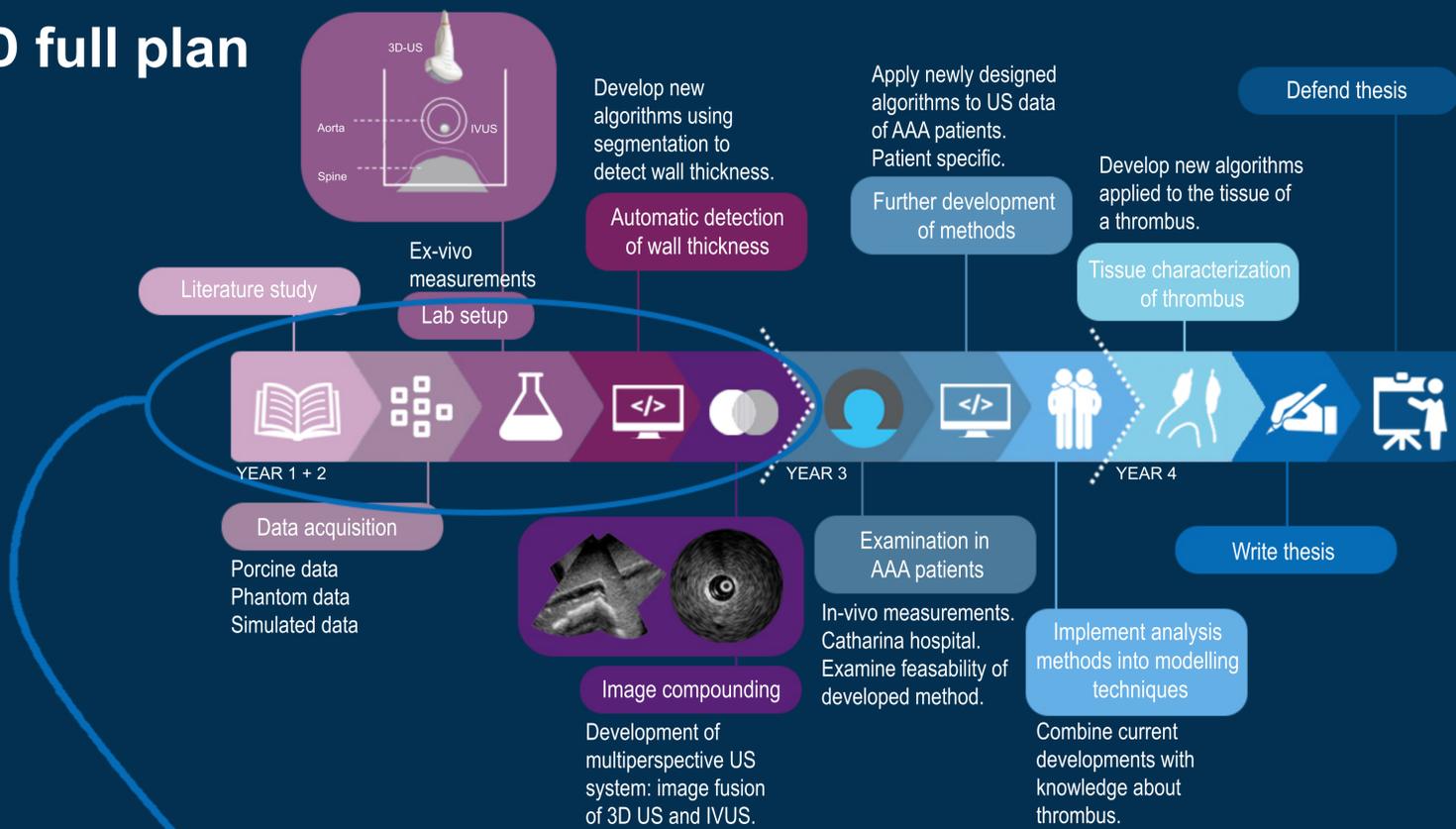


Minimally Invasive Ultrasound Imaging of Abdominal Aortic Aneurysms

The development of a non-invasive and minimally-invasive ultrasound (US) imaging method for the assessment of rupture risk in abdominal aortic aneurysms (AAA)

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PhD full plan

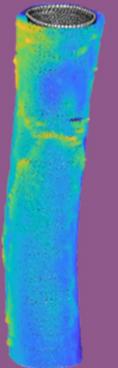


Motivation

A localized widening of the abdominal aorta is called an abdominal aortic aneurysm (AAA). An AAA can lead to death because of rupture of the aortic wall and therefore clinical intervention is needed when the risk of rupture is too high. Currently, AAAs are treated based on the diameter of the aorta. However, a better patient-specific marker is needed. The mean thickness of the wall was found to be an indicator in human health in multiple studies.^{1,2,3,4} Moreover, it was found that the thickness varies regionally⁵. However, this variation has not been used in previous rupture risk analysis studies. Therefore in this study, a method to assess the full geometry and wall thickness of the abdominal aorta is proposed to improve rupture risk analysis.

Segmentation

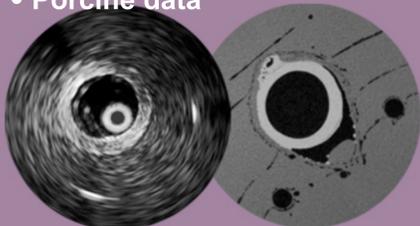
For the IVUS images an automatic segmentation method is developed to segment the lumen and the wall. From this, a full geometry of the abdominal aorta can be created. This way using IVUS complementary to non-invasive US, the wall thickness of the aorta and thrombus size are available. This data will be used to improve patient-specific AAA models for risk assessment.



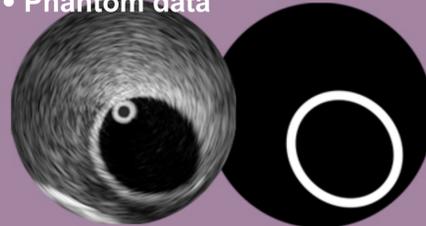
Data acquisition

Intravascular ultrasound (IVUS) images were measured or simulated. For each IVUS image, a ground truth image including wall thickness is obtained.

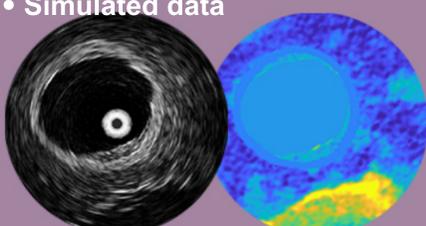
• Porcine data



• Phantom data



• Simulated data



Key points

- Automatic segmentation method for IVUS AAA images
- IVUS simulator
- Geometry and wall thickness of abdominal aorta
- Validation using ground truth images
- Providing clinicians to save a lot of time segmenting
- A marker to better approach the rupture risk of AAA
- Improve patient stratification using US-based models

References

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