

The LiverTwin: a novel ex-vivo experimental platform for multi-modal image-guided liver cancer treatment studies

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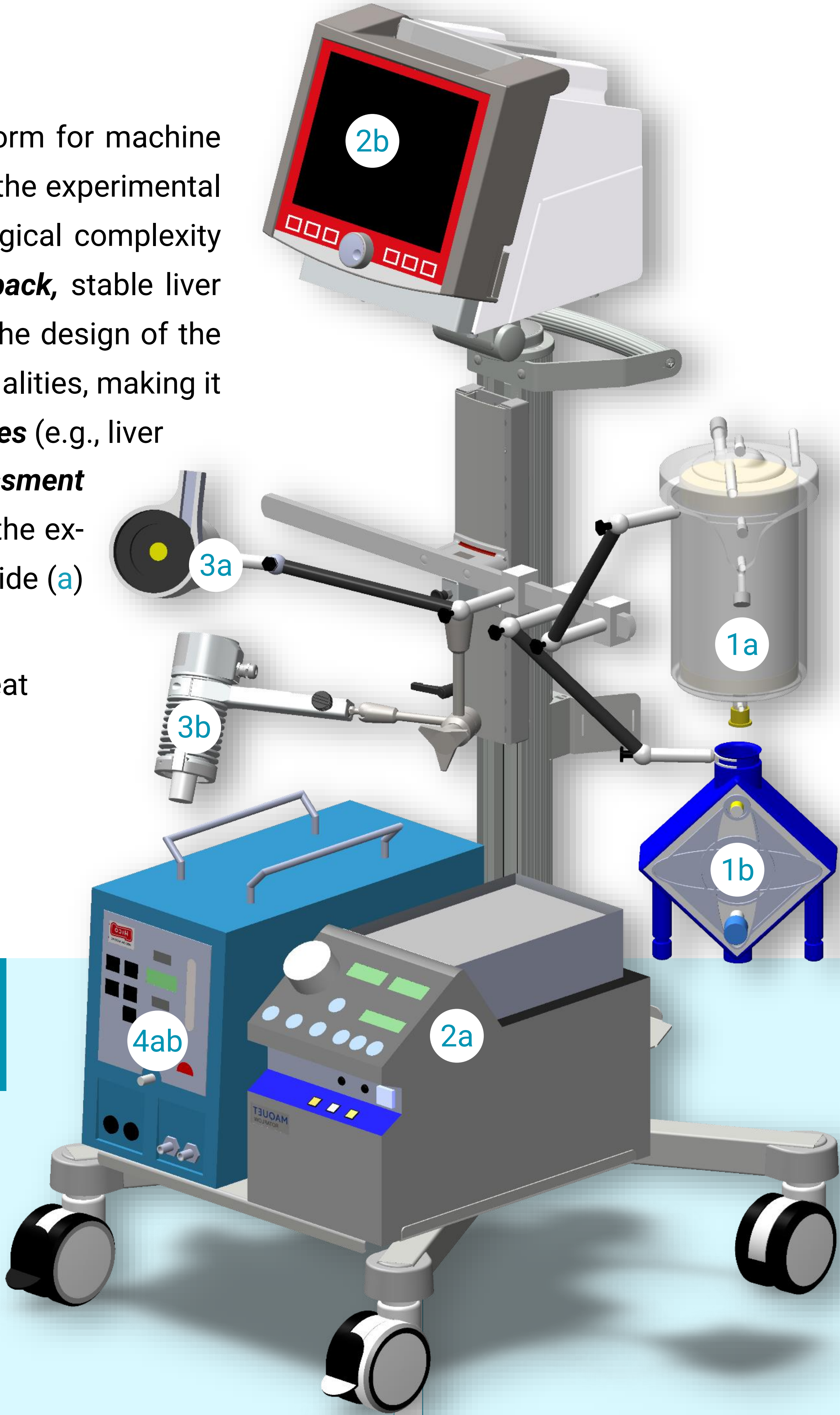
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The LiverTwin

The LiverTwin is an ex-vivo experimental platform for machine perfusion of pig livers. The platform combines the experimental flexibility of an in-vitro lab setup with physiological complexity that is found in-vivo. Using **physiological feedback**, stable liver perfusion can be achieved for up to 6 hours. The design of the platform supports a wide range of imaging modalities, making it ideal for **development of interventional techniques** (e.g., liver cancer treatments) and **liver condition assessment** using (novel) imaging modalities. The input to the ex-vivo liver can be tuned for both the portal vein side (a) as well as the hepatic artery side (b), using:

1. Hollow-fiber oxygenators with integrated heat exchangers
2. Pump controllers
3. Centrifugal pumps
4. Temperature regulator (37°C)



Physiological feedback



Ultrasonic flow monitoring

Blood pressure monitoring

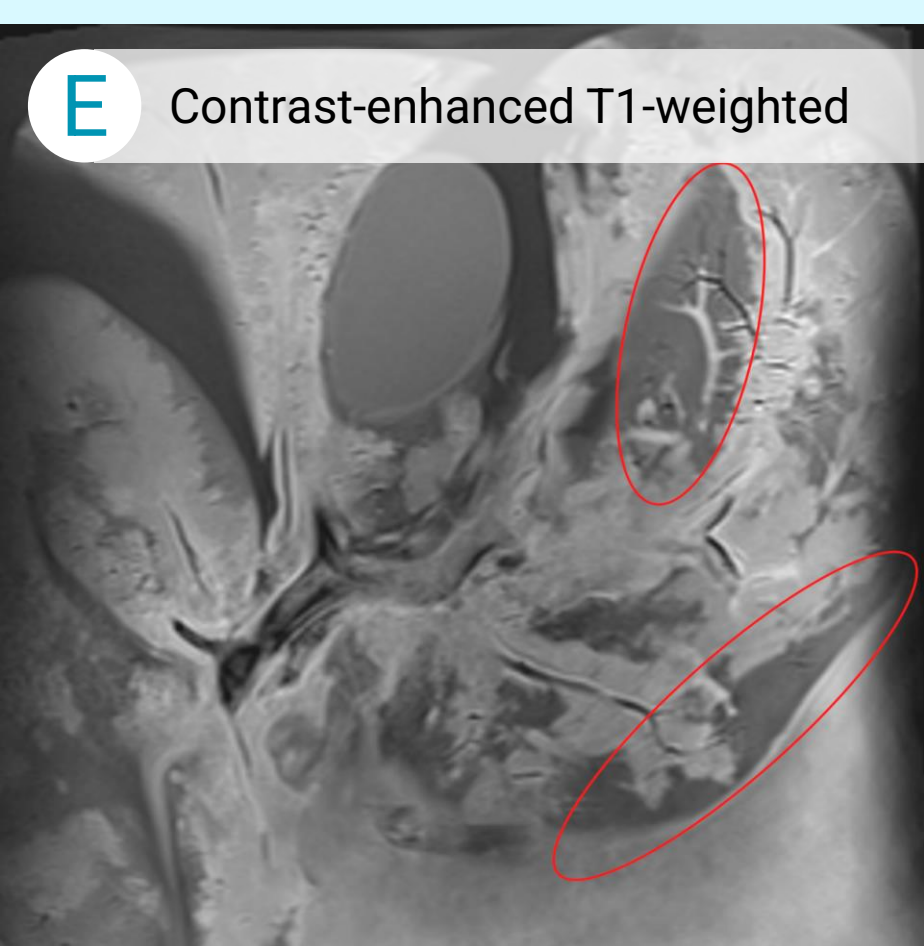
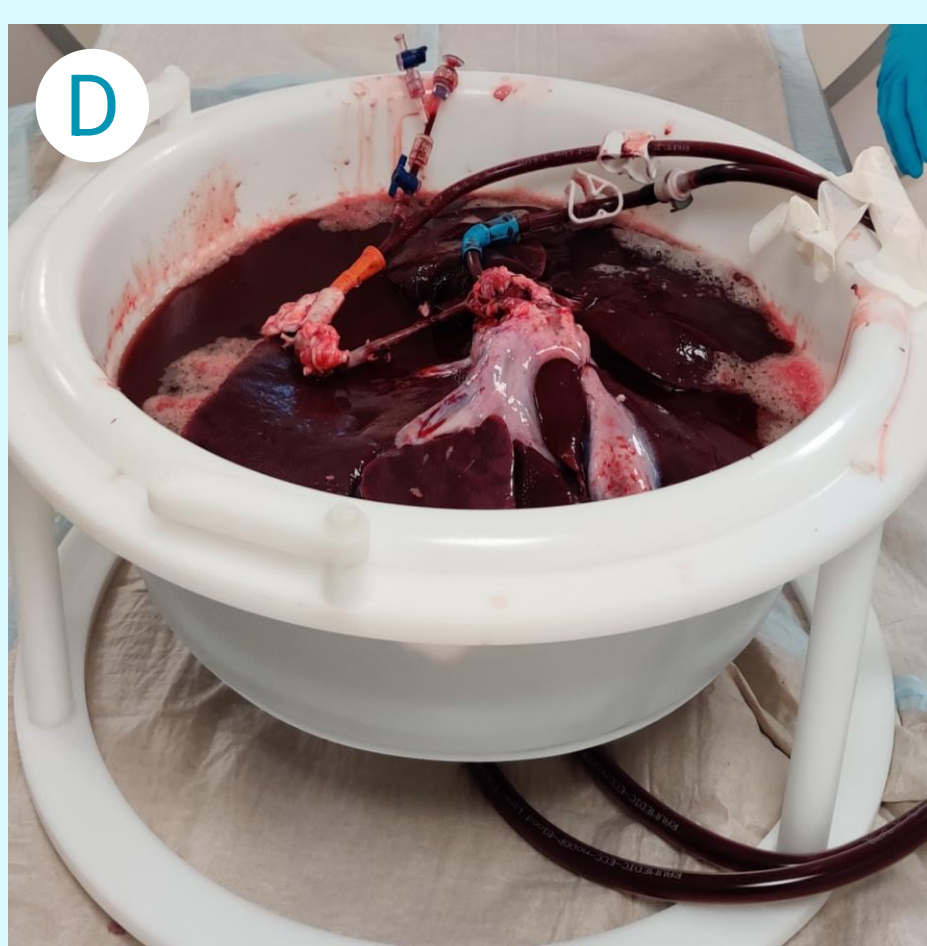
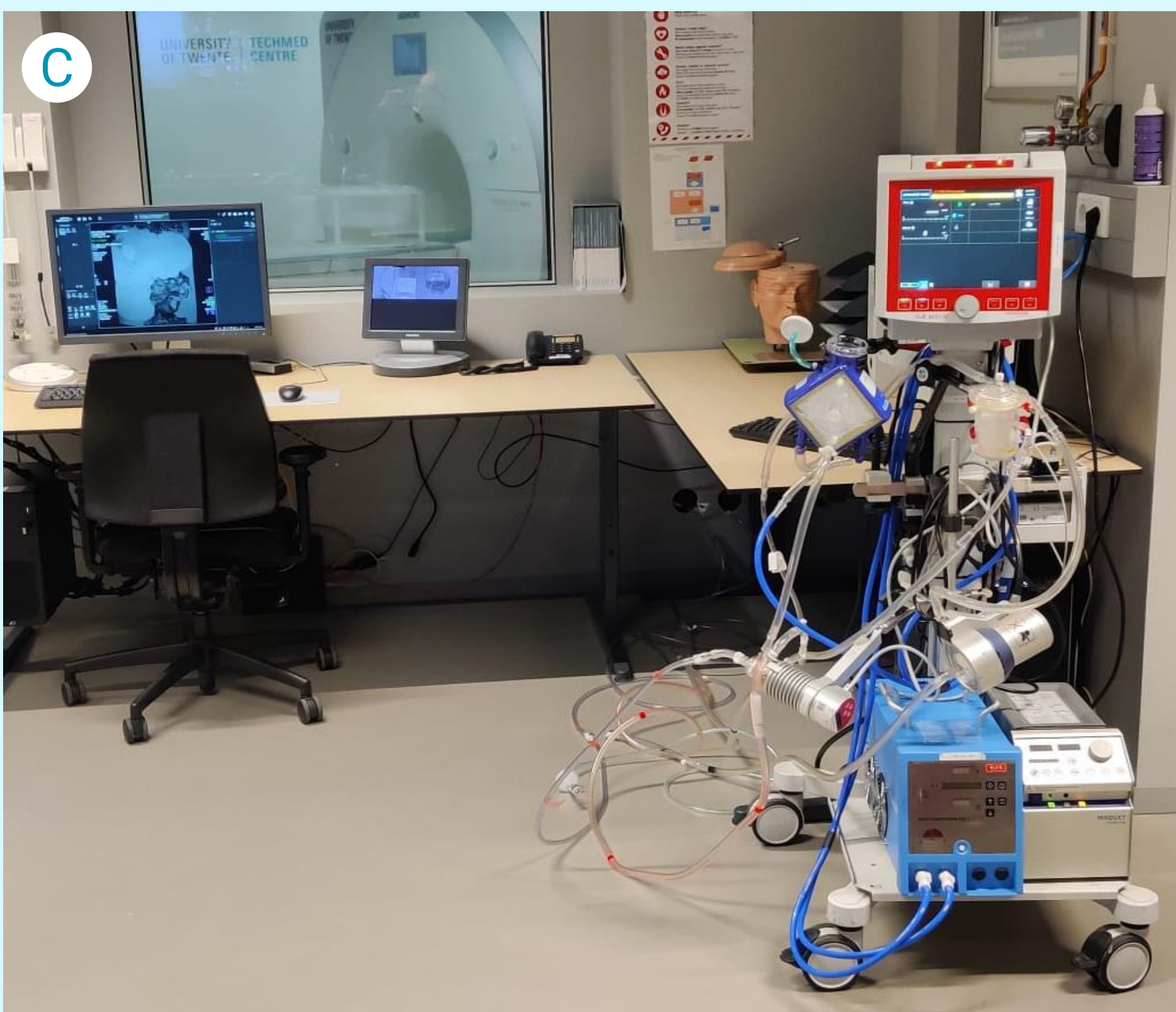
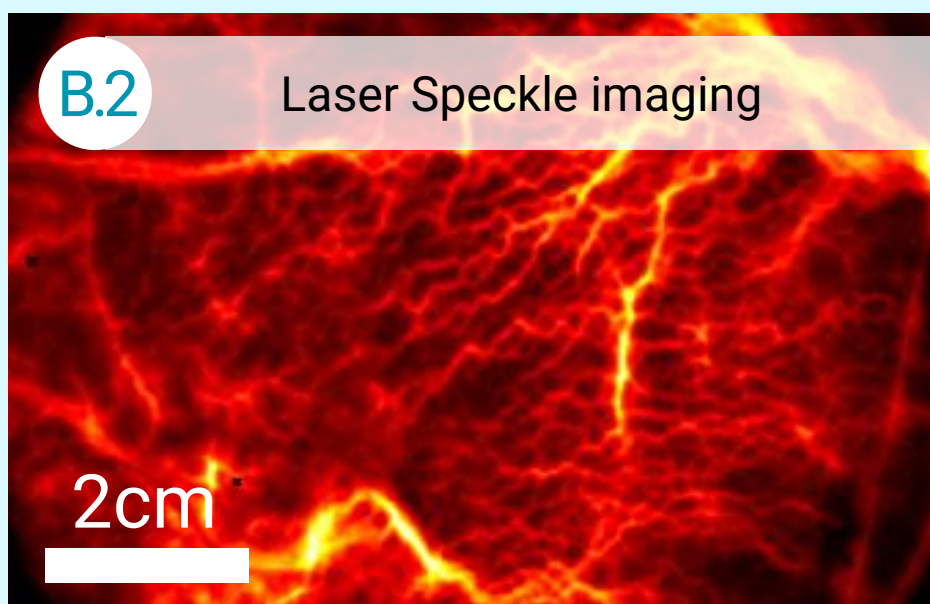
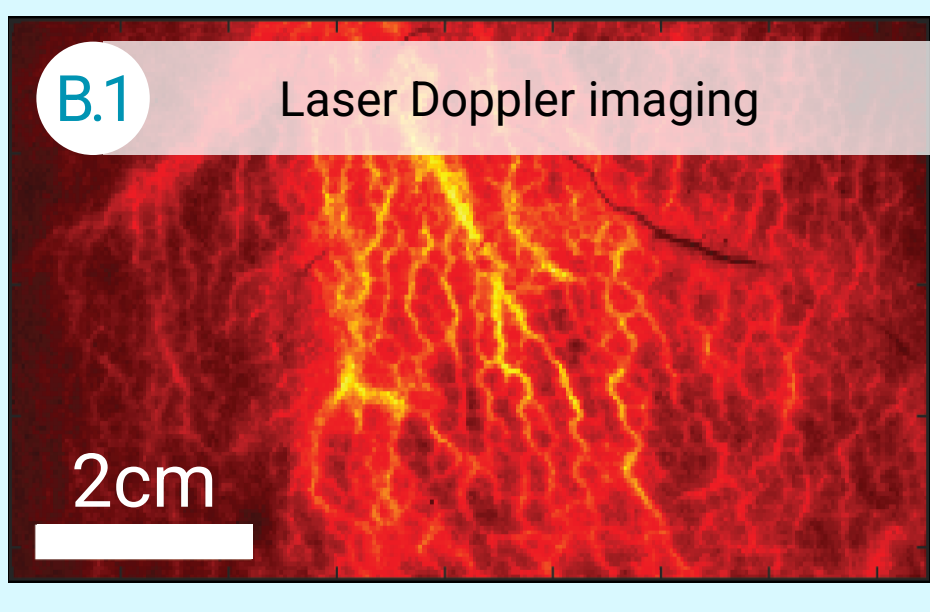
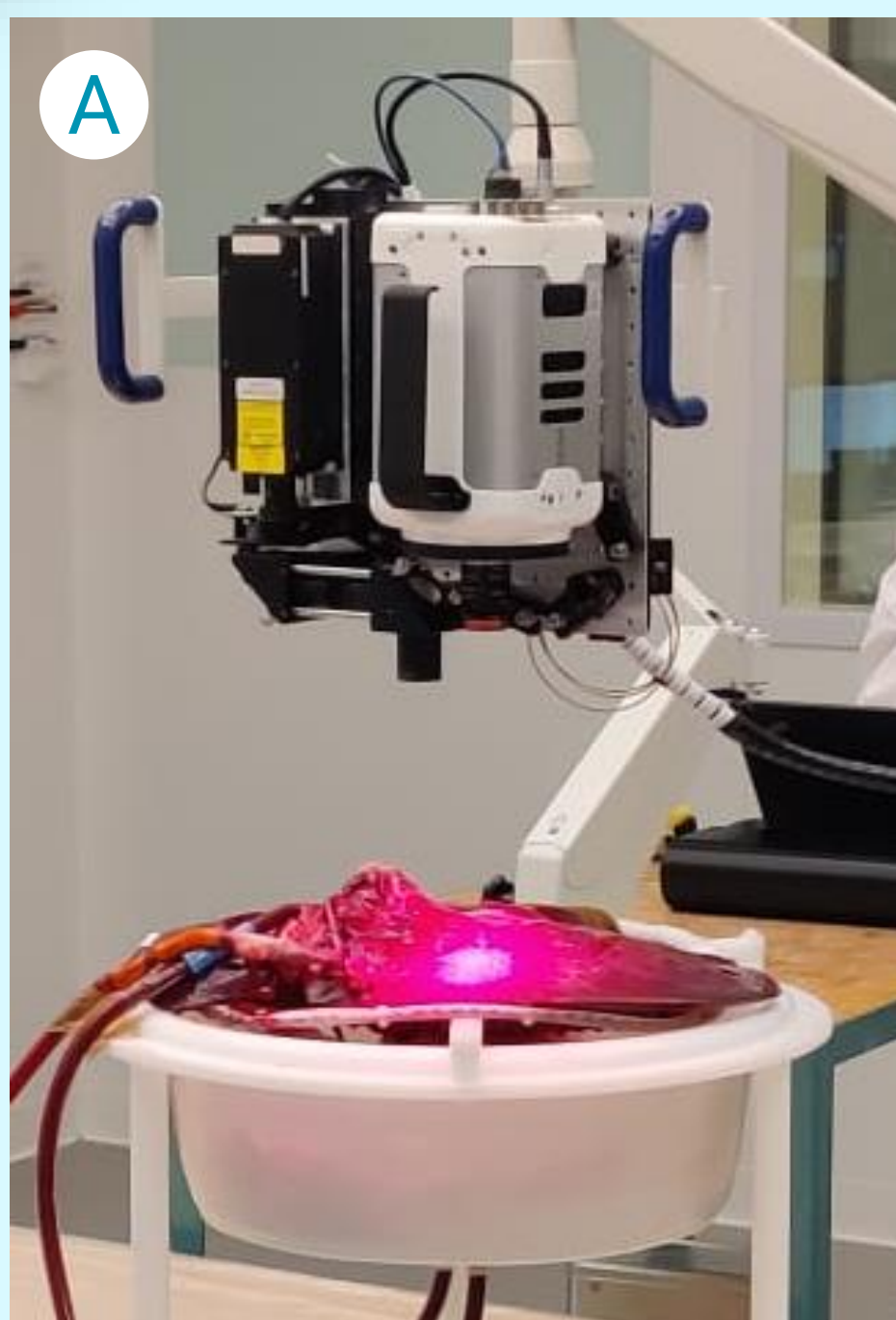
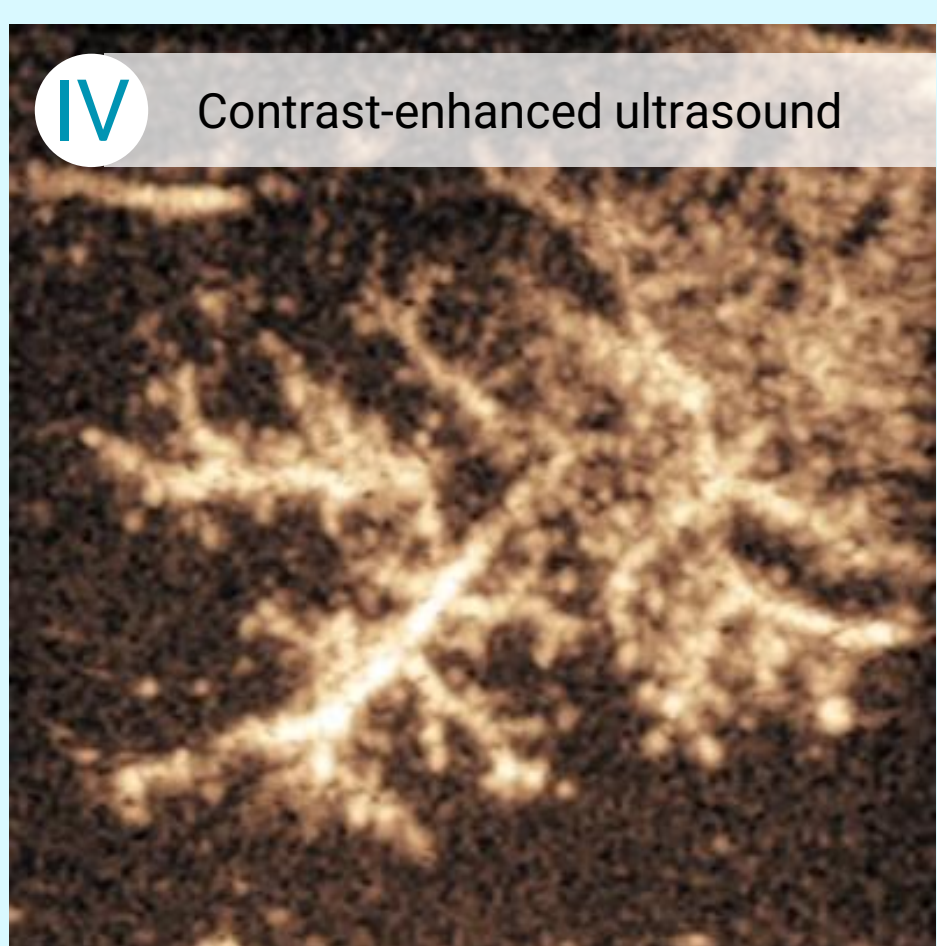
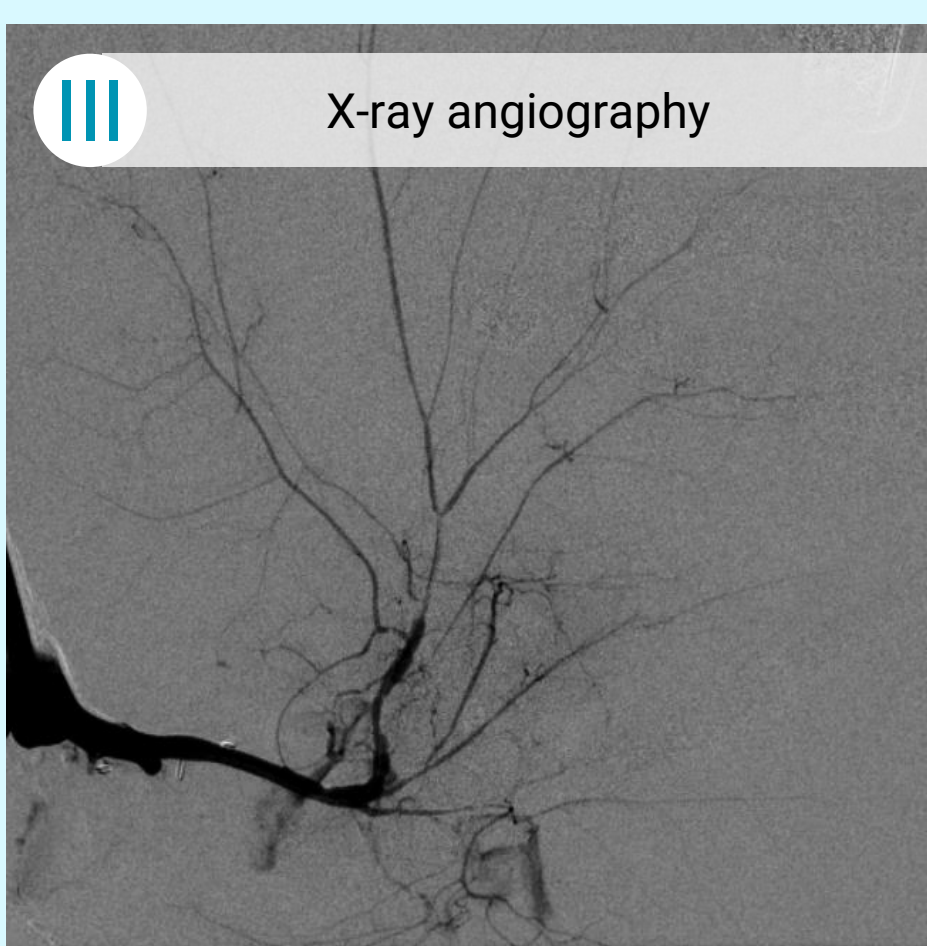
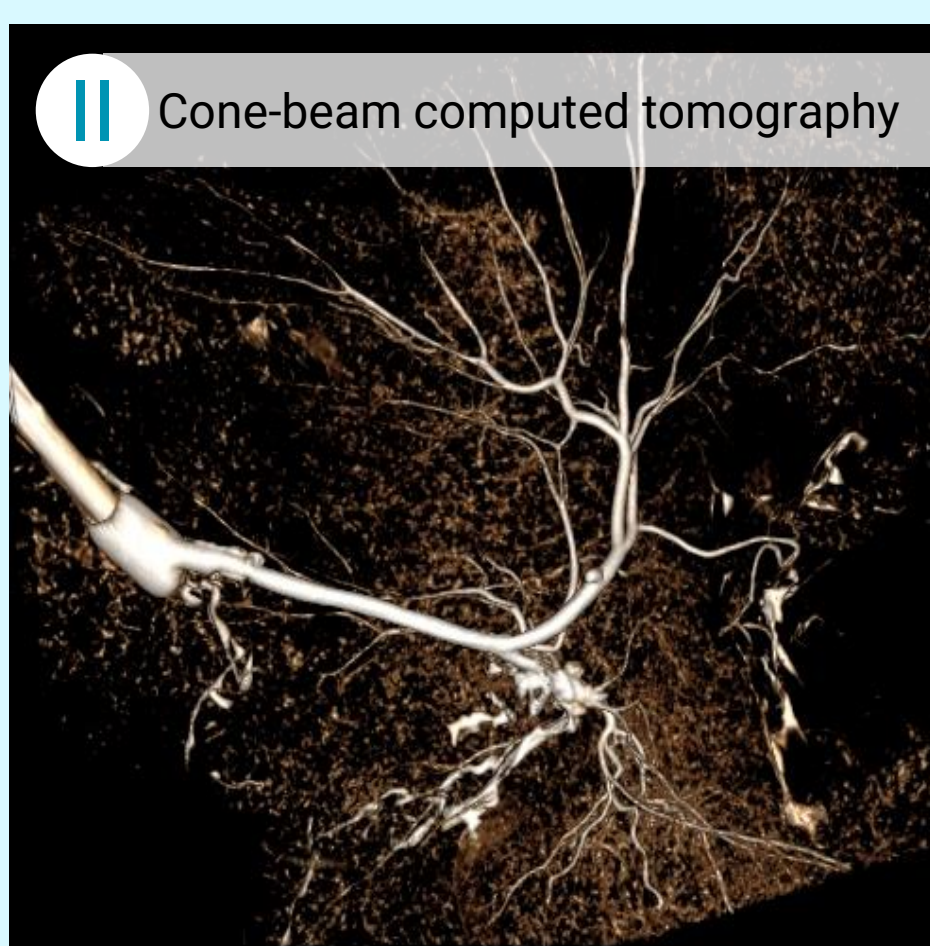
Blood gas analysis

Development of interventional techniques

- I. Combined computed tomography, X-ray and ultrasound imaging
- II. 3D visualization of vasculature using radiocontrast for treatment planning
- III. Roadmaps using radiocontrast for live catheter navigation
- IV. Targeting analysis using ultrasound contrast microbubbles¹

Liver condition assessment

- A. Non-invasive optical imaging
- B. Microperfusion analysis using two different optical modalities²
- C. Perfusion from MRI control room
- D. Liver submersion & non-magnetic reservoir for MRI
- E. Ischemia analysis with MRI contrast³

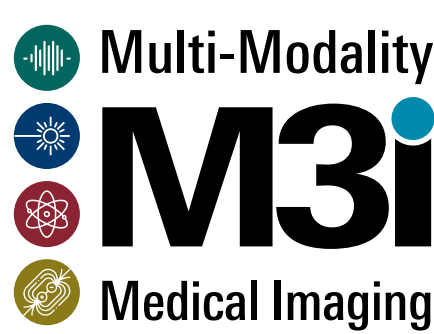


References

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