# IMAGE GUIDANCE DURING LIVER TACE USING 2D/3DRA REGISTRATION

*Ambrosini P.* [1], *Moelker A.* [2], *Ruijters D.* [3], *Niessen W.J.* [1, 4], *van Walsum T.* [1]

[1] Biomedical Imaging Group Rotterdam, Department of Radiology and Medical Informatics, Erasmus MC, Rotterdam, The Netherlands

[2] Department of Radiology, Erasmus MC, Rotterdam, The Netherlands

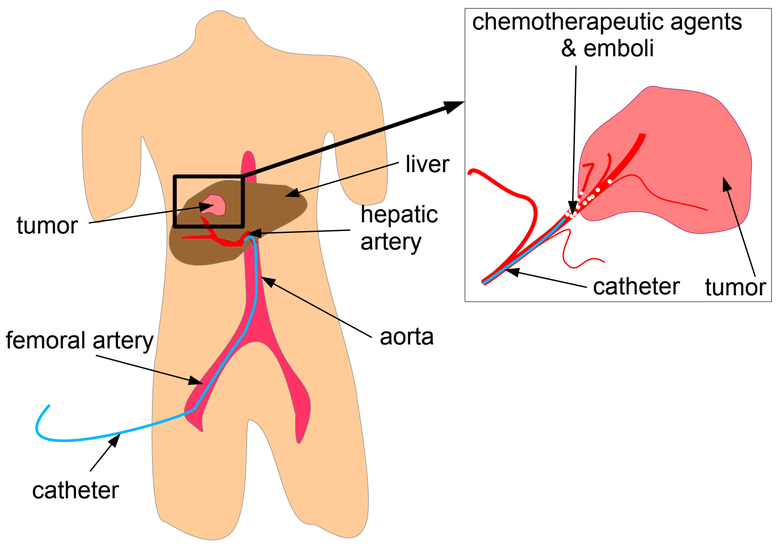
[3] Philips Medical Systems, Best, The Netherlands

[4] Imaging Science and Technology, Faculty of Applied Sciences, Delft University of Technology, Delft, The Netherlands

## Abstract

2D/3D registration is a key technology in image guidance because it facilitates fusion of 2D X-ray images with 3D pre/intraoperative images. Several methods have been presented in literature. Here we describe a possible improvement of image guidance during TACE procedure using 3D rotational angiography (3DRA) and 2D X-rays. The idea is to extract the catheter in the 2D X-rays, extract blood vessels in the 3DRA and then fuse 2D/3D using the knowledge that the catheter is inside the blood vessels.

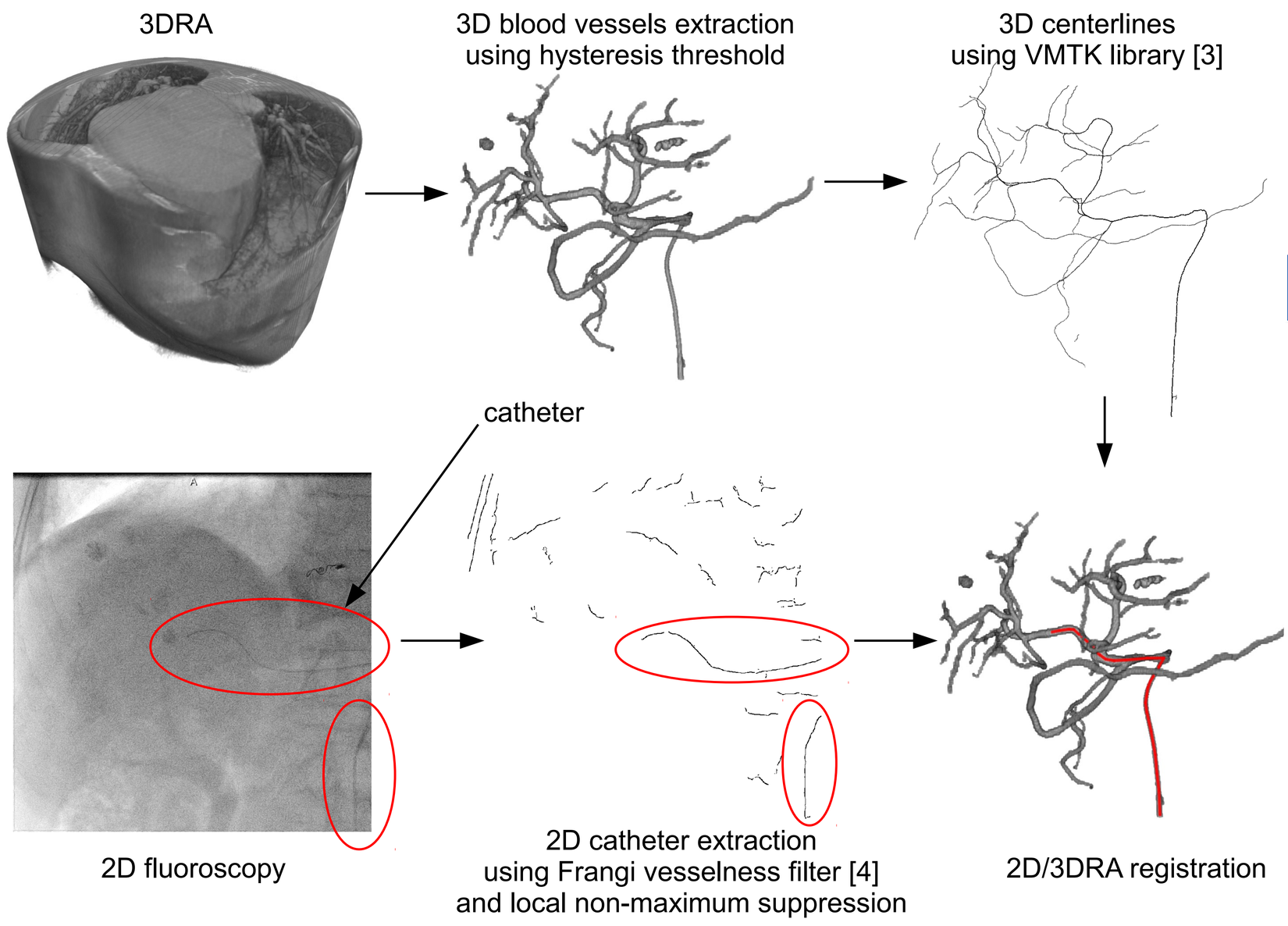
## TACE overview




## TACE procedure

**T**ranscatheter **A**rterial **C**hemo**E**mbolization is a minimal invasive procedure to treat **liver cancer** (Hepatocellular Carcinoma). The goal is to **kill/stop the growth of tumors**. First, a catheter is introduced into the hepatic artery via the femoral artery. Then, the interventionist navigates it to the artery that feeds the tumor. Next, he injects chemotherapeutic agents to kill the tumor and then emboli (beads) to cut off the blood supply. Currently interventionists guide the catheter using **2D X-rays** (**fluoroscopy**) where they can see only the catheter. Frequently, **angiographies** (2D X-rays with contrast agent injection) are acquired to visualize the arteries. The **difficulties** of this intervention are the **2d navigation**, **patient/breathing** motion, and the **inability to continuously visualize the catheter position in the arteries**.

## Quick overview




## 2D/3DRA registration

In abdominal catheterization, most proposed methods do 2D/3D registration with **2D intraoperative angiography** and **3D preoperative CTA** [1]. Then, the registration is used for the guidewire navigation helped with a breathing model and a partial catheter detection (the tip for example [2]). Here, we get an **intraoperative 3DRA** at the beginning of the procedure. And, we register it with **2D intraoperative X-rays** (**fluroscopy**). 3DRA has several advantages: 1) the contrast agent is injected directly in the arteries via the catheter so they are **better visible** compared to CTA; 2) the acquisition is done during the procedure, thus **less deformation** is expected during registration. The method steps are as follows. First, **blood vessels are extracted** from the 3DRA. Second, the **catheter is extracted** in real-time from the current fluoroscopy. Finally, the registration will be performed using **back-projection** of the extracted 2D catheter shape. This work is still in progress.

## References

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