# Supporting diagnostics and therapy planning for percutaneous ablation of liver and abdominal tumors and pre-clinical evaluation

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**Abstract**

Percutaneous ablation methods are used to treat primary and metastatic liver tumors. Image guided navigation support minimally invasive interventions of rigid anatomical structures. When working with the displacement and deformation of soft tissues during surgery, as in the abdomen, imaging navigation systems are in the preliminary implementation stage.

In this study a multi-stage approach has been developed to support percutaneous liver tumors ablation. It includes CT image acquisition protocol with the amplitude of respiratory motion that yields images subjected to a semi-automatic method able to deliver personalized abdominal model. Then, US probe and ablation needle calibration, as well as patient position adjustment method during the procedure for the preoperative anatomy model, have been combined. Finally, an advanced module for fusion of the preoperative CT with intraoperative US images was designed. These modules have been tested on a phantom and in the clinical environment.

The final average Spatial calibration error was 1,7 mm, the average error of matching the position of the markers was about 2 mm during the entire breathing cycle, and average markers fusion error 495 mm. The obtained results indicate the possibility of using the developed method of navigation in clinical practice.