Deep Learning for PSC: Diagnosis and Prediction in MRCP

Background
In recent years, deep-learning based image classification and segmentation algorithms have proven outstanding in the field of medical image analysis. We plan to leverage these algorithms for diagnosis of PSC in MRCP images. In later stages of the project, we will enhance our models to predict the exact clinical stage of the disease as well as to perform survival analysis in order to obtain a prognostic statement of disease progression.

Hypothesis
Modern deep learning algorithms can learn to differentiate between patients with and without PSC, can extract information about disease stage and progression and have the ability to transfer to data from other centers without re-training.

Study design
Retrospective study.
Training Cohort (UKE Hamburg):
- PSC: PSC-positive patients who received radial MRCP at the UKE, starting 2007.
- Control: radial MRCP of patients with no history or suspicion of PSC, no PSC-typical changes in MRCP. Exclusion of patients with liver cirrhosis.

Endpoints
- PSC yes/no
- PSC staging
- Survival analysis

Data collection
2D-PSC images in DICOM format
- 3T: 245 patients with PSC, 201 in control cohort
- 1.5T: 330 patients with PSC, control data collection still in progress

External validation is planned – we are looking for partnering centers! If you have radial MRCP data (PSC/control), do not hesitate to contact us!

Approvals
Internal research approved according to HmbKHG. Ethical approval under way.

Time plan

May 2021	– initial training of ML algorithms
August 2021	– finalization of data collection at UKE
September 2021	– final algorithm selection.
	– validation on external cohort(s)
	– publication of results

Contact details

Christoph Schramm c.schramm@uke.de
Anne Ernst anne.ernst@zmnh.uni-hamburg.de
Fabian Westhäußer fabian.westhaeusser@zmnh.uni-hamburg.de