



## **Deep Learning for PSC: Diagnosis and Prediction in MRCP & mpMRI**

### **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 and other mpMRI sequences. 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. Also, the developed algorithms benefit from simultaneously processing all available mpMRI sequences.

### **Study design**

Retrospective study.

Training Cohort (UKE Hamburg):

- PSC: PSC-positive patients who received radial MRCP at the UKE, starting 2007. Additional mpMRI sequences: T2, T1, in/opp phase.
- Control: radial MRCP of patients with no history or suspicion of PSC, no PSC-typical changes in MRCP. Exclusion of patients with liver cirrhosis. Additional mpMRI sequences: T2, T1, in/opp phase

### **Endpoints**

- PSC yes/no
- PSC staging
- Survival analysis

### **Data collection**

Radial MRCP images + T2, T1 & in/opp phase volumes 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) and/or other mpMRI sequences of PSC patients, do not hesitate to contact us!*

### **Approvals**

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

### **Time plan**

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|----------------|--|
| May 2021       | - initial training of ML algorithms                |
| August 2021    | - finalization of data collection at UKE           |
| September 2021 | - finalize classification model using 2D-MRCP      |
| October 2021   | - model adaption for staging and survival analysis |
| November 2021  | - validation on external cohort(s)                 |
| January 2022   | - model adaption for additional mpMRI sequences    |
| March 2022     | - validation on external cohort(s)                 |
| April 2022     | - publication of results                           |



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