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(CLINTEC), Enheten för medicinsk bild, funktion och teknologi**

## **Optimized MRI Methods for Simplified Oncological Imaging in Pancreas and Liver**

AKADEMISK AVHANDLING

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# ABSTRACT

Recent technological advances within the fields of Abdominal Imaging have revolutionised oncological imaging. In the investigation of the solid organs in the upper abdomen, extensive examinations are used in order to obtain accurate information. To improve the early detection of –still curable– pathological changes, novel methods that are faster, easier and still as highly accurate as the ones currently used, are warranted; in that way, the needs for higher efficiency in the modern multidisciplinary environment can be met in a cost-effective manner.

The overall purpose of this thesis was to develop and optimise MRI methods for the simplified oncological imaging evaluation of two important patient groups:

- a. those with pancreatic cancer, by applying diffusion-weighted (DW) MRI (studies I and II), and
- b. those with colorectal cancer liver metastases (CRLM), by using a novel, manganese-based, orally administered MRI contrast agent (CMC-001) (studies III and IV).

In **study I**, the accuracy of DW MRI was evaluated and compared with a conventional comprehensive MRI (MRI-c) protocol in 36 patients with pancreatic lesions (12 malignant and 24 benign) and 39 without lesions. The results showed that DW MRI has an accuracy that is similarly high to that of MRI-c for the detection of pancreatic cancer.

In **study II**, three different DW MRI techniques (respiratory-triggered, free-breathing, and breath-hold) were compared regarding image quality, signal intensity and ADC measurement in 15 patients with proven pancreatic cancer. The results showed superiority of the respiratory-triggered technique in both analyses for demonstrating pancreatic cancer.

In **study III**, the sensitivity of MRI to detect CRLM after ingestion of a full-dose of CMC-001 was compared with that of a comprehensive intravenous gadobenate dimeglumine protocol as well as their safety profile and patient acceptability were compared in 20 patients suspected of having 1-6 such lesions. The results showed that CMC-001 and the intravenous gadobenate dimeglumine had similar sensitivities; no safety issues were raised for neither contrast agent but CMC-001 had higher rates of gastrointestinal adverse events.

In **study IV**, the efficacy of three different doses of the contrast agent CMC-001 (corresponding to  $\frac{1}{2}$ ,  $\frac{1}{4}$  and  $\frac{1}{8}$  of the full dose) as well as its safety profile and patient acceptability were evaluated in 32 healthy volunteers. The results showed that  $\frac{1}{2}$  dose of CMC-001 had higher efficiency and still acceptable adverse drug reactions/adverse events.

In conclusion of studies I and II, DW MRI is as sensitive as the comprehensive MRI protocol in detecting pancreatic cancer and for that, the respiratory-triggering seems the optimal technique. In conclusion of studies III and IV, the sensitivity of the full dose of oral CMC-001 is as high as the intravenous gadobenate dimeglumine protocol but half-dose of this agent should be preferred due to higher patient acceptability.