

# Chinese Medicine Magnetite as A Custom-Made MR Negative Oral Contrast Agent

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## Abstract

This study aimed to develop a custom-made MR oral negative contrast agent by blending traditional Chinese medicine Magnetite with resistant starch xanthan gum and gelose 50. Thereafter, we test the feasibility of this new agent for signal suppression of upper gastrointestinal tract and its diagnostic value for magnetic resonance cholangiopancreatography (MRCP) and imaging of stomach tumor. The safety profile, palatability, compliance and complication were also evaluated.

This study was divided into three parts. They were in vitro study, animal study, and human study.

## In Vitro Study

In vitro study was performed with magnetite amount ranged from 0.015gram to 0.1 gram/ 100 ml H<sub>2</sub>O and found 0.015 gram/100 ml H<sub>2</sub>O was optimal when mixed with adequate amount of xanthan gum and gelose 50. Under such concentration, the signal intensity of fluid was totally suppressed and the contour of the containing tube was not distorted. Other concentration, although also suppressed the signal intensity well, caused marked tube distortion.

## Animal Study

When conducting the experiment in three New Zealand white rabbits, we found the fluid signal in the stomach was totally turned to be dark as compared with the non-orally enhanced pulse sequences. The contour of the stomach was also intact. There was no marked image artifact was seen. These rabbits were followed up for three days and no evidence of any side effect including vomiting, diarrhea was noted.

## Human Study

Totally twenty-four patients were included in this study. There were 12 males and 12 females. Age ranges from 2 years old to 85 years old. Fourteen patients came for MRCP examination due to suspicion of biliary or pancreatic problems. Seven patients were for studies of liver tumors. The rest three patients had stomach tumor.

Both axial and coronal sections of heavy T2WI were acquired for non-orally and orally-enhanced images. The signal intensity in the stomach of these 24 cases was completely suppressed and the mucosa was clearly delineated in enhanced images. There was no artifact was identified. For three patients with stomach tumors, the interface of the tumor with the stomach mucosa was clearly seen. For MRCP studies, the orally-enhanced images showed totally or nearly totally suppressed signal in the stomach and/or duodenum. This made the identification of the common bile duct and pancreatic duct much easier in thick slab heavy T2WI (Fig. 1 & 2). All patients were evaluated for the palatability of the contrast agent during the ingestion. And the possible complications including nausea, vomiting, abdominal pain, and diarrhea were evaluated immediately, hours, and one day after the ingestion of the contrast agent. All patients had no any complaint or side effects.



**Fig. 1.** After ingestion of magnetite suspension, the CBD in the right side image was more clearly identified than the non-enhanced image in the left side.



**Fig. 2.** After ingestion of magnetite suspension, the pancreatic duct in the right side image was more clearly identified than the non-enhanced image in the left side.

## References

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