Faecal tagging: a new strategy to obviate bowel cleansing before MR colonography

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Introduction
Colorectal cancer, mostly arising (>90%) from preexisting adenomatous polyps, continues to be the second leading cause of cancer death [1,2]. The impact of colonoscopy has remained limited due to poor patient acceptance [3]. MR-colonography, based on the acquisition of 3D MR data sets, permits accurate detection of colonic polyps with a diameter >5mm [4,5]. Since residual colonic stool cannot be differentiated from polyps, MR colonography requires a cleansed colon. The rigorous associated with colonic cleansing are known however to considerably reduce patient acceptance. The aim of the present study was to assess a colonic imaging strategy obviating the need for colonic cleansing altogether.

Theoretical Background: The need for colonic cleansing would be eliminated, if stool were to acquire a signal intensity different from polyps and identical to the enema used to fill and distend the colon. In principle there are two approaches to this concept of fecal tagging: dark polyps surrounded by bright stool and a bright enema, and bright polyps surrounded by dark stool and a dark enema. The first approach has been evaluated with some success [6]: Gd-DOTA was administered as an oral contrast agent with three meals preceding MR-colonography based on the administration of a Gd-based enema. The high cost of Gd-based contrast have limited the clinical utility of this technique. We now propose the other approach: by providing patients with Barium as an oral fecal tagging agent to render stool dark, and using Barium for the enema to distend the colon during MR-colonography, the colonic wall and polyps arising from it can be made visible following the intravenous administration of Gd-based extracellular contrast.

Methods
Seven healthy volunteers and 20 patients, due to undergo conventional colonoscopy for a suspected colorectal mass were included in this study which was approved by the local ethics committee. For fecal tagging 200 ml of a barium-containing contrast agent (Micropaque; Guerbet) were ingested with each of three low fiber meals preceding MR-colonography by six volunteers and all patients. As a control, a seventh volunteer did not ingest the contrast agent. Imaging was performed on a 1.5 T MR scanner (Magnetom Sonata, Siemens). To reduce bowel motion 20 mg of scopolamine (Buscopan) were administered iv. For MR colonography the colon was filled in the prone position with approximately 2000 ml of a 1:4 barium/water mixture. The filling process was monitored with a non-slice-select 2D acquisition (TR/TE 1.3/2; flip angle, 25°; 128 x 128 matrix), collecting one image every three secs. Gadobenate dimeglumine (Multihance, Bracco, Italy) was injected intravenously in a dosage of 0.2 mmol/kg at a flow rate of 3ml/sec. Subsequently 3D FLASH images were collected using the following parameters: TR/TE 1.6/0.6 msecs, flip angle 15°, field of view 45 cm, matrix of 230x256, acquisition time 22 sec. The data were interpreted based on multiplanar reformations and virtual colonoscopic views. In the volunteers 3D data sets were collected 25, 50, 75 and 100 seconds following the begin of the contrast injection. Based on CNR measurements between the colonic wall and lumen all patient exams were performed with a 75 sec delay following contrast administration.

Results
The oral administration of barium-containing contrast was well tolerated. 3D imaging revealed homogeneously low signal of colonic feces (Fig 1a). MRC performed without prior ingestion of the tagging agent could not be interpreted due to the presence of abundant bright stool (Fig 1b). The combination of fecal tagging, colonic filling and residual air resulted homogeneously low signal throughout the colonic lumen. Intravenous injection of gadolinium caused avid enhancement of the colonic wall. CNR measurements between colonic wall and lumen were maximal 75 sec after contrast injection with a mean CNR (bowel wall/lumen) of 42.5.

Discussion
Fecal tagging obviates the need for bowel cleansing and should therefore further enhance patient acceptance for MR colonoscopy. Barium used as the tagging agent is promising as it is inexpensive, commercially available and characterized by an excellent safety profile. Furthermore, it is not reabsorbed in the intestine and the application is well tolerated [7].

References