Non-invasive Distension of the Small Bowel for Optimized Magnetic Resonance Imaging.

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Introduction
Sufficient distension of the gut is crucial for intestinal imaging [1]. Enteroclysis is the standard approach for small bowel imaging but is invasive and often traumatizing for the patient [2]. Recently first reports on MR-enteroclysis have been published [3]. But even with MR-enteroclysis nasogastric intubation and tube placement under X-ray fluoroscopy is used by other authors [3].

Purpose:
The introduction of a totally non-invasive reliable peroral bowel distension method for MR imaging of the small bowel.

Methods
10 volunteers (5 female, 5 male) participated in the study. The exclusion criteria were known gastrointestinal disease and general contraindications to MRI. The study protocol was approved by the ethics committee of the hospital. Each volunteer gave a written informed consent.

A total of 20 ml Gd-DOTA (Meglumine gadoterate, Dotarem®, Guerbet, Roissy, France) in combination with 0.8g/kg body weight Metamucil® (Ispaghulae testae pulvis, Procter&Gamble, Cincinnati, Ohio, USA) were divided into 4 doses and diluted in a minimum of 250ml of water, each taken orally every hour. Except additional water no other food or beverages were allowed.

One hour after the last intake imaging was performed using a 1.5T MR unit (Philips Gyroscan NT PT 6000). 40mg iv Scopolamine butyl bromide (Buscopan®, Boehringer Ingelheim, Germany) were administered in order to minimise bowel motion. A 3D gradient echo data set with an isotropic resolution of 1.5mm (TR/TE 4.0/ 1.1 ms, flip-angle 25°, 80 slices, matrix 256X256, FOV 400mm) was acquired in apnoea over 30 seconds in prone position.

Data analysis was performed on a workstation (Easyvision, Philips) over the whole length of contrasted small bowel including all 3D-slices. Consensus evaluation was done incrementally by three of the authors (MP, JF, KUW) using the following criteria on a five point scale: 1. semiquantitative measurement of distension (ranging from collapsed over slight (up to 10mm), intermediate (between 10 and 20mm) to full distension (over 20mm)), 2. homogeneity of signal, 3. demarcation of the contrast enhanced tissue was rated qualitatively as optimal (scaling 5 ± 0) and all remaining segments could clearly be delineated.

The presence of artifacts was rated 2.4 ± 0.8. In 9 out of ten volunteers motion artifacts were noted. None of these bowel motion artifacts were hampering the image quality.

Discussion
In summary the current study presents a new non-invasive technique for distension of the small intestine. The method is feasible, reliable, easy-to-use and reproducible in volunteers. Both distension and the provided constant signal homogeneity permit an excellent MR image quality for optimal small bowel depiction.

References