

3D SSFP Acquisitions for MR Enterography

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Target Audience: Gastrointestinal MR radiologists

Purpose: To assess the feasibility of substituting a single coronal 3D SSFP acquisition for the multiple coronal and axial 2D SSFP acquisitions obtained in standard MR enterography protocols.

Methods: Coronal 3D SSFP acquisitions were obtained in 15 patients scheduled for clinically indicated MR enterography, with the following parameters: TR/TE 3.2/1.6 ms, flip angle 55, section thickness 1.4 – 2.0 mm, in-plane matrix 224 x 320, field of view 40 – 46 cm with partial phase FOV 0.8 – 1.0, and parallel imaging acceleration factor of 3. Imaging parameters were adjusted according to the acquisition volume prescribed to include large and small bowel and to the breath hold capacity of the patient.

3D SSFP coronal source images were assessed for overall image quality on a scale of 1 (uninterpretable) to 5 (perfect images), and for the presence of artifacts, also on a scale of 1 (severe artifacts, non-diagnostic images) to 5 (none). The type of each artifact was noted. The coronal source images and axial reformatted images were also evaluated for diagnostic adequacy in comparison to the conventional axial and coronal 2D SSFP images. Finally, the overall preference between standard 2D SSFP images and 3D SSFP images was noted.

Results: The 4 male and 11 female patients ranged in age from 21 to 62 years in age (mean 32 years), with indications including Crohn's disease in 6 patients, abdominal pain in 4 patients, diarrhea in 2 patients, and celiac disease, intestinal lymphangiectasia, and partial small bowel obstruction in single patients. The average acquisition time for the 3D SSFP series was 22 seconds. Coronal and axial reformatted 3D SSFP images were diagnostic in all patients, with an average image quality score of 3.7 and average artifact score of 3.9. Mild motion blurring was the most commonly encountered artifact, with susceptibility artifact noted in 4 patients with prominent bowel gas or surgical clips in the abdomen. 2D SSFP images were preferred in 10 patients and 3D SSFP images in 5 patients.

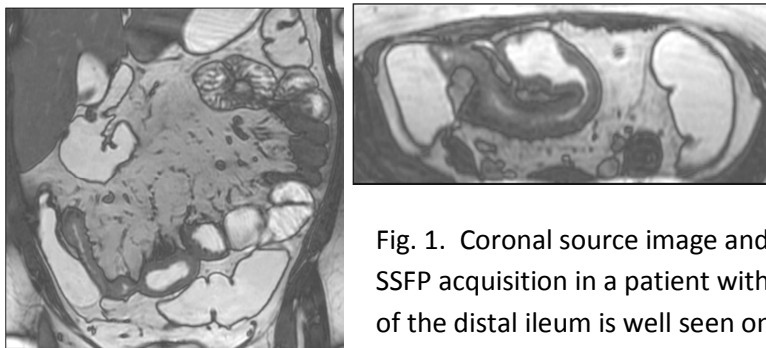


Fig. 1. Coronal source image and axial reformatted image from 3D SSFP acquisition in a patient with Crohn's disease. Mural thickening of the distal ileum is well seen on both images.

Discussion: This preliminary study suggests that it may be feasible to substitute a coronal 3D SSFP acquisition obtained in a single breath hold for separate coronal and axial 2D SSFP series obtained with multiple breath holds. In addition, the 3D volumetric acquisition allows reformatting in oblique planes to better demonstrate focal abnormalities in obliquely oriented bowel loops. Limitations include relatively long acquisition times when extensive anterior-posterior coverage is required and a slightly higher prevalence of motion artifact in comparison to the sequentially acquired 2D SSFP images.