

Comparison of a Recently Developed 3D SPGR Breath-hold Examination for Abdominal MR Imaging and 2D fast SPGR Breath-hold Equivalent for Image Characteristics

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INTRODUCTION: A recently developed MR imaging sequence denominated liver acquisition with volume acceleration (LAVA) is a three-dimensional (3D), spoiled gradient recalled echo (SPGR) sequence, using a partial Kz filling and a segmented special technique, which enables entire liver imaging within 20 seconds of breath-hold times. In this study, we applied the 3D LAVA images to pancreaticobiliary diseases and compared them with two-dimensional (2D) fast SPGR images.

METHODS: Within a 4-month period we examined 88 adult patients (45 men and 43 women; average age, 61 years; age range, 30-88 years) who had been referred because they were known to have or were suspected of having pancreaticobiliary diseases. We obtained all MR images by using a 1.5-T system (Twinspeed HD; General Electrics Medical Systems, Waukesha, Wis) with an eight-element body array coil. We obtained breath-hold 2D axial fast SPGR images and breath-hold 3D LAVA images before and after contrast material administration. In each subject, we acquired 2D fast SPGR images (150/4.2 [repetition time msec/echo time msec] for in phase, or 150/1.8 [repetition time msec/echo time msec] for opposed phase, 5mm thickness, 32-40cm field of view, 256x192 matrix, 5.00 mm thickness, acquisition time of 16 seconds) of the entire pancreas, and acquired 3D LAVA images (3.2/ 1.5 [repetition time msec/echo time msec], 32-40-cm field of view, 256x192 matrix, 5.00 mm thickness, acquisition time of 14 seconds) of the entire pancreas, and the flip angle was automatically set. The examinations included precontrast, precontrast fat-saturated and postcontrast fat-saturated SPGR breath-hold imaging. The fat-saturation strategy was used chemical shift selective method for opposed phase of the 2D fast SPGR sequences, and was used spectral presaturation with inversion recovery for the 3D LAVA sequences. We assessed overall image quality, intravascular artifacts, blurring using a 5-point scale (1; poor to 5; excellent). For each patient, matching regions of interest were placed over the liver, pancreas, spleen. On the basis of these measurements, the following parameters were computed: liver-to-spleen, pancreas-to-spleen signal intensity ratios (SIRs). Sixteen patients with pancreas cystic tumor and 11 patients with pancreas solid tumor were computed additionally: lesion-to-pancreas SIRs.

RESULTS: For postcontrast studies, the 3D LAVA images had a significantly higher score (3.7 ± 0.5) for overall image quality than did the 2D fast SPGR images (3.0 ± 0.4). For postcontrast studies, the 3D LAVA images had a significantly higher score (4.7 ± 0.5) for intravascular artifacts than did the 2D fast SPGR images (3.3 ± 0.4), indicating less artifacts for the 3D LAVA images. For pre- and postcontrast fat-saturated studies, the 3D LAVA images had significantly lower scores (4.3 ± 0.5 , 4.4 ± 0.5) for blurring than did the 2D fast SPGR images (4.6 ± 0.5 , 4.7 ± 0.5), indicating that 3D-LAVA images had poorer clarity compared with the 2D fast SPGR images. For precontrast studies, pancreas-to-spleen SIR was significantly higher on the 3D LAVA images (0.48 ± 0.25) compared with the 2D fast SPGR images (0.27 ± 0.20), and there was no statistically significant difference for pre- and postcontrast fat-saturated studies. For precontrast studies, cystic or solid lesion-to-pancreas SIR was significantly higher on the the 3D LAVA images (0.75 ± 0.06 , 0.41 ± 0.09) compared with the 2D fast SPGR images (0.64 ± 0.09 , 0.33 ± 0.08), and there was no statistically significant difference for pre- and postcontrast fat-saturated studies.

SUMMARY AND CONCLUSION: The 3D LAVA images have higher SIRs than the 2D fast SPGR images, and the 3D LAVA images can demonstrate pancreas lesion comparable to the 2D fast SPGR images. Postcontrast 3D LAVA images can reduce intravascular artifacts. The use of thin-section MR imaging with the 3D LAVA sequences may replace the 2D fast SPGR sequences.

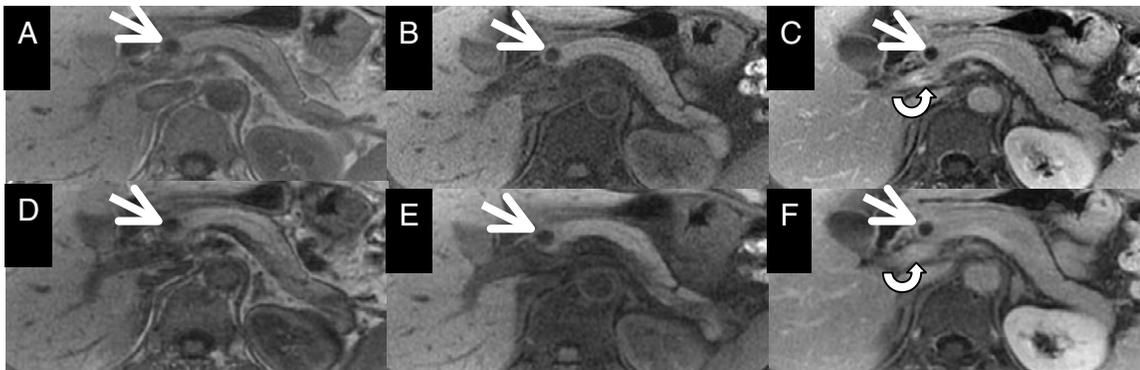


Fig 1. The 2D fast SPGR MR images (A-C) and the 3D LAVA MR images (D-F) in 62-year-old man with a pancreas cystic lesion (arrows in A-F) demonstrate similar image quality. (A) Precontrast 2D fast SPGR image. (B) Precontrast fat-saturated 2D fast SPGR image. (C) Postcontrast fat-saturated 2D fast SPGR image shows definite signal-intensity decrease mimicking portal venous thrombus (curved arrow). (D) Precontrast 3D LAVA image. (E) Precontrast fat-saturated 3D LAVA image. (F) Postcontrast fat-saturated 3D LAVA image shows homogeneous enhancement (curved arrow).