

Fetal MRI: SSFSE versus FIESTA

H. Shinmoto¹, Y. Tanami¹, K. Oshio¹, A. Tanimoto¹, N. Higuchi¹, S. Okuda¹, S. Kuribayashi¹

¹Diagnostic Radiology, Keio University School of Medicine, Tokyo, Japan

Synopsis

This study compares single shot fast spin echo sequence (SSFSE, GE) with fast imaging employing steady-state sequence (FIESTA, GE) in depiction of fetal anatomical details, including brain, chest, liver, gastrointestinal tract and musculoskeletal system. For the brain, both sequences provide comparable image quality. SSFSE is superior to FIESTA in evaluating demarcation of the lung and differentiation of the small intestine and the colon. In contrast, FIESTA is superior to SSFSE in evaluating the intrahepatic vascular structures and musculoskeletal structure. These two sequences should be adapted to suit the occasion for fetal pathology.

Introduction

In general, a single shot acquisition is required for the fetal magnetic resonance imaging (MRI) due to fetal movement. To date there are two adequate sequences to image the fetuses, which are single shot fast spin echo sequence (SSFSE, GE) and fast imaging employing steady-state sequence (FIESTA, GE). However, the comparative studies of two sequences regarding depiction of fetal anatomy are limited. In this study, we compared the relative efficacy of two sequences in the evaluation of fetal anatomy.

Methods

Studies were performed with a 1.5T Signa scanner (GE) using torso array coil. Twenty-four fetuses ranged from 20 weeks to 38 weeks who underwent MRI with both SSFSE and FIESTA at least one same direction were evaluated. Scan parameters are TR/TE= ∞ /98ms, 0.5 NEX, 31.2KHz bandwidth for SSFSE and TR/TE=4-5/2-2.5ms, FA 60°, 1NEX, 62.5KHz bandwidth for FIESTA, and 4-5mm slice thick on both sequences. Two experienced radiologists who are familiar with fetal MRI evaluated the depiction of fetal anatomical detail on both sequences, dividing into brain, chest, liver, gastrointestinal tract and musculoskeletal system. The image quality was graded into three categories by visual inspection for each organ as follows: 0, poor; 1: fair; 2: good.

Results

For the brain, both sequences revealed anatomical details well, including layering pattern, sulcation and ventricles, and there was no statistical difference on both sequences. For the liver, intrahepatic vascular structures are better recognized on FIESTA than on SSFSE. Regarding the chest and gastrointestinal tract, SSFSE showed significant superior image contrast compared with that for FIESTA on demarcation of the lungs (Fig.1) and differentiation of small intestine and colon (Fig.2). In contrast, FIESTA showed image contrast significantly superior to that for SSFSE on musculoskeletal structure (Fig.3).

Discussion

The image contrast of FIESTA is defined as T1/T2 and different from that of SSFSE. Fetal MRI has been performed on both sequences, however, advantages and disadvantage of both sequences for fetal imaging have not been clear. In this study, we evaluated the relative efficacy of both sequences on a region basis. For the chest, SSFSE was superior to FIESTA on demarcation of the lungs, which is important for calculating lung volume. This is because both the chambers of heart and the lungs appear hyperintense on FIESTA. For the gastrointestinal tract, SSFSE showed distinct signal intensities between the small intestine and the colon, however, these structures appeared hyperintense on FIESTA, making a clear distinction of them difficult. For the musculoskeletal structure, while SSFSE failed to delineate bone and soft tissue due to inherent blurring effect, FIESTA showed a clear differentiation of muscle, bony part and cartilaginous part, respectively. In conclusion, SSFSE and FIESTA should be adapted to suit the occasion for fetal pathology.

Fig. 2 SSFSE and FIESTA of the bowel.

The small bowel appears bright and the colon appears dark (arrow) on SSFSE. In contrast, the small bowel and the colon appear bright on FIESTA.

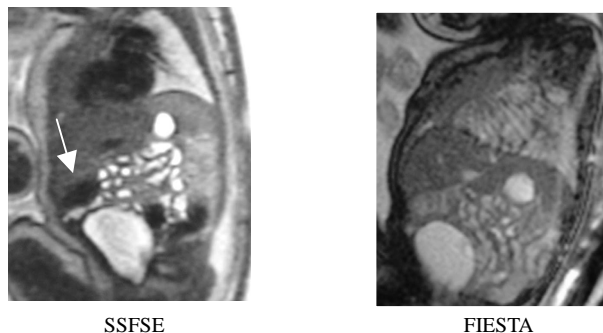


Fig. 1 SSFSE and FIESTA of fetal lungs.

SSFSE is superior to FIESTA on delineation of the lungs.

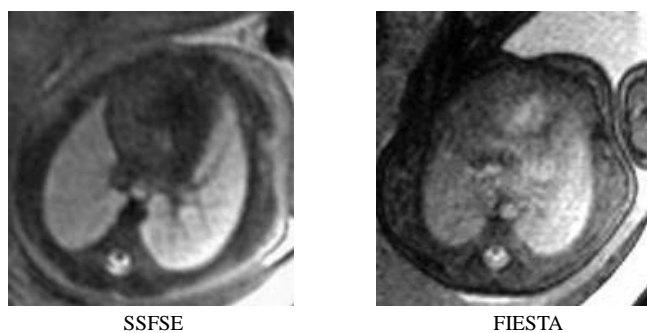


Fig. 3 SSFSE and FIESTA of the femoral bone.

Depiction of the bone and cartilage of the femoral bone is superior on FIESTA than that on SSFSE.

