Lung-to-liver signal intensity ratio of fetal magnetic resonance imaging: Comparison between HASTE and true-FISP imaging.

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Introduction

The evaluation method for fetal lung development has been introduced using lung-to-liver signal ratio (LLSR) at half-Fourier single-shot turbo spin-echo (HASTE) on magnetic resonance imaging (MRI) (1,2). Recently, fetal imaging at true-FIPS has been used for better imaging quality as well as lower specific absorption rate (3). However, imaging contrast may be different between HASTE and true-FISP, and the utility of the fetal LLSR at true-FISP has not been established. The purpose of this study was to compare LLSR at HASTE and true-FISP.

Subjects and Methods

Ninety six fetal MRI, performed with both HASTE (1160/156; flip angle, 150 degrees) and true-FISP (4.7/2.1; flip angle, 70 degrees) of the lung and liver, were retrospectively analyzed. MRI was performed using a1.5T unit. LLSR (i.e., the signal ratio of the lung to the liver) was calculated putting region-of-interests (ROIs) at the lung and liver on each sequence. Apparent abnormal lesions [congenital cystic adenomatoid malformation (n=9), congenital diaphragmatic herniation (n=16)] were excluded for the measurement of the signal intensities, and relatively homogeneous signal areas were used for the assessment. Imaging slice for analysis was selected, where the lung and the liver were demonstrated on an identical slice (Figure 1). Two or three slices were selected for signal measurement, and LLSRs of each slice were averaged on each imaging sequence. Correlation of LLSR between HASTE and true-FISP was assessed using Pearson's correlation coefficient analyses and paired t test.

Results

The LLSR at HASTE imaging ranged from 1.36 to 6.08 (mean, 2.76) and that at true-FISP imaging, 1.04 to 3.15 (mean, 1.95). There was a positive correlation of the LLSR between HASTE and true-FISP imaging ($p<0.01$, $R=0.54$) (Figure 2). LLSR at true-FISP was significantly lower than that at HASTE ($p<0.01$). Mean reduction of the LLSR at true-FISP to that at HASTE was 32.0% (95% confidence interval: 27.2, 36.8%).

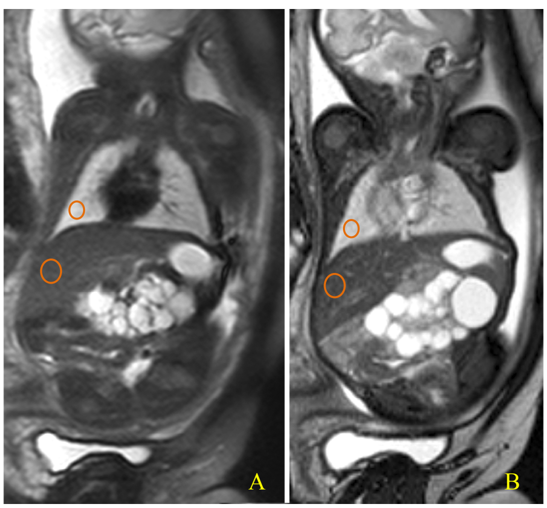

Figure 1.
Coronal HASTE (A) and true-FISP (B) imaging of a 32-week gestational age fetus. Schema presents the method to measure the signal in the lung and liver.
ROIs were chosen at a relatively homogenous area in each organ.

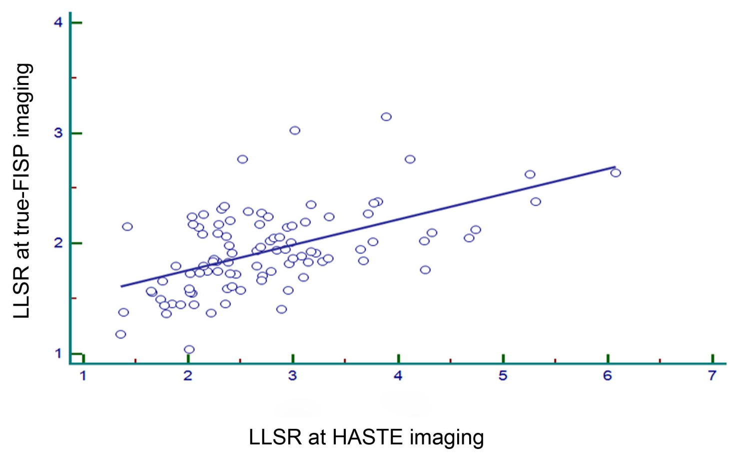

Figure 2.
Scatterplots with regression line show the relation of the lung-to-liver signal ratio (LLSR) at HASTE and true-FISP.
There was a positive correlation of LLSR between HASTE and true-FISP imaging ($p<0.01$, $R=0.54$).

Discussion and Conclusions

We found positive correlation of LLSR between HASTE and true-FISP, but lower LLSR at true-FISP compared to HASTE. Therefore, another criterion of LLSR for true-FISP may be needed to evaluate the fetal lung maturation. There are several factors to be considered between HASTE and true-FISP. First, the signal at lung showed very high at HASTE in some cases. Second, the branches of the vessels in the liver showed high signal at true-FISP. These might have contributed to the differences of LLSR between HASTE and true-FISP.
In conclusion, a positive correlation of the LLSR was found between HASTE and true-FISP imaging. LLSR at true-FISP tended to show lower than that at HASTE.

References

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