A Novel Non-contrast MRA Technique using Time-Spatial Labeling Inversion Pulse in combination with Flow-spoiled FBI for the Assessment of Small Arteries of the Finger.

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Background

MR angiography (MRA) of the hand presents several problems. It is very difficult to visualize to the small arteries of the hand selective using conventional time-of-flight or phase contrast MRA whose image quality significantly depends on direction of vessel, velocity and diameter of vessels. It is also very difficult to visualize the small arteries of hand selectively using Gadolinium-enhanced MRA. It is because that the diameter of hand arteries is very small and the time of delivery of contrast material to the distal extremity varies greatly among patients Recently, MRA using Flow-spoiled FBI (Flow-spoiled Gradient Pulses in ECG-triggered Three-dimensional Half-Fourier Fast Spin-Echo Imaging) sequence was reported for the assessment of arteries of the hand. But it was still inadequate appraisal method.

Purpose

Time-SLIP (Time-Spatial Labeling Inversion Pulse) is a novel imaging technique, which enables selective visualization of blood flowing into the imaging volume by positioning the selective excitation pre-pulse for black blood image at arbitrary location independently of the imaging volume. The feasibility of Flow-spoiled FBI sequence in combination with Time-SLIP method for selective visualization of small artery of hand without the use of contrast media was evaluated. We have studied the efficacy of Flow-spoiled FBI sequence in combination with Time-SLIP for the assessment of the arteries of the finger, as compared as two-dimensional time-of-flight technique (2D-TOF) and Flow-spoiled FBI without Time-SLIP.

Methods

All the studies were performed on a 1.5T MRI system (EXCELART Vantage XGV Toshiba Medical Systems, Japan). HEAD QD SPEEDER COIL was used. MRA using 2D-TOF, Flow-spoiled FBI and Time-SLIP sequence were performed for the assessment of arteries of the fingers in healthy volunteers. (2D-TOF:TR/TE=25/9ms Flow-spoiled FBI: TR/TE=2310/80ms Time-SLIP:TR/TE=2202-3670/80ms; various slice thickness, %RR, and BBTI).

Results

The respectively characteristic images were obtained by each method.

1) By MRA using 2D-TOF, we have experienced pseudo-stenosis or pseudo-obstruction of finger arteries, because 2D-TOF is depend of direction of vessel and velocity of blood flow. 2) It was difficult to separate the artery from vein by using Flow-spoiled FBI without Time-SLIP, because the velocity of blood flow is very slow in hand and fingers.3) Flow-spoiled FBI with Time-SLIP was most excellent for the evaluation of the continuity of the arteries in finger. Moreover, the depiction of only the artery was possible by using Tim-SLIP, since the spin labeling method of arterial blood is being used in Time -SLIP method.

Conclusions

MRA using Flow-spoiled FBI sequence in combination with Time-SLIP method is most effective for selective visualization of small arteries of the finger without the use of contrast media

References

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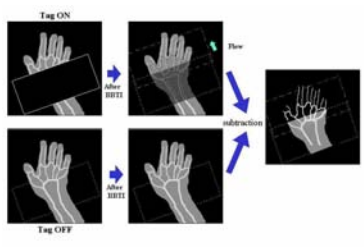

Fig.1 Time-Spatial Labeling Inversion Plus

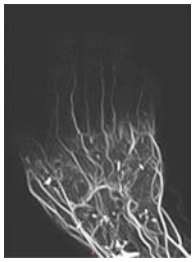

Fig.2 Time-Spatial Labeling Inversion Plus MRA