

Non-contrast MR Angiography of the Toes: Correlations with Age and Gender

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Purpose

The aim of our study is to selectively visualize toe arteries without contrast media and exhibit correlations with age and gender. Non-contrast ECG-gated 3D half-Fourier FSE MR angiography with time-spatial labeling inversion pulses (time-SLIP) was investigated for efficacy in depicting the toe arteries using swap phase encode extended data (SPEED) acquisition.

Materials and Methods

All studies were performed on 30 healthy volunteers (mean age, 39.8; range, 22-63 years; 15 men and 15 women) on a 1.5T MRI system (EXCELART Vantage XGV, Toshiba), using a QD head SPEEDER coil. The time-SLIP on-and-off alternate acquisition with a subtraction method was performed in this experiment. For assessment of the toe arteries using 3D half-Fourier FSE with time-SLIP, we varied phase-encode directions with the SPEED technique and compared that to other non-contrast MRA techniques, including time-of-flight (TOF) and half-Fourier FSE. Typical scan parameters as follows; TR/TE=3RR(2000-3000)/30ms, BBTI=1200-1400ms, matrix=256x256, FOV=300x300mm, section slice=3mm, and scan time=5-6min, depending on the volunteer's RR time.

Results

Selective visualization of the toe arteries was successfully achieved in all volunteers. Half-Fourier FSE MRA with time-SLIP using the SPEED acquisition showed excellent depiction of the toe arteries in all men and 10 female volunteers, and the phase-encode in head-foot (HF) direction was effectively dependent on age-related tortuous arteries, as showing in Fig 1. On the contrary, no significant difference for image quality was demonstrated between the half-Fourier FSE MRA with and without time-SLIP in 5 female volunteers who had hypoplastic arcuate arteries or narrow digital arteries with cold-induced vasospasm.

Conclusion

Non-contrast half-Fourier FSE MR angiography with time-SLIP using SPEED provided good visualization of the small and tortuous arteries of the toes, especially when the SPEED acquisition was optimized, except for extremely slow-flow arteries. Selective visualization of toe arteries without contrast media is of increasing significance in our aging population.

References

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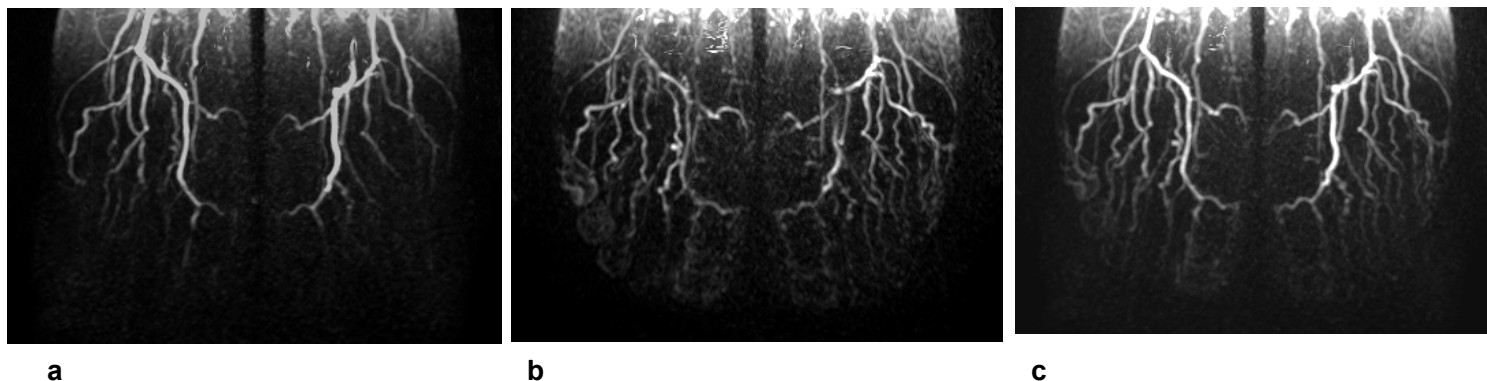


Fig. 1) Time-SLIP MRA maximum intensity projections (MIP) of the toes obtained on a 48-year-old male volunteer in R-L (a), H-F (b) phase-encode direction showed excellently longitudinal and transverse branches respectively. Time-SLIP MRA with SPEED (c), combined (a) with (b), was effective to visualize small and tortuous arterial trees.