Parenchyma Spin Labeling of Cerebral Intracranial Venous using Time-SLIP

yuichi yamashita[1], Hisae Chiba[1], Shin Takamatsu[1], Akari Yamada[1], Hiroyuki Miyazaki[2], Yoshihito Miyamoto[2], Satoshi Uchinomura[2], and Tsutomu Katoh[2]

[1]TOSHIBA MEDICAL SYSTEMS CORPORATION, Ootawara, Tochigi, Japan, [2]Sumitomo Besshi Hospital, Ehime, Japan

■INTRODUCTION

Recently, Perfusion and Hemodynamic using Arterial Spin Labeling in the head is being widely used. Further request to rule out venous thrombosis, and to observe the hemodynamic without using a contrast agent is being requested for frequently. However, this technique has easily been adapted to visualize Arterial Flow but, not as easy to adapt for the evaluation of venous flow. Time-SLIP (time-spatial labeling inversion pulse) is an arterial spin labeling technique. This technique utilizes an inversion recovery (IR) tag pulse to observe vascular flow. Utilizing a specific Inversion Time (BBTI) can demonstrate Vascular Flow similar to Intrinsic Contrast Material. [1,2]. The purpose of this study was to depict non-contrast-enhanced Hemodynamics of Intracranial Venous Flow using Time-SLIP technique at 3.0-T.

■MATERIAL and METHODS

All examinations were performed using 3.0T MRI system (Toshiba Medical Systems). Five healthy volunteers (25-41years) were examined using Time-SLIP with 3D bSSFP and evaluated with labeling method compared Move-in and Move-out, and various position of labeling tag, %R-R ratio with peripheral gating, segment (1 or 2) and varied BBTI (600 to 2200ms, with an increment of 200ms). Move-in method depicts the blood flowing into the tagging area. Move-out method is the subtraction image with and without Tag, which depicts the blood flowing out of the tagging area and suppressing background. Typical imaging parameters used TR/TE = 4.2/2.4ms, spatial resolution = 1.3mm, slice thickness 1mm. The total scan time was about 2.5 min.

■RESULTS and DISCUSSION

All of the volunteers' studies demonstrated the Hemodynamics of Intracranial Venous Flow. In comparison with Move-In and Move-out method, In Move-In signal suppression of the CSF is difficult, it is impossible to visualize blood vessels. Move-out was possible because background signal is suppressed; this allows blood vessels to be visualized. Indicate the labeling position in Fiq1. Visualization of the vein was possible by labeling directly to the brain parenchyma. Changes were observed in the representation by changing the labeling position. By increasing the %R-R cycle, contrast between blood and background suppression was improved. Moreover, signal recovery is delayed due to the extension of the T1 relaxation on 3T. When the numbers of segments were increased, contrast between blood and background was improved. However, by increasing the number of segments increases the scan time which can be a trade-off. Figure 1b shows the hemodynamics of the Intracranial Venous images obtained on a volunteer.

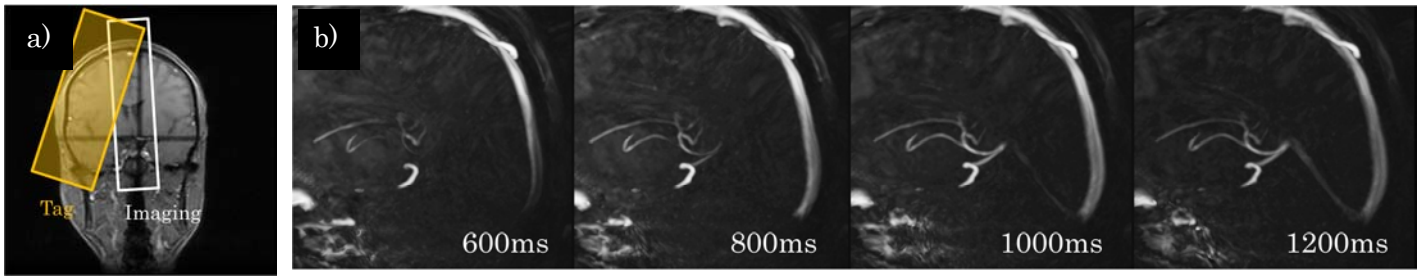

Fig. 1) a) Planning for visualize Cerebral Intracranial Venous. b) Hemodynamic of intracranial venous using time-SLIP 3D bSSFP

■CONCLUSION

Optimization of the time-SLIP 3D bSSFP technique was performed to depict the Hemodynamics of Intracranial Venous Flow. Since our technique does not require any contrast materials, one can repeatedly study the flow of Intracranial venous. However, further clinical evaluation is required.

Ref. 1] Kanazawa H, Miyazaki M, ISMRM p140, 2002. 2] Yui M, Miyazaki M, et al., ISMRM p2121, 2004.