

Evaluation of the Recipient Vessels after Orthotopic Liver Transplantation by Non-Contrast Magnetic Resonance Angiography: a SLEEK sequence

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Introduction

The recipient vessels after orthotopic liver transplantation (OLT) are often evaluated by CT and MRI, but the recipient vessels either may be contaminated by other vessel or may not be presented distinctly due to the individual hemodynamics changes. In addition, Gd or iodine contrast media are applied to CT and MRI for displaying the recipient vessel which may cause nephrogenic systemic fibrosis (NSF) and contrast-induced nephropathy respectively. Therefore, a non-contrast magnetic resonance angiography (NC-MRA) is desirable to develop for presenting the recipient vessels. In this study, we propose a new NC-MRA (Spatial Labeling with multiple inversion pulses, SLEEK) has the ability to delineate the recipient vessel after OLT.

Methods

The prospective NC-MRA study was performed on 16 OLT recipients (12 males and 4 females; age range 17–52 years). NCE-MRV using SLEEK sequence was carried out on a 1.5 T MR system (EXCITE HD, GE, Healthcare, Waukesha, WI, USA). The SLEEK preparation adopted multiple various transversal broad bands to present hepatic artery (HA), portal vein (PV), hepatic vein (HV), and inferior vena cava (IVC) respectively with an in-flow effect. The schematic picture was present in Fig1. TI is selected to null the inflow blood signal. Adiabatic SPIR chemical saturation pulse is applied prior to the data acquisition for fat signal saturation. The diagram of the pulse sequence was shown in Figure 2. All postprocessing techniques of anastomosed vessels were evaluated by two experienced radiologists with a joint reading performed in consensus. NC-MRA diagnosis was compared with CE-MRA.

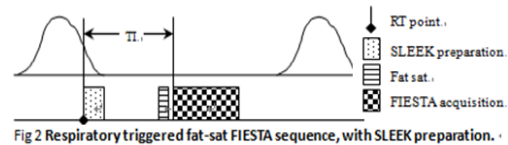
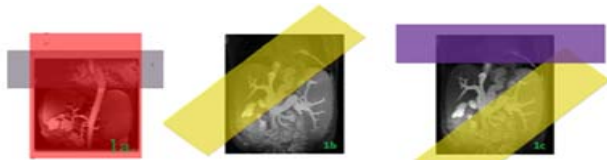


Fig1: The schematic picture of presenting recipient vessels with multiple various transversal bands. (a) One vertical SLEEK band covered the whole body to invert all signals and the other one transversal SLEEK band was located above liver to bring the in-flow artery blood back to display HA; (b) One oblique SLEEK band covered the liver and thoracic aorta to invert all HA and HV signals to show PV and IVC; (c) one transversal SLEEK band was located above liver to invert HA signals and one oblique SLEEK band covered the spleen vein and superior mesenteric vein to invert PV, depending on an in-flow effect to present HV.

Results

16 OLT recipients include 12 whole liver transplantations, 3 right lobe transplantations and 1 left lobe transplantation. The excellent correlation between NC-MRV and CE-MRA was found in predicting the presence of anastomosed site on HA, PV, HV and IVC. NC-MRA is superior to CE-MRA in displaying the third and fourth order segmental branches of PV and HV in the hepatic parenchyma. NC-MRA revealed abnormal findings in 4 out of 16 recipients, including PV stenosis or thrombosis in 2, HA stenosis in 1 and evidence of celiac hematoma in 1. NC-MRA with SLEEK has the possibility of overestimating the degree of anastomosed vessel stenosis.

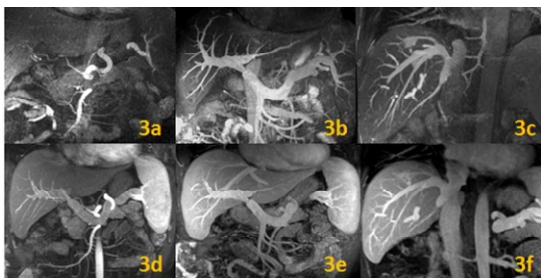


Fig 3: A 47 year old OLT recipient. Fig 3a-c is NC-MRA images and fig 3d-f is CE-MRA images for showing HA, PV and HV respectively. NC-MRA is corresponding with CE-MRA in predicting the presence of anastomosed site on HA, PV, HV and IVC. But NC-MRA avoided the PV interferences on CE-MRA for presenting HA; and NC-MRA was superior to CE-MRA in presenting the segmental branches of PV and HV.

Conclusion

NC-MRA using SLEEK may provide a precise assessment of the recipient vessels for OLT recipients. It is feasible for evaluating vascular lesion after OLT.

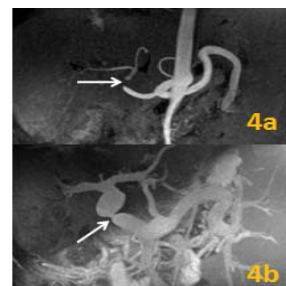


Fig 4: A 36 year old OLT recipient. Fig 4a-b is coronal HA and PV view on NC-MRA. The HA and PV stenosis were found and the degree of stenosis was overestimated.