

# NON-CONTRAST MR HEPATIC ARTERIOGRAPHY USING 3T-MRI AND TIME-SLIP: INITIAL EXPERIENCES

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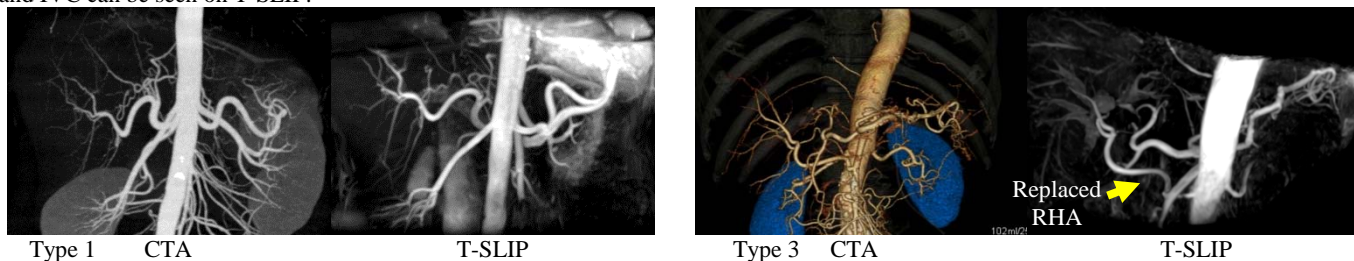
**Introduction:** The assessment and classification of anatomy of hepatic artery (HA) is an essential step for both diagnosis and management of various diseases in the upper abdomen. Development of non-invasive imaging techniques for this purpose is an urgent problem because of recent recognition of nephrogenic systemic fibrosis and high rate of renal dysfunction coexisting with liver diseases. In addition, anatomical surveillance of HA is required for healthy candidates in living donor liver transplantation. On the other hand, improvements of non-contrast MR angiographic techniques have been reported recently, especially at 3T-MRI because of its high blood labeling capability. One of these techniques is time-spacial labeling inversion pulse (T-SLIP). However, to date, we have no report on application of this technique for hepatic arteriography at 3T units. The purpose of this study was to develop and assess T-SLIP hepatic MR arteriography for assessment and classification of anatomy of HA.

**Materials and Methods:** This study comprised 31 patients (13 men and 18 women, mean age: 65.6 years) who were suspected to have malignant tumor in the liver, bile duct, or pancreas, all of whom underwent MR examination at a 3T scanner (Titan 3T, Toshiba Medical Systems, Ohtawara, Japan). Non-contrast hepatic MR arteriography were obtained with 3D-true SSFP (TR/TE/FA=4.8/2.4/90-110, matrix: 256×256(ZIP), thk: 2.0mm, 34slice, NEX: 1, resp. trigger, scan time: 5-7min, STIR, TI: 230) with selective IR pulse (black blood inversion time (BBTI): 1500). BBTI was set according to the preliminary results using 5 healthy volunteers. Visualization of HA was independently scored by two abdominal radiologists on a 4-point scale (1: common HA, 2: proper HA, 3: right and left HAs, 4: branches of right and left HAs). Scores of 3 or 4 were assessed to be clinically acceptable. In addition, visualization of right, left, and segment 4 HAs was scored on a 4-point scale (1: not visualized, 2: partially, 3: totally, 4: totally and well). Anatomy of HA was classified using Michels classification. In patients with bile duct or pancreatic malignancies, presence of arterial encasement indicating vascular invasion were recorded. Irregular respiration and visualization of bile duct or inferior vena cava (IVC) were recorded and their effects on HA visualization were assessed.

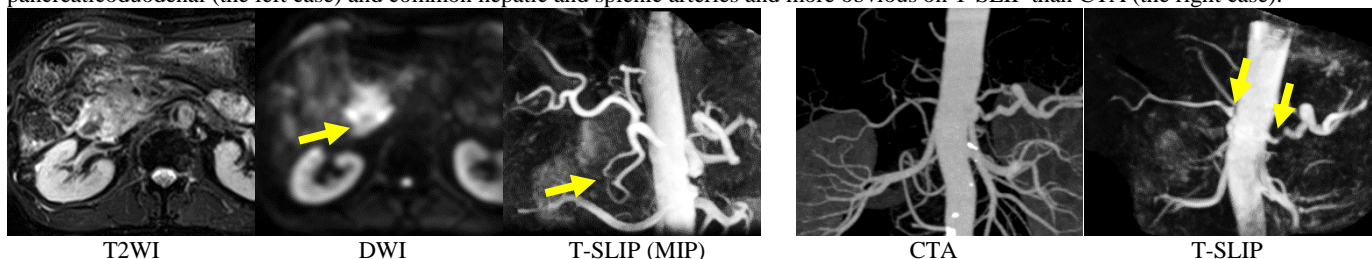
**Results:** Mean visualization score of HA was 3.4 and acceptable in 90% of the cases (28/31). Mean visualization scores of right, left, and segment 4 were 3.0, 3.2, and 2.0, respectively. Twenty-six cases were classified as Michels type 1 and 3 were type 3 (Figs. 1). Agreements between the observers were almost perfect ( $\kappa > 0.8$ ). Assessment classification of HA could not be done in 3 cases because of poor visualization. Arterial encasement was observed in 1 of 4 patients with bile duct cancers and 2 of 3 with pancreatic cancer. In 3 patients with poor visualization of HA, irregular respiration were observed in 1 and visualization of bile duct and IVC were observed in 2 and 1, respectively (Figs. 2). In some patients, visualization of bile duct increased anatomical information (Figs. 3).

**Conclusion:** Our results suggested that anatomy of hepatic artery can be assessed and classified using T-SLIP hepatic MR arteriography at 3T-MRI.

**Figs. 1. Cases of Michels types 1 and 3.** Anatomy of hepatic artery can be assessed and classified using T-SLIP hepatic MR arteriography. Bile duct and IVC can be seen on T-SLIP.



**Figs. 2. Cases of pancreatic cancer with arterial encasement.** Arterial encasement was clearly seen in both cases in posterior superior pancreaticoduodenal (the left case) and common hepatic and splenic arteries and more obvious on T-SLIP than CTA (the right case).



**Figs. 3. Cases with visualization of bile duct.** Visualization of bile duct is preventing right HA and its branches from good visualization on MIP image in the left case, however, they can be tracked on 2D source image. Pseudostenosis of common bile duct is clearly indicated in the right case.

