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Original Article

Percutaneous radiofrequency ablation of tumor feeding artery before target tumor ablation may reduce local tumor progression in hepatocellular carcinoma

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ABSTRACT

Background: Local tumor progression (LTP) in early-stage hepatocellular carcinoma (HCC) after radiofrequency ablation (RFA) remains high. Tumor feeding artery ablation (FAA) before target tumor ablation was reported to reduce LTP in patients with HCC >3 cm. The aim of our study is to investigate whether FAA before target tumor ablation may reduce LTP in HCC <3 cm.

Methods: We retrospectively analysis the outcome of patients with HCC <3 cm undergoing FAA before target tumor ablation (N = 17) compared to direct RFA to target tumor alone (N = 35).

Results: FAA significantly reduces LTP (FAA vs. non-FAA: local tumor progression 17.6% vs. 48.6%, $p = 0.038$), but not in intrahepatic recurrence: 29.4% vs. 25.7%, $p = 0.778$; or in overall recurrence rate: 41.2% vs. 62.9%, $p = 0.14$). The cumulative 1-year and 2-year LTP rates in FAA group were 17.6% and 17.6%, while 11.4% and 42.9% in non-FAA group ($p = 0.073$), respectively. The cumulative overall recurrence rates at 1-year and 2-year were 29.4% and 35.3% in FAA group, while 14.3% and 57.1% in non-FAA group ($p = 0.130$), respectively.

Conclusions: FAA before target tumor ablation may decrease LTP in HCC <3 cm. Further randomized control study will be helpful for validation.

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At a glance commentary

Scientific background on the subject

Feeding artery thermal ablation before target tumor radiofrequency ablation theoretically can reduce intra-, or peri-tumoral blood flow and subsequently reduce heat-sink effect and create a larger ischemic area around the target tumor, therefore, it would be more effective compared with direct target tumor ablation alone.

What this study adds to the field

The current results based on a relatively small sample size still show that feeding artery thermal ablation before radiofrequency ablation of target tumor can reduce local tumor progression in tumors smaller than 3 cm in diameter and in tumors at difficult-to-ablate location.

Hepatocellular carcinoma (HCC) is the most common malignancy worldwide [1]. Curative treatment as surgical resection, radiofrequency ablation (RFA), or liver transplantation are recommended for early-stage HCC [2–4]. RFA has gained attention as the option for unresectable HCC owing to its minimal invasiveness as compared with resection as well as high local tumor control, particularly for HCC smaller than 3 cm [5–10].

Most HCC is a hypervascular tumor with its blood supply majorly from hepatic artery. Many factors including intra-tumoral or peri-tumoral heat-sink effect, insufficient ablative margin or the presence of satellite around the target tumor are associated with incomplete ablation and local

tumor progression (LTP) [5–11]. To overcome these limitations, many novel algorithms have been accepted [5–11] but only one study reported that feeding artery ablation (FAA) before target tumor ablation in HCC >3 cm could reduce LTP [12]. To our knowledge, the effects of FAA for HCC <3 cm or for HCC at difficult-to-ablate location remain unknown. Therefore, the aim of our study is to compare the outcomes between patient with and without FAA before target tumor ablation.

Patients and methods

Patient recruitment

From January 2007 to April 2015, a total of 52 treatment naïve patients with single or two HCC whom underwent RFA in our department were retrospectively recruited. HCC was diagnosed with typical dynamic liver image (contrast-enhanced triphasic CT or MRI) showing characteristic tumor enhancement in the arterial phase with wash out in the portal venous or delay phase [13] in cirrhotic liver or tumor cytology plus dynamic liver image in non-cirrhotic patients [14]. None of these patients had visible vessel invasion or distant metastasis from image study prior to treatment, nor malignancy other than HCC. Baseline laboratory data including liver function, α -fetoprotein, creatinine, as well as underlying etiology such as HBV or HCV infection, existence of cirrhosis, gender, tumor number and tumor location were analyzed for predictors of recurrence post therapy. The diagnosis of cirrhosis was by histology confirmation or a grading system with coarse parenchyma, torturous vessels, uneven surface under ultrasonography combined with splenomegaly or existence of esophageal/gastric varices [15]. This study was approved by our institutional review board.

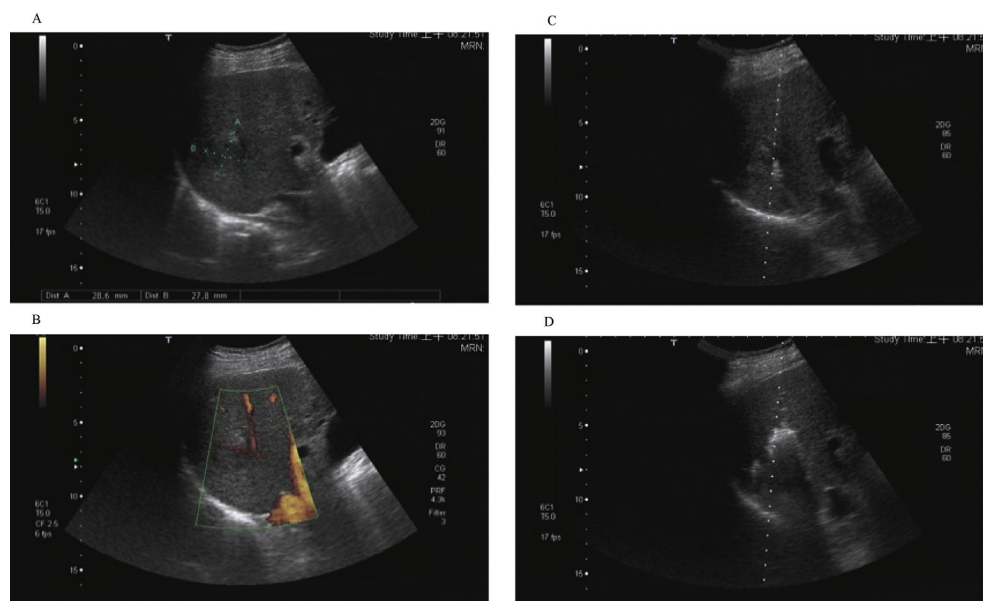


Fig. 1 – The process of feeding artery ablation during radiofrequency ablation treatment in HCC patient. (A: a 2.8 cm mixed echogenic tumor at segment 8; B: to identify the vessel nearby the tumor by color duplex ultrasonography; C and D: the ablated area appeared wedge shape hyperechoic change).

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