ORIGINAL ARTICLE

Contrast-enhanced harmonic EUS–guided radiofrequency ablation of hepatocellular carcinoma: a new horizon in endohepatology

Anudeep Katrevula, MD, DM, MRCP (UK),[1] Aniruddha Pratap Singh, MD, DM,[1] Marc Giovannini, MD,[2] Sundeep Lakhtakia, MD, DM, FASGE,[3] Nageshwar Reddy Duvvur, MD, DM, FRCP, FASGE[3]

INTRODUCTION

Contrast-enhanced harmonic imaging (CH-EUS) enhances the vascularity of lesions with EUS imaging by intravenous infusion of a sonographic-compatible contrast agent.[1] CH-EUS–guided radiofrequency ablation of solid abdominal tumors showed a response rate of around 70% in 1-year follow-up.[2] However, there is limited literature on EUS-guided radiofrequency ablation (RFA) using CH-EUS for the ablation of hepatocellular carcinoma.[3,4] Here, we report a case of CH-EUS–guided RFA of hepatocellular carcinoma located in the caudate lobe of the liver (Video 1, available online at www.videogie.org).

CASE PRESENTATION

A 48-year-old man with hepatitis B–related cirrhosis (Child A, model for end-stage liver disease Na 15) was receiving entecavir for the past 3 years. He had previously undergone a few sessions of esophageal variceal ligation. He had associated polycystic kidney disease with mild renal dysfunction. On standard follow-up evaluation, the alpha-fetoprotein value was elevated (53.10 ng/mL; normal 0-6 ng/mL). Dynamic MRI confirmed hepatocellular carcinoma (HCC) of size 2 × 1.6 × 1.6 cm in the caudate lobe (Fig. 1). Liver transplantation as a definitive therapy was refused by the patient. The multidisciplinary team suggested performing RFA of HCC. However, percutaneous ablation of the lesion was technically challenging because of its deep location and proximity to the inferior vena cava, thus leading to the option of EUS-guided RFA. A linear echoendoscope (GF-UCT180; Olympus, Tokyo, Japan) detected the lesion in the caudate lobe of the liver from the stomach.

CH-EUS was performed using SonoVue (Bracco, Milan, Italy), a second-generation US contrast agent that comes in a colorless glass vial containing 25 mg of dry, lyophilized powder in an atmosphere of sulphur hexafluoride. SonoVue is prepared by injecting 5 mL of sodium chloride (0.9%) solution into the vial and then shaking vigorously for 20 seconds to mix all the contents to obtain a white milky homogeneous liquid containing microbubbles. Two and a half milliliters of the reconstituted solution was injected into an 18-gauge intravenous cannula in the antecubital fossa, followed by 5 mL of saline flush. This dose can be repeated, if needed, up to 5 mL. Following injection of the microbubbles, the contrast enhancement in the lesion is described, as standard in relation to the surrounding parenchyma of the liver (as either hypo-, iso-, hyper-enhanced) during the arterial phase (5-25 seconds), portal phase (25-60 seconds), and late phase (>120 seconds) after bolus injection. The lesion in the index case showed heterogeneous hyperenhancement soon after (arterial phase) injecting contrast, suggesting hepatocellular carcinoma (Fig. 2). EUS-guided RFA was performed with the patient under deep sedation for a total duration of 5 minutes. A 19-gauge needle having a 10-mm-long monopolar active electrode (Starmed, Taewoong Medical, Seoul, South Korea) was placed along the distal edge of the lesion in the caudate lobe of the liver. Several superimposed ablations with energy settings at 22 W were performed sequentially moving proximally until the entire lesion, including a margin of about 5 mm surrounding normal liver tissue, was under direct EUS vision (Fig. 3). RFA leads to the formation of vapor bubbles in the treated tissue and was noted to appear as increased echogenicity on EUS. CH-EUS was performed in the same session following EUS-RFA ablation. The lesion appeared completely hypoechoic compared to the surrounding parenchyma, suggesting complete ablation (Fig. 4). The patient complained of mild self-limiting pain for the first 24 hours, which subsided spontaneously. There were no other procedure-related adverse events. A single dose of antibiotic

Abbreviations: CH-EUS, contrast-enhanced harmonic EUS; HCC, hepatocellular carcinoma; RFA, radiofrequency ablation.

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Department of Gastroenterology, AIG Hospitals, Hyderabad, India (1), Department of Medico-Surgical Digestive Oncology, Institute Paoli-Calmettes, Marseille, France (2), Department of Gastroenterology, AIG Hospitals, Hyderabad, India (3).

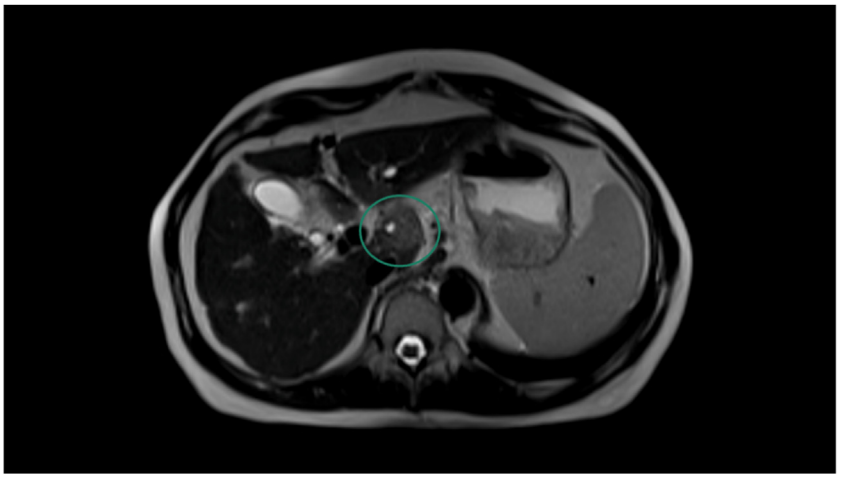

Figure 1. Heterogeneously hyperintense lesion on T2 measuring 2.1 × 1.6 × 1.6 cm in the caudate lobe of the liver.

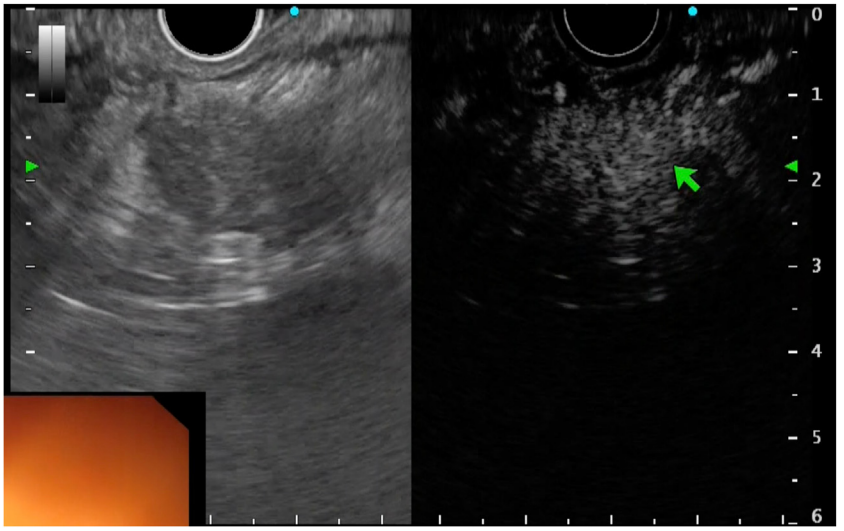

Figure 2. Contrast-enhanced harmonic EUS showing heterogenous enhancement of the lesion soon after the injection of contrast.

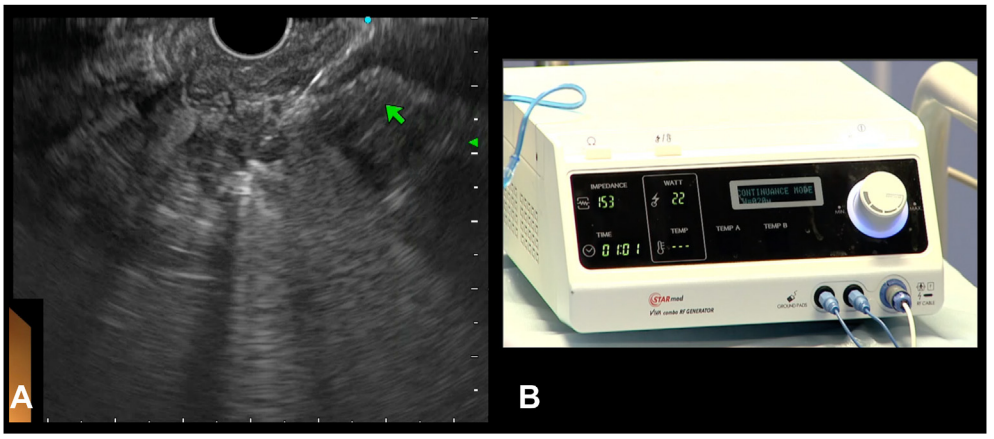

Figure 3. A, EUS-guided radiofrequency ablation of hepatocellular carcinoma showing echogenic changes in the caudate lobe of the liver. **B,** VIVA combo RF generator with the energy settings at 22 W (Starmed, Taewoong Medical, Seoul, South Korea).

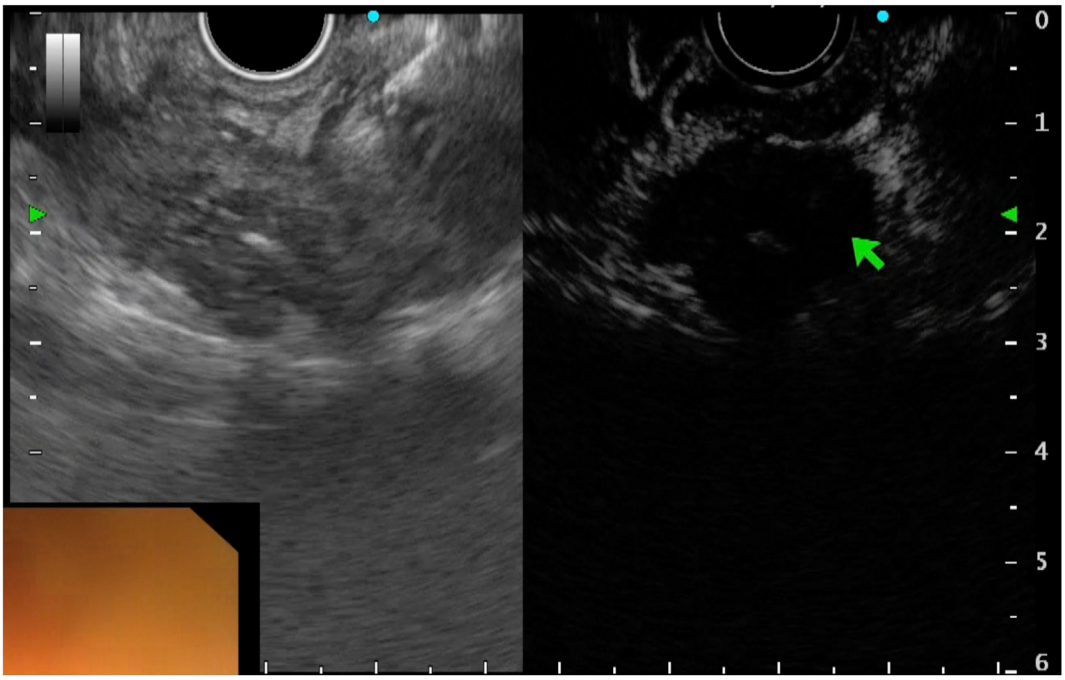

Figure 4. The lesion appeared hypoechoic compared to the surrounding parenchyma on contrast-enhanced harmonic EUS following ablation.

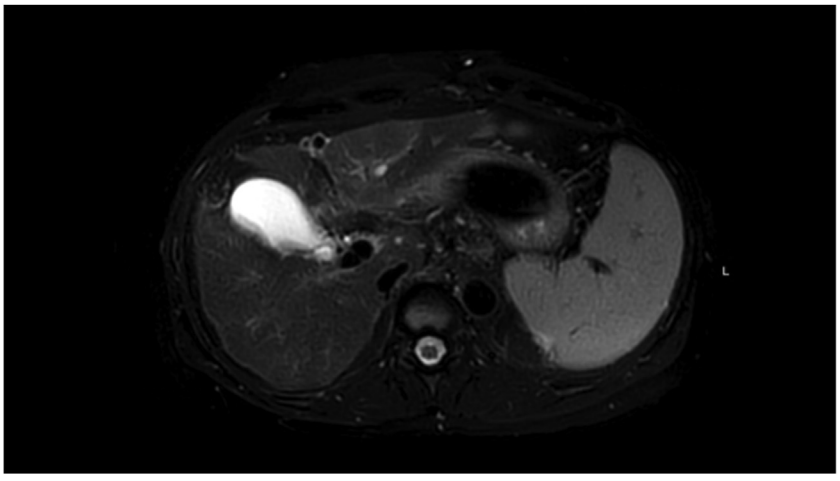

Figure 5. MRI at the 3-month follow-up revealed complete resolution of the lesion in the caudate lobe without any fresh lesion in the liver.

(injection ceftriaxone 2 gm) was given prior to the procedure. At the 3-month follow-up, the alpha-fetoprotein value was reduced to 5 ng/mL and MRI revealed complete resolution of the lesion in the caudate lobe without any fresh lesion in the liver (Fig. 5).

DISCUSSION

Conventional EUS may either fail to detect subtle lesions or delineate their margins accurately, thus affecting targeting of the fine-needle biopsy. These 2 drawbacks are aptly addressed by CH-EUS, which can also add value by evaluating the real-time completion effectiveness of local ablation. CH-EUS has the advantage of visualizing intratumoral vessels that are not conventionally detected with standard B-mode US imaging. The arterial phase during CH-EUS is crucial as a viable tumor can be seen within a few seconds of contrast injection. Also, CH-EUS performed soon after EUS-guided tumor ablation may show in real-time either successful treatment with complete disappearance of small feeding vessels within the tumor

or partial success where the residual tumor has focally enhancing areas that can be further ablated in the same session.[2] Traditionally, RFA is performed percutaneously under US or CT guidance for the management of HCC. Percutaneous RFA is technically challenging when targeting tumors located deep in the caudate lobe or the left lobe of the liver. The safety of EUS-guided RFA of the liver has been established in earlier studies and it can be considered in such cases.[5] Contrast-enhanced CT and MRI scans are standard reference imaging for evaluating therapeutic response after ablation. However, CH-EUS can be considered as alternate imaging in patients with renal failure or an iodine allergy. The excellent tolerance and high safety profiles of US contrast agents make them suitable for special circumstances. Thus, CH-EUS improves the efficacy of EUS-guided ablation of deep-seated liver lesions by aiding in their visualization and confirmation of successful ablation.

DISCLOSURE

The authors did not disclose any financial relationships.

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