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No-Touch Radio Frequency Ablation for a Subcapsular Hepatocellular Carcinoma: A Case Report and Review of Literature

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Abstract

Radiofrequency Ablation of subcapsular lesions poses a challenge due to the risks of tumour seeding along the track, hemorrhage and lower efficacy. "No touch ablation" is a relatively novel technique used in the ablation of subcapsular HCC with good results. This technique avoids direct puncture of the tumour by inserting more than one electrodes adjacent to and outside the tumor and activating them sequentially to perform ablation. The risk of track site seeding and haemorrhage is significantly reduced. We describe a case of a subcapsular HCC in a 65-year-old female patient which was successfully treated with this novel technique.

Keywords

- radio frequency ablation
- no-touch ablation technique
- hepatocellular carcinoma

Introduction

Radio frequency ablation (RFA) is a safe and effective technique for the treatment of early-stage hepatocellular carcinoma (HCC) of < 3 cm in size.[1] In patients of chronic liver disease with Child–Pugh stage A, survival after ablation is almost similar to that of open surgical resection.[2] However, for subcapsular lesions, RFA poses the risks of tumor seeding along the track and hemorrhage.[3] To overcome these, it is advisable to pass the probe through the normal nontumor liver. However, it may not always be possible to approach the subcapsular exophytic tumors through the normal liver parenchyma.[4] Further, the ablation of subcapsular tumors is more frequently incomplete due to the difficulty in obtaining safe ablation margins. Some interventional radiologists consider such tumors as a contraindication for standard monopolar RFA.

"No touch ablation" is a relatively novel technique used in successful ablation of subcapsular HCC. This technique avoids direct puncture of the tumor by inserting more than one electrode adjacent to and outside the tumor and activating them sequentially or simultaneously to perform ablation.[5] In addition, it provides better ablation margins. We describe one such case who was a 65-year-old female with subcapsular HCC and was successfully treated with no-touch RFA technique.

Case Presentation

A 65-year-old female patient of hepatitis B-related cirrhosis presented to the emergency with a history of two bouts of hematemesis. She was hemodynamically stable. Laboratory parameters showed a hemoglobin of 9.6 g/dL, urea of 21 mg/dL, total bilirubin of 0.7 mg/dL, albumin of 4.1 g/dL, and

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international normalized ratio of 1.1. Serum alfa fetoprotein was 8.2 ng/mL that was within normal limits. Her performance status was 0 and Child–Pugh stage was A. Endoscopy showed bleeding esophageal varices that were successfully treated. Subsequently, she underwent multiphase contrast-enhanced computed tomographic (CT) scan as a part of workup. It showed a lesion (2.5 × 2.5 cm size) in the subcapsular region of segment VI of liver with arterial phase hyperenhancement and washout in the venous phase images suggestive of HCC (►**Fig. 1**). There was no ascites. The patient was discussed in the multidisciplinary meeting and referred to interventional radiology for ablation. Since the lesion was subcapsular in location and there was no approach to the lesion through the normal liver, the no-touch ablation technique was chosen.

Two bipolar RF electrodes with 3 cm active tip were used for ablation. The RF energy was supplied by a two-channel 250-W, 470-kHz RF generator (CelonLabPower; Olympus-Celon, Teltow, Germany). The procedure was performed under general anesthesia. After cleaning and draping the local area, the RF probes were placed at the target site under ultrasound (US) guidance. The retronodular converging no-touch technique was used for ablation. The two electrodes were inserted through the nontumor liver parenchyma, 3 to 5 mm adjacent to the tumor margins, in a convergent direction toward the deeper aspect of the tumor (►**Fig. 2**). Since the lesion was subcapsular and close to the abdominal wall, artificial ascites was created by instilling 5% dextrose through a 6F arterial sheath in the perihepatic space. The fluid was instilled until there was a 0.5 cm margin between the tumor and the adjacent structures. Additionally, a 20 × 4 cm balloon catheter (Atlas PTA Dilatation, BD, Tempe, Arizona, USA) was inserted and inflated between the parietal wall and liver surface to further decrease the chances surrounding thermal injury during ablation. Since the balloon was not heat compliant, we positioned it just cranial to the lesion to avoid heat damage. Subsequently, ablation was started with both electrodes activated intermittently. A total of 30 kJ of energy was deposited. At the end of the procedure, US showed complete echogenicity of the lesion. The transducers were removed with track ablation. There was no perihepatic hematoma or hemoperitoneum immediately after the procedure. No complication was noted over the next 48 hours in the hospital. Follow-up imaging with CT scan was performed at 1 month and with magnetic resonance imaging at 3 and 6 months after the procedure. The imaging showed complete ablation of the tumor with no arterial enhancing areas suggestive of complete response (►**Fig. 3**).

Discussion

The treatment of unresectable small subcapular liver tumors has always been challenging for an interventional

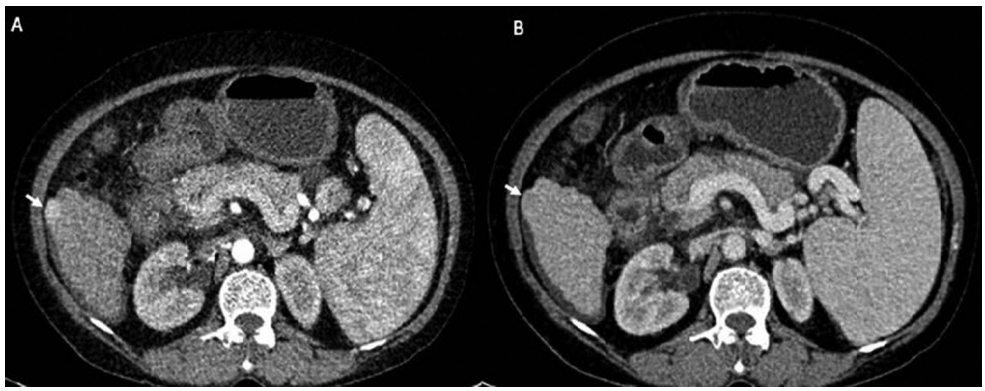

Fig. 1 Axial arterial (**A**) and venous (**B**) phase computed tomographic images show a small subcapsular lesion in segment VI of liver with arterial phase hyperenhancement and venous phase washout suggestive of hepatocellular carcinoma (arrow).

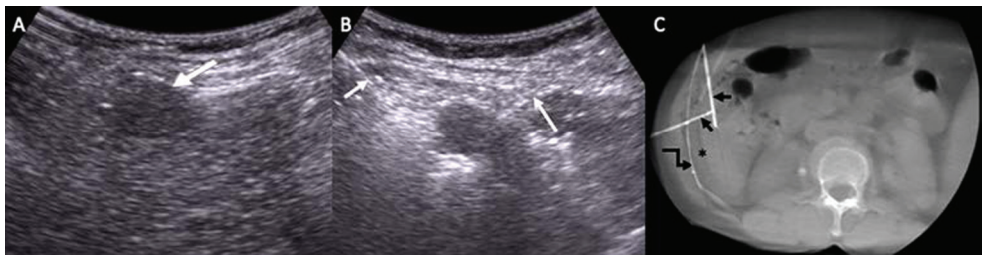

Fig. 2 (**A**) Ultrasound image shows a hypoechoic subcapsular lesion (arrow) in segment VI of liver. (**B**) Ultrasound image shows two bipolar radio frequency electrodes inserted percutaneously by a retronodular converging no-touch technique (white arrows). (**C**) Cone-beam computed tomographic image shows the two electrodes in situ (black arrows) with artificial ascites (asterisk) and a balloon catheter in situ (elbow connector).

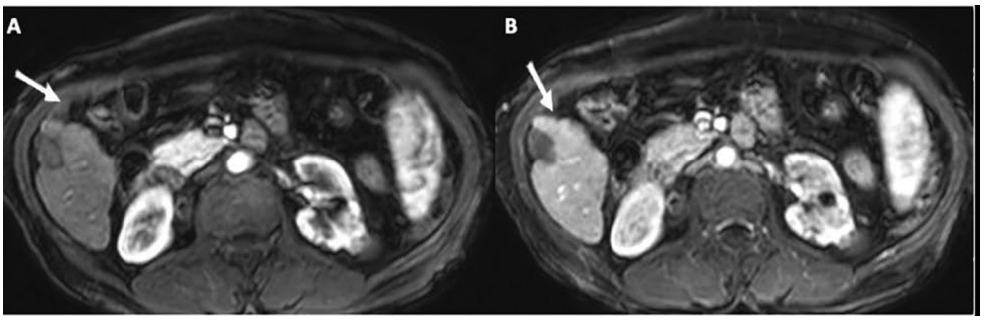

Fig. 3 Axial arterial (**A**) and venous (**B**) phase T1-weighted contrast-enhanced magnetic resonance imagings obtained 6 months postablation show no residual arterial phase enhancement (arrow) suggestive of complete response.

radiologist. The interventional treatment options include transtumoral RFA or microwave ablation, creation of artificial ascites additionally, no-touch multibipolar RFA, and transarterial chemoembolization (TACE) or a combination therapy using RFA and TACE.[5] Transtumoral RFA is associated with high complication rate including tumor rupture and seeding as well as hemorrhage.[5] In addition, direct puncture of the tumor has higher risk of track seeding with tumor cells and track recurrence. The rate of needle track seeding after RFA varies from 0.5 to 2.8% and the risk is higher in subcapsular tumors.[3] Hence, subcapsular tumors that cannot be accessed through the normal parenchyma are sometimes considered as a contraindication for tumor ablation. TACE is a palliative technique and may not be effective in peripheral tumors that may have extrahepatic arterial supply. Hence, there is a need for an effective image guided technique for complete treatment of subcapsular liver tumors.

No-touch RFA with multiple bipolar probes is emerging as a very good treatment option for subcapsular liver tumors up to 5 cm in diameter.[5] Here, more than one probes are placed adjacent to the peripheral margins of the tumor without directly puncturing it. The number of probes required depends on the size of the tumor. In this technique, the spread of RF energy during ablation is centripetal rather than centrifugal that decreases the risk of tumor cell seeding into the liver microcirculation and thus theoretically decreases the risk of tumor seeding. Moreover, it provides a wider ablation zone compared with the direct intratumoral ablation decreasing the incidence of margin site recurrence.[5] Although there are a few reports of increased incidence of liver failure due to a wide ablation zone, no-touch RFA is considered relatively safe.[5] Studies have shown a clinical success rate of 98% for subcapsular HCC treated with no-touch RFA with complication rates of 5.2%.[4] A major concern during no-touch multibipolar RFA for subcapsular HCC is thermal injury to the adjacent vital structures. A minimally invasive innovative approach that can be used is hydrodissection with creation of artificial ascites or by inflation of a balloon catheter between the tumor and surrounding structures like abdominal wall, colon, and kidneys. Apart from protecting the critical strictures, artificial ascites increases the visibility of the tumor under US.

In conclusion, "no-touch RF ablation" is a relatively novel, safe, and effective treatment option for subcapsular HCC that cannot be approached through the normal liver parenchyma.

Credit Author Statement

Sundeep Malla was involved in original draft-writing and conceptualization.

Manas Vaishnav, Shalimar, and K S Madhusudhan were involved in conceptualization and draft writing.

Sources of Support

None.

Conflict of Interest

None.

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