

Transarterial Chemoembolization as a Mechanism to Downstage Patients With Hepatocellular Carcinoma to Transplant Eligibility

Bryan Wright, BS¹; Robert M. Cannon, MD²; Andrew J. Gunn, MD³

ABSTRACT: We present a 63-year-old man diagnosed with hepatocellular carcinoma. He was deemed an appropriate liver transplant candidate, but currently outside Milan criteria, as the tumor was >5 cm in its largest dimension. The patient was referred to Interventional Radiology for consideration of transarterial chemoembolization as a mechanism to downstage the patient into transplant eligibility.

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KEY WORDS: hepatocellular carcinoma, orthotopic liver transplantation

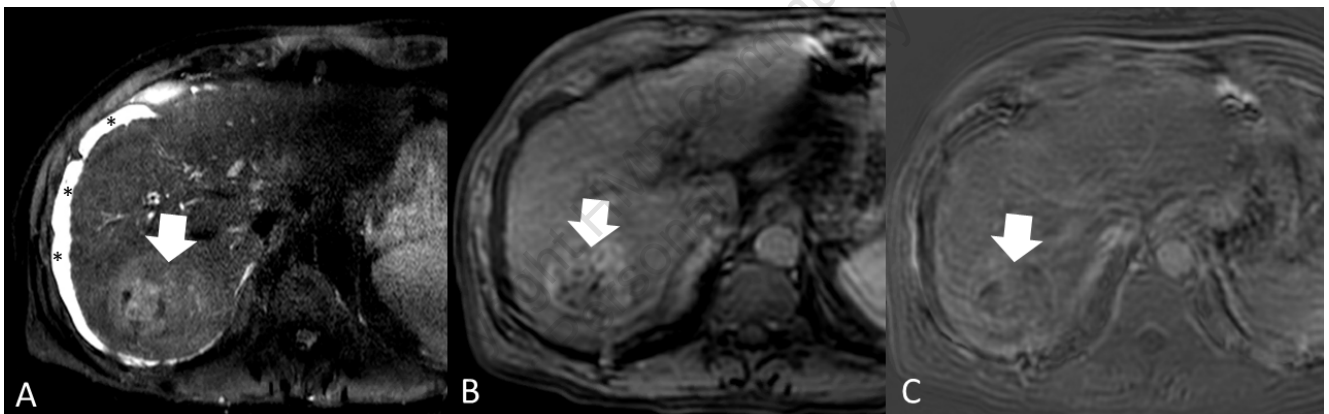


FIGURE 1. (A) Axial slice from a T2-weighted MRI demonstrates a well-circumscribed, hyperintense mass centered in segment 7 of the liver (white arrow) that measured 5.3 cm in the longest axial diameter. There is perihepatic ascites (black asterisks). (B) Axial slice from a T1-weighted MRI after contrast administration in arterial phase demonstrates the mass to be arterially enhancing relative to normal liver parenchyma (white arrow). (C) Axial slice from a subtracted image from a T1-weighted MRI obtained 3 minutes after contrast administration demonstrates areas of washout within the tumor (white arrow). The imaging findings were consistent with hepatocellular carcinoma.

Case Presentation

A 63-year-old man with a past medical history of hepatitis C and heavy alcohol use originally presented to the emergency department with altered mental status. At that time, his relevant labs included albumin of 3.7 g/dL, total bilirubin of 1.6 mg/dL, alkaline phosphatase of 122 IU/L; alanine aminotransferase (ALT) of 25 IU/L, aspartate aminotransferase (AST) of 40 IU/L, platelet count of 66,000/ μ L, international normalized ratio (INR) of 1.33, and quantitative hepatitis C viral load (HCV Quant) of 73,800 IU/mL. An abdominal ultrasound

demonstrated abdominal ascites, a cirrhotic morphology of the liver, and an echogenic mass in the right lobe of the liver. Hepatology admitted the patient for evaluation, and discharged the patient on lactulose once the encephalopathy had improved. As an outpatient, the patient underwent magnetic resonance imaging (MRI) that confirmed the diagnosis of hepatocellular carcinoma (HCC) in the right lobe of the liver (**Figure 1**). At this point, he was referred to the multidisciplinary liver tumor board for therapeutic options. The patient was deemed to be an appropriate liver transplant candidate but currently outside Milan criteria,¹ as the tumor was >5 cm in

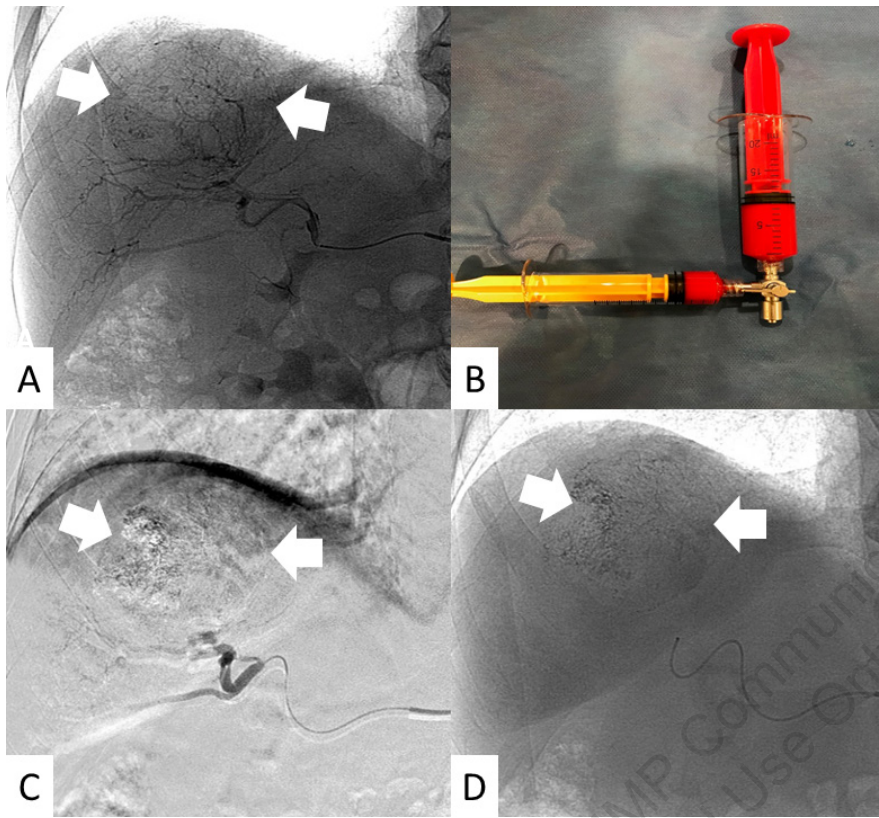


FIGURE 2. (A) Angiogram from the right hepatic artery demonstrates a hypervascular tumor in the right lobe of the liver (white arrows), consistent with preprocedural MRI. (B) Photograph of the doxorubicin and ethiodized oil emulsion prior to transarterial chemoembolization. (C) Digital subtraction angiogram after transarterial chemoembolization shows no residual flow to the tumor (white arrows). (D) Radiograph obtained after transarterial chemoembolization demonstrates the ethiodized oil and doxorubicin emulsion distributed within the tumor (white arrows), confirming delivery.

its largest dimension. Thus, the patient was referred to Interventional Radiology (IR) for consideration of transarterial chemoembolization (TACE) as a mechanism to downstage the patient into transplant eligibility.

Procedure

The right groin was prepared and draped in standard sterile fashion. Moderate conscious sedation using fentanyl and midazolam was employed. After local lidocaine, the right common femoral artery was accessed under sonographic guidance using a needle. Over a wire, a vascular sheath was placed into the artery and attached to a heparinized saline flush. A diagnostic Simmons 2 catheter (Terumo Corporation) was used to catheterize the superior mesenteric artery. Angiography demonstrated no hepatic supply and a patent portal vein. The diagnostic catheter was then used to perform angiography of the celiac artery, which demonstrated classic arterial anatomy. A 2.8 Fr Progreat microcatheter (Terumo Corporation) was advanced into the right hepatic artery, where angiography was repeated (**Figure 2**), demonstrating the hypervascular tumor. The microcatheter was advanced into the artery supplying segment 7 of the liver. After confirmatory angiography,

TACE was performed. The chemoembolic emulsion included 4 mL of doxorubicin 50 mg mixed with approximately 6 mL of ethiodized oil. After delivery of the entire emulsion, bland embolization of the artery was performed to stasis using 100-300 μ m Embosphere microspheres (Merit Medical). Repeat angiography demonstrated no additional flow to the tumor. Catheters and wires were removed. The arteriotomy was closed with a MynxGrip closure device (Cordis Corporation). The patient was discharged to home approximately 3 hours after the procedure. Follow-up MRI performed approximately 4-6 weeks after the procedure demonstrated a complete response to therapy (**Figure 3**).

Discussion

HCC is the third leading cause of cancer-related death worldwide, with the majority of cases occurring in patients with cirrhosis due to hepatitis, autoimmune disorders, alcohol use, or non-alcoholic steatohepatitis.² Overall survival for patients with HCC is significantly improved if they can undergo orthotopic liver transplantation, with 5-year survival rates reaching 60%-80% in patients with early-stage disease.³⁻⁶ According to the Milan criteria,¹ patients with HCC are

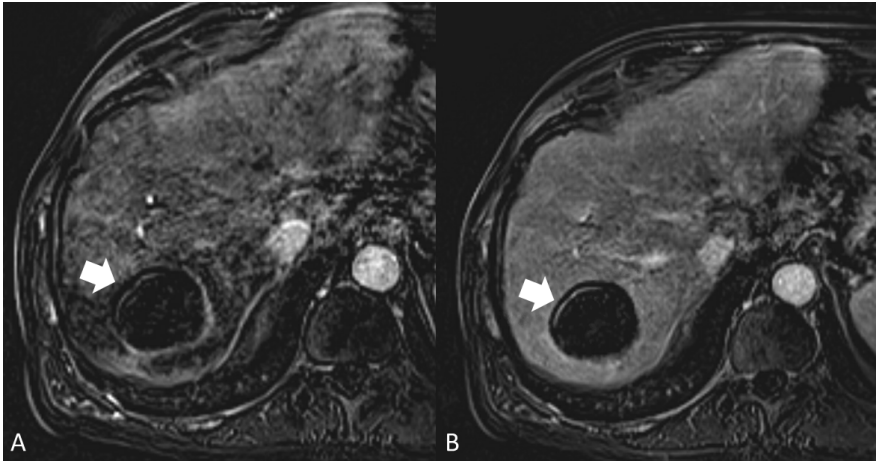


FIGURE 3. (A) Axial slice from a subtracted image from a contrast-enhanced, T1-weighted MRI in arterial phase obtained approximately 4 weeks after transarterial chemoembolization demonstrates no areas of residual enhancement within the tumor (white arrow), consistent with a complete response. (B) Axial slice from a subtracted image from a contrast-enhanced, T1-weighted MRI in portal venous phase obtained approximately 4 weeks after transarterial chemoembolization demonstrates no areas of residual enhancement within the tumor (white arrow), consistent with a complete response.

eligible for a transplant if they have a single tumor ≤ 5 cm in size or up to 3 tumors all ≤ 3 cm in size, although other factors including comorbidities, age, substance abuse, and psychosocial factors are also considered when assessing transplant candidacy.

IR has several image-guided, minimally invasive procedures that can help bridge transplant-eligible patients and downstage near-transplant-eligible patients, including percutaneous ablation, conventional TACE (as performed here), bland transarterial embolization (TAE), drug-eluting bead chemoembolization (DEB-TACE), and transarterial radioembolization (TARE) with yttrium-90.⁷⁻⁹ In this case, the patient's tumor burden placed them outside Milan criteria prior to any intervention. On follow-up, there was a complete response to therapy, thus downstaging the patient to transplant eligibility based on tumor burden. Current guidelines require the patient to maintain eligibility with respect to tumor burden for 6 months prior to being listed for orthotopic liver transplantation. This allows for patients with unfavorable tumor biology or micrometastatic disease to manifest before undergoing orthotopic liver transplantation. During this waiting period, patients can undergo local resection, ablation, TACE, TAE, TARE, or radiation as necessary.

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From ¹Oklahoma State University College of Osteopathic Medicine, Tulsa, Oklahoma; ²the Department of Surgery, University of Alabama at Birmingham, Birmingham, Alabama; and ³the Department of Radiology, University of Alabama at Birmingham, Birmingham, Alabama.

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Address for Correspondence: Andrew J. Gunn, MD, Department of Radiology, University of Alabama at Birmingham, 619 19th St S, NHB 623, Birmingham, AL 35249. Email: agunn@uabmc.edu