



# Transarterial Chemoembolization-Induced Ischemic Colitis: A Rare Complication Due to Nontarget Embolization

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## ABSTRACT

Nontarget embolization is a rare complication that may occur after a patient undergoes transarterial chemoembolization as a localized treatment of hepatocellular carcinoma. This phenomenon can occur because of variations in arterial blood supply to the liver and ultimately can lead to ischemic complications in unintended locations. We describe a case of nontarget embolization during transarterial chemoembolization causing ischemic colitis because of anatomic variation in the origin of the right hepatic artery. This case highlights the importance of recognizing rare side effects associated with this procedure and the need for comprehensive imaging to assess for anatomical variation to avoid poor outcomes.

**KEYWORDS:** ischemic colitis; transarterial chemoembolization; embolization; hepatocellular carcinoma

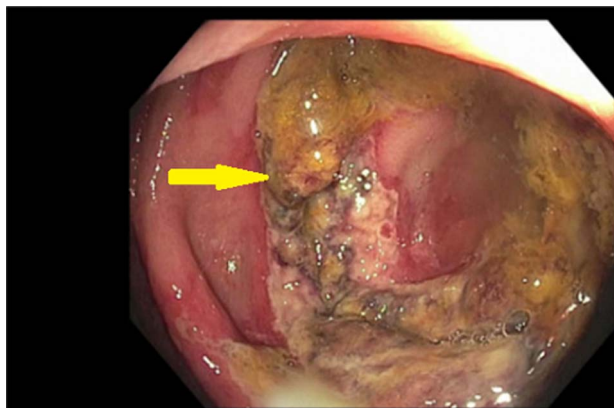
## INTRODUCTION

Hepatocellular carcinoma (HCC) is an increasingly prevalent malignancy seen among patients in the setting of cirrhosis.<sup>1</sup> With many different therapies implemented, treatment is largely guided based on tumor stage, liver function reserve, and overall patient performance status.<sup>1</sup> Transarterial chemoembolization (TACE) is a locoregional treatment used in patients with intermediate-stage HCC with relatively preserved liver function (Child-Pugh classification B up to 8 points) as well as the absence of cancer-related symptoms and extrahepatic spread.<sup>1</sup> While the procedure continues to evolve, this therapy largely entails injecting a chemotherapeutic agent into a branch of the hepatic artery supplying blood to the tumor while cutting off blood supply simultaneously through particle embolization, creating a profound cytotoxic effect enhanced by ischemia.<sup>2</sup> In theory, this procedure will allow for maximum and sustained concentration of these chemotherapeutic drugs within the tumor while providing minimal systemic exposure.<sup>1</sup>

Nontarget embolization is a rare and potentially devastating complication seldom occurring after TACE. This phenomenon has been hypothesized to occur because of anatomical variation in blood supply to nonhepatic structures or regurgitation of chemoembolic agents along the catheter during administration.<sup>3</sup> To date, there are no reported cases of TACE-induced ischemic colitis. In this study, we present a case of nontarget embolization during TACE leading to periprocedural ischemic colitis.

## CASE REPORT

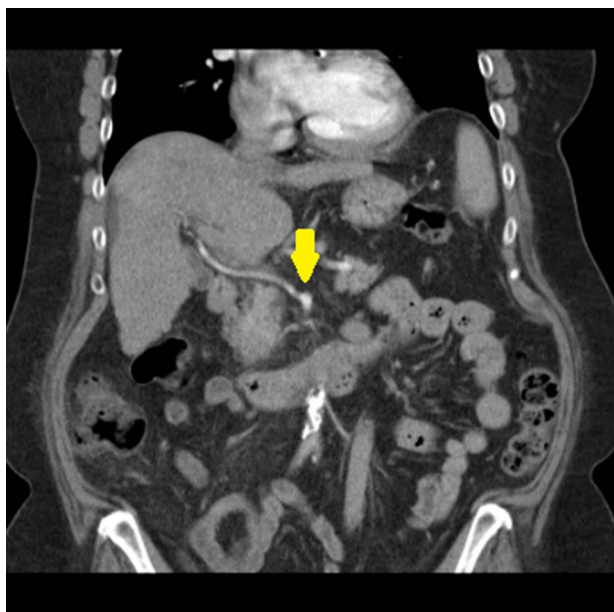
A 65-year-old woman with a history of HCC underwent an outpatient TACE for a 3.6 cm liver lesion. She tolerated the procedure without intraprocedural or periprocedural hypotension. She soon developed severe right upper quadrant pain in the immediate postprocedural period and was hospitalized for pain control. The workup was notable for elevated lactic acid (5.8 mmol/L) and acute kidney injury; abdominal computed tomography (CT) with contrast and angiography were deferred to avoid a significant contrast load. The patient was managed conservatively with intravenous fluids and pain control. On day 2 of hospitalization, the patient



**Figure 1.** Colonoscopy image demonstrating ischemic changes near appendiceal orifice (yellow arrow).

developed significant hematochezia and continued to have severe abdominal pain. Abdominal CT without contrast was obtained to evaluate for a postablation bleed, but there was no evidence of hemoperitoneum or hematoma. The gastroenterology team was consulted for evaluation, and the decision was made to perform esophagogastroduodenoscopy (EGD) and colonoscopy (CSP).

EGD demonstrated 2 nonbleeding superficial ulcers with a clean ulcer base (Forrest Class III) in the duodenal bulb. There was one esophageal ulcer without bleeding or stigmata of a recent bleed. CSP demonstrated multiple ulcers and erythema from the cecum to the descending colon, suggesting ischemic colitis (Figure 1). Biopsies obtained from her colon demonstrated superficial mucosal erosion and necrosis, crypt atrophy,



**Figure 2.** Computed tomography angiogram of the abdomen demonstrating the origin of the right hepatic artery from the superior mesenteric artery. In general, the right hepatic artery arises from the hepatic artery proper, a branch of the common hepatic artery from the celiac trunk.

and lamina propria hemorrhage with hyalinization, consistent with acute ischemic colitis.

A follow-up CT angiogram of the abdomen and pelvis demonstrated a patent abdominal aorta and all major branches, including the celiac, superior mesenteric, and inferior mesenteric arteries. The right hepatic artery was appreciated to arise from the superior mesenteric artery (Figure 2). There was evidence of mesenteric stranding in the right colon and hepatic flexure. She was treated with conservative measures alone and had complete resolution of her abdominal pain and hematochezia. She was continued on an oral proton pump inhibitor for the treatment of her esophageal and duodenal ulceration. The patient was discharged and continued to do well. She underwent a follow-up CSP at 6 months, which showed complete resolution of ischemic colitis, but had multiple medium-sized angiodysplastic lesions in the ascending colon. One year later, a repeat EGD for variceal surveillance showed resolution of esophageal and duodenal ulcerations. She had a good response to TACE without evidence of residual or progressive HCC.

## DISCUSSION

TACE is generally regarded as a safe and effective therapeutic option for patients meeting the appropriate criteria to undergo the procedure. Though generally tolerated, complications have been documented, including postembolization syndrome occurring in 90% of patients periprocedurally, manifesting as right upper quadrant pain, nausea, vomiting, fever, and malaise.<sup>3</sup> This can lead to prolonged hospitalizations.<sup>4</sup> Though rare in presentation, major complications may arise, such as abscess formation, intestinal perforation, or ischemia.<sup>5</sup>

Gastrointestinal ischemia has been hypothesized to occur because of carryover of embolic material into the visceral arteries, leading to the phenomenon known as nontarget embolization.<sup>3,5</sup> This presentation likely presents in a 2-fold manner because of anatomic variation of arterial supply to nonhepatic structures as well as reflux of chemoembolic agents during delivery.<sup>3</sup> It has been reported that nearly half of the general population has a form of anatomic variation in arterial blood supply to the liver.<sup>3</sup> Variations include the right hepatic artery originating from the superior mesenteric artery, the left hepatic artery originating from the left gastric artery, and an accessory middle hepatic artery.<sup>3</sup> Ultimately, variations in the origin of these arteries have the potential to affect arterial blood supply and influence procedural intervention.<sup>6</sup>

The majority of blood flow to the colon comes from the superior mesenteric and inferior mesenteric arteries as well as their associated microvascular plexuses.<sup>7</sup> While there are many known risk factors for the development of ischemic colitis, it is common to present because of an acute occlusion of the mesenteric vasculature as seen in vascular occlusive diseases (eg, thromboemboli), vasculitides, or thrombophilias.<sup>7,8</sup> In addition, patients may develop nonocclusive ischemia because of

sudden-onset intestinal hypoperfusion, such as in hemorrhagic shock, anaphylaxis, or mechanical obstruction (eg, intestinal volvulus).<sup>9</sup>

Regarding this patient, the etiology of acute ischemic colitis is likely because of an aberrant variation in her right hepatic artery originating from her superior mesenteric artery, predisposing her to an acute occlusion of her mesenteric artery with a transient hypoperfused state. As appreciated on her subsequent CT angiogram, there was evidence of patency among all major intestinal branches from her abdominal aorta, further supporting the hypothesis of transient hypoperfusion. This image confirmed the aberrancy of her right hepatic artery arising from her superior mesenteric artery. To the best of our knowledge, this is the first time acute ischemic colitis has been documented after TACE. Overall, it is important to consider the possibility of anatomical variations before TACE. By reviewing comprehensive imaging for variation in arterial blood supply, ischemic complications can likely be prevented when performing a TACE procedure.

## DISCLOSURES

Author contributions: J. Selzman: writing the draft and manuscript and performing the literature review. M. Gajendran: reviewing and editing the manuscript and supervision. B. El Kurdi: reviewing and editing the manuscript and supervision. V. Katabathina: reviewing the radiology images and critical revision of the manuscript. R. Wright: reviewing and editing the manuscript and supervision. C. Umopathy: reviewing and editing the manuscript and supervision. J. Echavarria: reviewing and editing the manuscript and is the article guarantor.

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Informed consent was obtained for this case report.

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