Combined Embolization and Ablation in an Angio-CT Interventional Suite

Courtesy: Bruno C. Odisio, MD, Department of Interventional Radiology,
The University of Texas MD Anderson Cancer Center, Houston, Texas, USA

Patient history

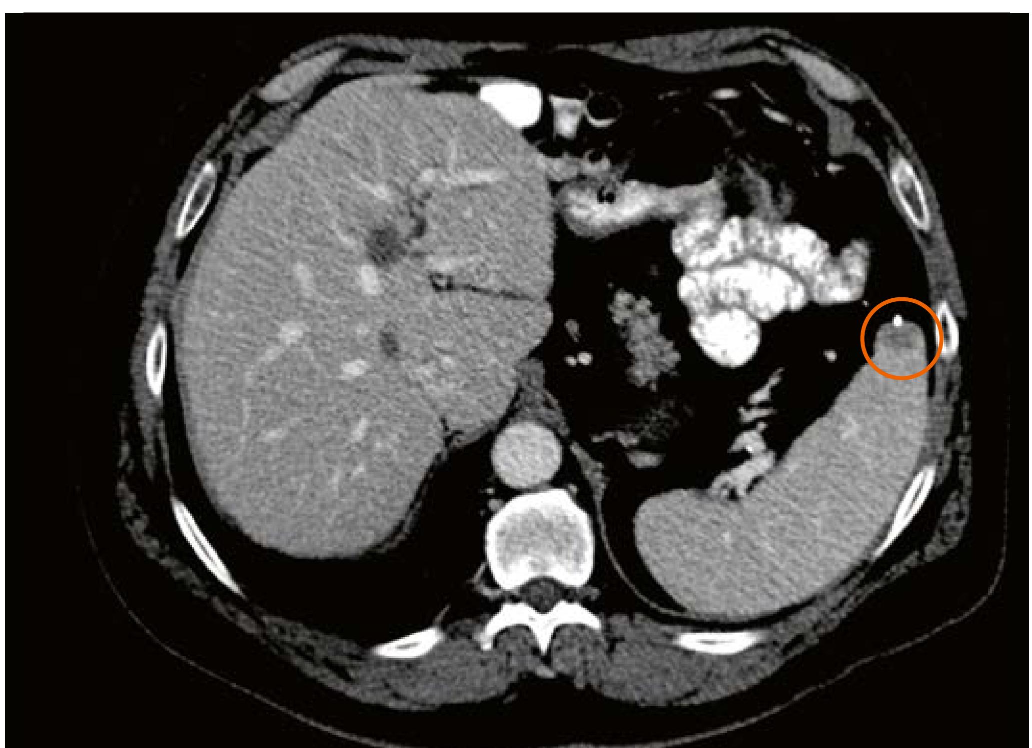
A 59-year-old male with metastatic colorectal cancer to spleen

Diagnosis

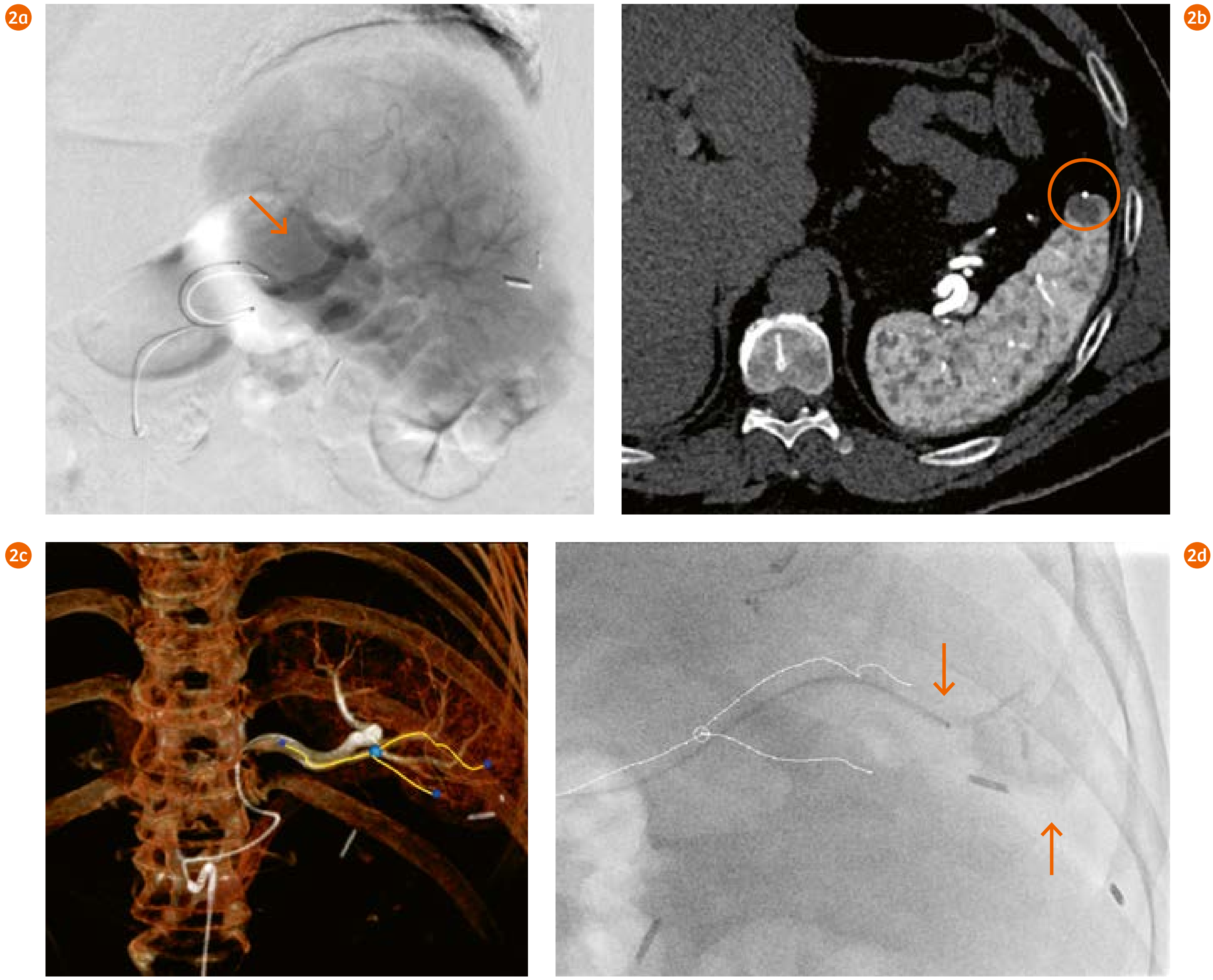
The patient was previously diagnosed with metastatic colorectal cancer to the liver and successfully treated using CT-guided liver ablation.
A new metastasis measuring 1.9 cm was found in the superior aspect of the spleen (Fig. 1). This was treated with percutaneous CT-guided microwave ablation and with a preablation superselective embolization of the feeder vessels to the tumor in order to reduce the risk of bleeding.

Treatment

Digital subtraction angiography (DSA) imaging of the splenic vasculature was acquired with femoral access using a 5F catheter into the celiac artery, followed by a 2.8F micro catheter into the splenic artery (Fig. 2a). An intra-arterial CT scan with contrast administration was



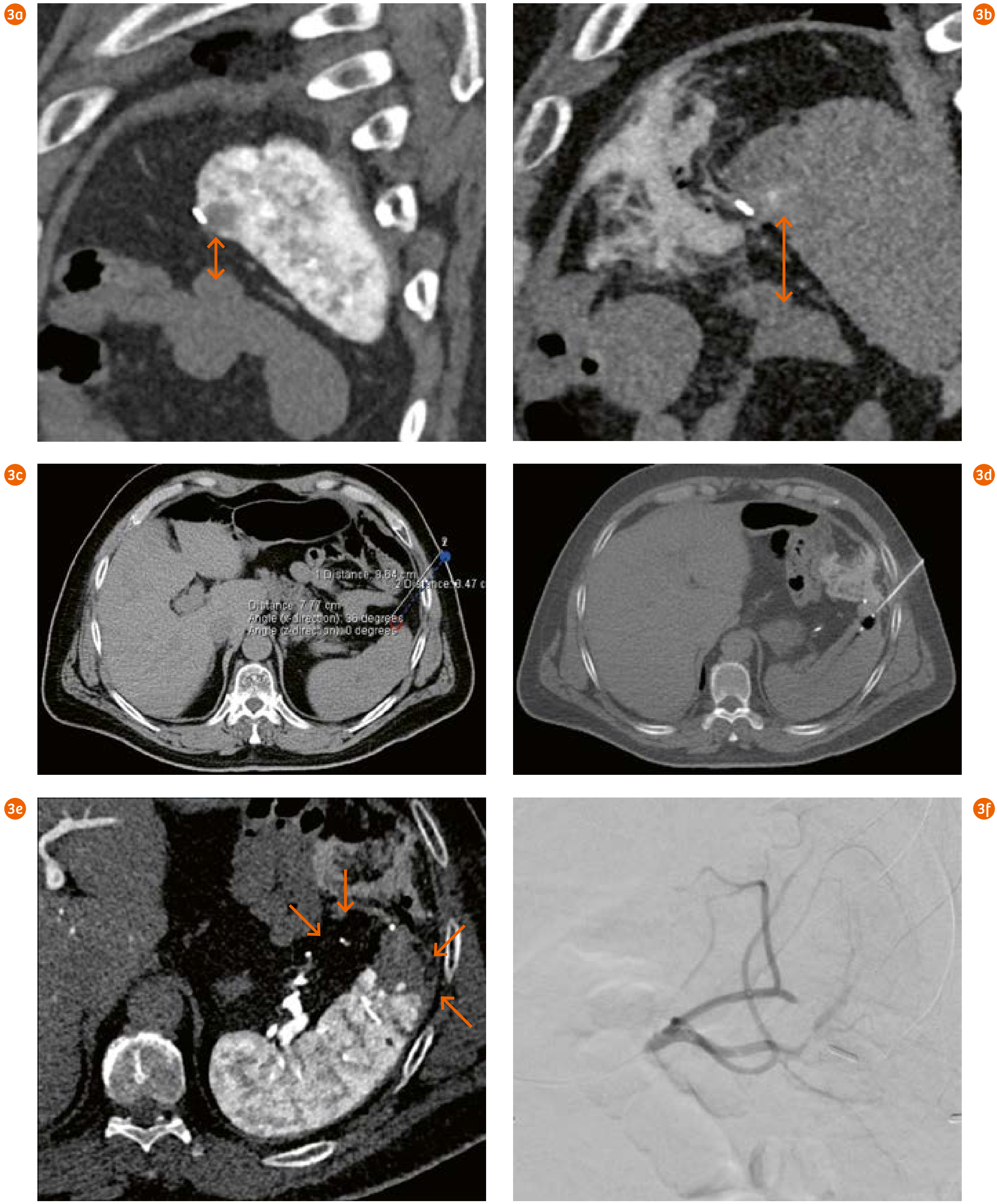
1 Diagnostic CT imaging showing metastasis to spleen. Note the previously treated liver metastasis.



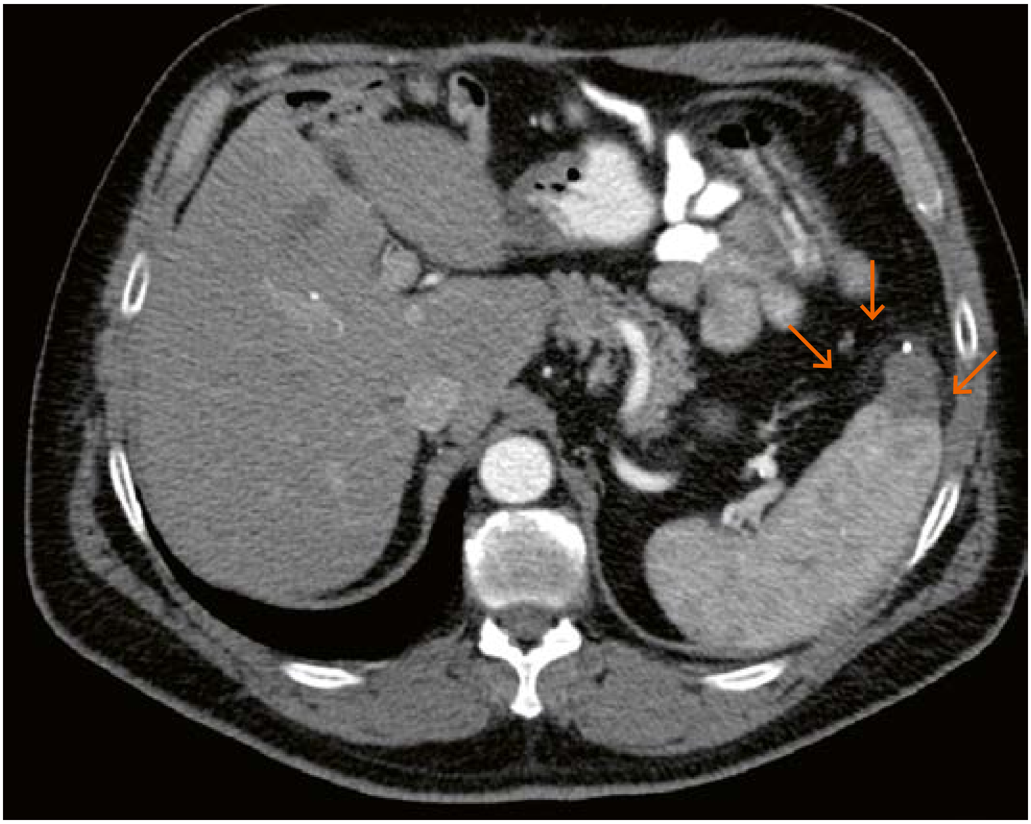
2 **Intraprocedural imaging during preablation embolization. (a) Planar DSA imaging to depict splenic vasculature. (b) Axial slice of intra-arterial CT image showing splenic lesion. (c) Identification of tumor feeder vessels using *syngo* Embolization Guidance package. (d) Fluoroscopic image of the point of embolization and contrast pooling into the tumor as well as the vessel path overlaid from intra-arterial CT.**

acquired from the splenic artery to map out the tumor feeder vessels. The contrast (Omnipaque 350) was administered at a rate of 3 mL/s for a duration of 14 s and a total volume of 42 mL. Multiplanar reformatted (MPR) images of the intra-arterial CT clearly illustrated the hypovascular tumor and the vessels supplying the splenic segment harboring the target tumor (Fig. 2b), which was not obvious on planar DSA images. After delineating the feeder vessels, superselective catheterization of the splenic artery branch supplying the area of interest was performed successfully, and the target feeding branches were embolized to stasis using 900-micron particles (Embozene) in order to reduce potential heat-sink effect (Fig. 2c–2d).

Following the embolization, microwave ablation under CT guidance was performed. In general, the spleen is prone to bleeding during insertion and removal of ablation needles. Therefore, femoral access was maintained throughout the ablation procedure to mitigate bleeding under angiography where needed. An initial noncontrast CT scan was acquired to plan the ablation needle path. Prior to inserting ablation probes, hydrodissection of perisplenic space with separation of the splenic flexure of the colon was performed successfully under CT guidance using an 18-gauge needle (Fig. 3a–3b). Two microwave antennas were inserted under CT guidance, and microwave ablation was performed



3 Intraprocedural imaging during microwave ablation. (a)–(b) Cross-sectional slices showing the space between spleen and colon before and after hydrodissection. (c) Axial slice showing the path planning on CT images for placing ablation probes. (d) Axial slice showing the ablation probe. (e) Immediate postablation intra-arterial CT highlighting the ablation margin and (f) Immediate postablation DSA confirming no evidence of bleeding.



4 Follow-up CT imaging showing successful ablation of the splenic metastasis.

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for 10 minutes at 65 W and a maximum temperature of 134 °C. Immediately after the removal of the ablation probes, the patient became tachycardic and hypotensive. A DSA was therefore acquired to rule out any bleeding caused by vasovagal reaction. Intra-arterial contrast-enhanced CT, also performed toward the end of the ablation procedure, confirmed the ablation margins and indicated no bleeding from the ablation (Fig. 3).

Follow-up imaging

Ablation and preablation embolization were performed successfully in the same setting with both angiographic and CT imaging. Follow-up CT imaging after 2 months showed primary efficacy of the combined embolization-ablation procedure with no residual disease (Fig. 4). Patient has remained disease-free for 11 months.

Comments

This combined embolization and ablation procedure was performed in an Angio-CT suite equipped with a CT scanner (SOMATOM Definition Edge with 128 slices) and a flat-panel C-arm angiography system (Artis Q, ceiling-mounted) with a common patient table, thus facilitating the advantages of imaging and image guidance using the two modalities. Since embolization is an intra-arterial therapy, it is performed in an angiography suite, while ablation, a percutaneous procedure, is traditionally performed using CT or ultrasound imaging. However, the combination of a CT scanner and angiography system allowed us to perform these two procedures in the same setting and with successful interplay of the technical and imaging information between the two procedures. For example, intra-arterial CT imaging was used to accurately identify the vessels feeding the splenic segment harboring the tumor during the embolization procedure under angiography imaging. Similarly, immediate postablation assessment of potential bleeding and ablation margins was performed, respectively, using DSA and CT imaging acquired with intra-arterial access. As a safety measure, CT-guided hydrodissection was performed to avoid ablation of critical structures, and femoral access was maintained for angiographic detection and embolization of possible bleeding. In summary, combining CT and angiography systems not only has the potential to enable these complex combined techniques, but also to bring the existing interventional therapies to a new level. ●

Contact
Yu Deuerling-Zheng
yu.deuerling-zheng@siemens-healthineers.com