

Why such a different appearance?

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Section: Abdominal imaging

Imaging Technique: Ultrasound

Imaging Technique: MR

Case Type: Clinical Cases

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Patient: 67 years, male

Clinical History:

A 67-year-old male presented, to undergo a follow-up evaluation of a hepatic disease that had occurred secondary to a neuroendocrine tumor of the midgut, one year earlier. He had undergone an uneventful radio-frequency treatment of three liver metastases.

Imaging Findings:

The 67-year-old male patient presented for a follow-up examination of a hepatic disease which had occurred secondary to a neuroendocrine tumor of the midgut. One year earlier, he had undergone an uneventful radio-frequency treatment of three liver metastases. An US examination was performed after an i.v. injection of an echo-amplifier medium. While scanning the left lobe, the examiner noted an abnormal area just next to one of the treated lesions (Fig. 1). Such an area had not been demonstrated at a prior CT examination. An MRI study was then performed to restage the patient's liver disease (Fig. 2). Focusing attention on the left lobe, it was found that the two lesions had comparable sizes but very different MR appearances. The new lesion was found to be inhomogeneously hyperintense on T2-weighted images, hypointense on T1w images and presented a rim of contrast uptake after a gadolinium injection. The old lesion was dark on T2w images, bright and umbilicated on T1w images, and no significant contrast-enhancement was shown.

Discussion:

The most typical feature of hepatic metastases from neuroendocrine tumors is their early enhancement after an i.v. administration of a contrast material (Dromain et al.), which is either a gadolinium-chelate for MR imaging or an iodine-compound. The same can be expected in US scans taken immediately after the injection of a blood-pool medium such as the second-generation echo-amplifier agents. The pattern can be that of a peripheral rim of early enhancement followed by some centripetal fill-in. Note that the hypervascular rim at the edge of the new hepatic lesion (Fig. 2d, arrowheads) has a regular inner contour and does not display any globular appearance, making the hypothesis of a hemangioma unlikely and thus indicating recurrent disease. Since such contrast dynamics depend on their rich blood (arterial) supply, neuroendocrine metastases appear fairly hyperintense on T2w scans. The old lesion, localized adjacent to the latter in the left hepatic lobe, appears dark on T2w images, but is bright on unenhanced T1w scans and no significant contrast-enhancement is seen. Due to its nodular shape with regular margins and a lack of perfusion, the hypothesis of focal steatosis is unlikely, moreover the T1w MRI scan acquired at out-of-phase TE excluded the presence of microvesicular fat (see Fig. 2, arrow). Hypovascular neuroendocrine histotypes have also been described, but the association of a typical hypervascular secondary lesion and the history of radio-frequency thermoablation makes post-treatment changes the correct interpretation for such an appearance. The rationale of an RF treatment is to induce coagulative necrosis in the tumoral foci. At a later stage, the water component becomes scarce and a dark central scar may be seen (see Fig. 2a). Hence, coagulative necrosis

secondary to thermoablation is responsible not only for the absence of contrast uptake on enhanced images, but also for the hyperintense appearance on unenhanced T1w MR images of neuroendocrine tumor metastases after RF treatment.

Differential Diagnosis List: RF thermoablation changes in metastasis from a neuroendocrine tumor.

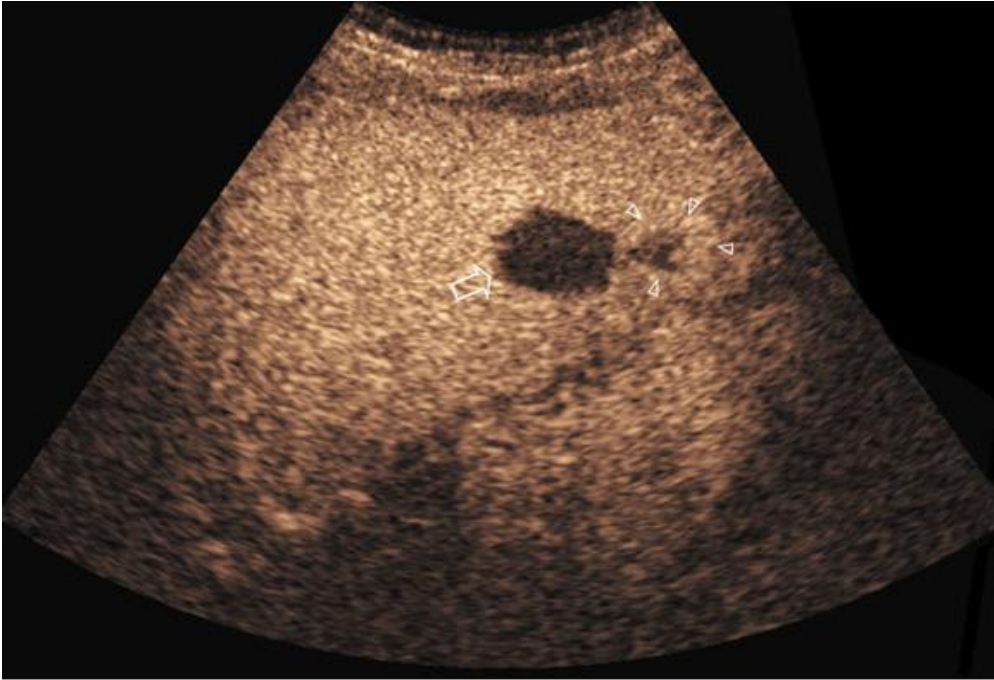
Final Diagnosis: RF thermoablation changes in metastasis from a neuroendocrine tumor.

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- Tsushima Y, Funabasama S, Aoki J, Sanada S, Endo K. Quantitative perfusion map of malignant liver tumors, created from dynamic computed tomography data. *Acad Radiol*. 2004 Feb;11(2):215-23. (PMID: [14974597](#))

Figure 1

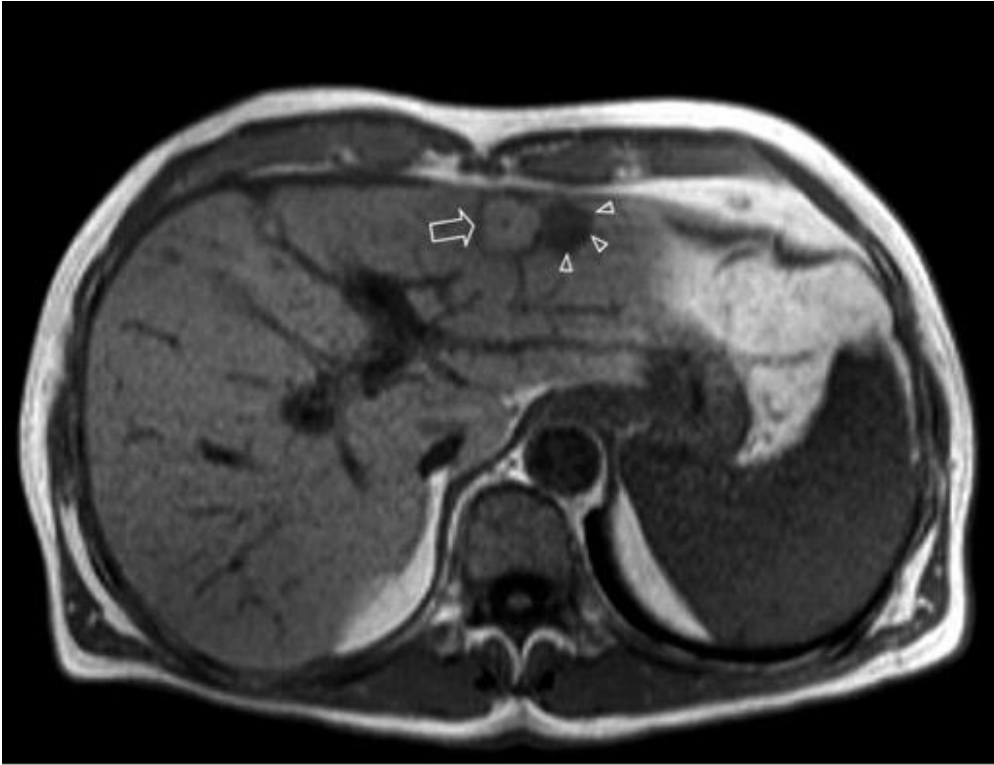
a



Description: The US image showing the treated unenhanced lesion on the left (arrow). A second abnormal area is seen close to the latter on the right side (arrowheads). Such a lesion, which has a hypoechoic core and enhances at its periphery, is typical of neuroendocrine tumor metastases. **Origin:**

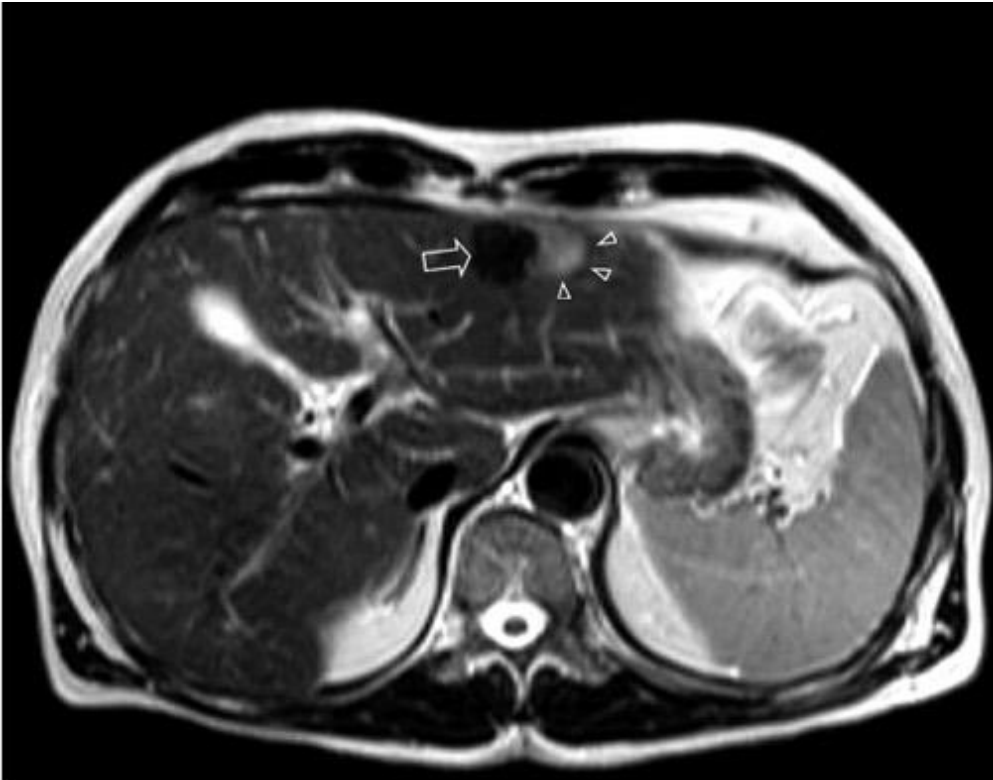
Figure 2

a



Description: An MR image showing the new lesion (arrowheads) as being hypointense on the FFE T1w scan. The old lesion (arrow) is seen to be hyperintense on the same sequence. **Origin:**

b



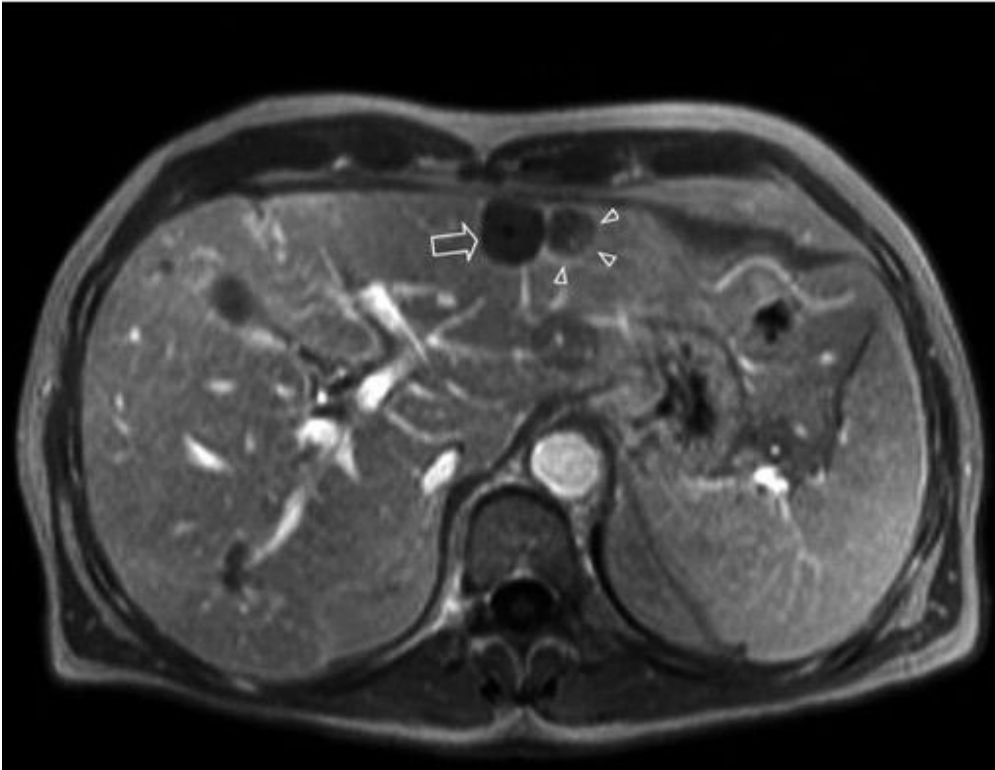
Description: An MR image showing the new lesion (arrowheads), which is bright on the TSE T2w image, whereas the old one (arrow) is seen to be dark on the same scan. **Origin:**

c



Description: Neither the new (arrowheads) nor the old (arrow) lesions displaying a significant signal decay in the FFE T1w image acquired at out-of-phase TE when compared to the in-phase FFE T1w scan. The possibility of focal steatosis can be ruled out. **Origin:**

d



Description: The FFE T1w scan obtained after an administration of a paramagnetic substance, showing the new lesion (arrowheads) with a peripheral rim of contrast-enhancement; the differential diagnosis of a hemangioma is unlikely due to the sharpness of the enhancing ring. The treated metastasis (arrow) does not enhance at all. **Origin:**