Late Emergence of Contrast-enhancing Fat Necrosis Mimicking Tumor Seeding after Renal Cryoablation

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ABSTRACT

Defining radiographic treatment success after percutaneous renal ablation is challenging due to variable ablation zone imaging findings over time. The present report describes two cases of progressively more evident enhancing soft-tissue nodules in the perinephric fat more than 2 years after cryoablation. Despite features concerning for tumor recurrence on computed tomography and magnetic resonance imaging, biopsies revealed fat necrosis in both cases. Renal ablation zone soft-tissue nodules can appear long after ablation, enhance with contrast medium, mimic applicator tract or ablation zone tumor seeding, and may require biopsy for confirmation of benignity.

ABBREVIATIONS

RCC = renal cell carcinoma, RF = radiofrequency

CASE REPORTS

Patient 1

History. A 76-year-old man with a history of prostate cancer was incidentally found to have a 2-cm enhancing solid exophytic right renal mass on computed tomography (CT; Fig 1a). A CT-guided core needle biopsy confirmed Fuhrman grade 2 clear cell renal carcinoma.

Ablation Procedure. Cryoablation of the patient's right renal mass was performed by using CT-fluoroscopic guidance. Five PERC-24 cryoprobes (HealthTronics, Austin, Texas) were inserted into the renal mass (Fig 1b). Freeze, passive thaw, freeze, and active thaw cycles were performed for 11, 8, 9, and 5 minutes, respectively, with argon (freezing) and helium (heating) gases. The ice ball entirely encompassed the tumor and extended into the perirenal fat with a minimum 13-mm margin from the tumor to the ice edge. The immediate postprocedure CT showed no evidence of hemorrhage or other visible complication.

Imaging Follow-up. Routine follow-up contrast-enhanced CT imaging (Discovery 64-slice CT, 2.5–5-mm slice thickness, 379–381 mA; Omnipaque 300 contrast agent; GE Healthcare, Waukesha, Wisconsin) was performed. One month after ablation, a large area of the lateral right kidney in the cryoablated region did not enhance with the administration of contrast agent. In the perinephric tissues corresponding to the region of previous ice ball formation, soft-tissue stranding and a thin nonenhancing halo of soft-tissue density were evident (Fig 2a). Twelve months after ablation, the ablation zone in the kidney was smaller and the perinephric soft-tissue halo was more clearly defined (Fig 2b). At this time, there was no evidence of recurrence in the ablation zone, perinephric space, or adjacent abdominal wall. By 26 months after ablation, the ablated region in the kidney had contracted, but a new nodular soft-tissue density measuring 1.9 × 1.2 cm had developed in the perirenal fat (Fig 2c). Located within the radius of the previous ice ball and along a cryoprobe insertion tract, this soft-tissue nodule enhanced by 40 HU on renal parenchymal phase compared with precontrast imaging. Additional smaller enhancing nodules, some containing calcifications, were also visible along the

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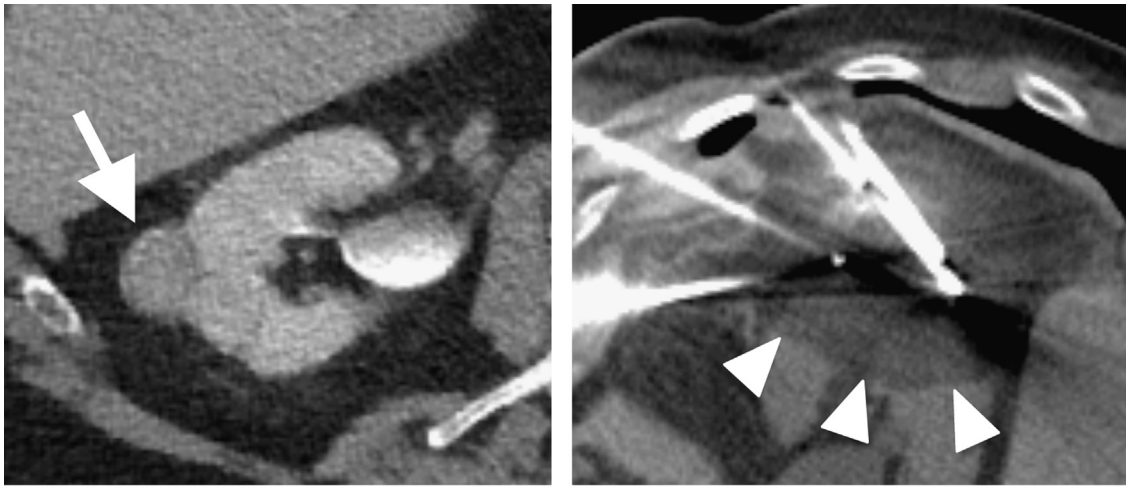

Figure 1. **(a)** Preprocedure contrast-enhanced axial CT imaging. The arrow points to a solid, enhancing, largely exophytic 2-cm right interpole renal mass. No perirenal infiltration or soft-tissue nodules were evident before ablation. **(b)** Intraprocedural noncontrast axial CT-guided percutaneous cryotherapy was performed. Arrowheads demarcate ice ball margins during the second freeze phase.

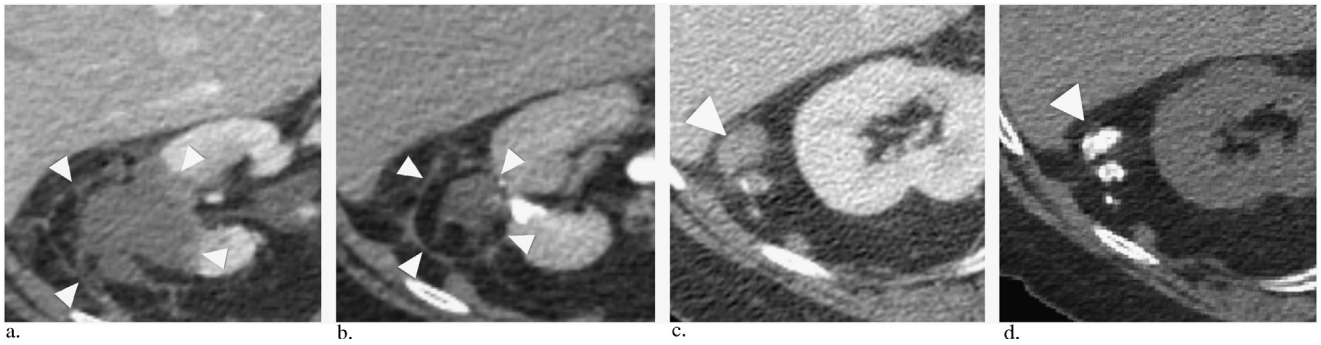

Figure 2. Follow-up contrast-enhanced axial CT imaging in patient 1. **(a)** At 1 month after ablation, no enhancement was seen in the renal ablation zone, and there was perinephric soft-tissue stranding and an emerging perinephric soft-tissue halo (arrowheads). **(b)** At 12 months after ablation, a smaller renal ablation zone was seen, with no evidence of tumor recurrence and a more defined perinephric soft-tissue halo (arrowheads delineate halo). **(c)** At 26 months after ablation, new, enhancing, and partially calcified nodular soft-tissue densities had appeared at the edge of the ablation zone in the perinephric fat (arrowhead). The largest nodule is indicated with an arrowhead. **(d)** At 32 months after ablation, there is near-complete calcification of the perinephric nodules (arrowhead).

peripheral ablation margin. By 32 months, the nodules decreased in size and calcified (Fig 2d).

Postablation Biopsy. Concern for tumor recurrence or seeding from the ablation probes motivated CT-guided core needle biopsies of the enhancing soft-tissue nodule (Fig 2c). The biopsy revealed benign fibroadipose tissue with focal fat necrosis and chronic inflammation associated with extensive foamy histiocytes without zevidence of malignant cells (cytokeratin stains AE1/AE3 were negative).

Patient 2

History. A 2.6-cm solid partially exophytic mass was incidentally discovered in the left kidney in a 41-year-old man undergoing imaging for abdominal pain (Fig 3a). A biopsy was recommended to confirm renal malignancy, but the patient declined.

Ablation Procedure. CT-guided percutaneous cryoablation was performed with two PERC-17 cryoprobes (HealthTronics) inserted from a left lateral approach for argon and helium gas–mediated cycles (12-min freeze, 8-min stick-thaw, 12-min freeze and active thaw to 15°C). Ice margins were well distributed around the mass, with the ice ball "tail" extending along the cryoprobe shafts into the lateral perinephric fat posterior to the descending colon (Fig 3b). There were no bleeding or other complications.

Imaging Follow-up. Magnetic resonance (MR) imaging (1.5 T; GE Medical Systems) follow-up was obtained at 3, 12, and 27 months after cryoablation with and without gadolinium contrast medium (20 mL