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CLASSICS IN ABDOMINAL RADIOLOGY

"Flip-flop enhancement" in renal infarction

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The "flip-flop enhancement" is a characteristic radiological finding of renal infarction described on CT images. This appearance is generated by hyperattenuation of the infarcted renal parenchyma in contrast-enhanced CT on delayed phase, showing inverted enhancement compared to the same hypodense region on corticomedullary and nephrographic phases (Fig. 1) [1].

Flip-flop enhancement can be observed for up to several hours after intravenous injection of contrast agents (24–48 h) in about 70–75% of cases of renal ischemia (Fig. 2) [2]. Pathologically, this sign could be due to an increased permeability through the damaged capillary that causes extravasation of contrast agent from the ischemic glomerular membrane to the extracellular space [2].

Differential diagnosis for the imaging appearance of renal infarction includes pyelonephritis, since in both conditions post-contrast CT images demonstrate a focal wedge-like region of reduced enhancement on early phases, compared with the normal portions of the kidney. However, in kidney infection, neither the "cortical rim sign" nor "flip-flop enhancement" are found in CT imaging [3].

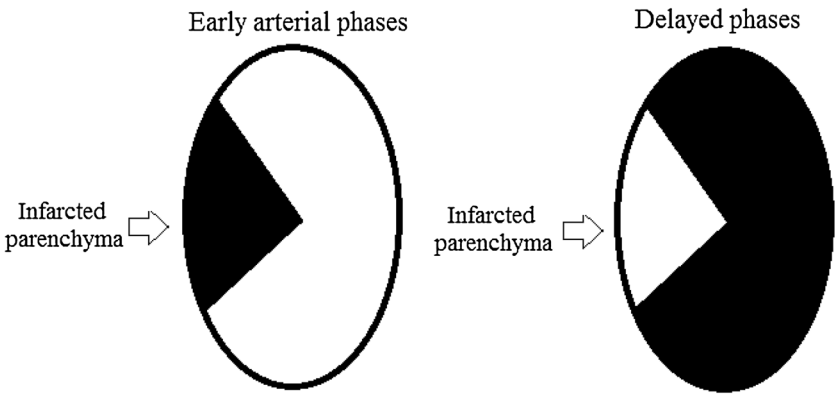

Fig. 1 Schematic representation of contrast-enhanced CT appearance of renal infarction. On early phases, segmental renal infarct may result in a wedge-shaped area of abnormal renal parenchymal hypoenhancement (arrow) compared with the normal portions of the kidney. Conversely, renal infarct appears as an increased attenuation area on delayed phases (arrow)

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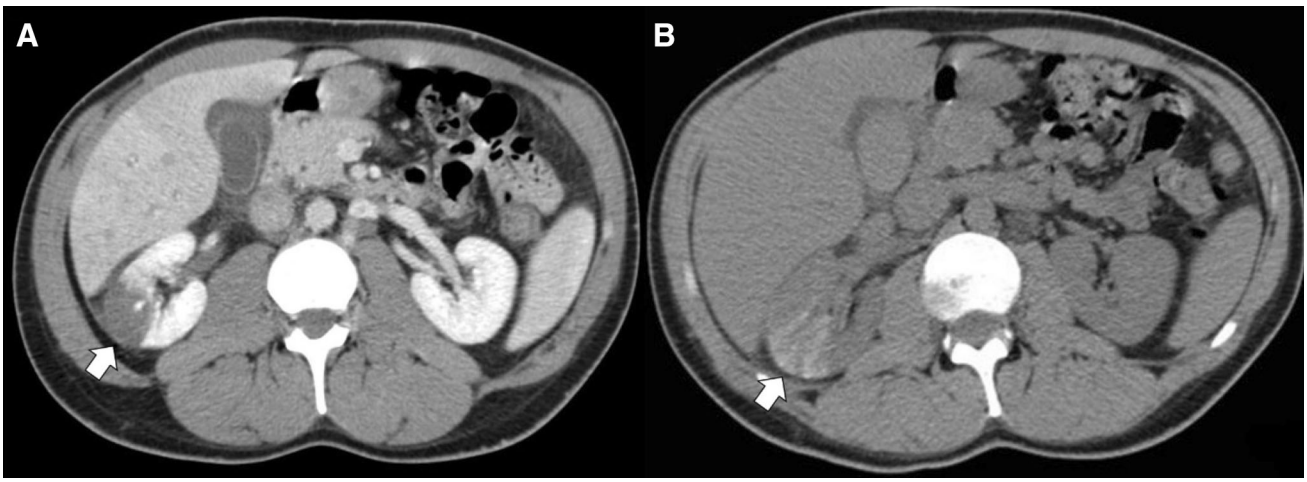

Fig. 2 Acute renal infarction of right kidney in a 32-year-old man. **a** Axial CT image on nephrographic phase shows a wedge-shaped parenchymal defect (arrow) that involves both the cortex and medulla and extends to the capsular surface. **b** Corresponding axial CT image on delayed phase (20 h after contrast agent injection) demonstrates the "flip-flop" enhancement, due to persistent retention of contrast agent in the abnormal segment (arrow)

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interests.

Research involving human participants and/or animals This article does not contain any studies with human participants or animals performed by any of the authors.

Informed consent Statement of informed consent was not applicable since the manuscript does not contain any patient data.

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