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The "spoke wheel" sign in mesenteric carcinoid

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The "spoke wheel" sign is a radiological finding described on CT images of small bowel carcinoid metastasis in the mesentery [1]. This appearance is generated by soft tissue linear stranding within the mesentery, radiating from the centrally located metastatic implant toward adjacent bowel loops, resembling a "spoke wheel" (Fig. 1) [1].

Carcinoid tumors are uncommon neuroendocrine neoplasms originating from endocrine amine precursor uptake and decarboxylation (APUD) cells. Although they can occur in any organ, approximately 60–70% of carcinoid tumors are located in the gastrointestinal tract, which has the largest reservoir of neuroendocrine cells in the body [2]. Gastrointestinal carcinoids most frequently affect the rectum (34%), followed by the small bowel (26%) [2].

On CT imaging, primary carcinoid of small intestine may be seen as small intramural masses, polypoid lesions or concentric mural thickening [2]. However, carcinoid metastasis in the mesentery may be the only imaging manifestation of a neuroendocrine tumor of the small bowel. The mesenteric involvement may manifest as enlarged lymph nodes or masses, often containing calcification, and with spiculated irregular margins, surrounded by desmoplastic reaction, configuring the "spoke wheel" pattern (Fig. 2) [3].

Fig. 1 A spoke wheel. Public domain image (https://pixabay.com/it/ruota-legno-ruota-del-carro-isolato-2960045/). Accessed 29/09/2018

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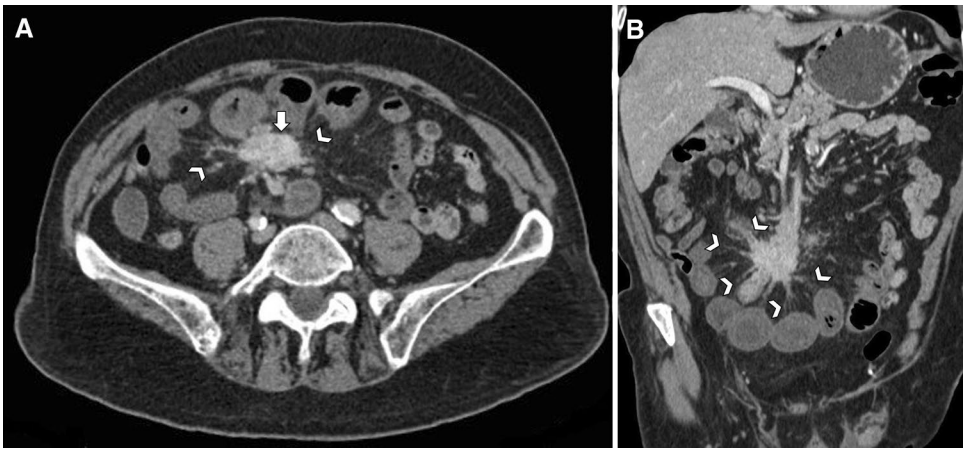

Fig. 2 Carcinoid tumor metastasis in the mesentery in an 85-year-old man. **a** Axial contrast-enhanced CT image shows a spiculated mesenteric mass (arrow), surrounded by radiating soft-tissue strands in the mesentery (arrowheads), producing the characteristic spoke wheel appearance. **b** The spoke wheel sign is better visualized on coronal reformatted contrast-enhanced CT image (arrowheads)

The mesenteric retraction is thought to be due to the effects of serotonin and other vasoactive peptides produced by the tumor [4].

Differential diagnosis for the spoke wheel imaging appearance of the mesentery includes sclerosing mesenteritis and peritoneal carcinomatosis [1].

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Compliance with ethical standards

Disclosure of potential 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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