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# A rare manifestation of clinical T1 renal tumor with parasitic arterial supply from the superior mesenteric artery

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## ABSTRACT

A 50-year-old man with von Hippel-Lindau syndrome who had undergone repeated tumor enucleation and transcatheter arterial embolization for multiple renal cell carcinomas (RCC) was referred to our hospital for percutaneous cryoablation (PCA) of an RCC of 42 mm in the midpole region of the right kidney. Transcatheter arterial embolization was planned prior to devascularize the RCC and selective angiography revealed parasitic arterial supply to the tumor by the ileocecal artery. Parasitic arterial supply to RCCs, particularly in patients with history of nephron-sparing treatment, can originate even from an intraperitoneal source and may lead to unexpected embolization.

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## Introduction

Recently, transcatheter arterial embolization (TAE) for renal cell carcinomas (RCC) prior to percutaneous cryoablation (PCA) was reported as an effective procedure to reduce perioperative complications such as hemorrhage [1,2]. The renal or the capsular artery usually supplies RCCs, but parasitic supply from other arteries is also known. We report a rare manifestation of RCC supplied by the ileocecal artery.

## Case report

A 50-year-old man with known von Hippel-Lindau syndrome, who had undergone tumor enucleation 7 times and TAE twice for multiple RCCs, was referred to our hospital for PCA for RCC. Preoperative contrast-enhanced computed tomography (CECT) demonstrated an RCC of 42 mm diameter in the midpole region of the right kidney (Fig. 1). TAE was planned prior to PCA to devascularize the RCC.

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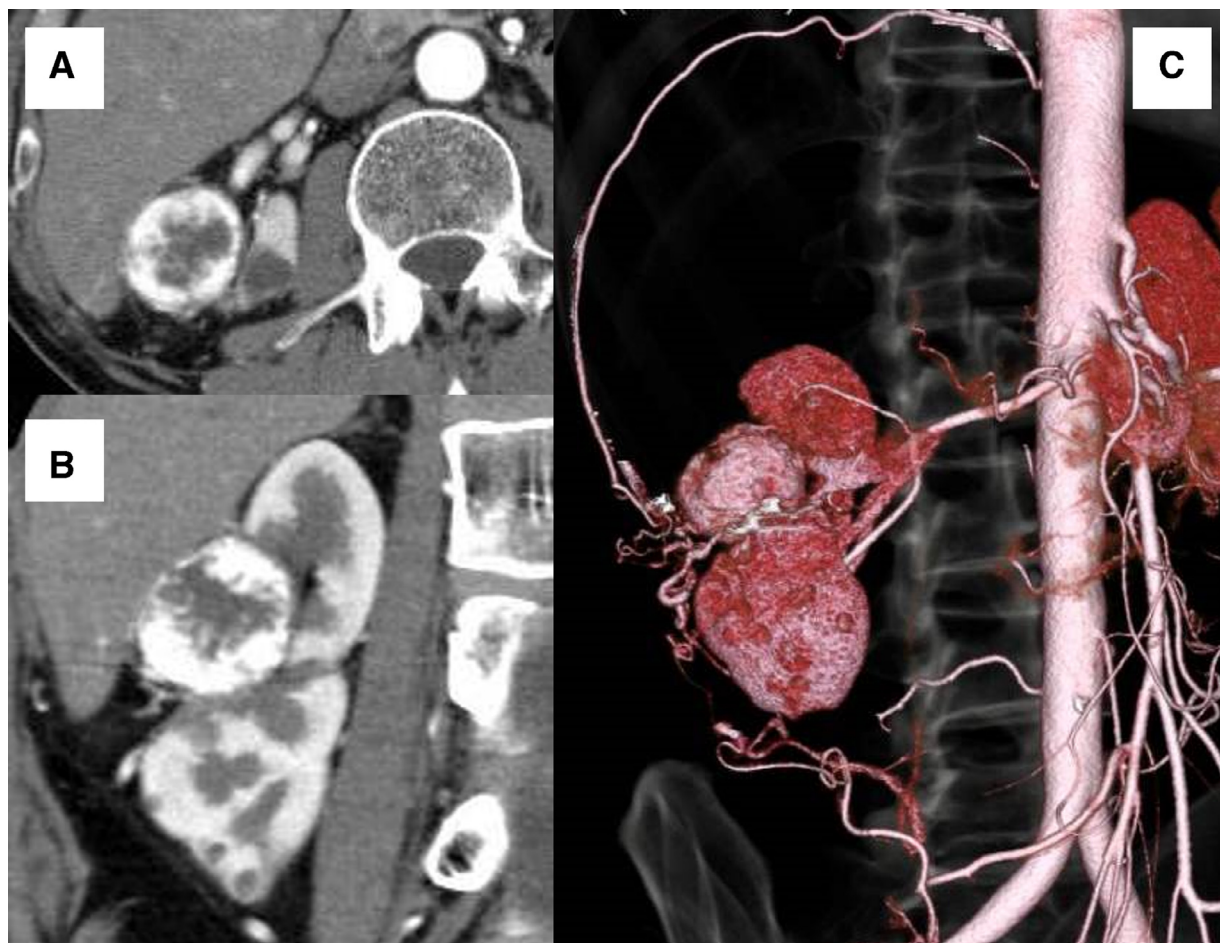
A 5-French (Fr) 25-cm sheath introducer was inserted from the right femoral artery under local anesthesia. Right renal angiography revealed tumor stain of only a part of the RCC. Preoperative CECT suggested some branches of the superior mesenteric artery (SMA) and the intercostal artery as feeding arteries of the RCC, and selective angiography defined the 11th right intercostal artery and the ileocecal artery as the feeding arteries. A 2.1-Fr microcatheter was advanced as distal as possible from the renal artery and the 11th intercostal artery, and embolization using a mixture of iodized oil (Lipiodol, Andre Guerbet, Aulnay-sous-Bois, France) and absolute ethanol (Fuso Pharmaceutical Industries, Ltd., Osaka, Japan) was performed carefully to avoid embolization of nontarget lesion via collateral circulation. The parasitic arterial supply from the ileocecal artery was not embolized considering nontarget embolization caused by reflux of the embolic material. PCA on the day following TAE was performed successfully without hemorrhagic complication.

## Discussion

Renal arteries after they perforate the renal sinus are known as “end-arteries,” which have no collateral connections to

neighboring segments [3]. However, many potential routes of renal collateral circulation are known and additional arterial supply to RCCs from extrarenal sources is called parasitic circulation. Retroperitoneal vessels, such as the lumbar, intercostal, inferior phrenic, adrenal, ureteric, and gonadal arteries, are frequent sources of parasitic circulation [4]. Abrams et al reported 3 major systems of collateral renal flow—the capsular, peripelvic, and periureteric systems—and they concluded that the third lumbar artery is the most common source of anastomotic flow to the kidney [5].

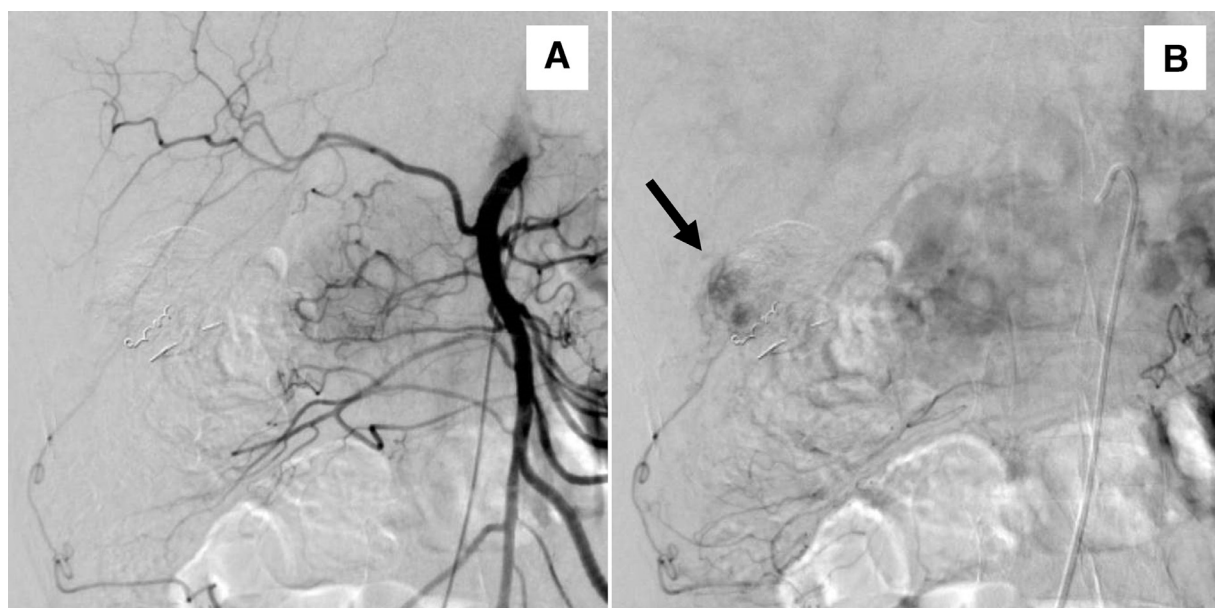
On the other hand, parasitic arterial supply from mesenteric arteries is ultimately rare. Sondag et al reported that a 15-cm RCC in the lower pole of the right kidney that invaded the mesentery near the ascending colon was supplied by the ileocecal artery. They also reported 2 cases of hypernephroma of 9-cm diameter supplied by the inferior mesenteric artery (IMA) [6]. Buist concluded that large RCCs that arose from the lower pole region of the left kidney had additional arterial supply to the lower portion of the tumor from branches of an enlarged IMA [4]. It would be interesting that our case was relatively small and located in midpole of the kidney in contrast to previous reports. As far as we know, this is the first case report demonstrating the clinical T1 renal tumor with parasitic arterial supply from the SMA. Although not so huge



**Fig. 1** – Preoperative contrast-enhanced computed tomography (CECT) revealed renal cell carcinoma (RCC) of 42-mm diameter in the midpole of the right kidney. (A) Axial image. (B) Coronal image. (C) Three-dimensional volume rendered CT (3DCT-VR) demonstrated an enlarged intercostal artery and ileocecal artery toward the RCC.



**Fig. 2 – A)** Right renal angiography revealed that the right renal artery supplied only a part of the RCC. Coils placed at previous hospital were also seen. **(B)** The 11th right intercostal artery supplied the RCC.



**Fig. 3 – The ileocecal artery meandered and extended toward the right RCC. The inferior and lateral part of the RCC was supplied by the ileocecal artery (arrow).**

renal tumors as our case, past history of nephron-sparing treatment such as enucleation, radiofrequency ablation, PCA, and TAE may develop parasitic arterial supply even from the intraperitoneal source such as ileocecal artery.

Cox et al reported 2 cases of colonic infarction, a rare complication, after TAE for RCC (one in the left kidney and one in the right) using absolute ethanol and concluded that reflux of embolic material into the abdominal aorta caused nontarget

embolization [7]. Sheth et al demonstrated renoduodenal fistula after TAE of renal angiomyolipoma and hypothesized that inflammatory changes that arose in response to the ischemia induced by embolization resulted in erosion into the duodenal lumen [8]. However, we believe unexpected embolization via collateral arteries, such as the SMA, in a retrograde manner may account for infarction of adjacent organs, particularly in patients with very large tumors. Recognition of potential

routes of collateral circulation to the kidneys, careful assessment of preoperative images and selective angiography, and avoidance of indentation of embolic materials may help prevent such complications.

In conclusion, in patients with history of multiple nephron-sparing treatments, unusual arteries may develop even from the intraperitoneal space such as branches of the SMA, to feed RCCs, and accurate assessment of selective angiography is mandatory.

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### Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:[10.1016/j.radcr.2018.07.003](https://doi.org/10.1016/j.radcr.2018.07.003).

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