Radiology Case Reports 15 (2020) 580–585

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/radcr

Case Report

# Bowel injury complicating percutaneous cryoablation of large renal cell carcinoma

*Masaya Miyazaki, MD*[a,b,*], *Yuki Komatsu, MD*[b], *Terutaka Yoshihara, MD*[b], *Shintaro Kimura, MD*[b]

[a] *Department of Applied Medical Imaging, Gunma University Graduate School of Medicine, Maebashi, Gunma, Japan*
[b] *Department of Diagnostic and Interventional Radiology, Gunma University Hospital, Maebashi, Gunma, Japan*

ARTICLE INFO

*Article history:*
Received 21 January 2020
Revised 18 February 2020
Accepted 20 February 2020

*Keywords:*
Cryoablation
Renal cell carcinoma
Bowel injury
CT guided

ABSTRACT

We report the case of a bowel injury, which occurred after the percutaneous cryoablation (PCA) of large renal cell carcinoma (RCC). A 50-year-old man with RCC measuring 47 mm in diameter. First, we performed transarterial embolization for the tumor, followed by PCA with hydrodissection, which displaced the small intestine from the iceball. The procedure was completed without any complication on the procedural day; however, the patient complained of appetite loss and abdominal pain 2 days after PCA. Computed tomography revealed a bowel injury at the small intestine adjacent to the tumor. After 7 days, ileus tube insertion, and fasting, the patient recovered from the bowel injury and was discharged 10 days after PCA. He underwent a second PCA because of a small recurrent renal tumor 5 months after the first PCA without complications. This case indicated that a bowel injury after PCA for RCC could be treated conservatively.



## Introduction

Ablation procedures, including percutaneous cryoablation (PCA), radiofrequency, and microwave ablation, for renal cell carcinoma (RCC) are increasing worldwide because patients with RCC occasionally have comorbidities, thereby, excluding them as candidates for surgical resection [1–3]. PCA is a promising treatment for RCC with a relatively low complication rate. The most common complications of PCA for RCC are bleeding and hematuria, and the relatively rare complication is bowel injury, although it could be fatal [4–10]. Herein, we present a case of acute bowel injury after PCA for RCC that was treated conservatively.

## Case

A 50-year-old man was referred to our department for cryoablation of a right RCC. He had undergone right hemicolectomy 15 years previously because of an ascending colon cancer and had received percutaneous cardiac intervention 7 years before due to angina. He was also treated with an

* Corresponding author.
E-mail addresses: mmiyazak@gunma-u.ac.jp (M. Miyazaki), yukikasahara0219@gmail.com (Y. Komatsu), t.t.yoshihara44@gmail.com (T. Yoshihara), n401028b@gmail.com (S. Kimura).
https://doi.org/10.1016/j.radcr.2020.02.015

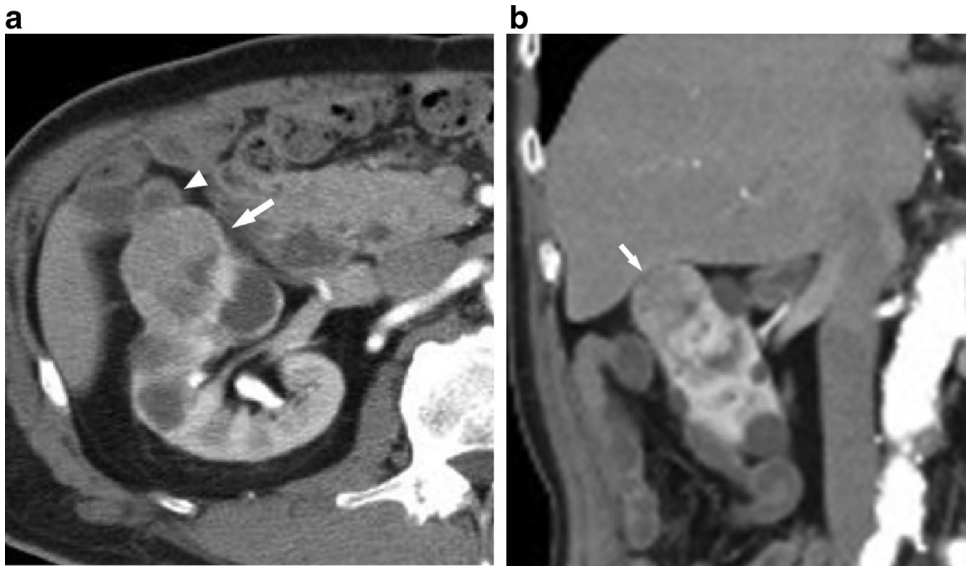


**Fig. 1 – Contrast-enhanced CT demonstrated the exophytic renal tumor (arrow) of 47-mm diameter adjacent to the small intestine (arrow head). (A) Axial image of arterial phase. (B) Coronal image of arterial phase.**

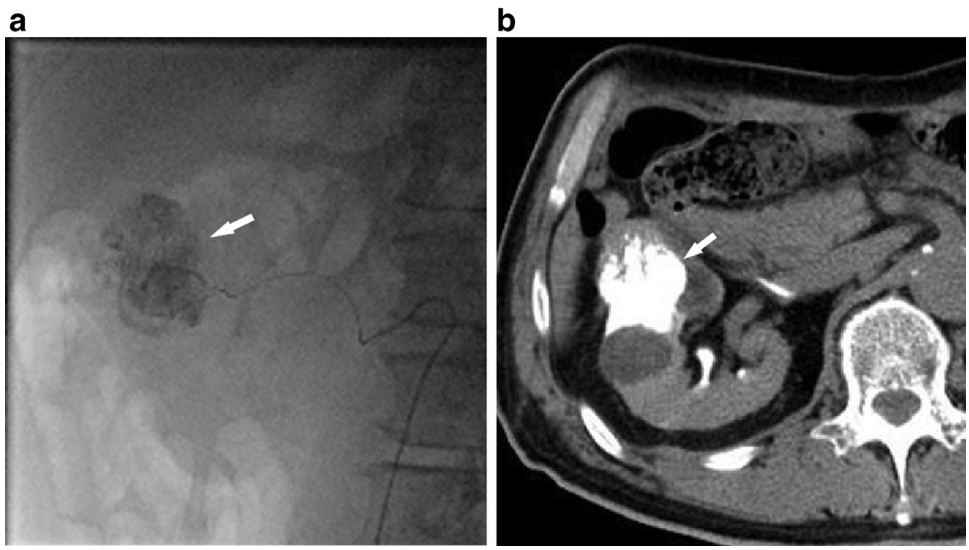


**Fig. 2 – TAE before cryoablation. (A) TAE using ethiodized oil and gelatin sponge particles was performed under the Seldinger technique (arrow). (B) The ethioidized oil deposition (arrow) into the tumor was observed on plain CT after TAE.**

intra-arterial cisplatin infusion with concomitant radiotherapy for tongue cancer in the past year. Based on these comorbidities, urologists and interventional radiologists decided to treat the renal tumor with computed tomography (CT)-guided PCA. Contrast-enhanced CT demonstrated the exophytic renal tumor of 47-mm diameter adjacent to the small intestine (Fig. 1). The procedures were performed after obtaining written informed consent from the patient. First, transarterial embolization (TAE) using ethiodized oil (lipiodol; Guerbet, Villepinte, France) and gelatin sponge particles was performed under the Seldinger technique before cryoablation (Fig. 2) because the renal tumor was large. The cryoablation was performed 2 days after TAE. After skin preparation and local anesthesia, four 17-gauge cryoneedles (IceRod; Galil Medical, Yokneam, Israel) were inserted into the renal tumor under intermittent CT-fluoroscopy guidance (SOMATOM Sensation Open; Siemens Healthcare, Erlangen, Germany). To avoid pneumothorax, a 19-gauge needle was inserted into the pleural space, and a dozen milliliters of air were injected to the pleural space to obtain artificial pneumothorax. In addition, to avoid bowel injury, a 19-gauge coaxial needle was placed between the renal tumor and the small intestine, and a diluted (5%) iodine contrast medium (Iohexol; 300 mgI/mL; Daiichi-Sankyo, Tokyo, Japan) was injected for displacing the small intestine away from the renal tumor (hydrodissection technique). After our judgment of bowel displacement on CT,

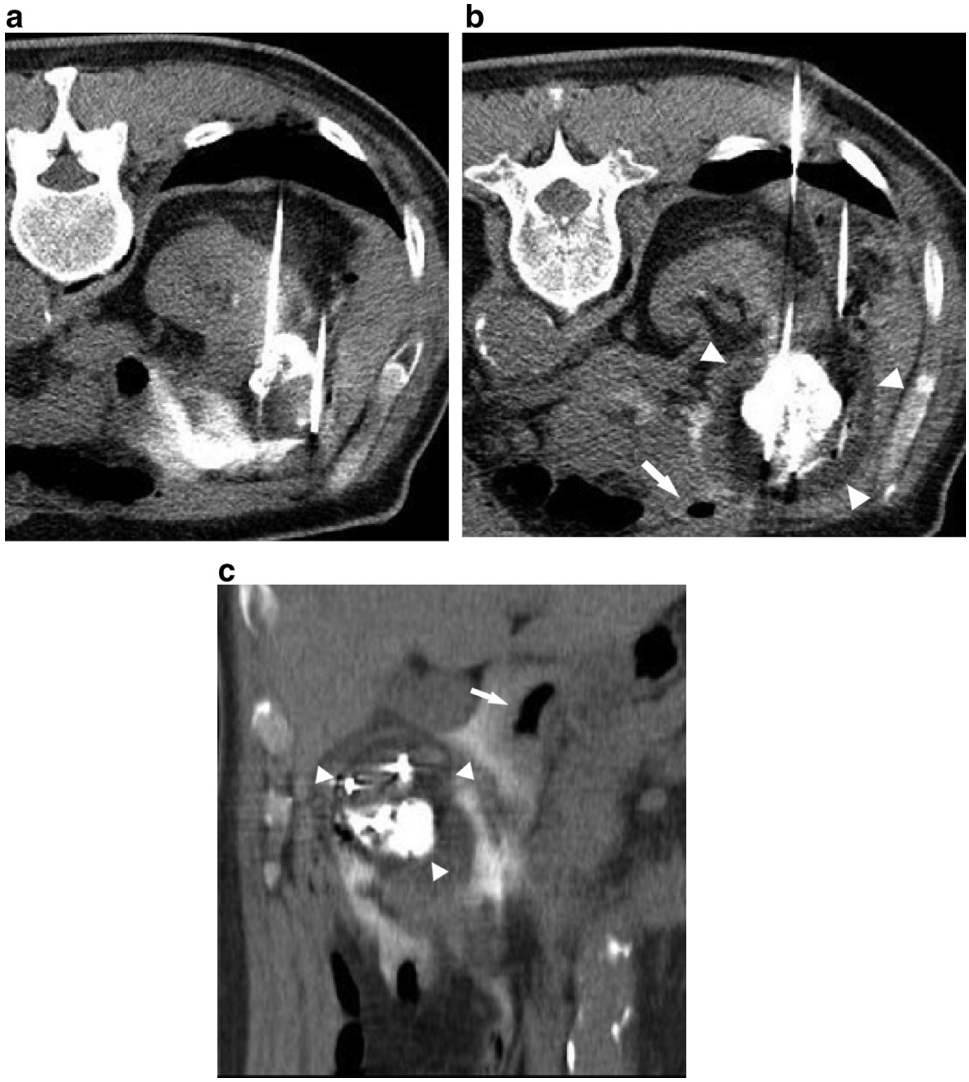


**Fig. 3 – Percutaneous cryoablation under CT-fluoroscopy guidance. (A) Seventeen-gauge cryoneedles were inserted into the renal tumor under intermittent CT-fluoroscopy guidance, and cryoablation was performed. (B, C) To avoid bowel injury, a 5% diluted iodine contrast medium was injected for displacing the small intestine (arrow) away from the iceball, which had been detected as low-attenuation on axial and coronal image of CT (arrow head). We could not detect iceball extension to the small intestine (arrow) on CT.**

2 freeze–thaw cycles were performed as a 10-min freeze followed by a 5-min passive thaw for each cycle using an argon-helium–based cryoablation delivery system (CryoHit; Galil Medical). During cryoablation, intermittent monitoring was performed using CT-fluoroscopy, and a conventional CT scan was performed immediately after each freezing cycle. On each CT image, we could not detect iceball (usually detected as low-attenuation on CT) extension to the small intestine. The cryoablation procedure was finished without complications on the procedural day (Fig. 3).

Two days after the procedure, the patient complained of loss of appetite and tenderness of the right upper abdomen but showed no signs of peritoneal irritation. Contrast-enhanced CT revealed edematous thickening of the small intestinal wall with poor contrast enhancement and small air densities around the small intestine (Fig. 4). The surgeon decided on a conservative treatment for the patient because he showed no signs of peritoneal irritation. The ileus tube was inserted to the small intestine (Fig. 5) because small bowel obstruction was found on CT. After 7 days from the ileus tube insertion and fasting, the bowel wall thickness and obstruction improved, and the patient could resume a diet. Ten days after cryoablation, the patient was discharged. Within 2 months after cryoablation, an air density was observed in the renal tumor on CT, which indicated the presence of a tumor-bowel fistula (Fig. 6). However, 3 months after cryoablation, the air density in the tumor had disappeared; the renal tumor had shrunk; the bowel wall was enhanced again. Therefore, we concluded that the tumor-bowel fistula had improved. However, the small enhanced nodule was observed in the ablated area on contrast-enhanced CT, which indicated a recurrent or residual tumor (Fig. 7).

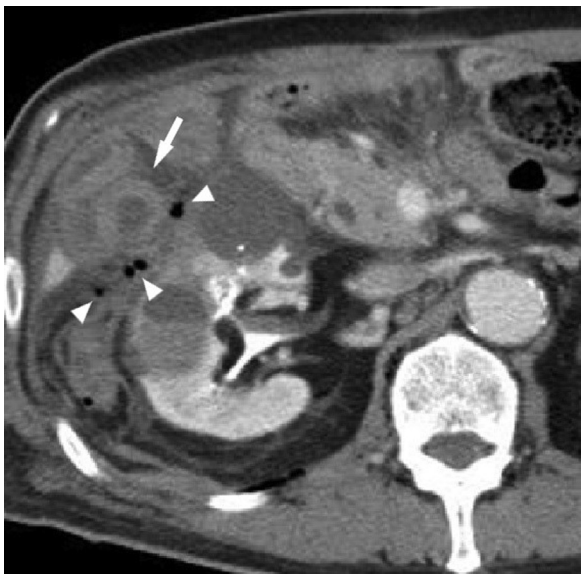

**Fig. 4 – Contrast-enhanced CT 2 days after cryoablation revealed edematous thickening of the small intestinal wall with poor contrast enhancement (arrow) and small air densities (arrow head) around the small intestine.**

**Fig. 5 – The ileus tube was inserted to the small intestine.**

Five months after the first cryoablation, the second cryoablation was performed with prior TAE using Lipiodol under the Seldinger technique. The second cryoablation was performed using 1 cryoneedle (IceSeed, Galil Medical) carefully inserted to the recurrent tumor 1.5 cm from the bowel wall to avoid bowel freezing. Total 13-min freezing in three cycles was performed without any procedural complication (Fig. 8).

The tumor had completely disappeared along with complications from bowel injury 1 year after the second cryoablation (Fig. 9), and no local tumor recurrence has been observed for 3.5 years.

**Fig. 6 – Within 2 months after cryoablation, an air density (arrow) was observed in the renal tumor on CT, which indicated the presence of a tumor-bowel fistula.**

**Fig. 7 – Three months after cryoablation, the air density in the tumor had disappeared, the renal tumor had shrunk, and the bowel wall had enhanced again. However, the small enhanced nodule (arrow) was observed in the ablated area on contrast-enhanced CT, which indicated a recurrent or residual tumor.**

## Discussion

Bowel injury after PCA for RCC has been reported in literature [4–10] with the rate of bowel injury after renal PCA reported as 0% to 5%. Most patients are treated conservatively. However, Gobara et al [7] reported a case of acute bowel injury due to renal PCA treated with surgical resection. According to the

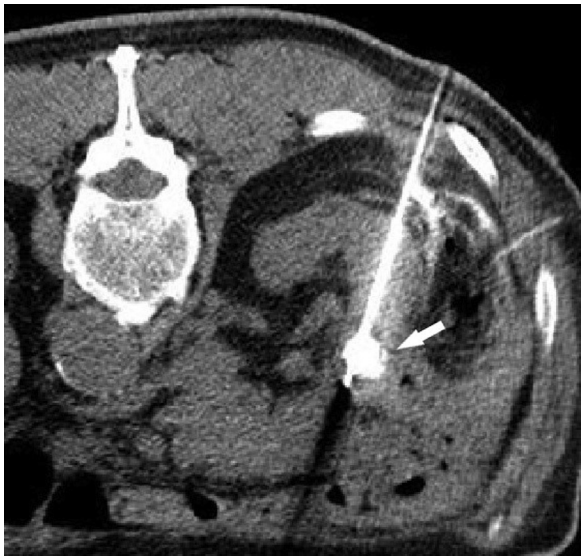

**Fig. 8 – Five months after the first cryoablation, the second cryoablation was performed with prior TAE using Lipiodol under the Seldinger technique. One cryoneedle carefully inserted to the recurrent tumor 1.5 cm far from the bowel wall to avoid bowel freezing (arrow).**

**Fig. 9 – The tumor had completely disappeared (arrow), and no complications of bowel injury were observed one year after the second cryoablation.**

case report, necrosis and hemorrhage were seen in all layers of the colon in the pathological examination for the resected colon, which had been frozen in the PCA procedure. However, Gobara et al described that the emergency surgery might be an overtreatment and that it may be because most previous cases were treated conservatively in past studies. Shimizu et al and Morgan et al reported cases of bowel injury after renal PCA [5,8], and their cases were treated conservatively because the patients did not complain of any symptoms. In our case, the patient complained of some symptoms but showed no signs of peritoneal irritation; therefore, we provided conservative treatment without surgical intervention.

To avoid bowel injury after renal PCA, the hydrodissection technique is important, particularly for the anterior located RCCs. Schmit et al [11] evaluated 38 anteriorly located RCCs treated with PCA, and based on their evaluation, changing the patient position and hydrodissection technique helped avoid bowel injury. Hydrodissection was required in 68% of cases of anteriorly located RCCs treated with PCA despite optimized patient positioning in their study. In our case, despite optimized patient positioning and adequate hydrodissection before freezing, acute bowel injury occurred. We speculated that the large tumor size (47 mm) and the patient condition after right hemicolectomy were risk factors for acute bowel injury. The renal tumor and small intestine were directly adjacent in our case because the tumor was relatively large, and the ascending colon had been resected because of colon cancer. Pericolonic fat usually exists between a renal tumor and a colon, and fat is a good thermal insulator in thermal ablation therapy. In our case, there was no fat deposition between the renal tumor and the small intestine because the colon had been resected along with pericolonic fat. In addition, the renal tumor might have adhered to the small intestine because of the right hemicolectomy. Therefore, the iceball easily reached the small intestine despite optimized patient positioning and adequate hydrodissection.

## REFERENCES

[1] Zhou W, Arellano RS. Thermal ablation of T1c renal cell carcinoma: a comparative assessment of technical performance, procedural outcome, and safety of microwave ablation, radiofrequency ablation, and cryoablation. J Vasc Interventional Radiol 2018;29(7):943–51.
[2] Atwell TD, Schmit GD, Boorjian SA, Mandrekar J, Kurup AN, Weisbrod AJ, et al. Percutaneous ablation of renal masses measuring 3.0 cm and smaller: comparative local control and complications after radiofrequency ablation and cryoablation. Am J Roentgenol 2013;200(2):461–6.
[3] Uppot RN, Silverman SG, Zagoria RJ, Tuncali K, Childs DD, Gervais DA. Imaging-guided percutaneous ablation of renal cell carcinoma: a primer of how we do it. Am J Roentgenol 2009;192(6):1558–70.
[4] Mozo M, Gonzalo R, Gutierrez JM, Gutierrez LE, Cotruta L, Roca A, et al. Colorenal fistula after renal tumour cryotherapy. Int J Surg Case Rep 2018;53:441–3.
[5] Shimizu K, Mogami T, Michimoto K, Kameoka Y, Tokashiki T, Kurata N, et al. Digestive tract complications of renal cryoablation. Cardiovasc Interventional Radiol 2016;39(1):122–6.
[6] Schmit GD, Thompson RH, Buttar NS. Colorenal fistula repair using a combined percutaneous CT-guided and endoscopic approach. J Vasc Interventional Radiol 2016;27(6):896–7.
[7] Gobara H, Hiraki T, Iguchi T, Fujiwara H, Nagasaka T, Kishimoto H, et al. Acute bowel injury due to cryoablation for renal cell carcinoma: correlated radiologic and pathologic findings. Acta Med Okayama 2016;70(6):511–14.
[8] Morgan AI, Doble A, Davies RJ. Successful conservative management of a colorenal fistula complicating

percutaneous cryoablation of renal tumors: a case report. J Med Case Rep 2012;6:365.
[9] Wysocki JD, Joshi V, Eiser JW, Gil N. Colo-renal fistula: an unusual cause of hematochezia. World J Gastrointest Pathophysiol 2010;1(3):106–8.
[10] Vanderbrink BA, Rastinehad A, Caplin D, Ost MC, Lobko I, Lee BR. Successful conservative management of colorenal fistula after percutaneous cryoablation of renal-cell carcinoma. J Endourol 2007;21(7):726–9.
[11] Schmit GD, Atwell TD, Leibovich BC, Callstrom MR, Kurup AN, Woodrum DA, et al. Percutaneous cryoablation of anterior renal masses: technique, efficacy, and safety. Am J Roentgenol 2010;195(6):1418–22.