

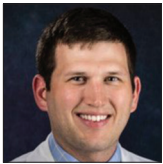


Interventional Oncology Case Report

Persistent chyluria following renal cryoablation: A case report

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ABSTRACT

Chyluria is a rare complication following renal intervention including partial nephrectomy and percutaneous ablation. To date, there are no reported cases of chyluria following renal cryoablation. An 82-year-old female patient at our institution underwent CT-guided percutaneous cryoablation for a renal cell carcinoma and presented with macroscopic fat in the urine 5 months after cryoablation. Presenting symptoms were polyuria, dysuria, and cloudy white urine. CT showed a fat-urine level in the ureter and bladder most consistent with chyluria. The patient experienced several episodes of presumptive lower urinary tract infection following diagnosis for which she was treated medically. Follow-up CT imaging 5 months post-diagnosis revealed persistent fat-fluid level in the collecting system and bladder. Operators performing renal cryoablation should be aware of the clinical and imaging manifestations of this complication.

Keywords: Case report, Chyluria, Cryoablation, Fat, Renal

INTRODUCTION

Chyluria is a condition characterized by milky white urine due to the leakage of lymph into the urinary collecting system. Chyluria has been well documented to occur in filariasis, a parasitic infection endemic to countries with tropical climates, secondary to infection, and obstruction of the bladder lymphatics.^[1] In Western countries, however, chyluria is typically non-parasitic in nature, rare, and occurs most commonly secondary to retroperitoneal tumors and abscesses.^[2] Post-surgical cases of chyluria have been reported as sequelae of urological procedures such as partial nephrectomy as well as radiofrequency (RF) ablation for renal tumors.^[3,4] These cases are rare and are thought to occur due to the formation of a fistulous connection between the lymphatics and the collecting system of the kidney.^[1] A study by Dalela *et al.* found that triglycerides are found in the urine in 100% of chyluria samples, and triglyceride levels >15 mg/dl were indicative of chyluria.^[5] Other tests have been described to determine the presence of chyle in the urine including adding ether to a urine sample and then centrifuging the sample to confirm the presence of fat globules and to exclude phosphaturia. Additional staining with Sudan III can help confirm the diagnosis of chyluria.^[5,6] We present a case of chyluria following renal cryoablation.

CASE REPORT

An 82-year-old female presented for the evaluation of a right-sided lower pole renal mass discovered incidentally years prior during workup for back pain. This was initially followed by routine

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surveillance imaging, which demonstrated >5 mm growth over the course of 1 year and prompted the patient to seek treatment. MRI revealed a 3.7 × 2.7 × 2.7 cm (T1a) solid renal neoplasm in the inferior pole of the right kidney [Figure 1]. She elected to undergo cryoablation and biopsy of the lesion.

The procedure was performed under general endotracheal anesthesia in the prone position. CT guidance was utilized to place three Ice Force cryoablation probes (Boston Scientific Corporation, Marlborough, MA, USA). Two 20-gauge core biopsy samples were obtained through an 18 Ga Hawkins needle (Argon Medical Devices, Inc., Frisco, TX, USA). Next, two freeze/thaw cycles were performed with intermittent CT imaging to verify adequate coverage of the lesion with the ice ball [Figure 2]. Each freeze cycle duration was 10 min followed by an 8 min thaw cycle. CT imaging was performed at the end of each freeze cycle. Immediate post-procedural CT scan showed no evidence of perinephric hematoma. Final pathology revealed T1a clear cell renal cell carcinoma.

The patient was observed in the hospital overnight, and she presented the following morning complaining of the right flank pain, and her serum creatinine was elevated from baseline. This prompted non-contrast CT evaluation, which revealed clot within the right mid-ureter with associated right-sided hydronephrosis. The patient subsequently underwent cystourethroscopy with the right retrograde pyelography and right ureteral stent placement. Her ureteral stent was removed 1 month later with no complications; at this visit, the patient complained of mild intermittent right flank pain but no urinary symptoms. She had continued outpatient follow-up telemedicine appointments 2- and 3-month post-cryoablation, where she noted resolution of flank pain and no urinary symptoms.

Five months post-cryoablation, the patient presented to the ED with the complaints of constipation and blood per rectum for 3 days. She also had concern for a UTI with symptoms of polyuria, dysuria, and cloudy white urine for 1 week's duration. CT abdomen/pelvis revealed a fat-fluid level in the ureter and the bladder [Figure 3]. The patient subsequently underwent cystoscopy with the right retrograde pyelography which revealed a yellow fat globule in the non-dependent portion of the bladder as well as fat globules effluxing from the right ureteral orifice. The patient has experienced two episodes of cloudy urine with dysuria and urgency during 6 months of post-diagnosis monitoring that resolved with antibiotic treatment, and most recent CT performed 5 months post-diagnosis revealed persistent fat-fluid levels in the collecting system and bladder.

DISCUSSION

Cryoablation has become a well-established treatment for small, solitary renal neoplasms and can be employed as a

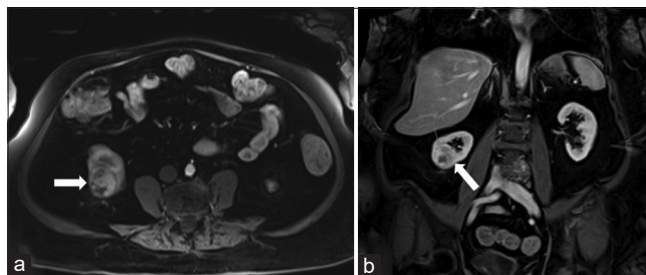


Figure 1: An 82-year-old female who presented for routine surveillance imaging of a renal mass. Post-contrast axial (a) and coronal (b) T1 MRI imaging of the lower pole of the right kidney shows 3.7 cm enhancing solid renal neoplasm (arrows).

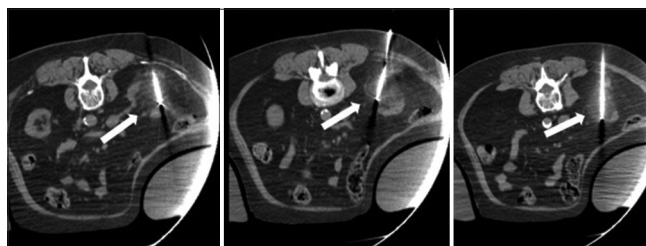


Figure 2: An 82-year-old female who presented for cryoablation of a T1a clear cell adenocarcinoma of the right kidney. Axial CT images during cryoablation demonstrating 3 Ice Force cryoablation needles in the lesion with good ice coverage around the lesion (arrows).



Figure 3: An 82-year-old female who presented with dysuria, frequency, and cloudy white urine 5 months post-cryoablation. Axial CT images showing fat-fluid levels (arrows) in the proximal ureter (a) and bladder (b).

nephron-sparing strategy.^[7] Complication rates are low, and known complications include hemorrhage, injury to the ureter or central collecting system, nerve injury, and infection.^[8] To the best of our knowledge, there are no reports of chyluria after renal cryoablation. Chyluria has been reported after both partial nephrectomy and RF ablation, thought to occur due to the creation of a fistulous connection between the lymphatic vessels in the kidney and the collecting system. A retrospective review of 125 patients with renal tumors by Miller *et al.* reported four asymptomatic patients who developed chyluria after partial nephrectomy.^[3] The incidence of chyluria is more common after RF ablation. A retrospective review of 62 consecutive patients with renal tumors who underwent RF ablation found that of the 41 patients with at

least three CT scans after treatment, 17 (41%) were found to have chyluria evidenced by fat-fluid levels in the bladder on at least one post-treatment CT scan.^[4] All cases of suspected chyluria were diagnosed on imaging review. The mean time to detection of chyluria was 44.5 weeks (range 3–84 weeks) in this series, and review of these 17 patients found no significant effect of maximum ablation defect diameter for predicting occurrence of chyluria.^[4]

Although a lack of data exist for chyluria in post-operative renal cryoablation patients, the cause of the present patient's fat in urine could be related to damage of the lymphatic drainage system within the kidney occurring during needle insertion, biopsy, or during the cryoablation. Over time, this may have allowed for the formation of a fistulous communication between the renal lymphatics and collecting system. The natural physiology of the renal lymphatic system may provide insight into the development of chyluria. The kidney has a dual lymphatic drainage system of the cortex and renal capsule that serve as a protective mechanism against lymphatic obstruction; however, both pathways ultimately drain into hilar lymphatics.^[9] Thus, cryoablation of renal tumors within close proximity to the renal calyces or hilum may increase the likelihood of lymphatic fistulization. Cryoablation has the advantage of preserving the extracellular collagen tissue matrix along the periphery of the treatment boundary when compared to thermal ablative techniques and, thus, contributes a theoretically lower risk of causing non-target injury to the renal collecting system and renal lymphatic system.^[10] Nevertheless, this remains the most likely mechanism by which the patient developed chyluria, as evidenced by CT imaging performed at the time of symptomatic presentation showing fat attenuation within the collecting system extending from the ablated tumor, throughout the ureter, and layering within the bladder.

An additional consideration would include liquefaction of the renal sinus fat over time with eventual drainage of the liquefied fat into the ureter and bladder. However, no urinoma was found near the ablation site on any of the patient's post-cryoablation imaging, a finding that is likely to occur if there was a fistulous connection between liquefied renal sinus fat and the renal collecting system. In addition, the timeline of the patient's presentation occurred 5 months postoperatively, which is consistent with earlier published series of chyluria following RF ablation.^[4] Furthermore, persistence of fat in the urine over the 6-month post-diagnosis follow-up interval calls into question the likelihood of continuous renal sinus fat liquefaction and efflux into the collecting system.

The management of chyluria depends on the underlying cause and the severity of symptoms, which can range from asymptomatic with occasional episodes of cloudy white urine to malnutrition secondary to massive proteinuria. Other possible symptoms include urinary urgency, dysuria, urinary

retention, hematuria, and peripheral edema.^[6,11] Conservative management through high-protein and low-fat diets with high fluid intake is indicated in asymptomatic or mildly symptomatic cases and has been shown to have a greater than 70% rate of successful clinical management.^[6] When conservative measures fail, sclerotherapy with 1% silver nitrate is a minimally invasive technique that has been shown to provide immediate and lasting symptom improvement.^[6] More recently, pre-procedural lymphangiography to identify the size and number of fistulas followed by interstitial lymphatic embolization has emerged as an effective procedure performed by interventional radiologists for patients with severely symptomatic chyluria or chyluria refractory to conservative or minimally invasive treatment.^[12-14] More invasive surgical options include chylolymphatic disconnection with lymphovenous anastomoses or nephrectomy.^[6]

Throughout 6 months of post-diagnosis clinical monitoring, the patient has been managed conservatively with dietary modifications. She has experienced intermittent UTI episodes that have resolved with antibiotic treatment. This may represent a clinical association of chyluria persistence, as most recent CT imaging 5 months post-diagnosis showed unchanged fat-fluid levels in the collecting system and bladder.

CONCLUSION

The incidence of post-operative chyluria may continue to rise as a greater number of patients undergo ablation of small, solid renal neoplasms. While many cases can be asymptomatic and resolve spontaneously, it is important to consider chyluria as a possible complication of renal cryoablation. This imaging finding should prompt post-prandial testing for urine triglyceride levels or urine chylomicrons. Patients like ours who initially present symptomatically and appear to achieve spontaneous resolution should be monitored for recurrent UTI symptoms, as they may be a sign of chyluria persistence.

Declaration of patient consent

Patient's consent not required as patients identity is not disclosed or compromised.

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Conflicts of interest

There are no conflicts of interest.

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