**CLINICAL VIGNETTE**

# Multiple Complications of Cryoablation in the Same Patient

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A 77-year-old man with type 2 diabetes and prostate cancer was noted to have a right renal mass on computer tomography (CT) scan to evaluate a suspicious iliac lymph node for metastasis (Figure 1). Follow-up magnetic resonance imaging (MRI) revealed a 4 cm enhancing mass in the right kidney and a 1 cm enhancing mass on the left kidney concerning for renal cell carcinoma. Urology recommended referral to interventional radiologist (IR) for percutaneous ablation of the right renal mass with monitoring of the left. A 4-probe right renal mass cryoablation with biopsy (Figure 2) was performed by IR who recommended ciprofloxacin for post-procedure infection prophylaxis. After the procedure, the patient was noted to be hypertensive with pink-tinged urine with a small blood clot. He was given hydralazine and admitted to monitor for bleeding and the need for continuous bladder irrigation if significant clots formed. Overnight, his hematuria resolved. However, the next morning the patient complained of weakness and right lower quadrant pain. He remained hemodynamically stable but was tender to palpation in the right lower quadrant and his hemoglobin had dropped from 9.7 g/dL to 8.0 g/dL. Abdominal CT showed a retroperitoneal hematoma was present (Figure 3). The next morning, the patient was febrile to 101 °F with associated chills and nausea. His white blood cell count was normal, and hemoglobin was stable. Chest radiograph was negative for consolidation and blood and urine cultures were collected. The working diagnosis was post ablation syndrome (PAS), and he was kept in hospital for further observation. Overnight the patient was again febrile to 101.6 °F. Antibiotics were broadened pending culture results. The patient felt well, denied pain, and was tolerating his diet. The next day the patient was afebrile, felt well, and blood and urine cultures remained negative. He was discharged to finish his course of prophylactic ciprofloxacin. The pathology report later returned confirming papillary renal cell carcinoma (RCC).

***Discussion***

Percutaneous image-guided thermal ablation is an effective, nephron-sparing, minimally invasive treatment option for stage T1 RCC. Cryoablation utilizes rapid cooling of straight metallic probes, inserted into the target lesion to cause cell necrosis by direct cellular injury and indirectly through changes in the cellular microenvironment. The procedure can be performed laparoscopically or percutaneously under imaging guidance.

Fourteen percent of procedures are associated with bleeding (hematuria, retroperitoneal hematoma, or abdominal wall hematoma). The amount of bleeding is usually minimal and does not require intervention. Despite this, many centers advocate overnight admission for observation. While not evidence-based, post-procedural antibacterial prophylaxis is often prescribed. Our patient was admitted to monitor post procedure hematuria, and he was subsequently noted to have a retroperitoneal hematoma and PAS.

Cryoablation is frequently complicated by PAS. Caused by cytokine release, PAS consists of fever, flu-like symptoms, nausea and vomiting. Most symptoms attributable to PAS are early-onset and self-limited, rarely exceeding one-week duration. PAS following cryoablation of renal tumors is common, but less frequent than after radiofrequency ablation.[1] However, it often goes unrecognized and patients may undergo extensive, unnecessary clinical investigation. Fever in the hospitalized patient has a broad differential (Table 1). It is important to recognize that late onset, more than 2 days post-procedure or persistent fever may indicate presence of infection and should not be ignored.[2]

In addition to PAS and bleeding, cryoablation may cause other complications, including ureteral stricture, urinoma, urinary tract infection, and injury to adjacent organs such as nerves, bowel, pleura (causing pneumothorax), and adrenal glands. Larger renal tumors are at higher risk of complications, and prophylactic tumor embolization may reduce risk of post-procedural bleeding.[3] To avoid damage to surrounding structures, displacement with saline or air under imaging guidance can be utilized.

Cytokine-mediated cryo-shock syndrome has been described after ablation of larger tumors, and is characterized by hypotension, dyspnea, and disseminated intravascular coagulation. In addition, aggressive manipulation of probes in frozen tissue can result in parenchymal tears and subsequent bleeding.[4] Interestingly, pain is not a very common complication of cryoablation, probably due to the anesthetic effect of cold temperatures. Despite the frequency of minor complications surrounding cryoablation (11-29%), serious adverse reactions are very rare. This combined with high efficacy of this procedure (96%) makes cryoablation a relatively safe and effective modality to treat renal cell carcinoma.[5]

Our patient had 3 minor complications: hematuria, retroperitoneal hematoma, and post ablation syndrome. As all were

recognized early, and he did well and did not require a prolonged hospitalization.

Table 1. Selected Causes of Fever in Hospitalized Patient

| Etiology: | Potential cause: |
|---|---|
| Infectious | Pneumonia |
| | Urinary tract infection |
| | Bacteremia |
| | Skin and soft tissue infection |
| Malignancy | Lymphoma |
| Post-procedural | Transfusion reaction |
| Ischemia | Myocardial infarction |
| | Pulmonary embolism |
| Drug reaction | Antibiotics |
| Inflammatory | Inflammatory arthropathies<br>Cytokine storm<br>Post-surgical inflammation<br>Malignancy |

***Figures***

Figure 1. Axial Computed Tomography (CT) image with contrast demonstrating a 4 cm mass (arrow) in the right kidney.

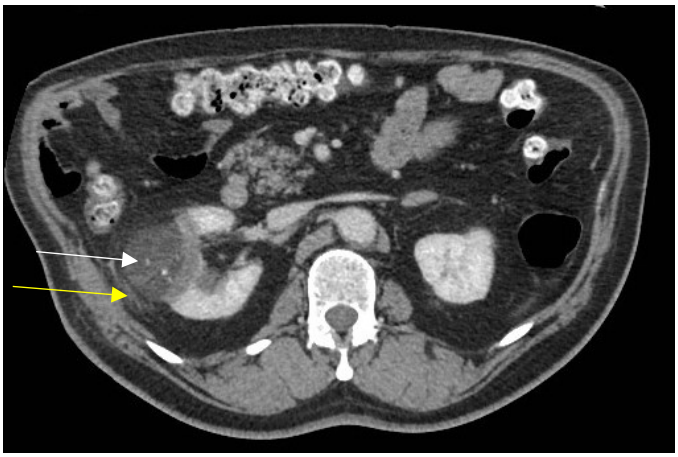

Figure 2. Axial Computed Tomography (CT) image with contrast performed at the conclusion of the cryoablation demonstrating the treatment zone (white arrow). Note a tiny adjacent retroperitoneal hematoma (yellow arrow).

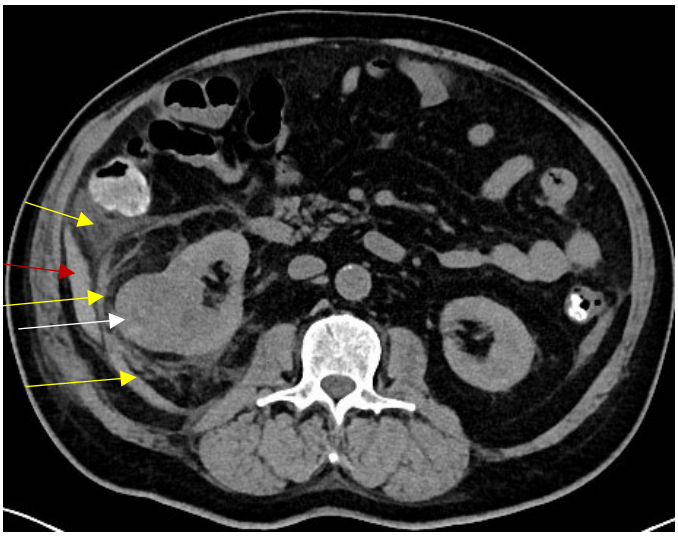

Figure 3. Axial Computed Tomography (CT) image without contrast performed approximately 24 hours after the cryoablation demonstrating the treated tumor (white arrow) and a retroperitoneal hematoma (yellow arrows). For orientation, the inferior margin of the liver is demarcated by a red arrow.

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