Percutaneous Cryoablation for Successful Treatment of a Persistent Urine Leak after Robotic-Assisted Partial Nephrectomy

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ABSTRACT

Urine leak after nephron-sparing surgery is a difficult and morbid situation that may delay recovery and necessitate additional hospitalization and intervention. The use of cryoablation to treat a 34-year-old woman with persistent urine leak after robotic-assisted partial nephrectomy is described. Surgery was performed to treat ureteral duplication that resulted in recurrent urinary tract infections and back pain. Cryoablation was performed with computed tomography guidance, targeting urine extravasation observed after the administration of intravenous contrast medium. Imaging performed after ablation confirmed resolution of the urine leak; renal function was preserved.

ABBREVIATIONS

IVP = intravenous pyelography, JP = Jackson-Pratt

Urine extravasation is a well-described complication after nephron-sparing renal surgery, with urinary leak observed in approximately 3%–6% of patients (1). Although studies directly comparing the frequency of urinary leak after robotic-assisted partial nephrectomy with the frequency of leak after either open or laparoscopic partial nephrectomy are lacking, Benway et al (2) noted no difference in the incidence of collecting system injury with robotic-assisted partial nephrectomy. When a leak does occur, most patients do not require an intervention because urine leaks often resolve spontaneously. When intervention is required, the most frequently performed interventions are insertion of a percutaneous drain, nephrostomy tube, or a double-J stent (3), although resolution may be protracted. In 831 patients treated with nephron-sparing surgery for renal cell carcinoma, a urine leak was observed in 6.5% of patients (median duration, 63 d; range, 8–230 d) (4). A major factor associated with urine leak after partial nephrectomy is intentional or unintentional intraoperative entry of the collecting system (4). In the case presented in this report, urine leak occurred after partial nephrectomy of a duplicated system with a minimally functional, obstructed upper pole moiety as a result of the presence of unrecognized residual functional tissue left after partial nephrectomy. In this case, percutaneous cryoablation was used to successfully treat residual functional renal parenchyma, which resulted in persistent urine leak after partial nephrectomy.

CASE REPORT

This study was exempted from institutional review board approval. All data were handled in accordance to the Health Insurance Portability and Accountability Act. The patient provided informed consent to the procedures.

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A 34-year-old woman presented with a 7-year history of back pain and recurrent urinary tract infections. Clinical evaluation included an abdominal ultrasound study and computed tomography (CT) intravenous pyelography (IVP), which demonstrated a duplicated left urinary collecting system. The left upper pole moiety demonstrated severe hydroureteronephrosis with a ureterocele identified at the ectopic ureteral insertion onto the bladder neck. A technetium-99m mercaptoacetyltriglycine scan demonstrated split renal function of 39% to the left kidney and 61% to the right kidney with poor perfusion and function of the upper pole moiety of the left kidney (Fig 1). The patient agreed to an upper pole partial nephrectomy for treatment.

Intraoperatively, the hilar anatomy was found to be complicated because of the duplex system. Using the da Vinci Surgical System (Intuitive Surgical, Sunnyvale, California), the upper pole renal pelvis was identified and found to be massively dilated and thin-walled with minimal associated vascularity that was controlled with electrocautery and clips. The identified upper pole parenchyma was entered and excised with monopolar scissors. Subsequently, the remaining urothelium on the upper pole surface was removed by monopolar scissors or cauterized with an argon beam. The collecting system was tested by injection of saline through the normal lower pole ureter, which revealed no evidence of extravasation. A No. 10 flat Jackson-Pratt (JP) drain was placed in the resection bed. The distal upper pole ureter was later resected as part of a staged procedure after the initial partial nephrectomy.

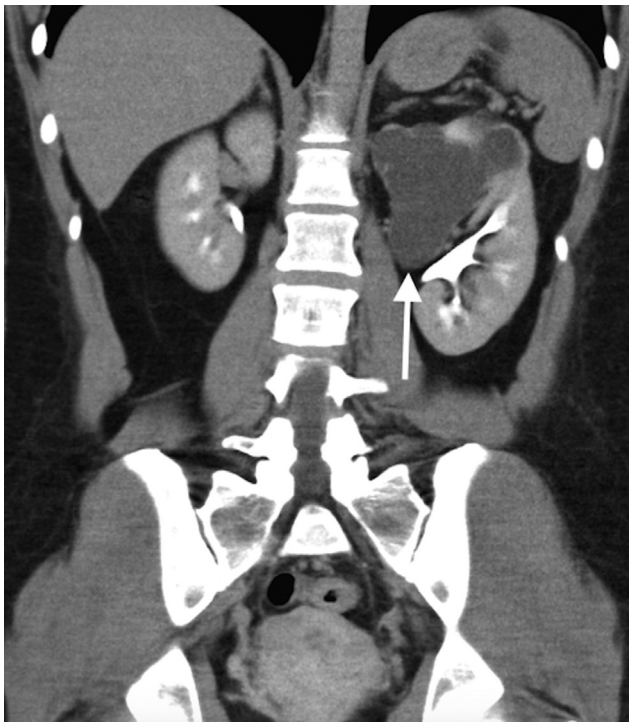

Figure 1. Preoperative coronal image from CT IVP demonstrates a dilated upper pole collecting system (arrow) with a thin rim of atrophic renal parenchyma.

The patient's postoperative course was complicated by persistent output from the JP drain, with fluid analysis demonstrating high creatinine concentration consistent with a urine leak. CT IVP was performed 2 days after surgery, demonstrating pooling of contrast-enhanced fluid in the operative bed on delayed phase images, confirming a urine leak (Fig 2). The area of extravasation appeared to be emanating from a small, irregular area that was medially located and thought to be contiguous with the lower pole moiety intraoperatively. The lower pole calyces, pelvis, and ureter were intact without evidence of extravasation.

Nonsurgical management was initially pursued, and the patient was discharged to home with the JP drain in place. Outputs of approximately 200–220 mL of urine persisted for 2 weeks. As a result of the complexity of the original anatomy and resection, surgical repair was deferred because it was thought that recognizing the area of residual tissue would be difficult, as it was not easily identifiable even during the initial surgery. Also, because the area of residual tissue was not likely to be easily separable from the lower pole moiety and was close to the hilar vessel of the lower pole moiety, an attempted surgical resection could risk functional damage to the lower pole or a leak from the lower pole collecting system. Percutaneous drainage with a nephrostomy tube and ureteral stent was not appropriate because the issue was not one of healing the collecting system, as the upper pole collecting system had been resected, but one of removing residual, functional renal parenchyma. After multidisciplinary discussions, a proposal was made to perform percutaneous ablation of the area of extravasation observed on CT IVP to abolish the leak and to destroy the marginal renal parenchyma producing the leaking urine, using cryoablation to minimize the risk of injury to the normal lower pole collecting system.

Figure 2. Postoperative intravenous contrast–enhanced CT scan with a 9-minute delay demonstrates surgical material (V-Loc 180 barbed sutures; Covidien, Dublin, Ireland) at the operative bed corresponding to high density (asterisks) and extravasation of contrast material (arrow), confirming a urine leak.