



Hybrid Laparoscopic and Ultrasound-Guided Thermal Ablation of Recurrent Renal Cell Carcinoma in a Patient with von Hippel-Lindau Disease and a Solitary Kidney

Warren Clements^{1,2,3} Sivanewaran Lechmiannandan⁴ Nicholas Campbell^{2,4} Heather K. Moriarty⁵

¹Department of Radiology, Alfred Hospital, Victoria, Australia

²Department of Surgery, Monash University Central Clinical School, Victoria, Australia

³National Trauma Research Institute, Victoria, Australia

⁴Department of Urology, Alfred Hospital, Victoria, Australia

⁵Department of Radiology, Cork University Hospital, Cork, Ireland

Address for correspondence Warren Clements, BBiomedSc (Hons), MBBS, FRANZCR, EBIR, Department of Radiology, Alfred Hospital, Victoria 3004, Australia (e-mail: w.clements@alfred.org.au).

J Clin Interv Radiol ISVIR 2023;7:208–210.

Abstract

von Hippel-Lindau disease is an inherited autosomal dominant multisystem cancer syndrome. Multiple malignancies including renal cell carcinoma (RCC) occur in approximately 40%. A 69-year-old female presented with recurrent RCC in a solitary kidney, after previous partial nephrectomy and ablation. The 19-mm lesion was anterior and adherent to the descending colon, obviating percutaneous hydrodissection. A combined urology-interventional radiology procedure was performed including laparoscopic division of adhesions and mobilization of the colon, followed by direct laparoscopic and ultrasound-guided radiofrequency ablation. This novel approach was technically and clinically successful, which highlights the advantages of working in a multidisciplinary environment.

Keywords

- RCC
- ablation
- hybrid
- single kidney
- laparoscopy

Introduction

von Hippel-Lindau disease is an inherited autosomal dominant multisystem cancer syndrome involving the von Hippel-Lindau gene in the third chromosome.¹ It affects approximately 1 in every 36,000 live births, and patients are at risk of developing multiple malignancies including renal cell carcinoma (RCC) that occurs in approximately 40%.^{1,2} Given the propensity for developing multiple tumors and the morbidity associated with dialysis, treatments that spare renal parenchyma are vitally important. We present a novel treatment using combined laparoscopic and ultrasound-guided radiofrequency ablation.

Case Report

A 69-year-old female presented for the management of recurrent RCC. Her history was remarkable for von Hippel-Lindau disease. Many years prior to this presentation, the patient was treated with right nephrectomy for multiple sequential RCCs. In the residual left kidney, open partial nephrectomy of three lesions was performed 12 years prior, followed by five RCC ablation procedures. At the time of presentation, the patient was asymptomatic and passing urine normally, with serum creatinine 102 $\mu\text{mol/L}$ (estimated glomerular filtration rate 52 mL/min/1.73m²). Renal magnetic resonance imaging showed the presence of a new

article published online
June 6, 2023

DOI <https://doi.org/10.1055/s-0043-1769102>.
ISSN 2457-0214.

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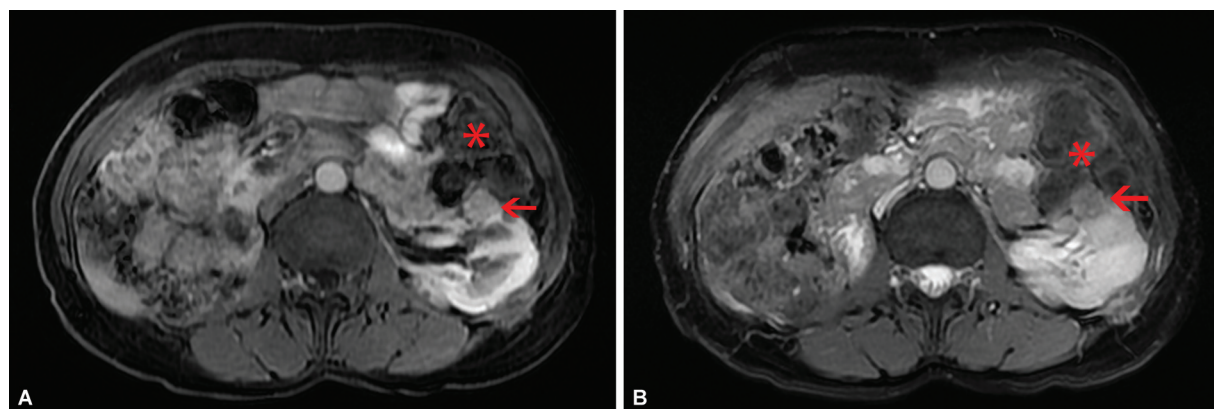


Fig. 1 Pre-procedure magnetic resonance imaging (A) T1 post-contrast sequence and (B) T2 fat suppression sequences showing the enhancing mass (arrow) at the anterior aspect of the mid-pole, directly abutting the descending colon (asterisk) with no interposing fat plane.

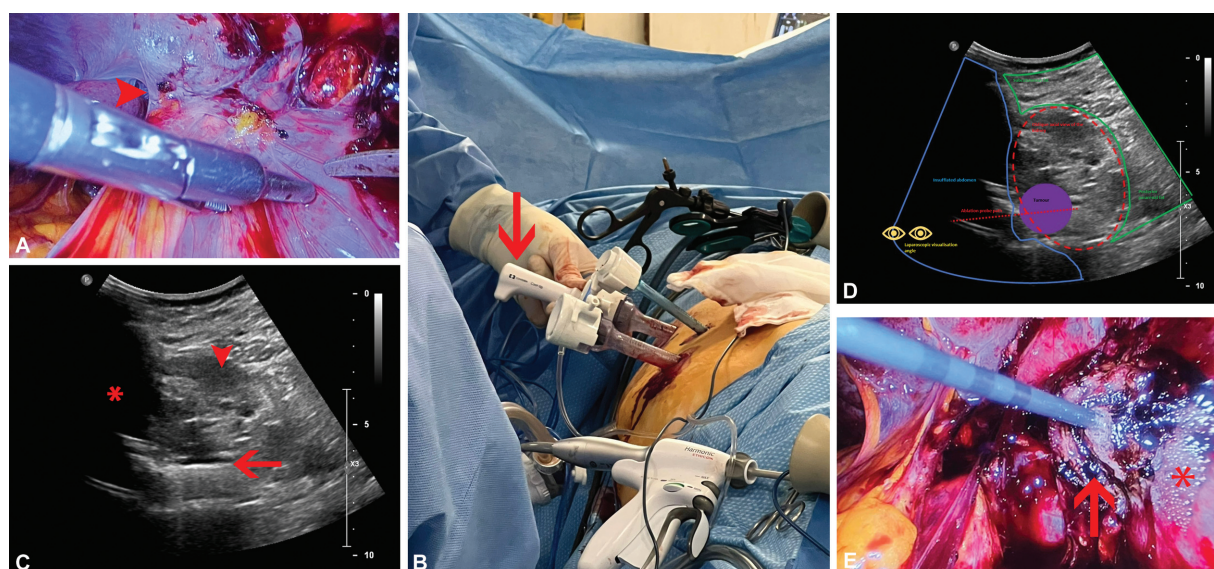


Fig. 2 Laparoscopic images (A) mobilizing the descending colon and the presence of adhesions (arrowhead). The 20 × 3cm Cool-Tip ablation probe was placed through a laparoscopic port (B) into the lesion. On-table percutaneous ultrasound (C) showed the kidney in axial plane (arrowhead) with gas in the insufflated intraperitoneal space (asterisk), and the probe placed through the lesion (arrow). Graphical labels are also shown (D) indicating the oblique axial position of the kidney and the anterior exophytic location of the tumor, with the laparoscopic angle and needle approach indicated. During ablation (E), the lesion was visibly blanching (arrow) and gas bubbles were generated as expected (asterisk).

19mm lesion, anterior, in the interpolar region and partially exophytic. The lesion was directly adjacent to the descending colon without any interposing fat plane (►Fig. 1A and B).

The patient was discussed at a combined interventional radiology-urology multidisciplinary meeting. Percutaneous thermal ablation was considered however. It was felt likely that the descending colon will be adherent to the tumor given previous open partial nephrectomy, and thus image-guided hydrodissection may not be successful. A decision was made to perform a combined procedure.

The patient was placed under general anesthetic in the right lateral position. Three 12 mm laparoscopic ports were inserted as well as a 5 mm port over the lateral left flank. Dense adhesions were identified at the left splenic flexure. These were divided and the colon mobilized under laparoscopic guidance (►Fig. 2A). The tumor was confirmed by

both laparoscopic visualization and on-table percutaneous ultrasound via a flank approach. A decision was made to place the ablation probe laparoscopically given it was visualized anteriorly and would avoid the need for the probe to traverse the parenchyma from a posterior approach. A 20 × 3cm radiofrequency ablation probe (Cool-Tip, Covidien, Dublin, Ireland) was placed into the lesion through a laparoscopic port (►Fig. 2B) with both visual and ultrasound confirmation of the probe through the center of the lesion, and to the required depth (►Fig. 2C and D). Ablation was performed for 12 minutes (►Fig. 2E). The patient recovered well and remained inpatient for 2 nights, and discharged after passing flatus. Follow-up imaging showed successful ablation of the tumor with no enhancement (►Fig. 3A and B) and stable renal function. The patient remains free of RCC at 14 months following treatment.

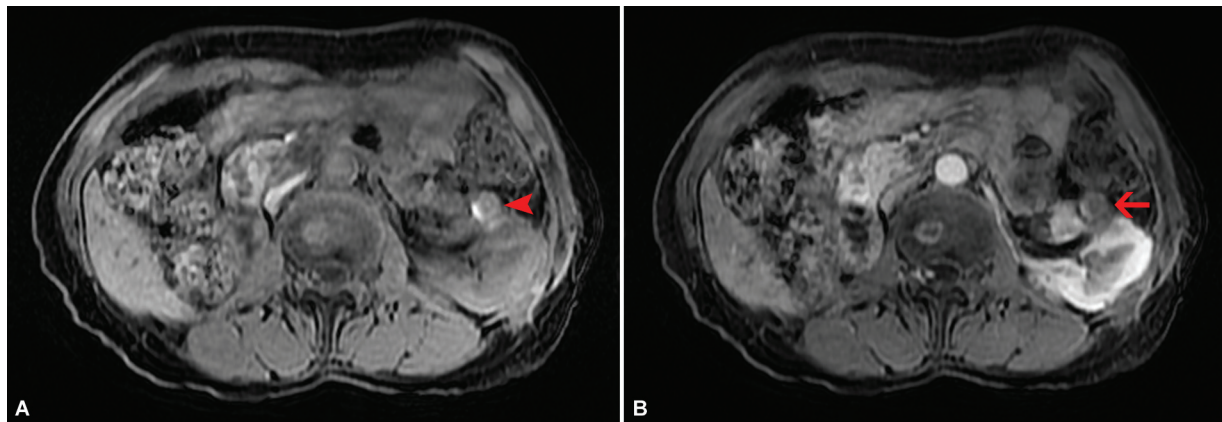


Fig. 3 Postablation magnetic resonance imaging showed that the lesion was mildly T1 hyperintense on the precontrast fat-suppressed T1 images (A), with no enhancement of the lesion post-contrast (B) (arrow).

Discussion

Treatment of patients with von Hippel-Lindau disease is challenging and is best decided in a combined interventional oncology team environment. This includes the specific expertise from interventional radiologists in addition to diagnostic radiologists and urologists.

There is no consensus on the best treatment for patients in this cohort. Partial nephrectomy for larger lesions more than 4cm may be preferable.³ However, the recurrent nature of tumor means potential difficulty with repeated surgical access due to scarring must also be considered. Thermal ablation with radiofrequency, microwave, or cryoablation may be preferred particularly for lesions smaller than 4cm, as it may not adversely affect the renal function as much as partial nephrectomy.⁴ However, thermal ablation also carries risks and nontarget thermal injury may be seen. This risk can be reduced with introduction of a thermal protectant such as saline, dextrose, carbon dioxide, or an angioplasty balloon⁵ as long as it can be appropriately delivered to the desired location.

In our case, surgical mobilization of the colon provided protection from thermal injury. The anterior location of the lesion provided additional benefits of direct anterior needle approach without the need to traverse the 14-gauge probe through the remaining renal parenchyma if a posterior approach was used. The biggest risk we encountered was identification of the deep margin of tumor, and appropriate depth of placement of the probe. Laparoscopic ultrasound was available, but it was difficult to adequately judge the angle and depth from this approach. The use of combined on-table ultrasound directly via the flank obviated this difficulty as the ultrasound waves were transmitted through the posterior aspect of the kidney, allowing us to visualize the deep margin of the tumor and ablation probe depth relative to the hilar vessels. As the insufflated gas was anterior to Gerota's fascia, it did not interfere with the real-time imaging. The use of

contrast-enhanced ultrasound was an additional tool available to the team, but not needed given sufficient image quality.

Conclusion

Management of recurrent RCC in patients with von Hippel-Lindau disease is a challenge. Thermal ablation offers advantages minimizing invasiveness and preservation of renal function. In this case, we show that the use of a hybrid approach with surgical mobilization of the colon and combined laparoscopic and percutaneous ultrasound-guided probe placement may be an effective way to protect from nontarget thermal injury while remaining technically and clinically successful. This case highlights the benefit patients may receive when multiple specialist teams work together.

Conflict of Interest

None declared.

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