Protecting Adjacent Structures in RCC Ablation: A Case of Combined Pneumodissection and Hydrodissection

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Background

- Microwave ablation is a **minimally invasive, locoregional thermal energy** therapy that destroys tumors.
- It's commonly used for Renal Cell Carcinoma (RCC), offering shorter hospital stays, faster treatment times, and real-time ultrasound guidance compared to other ablative therapies.
- Strategies to **avoid non-target ablation** of close structures such as the bowel, inferior vena cava, collecting system, and body wall include **pneumodissection and hydrodissection**.
- In this case, we highlight an Interventional Radiology (IR) treatment approach that leverages pneumodissection and hydrodissection to provide a safe microwave ablation therapy for a RCC tumor.

Case Summary

- A 56-year-old man with hypertension and ascites presented with dyspnea and right-sided pleural effusion.
- IR was consulted for paracentesis and management of a suspected right renal malignancy with biopsy and ablation.
- The patient was placed in left lateral decubitus position where a safe window was achieved.
- Under CT and fluoroscopic guidance, a 5F Yueh needle was advanced between the right kidney away from the IVC and descending colon to introduce 5% Dextrose in Water (D5W) for hydrodissection in the retroperitoneal space, followed by room air for pneumodissection.
    - A 17 gauge needle was used to obtain an 18g specimen from the mass.
- After proper margination of structures were noted on CT, a 14g Amica ablation probe was introduced under CT fluoroscopy guidance.
- After confirmation of placement with contrast administration, microwave ablation was performed for a total of 12 minutes and 40W.
- Needles were then removed, hemostasis achieved, and sterile dressing applied.

Case Images

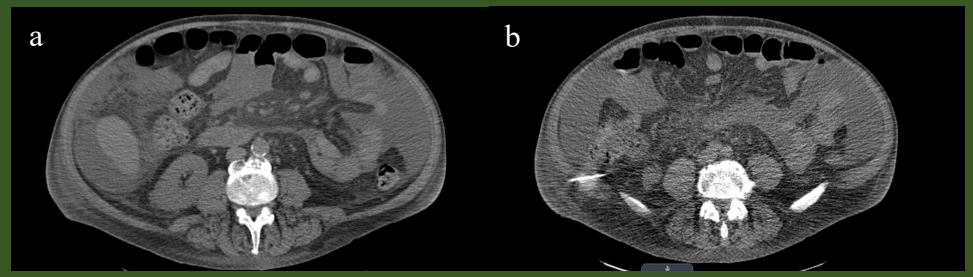

Figure 1: a) Axial CT image of right colon in close proximity to right kidney; b) Needle introduced for hydrodissection with D5W and pneumodissection with room air

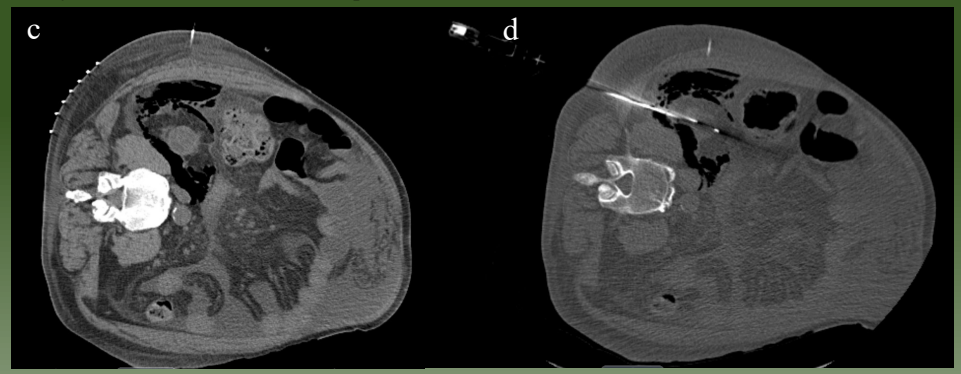

Figure 2: c) Patient moved to left lateral decubitus position for biopsy and thermal ablation after hydrodissection and pneumodissection; d) 17g biopsy needle in place

Figure 3: e) Microwave ablation needle in place; f) Post-ablation imaging showing destruction of kidney lesion with no involvement of central vascular structures or colon

Results/Discussion

- The patient tolerated the procedure well with no technical complications
- IR was only consulted afterward for routine paracentesis (positive for actinomyces)
- Biopsy results returned: Clear Cell Renal Cell Carcinoma, WHO/ISUP Grade 1. Follow up protocol which consists of a CT imaging at 3,6, and 12 months was initiated.
    - CT 3 months: no recurrent mass noted; changes s/p microwave ablation noted
- For microwave ablation, D5W or normal saline can be used
    - During radiofrequency ablation, a non-ionic fluid such as D5W is preferred to prevent current propagation
- Warm saline or D5W can be used as a protective barrier for cryoablation cases

Conclusion

- A combination of pneumodissection and hydrodissection can be effectively used to protect dependent and non-dependent non-target structures during microwave ablation for RCC.
- It is important to utilize imaging modalities to extensively appraise the location of such structures prior to ablation and to monitor the dissection in real time to ensure that adequate displacement is maintained.

References

1. Krieger JR, Lee FT , Jr, McCormick T, et al. Microwave Ablation of Renal Cell Carcinoma. *J Endourol*. 2021;35(S2):S33-S37. doi:10.1089/end.2020.1078
2. Elhelf IAS, Armashi H, Freedman A. Tips and Tricks for Successful Percutaneous Cryoablation of Large Renal Cell Carcinomas. Tomography. 2022 Oct 15;8(5):2604-2608. doi: 10.3390/tomography8050217. PMID: 36287816; PMCID: PMC9610666.
3. van Erp GCM, Hendriks P, van den Hurk SA, Winder HF, Scholtes WPM, De Bats LBEM, Dijkstra J, Burgmans MC. Hydrodissection in microwave ablation: the effectiveness of 0.9 % NaCl versus 5 % dextrose in an ex vivo experimental set-up. Res Diagn Interv Imaging. 2025 May 20;14:100060. doi: 10.1016/j.redii.2025.100060. PMID: 40503094; PMCID: PMC12148655.
4. Khan F, Ho AM, Jamal JE, Gershbaum MD, Katz AE, Hoffmann JC. Long-term outcomes after percutaneous renal cryoablation performed with adjunctive techniques. *Clin Imaging*. 2018;50:62-67. doi:10.1016/j.clinimag.2017.12.003