S5 Imaging and Cryoablation in Renal Cell Carcinoma

Objectives

- Define Renal Cell Carcinoma
- Describe how CT and Cryoablation are used to diagnose and treat Renal Cell Carcinoma

What is Renal Cell Carcinoma?

- Renal Cell Carcinoma (RCC) is one of the most prevalent types of kidney cancer often not getting diagnosed until the late stages or until symptoms present themselves
- RCC forms in the tubules of the kidneys which are small structures that help to filter waste and direct nutrients into the blood
- Three common subtypes of RCC:
  - Clear Cell Renal Carcinoma
  - Papillary Renal Cell Carcinoma
  - Chromophobe Renal Cell Carcinoma (*Renal Cell Carcinoma*, 2024)

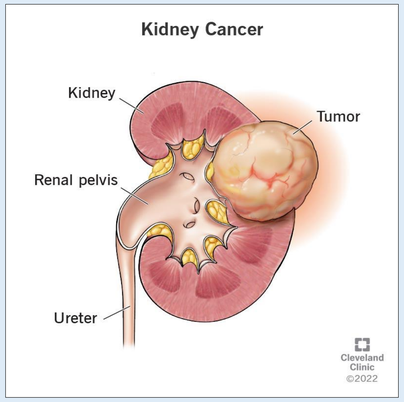

Figure 1

4 Stages of RCC

- **Stage 1**: identified by tumors less than 7 cm in size contained within the kidney
- **Stage 2**: identified by tumors greater than 7 cm that have been contained in the kidney
- **Stage 3**: identified with a tumor of any size that has spread to surrounding structures
- **Stage 4**: identified by a tumor of any size with spread to other organs and lymph nodes (*Renal Cell Carcinoma*, 2024)

Imaging of Renal Cell Carcinoma

- CT is commonly used to diagnose and stage RCC, with the nephrogenic phase (80-120 seconds after contrast) always obtained to assess renal masses
- Corticomedullary and excretory phases beginning 20-60 seconds and 3 minutes, respectively, are utilized to subtype and assess the vascular structures (F. J. Barba Tamargo1, 2019).
- Dual Energy CT (DECT) is preferred over conventional CT as it utilizes two energy levels to improve material differentiation, which provides better imaging with lower radiation doses and fewer images (Bellin, et. Al., 2024).

Treatment

- Cryoablation has been used since the mid-19th century, with Dr. James Arnott using salt solution and crushed ice to freeze cancers at temperatures just above freezing (Erin & Clark, 2010).
- It is primarily used for stage one RCC patients or those needing to preserve renal function due to other conditions, multiples RCCs, or age (Maria & Georgiades, 2015).
- Cryoablation is performed by inserting probes percutaneously into the tumor, rapidly cooling them to freeze the tumor.

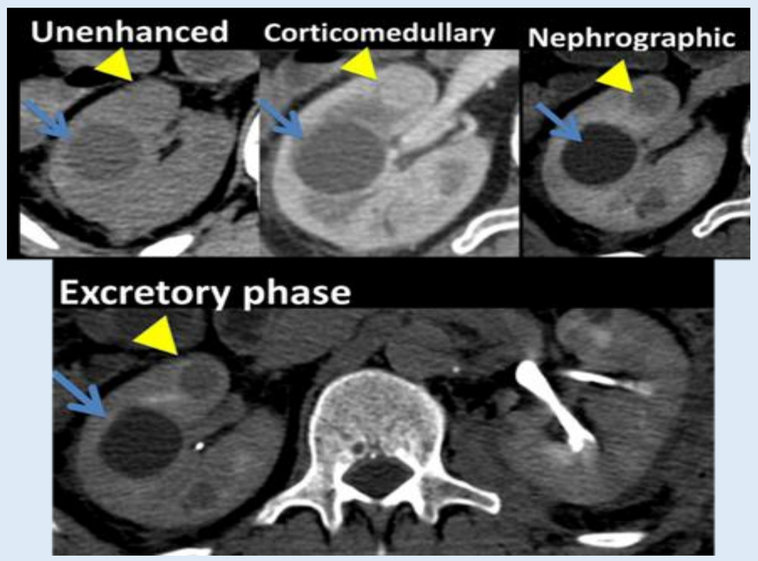

Figure 2

Figure 3

CT and Cryoablation

First, a scan without contrast ensures optimal access to the lesion before prepping the skin. Then, a contrast-enhanced scan of the kidneys helps to identify the lesion. After probe placement, focal volumetric scans confirm the placements and the need for additional probes. Cooling and warming cycles are monitored with focal volumetric CT scans every five minutes to track ice ball formation (Seager et al., 2020b).

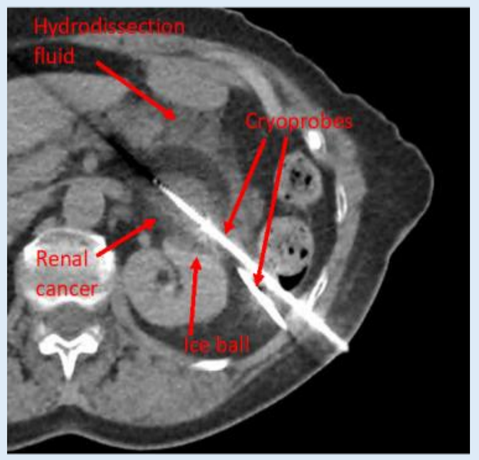

Figure 4

Conclusion

CT and imaging techniques are crucial for detecting, diagnosing, and managing renal cell carcinoma (RCC). They help in tumor localization, staging, and monitoring. Cryoablation, a minimally invasive treatment, relies on these tools for precise targeting and monitoring during the procedure. The combination of CT and imaging methods, especially with cryoablation, provides an effective, patient-centered approach to treating RCC.