

Cryoablation for Stage I RCC Case Presentation

Diego Hipolito, MS4 5/20/19

Focused patient history and workup

- 48 yo F with history of Right RCC s/p cryoablation on 6/11/18 at OSH who presents for repeat procedure due to high suspicion for residual tumor post-ablation seen on CT. She complains of mild right sided flank pain, but denies hematuria or increased urinary frequency. No evidence of disease progression was seen on imaging.
- PE: unremarkable at time of presentation
- Labs: CBC and BMP unremarkable; Cr stable at 0.73

RCC Workup

- Clinical Presentation: Flank pain, invasion of urinary tract (hematuria), paraneoplastic syndromes, presence of metastasis. However, incidental renal masses seen on imaging account for the majority of RCC diagnosis.
- Vitals/PE/Labs: Monitor BP, palpable flank mass, CVA tenderness
- Labs: CBC, Cr, UA
- Imaging based on ACR appropriateness Criteria

ACR Appropriateness Criteria for Renal Masses

American College of Radiology ACR Appropriateness Criteria®

Clinical Condition: Indeterminate Renal Mass

Variant 1: Patient with normal renal function.

Radiologic Procedure	Rating	Comments	RRL*
CT abdomen without and with IV contrast	9	Either CT or MRI is appropriate. Use thin-section CT.	☼☼☼☼
MRI abdomen without and with IV contrast	8	Either CT or MRI is appropriate.	○
US kidney retroperitoneal with duplex Doppler	8		○
Biopsy renal mass	5		Varies
MRI abdomen without IV contrast	3	This procedure can be useful to characterize simple cysts.	○

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Clinical Condition: Renal Cell Carcinoma Staging

Radiologic Procedure	Rating	Comments	RRL*
CT abdomen without and with IV contrast	9	This procedure is complementary to x-ray chest.	☼☼☼☼
X-ray chest	8	This procedure is complementary to CT.	☼
MRI abdomen without and with IV contrast	8	This procedure is an alternative to CT.	○
CT abdomen with IV contrast	7	This procedure is an alternative to CT without and with contrast.	☼☼☼

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Post-Treatment Follow-up and Active Surveillance of Clinically Localized Renal Cell Cancer

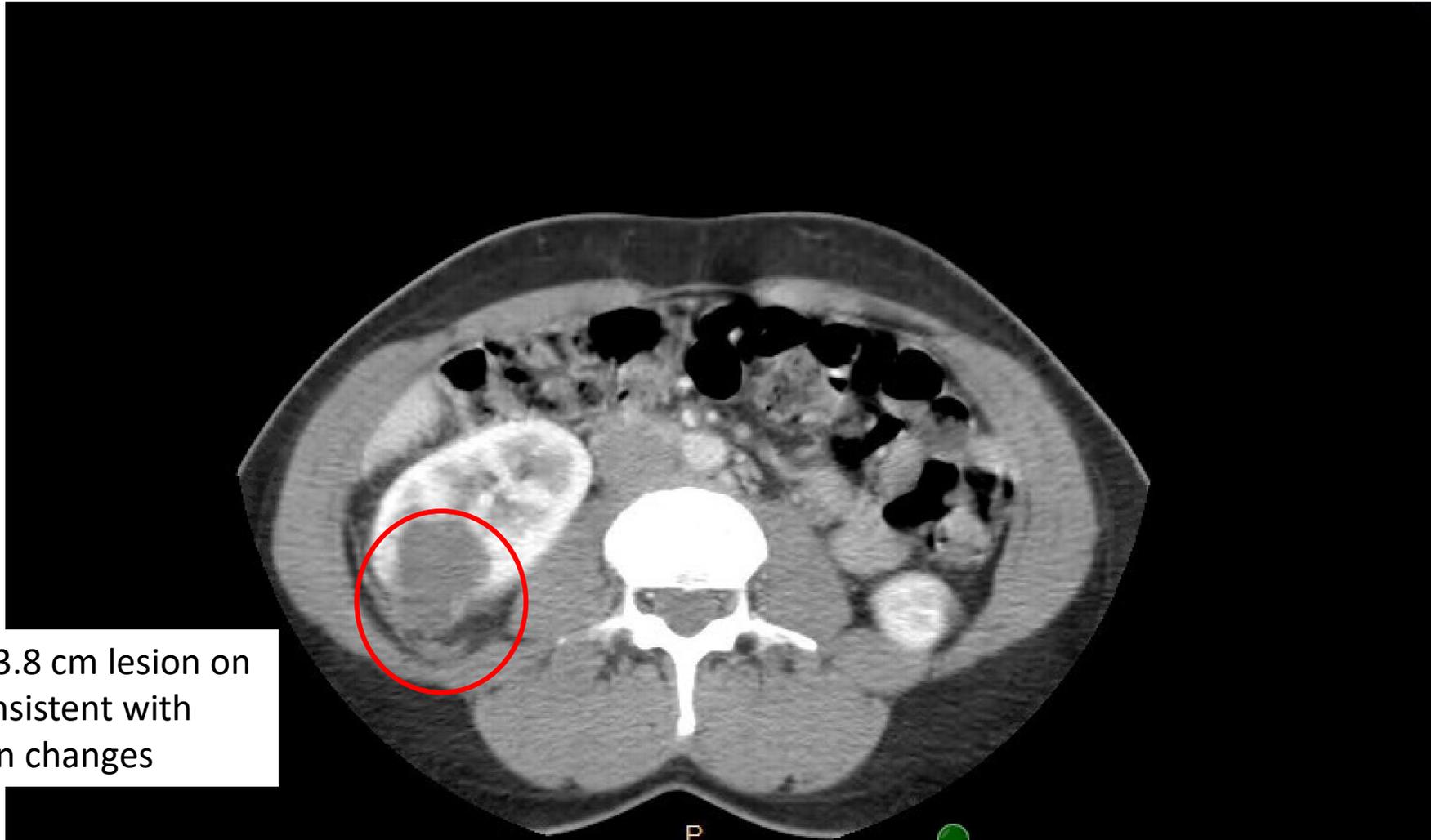
Variant 1: Follow-up for clinically localized renal cell cancer; post radical or partial nephrectomy.

Procedure	Appropriateness Category	Relative Radiation Level
CT abdomen with IV contrast	Usually Appropriate	☼☼☼
MRI abdomen without and with IV contrast	Usually Appropriate	○
CT abdomen without and with IV contrast	Usually Appropriate	☼☼☼
CT abdomen and pelvis with IV contrast	May Be Appropriate	☼☼☼

Imaging Modalities

- **CT w/ and w/o contrast:** 1st line modality for evaluation of renal mass and helps to characterize both solid and cystic lesions. The CT should include 3 phases, non-contrast imaging followed by contrast-enhanced imaging in corticomedullary and nephrographic phases, in order to properly characterize renal masses. If a lesion is suspicious and warrants further evaluation, patient should undergo biopsy.
- **US:** Alternative imaging modality to characterize renal masses. It is usually sufficient as a standalone modality to characterize category I renal cysts using the Bosniak classification of cystic renal masses by CT.
- **MRI:** Helpful to evaluate for tumor growth as it evaluates for invasion into the collecting system or the vessels better than the other modalities.

Imaging studies from PACS 1



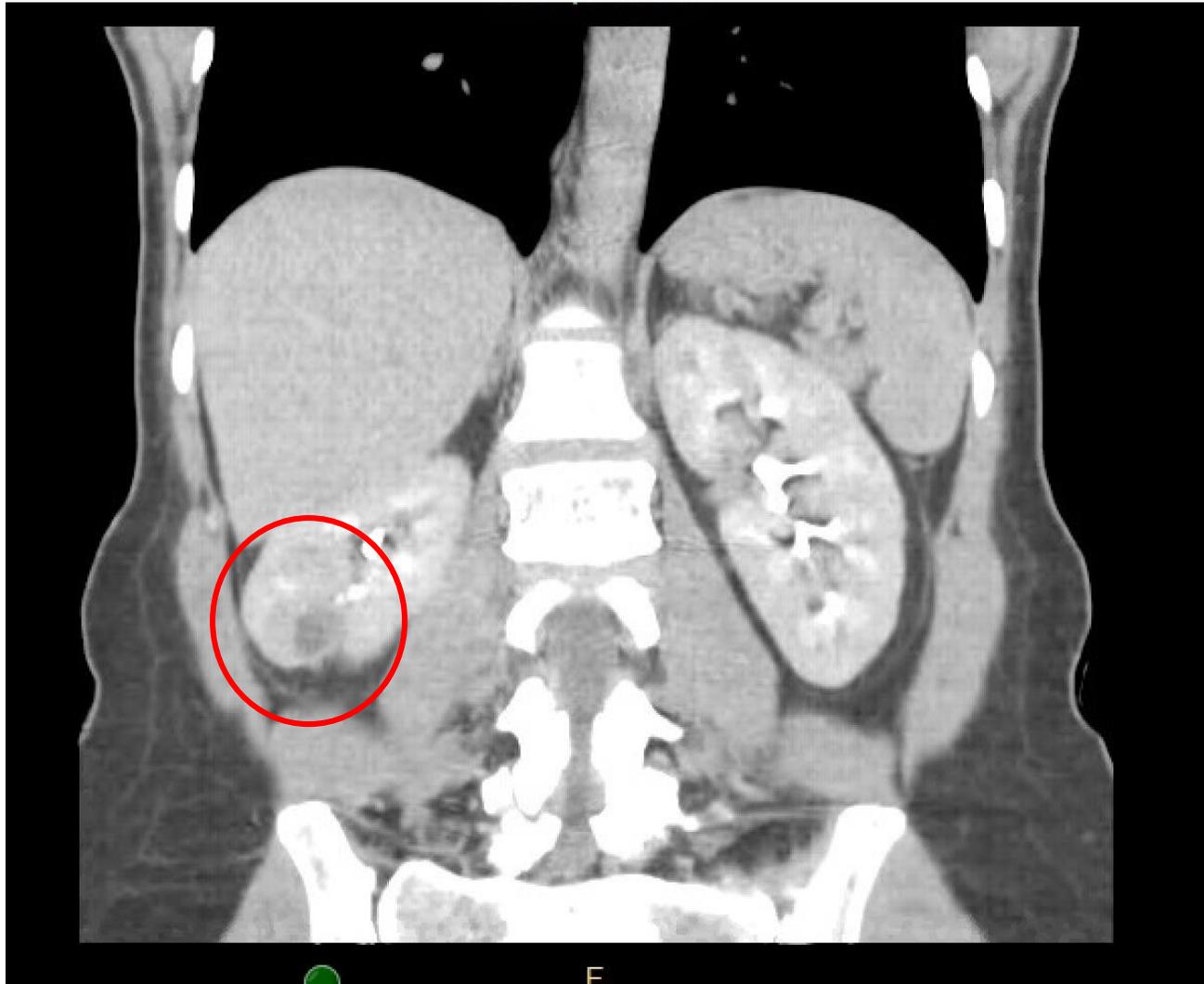
Hypodense 3.8 cm lesion on R-kidney consistent with post-ablation changes

Imaging studies from PACS 2



Hyperdense rim of tissue surrounding post-ablation zone suspicious for residual RCC

Imaging studies from PACS 4



Patient treatment

- RFA and cryoablation are minimally invasive procedures that use temperature extremes to produce tumor cell death. Currently, both RFA and cryoablation are approved by the FDA to treat Stage I RCC (T1aN0M0), tumor ≤ 4 cm in greatest dimension, limited to the kidney.
- Indications:
 - Small incidentally detected RCC (< 4 cm)
 - Poor surgical candidates
 - Need for nephron-sparing treatment
- Patient previously underwent cryotherapy but the ablation margin was not large enough to appropriately treat the entire tumor. Given no disease progression and residual tumor being < 4 cm, patient underwent repeat cryoablation

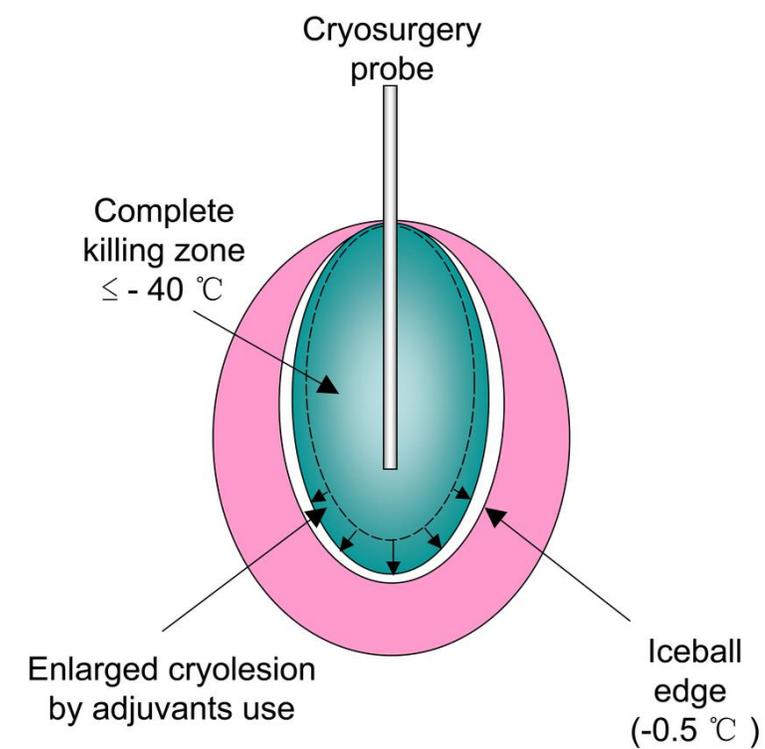
Cryoablation

How does it work?

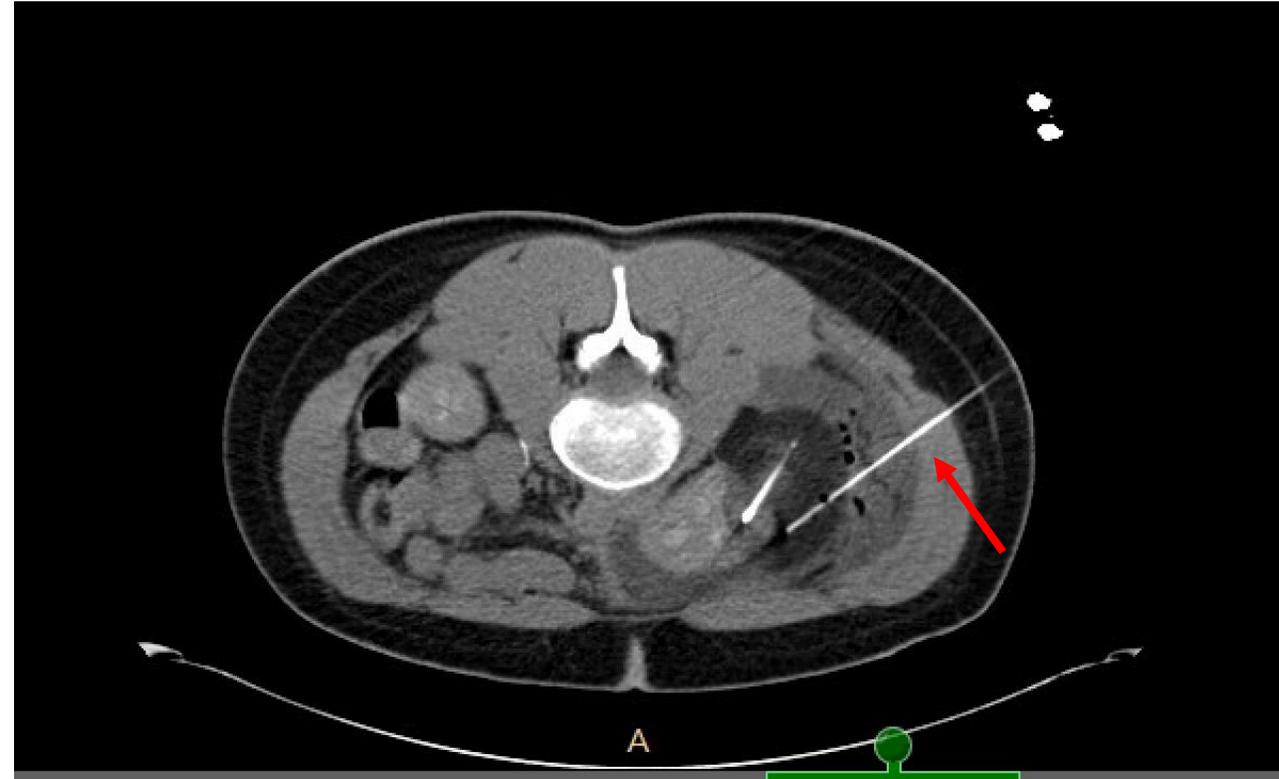
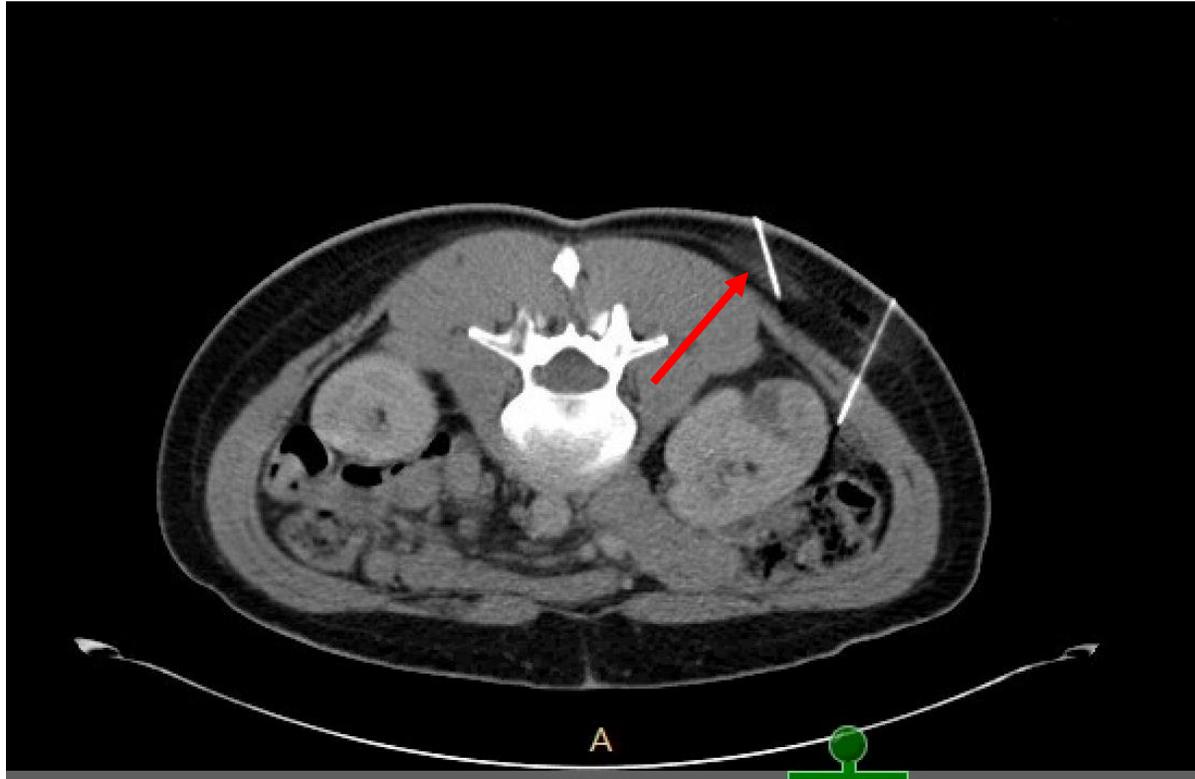
- Cryoablation leads to ice formation within the extracellular space creating an osmotic gradient. As a result, the osmolarity of the extracellular space is greater than that of the intracellular space, which triggers movement of free water into the extracellular space and leads to cellular dehydration. This leads to cellular membrane rupture and, ultimately, local tissue ischemia.

What factors to consider when treating RCC?

- Tumor size: considered one of the most important prognostic factors when determining treatment outcome. Tumors less than 3 cm can be usually treated with a single session; whereas, tumors bigger in size may require multiple sessions because the tumor margins may fall outside the probe's complete kill zone.
- Location: Tumors along the periphery of the renal parenchyma tend to have better treatment outcomes. These tumors tend to have less vascularity given their location and may be treated with a single session.

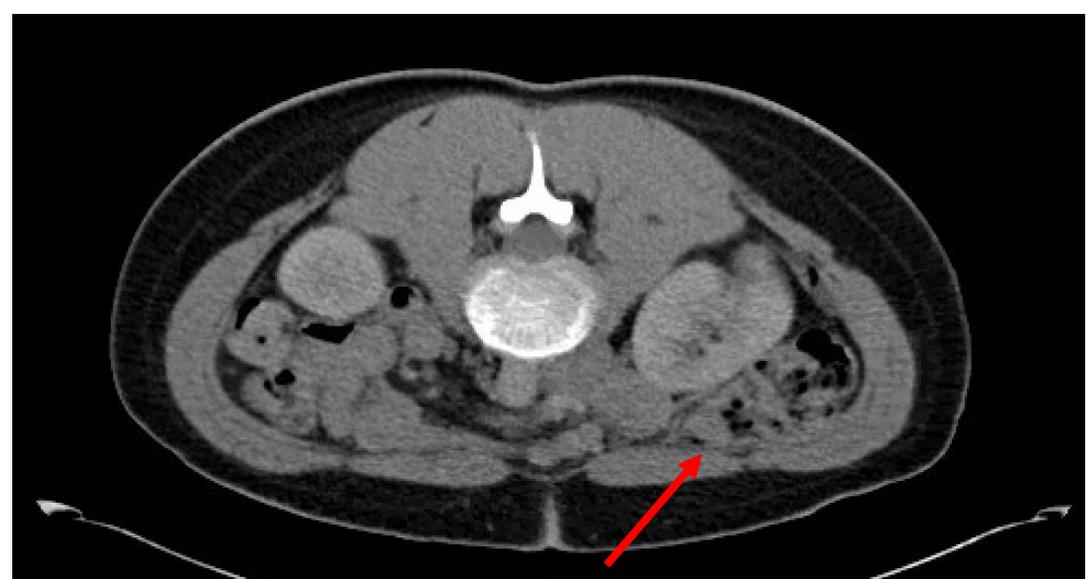


Imaging studies from PACS 4

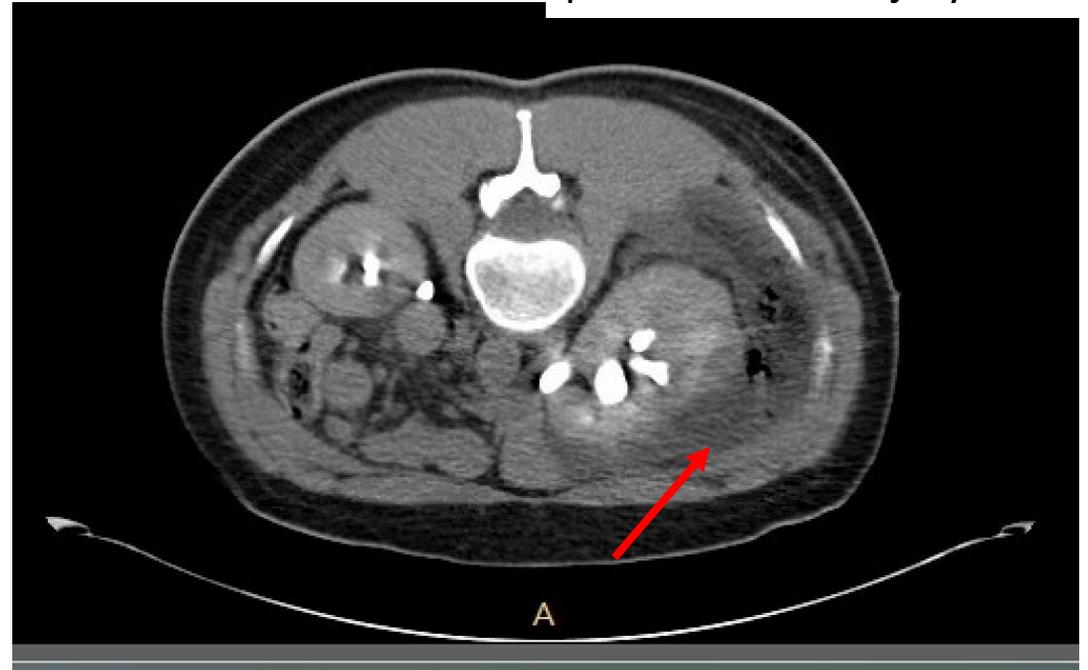


Complications of Cryoablation

Hematoma adjacent to site of cryoablation



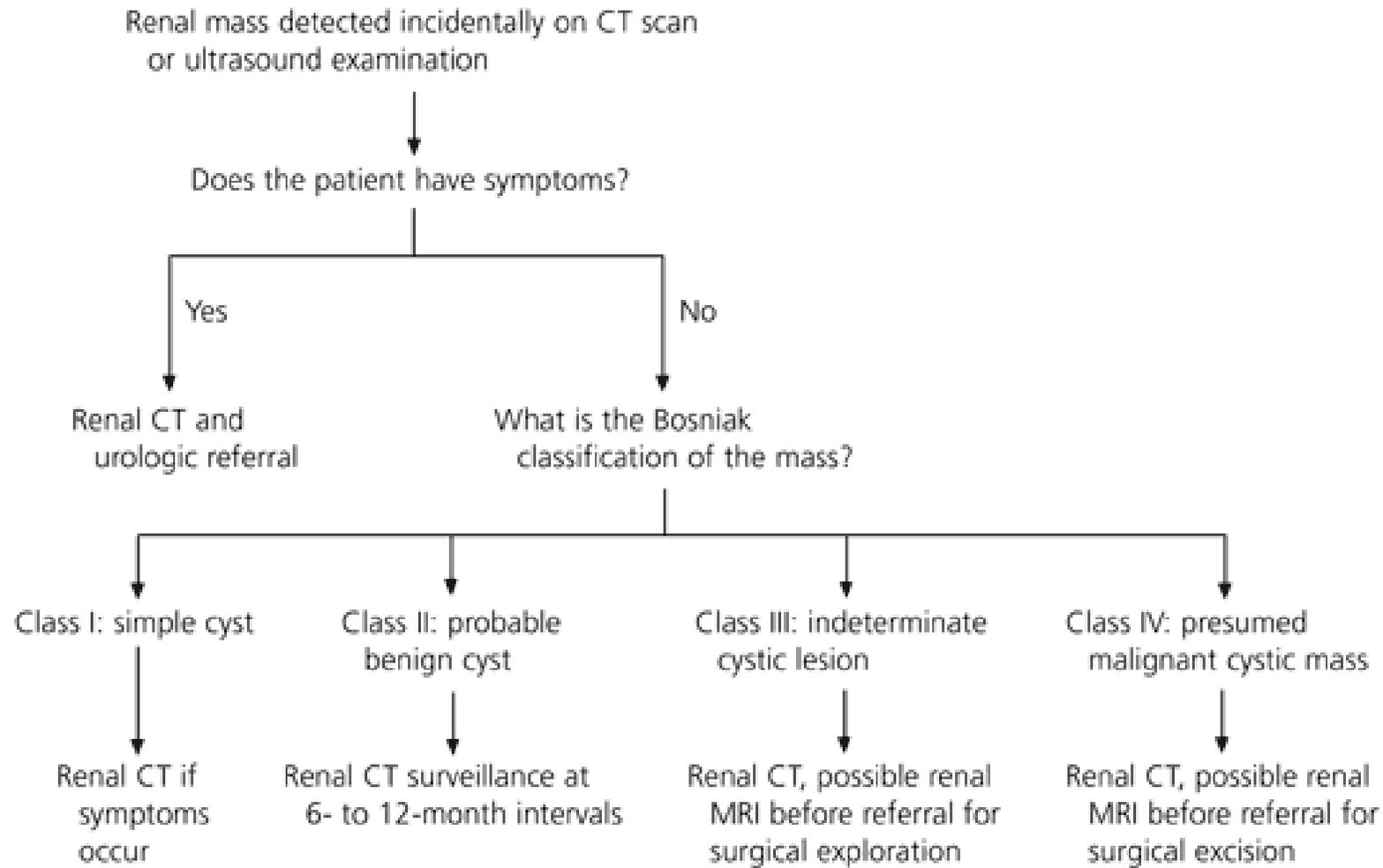
Hydro-dissection to prevent bowel injury



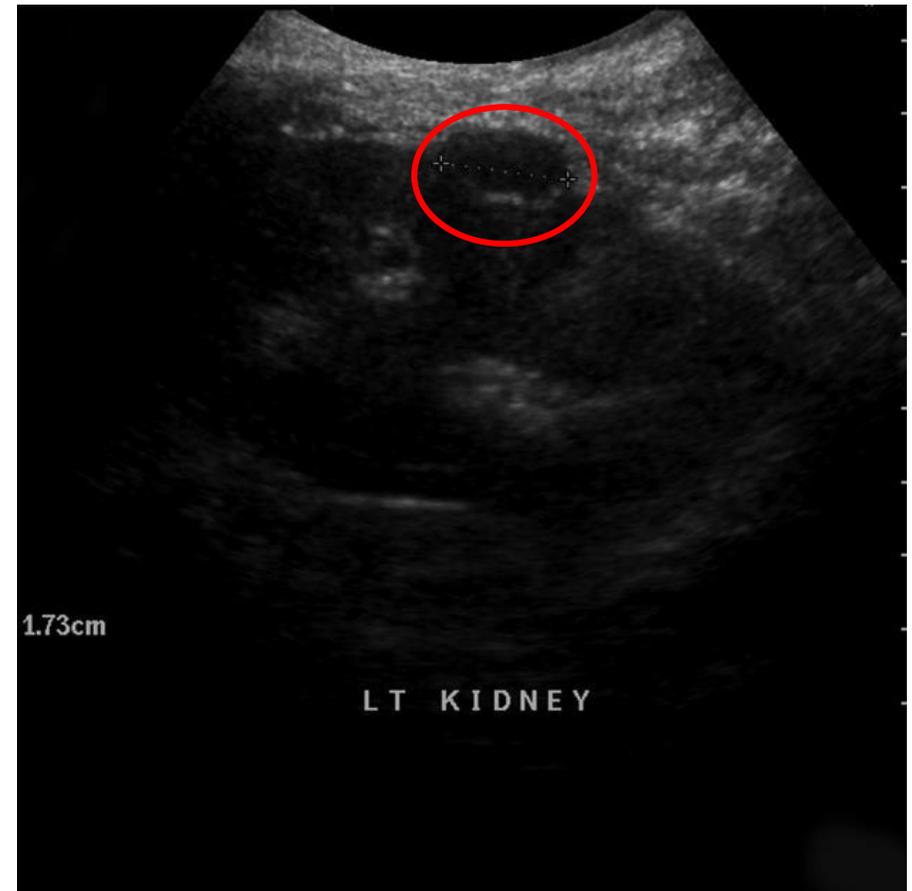
Imaging Modalities for Characterizing Renal Masses

	CT non-con/con	MRI	US
Sensitivity	88%	90%	46%
Specificity	75%	75%	12%
Radiation exposure	10-30 mSv	None	None
Cost	\$1,392	\$2,611	\$428

Management of Incidental Renal Mass on CT/US



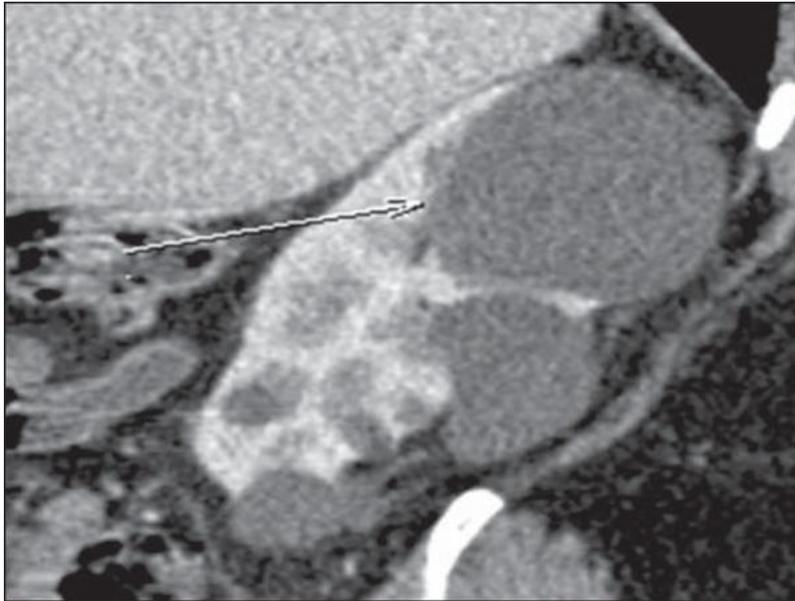
Renal Mass on US



The Bosniak classification of renal cystic disease

- uncomplicated, simple benign cyst
- anechoic, posterior enhancement (through transmission), round or oval shape, thin, smooth wall
- homogeneous water content, sharp delineation with the renal parenchyma, no calcification, enhancement or wall-thickening

Renal masses on CT



A

Category II: Malignant risk less than 3%; no follow-up required

Cystic lesion with some abnormal radiological features

- <1 mm septations (hairline thin)
- fine calcifications within the septum or wall
- <3 cm in diameter
- hyperdense cysts (>20 Hounsfield units)

Category IIF: Malignant risk 5-10%; follow-up recommended

Cystic lesion with increased abnormal findings

- - multiple thin septum
- - septa thicker than hairline or slightly thick wall
- - calcification, which may be thick
- - intrarenal, >3 cm
- - *no contrast enhancement*

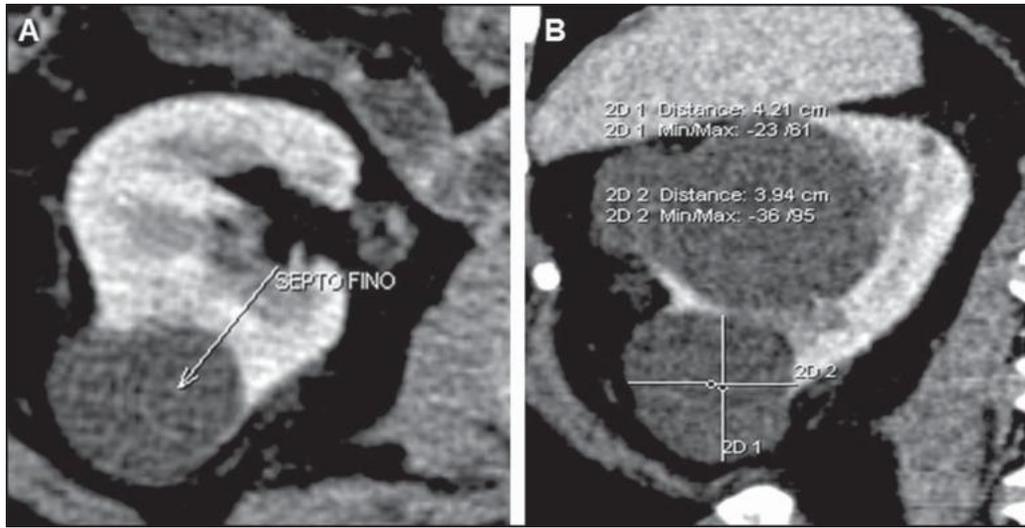
Category III: Malignant risk 40-60%; surgical excision recommended

More complicated

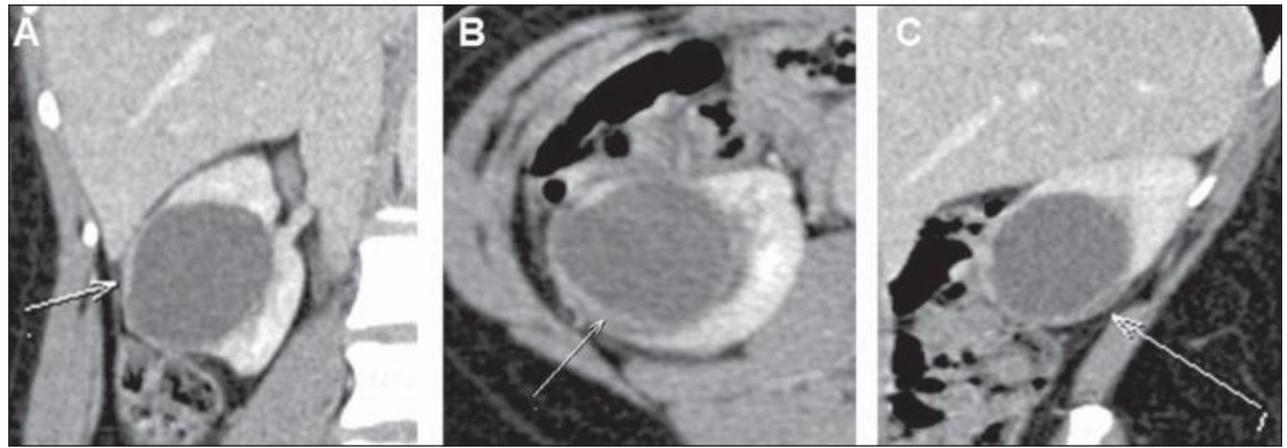
- - uniform wall thickening/nodularity
- - thick/irregular calcification
- - thick septa
- - *enhances with contrast*

Category IV: Malignant risk greater than 80%; surgical excision recommended

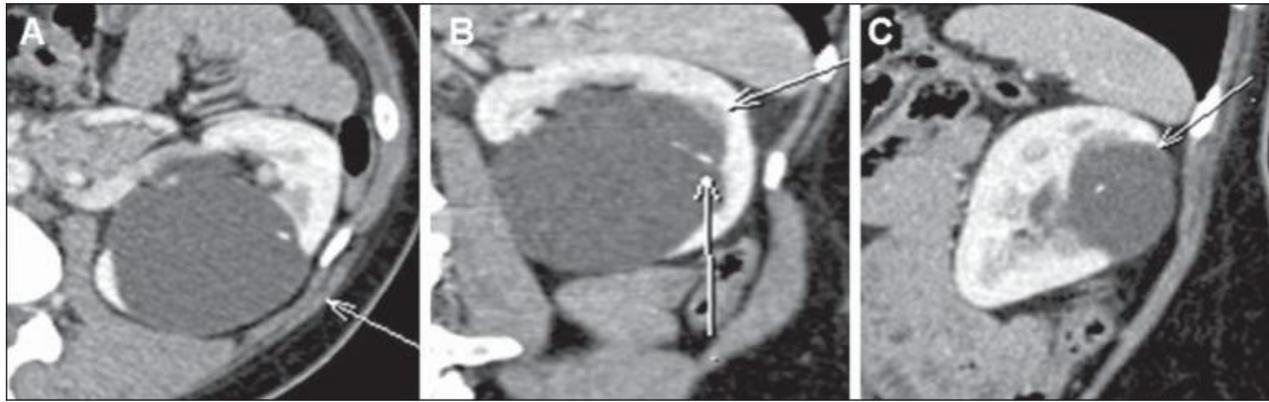
- - large cystic components
 - - irregular margins/prominent nodules
 - - solid enhancing elements, independent of septa
-



B



C



D



E

Test Yourself/Questions

- What is the 1st line imaging modality to characterize a renal mass?
 - CT with and without contrast
- When should you refer a patient for cryoablation?
 - Renal mass is less than 4 cm and is confined to the renal parenchyma
 - Patient is a poor surgical candidate
 - Need for nephron-sparing treatment
- US can be used to evaluate what category of renal masses based on the Bosniak criteria?
 - Category 1

References

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