

AUA  
2026  
Washington, DC

MAY 15-18

# Small Renal Masses: Alternatives To Surgery

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AUA-2026  
Washington, DC

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#### Disclosures:

- Endo Pharma – Grant for Urology fellowship (2022-2023)
- Urogen pharma – Advisory board (Oct-Nov 2025)

## Objective

After participating in this CME Activity, Participants will be able to:

Evaluate renal masses and identify appropriate nonsurgical management strategies.

## Agenda

- Definitions.
- Background.
- Alternatives to surgery:
  - Active surveillance.
  - Percutaneous therapies.
    - Microwave ablation.
    - Radiofrequency ablation.
    - Cryoablation.
- Renal mass biopsy.
- Future directions.



## Definitions

**Small renal mass:** a renal tumor that is sized less than 4 cm in greatest diameter.

**Microwave ablation:** percutaneous use of electromagnetic waves to generate high temperatures to destroy renal tumors.

**Thermal ablation:** minimally invasive, image-guided procedure that uses extreme heat or cold to destroy diseased tissue.

**Radiofrequency ablation:** a minimally invasive, image-guided procedure that uses radio waves to generate heat to destroy renal tumor.

**Renal mass biopsy:** image-guided procedure used to determine if a tumor is cancerous, benign, or infected by extracting a small tissue sample with a needle.

## Background

Small renal masses are classified as masses less than 4cm in size.

Detection rates have significantly increased since the 1970s from 7-13% to 46-64% 2025.

- Better images.
- Patient self awareness.
- Greater understanding of risk factors.

# Guidelines (AUA)

## Renal Mass and Localized Renal Cancer<sup>1</sup>

### Evaluation and Counseling

#### EVALUATION/DIAGNOSIS

1. Obtain high quality, multiphasic cross-sectional abdominal imaging to optimally characterize the renal mass.
2. Obtain **CEA, CA125, and LDH**. If malignancy suspected, metastatic evaluation should include chest imaging and careful review of abdominal imaging.
3. Assign **CKD stage** based on GFR and degree of proteinuria.

#### RENAL MASS BIOPSY (RMB)

1. Counsel regarding rationale, potential risks and non-diagnostic rates of RMB.
2. RMB should be considered when a mass is suspected to be hemangioma, metastatic, inflammatory, or infectious.
3. RMB should be obtained on a utility based approach, whenever it may influence management. RMB is not required for all **sporadic, pathologic** who are unwilling to accept the uncertainties associated with RMB, or in **genetically inherited** who will be managed conservatively independent of RMB.
4. **Multiple area biopsies are preferred** over FN.

#### COUNSELING

1. A **surgeon should lead the counseling process and should provide all management strategies**. A multidisciplinary team should be involved when needed.
2. Counseling should include current perspectives about **tumor biology** and a patient-specific oncologic risk assessment for rTA tumors, the low oncologic risk of many small renal masses should be reviewed.
3. Counseling should review the most common and serious adverse and non-oncologic outcomes of each treatment pathway and the importance of patient age, comorbidity, and life expectancy.
4. Physicians should review the importance of renal functional capacity related to renal mass management, including risk of progressive CKD potential short-term need for dialysis, and long term overall survival considerations.
5. Consider **referral to nephrology** in patients with a high risk of CKD progression, including those with GFR < 45, confirmed proteinuria, diabetes with preceding CKD, or whenever GFR is expected to be < 30<sup>2</sup> after intervention.
6. Recommend **genetic counseling** for all patients < 40 years of age with renal neoplasms, those with metachronal or bilateral renal masses, or whenever: 1) the personal or family history suggests a familial RCC syndrome; 2) there is a first- or second-degree relative with a history of renal malignancy or a known clinical or genetic diagnosis of a familial renal neoplastic syndrome (even if kidney cancer has not been observed); 3) whenever the patient's pathology demonstrates histologic findings suggestive of such a syndrome.

### Intervention (PN, RN, or TA)<sup>3</sup> or Active Surveillance (AS)

### Intervention (PN, RN, or TA)

#### RENAL NEPHRECTOMY (PN) AND NEPHROSPARING APPROACHES

1. **Prostate PN** is the management of the rTA renal mass when intervention is indicated.
2. **Distal nephron-sparing** approaches for patients with an anatomically or functionally **solitary kidney, bilateral masses, known familial RCC, preexisting CKD, or postoperative**.
3. **Consider nephron-sparing approaches** for patients who are **young, have metabolic, genetic, or comorbidity that are likely to impact renal function in the future**.

#### RADICAL NEPHRECTOMY (RN)

1. Physicians should consider RN for patients whenever **resected anatomy, potential is suggested by tumor size, RMB, and/or imaging**. In this setting, RN is preferred if all of the following criteria are met: 1) High tumor complexity and PN would be challenging even in experienced hands; 2) No preceding CKD, proteinuria, and 3) normal contralateral kidney and new baseline eGFR will likely be > 45<sup>2</sup> even if PN is performed. **If all of these criteria are not met, PN should be considered unless there are overriding concerns about the safety or oncologic efficacy of PN.**

#### RENAL ABLATION (TA)

1. Consider TA as a **primary approach** for management of **rTA solid renal masses < 4 cm**. **Radiofrequency ablation** is preferred.
2. Both **radiofrequency ablation and cryoablation are options**.
3. **RMB should be performed pre-treatment** at the time of TA.
4. **Counseling about TA** should include information regarding increased likelihood of tumor persistence/recurrence after primary TA, which may be addressed with repeat TA if further intervention is elected.

#### PRINCIPLES RELATED TO PN

1. **Optimize preservation of renal function** by optimizing nephron mass preservation and avoiding prolonged warm ischemia.
2. **Negative surgical margins should be a priority**. The extent of normal parenchyma removed should be determined by surgeon discretion taking into account the clinical situation, tumor characteristics including growth pattern, and interface with normal tissue. Excision should be considered in patients with familial RCC, multifocal disease, or severe CKD to optimize parenchymal mass preservation.

#### SURGICAL PRINCIPLES

1. In the presence of clinically concerning regional lymphadenopathy, **lymph node dissection**, including all clinically positive nodes should be performed for staging purposes.
2. **Adjuvant therapy** should be performed if imaging and/or intraoperative findings suggest metastases or direct invasion.
3. A **minimally invasive approach** should be considered when it will not compromise oncologic, functional and perioperative outcomes.

#### OTHER CONSIDERATIONS

1. **Pathologic evaluation of the adjacent renal parenchyma** should be performed and recorded after PN or RN to assess for possible nephropathic disease, particularly for patients with CKD or risk factors for developing CKD.
2. Consider **referral to medical oncology** whenever there is concern for clinical metastases or incompletely resected disease (macroscopic positive margin or gross residual disease). Patients with high risk or locally advanced, fully resected renal cancers should be counseled about the risk/benefit of adjuvant therapy and encouraged to participate in adjuvant clinical trials, facilitated by medical oncology consultation when needed.

### Follow-up after Intervention

American Urological Association. (2021). Renal mass and localized renal cancer: Evaluation, management, and follow-up. [www.auanet.org/guidelines](http://www.auanet.org/guidelines)

# Management options

## Active surveillance

Commonly used for patients who:

- Do not wish to undergo surgery.
- Are too ill to tolerate surgery.
- Whose mass is showing stable size and no/minimal growth. (<0.5cm/yr)

## Active Surveillance

Monitoring protocol:

- Every 6 -12 months with cross sectional images/ labs.
  - CT abdomens or MRI abdomen.
  - Comprehensive metabolic panel.
  - Chest images. (CXR or CT)

# Percutaneous interventions

## Microwave ablation

- Has been shown to have similar cancer specific survival rates as well as metastatic free survival as compared to partial or radical nephrectomies.
- Utilizing **high** intensity microwaves to thermally ablate tumor.
- Creates a larger, more predictable renal ablation cavity than radiofrequency ablation techniques.
- Shown to have superior post-operative recovery rates compared to partial or radical surgery.
- Can be utilized for sicker, less surgery inclined patients.

Roadman, D. F., Shapiro, D. D., Das, A., Nelson, L. W., Lotan, P., Risk, M. C., Richards, K. A., Koehne, E. L., Jarrard, D. F., Lee, F. T., Jr, Allen, G. O., Golden, E., Ziemlewicz, T., Hinshaw, J. L., & Abel, E. J. (2026). Percutaneous Microwave Ablation Preserves Renal Function with Similar Long Term Oncologic Outcomes Compared to Surgery for Clinical T1 Renal Cell Carcinoma. *Cancers*, 18(2), 334. <https://doi.org/10.3390/cancers18020334>

## Microwave ablation

Follow up:

- Cross sectional CT or MRI within 3 months of initial microwave therapy.
  - Observe for a cavity and fully ablated site.
  - Observe for any recurrence within the ablation cavity.

## Microwave ablation

Follow up continued:

- Images every 6 months. (CT w/wo or MRI w/wo)
- CMP every 6 months.

Recurrence:

- Can retreat with ablation.
- Can proceed with partial vs. radical nephrectomy.

# Radiofrequency ablation

Initially the first and still very widely used method of renal mass ablation.

Easy access, cost effective.

Uses heat (less than microwave) to ablate renal tumors.

Bertolotti, L., Bazzocchi, M. V., Iemma, E., Pagnini, F., Ziglioli, F., Maestroni, U., Patera, A., Natale, M. P., Martini, C., & De Filippo, M. (2023). Radiofrequency Ablation, Cryoablation, and Microwave Ablation for the Treatment of Small Renal Masses: Efficacy and Complications. *Diagnostics (Basel, Switzerland)*, 13(3), 388. <https://doi.org/10.3390/diagnostics13030388>

# Radiofrequency ablation

Some advantages to this method include:

- Widely available.
- Cheaper than microwave ablation technology.
- Can be used for hilar tumors.
  - located within the helium of the kidney.

Disadvantages:

- Can not get as hot as microwave.
- "Heat sink effect."

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## Radiofrequency ablation

Follow up:

- First CT or MRI at 3 months
- Every 6 months for 2 years
- Annually or longer there after

Monitoring:

- Same as microwave ablation

## Cryoablation

At -190 degrees C, freeze, thaw cycling leads to cellular necrosis and death.

Goal is to create an ice ball around tumor to locally destroy it.

Can us multiple probes, spaced mm apart for complete coverage.

# Cryoablation

## Disadvantages:

- Can cause hemorrhages.
- Can lead to damage to surrounding tissue.
- More time intensive. (due to thaw, freeze cycling)

# Cryoablation

## Follow up:

- First CT or MRI at 3 months.
- Every 6 months for 2 years.
- Annually or longer there after.

## Monitoring:

- Same as microwave/radiofrequency ablation.

## When to use...

Microwave ablation:

- Can be used for 3cm tumors, no heat sink loss, better cavity control.

Radiofrequency ablation:

- Strongly indicated for <3cm and exophytic.
- Not encouraged for central tumors due to the heat sink loss.

Cryoablation:

- Tends to be better suited for larger cT1a tumors and can even go to 4.0cm or more. ( operator dependent)

## Renal mass biopsy

Role has evolved over the last 20 years.

- Recommended prior to ablative procedures.
- When results would alter treatment options.
- When patient requests, and results would influence their decision.

## Renal cell cancer – basics

80,000 new cases annually.

Mean age of diagnosis is: 65

Lifetime risk of renal cell cancer diagnosis: 2.2%

Number of deaths annually: 15,000

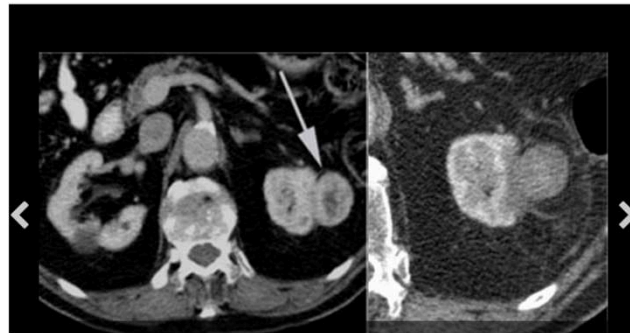
American Cancer Society. (2025, January 16). Key statistics about kidney cancer. [www.cancer.org/cancer/types/kidney-cancer/about/key-statistics.html](https://www.cancer.org/cancer/types/kidney-cancer/about/key-statistics.html)

## Images – because they are fun



← Small renal mass.

Pre/post ablation of small renal mass. ↓



Sebastiá, C., Corominas, D., Musquera, M. et al. Active surveillance of small renal masses. *Insights Imaging* 11, 63 (2020). <https://doi.org/10.1186/s13244-020-00853-y>

UCSF Department of Radiology & Biomedical Imaging. (n.d.). *Radiofrequency/Microwave Ablation for Treating Kidney Tumors*. University of California, San Francisco. <https://radiology.ucsf.edu/patient-care/services/kidney-tumor-ablation/two>

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# Future direction

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## Future offerings

Histotripsy.

Irreversible Electroporation.

Combination Therapies.

Pre ablation immunotherapy or arterial embolization.

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## Future offering

### Histotripsy:

- Uses noninvasive ultrasound to create a cavitation and tissue destructions.
- Can be precise, localized.
- Remains in clinical trial.

### Irreversible Electroporation:

- Use of pulsated electrical current to create nanopores to lead to apoptosis and renal mass death.

Dai, J. C., Morgan, T. N., Steinberg, R. L., Johnson, B. A., Garbens, A., & Cadeddu, J. A. (2021). Irreversible Electroporation for the Treatment of Small Renal Masses: 5-Year Outcomes. *Journal of endourology*, 35(11), 1586–1592. <https://doi.org/10.1089/end.2021.0115>

Dai, J. C., Morgan, T. N., Steinberg, R. L., Johnson, B. A., Garbens, A., & Cadeddu, J. A. (2021). Irreversible electroporation for the treatment of small renal masses: 5-year outcomes. *Journal of Endourology*, 35(11), 1586–1592. <https://doi.org/10.1089/end.2021.0115>

## Future offering

### Combination therapy: (arterial embolization + ablation)

- Could be used for tumors up to 5cm.
- Can be used for central tumors due to lack of heat sink concerns.
- Complications include hematoma and fluid collections.

## Summary points

Surgery is still the go-to approach for most patients. But not everyone can or should have surgery, so other options are being used more often, especially for patients with complex health issues. Active surveillance and Ablation are nonsurgical options.

It's important to stay up-to-date on all available options so we can match each patient with the best fit.

Thank you!!

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## References

- American Cancer Society. (2025, January 16). *Key statistics about kidney cancer*. <https://www.cancer.org/cancer/types/kidney-cancer/about/key-statistics.html>
- American Urological Association. (2021). *Renal mass and localized renal cancer: Evaluation, management, and follow-up*. <https://www.auanet.org/guidelines>
- Bastian, J. F., Seely, D. T., Day, A., White, J. J., Kolb, D., Bowers, C. A., Bailey, E., Jones, D. E., Fry, T. J., Gray, D. B., Oliver, T., Weber, J., Miller, J. J., & MacFarlane, J. E. (2020). *Deuterium–tritium (DT) fusion neutron spectrum measurements at the National Ignition Facility using the Magnetic Recoil Spectrometer*. *Physics of Plasmas*, 27(3), 032703. <https://doi.org/10.1063/1.5144255>
- Bertolotti, L., Bazzocchi, M. V., Iemma, E., Pagnini, F., Ziglioli, F., Maestroni, U., Patera, A., Natale, M. P., Martini, C., & De Filippo, M. (2023). *Radiofrequency ablation, cryoablation, and microwave ablation for the treatment of small renal masses: Efficacy and complications*. *Diagnostics*, 13(3), 388. <https://doi.org/10.3390/diagnostics13030388>
- Choy, B., Nayar, R., & Lin, X. (2023). *Role of renal mass biopsy for diagnosis and management: Review of current trends and future directions*. *Cancer Cytopathology*, 131(8), 480–494. <https://doi.org/10.1002/cncy.22697>
- Dai, J. C., Morgan, T. N., Steinberg, R. L., Johnson, B. A., Garbens, A., & Cadeddu, J. A. (2021). *Irreversible electroporation for the treatment of small renal masses: 5-year outcomes*. *Journal of Endourology*, 35(11), 1586–1592. <https://doi.org/10.1089/end.2021.0115>
- HistoSonics. (2023, October 24). *World's first kidney tumor treated using the HistoSonics Edison histotripsy system*. <https://histosonics.com/news/worlds-first-kidney-tumor-treated-using-the-histosonics-edison-histotripsy-system/>
- Sebastià, C., Corominas, D., Musquera, M., Paño, B., Ajami, T., & Nicolau, C. (2020). *Active surveillance of small renal masses*. *Insights into Imaging*, 11(1), 63. <https://doi.org/10.1186/s13244-020-00853-y>
- University of California, San Francisco, Department of Radiology and Biomedical Imaging. (2016, March 24). *Kidney tumor ablation: A nonsurgical option to nephrectomy*. <https://radiology.ucsf.edu/news/kidney-tumor-ablation-nonsurgical-option-nephrectomy>