Karolinska Institutet | KAROLINSKA UNIVERSITETSSJUKHUSET

Karolinska Comprehensive Cancer Center

Kidney biopsy and other diagnostic methods

20240123

Take home message

- Always take a biopsy of a small renal mass if active treatment is planned
- There are some evolving radiological features that can help

EAU guidelines

Renal mass biopsies are associated with reduced overtreatment of benign masses and offers patients additional information (i.e. grade, subtype) for an informed decision regarding optimal management.	3

Perform a renal tumour biopsy before ablative therapy and systemic therapy without previous pathology.	Strong
Perform a percutaneous biopsy in select patients who are considering active surveillance.	Weak
Use a coaxial technique when performing a renal tumour biopsy.	Strong
Do not perform a renal tumour biopsy of cystic renal masses unless a significant solid component is visible at imaging.	Strong
Use a core biopsy technique rather than fine needle aspiration for histological characterisation of solid renal tumours.	Strong

AUA

RENAL MASS BIOPSY (RMB)

1. Counsel regarding rationale, positive/negative predictive values, potential risks and non-diagnostic rates of RMB.

2. RMB should be considered when a mass is suspected to be hematologic, metastatic, inflammatory, or infectious.

3. RMB should be obtained on a utility-based approach, whenever it may influence management. RMB is not required for: a) young/healthy patients who are unwilling to accept the uncertainties associated with RMB; or b) older/frail patients who will be managed conservatively independent of RMB.

4. Multiple core biopsies are preferred over FNA.

Why take biopsies of SRM

- 15-30 % of patients that are operated on have benign lesions
- Unnecessary surgery with risks for the patients
- Resources

Performance of kidney biopsies

- High sensitivity and specificity (approx. 98%)
- Low risk of complications (<1% for CD≥3)
- Good but not excellent correlation between biopsy and final pathology
- Grade can vary a lot
- 10-15% will be inconclusive
- Second biopsy lowers that number to < 3 %

Comparison with other tumors

Karolinska Comprehensive Cancer Center

Table 1
Accuracy, complication, and recommendation of image-guided biopsy of solid masses in seven different solid organs.

	Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value	Benign Rate[a]	Inconclusive	Complication[b]	Recommendation
Breast	87% [41]	98% [41]	99 [41]	63 [41]	65% [42]	7% [41]	NR	Biopsy is mandatory
Prostate[c]	80% [43]	94% [43]	85 [43]	92 [43]	66% [43]	NR	4% [44]	Biopsy is mandatory
Lung[d]	95% [45]	96% [45]	99 [45]	84 [45]	23% [45]	1% [45]	6% [46]	Biopsy is circumstanti
Pancreas[f]	91% [17]	97% [17]	98 [17]	78 [17]	7% [16]	NR	< 1% [18]	Biopsy is circumstanti
Thyroid[h]	72% [47]	99% [47]	98 [47]	88 [47]	66-93% [47,48]	12% [48]	< 0.1% [48]	Biopsy is mandatory
Kidney	98% [10]	96% [10]	99.8 [10]	69 [10]	17% [3]	14% (2.8% after repeat biopsy) [10]	< 1% [39]	Not routine
Liver	86%–96%[49]	95%–100% [49]	98 [50]	61 [50]	NR	0%–10% [49]	< 1% [49]	Biopsy is circumstanti

[a] Percentage of benign diagnosis when imaging was suspicious for malignancy, BI-RADS 4. Not including BI-RADS 5 which imaging has a 98% positive predictive value for.
[b] Rate of significant complication defined as Clavien-Dindo II or higher OR major complication by the Society of Interventional Radiology.
[c] MRI-guided prostate fusion-biopsy accuracy and benign rate on patients with a positive MRI in biopsy-naïve men for clinically significant prostate cancer (ISUP 2 or higher).
[d] CT-guided core needle transthoracic lung biopsy.
[e] Biopsy is not mandatory due to risk of complications.
[f] Endoscopic ultrasound-guided fine-needle aspiration (standard).
[g] Biopsy is not routinely recommended for all patients due to aggressiveness of the tumor; it is recommended when it could change management (neoadjuvant chemotherapy).
[h] Fine needle aspiration thyroid biopsy (standard).
[i] Biopsy is not needed in patients with cirrhosis or chronic hepatitis B virus when positive imaging criteria (LI-RADS) are presentNR, Not reported on studies.

Gao B, Gorgen ARH, Bhatt R, et al. Avoiding "Needless" nephrectomy: What is the role of small renal mass biopsy in 2024?. *Urol Oncol*. 2024;42(8):236-244. doi:10.1016/j.urolonc.2024.04.002

Practice will change

- Needless surgery will be lowered (from 23% to 3%)*
- More patients will opt for active surveillance (approx. 30%)*
- CUA guidelines recommend AS for all patients with SRM < 2 cm[º]

*Jiang P, Arada RB, Okhunov Z, et al. Multidisciplinary Approach and Outcomes of Pretreatment Small (cT1a) Renal Mass Biopsy: Single-Center Experience. *J Endourol*. 2022;36(5):703-711. doi:10.1089/end.2021.0664

[º]Guidelines | Canadian Urological Association

The risk of missing a cancer

- Negative predictive value 70%

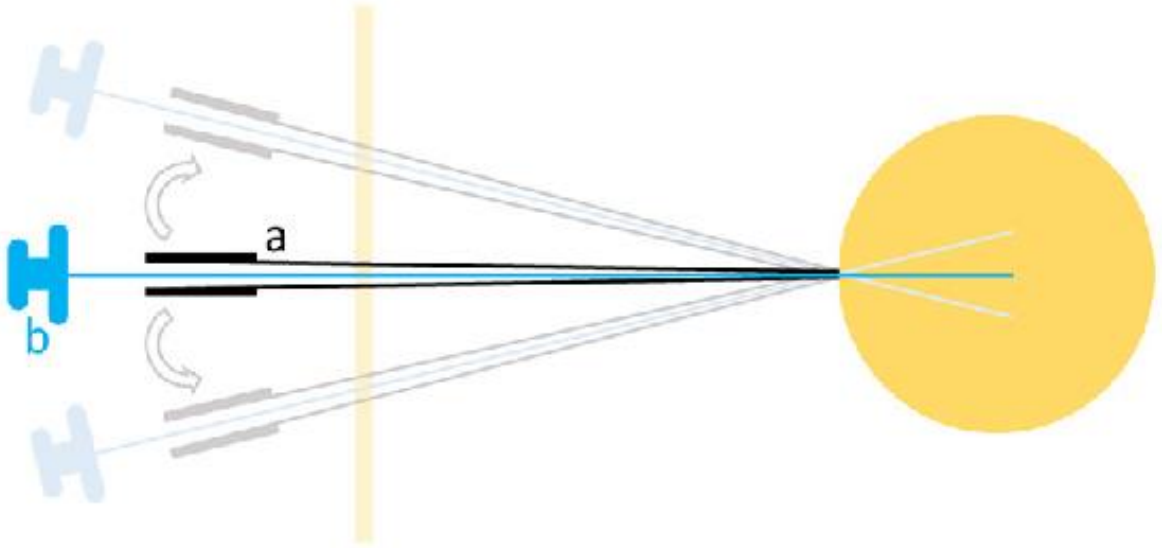
- Small tumors have a very low risk of metastasising
- Oncocytomas can have hybrid features and increase the need for AS
- Still, small chromphobe tumors have a very low risk of metastasising

Cost

- Health economic study in Sweden (unpublished data)
- Increasing the biopsy rate from 25% to 75% for SRM would save approx. 7 MSEK
- Increase from 280 to 720 biopsies/year
- 100 unnecessary surgeries avoided

How to do it

- US or CT-guided
- At least 2 cores but the more the merrier
- 16-18 gauge needle
- Coaxial technique



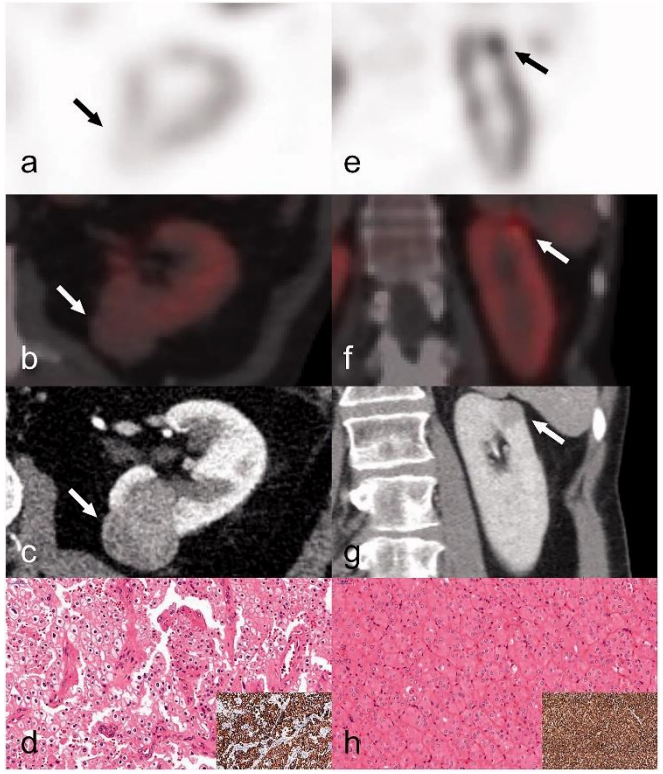
Other diagnostic ways

- ^{99m}Tc-sestamibi SPECT/CT

- [^{89} Zr]Zr-girentuximab PET–CT

^{99m}Tc-sestamibi SPECT/CT

- High uptake in mithocondria (oncocytomas, oncocytic tumors, hybrid oncocytic tumors and some chromophobe RCCs



Tzortzakakis, A., Papathomas, T., Gustafsson, O., Gabrielson, S., Trpkov, K., Ekström-Ehn, L., … Axelsson, R. (2022). 99mTc-Sestamibi SPECT/CT and histopathological features of oncocytic renal neoplasia. *Scandinavian Journal of Urology*, *56*(5-6), 375–382. https://doi.org/10.1080/21681805.2022.2119273

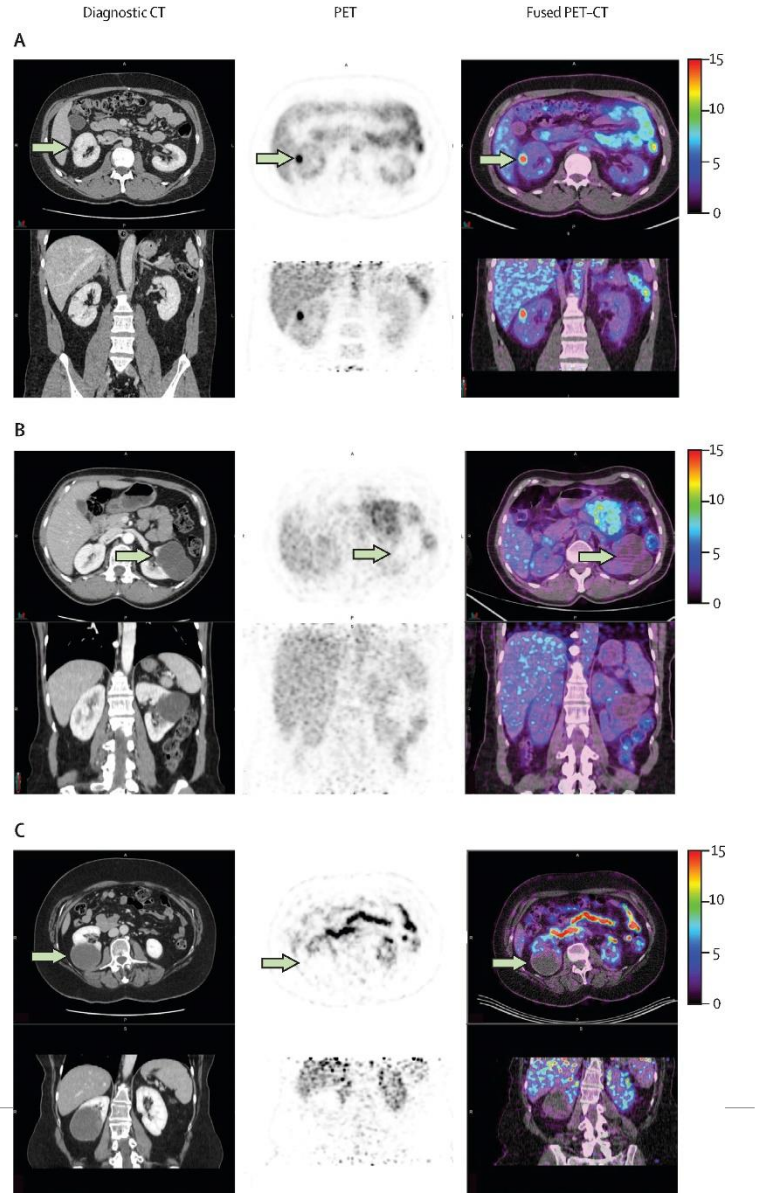
Conclusion in review

- SestaMIBI SPECT/CT has good sensitivity and specificity in differentiating renal oncocytoma and HOCT from all other renal lesions, and in particular from those with more aggressive oncological behavior. Although these results are promising, further studies are needed to support the use of SestaMIBI SPECT/CT outside research trials.

Basile G, Fallara G, Verri P, et al. The Role of ^{99m}Tc-Sestamibi Single-photon Emission Computed Tomography/Computed Tomography in the Diagnostic Pathway for Renal Masses: A Systematic Review and Meta-analysis. *Eur Urol*. 2024;85(1):63-71. doi:10.1016/j.eururo.2023.07.013

[^{89} Zr]Zr-girentuximab PET–CT

- Antibody to carbonic anhydrase 9 (highly expressed in ClearCellRCC)
- ZIRCON-trial: RM < 7 cm, 300 patients included
- Sens 86%, Spec 87%, PPV 93%, NPV 75%



Shuch B, Pantuck AJ, Bernhard JC, et al. [^{89}Zr]Zr-girentuximab for PET-CT imaging of clear-cell renal cell carcinoma: a prospective, open-label, multicentre, phase 3 trial. *Lancet Oncol*. 2024;25(10):1277-1287. doi:10.1016/S1470-2045(24)00402-9

Take home message

- Always take a biopsy of a small renal mass if active treatment is planned
- There are some evolving radiological features that can help