



2^{ème}
FORUM DES
CANCERS
UROLOGIQUES

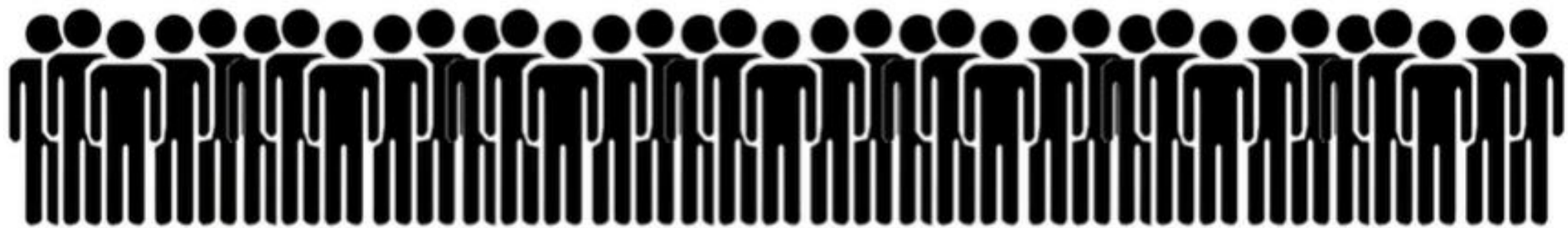
QUOI DE NOUVEAU SUR L'IMAGERIE DES LESIONS KYSTIQUES DU REIN ?

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Jeudi 09 Juin 2022

Cystic renal masses are **common**...



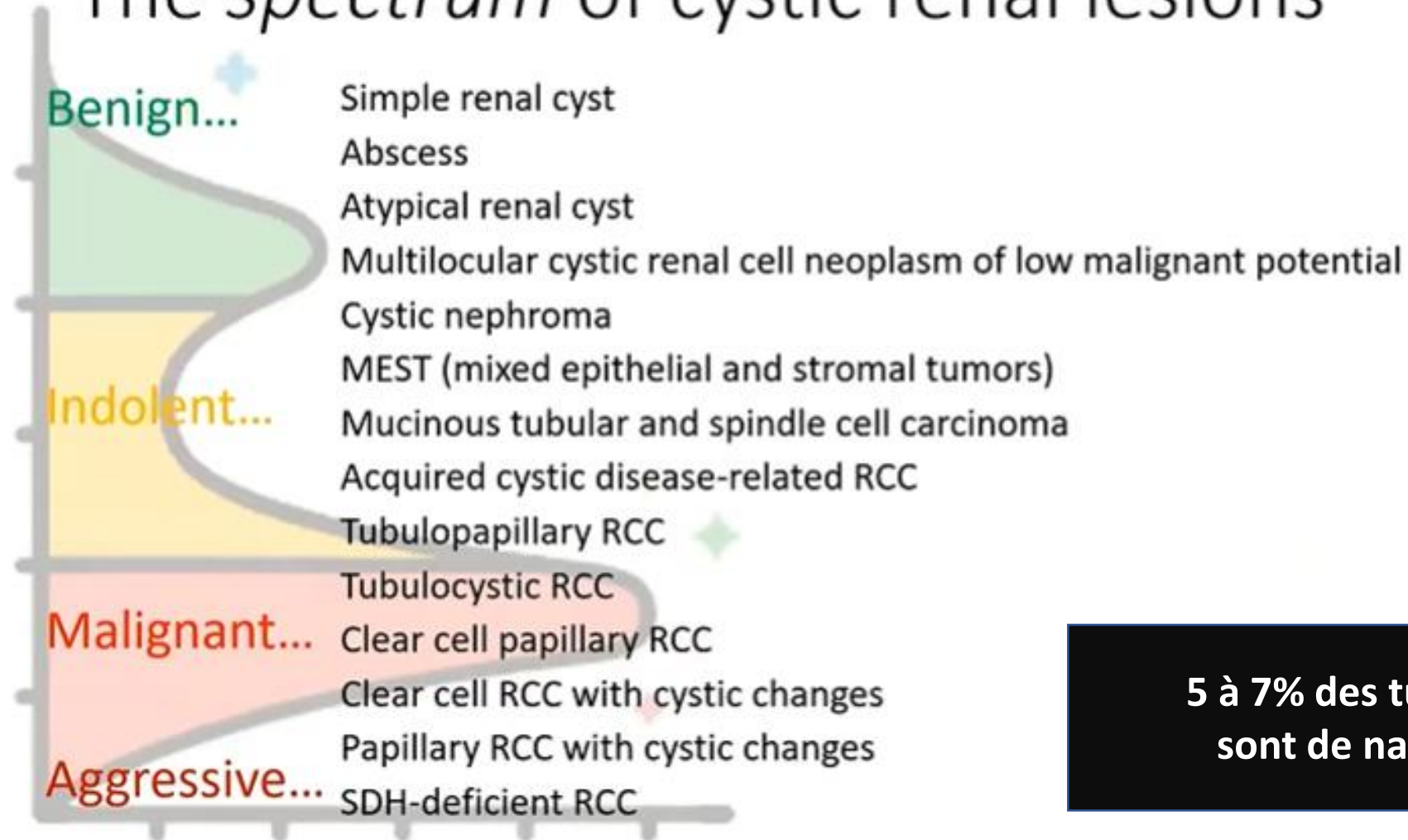
65-70%

of newly diagnosed renal masses are
cysts or cystic.

20-40%

adults >50 years-old
have a renal cyst.

The *spectrum* of cystic renal lesions



**5 à 7% des tumeurs du rein
sont de nature Kystique**

STATE OF THE ART

Morton A. Bosniak, MD

The Current Radiological Approach to Renal Cysts¹

Radiology, 158 (1986), pp. 1-10

AN UPDATE OF THE BOSNIAK RENAL CYST CLASSIFICATION SYSTEM

GARY M. ISRAEL AND MORTON A. BOSNIAK

[Urology](#). 2005 Sep;66(3):484-8.

An update of the Bosniak renal cyst classification system.

[Israel GM¹](#), [Bosniak MA](#).



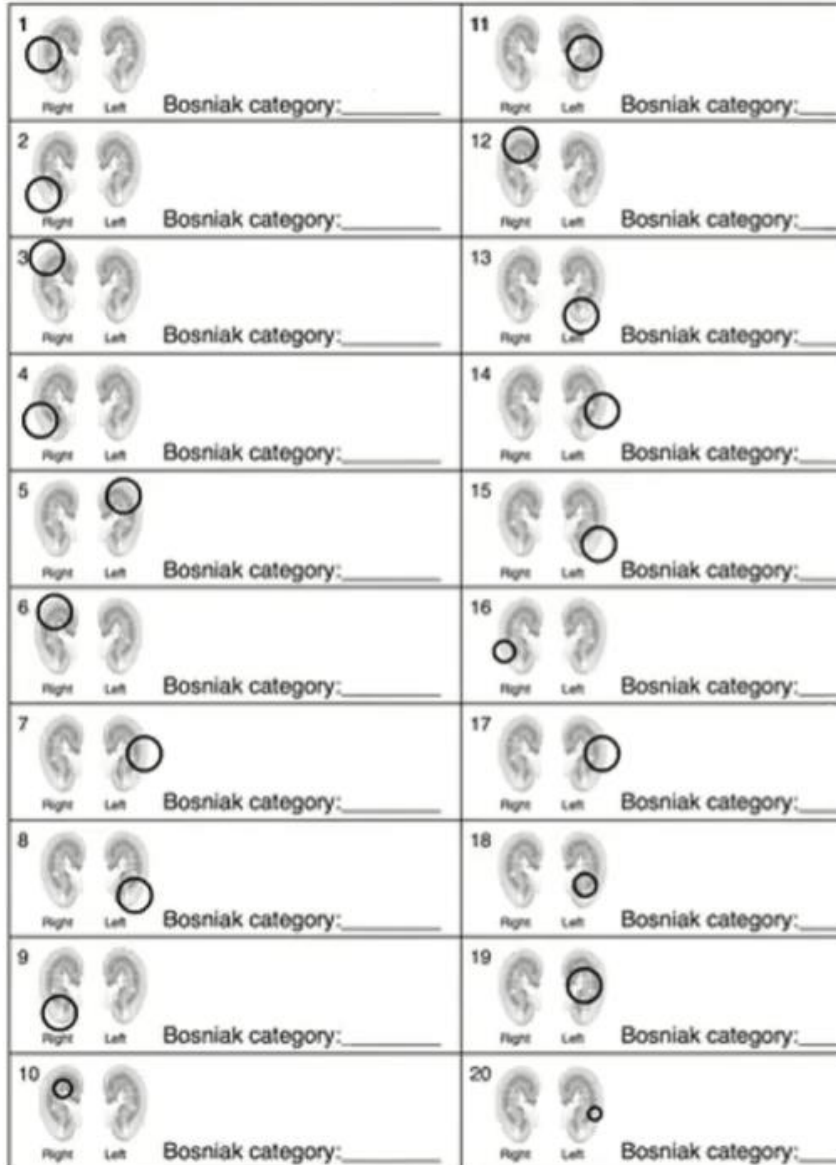
DR MORTON A BOSNIAK



What's wrong with Bosniak?

1. Interobserver agreement
 - Histologic/pathologic definitions are strong.
 - Radiologic definitions are subjective.
 - What defines cystic? Percentage?
 - Interobserver variability?
2. Predictor of meaningful outcomes...
 - Likelihood of malignancy
 - Does not predict recurrence, cancer specific survival
 - Not influenced by intervention





Bosniak inter-observer and intra-observer agreement (among expert radiologists)

Radiologists correctly classified lesions:

- **Bosniak I: 95–100%**
- Bosniak II: 59–93%
- Bosniak IIF: 54–92%
- Bosniak III: 47–95%
- **Bosniak IV: 77–100%**

Interobserver variability: 0.85-0.98 (very good)

Intraobserver variability: 0.99 (very good)

Graumann, et al. Acta Radiologica, 2015.

Bosniak Classification for Complex Renal Cysts Reevaluated: A Systematic Review

Ivo G. Schoots,* Keren Zaccai, Myriam G. Hunink† and Paul C. M. S. Verhagen

From the Department of Radiology and Nuclear Medicine (IGS, MGH), Urology (KZ, PCMSV) and Epidemiology (MGH), Erasmus MC - University Medical Center Rotterdam, Rotterdam, the Netherlands, and Harvard School of Public Health, Harvard University, Department of Health Policy and Management, Boston, Massachusetts (MGH)



META-ANALYSIS: 39 studies / 3,036 complex renal cysts (Bosniak II, IIF, III and IV)

Table 3. Studies on interobserver variability (kappa) among radiologists

References	No. Observers	Total Cysts	Bosniak					No. Benign	No. Malignant	Agree (%)	Kappa
			I	II	IIF	III	IV				
Siegel et al ⁵	3	70	22	8	—	11	29	38	32	59*	0.57
Siegel et al ⁴⁰	3	69	20	—	—	—	—	—	—	93†	—
Benjaminov et al ⁴¹	2	32	—	0–5	2–7	8–13	12–17	11	21	50	0.52‡
Bertolotto et al ⁴²	2	70	—	18–23	26–27	12–17	8–9	8§	15§	—	0.64‡
Kim et al ¹⁵	2	125	30–34	22–32	10–13	24–26	26–33	72	53	61	0.70
Weibl et al ²⁸	2	71	—	7–25	3–12	5–8	3–26	25	46	25–88	—
El-Mokadem et al ³³	2	96	—	8–13	50–53	21–28	7–12	9§	29§	70	0.69‡
Graumann et al ⁴³	3	100	18–19	16–27	6–13	9–19	17–22	—	—	66–94	0.85–0.98‡

* Overall 41% disagreement, with 11% disagreement on category I or II vs category III or IV, thus with consequences for therapy.

† Agreement reported only on presence or absence of enhancement (cutoff in protocol 15 HU).

‡ Weighted kappa.

§ Histology available in part of cysts only.

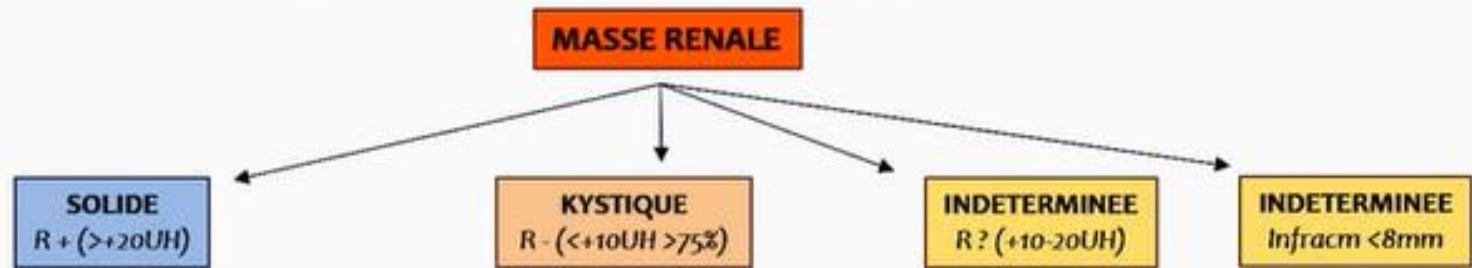
|| Agreement with consensus classification (performed by the same observers).

Rates of Malignancy:

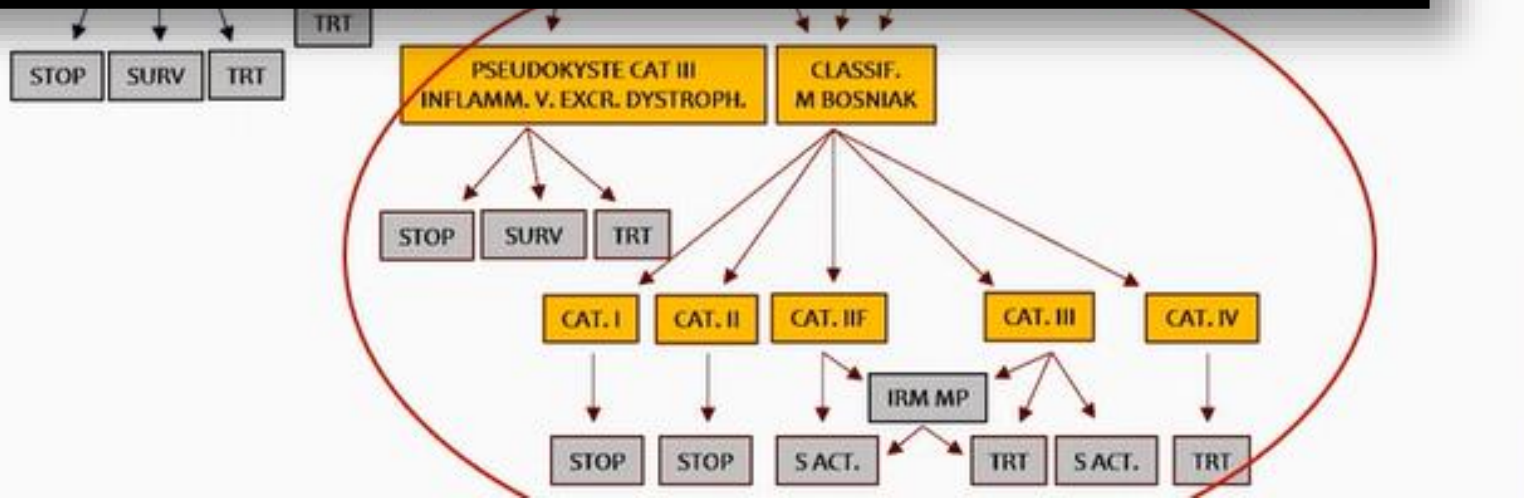
High **κ values** due to agreement regarding Bosniak I and IV masses

Absolute disagreement range: 6% to 75% (notable for Bosniak II, IIF, and III)

Conclusion: “Large inter-reader variability for a clinical imaging test.”



Cystic mass contains approximately less than 25% enhancing tissue.

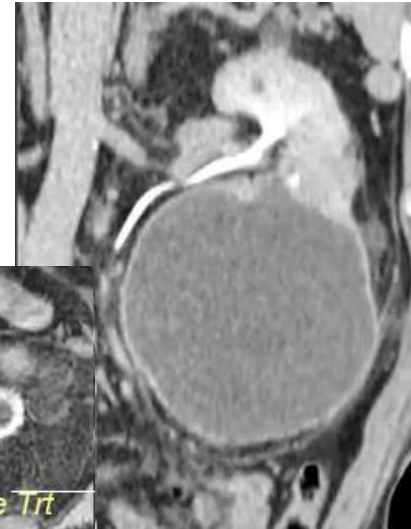
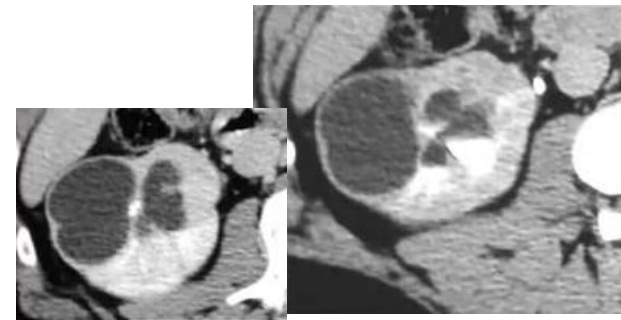
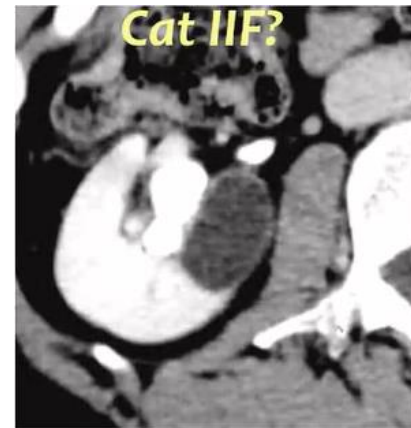
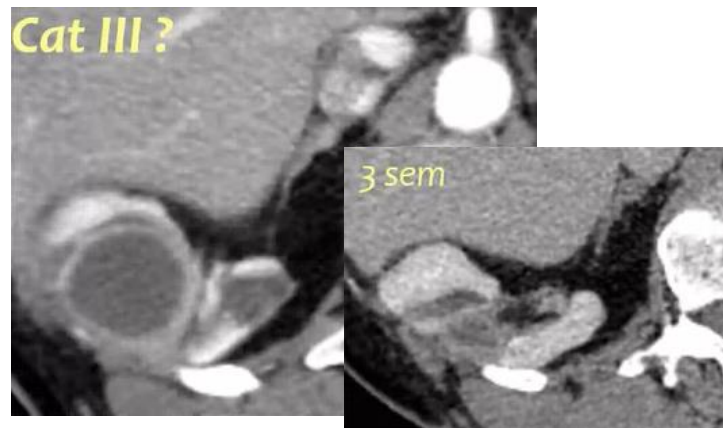


CLASSIFICATION DE BOSNIAK : Champ d'application

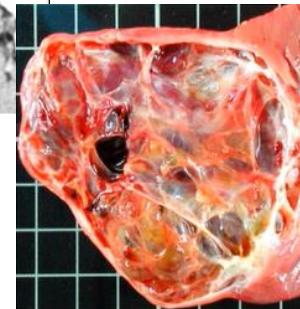
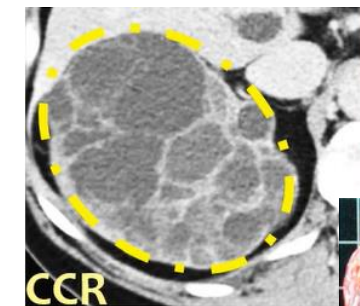
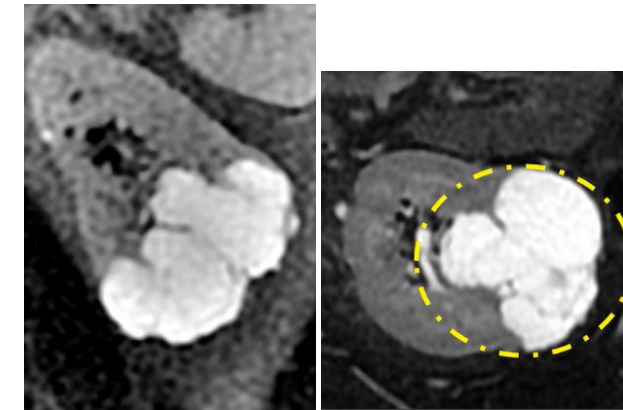
En dehors de:

- Lésions d'origine urothéliale (diverticule, hydrocalice)
- Origine infectieuse et parasitaire (abcès chronique,...)
- Contexte uro (hémorr, trauma), ATCD intervention
- Dystrophie kystique localisée

- Ne pas classer!
- Histoire clin, suivi, phase excrétoire, ponction,...
- Aspect de dystrophie kystique



Dystrophie Kyst. Localisée Cluster non encapsulé



Outils diagnostiques

▪ Les densités et leurs variations



➤ Densité spontanée

- « Hydrique » $< +20 \text{ H}$ (-5 à +15UH)
- Hyperdense $> +50\text{UH} / +70\text{UH}$



➤ Rehaussement (MR homogène)

- Négatif $\Delta\text{UH} < +10\text{H}$
- Positif $\Delta\text{UH} > +20\text{H}$
- Indéterminé $\Delta\text{UH} 10\text{-}20\text{H}$

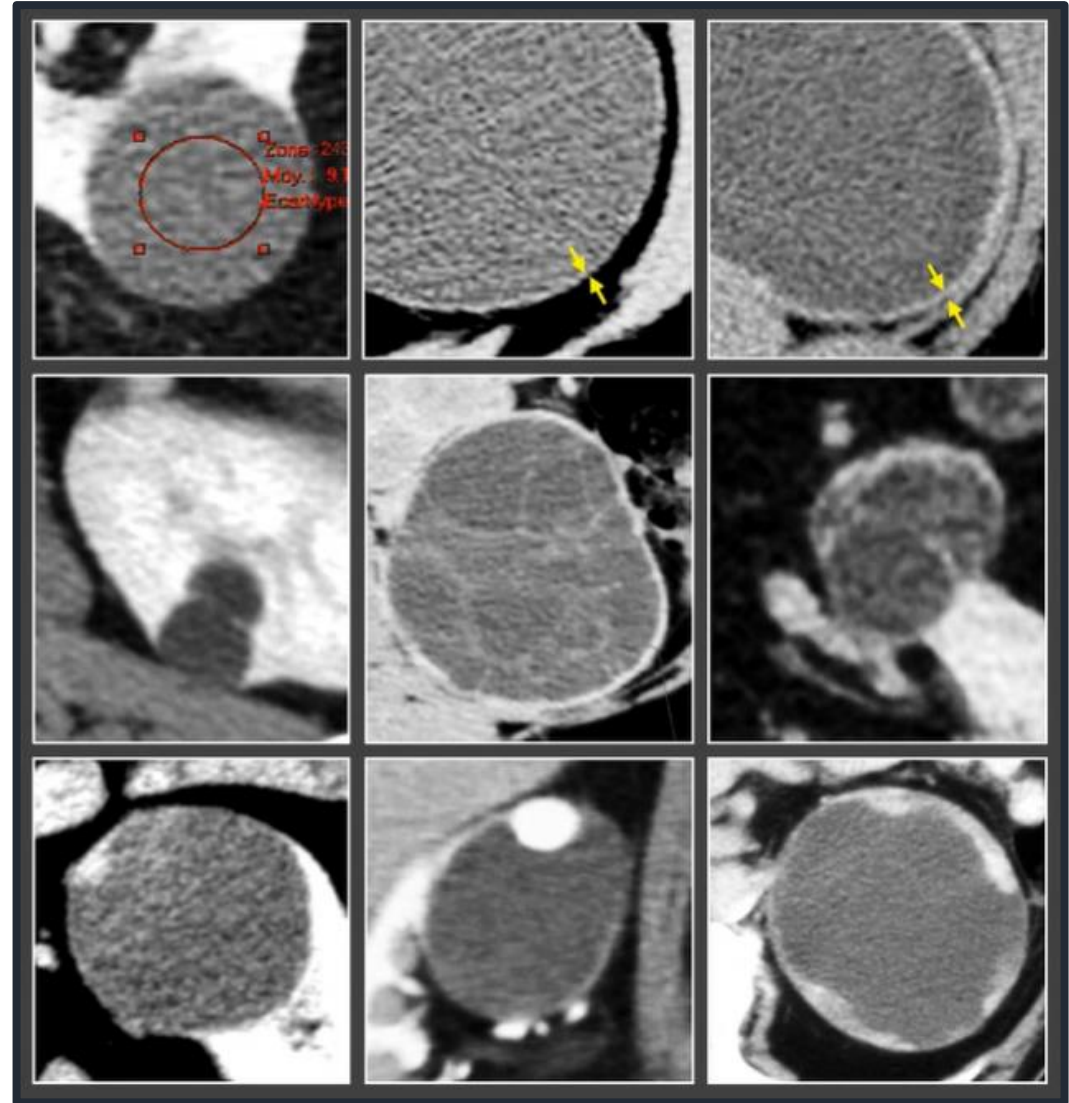
Outils diagnostiques

■ La paroi et les cloisons

- Non visible : interface
- Fine : $\leq 2\text{mm}$
- Epaisse: $\geq 3\text{mm}$
- Nombre de cloisons: 1-3 / ≥ 4
- Régulière vs irrégulière

➤ Épaississement focal:

- Angle obtus $< 4\text{mm}$
- Angles obtus $\geq 4\text{mm}$
- Nodulaire angles aigus



Outils diagnostiques

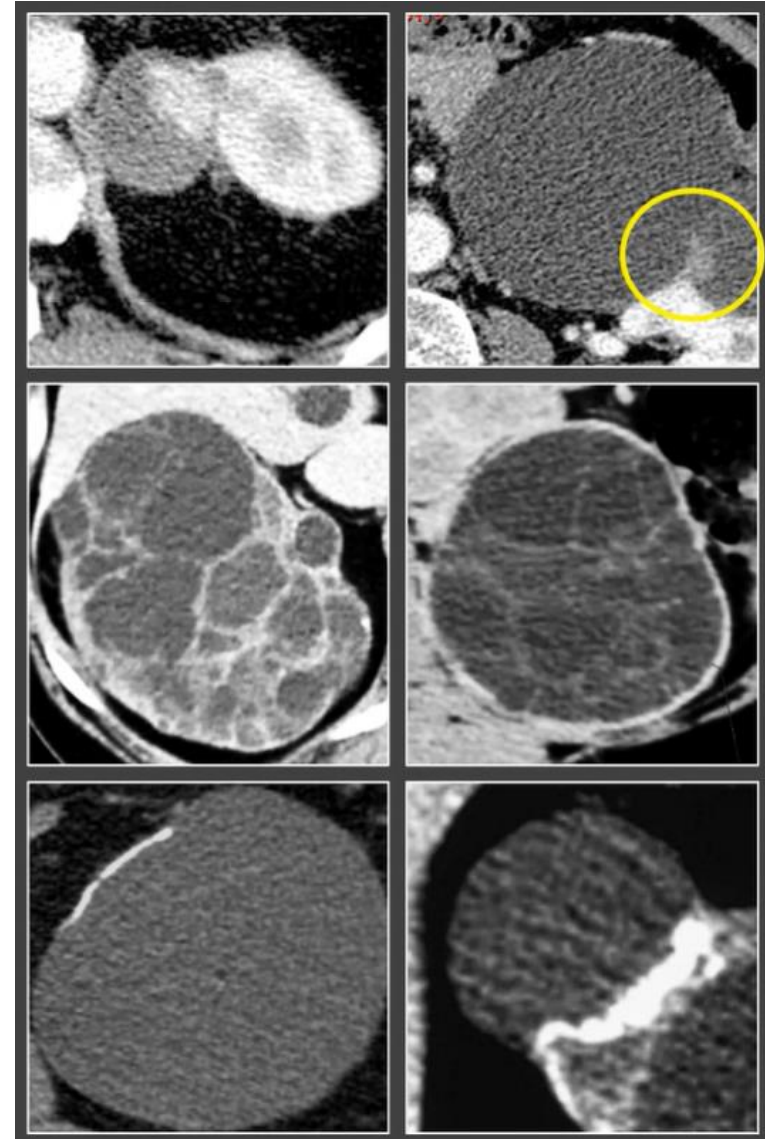
■ La paroi et les cloisons

➤ Rehaussement:

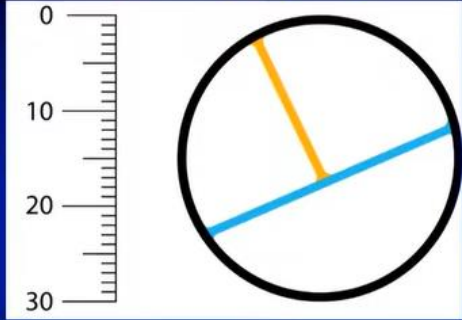
- Perceptible non mesurable
- Mesurable modeste/marqué
- Fct épaisseur → R+ vs R-

➤ Calcifications:

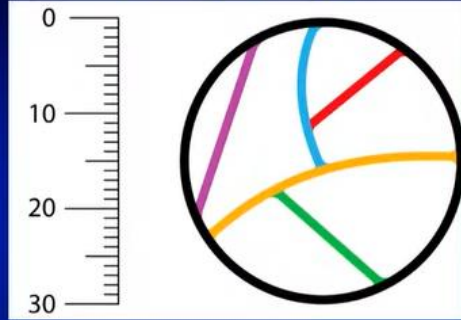
- Fine / punctif. Vs épaisse
- Régulière vs irrégulière



Few (≤ 3) vs Many (≥ 4) Septa

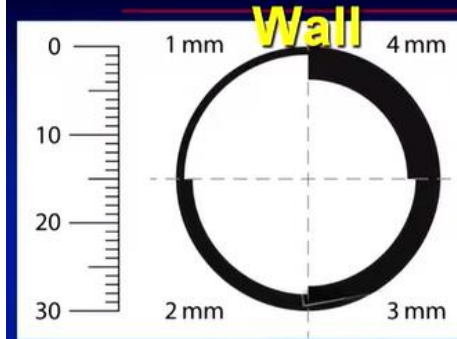


- Two Septa
- Bosniak II: 3 or less, thin septa

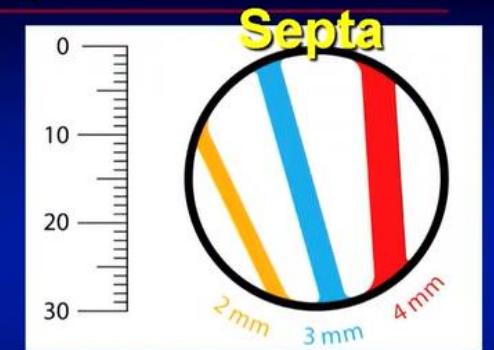


- 5 Septa
- Bosniak IIF: 4 or more, thin septa

Thin vs Minimally thick vs Thick



- ≤ 2 mm = Bosniak I, II
- 3 mm = Bosniak IIF if enhancing
- 4 mm = Bosniak III if enhancing

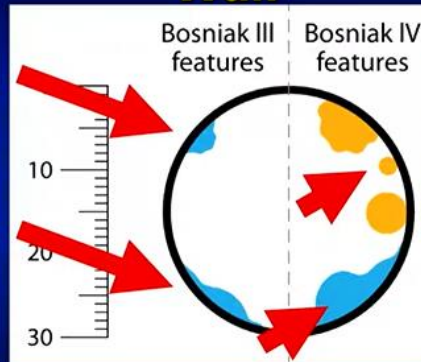


- ≤ 2 mm = Bosniak I, II
- 3 mm = Bosniak IIF if enhancing
- 4 mm = Bosniak III if enhancing

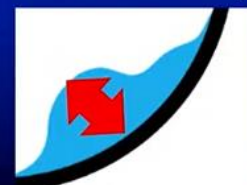
Nodule vs irregularly thickened

Wall

- Bosniak III because convex protrusions are < 4 mm (perpendicular to wall) and with obtuse margins



- Bosniak IV because convex protrusions are with acute margins or are with obtuse margins and ≥ 4 mm (perpendicular to wall)



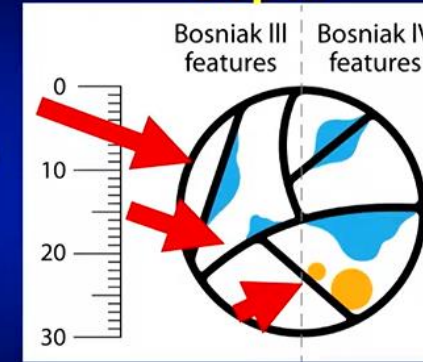
Irregularly thickened

Nodules

Nodule vs irregularly thickened

Septa

- Bosniak III because convex protrusions are < 4 mm (perpendicular to septa) and with obtuse margins



- Bosniak IV because convex protrusions are with acute margins, or are with obtuse margins and ≥ 4 mm (perpendicular to septa)

Irregularly thickened

Nodules

Bosniak I Cyst

■ Original Definition

- Well-marginated
- Water attenuation (-10HU - +20HU)
- No enhancement, no septa or Ca²⁺
- Hair-line thin, smooth wall

■ Proposal

- Hairline: ≤ 2mm; wall may enhance
- -9 HU - + 20HU; US and MRI can be used



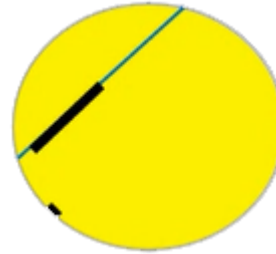
Benign simple cyst

Silverman SG et al Radiology 2019

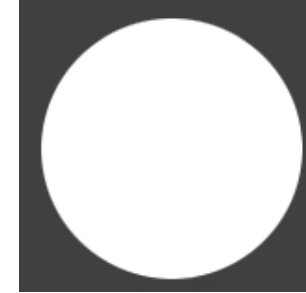
Bosniak II Cyst

■ Original Definition

- Well-marginated
- Water attenuation



Cat.II



Cat.II hyperdense

= Type I + D \geq 50UH
Hémorragie ancienne
Riche en protéines
« Lait » calcique

- Thin and few smooth septa, no enhancement

- Thin, border forming Ca²⁺



■ Proposal

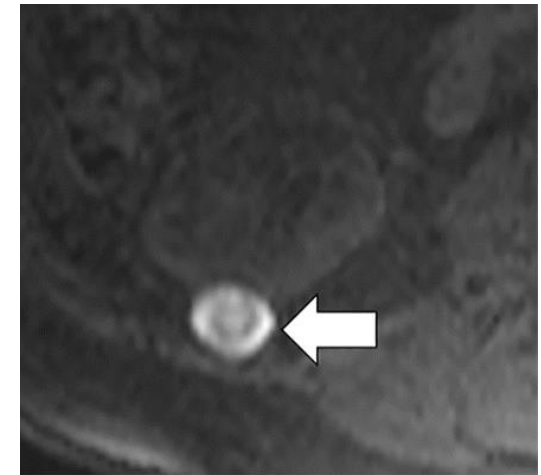
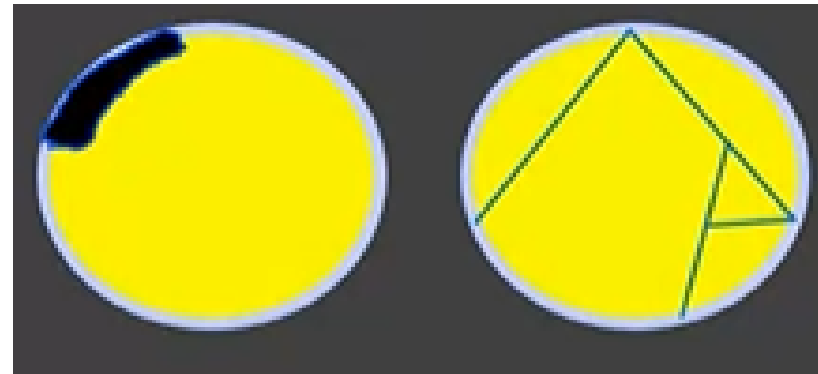
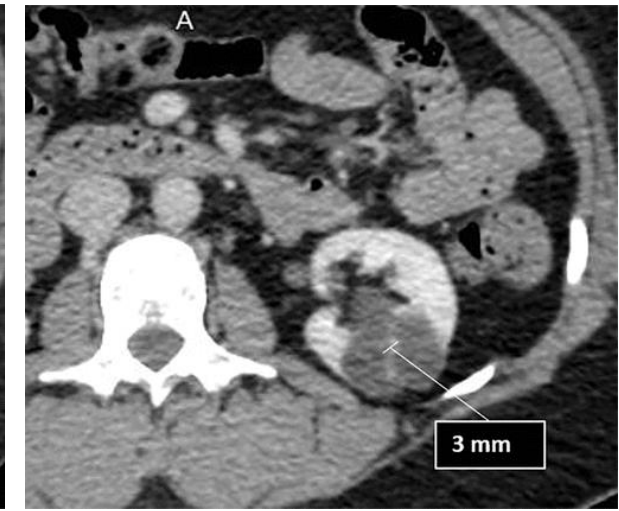
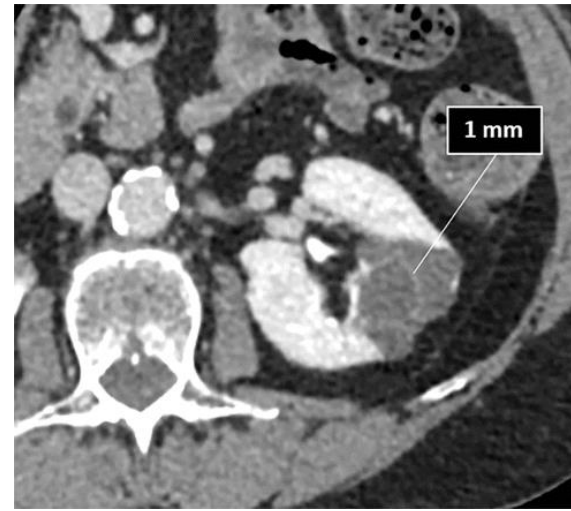
- Thin septa/wall: \leq 2mm; few; \leq 3; septa/wall may enhance
- Any Ca²⁺; obtain MRI if abundant



Bosniak IIF Cystic Mass

■ Original Definition

- Well-defines margin
- Many septa: may be minimally thick
- Perceived only enhancement
- Hyperdense cysts > 3cm
- Thick Ca^{2+}



■ Proposal

- Smooth minimally thick (3mm) enhancing wall/septa, or many (≥ 4) . Smooth thin ($\leq 2\text{mm}$) enhancing septa;
- MRI hyperdense 'cysts' > 3cm, and masses with thick Ca^{2+}

Bosniak III Cystic Mass

■ Original Definition

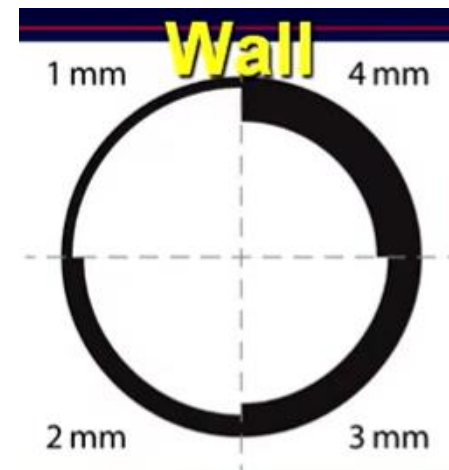
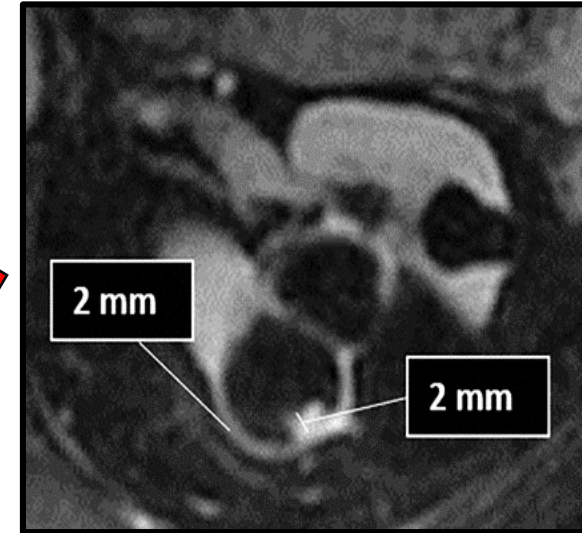
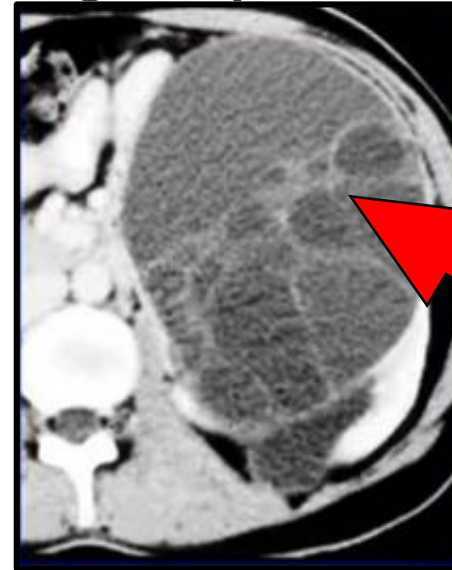
- Well-defines margin
- Thick septa (one or more)
- Measurable enhancement

■ Proposal

- CT or MRI: one or more enhancing thick ($\geq 4\text{mm}$ width) or enhancing irregular (displaying $\leq 3\text{mm}$ obtusely margined convex protrusions(s)) in walls or septa

Silverman SG et al Radiology 2019

Benign, septated cyst



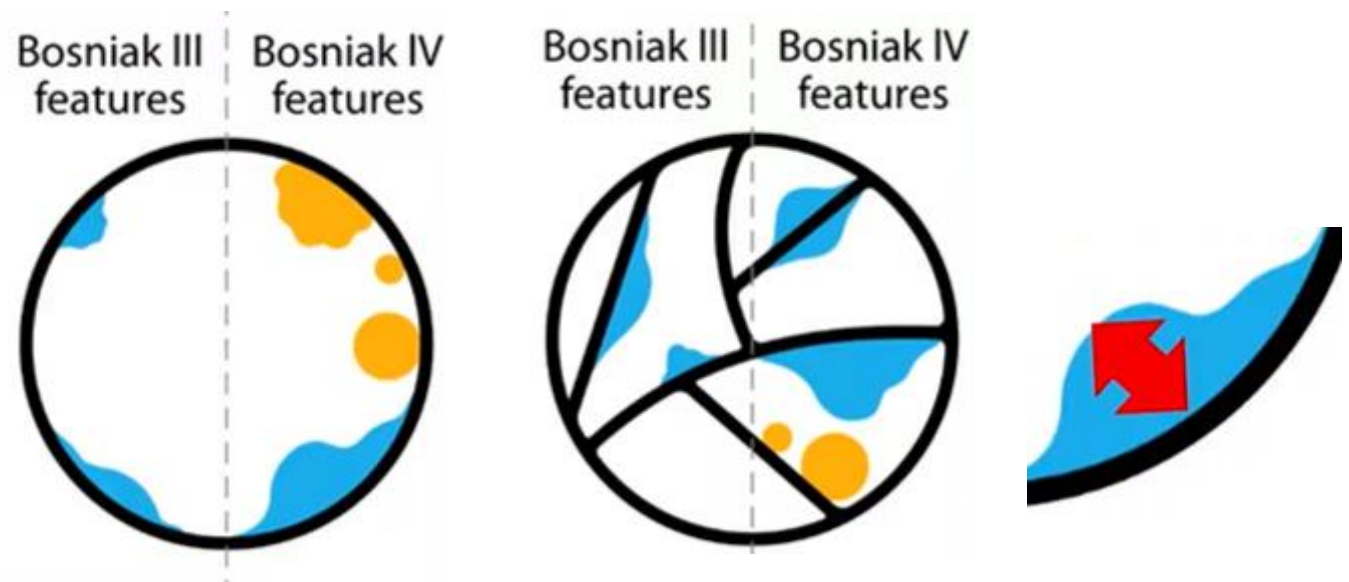
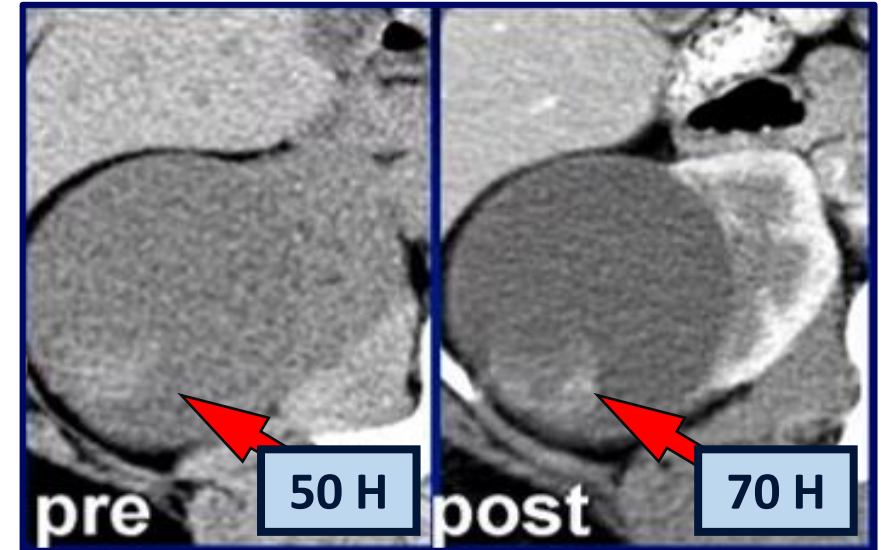
Bosniak IV Cystic Mass

■ Original Definition

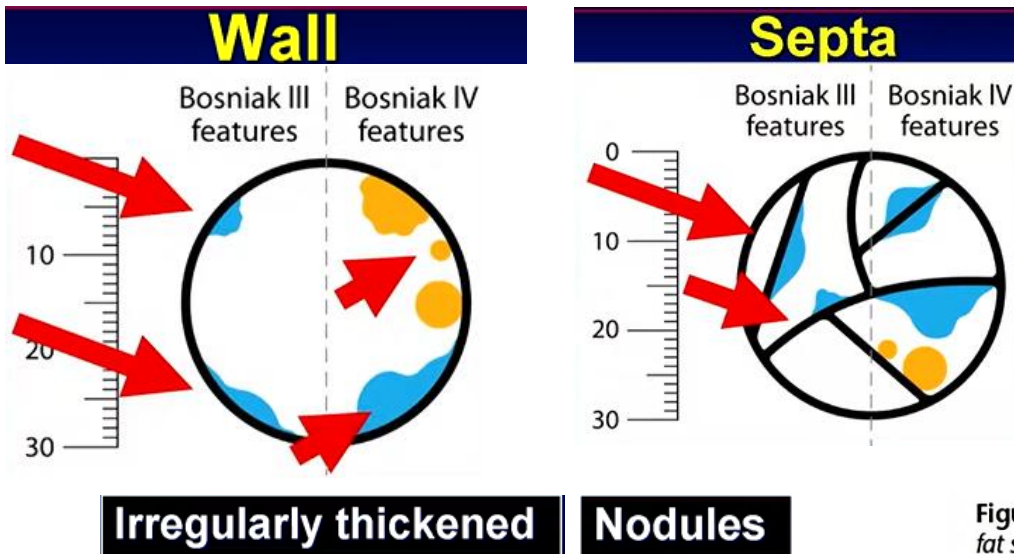
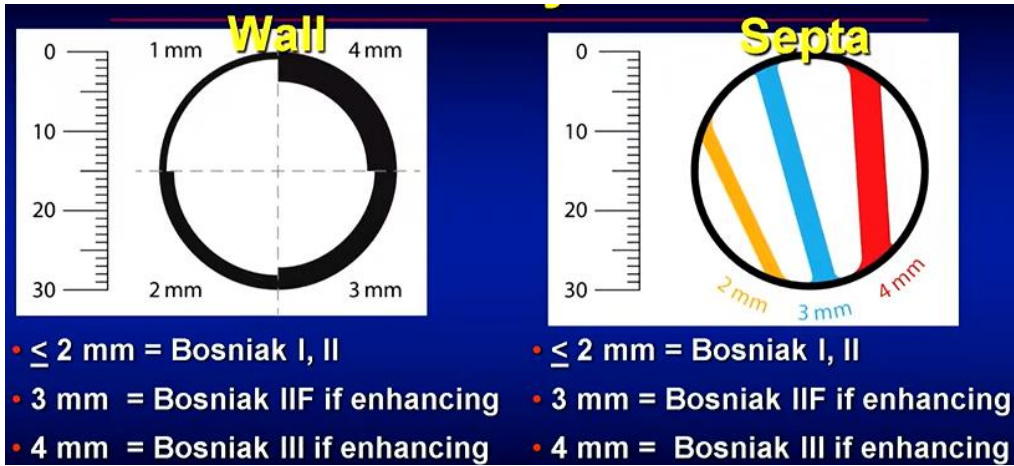
- Enhancing **nodule(s)** apart from the wall

■ Proposal

- CT or MRI: One or more enhancing nodule(s) ($\geq 4\text{mm}$ convex protrusion with obtuse margins, or any size convex protrusion with acute margins)



Silverman SG et al Radiology 2019



Renal Mass Protocol MRI and <25% enhancing tissue and no macroscopic fat

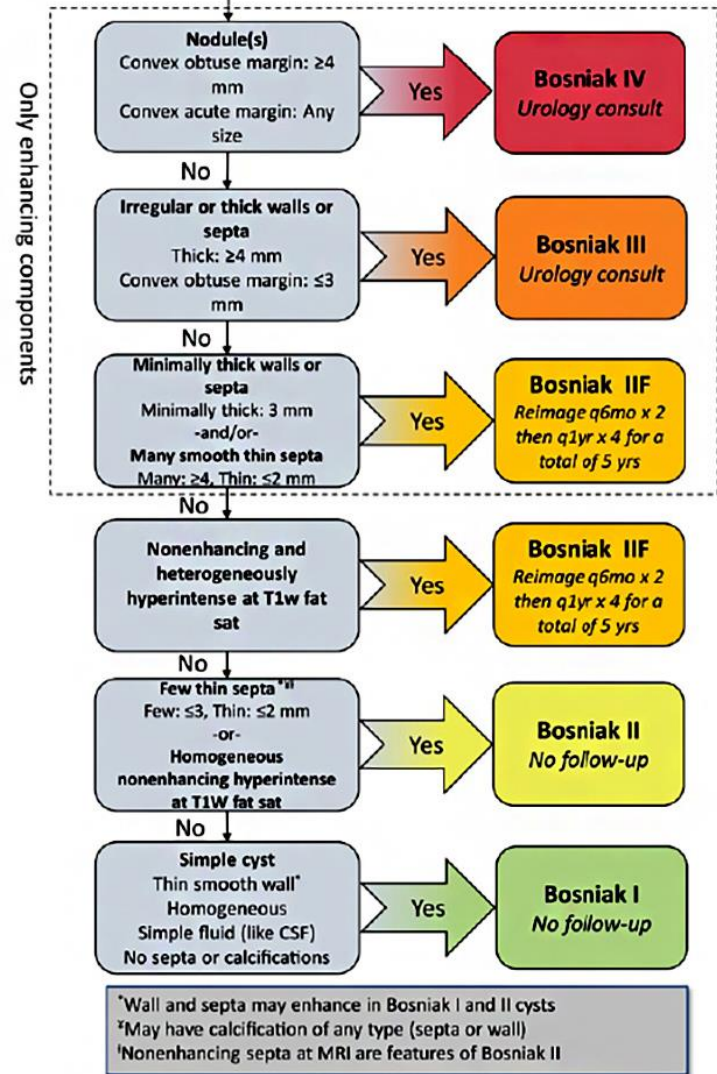
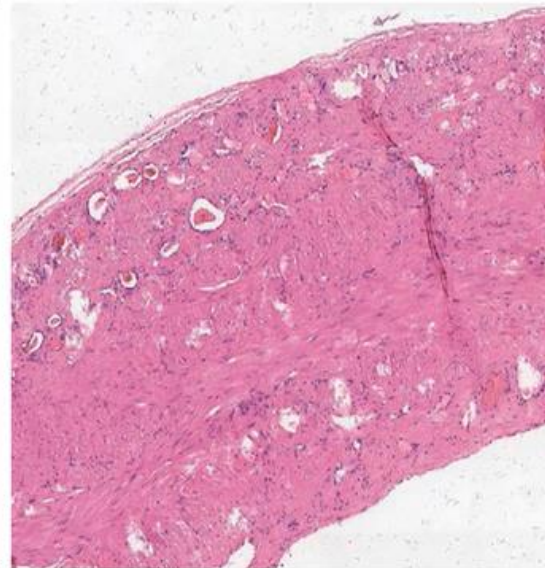
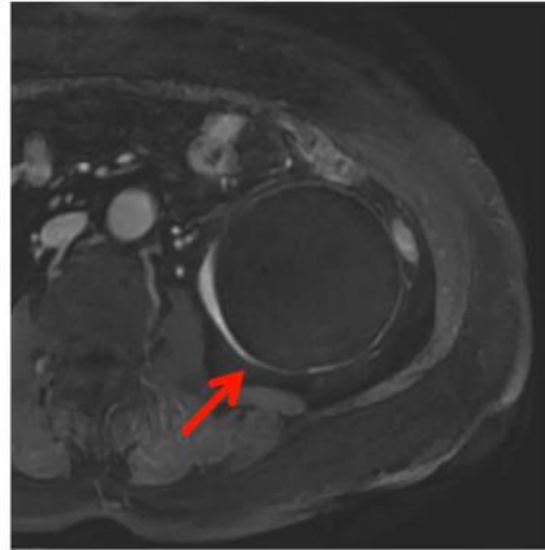
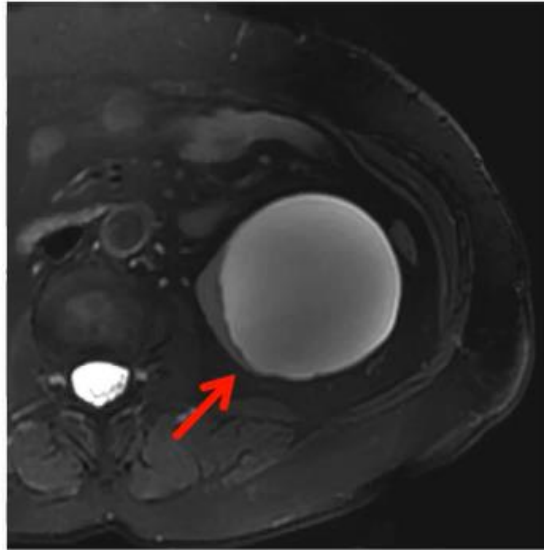


Figure 3. Flow diagram shows how to apply the Bosniak classification of cystic masses, version 2019 at MRI. CSF = cerebrospinal fluid, fat sat = fat saturated, q1 yr = every year thereafter, q6mo = every 6 months, SI = signal intensity, T1w = T1-weighted, T2w = T2-weighted.

2019 (Class I) version vs 2005 (Class IIF)



Classification:

Class I cyst (Bosniak version 2019)

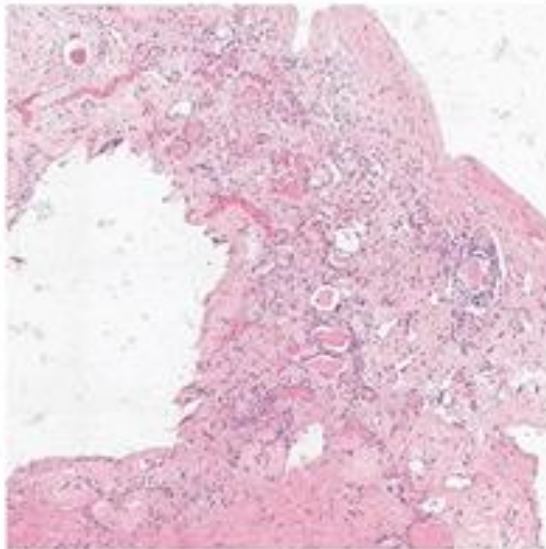
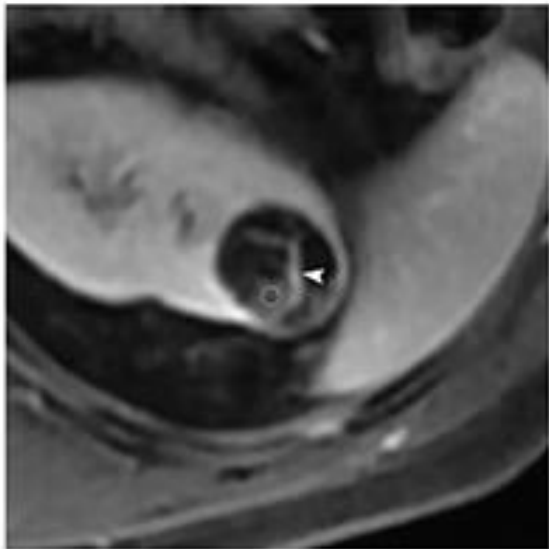
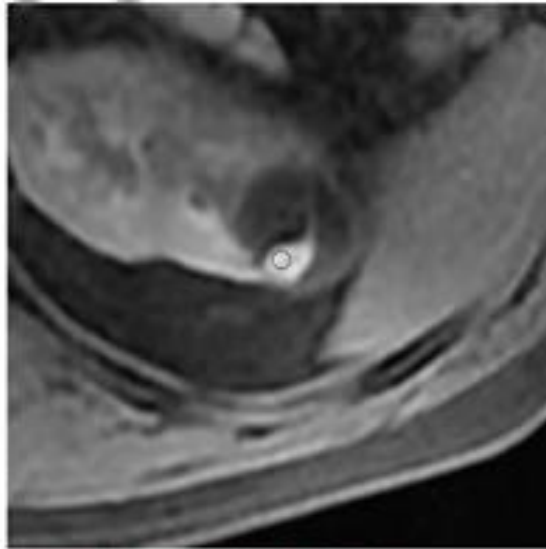
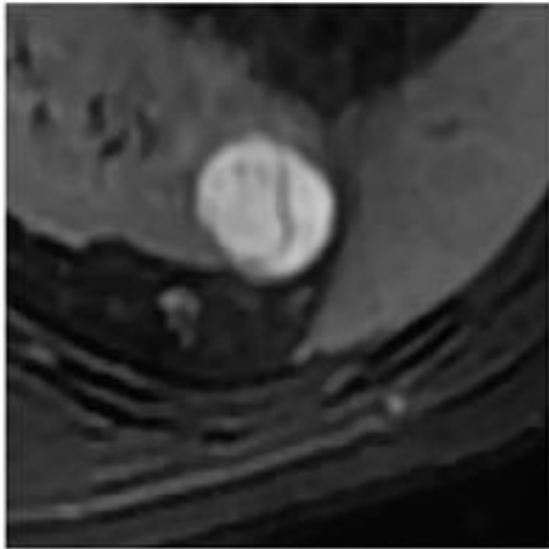
Thin \leq 2 mm wall

Class IIF cyst (Bosniak version 2005)

Thicker-than-hairline wall

Perceived enhancement of wall

2019 (Class IIF) version vs 2005 (Class III)



Classification:

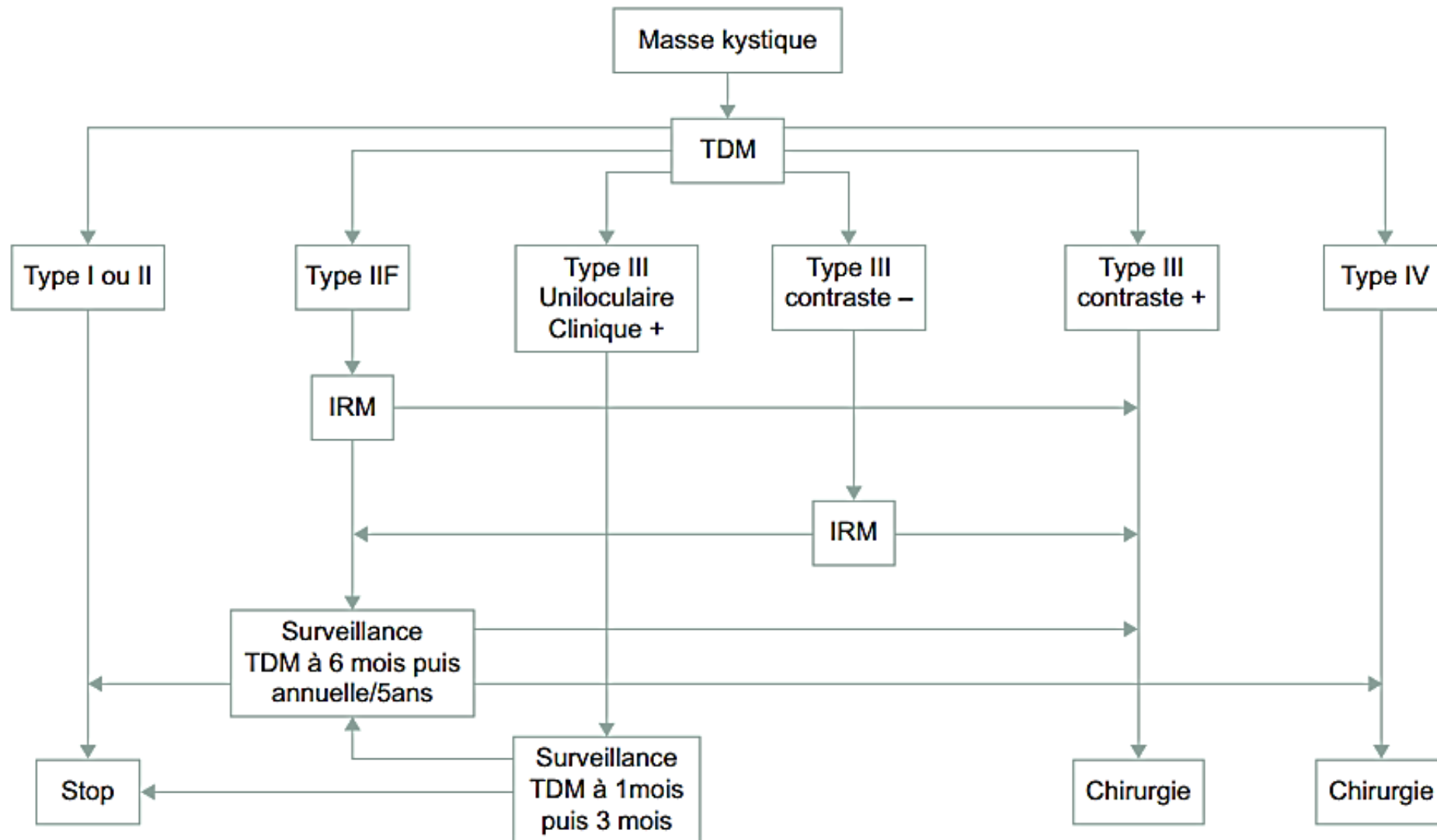
Class II F cyst (Bosniak version 2019)

Minimally thickened enhancing septum

Class III cyst (Bosniak version 2005)

Measurable enhancement of thickened septum

Place de l'IRM



CONCLUSION

- La classification Bosniak version 2019 vise à améliorer la capacité de la classification originale, Cependant elle reste un système de prédiction de malignité et non un algorithme de gestion complet (Les facteurs liés au patient tels que l'âge, les comorbidités, l'EDV, les préférences et la tolérance de risque doivent tous être pris en compte dans un plan de traitement).
- Des études plus approfondies seront nécessaires pour déterminer si la classification actualisée de Silverman permettraient de mieux gérer les masses rénales kystiques.



Merci de votre attention !

