

Renal Papillary Adenoma

Morphology · differential diagnosis · classification boundaries

Renal epithelial neoplasms

An integrated pathology lecture

Dr Abu Suraih Sakhri

MBBS, MD (Pathology)

www.abusuraihsakhri.com

Learning objectives

- Define papillary adenoma within the spectrum of renal epithelial tumors.
- Recognize its gross and microscopic features.
- Apply the low-grade morphology and 15-mm size boundary correctly.
- Differentiate mimics and explain limitations of biopsy, IHC, and genetics.
- Interpret small renal lesions using clinical and sampling context.

Renal tumors: Position of papillary adenoma

Renal neoplasms

```
graph TD; A[Renal neoplasms] --> B[Benign / low-risk lesions]; A --> C[Malignant neoplasms]; B --> D[Example: Papillary adenoma<br/>Small, bland tubular / papillary lesion in the cortex.]; C --> E[Example: Papillary RCC<br/>Morphologic overlap; Classification requires complete context.];
```

Benign / low-risk lesions

Malignant neoplasms

Example: Papillary adenoma

Small, bland tubular / papillary lesion in the cortex.

Example: Papillary RCC

Morphologic overlap; Classification requires complete context.

Core distinction

“Papillary” describes architecture; It does not independently define biologic behavior.

Definition: A small renal tubular epithelial neoplasm

- Papillary adenoma is a discrete proliferation of renal tubular-type epithelium.
- Architecture is papillary, tubular, or tubulopapillary.
- The cells show bland, low-grade cytology.
- It is categorized separately from papillary renal cell carcinoma.

Do not infer

“Adenoma” requires size and morphologic context—not a single bland field.

Why papillary adenoma is a useful diagnostic concept

Observation

Common microscopic incidental finding

Often not a clinically evident mass

Can resemble a small papillary RCC

Frequently discovered during evaluation of another process

Practical consequence

Separates low-risk lesions from malignancy

Avoids overtreatment from isolated cytologic resemblance

Requires careful size and grade assessment

Encourages whole-lesion evaluation

Autopsy prevalence is substantial

7%–22%

Autopsy frequency reported

Interpretation

These tumors are frequent occult pathologic findings; Do not equate an autopsy percentage with clinical cancer incidence.

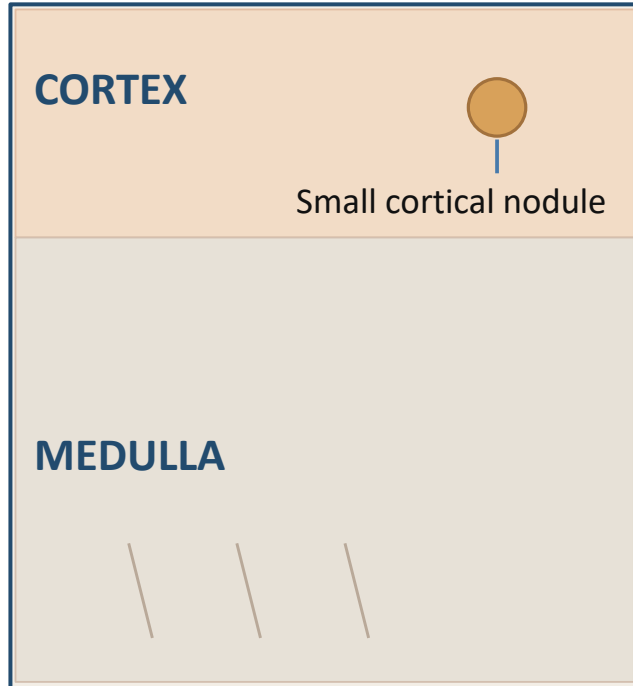
Prevalence does not mean clinical aggressiveness



Avoid conflation

An incidental benign epithelial nodule is not equivalent to a diagnosed renal carcinoma.

Anatomic origin: Renal tubular-type epithelium



Schematic section

Anatomic context

Papillary adenomas arise in the renal parenchyma, usually as cortical nodules; They do not originate in urothelium lining the renal pelvis.

Cortical location separates it from pelvic tumors

Papillary adenoma

Cortical parenchyma

Renal epithelial tumor

Papillary / tubular microarchitecture

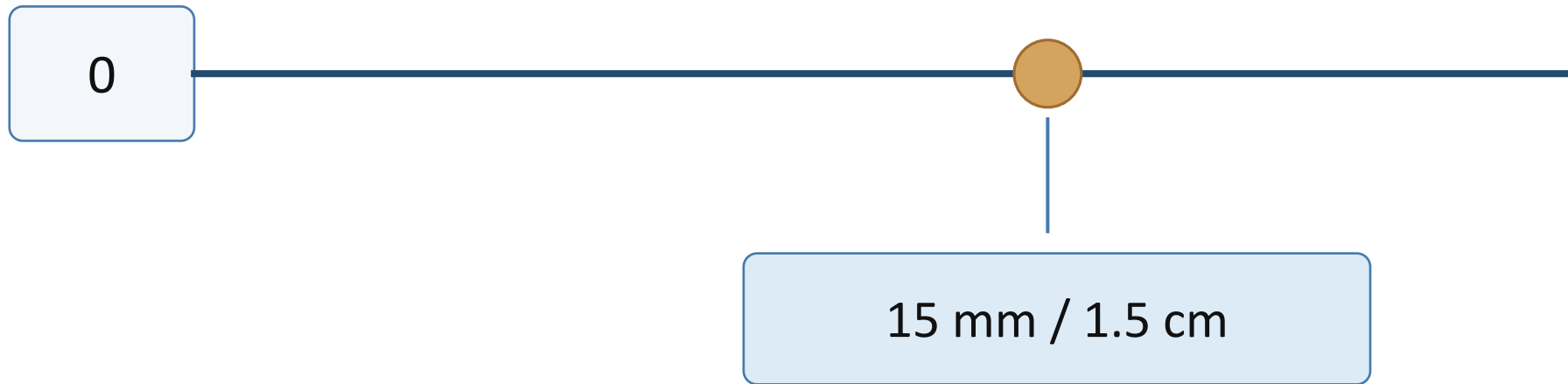
Pelvic urothelial lesion

Renal pelvis or calyces

Urothelial lining / urothelial tumor

Different histogenesis and morphologic differential

Gross size: Small, typically below 1.5 cm

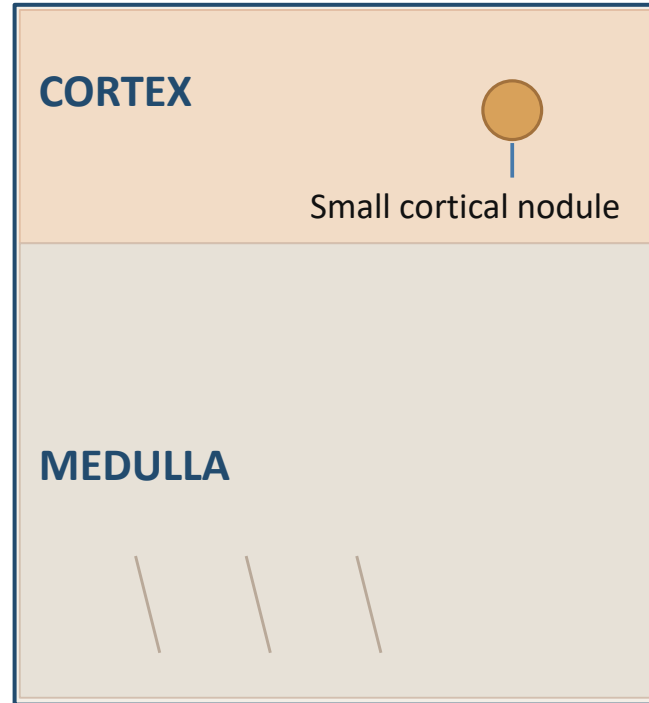


Teaching threshold in modern classification

Important

This cutoff is operational. Size does not override cytologically aggressive features.

Gross distribution: Circumscribed cortical nodules



Schematic section

Robbins description

Discrete, well-circumscribed, pale yellow-gray nodules located in the renal cortex.

Pathology implication

Small cortical foci may be detected only by careful sampling or on non-tumor renal tissue sections.

Gross appearance cannot confirm histologic subtype

Macroscopic clue

Small size

Sharp circumscription

Pale yellow-gray appearance

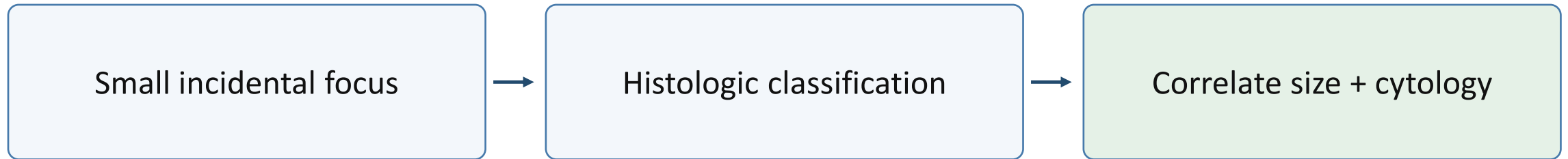
Why it is insufficient

Not exclusive to papillary adenoma

Other renal tumors may look circumscribed

Microscopic features and full context are required

A clinically detected renal mass is a different setting



Clinical boundary

Do not label a radiologic renal mass “papillary adenoma” on size alone.

Microscopic architecture is papillary and tubular

Papillary

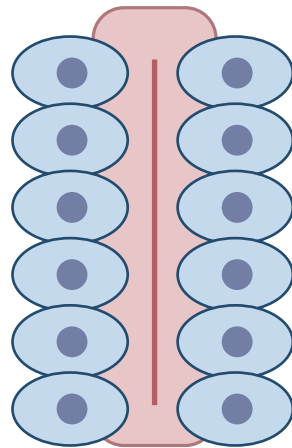
Branching fronds form a complex papillary configuration.

Tubular

Tubule-like channels may constitute part of the lesion.

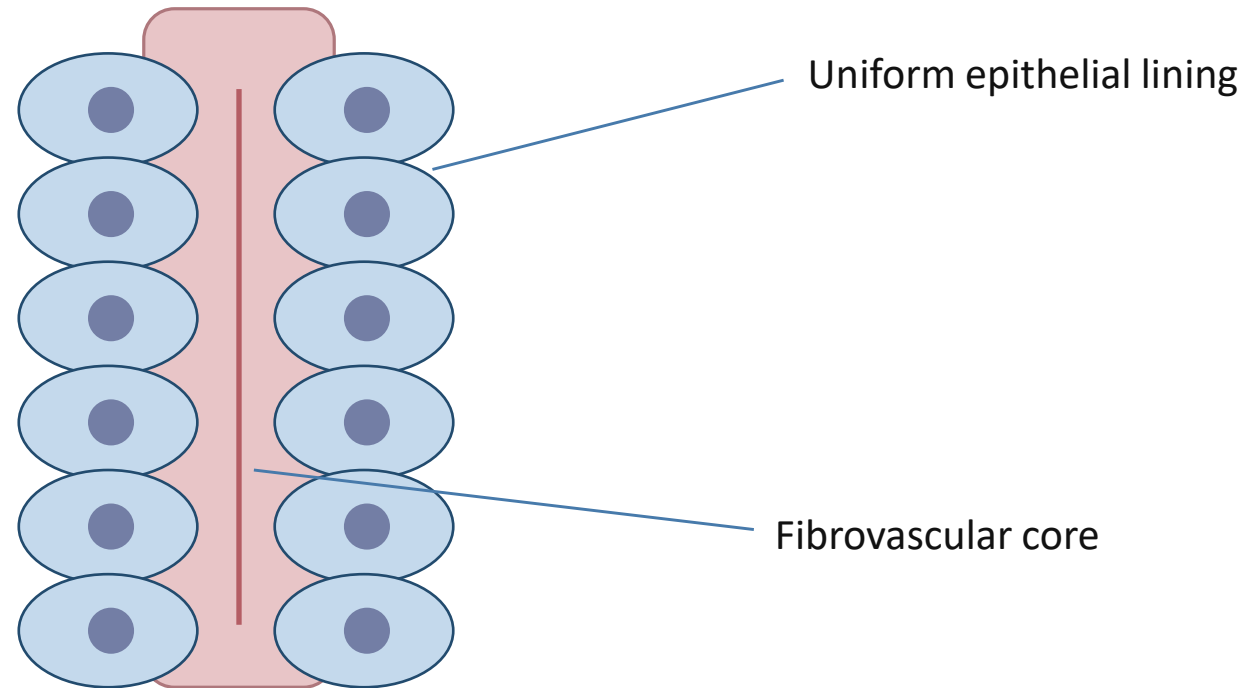
Solid nests

Areas of compact epithelial growth may also occur.



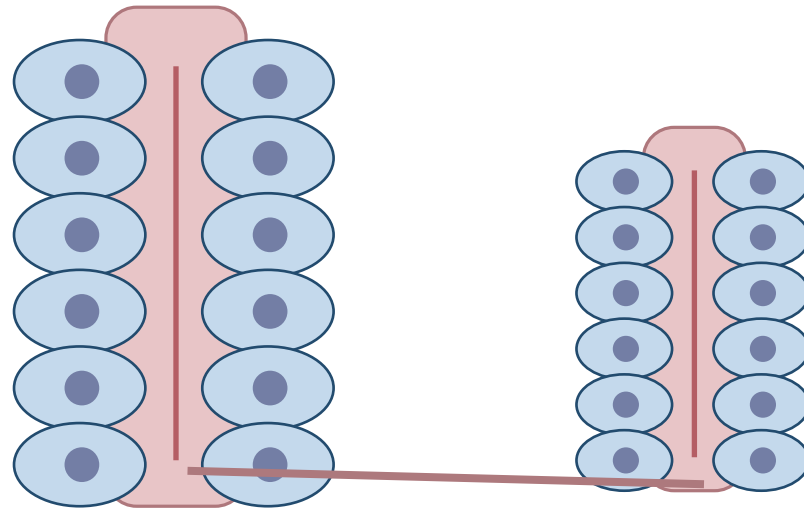
Schematic

Papillae are epithelial fronds around a central core



Schematic

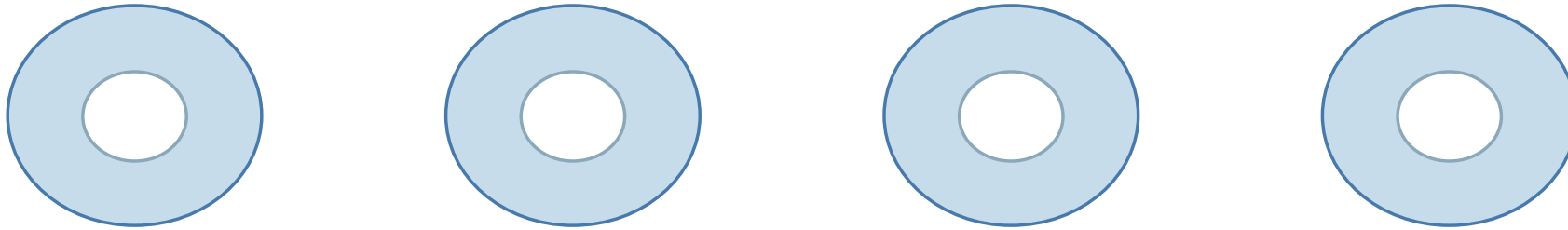
Branching papillae explain the lesion name



Branching fronds create a complex papillary contour

Schematic

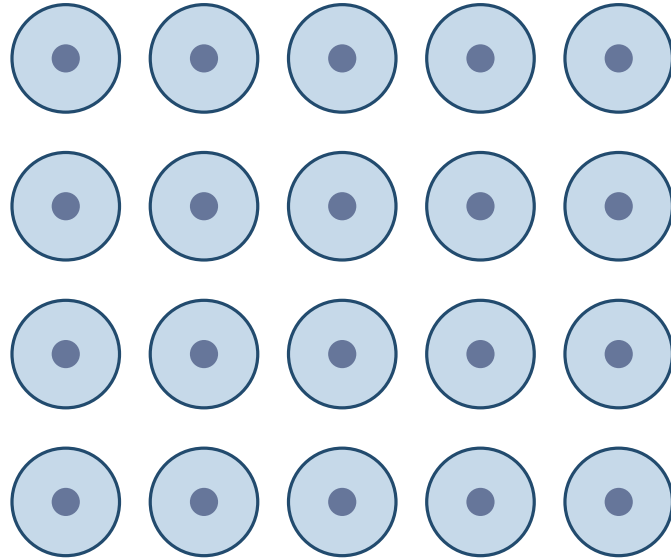
Tubules can coexist with papillae



Tubulopapillary architecture can vary within one small lesion

Schematic

Solid cell nests are compatible with adenoma



Interpretation

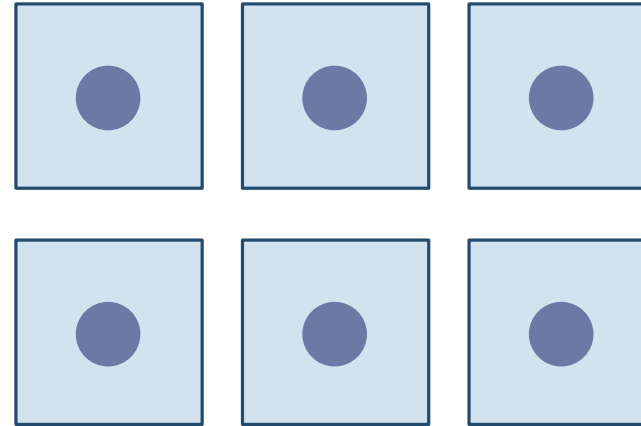
A compact nest-like field is not sufficient to call a neoplasm malignant. Architecture must be integrated with the overall low-grade lesion.

Schematic

Epithelial cells are cuboidal to polygonal

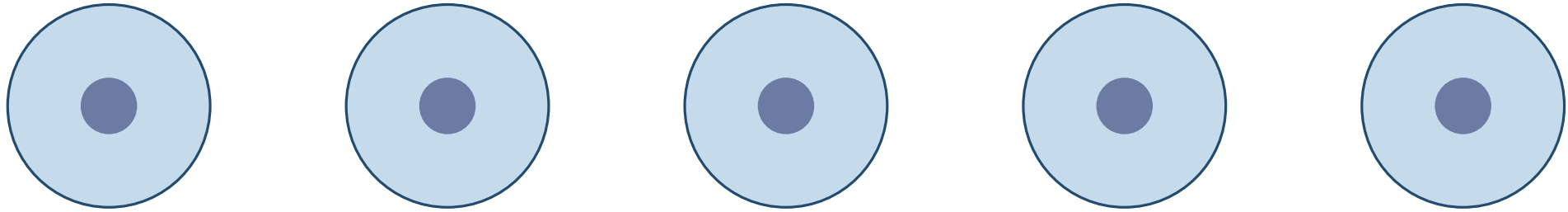
Expected cell form

Low, uniform epithelial cells line papillae and tubules; Cells are not overtly pleomorphic.



Schematic

Nuclear appearance: Small and uniform



Regular, small central nuclei; No significant atypia

Schematic

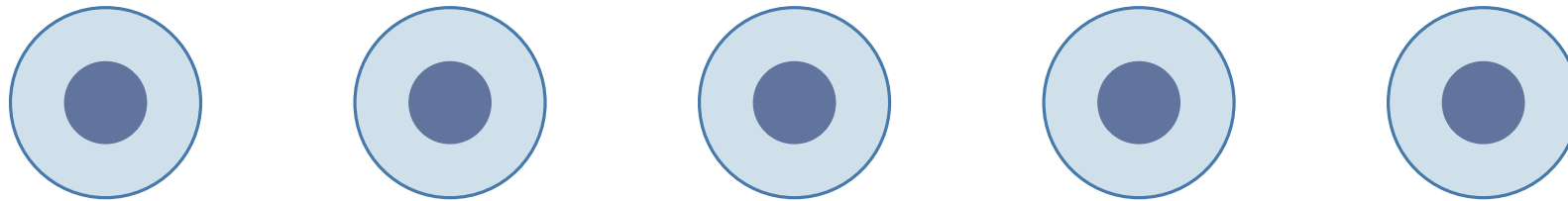
Cytoplasmic appearance: Scant relative to nucleus

Robbins

Cells have scant cytoplasm with bland central nuclei.

Diagnostic relevance

Cytoplasmic volume alone is nonspecific;
Uniform nuclei and lesion-level classification
remain more important.



Schematic

Absent atypia is integral, not incidental

Compatible with low grade

Small, similar nuclei

Smooth contours

No marked pleomorphism

No overtly malignant cytology

Features to investigate

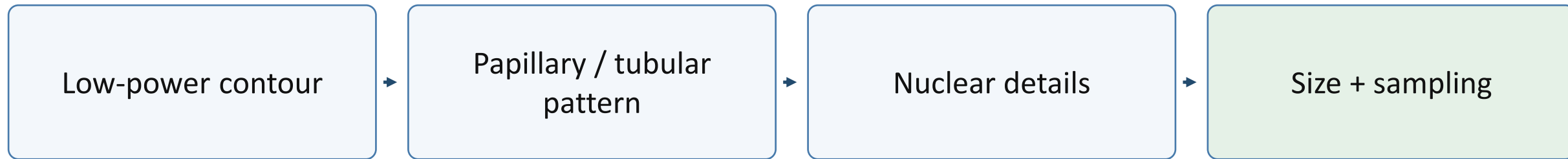
Striking nucleoli

Marked pleomorphism

Necrosis or aggressive architecture

Concern for carcinoma → reassess diagnosis

Low-power to high-power assessment



Sequence

Architecture and nuclear findings must be reviewed across the full lesion.

A summary of the core morphologic pattern

Domain	Typical finding	Diagnostic role
Site	Renal cortex	Supports location
Gross	Pale, small, circumscribed	Not independently diagnostic
Architecture	Papillary / tubular / nests	Establishes pattern
Nuclei	Small, uniform, bland	Low-grade prerequisite
Size	Typically ≤ 15 mm	Operational boundary

Papillary adenoma and papillary RCC share features

Papillary adenoma

Papillary / tubulopapillary growth

Bland small cells in low-grade lesions

Some overlapping immunophenotypic findings

Trisomies of chromosomes 7 and 17

Papillary RCC

Papillary / tubulopapillary growth

Low-grade variants can look identical

Shared marker expression

Shared cytogenetic abnormalities

Cytogenetic overlap: Chromosomes 7 and 17

Trisomy 7

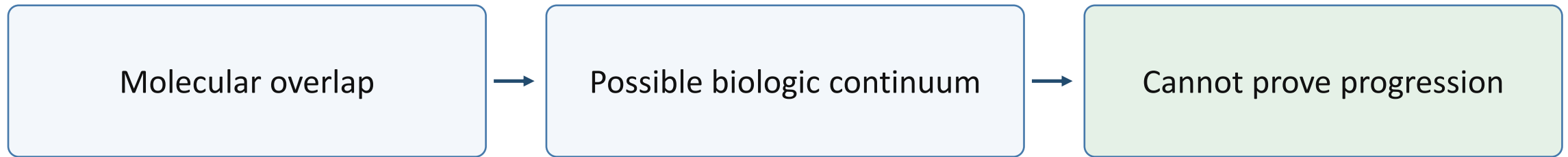
Trisomy 17

Seen in papillary adenoma and papillary RCC

Interpretation

A shared genetic change supports biological relatedness—not a diagnosis of carcinoma.

Shared genetics do not establish malignant behavior



Boundary

An adenoma–carcinoma sequence has been proposed; An individual adenoma cannot be assumed to progress.

Papillary RCC can show MET pathway abnormalities

Small adenoma

Papillary adenoma

Documented overlap: +7, +17

Do not assign MET mutation without testing

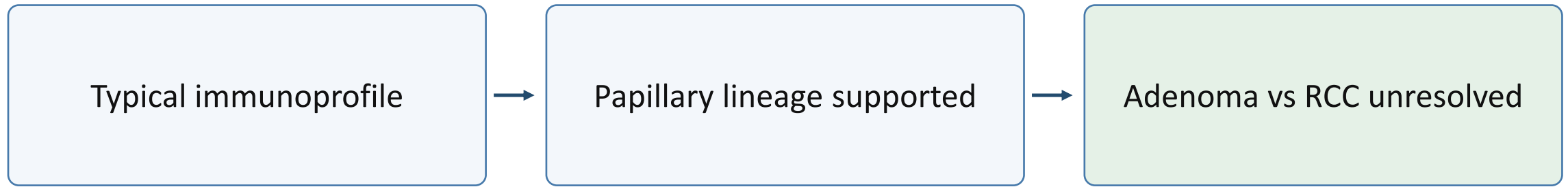
Related carcinoma context

Hereditary papillary RCC

Gain-of-function MET mutations documented

Some sporadic papillary RCCs also harbor MET changes

Immunohistochemistry cannot substitute for size



Central limit

No routine single stain reliably separates papillary adenoma from low-grade papillary RCC.

CK7 and AMACR: Supportive, not decisive

Marker	Usual pattern	Correct interpretation
CK7	Often positive	Compatible with papillary differentiation
AMACR	Often positive	Compatible with papillary differentiation
Together	May support papillary lineage	Do not classify behavior alone

Caution

Stain patterns must be interpreted with morphology, lesion size, and material limitations.

Why a numerical threshold is used

- Bland papillary adenoma and low-grade papillary RCC can be microscopically identical.
- A size boundary operationalizes a practical classification.
- The threshold does not imply an abrupt biological transformation at 15 mm.
- Atypical or invasive features remain red flags regardless of size.

The 15-mm boundary is a diagnostic convention

≤ 15 mm + low-grade features

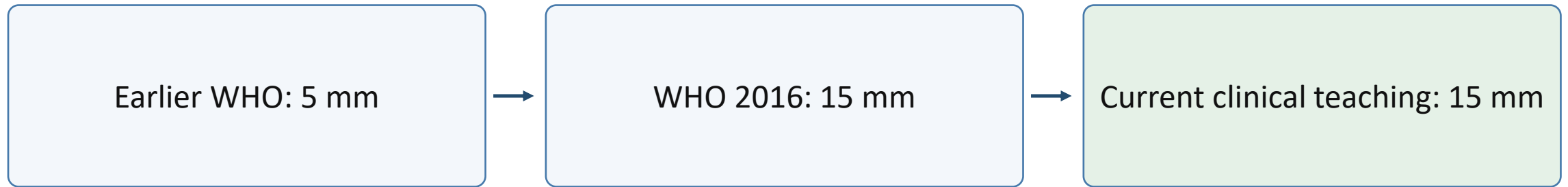
Potential papillary adenoma

> 15 mm

Classify as papillary RCC when appropriate

Not a one-variable rule A small tumor with marked atypia must not be called an adenoma.

How the historical definition changed



Context

Always specify the classification edition when discussing a size threshold.

A 12-mm bland tumor: Possible adenoma

Observed features

Cortical nodule, 12 mm, papillary / tubular, uniform low-grade nuclei.

Reasoning

Size is within the operational boundary and morphology is compatible—provided the entire lesion is assessed.

Caveat

The term should not rest on a limited core biopsy with uncertain true size or unassessed features.

An 18-mm low-grade papillary lesion: Not adenoma

Observed features

Well-circumscribed 18-mm papillary renal epithelial tumor; Nuclei remain bland.

Diagnostic logic

Histologic blandness does not override the size-based definition: Evaluate/classify as papillary RCC.

Pitfall

Do not downgrade a >15-mm papillary RCC to adenoma because of an innocuous appearance.

A 9-mm lesion with marked atypia is not “safe”

Observed features

Small papillary nodule with nuclear pleomorphism and conspicuous nucleoli.

Diagnostic logic

Marked cytologic atypia contradicts the bland adenoma profile even though size is below 15 mm.

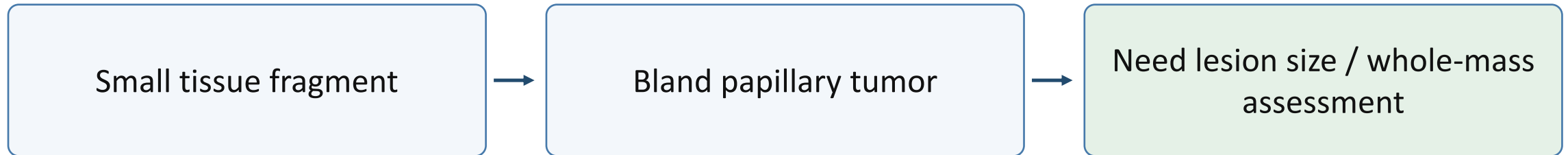
Rule

Assess high-grade features first; The cutoff applies to appropriately low-grade lesions.

Whole-lesion size matters more than slide dimensions

- Record the largest pathologic tumor dimension when available.
- Do not estimate an entire mass from one histologic field or a small core.
- If the lesion is incompletely represented, disclose the limitation.
- Correlate the pathologic specimen with imaging and operative information.

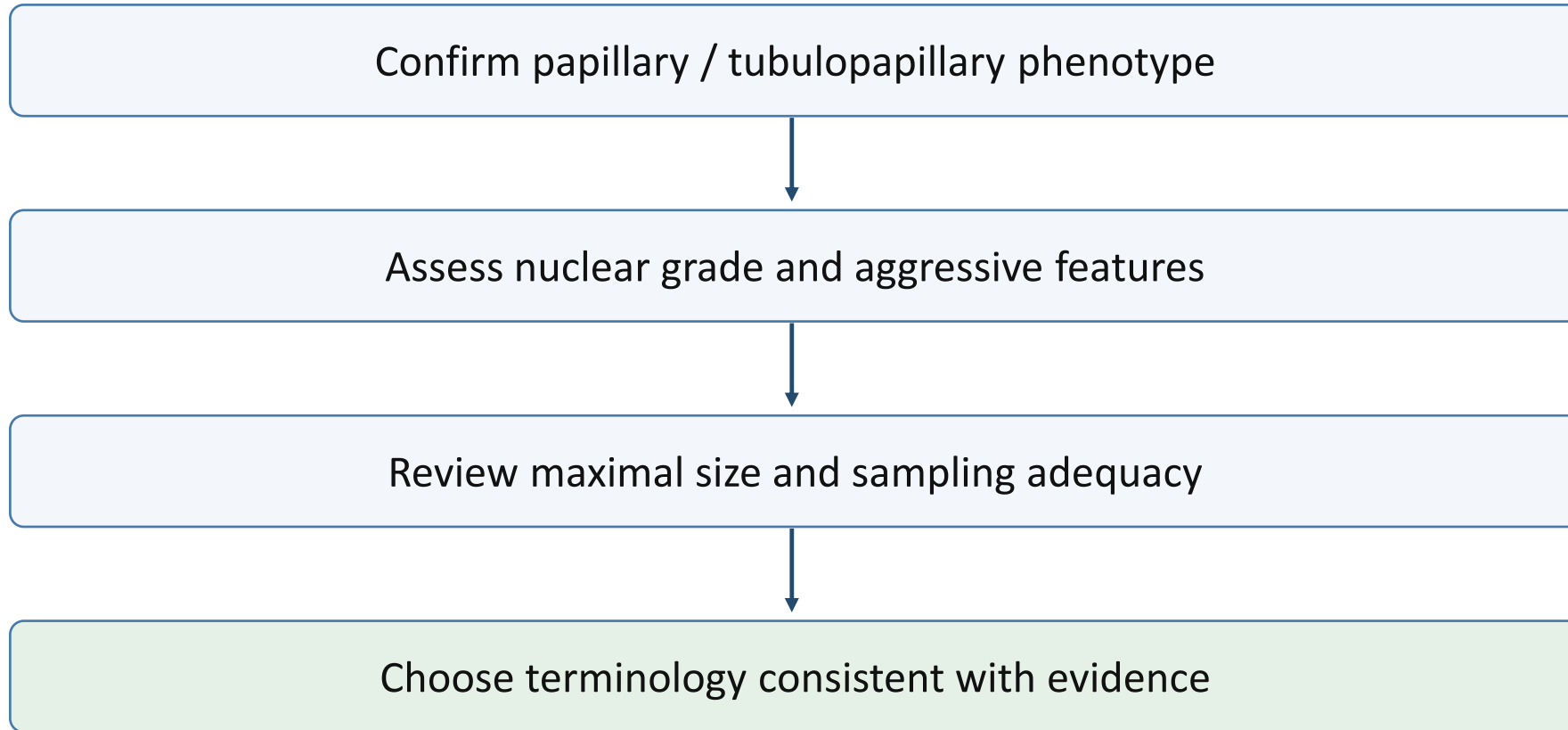
Core biopsy may not establish adenoma



Preferred uncertainty

Report a low-grade papillary renal epithelial neoplasm when categorical classification is unsupported by sampling.

A practical decision sequence for small papillary lesions



Growth pattern and nuclei have different roles

Question	Evidence	Consequence
What is the lineage?	Architecture $\pm$ CK7 / AMACR	Papillary epithelial lesion
Is it bland?	Small regular nuclei; No atypia	Low-grade morphology
Is it an adenoma?	Complete size $\leq$ 15 mm; No warning features	Potential adenoma diagnosis
Is sampling adequate?	Whole lesion / appropriate material	Confidence or qualified report

Papillary RCC is the most important differential

Papillary adenoma

Very small / ≤ 15 -mm category

Bland low-grade cells

Unencapsulated focus may occur

Cannot be separated by IHC alone

Papillary RCC

Often exceeds 15 mm

Can show identical low-grade histology

May be multifocal and larger

Gross size and malignant features decide

Papillary RCC: Additional tumor-level features

- Papillary RCC has papillary, tubular, or solid architecture.
- Larger tumors may be cystic and hemorrhagic.
- Foamy histiocytes can populate papillary cores.
- Psammoma bodies may occur.
- These findings alone do not prove invasion in a tiny lesion.

Clear cell RCC differs in lineage-pattern combination

Papillary adenoma

Small cuboidal or polygonal bland cells

Papillary / tubulopapillary architecture

Generally scant cytoplasm

Clear cell RCC

Commonly clear / granular cytoplasm

Nested, tubular, or solid arrangements

Prominent vascular network; VHL pathway

Renal oncocytoma: A separate benign epithelial tumor

Papillary adenoma

Papillary / tubular architecture

Scant cytoplasm; Small nuclei

Typically a tiny cortical nodule

Oncocytoma

Eosinophilic granular cytoplasm

Many mitochondria; Distinct morphology

Often tan–mahogany, sometimes central scar

Angiomyolipoma: Distinguish a mesenchymal tumor

Papillary adenoma

Epithelial tubules / papillae

Low-grade epithelial cells

Trisomy 7/17 may be present

Angiomyolipoma

Blood vessels + smooth muscle + adipose

Often associated with tuberous sclerosis

Bleeding is an important clinical issue

Metanephric adenoma: A small-cell mimic

Papillary adenoma

Papillary or tubulopapillary

Low-grade cuboidal epithelium

CK7/AMACR often supportive

Metanephric adenoma

Closely packed tiny tubules; Glomeruloid areas

Very scant cytoplasm / basophilic look

Distinct ancillary profile may help

Tubulopapillary hyperplasia may resemble a tiny tumor

Papillary adenoma

Expansile, discrete neoplastic nodule

Distorts/displaces renal microarchitecture

Organized papillary and tubular proliferation

Tubulopapillary hyperplasia

Non-expansile proliferation

Native renal architecture remains recognizable

Interpret in background kidney context

Diagnostic comparison across four entities

Entity	Architecture / cytology	Crucial distinction
Papillary adenoma	Small bland papillary/tubular	≤15 mm + bland + appropriate sampling
Papillary RCC	Papillary/tubular, variable grade	Size >15 mm or malignant features
Oncocytoma	Eosinophilic oncocytes	Granular cytoplasm / solid architecture
Angiomyolipoma	Vessels + muscle + fat	Mesenchymal components

Anatomic and histologic context must agree



Do not shortcut

A papillary growth pattern cannot replace examination of the cells and background kidney.

Background renal disease can alter detection

- Papillary adenomas are encountered in kidneys examined for other diseases.
- The published literature reports increased detection in end-stage kidneys.
- Background tubular changes may complicate interpretation of microscopic foci.
- Do not equate an association with proof that one lesion will progress.

Multiplicity requires assessment, not assumption

Small papillary lesions

Multiple papillary adenomas can be detected in parenchyma.

Record number and size where clinically relevant.

Review background disease and tumor history.

Related carcinoma context

Papillary RCC also may be multifocal.

Multiplicity alone cannot establish an adenoma diagnosis.

Consider hereditary context only when the overall findings warrant it.

Reporting example: Complete small benign lesion

Sample educational wording

Papillary adenoma of the kidney, 8 mm, low-grade papillary and tubular architecture, completely examined.

Why this works

Diagnosis is supported by the size, bland morphology, and adequate assessment of the full lesion.

Educational example

Not a universal reporting template or substitute for local synoptic requirements.

Reporting example: Limited papillary tumor biopsy

Sample educational wording

Low-grade papillary renal epithelial neoplasm; Adenoma versus papillary RCC cannot be resolved on this limited sample.

Why this works

It communicates the observed morphology without inventing tumor dimensions or biologic classification.

Follow-up needed

Correlate with radiologic tumor size and clinical context.

Case A: Incidental cortical nodule

Illustrative case

During nephrectomy for an unrelated process, an 8-mm cortical nodule is entirely sampled. Bland papillary / tubular epithelium is present.

Decision point

Which diagnosis best matches the findings?

Interpretation

Papillary adenoma is compatible with this complete, low-grade, sub-15-mm lesion.

Case B: Low-grade but larger tumor

Illustrative case

A 22-mm renal cortical mass shows predominantly papillary growth, scant cytoplasm, and uniform low-grade nuclei.

Decision point

Does bland cytology justify the term adenoma?

Interpretation

No. The lesion exceeds the size convention and should be assessed/classified as papillary RCC.

Case C: Small lesion with an alarming focus

Illustrative case

A 10-mm papillary lesion has areas with pronounced nuclear pleomorphism and conspicuous nucleoli.

Decision point

Can the size cutoff alone establish papillary adenoma?

Interpretation

No. Significant atypia precludes simply applying the benign size-based definition.

Case D: Limited biopsy, uncertain total dimension

Illustrative case

A core biopsy shows bland CK7-positive / AMACR-positive papillary epithelial fragments. Tumor size is not established.

Decision point

What is a defensible pathology interpretation?

Interpretation

Describe a low-grade papillary renal epithelial neoplasm, acknowledge uncertainty, and correlate with imaging.

Five diagnostic rules to retain

- Papillary adenoma is a small, bland epithelial tumor of renal tubular type.
- Papillary, tubular, and focal solid patterns may coexist.
- Its low-grade appearance overlaps with papillary RCC.
- A 15-mm boundary is used only in the correct morphologic setting.
- Ancillary markers and genetics support lineage—not benign behavior.

Primary source and supporting literature

- Robbins, Cotran & Kumar. Pathologic Basis of Disease. 11th ed. Chapter 20, pp. 862–864.
- WHO Classification of Tumours Editorial Board. Urinary and Male Genital Tumours. 5th ed. IARC; 2022.
- Khani F, Robinson BD. Precursor lesions of urologic malignancies. Arch Pathol Lab Med. 2017.
- Renshaw AA et al. Diagnostic terminology for benign / low-risk tumors on renal cytology. Cancer Cytopathol. 2024.
- Lobo J et al. WHO 2022 landscape of papillary and chromophobe RCC. Histopathology. 2022.