Biopsy Diagnosis of Renal Mass: BeST Practical Approach

Steven Shen, MD, PhD
Department of Pathology & Genomic Medicine
Houston Methodist Hospital &
Weill Medical College of Cornell University
Houston, Texas, USA
What I learned from Dr. Ro

• Do Your BeST
• Work Hard
• Teaching is Learning
• Walk Fast
• Check Pubmed
• Write It Up
Renal Mass Biopsy Diagnosis

Outline

• Introduction
• Types of renal tumors
• Categorization and diagnosis
• Use of immunohistochemistry
• Case examples
Introduction

- **Increased** incidence of renal neoplasm and incidental mass
- **Increased** use of partial nephrectomy
- **Increased** treatment modalities (active surveillance, ablative and targeted therapies)
- **Increase** Renal Mass Biopsy (RMB)
Indications for RMB

- Has other primary (r/o mets)
- Has prior renal tumor (r/o recurrence)
- Multiple synchronous tumors
- Suspecting abscess or lymphoma
- Candidates for active surveillance
- Candidates for ablative therapy
- Diagnosis in pts. with disseminated mets or unresectable tumor
RMB: Getting Adequate Material

Insufficient material is common

- Rate variable: 0-47%
  (Volpe A et al. *Eur Urol* 2012; 62: 491)
- More frequent in small, cystic or hemorrhagic, and necrotic lesion

Approaches to getting material

- Communicate with radiologist!
- Correlate with cytology
- Standardized histology protocols
RMB Technical Recommendation

- Image guidance (CT/MRI/US)
- At least 2 cores
- 18G or larger needles
- Sampling peripheral & central
- Complications: rare, tumor seeding exceedingly rare, minimal morbidity

Tsivian M et al. BJUI. 2014
RMB: Objectives

To establish the following:

- Neoplasm or not
- Histologic type
- Tumor grade
- Other features
Diagnostic Accuracy of RMB

86-100% Differentiating malignant from benign

~100% Specificity

86-98% Accuracy histol. subtyping

46-76% Accuracy in grading
Types of Renal Cell Neoplasm Continue to Increase…

1975 (AFIP Fascicle)  2
1997 (UICC/AJCC Consensus)  8
2004 (WHO)  12
2016 (WHO)  16
Renal Cell Neoplasms (2016 WHO)

- Clear cell RCC
- Papillary RCC
- Chromophobe RCC
- Collecting duct ca
- Renal medullary carcinoma
- Renal cell carcinoma, unclassified
- Multilocular cystic renal neoplasm of low malignant potential
- SDH-deficient RCC
- HLRCC-associated RCC
- MiT family translocation RCC
- Mucinous tubular and spindle cell RCC
- Tubulocystic RCC
- ACD-associated RCC
- Clear cell papillary RCC
- Papillary adenoma
- Oncocytoma
Terminology and Its Rationale for Renal Neoplasm is All Over the Place

**Cytoplasm:** clear cell, chromophobe RCC

**Growth pattern:** papillary RCC

**Cell type:** oncocytoma

**Combination pattern & cell:** clear cell papillary RCC

**Embryologic feature:** metanephric adenoma

**Background disease:** ACD-associated RCC

**Anat. location:** collecting duct, medullary carcinoma

**Size:** papillary adenoma

**Molecular changes:** MiT family translocation RCC

**Familial predisposition:** HLRCC-associated, SDH-deficient
Adult Renal Cell Neoplasm by Frequency

- Clear cell RCC ~65%
- Papillary RCC ~15%
- Chromophobe RCC ~6%
- Oncocytoma ~5%
- Clear cell papillary RCC ~3%
- MiT family translocation ~2%
- Others ...
Pattern Categorization

1. Clear cell
2. Papillary
3. Oncocytic
4. Cystic
5. Spindle cell
6. High grade
CLEAR CELL Category

Clear cell RCC
Chromophobe RCC
Clear cell papillary RCC
Xp11 translocation RCC
Papillary RCC with clear cells
Renal urothelial carcinoma
Clear Cell RCC
Morphologic Spectrum

Growth Patterns
- Solid/acinar (classic)
- Tubular/Cystic
- Pseudopapillary
- Hemorrhagic
- Hyalinized

Cytomorphology
- Clear cell
- Granular
- Epithelioid
- Rhabdoid
- Spindly/sarcomatoid
Clear Cell RCC Growth Patterns

- Solid/acinar
- Sinusoid
- Tubular
- Vascular
- Hyalinized
- Hemorrhagic
- Pseudopapillary
- Sclerotic
Clear Cell RCC Cytologic and Nuclear Features
Clear cell RCC: Heterogenous
Clear cell RCC: Heterogenous
Non-clear cell RCC with clear cells

- Papillary RCC
- Chromophobe RCC
- Clear cell papillary RCC
- Renal urothelial carcinoma
PAPILLARY Category

Papillary RCC, type 1 and 2
Clear cell papillary RCC
Clear cell RCC
Chromphobe RCC (rarely)
Mucinous tubular spindle cell ca
Metanephric adenoma
Collecting duct carcinoma
Metastatic
Papillary RCC Morphologic Spectrum

Growth Patterns
- Papillary
- Tubular
- Glomeruloid
- Solid or cystic

Cell Types
- Basophilic
- Eosinophilic
- Clear
- Sarcomatoided
Papillary RCC
ONCOCYTIC Category

Oncocytoma
Chromophobe RCC
Hybrid oncocytic tumor
Clear cell RCC with granular cells
Type 2 papillary or oncocytic papillary
ACD-associated RCC
Epithelioid angiomyolipoma
Carcinoid
Adrenal cortical
Oncocytic Tumor

- Chromophobe RCC
- Oncocytoma
- Angiomyolipoma
- Clear cell RCC
CYSTIC Category

- Clear cell RCC
- Papillary RCC
- Clear cell papillary RCC
- Oncocytoma
- Cystic nephroma/mixed epithelial and stromal tumor of kidney
- Benign cystic renal disease
SPINDLE CELL Category

RCC/UCa with sarcomatoid
Mucinous tubular spindle cell RCC
Leiomyoma/leiomyosarcoma
Angiomyolipomta (fat-poor)
Other renal sarcoma
HIGH GRADE Category

RCC: Any type

Urothelial carcinoma

Metastatic carcinoma
Overall Categorization

- Papillary
- Clear Cell
- Oncocytic
- Spindle/high grade

Cystic
Immunohistochemistry plays an important role in the diagnosis of renal mass biopsy
Renal Tumors
Diagnostic and Prognostic Biomarkers

Puay Hoon Tan, MD, FRCPA,* Liang Cheng, MD,† Nathalie Rioux-Leclercq, MD,‡ Maria J. Merino, MD,§ George Netto, MD,¶ Victor E. Reuter, MD,¶¶ Steven S. Shen, MD,# David J. Grignon, MD,† Rodolfo Montironi, MD, FRCPa,** Lars Egevad, MD,†† John R. Srigley, MD, FRCPC,‡‡ Brett Delahunt, MD, FRCPA,§§ Holger Moch, MD,|||| and The ISUP Renal Tumor Panel


Best Practices Recommendations in the Application of Immunohistochemistry in the Kidney Tumors
Report From the International Society of Urologic Pathology Consensus Conference

Victor E. Reuter, MD,* Pedram Argani, MD,† Ming Zhou, MD, PhD,‡ Brett Delahunt, MD, FRCPA,§ and Members of the ISUP Immunohistochemistry in Diagnostic Urologic Pathology Group

Establishing Renal Cell Origin

- **Recommended marker by ISUP:**
  - PAX-8

- **Potentially useful markers:**
  - CD10
  - RCC marker antigen
  - KSP-cadherin

Reuter V et al. AJSP 014; 38:e35-e49
IHC for Histologic Subtyping

Should be based on morphologic patterns and differential diagnosis

Reuter V et al. AJSP 2014; 38:e35-e49
Diagnostic Approach

- On-site cytologic evaluation
- Multiple H&E levels (3x)
- Growth patterns
- Cytology (cytoplasm)
- Differential diagnosis
- IHC work-up
- Report and communication
Do we need IHC for all cases of renal mass biopsy?

No!

For many tumors that have classic morphology, a histologic diagnosis can be made on H&E section.
Share we see some case examples!

Do I have a good sample?

What’s overall category based on patterns/cells?

Do I see features that are classic for a histologic subtype?

Is it typical enough for a specific diagnosis?

If not, what are my differential?

What are the IHC markers that I may use?

Can I reach a definitive diagnosis?
Case 1: 73 yo female with 5.0 left renal mass
Case 1: Oncocytoma
Case 2: 82 yo man with large R renal mass and inferior vena cava extension.
Case 2: Clear cell RCC
Case 3: 54M 5.5 cm R renal mass
Case 3: Papillary RCC
Case 4: 70M 4.5 cm R renal mass
Case 4: Clear cell RCC

**Markers:**
- CK7
- CD10
- Vimentin
Common Situations That IHC May Be Helpful

- Clear cell RCC with granular cells
- Chromophobe vs. clear cell RCC
- Chromophobe vs. oncocytoma
- Clear cell pRCC vs. clear or pRCC
- Solid papillary RCC vs. clear cell
- High grade carcinoma
- Confirm AML, urothelial ca, etc.
Case 5: Chromophobe RCC
Case 6: 52M with 3.5 cm L renal mass
Case 6: Papillary RCC, type 1

AMACR

CD57

WT-1
Metanephric Adenoma vs Papillary RCC

Metanephric Adenoma

Papillary RCC

RCCm

AMACR

WT-1
Case 7: 78F 2.7 cm R RMB
Case 7: Clear cell papillary RCC
Case 8: 48F 6.5 cm left renal mass
Case 8: Angiomyolipoma
Case 9: 69 F with 6.5 cm right renal mass
Case 9: High grade unclassified RCC with spindle cells
Radical Nephrectomy

- Negative: RCCm, AMACR
- Positive (focal): CK7, Vim, CD10

- Clear cell RCC with sarcomatoid changes
- T3aN1 (5/25)
Case 10: Invasive urothelial carcinoma

CK7

p63
Summary – Renal Mass Biopsy

- Obtain adequate material
- Get familiar with renal tumor entities
- Adopt a pattern-based histologic evaluation and diagnostic approach
- Use IHC in selective situations
- Acknowledge the limitation
Thank you!