

**Specialty area:** SUNRISE Hot Topics in Body MRI

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**Highlights**

- Renal cell carcinoma (RCC) is a heterogeneous disease that includes multiple histopathologic subtypes that differ in their genetic expression pattern, clinical behavior, and response to therapy.
- The MRI appearance of RCC correlates to the underlying molecular biology and histopathologic findings in RCC
- Certain MRI features such as tumor necrosis in clear cell RCC and infiltrating appearance in papillary RCC correlate with a more aggressive biology and possibly with a higher risk for developing metastatic disease.

**Title:** The MRI Phenotype in Renal Cell Carcinoma: Is It Clinically Relevant?

**Target audience:** – Physicians with interest in genitourinary pathology, researchers who want to learn about renal mass characterization with MRI

**OBJECTIVES:** – To review the subtypes of renal cell cancer (RCC) and the implications of the histopathologic diagnosis in the era of targeted therapies. To illustrate the characteristic MRI findings that are associated to the different histopathologic subtypes in RCC. To discuss the implications of the MRI appearance, or MRI phenotype, on the clinical outcomes in patients with RCC. To present the potential role of new MRI techniques in the study of the pathophysiology of RCC.

**DISCUSSION:** Renal cell carcinoma (RCC) is a heterogeneous disease composed by different histopathologic subtypes, which differ in their prognosis, biologic behavior and response to available therapies. Patients with clear cell RCC (ccRCC) may respond to immunotherapy with interferon as well as to treatment with tyrosine kinase inhibitors. Cytoreductive nephrectomy is primarily indicated in ccRCC patients presenting with stage IV disease. However, these therapies are in general less effective in papillary RCC although alternative therapies with inhibitors of the mammalian target of rapamycin (mTOR) like temsirolimus have recently shown promising results. Thus, a specific preoperative histopathologic diagnosis may have important implications in the selection of the best treatment option both in patients with localized disease and those with metastatic disease.

The most common subtypes of kidney cancer demonstrate different imaging features on standard T1-, T2-weighted, and dynamic contrast-enhanced MRI sequences. Some of these are related to the underlying molecular biology of the tumor such as upregulation of tumor angiogenesis. For example, clear cell RCC exhibit a much avid enhancement pattern than that of papillary and chromophobe RCC when assessed with dynamic contrast enhanced MRI (1). These subtypes can be distinguished based upon the corticomedullary phase percentage enhancement. The use of a threshold value of 84% enhancement in the corticomedullary phase allows differentiation of clear cell and papillary renal cell carcinoma with sensitivity of 93% and specificity of 96% (1). Similarly, differences in tumor vascularity can be explored with arterial spin labeling techniques (2). A correlation between tumor cellularity and the apparent diffusion coefficient derived from diffusion-weighted acquisitions has been described for RCC (3). During this talk we will review the

prognostic implications of some of these MRI features including the presence of tumor necrosis in clear cell RCC and the infiltrating appearance in papillary RCC.

**REFERENCES:**

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3. Manenti G, Di Roma M, Mancino S, et al. Malignant renal neoplasms: correlation between ADC values and cellularity in diffusion weighted magnetic resonance imaging at 3 T. *Radiol Med* 2008;113(2):199-213.