Radiogenomics of Clear Cell Renal Cell Carcinoma: Preliminary Findings of The Cancer Genome Atlas-Renal Cell Carcinoma (TCGA-RCC) Research Group

**Purpose:**
To investigate associations between imaging features and mutational status of clear cell renal cell carcinoma (ccRCC).

**Materials and Methods:**
This multi-institutional, multi-reader study included 103 patients (77 men; median age 59 years, range 34-79) with ccRCC examined with CT in 81 patients, MRI in 19, and both CT and MRI in three; images were downloaded from The Cancer Imaging Archive, an NCI-funded project for genome-mapping and analyses. Imaging features [size (mm), margin (well-defined or ill-defined), composition (solid or cystic), necrosis (for solid tumors: 0%, 1%-33%, 34%-66% or >66%), growth pattern (endophytic, <50% exophytic, or 50% exophytic), and calcification (present, absent, or indeterminate)] were reviewed independently by three readers blinded to mutational data. The association of imaging features with mutational status (VHL, BAP1, PBRM1, SETD2, KDM5C, and MUC4) was assessed.

**Results:**
Median tumor size was 49 mm (range 14-162 mm), 73 (71%) tumors had well-defined margins, 98 (95%) tumors were solid, 95 (92%) showed presence of necrosis, 46 (45%) had 50% exophytic component, and 18 (19.8%) had calcification. VHL (n = 52) and PBRM1 (n = 24) were the most common mutations. BAP1 mutation was associated with ill-defined margin and presence of calcification (p = 0.02 and 0.002, respectively, Pearson’s χ² test); MUC4 mutation was associated with an exophytic growth pattern (p = 0.002, Mann-Whitney U test).

**Conclusions:**
BAP1 mutation was associated with ill-defined tumor margins and presence of calcification; MUC4 mutation was associated with exophytic growth. Given the known prognostic implications of BAP1 and MUC4 mutations, these results support using radiogenomics to aid in prognostication and management.

**Download**
- Image Data - DICOM
- Feature values, mutation status, and clinical variables - FullDataforAnalysis071714.csv