Hi, this is Dr. Jeff Klein, editor of *RadioGraphics* and welcome to the *RadioGraphics* audio summary podcast. Each issue, I will be highlighting a few of our articles that I think are important.

**Breast Cancer Tissue Markers, Genomic Profiling, and Other Prognostic Factors: A Primer for Radiologists.**
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Nikki Tirada, MD • Mireille Aujero, MD • Gauri Khorjekar, MD • Stephanie Richards, MD • Jasleen Chopra, MD • Sergio Dromi, MD • Olga Ioffe, MD

While radiologists are familiar with the use of the American Joint Committee on Cancer (AJCC) TNM staging system for guiding treatment and determining disease prognosis, other factors including patient demographics and lifestyle, imaging findings, histopathologic examination, and molecular findings have a direct effect on patient survival and the risk of recurrent disease following treatment. This paper from Dr. Nikki Tirada and colleagues at the University of Maryland School of Medicine begins with a review of how patient age at diagnosis, race and ethnicity, and lifestyle factors such as smoking and obesity impact disease risk and detection and mortality rates from breast cancer. For the radiologist, there are a number of imaging characteristics that must be considered, particularly the impact of screening on breast cancer detection rates and disease prognosis. Breast density, the subject of 2 articles in the March 2015 issue of *RadioGraphics*, is now a well-recognized independent risk factor for breast cancer, as is tumor size or the T stage of disease. There are multiple imaging-related factors that impact prognosis. These include the presence of multicentric or multifocal disease, an extensive intraductal component of tumor (defined as intraductal foci or DCIS exceeding 25% of adjacent breast tissue separate from the main tumor mass), skin or chest wall involvement (indicating T4 or at least stage IIIb disease), a diagnosis of inflammatory breast cancer, nodal involvement, peritumoral lymphovascular invasion (which can be suspected based on breast MR findings), and tumor necrosis. Regarding pathologic considerations, histologic total tumor scores from 1 to 3 are graded by pathologists using the Nottingham Histologic Score System, with a higher tumor grade (i.e. grade 3 tumors) associated with more aggressive tumors and portending a worse prognosis; the paper provides a series of nicely-annotated photomicrographs to illustrate the histopathologic scoring and grading of these tumors. The 4 biomarkers tested consistently in invasive breast cancer biopsy and excised breast specimens include ER, PR, HER2, and Ki-67 antigen. The paper provides photomicrographs of immunohistochemically-stained and fluorescence in-situ hybridization specimens for these biomarkers and shows the various patterns of staining that pathologists utilize in their analysis of biopsy specimens. The authors then provide the rationale for assessing the presence or absence of these biomarkers in breast cancer specimens. Tumors are then divided into 4 subtypes based on their hormone receptor status and gene expression patterns; these include luminal A and luminal B subtypes, which are the most common, HER-2 enriched tumors (which are the least common), and triple-negative tumors. The final section of the paper reviews gene expression profiles or genomic assays such as MammaPrint, EndoPredict, and Prosigna/PAM50, which are useful in predicting cancer recurrence and thereby in guiding the use of adjuvant chemotherapy or endocrine therapy in select patients with early stage breast cancer.

**2017 AUA Renal Mass and Localized Renal Cancer Guidelines: Imaging Implications**
Ryan D. Ward, MD • Hajime Tanaka, MD • Steven C. Campbell, MD, PhD • Erick M. Remer, MD

Given that localized (i.e. Stage I or II) renal cell carcinoma is being detected with increased frequency, it is important for radiologists to be familiar with current American Urological Association guidelines for the diagnosis and management of these tumors. In this paper from the Cleveland Clinic and Tokyo Medical and Dental University, Dr. Ryan Ward and colleagues begin their review with a discussion of the imaging issues associated with renal masses, particularly the use of high-quality contrast-enhanced CT or MR for evaluation. After a review of the Society of Abdominal Radiology imaging protocols for renal CT and MR, the authors briefly review staging of disease and standardized reporting of imaging findings. The AUA guidelines for renal mass biopsy are detailed, followed by a review of tumor management strategies including nephrectomy, thermal ablation, and active surveillance, all highlighted in table format with supporting case examples illustrating preoperative imaging findings and intraoperative appearances. The paper nicely reviews the expected appearances and complications associated with the various therapeutic options including tumor enucleation as a form of partial nephrectomy and both cryoablation and radiofrequency ablation that are included as treatment options in the AUA guidelines for clinical stage T1a tumors. The use of active surveillance or expectant management, considered for small tumors in patients with significant risks for intervention and/or significant comorbidities, is also reviewed, with details provided for the appropriate intervals and duration of CT or US surveillance.
From four North American institutions comes a paper in the current issue of *RadioGraphics* that reviews the imaging spectrum of HIV-related malignancies. Although the introduction of highly-active anti-retroviral therapy has led to a reduction in the incidence of AIDS-defining malignancy in HIV-infected patients, there is now an increase in the rate of non-AIDS-defining malignancy that includes Hodgkin lymphoma, lung cancer, hepatocellular carcinoma, and head and neck cancers. The paper begins by reviewing the epidemiology behind HIV-related malignancy; perhaps most striking is that 40% of HIV-infected patients will be diagnosed with cancer, a rate expected to increase with increasing life expectancy in this group. After listing both AIDS-defining and non-AIDS-defining malignancies, the paper delves into the clinical and imaging manifestations of Kaposi sarcoma and the lymphoproliferative disorders including diffuse large B-cell lymphoma, Burkitt lymphoma, primary CNS and primary effusion lymphoma, and multicentric Castleman disease. A less well recognized AIDS-defining malignancy is invasive cervical carcinoma, which is discussed and illustrated. The spectrum of non-AIDS-defining malignancies includes Hodgkin lymphoma, seen with an eight-fold increase in incidence as compared to non-HIV-infected patients, and lung cancer, which is the most common non-AIDS-defining malignancy with a 2-4x increase in risk as compared to non-infected patients, even when controlling for smoking history. Adenocarcinoma is the most common form of lung cancer seen and is often diagnosed at an advanced stage due to delays in diagnosis. Hepatocellular carcinoma, although not directly associated with HIV infection, is seen in HIV-infected patients at a younger age and more advanced stage due to co-infection with hepatitis B or C that share transmission methods with HIV. HPV-associated malignancies seen with increased frequency in HIV patients include head and neck and anal squamous cell carcinoma. The final section of the paper reviews those conditions that mimic HIV-related malignancies, particularly opportunistic infections such as toxoplasmosis and tuberculosis that can produce masses in the central nervous system, pneumonia and tuberculosis in the chest mimicking or masking lung cancer, Mycobacterium avium or tuberculosis infection as a cause of lymph node enlargement, and thymic hyperplasia mimicking thymoma or lymphoma in the anterior mediastinum.

In their paper in the current November 2018 issue of *RadioGraphics*, Dr. Noriko Oyama-Manabe and colleagues from Sapporo, Japan review the spectrum of cardiovascular abnormalities seen in patients with IgG4-related disease. First recognized in the early 2000s in association with autoimmune pancreatitis, IgG4 involvement of the thoracic and abdominal aorta, its branches including the coronary arteries, and the pericardium have been more recently elucidated. The diagnosis typically requires the presence of diffuse or localized swelling or masses in involved organs, serum IgG4 levels ≥135 mg/dL, and lymphocytolymphocytic infiltration on histopathologic examination. Infra-renal abdominal aortic involvement is most common, with arterial wall thickening and enhancement and occasionally the presence of pseudotumors. Coronary artery involvement, seen as arteritis or aneurysms, is invariably associated with aortic or other arterial involvement. IgG4-related pericarditis is uncommon and is seen as pericardial thickening with increased FDG uptake on PET. FDG-PET can be used to detect and quantify vascular inflammation in affected patients. Other vasculitides involving medium to large vessels that need to be distinguished from IgG4-related disease include giant cell arteritis, Takayasu arteritis, and less common conditions. The thoracic aorta and its branches, in particular the subclavian arteries, and the pulmonary arteries tend to be involved in Takayasu disease which tends to affect younger women, whereas these vessels are typically spared in IgG4-related disease. An important clinical feature seen in IgG4 cardiovascular disease absent in giant cell arteritis or Takayasu is the presence of additional organ involvement, particularly pancreatic or retroperitoneal disease. In patients with IgG4 cardiovascular disease treated with corticosteroids or rituximab, delayed phase contrast-enhanced CT and FDG-PET can be used to assess disease activity and response to treatment.

While uncommon as compared to metastatic disease to the lungs and congenital lung lesions, pediatric primary lung malignancies are important entities for the radiologist to be aware of and to distinguish from inflammatory disease and benign tumors. In this paper from the American Institute for Radiologic Pathology, the authors approach the topic by
tive results can be seen in smaller tumors and primary lesions shown to have greater accuracy than CT, although false negative results are seen in association with CPAMs or as secondary malignancies in patients treated for nonpulmonary malignancies. NUT midline carcinoma arising in the head, neck or mediastinum is an aggressive form of squamous cell carcinoma seen in patients of median age 22 years, with thoracic lesions more frequently seen in patients of median age 22 years, with thoracic lesions often due to granulomatous infections such as tuberculosis and in patients with sarcoidosis. In the M categorization of disease, PET is the modality of choice for the evaluation of extracranial metastases and has supplanted routine bone scintigraphy for skeletal involvement in patients with lung cancer. For brain metastases, contrast-enhanced MR has higher sensitivity than FDG-PET and is recommended to exclude brain metastases in non-small cell lung cancer patients with stage II to stage IV disease. Another utility of FDG PET/CT in lung cancer patients is in the detection of a second primary malignancy, found in approximately 1-3% of patients; common sites include the colon, thyroid, upper GI tract, and ovaries. Finally, the authors discuss the limitations of FDG/PET in this setting, with a focus on false positive and false negative lesions. This important paper should be useful to all who are involved in the evaluation and management of lung cancer patients.

Lung cancer remains the leading cause of cancer-related death in the U.S. Given the recent 2018 update to the TNM staging system for lung cancer, the current role of FDG PET/CT is important for radiologists and all physicians caring for lung cancer patients to understand. The paper begins with a review of the eighth edition of the TNM system for staging non-small cell lung cancer, using a table and series of anatomic drawings to illustrate the various T, N and M descriptors. The authors then review the published evidence on the use of FDG PET/CT for staging lung cancer, citing the landmark prospective study by van Tinteren and colleagues in The Lancet in 2002 which confirmed its utility in the preoperative staging of lung cancer patients. The role of FDG PET/CT in T characterization is reviewed, with a focus on its limitations for small and subsolid tumors. For mediastinal nodal staging, FDG PET/CT has been shown to have greater accuracy than CT, although false negative results can be seen in smaller tumors and primary lesions with lower metabolic activity, while false positive results are most often due to granulomatous infections such as tuberculosis and in patients with sarcoidosis. In the N categorization of disease, FDG PET/CT is recommended to exclude nodal metastases in patients with stage I to stage IV disease. Another utility of FDG PET/CT in lung cancer patients is in the detection of a second primary malignancy, found in approximately 1-3% of patients; common sites include the colon, thyroid, upper GI tract, and ovaries. Finally, the authors discuss the limitations of FDG/PET in this setting, with a focus on false positive and false negative lesions. This important paper should be useful to all who are involved in the evaluation and management of lung cancer patients.