


Contents

Preface: Making Sense of Diffuse Lung Disease xv

Stephen Hobbs

Current Imaging of Idiopathic Pulmonary Fibrosis 873

James F. Gruden, Daniel B. Green, Francis G. Girvin, and David P. Naidich

 Video content accompanies this article at <http://www.radiologic.theclinics.com>.

The major role of imaging (CT) in usual interstitial pneumonia (UIP)/idiopathic pulmonary fibrosis (IPF) is in the initial diagnosis. We propose several modifications to existing guidelines to help improve the accuracy of this diagnosis and to enhance interobserver agreement. CT detects the common complications and associations that occur with UIP/IPF including acute exacerbation, lung cancer, and dendriform pulmonary ossification and is useful in informing prognosis based on baseline fibrosis severity. Serial CT imaging is a topic of great interest; it may identify disease progression before FVC decline or clinical change.

Interstitial Lung Abnormality—Why Should I Care and What Should I Do About It? 889

Andrea S. Oh and David A. Lynch

Interstitial lung abnormalities (ILAs) are specific computed tomography (CT) findings that are potentially compatible with interstitial lung disease (ILD) in patients without clinical suspicion for disease. ILAs are associated with adverse clinical outcomes including increased mortality, imaging progression and lung function decline, and increased lung injury risk with lung cancer therapies. It is expected that identification of ILAs will increase with implementation of lung cancer screening and diagnostic CT imaging for workup of other pathologies. As such, radiologists will play a critical role in the diagnosis and management of ILAs.

Updated Imaging Classification of Hypersensitivity Pneumonitis 901

Lydia Chelala, Ayodeji Adegunsoye, Brittany A. Cody, Aliya N. Husain, and Jonathan H. Chung

Hypersensitivity pneumonia (HP) refers to a heterogeneous group of interstitial lung diseases resulting from a non-IgE immune-mediated reaction to inhaled pathogens in susceptible and sensitized hosts. Environmental and genetic factors are important substrates of disease pathogenesis. A recurrent or ongoing airborne exposure results in activation of humoral and cellular immune responses. This article discusses key clinical, radiologic, and histopathologic features of HP and reviews current recommendations.

Imaging of Pulmonary Manifestations of Connective Tissue Disease 915

Kimberly Kallianos

The majority of connective tissue diseases (CTDs) are multisystem disorders that are often heterogeneous in their presentation and do not have a single laboratory, histologic, or radiologic feature that is defined as the gold standard to support a specific diagnosis. Given this challenging situation, the diagnosis of CTD is a process that requires the synthesis of multidisciplinary data which may include patient clinical symptoms, serologic evaluation, laboratory testing, and imaging. Pulmonary manifestations of connective tissue disease include interstitial lung disease as well

as multicompartamental manifestations. These CT imaging patterns and features of specific diseases will be discussed in this article.

Pathogenesis, Imaging, and Evolution of Acute Lung Injury

925

Seth Kligerman

Acute lung injury (ALI) exists on a continuum that includes diffuse alveolar damage, acute fibrinous and organizing pneumonia, and organizing pneumonia. The primary site of injury in ALI is the same, which likely explains similar imaging patterns across the pathologic spectrum. Radiologic outcomes in ALI depend on the degree of injury and the subsequent healing response. Although ALI can heal without permanent injury, development of fibrosis is not uncommon and may be debilitating. ALI is associated with the usual interstitial pneumonia and nonspecific interstitial pneumonia patterns of fibrosis and repeated episodes of ALI are likely a cause of fibrosis progression.

Imaging of Smoking and Vaping Related Diffuse Lung Injury

941

Katherine A. Cheng, Holly Nichols, H. Page McAdams, Travis S. Henry, and Lacey Washington

Lung injury associated with smoking tobacco or other substances results in a variety of clinical presentations and imaging patterns, depending on mechanism of injury and substance inhaled. Patients may present in the acute setting, as in the case of acute eosinophilic pneumonia, e-cigarette or vaping product use-associated lung injury, crack lung, or heroin inhalation. They may present with subacute shortness of breath and demonstrate findings of pulmonary Langerhans cell histiocytosis, respiratory bronchiolitis, or desquamative interstitial pneumonia. Alternatively, they may present with chronic dyspnea and demonstrate findings of emphysema or smoking-related interstitial lung fibrosis.

Imaging of Cystic Lung Disease

951

Cato Chan and Christopher Lee

Diffuse cystic lung disease refers to multiple rounded lucencies or low-attenuating areas with well-defined interfaces with normal lung. Parenchymal lucencies, such as cavitory disease, may mimic cystic lung disease. Cystic lung disease generally has a nonspecific presentation. Pulmonary cysts may present in isolation or with ancillary imaging features, such as ground-glass opacities or nodules. Clinical features, such as connective tissue disease, can narrow the differential diagnosis. In cases with indeterminate imaging and clinical features, open lung biopsy should be considered. Ultrarare cystic lung diseases, such as light chain deposition disease, can mimic more common diseases.

Mosaic Attenuation Pattern: A Guide to Analysis with HRCT

963

Gregory M. Lee, Melissa B. Carroll, Jeffrey R. Galvin, and Christopher M. Walker

Mosaic attenuation pattern is commonly encountered on high-resolution computed tomography and has myriad causes. These diseases may involve small airways, vessels, alveoli, or interstitium, with some involving compartmental combinations. Small airways disease is caused by cellular bronchiolitis, infiltrated by inflammatory cells or constrictive bronchiolitis, resulting in fibrosis of the small airways. Any acute or chronic cause of ground-glass opacity can result in a mosaic pattern. Vascular causes of mosaic attenuation include chronic thromboembolic pulmonary

hypertension and rarely other causes of pulmonary arterial hypertension. Ancillary CT findings along with the clinical history help narrow the differential diagnosis. Biopsy is uncommonly required for definitive diagnosis.

Imaging Patterns in Occupational Lung Disease—When Should I Consider? 979

Yasmeen K. Tandon and Lara Walkoff

Occupational lung diseases (OLDs) encompass a broad group of entities related to the inhalation of a variety of agents in the workplace. OLDs may affect the lung parenchyma, pleura, and/or airways. OLDs can pose a diagnostic challenge for radiologists due to a lack of exposure history and overlap in imaging findings with nonoccupational-related entities. For this reason, it is important for the radiologist to be familiar with the high-resolution computed tomography patterns associated with OLDs and consider OLDs when formulating a differential.

Diagnosis and Treatment of Lung Cancer in the Setting of Interstitial Lung Disease 993

Dane A. Fisher, Mark C. Murphy, Sydney B. Montesi, Lida P. Hariri, Robert W. Hallowell, Florence K. Keane, Michael Lanuti, Meghan J. Mooradian, and Florian J. Fintelmann

Interstitial lung disease (ILD) including idiopathic pulmonary fibrosis increases the risk of developing lung cancer. Diagnosing and staging lung cancer in patients with ILD is challenging and requires careful interpretation of computed tomography (CT) and fluorodeoxyglucose PET/CT to distinguish nodules from areas of fibrosis. Minimally invasive tissue sampling is preferred but may be technically challenging given tumor location, coexistent fibrosis, and pneumothorax risk. Current treatment options include surgery, radiation therapy, percutaneous thermal ablation, and systemic therapy; however, ILD increases the risks associated with each treatment option, especially acute ILD exacerbation.

Advances in Imaging of the ChILD – Childhood Interstitial Lung Disease 1003

Olivia DiPrete, Abbey J. Winant, Sara O. Vargas, Vanessa Rameh, Apeksha Chaturvedi, and Edward Y. Lee

Childhood interstitial lung disease (chILD) refers to a diverse group of rare diffuse parenchymal lung diseases affecting infants and children, previously associated with considerable diagnostic confusion due to a lack of information regarding their clinical, imaging, and histopathologic features. Due to improved lung biopsy techniques, established pathologic diagnostic criteria, and a new structured classification system, there has been substantial improvement in the understanding of chILD over the past several years. The main purpose of this article is to review the latest advances in the imaging evaluation of pediatric interstitial lung disease within the framework of the new classification system.

MR Imaging for the Evaluation of Diffuse Lung Disease: Where Are We? 1021

Bryan O'Sullivan-Murphy, Bastiaan Driehuis, and Joseph Mammarrappallil

Patients with diffuse lung diseases require thorough medical and social history and physical examinations, coupled with a multitude of laboratory tests, pulmonary function tests, and radiologic imaging to discern and manage the specific disease. This review summarizes the current state of imaging of various diffuse lung diseases by hyperpolarized MR imaging. The potential of hyperpolarized MR imaging as a clinical tool is outlined as a novel imaging approach that enables further understanding of

the cause of diffuse lung diseases, permits earlier detection of disease progression before that found with pulmonary function tests, and can delineate physiologic response to lung therapies.

Artificial Intelligence in the Imaging of Diffuse Lung Disease

1033

Jessica Chan and William F. Auffermann

Diffuse lung diseases are a heterogeneous group of disorders that can be difficult to differentiate by imaging using traditional methods of evaluation. The overlap between various disorders results in difficulty when medical professionals attempt to interpret images. Artificial intelligence offers new tools for the evaluation and quantification of imaging of patients with diffuse lung disease.