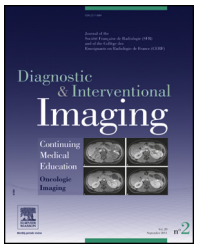
Diagnostic and Interventional Imaging (2016) xxx, xxx—xxx



CONTINUING EDUCATION PROGRAM: FOCUS. . .

Lung adenocarcinomas: correlation of computed tomography and pathology findings

J.G. Cohen[a,b], E. Reymond[a], A. Jankowski[a], E. Brambilla[b,c,d], F. Arbib[e], S. Lantuejoul[b,c,d], G.R. Ferretti[a,b,c,*]

[a] *Clinique universitaire de radiologie et imagerie médicale (CURIM), CHU A.-Michallon, BP 217, 38043 Grenoble cedex 9, France*
[b] *Université Grenoble-Alpes, 38000 Grenoble, France*
[c] *Département d'anatomo-cytologie pathologie (DACP), CHU A.-Michallon, 38043 Grenoble, France*
[d] *Inserm U 823, institut A.-Bonniot, 38000 Grenoble, France*
[e] *Clinique universitaire de pneumologie, pôle d'oncologie, CHU A.-Michallon, 38043 Grenoble, France*

KEYWORDS
Lung adenocarcinoma;
Pathology;
Computed tomography;
Subsolid nodules;
Solitary pulmonary nodule

Abstract Adenocarcinoma is the most common histologic type of lung cancer. Recent lung adenocarcinoma classifications from the International Association for the Study of Lung cancer, the American Thoracic Society and the European Respiratory Society (IASLC/ETS/ERS, 2011) and World Health Organization (WHO, 2015) define a wide range of adenocarcinoma types and subtypes featuring different prognosis and management. This spectrum of lesions translates into various CT presentations and features, which generally show good correlation with histopathology, stressing the key role of the radiologist in the diagnosis and management of those patients. This review aims at helping radiologists to understand the basics of the up-to-date adenocarcinoma pathological classifications, radio-pathological correlations and how to use them in the clinical setting, as well as other imaging-related correlations (radiogenomics, quantitative analysis, PET-CT).

* Corresponding author. Clinique universitaire de radiologie et imagerie médicale, CHU de Grenoble, 38043 Grenoble cedex 9, France.
E-mail addresses: JCohen@chu-grenoble.fr, Rudra38@gmail.com (J.G. Cohen), EReymond@chu-grenoble.fr (E. Reymond), AJankowski@chu-grenoble.fr (A. Jankowski), EBrambilla@chu-grenoble.fr (E. Brambilla), FArbib@chu-grenoble.fr (F. Arbib), Slantuejoul@chu-grenoble.fr (S. Lantuejoul), GFerretti@chu-grenoble.fr (G.R. Ferretti).

http://dx.doi.org/10.1016/j.diii.2016.06.021
2211-5684/

Lung cancer is the leading cause of cancer-related death in developed countries. Adenocarcinoma (ADC) is the most common histologic type of lung cancer with an increasing prevalence, currently accounting for more than 40% of cases of non-small cell lung cancer (NSLC), occurring in smokers and non-smokers [1].

The International Association for the Study of Lung cancer (IASLC), the American Thoracic Society (ATS) and the European Respiratory Society (ERS) published in 2011 a multidisciplinary classification of lung ADCs, resulting from a consensus between chest physicians, oncologists, thoracic surgeons, pathologists, molecular biologists and radiologists [3]. Further refinements were made in the WHO classification of 2015, integrating genetic and molecular data [2].

The radiological presentation of peripheral ADCs is singular with a spectrum varying from subsolid to solid nodules and masses. This wide range of imaging findings was shown to have a good correlation with adenocarcinoma subtypes, histological patterns, as well as prognosis [3].

This review article therefore aims at helping radiologists to better understand current pathological classifications of adenocarcinoma, their correlation with CT-findings and how to use this knowledge in a clinical setting in order to improve patient management.

The lung adenocarcinoma spectrum in 2016 (IASLC/ETS/ERS and WHO classifications)

Pre-invasive lesions

Atypical adenomatous hyperplasia (AAH)

AAH has been documented as being a precursor lesion of a subset of adenocarcinomas arising from terminal respiratory units [4]. It is defined as a peripheral small ($\leq$ 5 mm) focal proliferation of atypical type II pneumocytes and/or Clara cells lining the alveolar walls and/or respiratory bronchioles, without any sign of invasion. AAH is usually an incidental finding on resection specimen in the vicinity of a larger ADC.

Adenocarcinoma in situ (AIS)

AIS is a new category of ADC that was introduced in the 2011 IASLC/ATS/ERS classification, replacing the former bronchiolo-alveolar carcinoma (Fig. 1). AIS is a purely lepidic proliferation of type II pneumocytes/Clara cells, which implies no stromal, vascular or pleural invasion. AIS is a rare occurrence, accounting for 3 to 4% of all non-small cell carcinomas (NSCLC). Those lesions are mostly non-mucinous. AIS is generally larger than AAH, measuring between 5 and 20 mm but less than 30 mm. Due to its non-invasiveness, AIS has a 100% 5-year survival after surgery [5].

Invasive tumours

Minimally invasive adenocarcinoma (MIA)

MIA is a new category of ADC that was introduced in the 2011 IASLC/ATS/ERS classification. It describes an ADC of less than 30 mm in diameter with a predominant lepidic pattern, but unlike AIS, it harbors an invasive area measuring less than 5 mm composed of any subtype of invasive adenocarcinoma. It is usually a solitary tumor, but synchronous lesions may occur. Those lesions also benefit from an excellent prognosis after surgery, which was estimated between 98 and 100% [3,6]. This favorable prognosis was the reason of their separation from the group of invasive ADC described thereafter.

Invasive ADC

Invasive ADC, which represents at least 70% of resected ADCs, is defined by the presence of an invasive component larger than 5 mm (Fig. 2) [3]. Invasive ADCs are pathologically heterogeneous, often made of a complex mixture of acinar, papillary, micropapillary, lepidic and solid patterns. They are named according to the predominant histologic pattern. Some of those subtypes are associated with specific prognosis: for example, lepidic predominant ADCs (also known as LPAs), are characterized by an excellent 5-year post-resection survival of 90% [3]. On the contrary, the presence of a micropapillary pattern inside the tumour significantly worsens the prognosis [7]. AIS, MIA, lepidic and papillary predominant invasive ADCs are more frequently

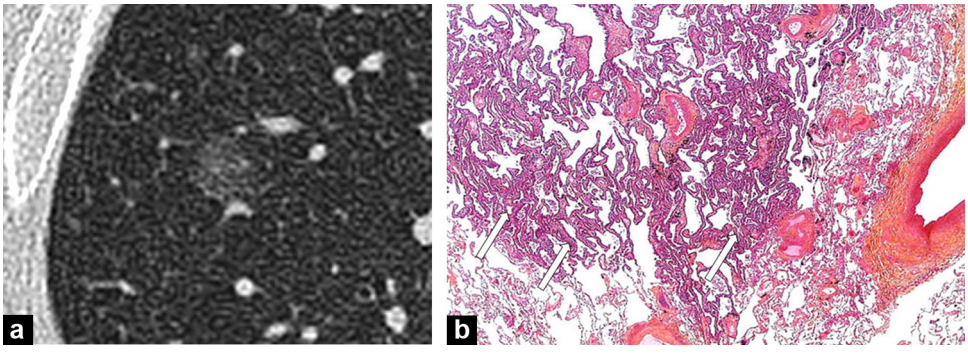


Figure 1. Axial thin-section CT scan (a) and photomicrograph (b) (HES stain, × 100) of an adenocarcinoma in situ in a 59-year-old male patient, manifesting as a low attenuating pure GGN on CT and showing atypical pneumonocytes growing along alveolar septa without disrupting the underlying alveolar walls on pathology (arrows).

Please cite this article in press as: Cohen JG, et al. Lung adenocarcinomas: correlation of computed tomography and pathology findings. Diagnostic and Interventional Imaging (2016), http://dx.doi.org/10.1016/j.diii.2016.06.021