2019新型冠状病毒(2019-nCoV)肺炎患者的影像学改变

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2019新型冠状病毒(2019-nCoV)肺炎患者的影像学改变Imaging changes in patients with 2019-nCov



在过去的一个月中，武汉爆发了一种新的冠状病毒，即2019-nCov。这种病毒流行已迅速传播到国内其他地区乃至整个中国，与流行病学关系密切的是华南海鲜批发市场，该市场出售活体动物。被诊断出该病毒的人数急剧增加。截至2020年1月30日，中国共报告确诊病例7736例，死亡170例，疑似病例9267例，出院患者124例。中国卫生部门立即进行了调查，以确定和控制该疾病，包括隔离怀疑患有该疾病的人，密切监测接触者，收集患者流行病学和临床数据以及制定诊断和

2019年新型冠状病毒(2019-nCoV) 的基因序列使快速开发针对2019-nCoV的即时实时RT-PCR诊断测试成为可能[1]。 2019-nCoV是2B组的β CoV，其遗传序列与SARS-CoV至少有70%相似性[2]。
Chaolin Huang及其同事报告了到2020年1月2日在武汉指定医院收治的首批41例确诊为2019-nCoV感染的患者的临床特征[3]。 Chen Wang简要总结了感染2019-nCoV，MERS-CoV和SARS-CoV的患者的特征[1]。与SAR
S的迅速发病不同，2019-nCov感染的
潜伏期通常为3至7天，最多14天。发烧，疲劳和干咳是前驱期的主要表现。 Chan等报道了与2019-nCoV相关的家族性肺炎，表明人与人传播[4]。在潜伏期患者可以成为感染源;因此，患者的早

期诊断至关重要。要明确诊断2019-nCov相关性肺炎，需要检测拭子，痰液，下呼吸道分泌物或血液中的新冠状病毒核酸。但是，新的冠状病毒核酸试剂盒供不应求。
胸部CT检查对于新型肺炎的初步诊断非常重要，而且CT的变化是可变的。本研究通过收集我院2019-nCov相关性肺炎患者的胸部CT，总结了患者的常见影像学改变。当2019-nCoV患者出现持续发烧，咳嗽和无法解释的肌无力
时，通常会发现CT阳性。**早期CT肺改变**多种多样：可能表现为**肺磨玻璃影**(**图1a – c**)、**肺部实变和结节**(**图1d**)、以及**中心处局部实变，周围有磨玻璃样密度**(**图1e**)。根据疾病的病程，肺炎可能同时**累及一个或多个肺**叶(**图1a，c，g**)。当累及一到两个肺叶时，对肺功能的影响并不严重，呼吸急促和呼吸困难的症状也并不严重。随
着疾病的
进展，肺实变区域
开始吸收，密度降低，并逐渐转变为
不透光磨玻璃密度，如“**融糖样**”(**图1f**)。另外，如果患者得到有效的治疗，或者如果免疫力成功抵抗了病毒，那么炎症将被进一步吸收并且其程度将降至最低。疾病会改善，也
许会出现**肺纤维条索影**(**图1g**)。这一点与流感很类似。如果治疗不及时，或者患者自身免疫力无法抵抗病毒，则会威胁到生命。肺部可发展为“**白肺**”改变(图1h)，但是这种改变仅见于极少数肺泡弥漫性受损累及多叶的患者。在此阶段，通气功能将严重受损，需要持续吸氧，甚至需要进行体外膜肺氧合(ECMO)。
被2019-nCoV感染后，患者可以在出现影像学改变时传播感染。
因此，早期影像学诊断至关重要。 本研究的目的是帮助基于影像学改变的早期诊断，建立早期隔离和早期治疗的患者，并通过及时实施有效对策的公共卫生策略参与控制暴发。

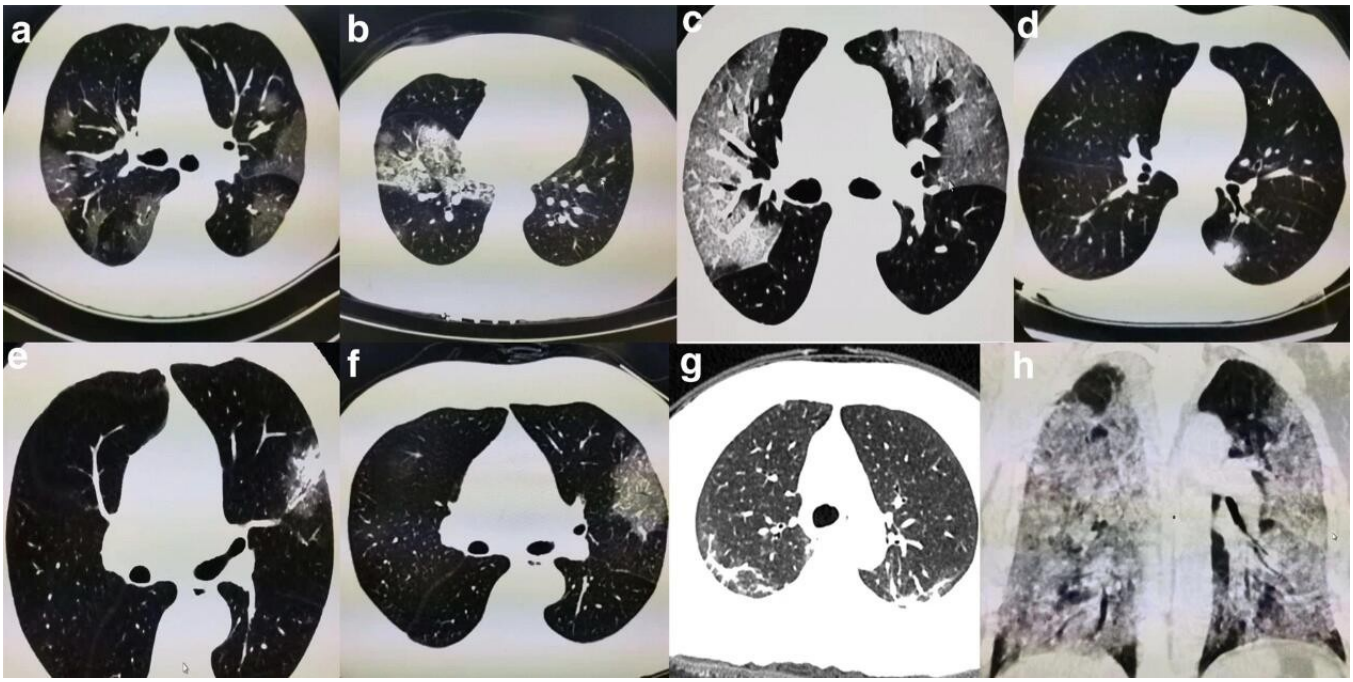


图1：*2019-nCov患者的影像学改变 2019-nCoV相关性肺炎的CT图像。(**a – c**).磨玻璃密度混浊; (**d**)肺实变和结节; (**e**)中心实变影，伴有周围磨玻璃密度;*

(f
)随着疾病的进展，肺的实变区开始吸收，从而密度降低并逐渐改变为磨玻璃样密度，如“融糖样”; (g)炎症已吸收，肺纤维条索; (h)肺炎恶化，肺部发展为“白肺”阶段

In the past month, the outbreak of a new coronavirus from Wuhan, i.e., 2019-nCov, has spread rapidly across China and beyond, with an epidemiological link to the Huanan Seafood Wholesale Market, which sells live animals. The number of people diagnosed with the virus has shown a sharp rise. On January 30, 2020, China reported a total of 7,736 confirmed cases, 170 deaths, 9,267 suspected cases, and 124 discharged patients. Chinese health authorities did an immediate investigation to characterize and control the disease, including isolation of people suspected to have the disease, close monitoring of contacts, epidemiological and clinical data collection from patients, and development of diagnostic and treatment procedures. By January 7, 2020, Chinese scientists had isolated a novel coronavirus (nCoV) from patients in Wuhan. The genetic sequence of the 2019 novel coronavirus (2019-nCoV) enabled the rapid development of point-of-care real-time RT-PCR diagnostic tests specific for 2019-nCoV [1]. The 2019-nCoV is a β CoV of group 2B with at least 70% similarity in genetic sequence to SARS-CoV [2].

Chaolin Huang and colleagues report clinical features of the first 41 patients admitted to thedesignated hospital in Wuhan who were confirmed to be infected with 2019-nCoV by January 2, 2020 [3]. Chen Wang briefly summarized characteristics of patients who have been infected with 2019-nCoV, MERS-CoV, and SARS-CoV [1]. Unlike the rapid onset of SARS, the incubation period infected by 2019-nCov is generally 3 to 7 days, and up to 14 days. Fever, fatigue, and dry cough are the main manifestations at the prodromal phase. Chan et al reported a familial cluster of pneumonia associated with the 2019-nCoV, indicating person-to-person transmission [4]. Patients can become the source of infection in the incubation period; therefore, the early diagnosis of patients is crucial. The definite diagnosis of 2019-nCov related pneumonia requires detection of the new coronavirus nucleic acid in swabs, sputum, secretions from the lower respiratory tract, or blood. However, the new coronavirus nucleic acid kits are in short supply.

Chest CT examination is very important in the initial diagnosis of the new type of pneumonia, and CT changes are variable. By collecting chest CT of patients with 2019-nCov related pneumonia in our hospital, we summarized the common imaging changes of the patients. CT is often found to be positive when patients with 2019-nCoV develop persistent fever, cough, and unexplained weakness. Early CT lung manifestations are diverse: they may be lung ground glass shadow (Fig.1a – c), pulmonary consolidation and nodules (Fig.1d), and local consolidation in the center with ground glass density around (Fig.1e). Depending on the course of the disease, pneumonia may involve one or more lobes simultaneously (Fig.1a, c, g). When one or two lobes are involved, the effect on lung function is not serious, and the symptoms of shortness of breath and dyspnea are not severe. As the disease progresses, the consolidation area of the lung begins to absorb, reducing its density and gradually becoming a ground glass opacity, like “ melted sugar ” (Fig.1f). At this point, if the patient receives effective treatment or if immunity successfully fights against the virus, the inflammation will be further absorbed and the extent will be minimized. The disease will improve, perhaps leaving the lung fiber cord focus (Fig.1g). This very much resembles a bout of flu. If the treatment is not received promptly or if immunity fails to fight off the virus, in time, it becomes life-threatening. Lung can progress to a "white lung" appearance (Fig.1h), however, this is only seen in a very small number of patients with diffuse alveolar damage involving multiple lobes. At this stage, the ventilation function will be seriously impaired, requiring continuous oxygen inhalation, and even extracorporeal membrane pulmonary oxygenation (ECMO).

After getting infected by the 2019-nCoV, the patient can transmit the infection when the imaging manifestations appear. Therefore, early imaging diagnosis is of paramount importance. The purpose of this study is to help early diagnosis based on imaging findings, to set up early isolation and early treatment of patients, and to participate in controlling the outbreak by public health strategies of timely implementation of effective countermeasures.

Figure: Imaging changes in patients with 2019-nCov

CT images of 2019-nCoV related pneumonia.a – c. ground glass opacities; (d) pulmonary consolidation and nodules; (e) local consolidation in the center with peripheral ground glass opacity; (f) as the disease progresses, the consolidation area of the lung begins to absorb, reducing its density and gradually becoming ground glass opacity, like a “ melted sugar ”; (g) the inflammation has absorbed, leaving the lung fiber cord focus; (h) the pneumonia deteriorated and the lungs progressed to the “ white lung ” stage

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