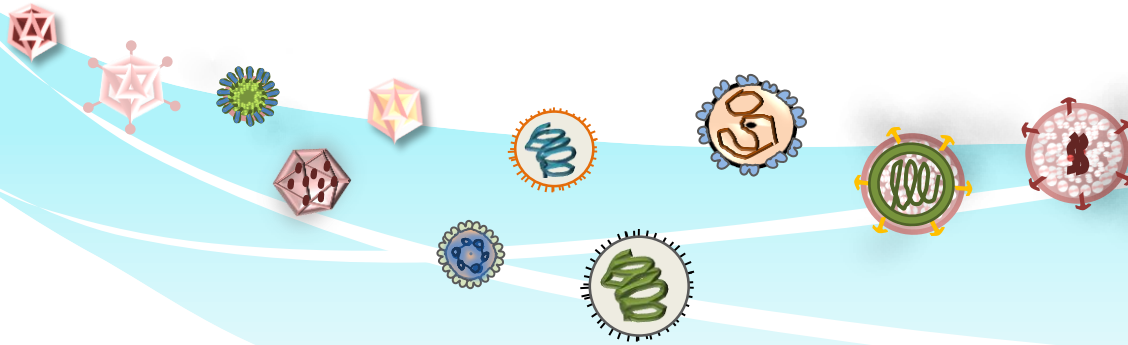
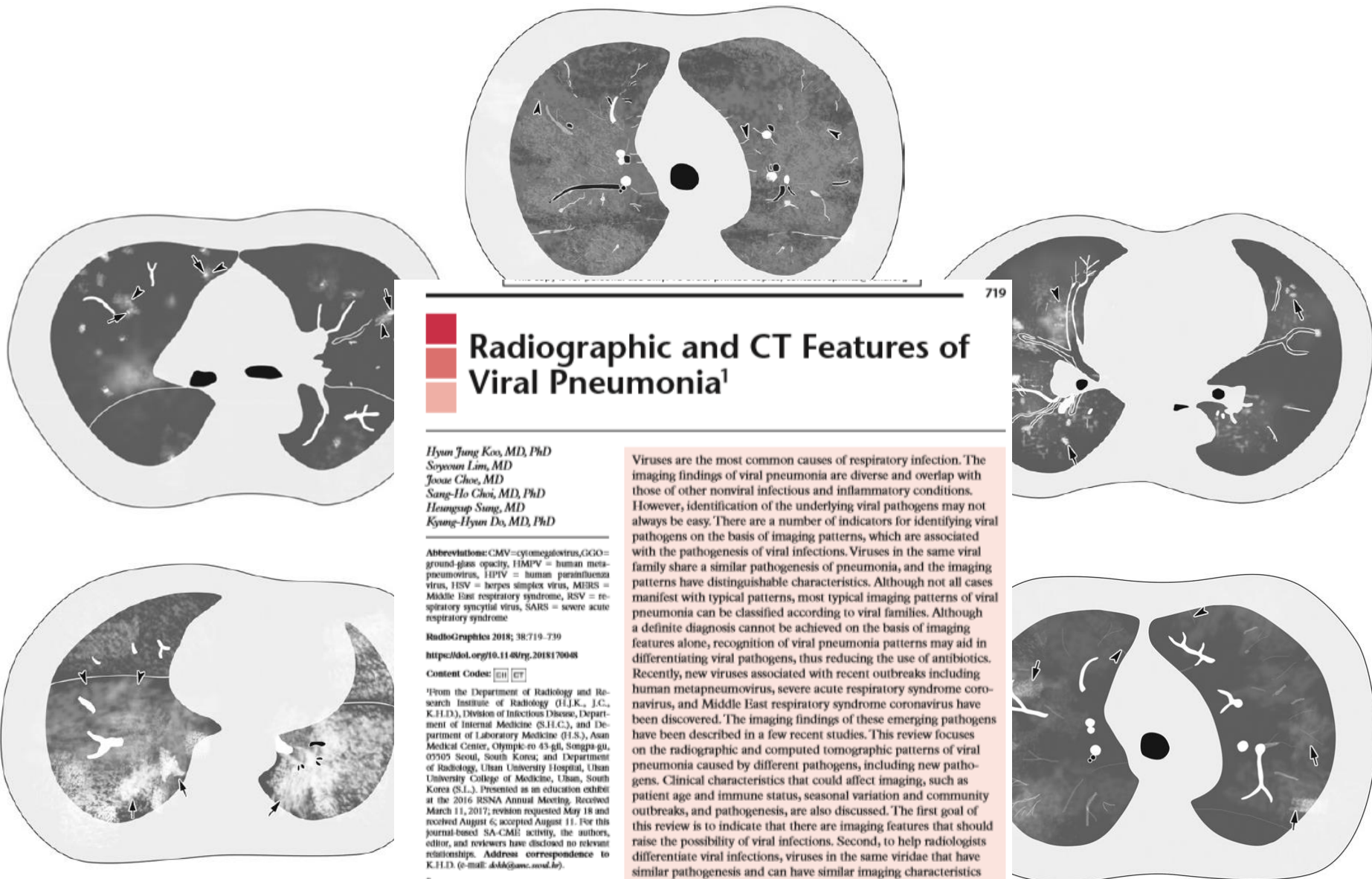


# Emerging Pulmonary Infection : Can We Identify Emerging Viral Pneumonia?



울산대학교 의과대학  
서울아산병원 영상의학과  
도경현

# Pathogenesis and CT Pattern of Viral Pneumonia



## Radiographic and CT Features of Viral Pneumonia<sup>1</sup>

Hyun Jung Koo, MD, PhD  
Soyoun Lim, MD  
Jooae Choe, MD  
Sang-Ho Choi, MD, PhD  
Heungsop Sung, MD  
Kyoung-Hyun Do, MD, PhD

**Abbreviations:** CMV = cytomegalovirus, GGO = ground-glass opacity, HMPV = human metapneumovirus, HPIV = human parainfluenza virus, HSV = herpes simplex virus, MERS = Middle East respiratory syndrome, RSV = respiratory syncytial virus, SARS = severe acute respiratory syndrome

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**Content Codes:**

<sup>1</sup>From the Department of Radiology and Research Institute of Radiology (H.J.K., J.C., K.H.D.), Division of Infectious Disease, Department of Internal Medicine (S.H.C.), and Department of Laboratory Medicine (H.S.), Asan Medical Center, Olympic-ro 43-gil, Songpa-gu, 05505 Seoul, South Korea; and Department of Radiology, Ulsan University Hospital, Ulsan University College of Medicine, Ulsan, South Korea (S.L.). Presented as an education exhibit at the 2016 RSNA Annual Meeting. Received March 11, 2017; revision requested May 18 and received August 6; accepted August 11. For this journal-based SA-CME activity, the authors, editor, and reviewers have disclosed no relevant relationships. Address correspondence to K.H.D. (e-mail: skhk@amc.seoul.kr).

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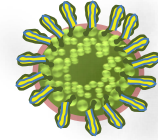
### SA-CME LEARNING OBJECTIVES

After completing this journal-based SA-CME

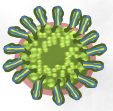
Viruses are the most common causes of respiratory infection. The imaging findings of viral pneumonia are diverse and overlap with those of other nonviral infectious and inflammatory conditions. However, identification of the underlying viral pathogens may not always be easy. There are a number of indicators for identifying viral pathogens on the basis of imaging patterns, which are associated with the pathogenesis of viral infections. Viruses in the same viral family share a similar pathogenesis of pneumonia, and the imaging patterns have distinguishable characteristics. Although not all cases manifest with typical patterns, most typical imaging patterns of viral pneumonia can be classified according to viral families. Although a definite diagnosis cannot be achieved on the basis of imaging features alone, recognition of viral pneumonia patterns may aid in differentiating viral pathogens, thus reducing the use of antibiotics. Recently, new viruses associated with recent outbreaks including human metapneumovirus, severe acute respiratory syndrome coronavirus, and Middle East respiratory syndrome coronavirus have been discovered. The imaging findings of these emerging pathogens have been described in a few recent studies. This review focuses on the radiographic and computed tomographic patterns of viral pneumonia caused by different pathogens, including new pathogens. Clinical characteristics that could affect imaging, such as patient age and immune status, seasonal variation and community outbreaks, and pathogenesis, are also discussed. The first goal of this review is to indicate that there are imaging features that should raise the possibility of viral infections. Second, to help radiologists differentiate viral infections, viruses in the same viridae that have similar pathogenesis and can have similar imaging characteristics are shown. By considering both the clinical and radiologic characteristics, radiologists can suggest the diagnosis of viral pneumonia.

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# Coronaviridae



- Transmitted by fecal-oral route or by aerosols of respiratory secretions
- Infect a wide range of mammals and birds and occur worldwide
  - SARS corona virus
  - MERS corona virus



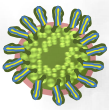
## Middle East Respiratory Syndrome (MERS) Coronavirus

### ❖ Introduction

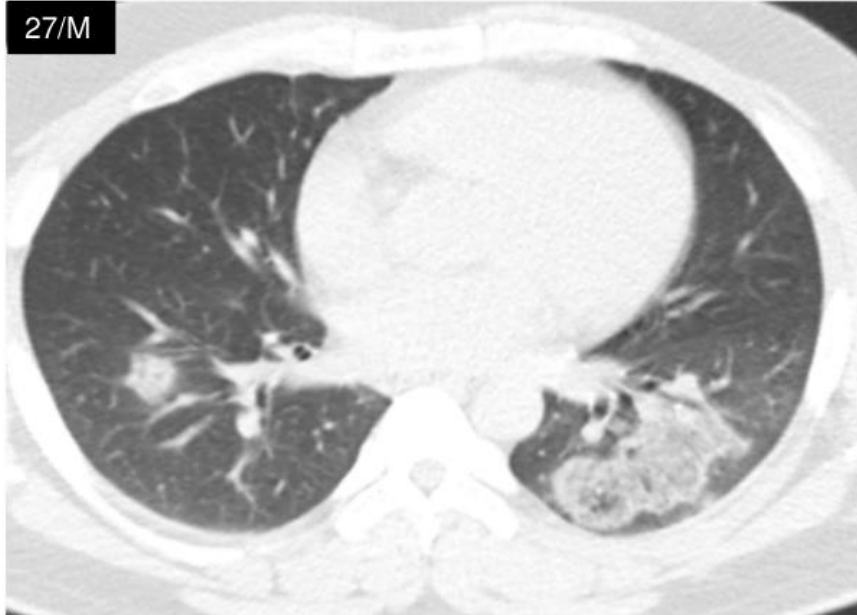
- Firstly identified in Saudi Arabia in 2012.
- Zoonotic virus that is transmitted from animals to humans.
- Human-to-human infections, camels are likely to be a major reservoir host for MERS-CoV and an animal source of MERS infection in humans
- Outbreak in the Republic of Korea is the largest outbreak outside of the Middle East.

### ❖ Clinical Findings

- Sx.: fever, cough and shortness of breath.
- 36% of reported patients with MERS have died.
- High risk of severe MERS infection: diabetes, renal failure, chronic lung disease, and immunocompromised persons
- Treatment: Supportive care

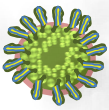


## Middle East Respiratory Syndrome (MERS) Coronavirus



### Coronaviridae

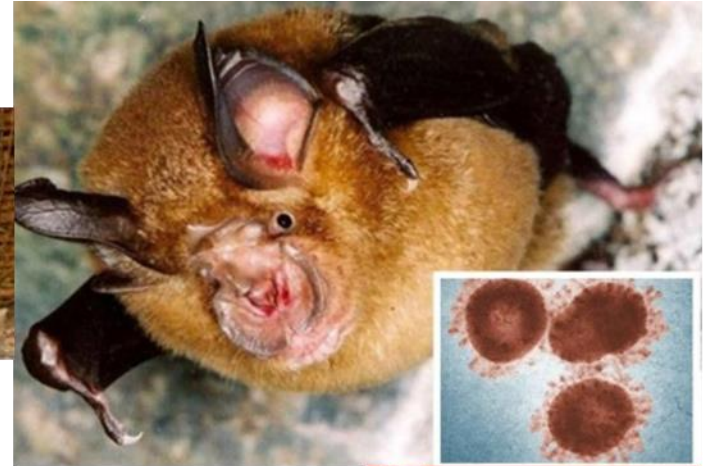
<b>Transmission</b>	Droplet, airborne, contact
<b>Pathogenesis</b>	Cellular transcription disruption → apoptosis
<b>Distribution</b>	Peripheral, multifocal
<b>Consolidation</b>	+++
<b>GGO</b>	+
<b>Nodule</b>	Rare
<b>Bronchial wall thickening</b>	UC
<b>Pleural effusion</b>	Rare
<b>Systemic involvement</b>	-



# Severe Acute Respiratory Syndrome (SARS) Coronavirus

## Introduction

- Severe Acute Respiratory Syndrome
- Fatality rate of 11%
- human-to-human transmission occurred in the health care setting
- Natural reservoir: wild animals, such as raccoon-dogs, ferrets, and civets

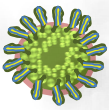


## Pathology and Clinical findings

- $\leq 10$  days: acute-phase **DAD**
- $> 10$  days: organizing-phase **DAD**, superimposed bacterial bronchopneumonia
- Influenza-like and include fever, malaise, myalgia, headache, diarrhea, and shivering
- Progress to clinical, radiologic, and pathologic features of ARDS
- Lymphopenia, DIC, elevated LDH and CK







# Severe Acute Respiratory Syndrome (SARS) Coronavirus

## Coronaviridae

<b>Transmission</b>	Droplet, airborne, contact
<b>Pathogenesis</b>	ACE system involve → <b>DAD</b>
<b>Distribution</b>	Peripheral, multifocal
<b>Consolidation</b>	+++
<b>GGO</b>	+
<b>Nodule</b>	Rare
<b>Bronchial wall thickening</b>	UC
<b>Pleural effusion</b>	Rare
<b>Systemic involvement</b>	-



AJR 2003

## Radiography

- Focal or multifocal unilateral or bilateral consolidation
- Mainly peripheral, middle and lower
- Focal or diffuse GGO or lobar consolidation
- Normal: 20%-40%

## CT

- Focal, multifocal, or diffuse GGO or consolidation
- Crazy-paving pattern