

# HCRT Evaluation on H1N1 Pneumonia

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## ABSTRACT

We are presenting HRCT chest case study of 40 patients with laboratory proved H1N1 influenza A infection presenting with acute chest symptoms. Most common HRCT findings were multifocal ground glass opacities with consolidations in the peripheral portion. Ill-defined pulmonary nodules were found in few patients.

**Keywords:** Computed Tomography, HRCT, H1N1, Ground glass

## Introduction

Influenza A viruses are an important cause of pandemic respiratory disease [1]. For most patients with this infection, chest radiograph is first radiological investigation and can show multiple air space opacities however can be normal or may not give adequate information because of poor respiratory efforts secondary to patients condition. Here high-resolution CT (HRCT) is important imaging modality of choice and gives adequate information and is also helpful in assessing complications and providing evidence of mixed pulmonary infections in patients not responding to therapy [2,3]. We are presenting a case study of HRCT findings of proved cases of H1N1 Influenza A infection during 2010 to 2012. Purpose of this article is to illustrate and describe the various CT manifestations of H1N1 viral infection.

## Materials and Methods

### Case selection

We performed retrospective analysis of 40 proved cases of H1N1 Influenza A pneumonia on the basis of clinical examination and positive throat swab (RT PCR assay). Patients ranged in age from 18 to 52, out of which 22 were female and 18 were male. Cases of H1N1 with superimposed bacterial pneumonia were excluded using clinical and laboratory criteria.

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## Imaging Technique

All patients were evaluated with CT scanner (Siemens, Somatom Definition AS, Erlangen German) Images were acquired in mediastinal and High resolution lung window algorithm using 1mm slice thickness with 10mm interslice gap.

## Results

### Clinical and Laboratory Findings

Most common clinical features for H1N1 virus infection at presentation are acute breathlessness, fever, cough, and headache. Throat swab (RT PCR assay) of all patients were tested positive for H1N1 influenza A. Chest radiograph of all patients showed some abnormality or raised its possibility

### HRCT Findings

Out of 40 patients, nine patients did not show any pulmonary abnormality. Most common positive CT findings in patients with H1N1 infection are multifocal ground-glass opacities, areas of consolidation, or a mixed pattern of ground-glass opacities and areas of consolidation [Fig,1, 2, 3,4]. The abnormalities are frequently bilateral and peripheral subpleural location [fig 5] only in two cases opacities were peribronchovascular distribution. Figs. 7 Ill-defined parenchymal nodules with random distribution were seen in two patients [fig 6,8]. Parenchymal abnormalities did not show any zonal predominance or, more rarely, unilateral (Fig. 9). Patients with widespread consolidations have a more severe clinical course than those who do not [2]. Although none of these patterns is specific of H1N1 infection, the main patterns of disease that are most suggestive of H1N1 are scattered lung consolidations, ground-glass opacities, or

both in a peribronchovascular or sub pleural distribution. Strikingly pleural effusion and mediastinal lymphadenopathy is absent in all cases.

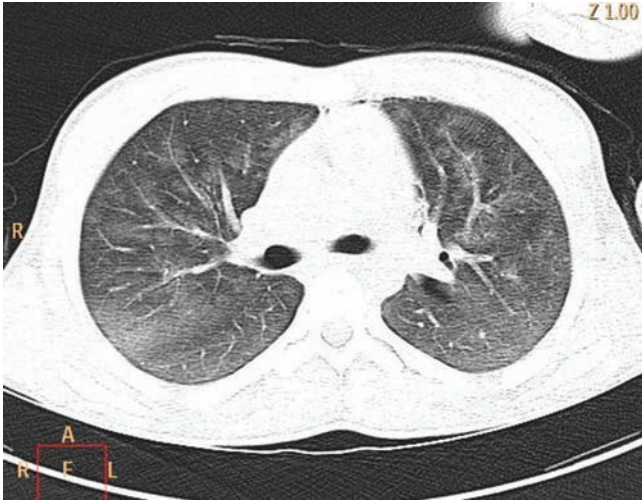


Fig.1: Diffuse bilateral ground glass opacities

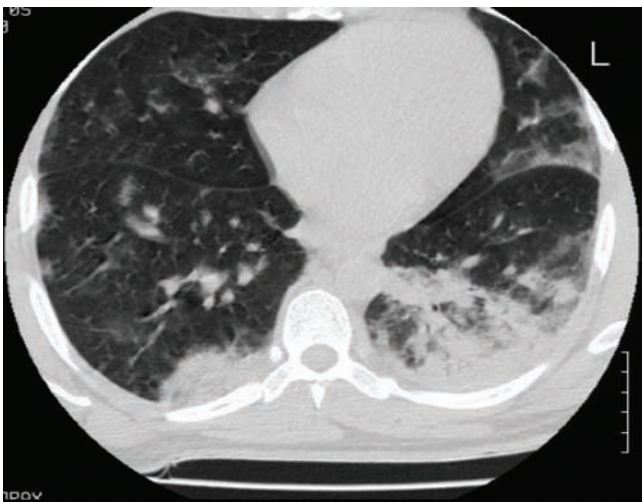


Fig.2: Bilateral multifocal consolidations and ground glass opacities in subpleural region

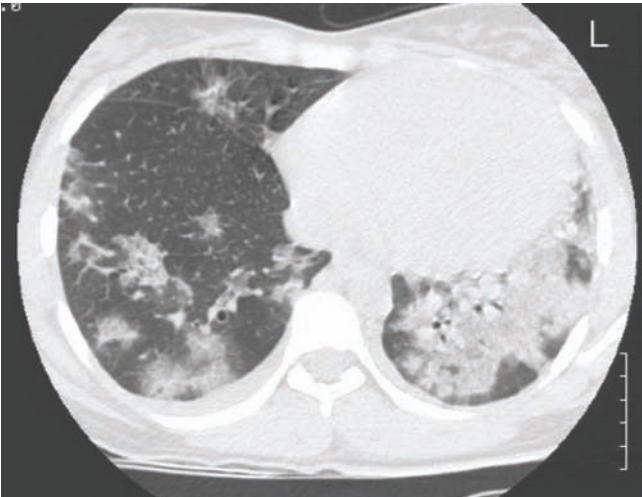


Fig.3 : Extensive patchy ground glass densities and consolidations

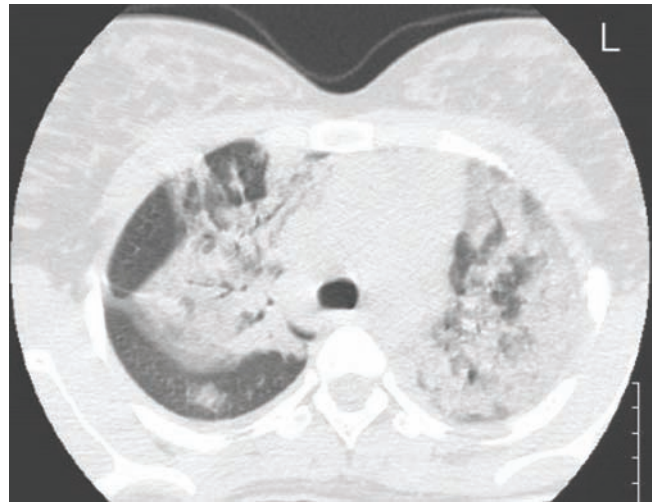


Fig.4: Extensive patchy ground glass densities and consolidations in upper lobes

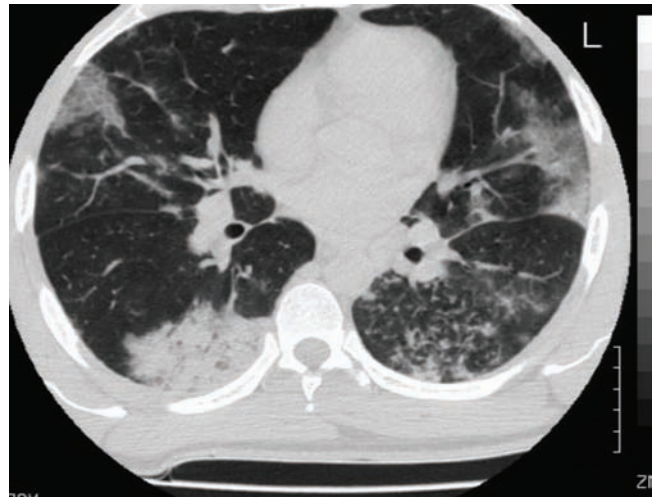


Fig.5: Subpleural and peripheral location of ground glass opacities and consolidations



Fig.6: Scattered ill-defined nodular densities in upper lobes

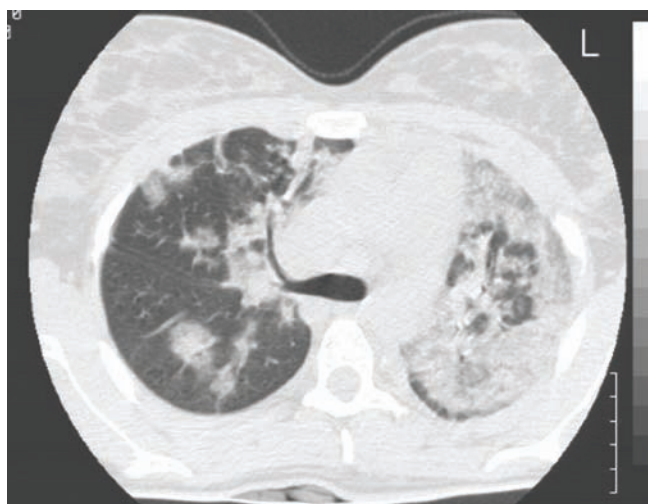


Fig.7: Coronal image showing multiple scattered nodular densities in bilateral lung parenchyma

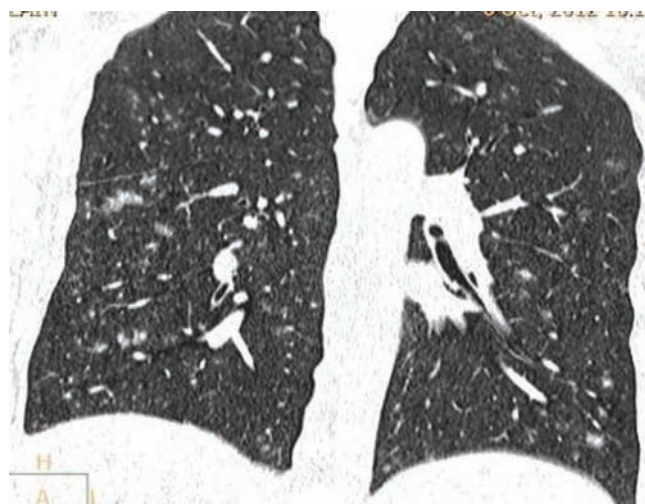


Fig 8: Few of the densities are peribronchovascular in distribution and predominant peripheral in location

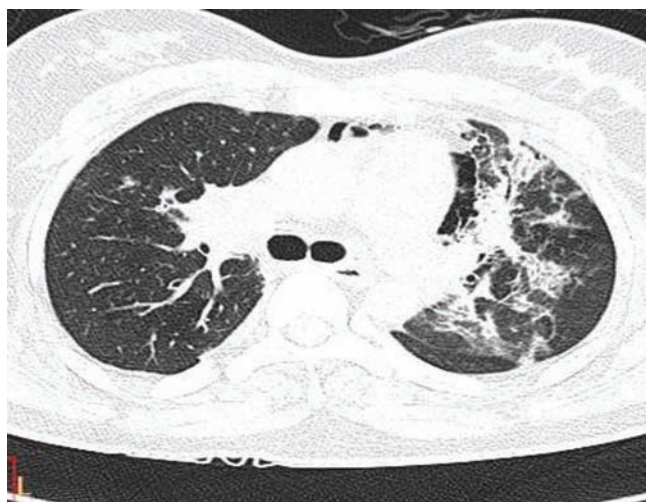


Fig.9: Unilateral consolidation and ground glass opacities

**Table 1. Age and sex wise distribution**

Age	Male	Female	Total
0-10	0	0	0 (0 %)
10-20	1	4	5 (12.5 %)
20-30	4	3	7 (17.5 %)
30-40	6	8	14 (35 %)
40-50	3	4	7 (17.5 %)
50-60	4	3	7 (17.5 %)

**Table 2 Incidence of detection on HRCT**

Total	Throat swab positive	HRCT positive
40	40	31

**Table 3 Incidence of positive HRCT findings**

Mix ground glass and consolidations	Ground glass densities	consolidations	Nodules	Positive findings
12	14	5	2	Number
30	35	12.5	5	percentage

## Discussion

This pattern of multifocal ground glass opacities with consolidation is commonly seen in other conditions like acute stage of cryptogenic organizing pneumonia, hypersensitivity pneumonitis, chronic eosinophilic pneumonia, other viral pneumonias, diffuse alveolar hemorrhage etc. [11]. So clinical findings and laboratory evidence of the infection when suspected is very important [2].

Another uncommon parenchymal finding is the halo sign, which is ground-glass opacities surrounding a consolidation, nodule, or mass [5]. Elicker et al. [5] reported that CT features associated with either large or small airways disease such as airway thickening or dilatation, centrilobular nodules [fig.11] and tree-in-bud opacities were frequent in their series of immunocompromised patients. Sometimes consolidations develop secondary to bacterial infections during course of the disease and radiological assessment becomes difficult [2]. However appearance of lobar, multilobar consolidations, cavitations and appearance of pleural effusion are important features which gives glue to the diagnosis. Here clinical course of the disease and follow up imaging is important. Consolidations and ground glass opacities secondary to H1N1 infection regress during convalescence [2]. Only two patients in the study showed multiple centrilobular nodules with branching and tree in bud appearance suggesting small airways involvement. These findings are previously described in a study by Elicker et al. [5] in immunocompromised patients.

Pulmonary injury may predispose individuals who become infected with H1N1 virus to the formation of cysts that may rupture, causing the formation of an extra alveolar air collection. The free air may dissect and rupture through the visceral pleura, causing pneumothorax, or may track centrally into the hila and mediastinum, causing pneumomediastinum] (Fig. 10). However, in most studies, chest CT with soft-tissue window settings displayed several notable negative findings including the absence of lymphadenopathy and pleural or pericardial effusions

## Differential Diagnosis

HRCT findings of multifocal peripheral scattered areas of consolidation or ground-glass opacities are not specific for influenza pneumonia [2]. Other viral pneumonias, cryptogenic organizing pneumonia (COP, chronic eosinophilic pneumonia (CEP), acute stage of hypersensitivity pneumonitis, parasitic infections like *Pneumocystis carinii* pneumonia in immunocompromised patients. Clinical history, symptoms,

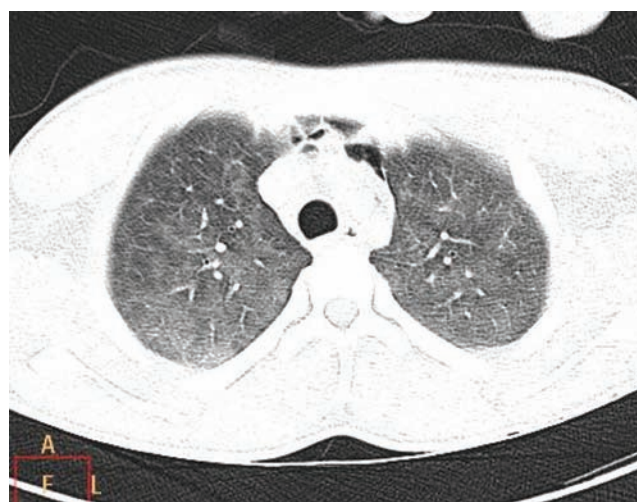


Fig.10: Diffuse ground glass opacities with small pneumomediastinum



Fig.11: Diffuse ground glass opacities with centrilobular nodules

occupational history and laboratory results are very important [11].

Sudden onset of infectious symptoms in H1N1 pneumonia is the most important parameter for differentiating H1N1 infection from COP and CEP. Other diseases most likely to be confused with H1N1 infection are other bacterial, atypical, fungal and viral infections. Clinical and laboratory data and the presence of unusual imaging findings seen in H1N1 infection, such as pleural effusion, lymphadenopathy and lobar consolidation, break down can help in establishing the correct diagnosis [13]. Although the CT findings of H1N1 infection frequently overlap with those of other infections, a pattern of extensive or diffuse ground-glass opacities and consolidations, mainly when in a peribronchovascular or subpleural distribution, can be highly correlated to H1N1 infection [7]. Less typical tomographic presentations have a broad differential diagnosis. The finding of ground-glass opacities on HRCT in patients with AIDS is highly related to *Pneumocystis carinii* pneumonia and cytomegalovirus pneumonia..

H1N1 infection should also be included in the differential diagnosis of pulmonary infections that cause ground-glass opacities in patients with AIDS [14]. Lymphocytic interstitial pneumonia and nonspecific interstitial pneumonia may present as groundglass opacities on HRCT [15].

### Conclusion and Summary

Multifocal ground glass peripheral ground glass opacities with or without consolidation or nodules is a common HRCT finding of pulmonary H1N1 infection which is non specific for the diagnosis. However, when associated with clinical and laboratory data, imaging findings can be of great value in staging disease, assessing complications, and following up patients, especially in cases with a severe course.

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