

HRCT THORAX FINDINGS OF INFLUENZA A H1N1 PNEUMONIA IN A TERTIARY CARE HOSPITAL IN SOUTH INDIA

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ABSTRACT

BACKGROUND

Influenza viruses are common seasonal pathogens affecting the human respiratory system. H1N1 pneumonia (swine flu) is a highly contagious respiratory disease caused by one of the several swine flu influenza A viruses. H1N1 infection can present with illness ranging from an asymptomatic infection to life threatening ARDS in vulnerable groups. H1N1 pneumonia can present with a wide variety of radiological findings. HRCT Thorax has been of great importance in identifying the extent of the lung involvement and diagnosing H1N1 pneumonia in an emergency set up.

MATERIALS AND METHODS

A retrospective study of HRCT-Thorax findings of 28 patients with H1N1 pneumonia, confirmed through laboratory tests, during the period of September 2016 to February 2017. CT Thorax were evaluated for the radiological patterns and distribution.

RESULTS

The predominant radiological findings in HRCT thorax were Bilateral and diffuse. Ground glass opacities (71%), Consolidation (50%), Pleural effusion (32%) and nodularity (7%). Peribronchial and subpleural consolidation is predominantly seen. Other findings include emphysematous changes and lymphadenopathy.

CONCLUSION

Bilateral diffuse ground glass opacities with areas of consolidation of peribronchial and subpleural predominance and pleural effusion are the commonest radiological finding of H1N1 pneumonia.

KEYWORDS

H1N1, HRCT Thorax.

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BACKGROUND

Influenza A viruses belongs to the family Orthomyxovirus with 16 variants of hemagglutinin and 9 varieties of neuraminidase proteins used for subtyping.¹

A Pandemic is defined as, "an epidemic occurring worldwide, or over a very wide area, crossing international boundaries and usually affecting large numbers of people". Influenza infection occurs almost every year with different strains of hemagglutinin and neuraminidase proteins. However, Influenza A pandemics occurred three times in the

20th century. H1N1 in 1918, H2N2 in 1957 and H3N2 in 1968. H1N1 pandemics re-emerged in 1977 and in April 2009.²

In 1918 pandemic of H1N1 influenza, about five hundred million people were estimated to be infected with this strain and the death toll rise to 50–100 million people worldwide.^{3,4}

In 1977, the re-emergence of influenza with subtype H3N2 was named as "Seasonal Flu" and a new influenza virus pandemic was seen in 2009 which was referred as "Swine flu" as many of the genes in this virus were similar to the one found in the pigs in North America. Further studies revealed that it has two genes from flu virus that normally circulate in Pigs in Europe and Asia, a bird gene (avian) and a human gene hence called "Quadruple reassortant" virus.^{1,5}

Children, young adults and found to be the susceptible group for the disease. However, population susceptible for complications include pregnant women, elderly age group, and people with chronic obstructive pulmonary disease, coronary artery disease, chronic kidney disease, chronic liver

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disease and neurological diseases as co morbid conditions.^{1,2} Immunocompromised are more prone for other secondary bacterial infections.^{1,2}

Clinical features of H1N1 influenza includes fever, sore throat, non-productive cough, rhinorrhoea, nasal congestion, malaise of seasonal flu and gastrointestinal symptoms such as nausea, vomiting and diarrhoea. History of recent travel to the country with pandemics within 7 days will raise the suspicion of the disease. The diagnosis of H1N1 influenza is confirmed by real time RT-PCR (reverse transcriptase polymerase chain reaction) of samples from pharyngeal or nasopharyngeal swab. Other laboratory findings are leukopenia, lymphopenia, leucocytosis, thrombocytopenia and elevated creatinine phosphokinase levels.

Usual complication of the disease includes refractory hypoxemia requiring oxygen supplementation to mechanical ventilation. Refractory hypoxemia may further lead to renal compromise (common), cardiac failure and sepsis.

MATERIALS AND METHODS

The study was carried out in a tertiary care hospital in Chennai. A retrospective study to present the common radiological findings of H1N1 infected patients with diagnosis confirmed by real time reverse transcriptase polymerase chain reaction assay during the period of September 2016 to February 2017.

The study population of twenty-eight patients (17 female and 11 male) of age group 20-80 years of H1N1 bronchopneumonia, who underwent high resolution computed tomography of thorax during the period of hospital stay.

It is mainly to present the common radiological findings presenting in the H1N1 Broncho pneumonia. The outcomes of the patients were also analysed and reported. These patients were subjected to undergo high resolution computed tomography of thorax during the hospital stay in the 64 slice multidetector computed tomography scanner and were archived in Picture Archiving and Communication System and were reported by different radiologists. The computed tomography images were again reviewed and interpreted by a trained Radiologist and a Pulmonologist and the final interpretation were reached by consensus.

The images were evaluated for various radiological patterns (consolidation, nodules, ground glass opacities (GGO's), pleural effusion and lymphadenopathy) and the distribution (unilateral or bilateral and lobar predominance).

Ground glass opacities are defined as an area of increased attenuation in the lung parenchyma with

preserved bronchial and vascular markings. Consolidation is defined as the homogenous increase in the lung parenchymal attenuation which obscures the vascular and bronchial markings. Nodules are the focal round opacities. Other findings included were pleural effusion and lymphadenopathy.

The radiological findings are further categorised as bilateral or unilateral involvement to understand the severity of the disease and the common lobar predominance (bilateral upper lobes, right middle lobe, left lingual, bilateral lower lobes or diffuse) is studied.

RESULTS

The retrospective study of high resolution computed tomography of thorax of H1N1 bronchopneumonia patients for the common radiological findings gave us the following results.

Of the 28 patients 17 (60.7%) of them were females and 11 (39.3%) of them were males. The mean age group was 51.39 years with SD of 17.02.

Of the 28 patients 5 of them had no significant radiological findings and rest 23 of them showed radiological features like consolidation or ground glass opacities or pleural effusion and those were analysed and presented in the table.

20 patients (71%) had presented with ground glass opacities, 14 patients (50%) presented with consolidations. 64% of them presented with ground glass opacities and consolidation combination. Combination of consolidation with ground glass opacities and pleural effusion is seen in 21%.

6 patients had peribronchial and sub pleural pattern of distribution and 5 of them had mixed pattern of distribution. Sub pleural pattern of distribution is seen in 4 patients. Peri bronchial pattern alone is seen in 2 patients and same in perihilar pattern of distribution.

Nodularity is seen in 2 patients (7%) and both the lesion was unilateral and seen in left lung. Of the 2 patients, one had nodular opacity along with consolidation, Ground Glass Opacities and effusion.

Among the patient with radiological features in computed tomography chest 2 patients (7%) had unilateral lung involvement, rest of them presented with bilateral involvement (76%).

Majority of the patients presented with diffuse involvement. One patient presented with only upper lobe involvement. Rest of them were presented with lower lobe alone or with combination with other lobes.

Radiological Findings		Number of Patients
Opacities	Only Consolidation	Nil
	Consolidation with ground glass opacities	9
	Consolidation, Ground Glass Opacities, Pleural Effusion	4
	Ground glass opacities	3
	Nodule	1
	Nodule, Consolidation, Ground Glass Opacities, Pleural Effusion	1
	Pleural effusion	1

Laterality	Bilateral	18
	Unilateral	2
Distribution	Peribronchial and sub pleural	6
	Mixed pattern	5
	Sub pleural	4
	Peri Hilar	2
	Peribronchial	2
	Peri Hilar and Peri Bronchial	1

Other findings include emphysematous changes in one patient and lymphadenopathy in one patient is seen.

Showing Extensive Ground Glass Opacities in All Lobes in BL Lungs

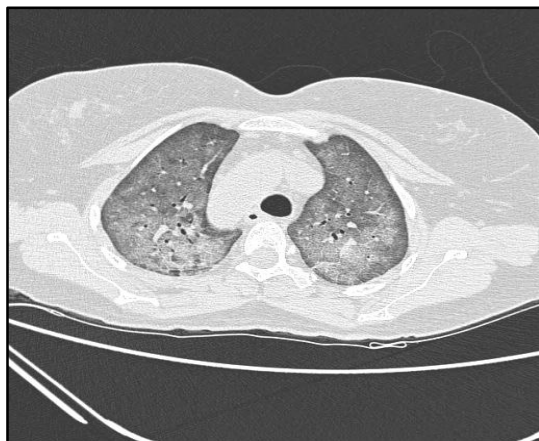


Figure 1



Figure 2

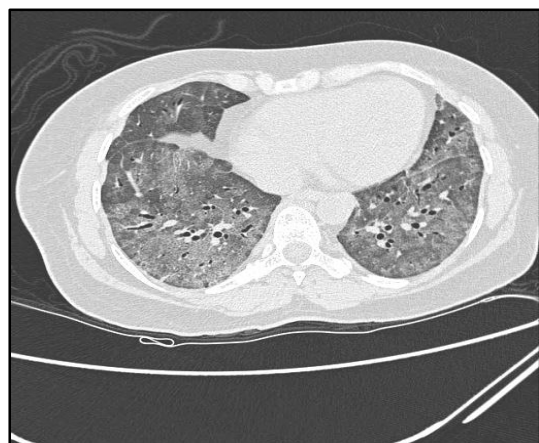


Figure 3

Figure 1-3. CT Image of a 52- Year-Old Female Patient.

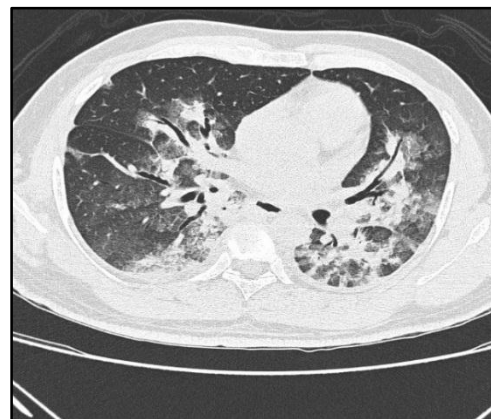


Figure 4

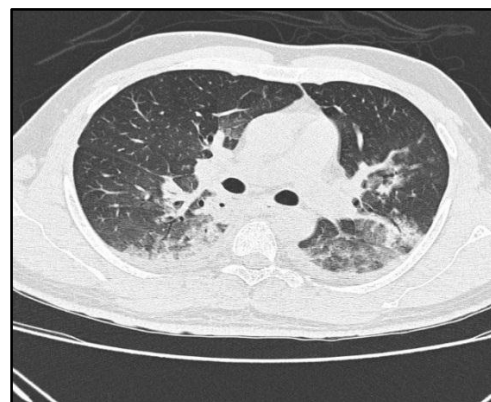


Figure 5

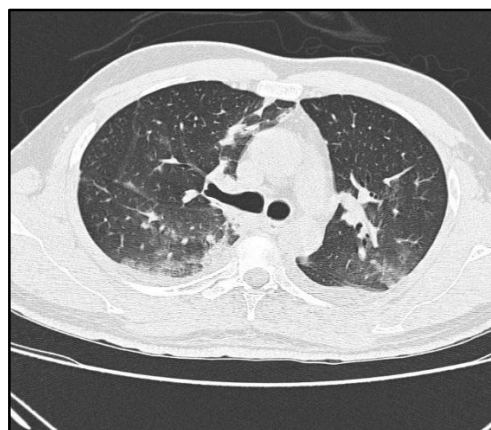


Figure 6

Figure 4-6. CT Image of 41-Year-Old Male Showing Bilateral Lower Lobe RT Middle Lobe and Lingula Consolidation with All Lobes Ground Glass Opacities and Bilateral Minimal Pleural Effusion.

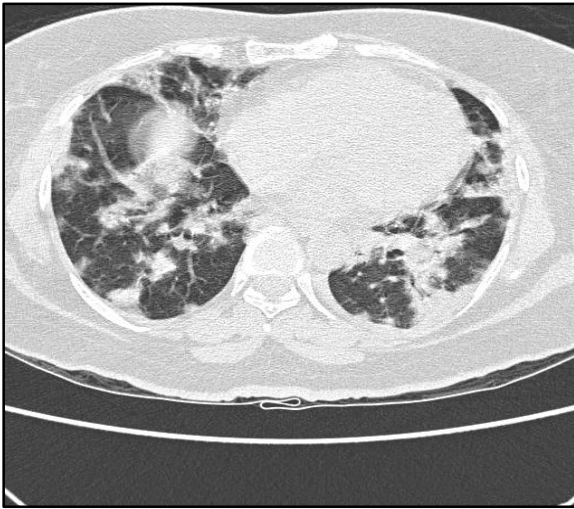


Figure 7



Figure 8

Figure 7, 8. CT Image of 40 Years Old female Bilateral diffuse Consolidation and Ground Glass Opacities.

DISCUSSION

Influenza viruses are common seasonal pathogens affecting human respiratory system. H1N1 pneumonia can present with illness ranging from an asymptomatic infection to life threatening acute respiratory distress syndrome in vulnerable groups.

The radiological findings of H1N1 bronchopneumonia is highly helpful in identifying the extent and severity of the disease. Chest radiographs are usually done for the initial assessment in patients presenting with respiratory symptoms. However, high resolution computed tomography of thorax is preferred in patients with H1N1 pneumonia. Although the diagnosis of viral infection is based upon the clinical profile and microbiological identification of the virus, identification of certain radiological features of the disease with HRCT will be useful and especially in patients with atypical clinical manifestations. Hence identification of common tomographic findings plays a role in clinical practise. Various studies have been reported on common radiological findings and severity.

A study on chest radiograph and computed tomography thorax of the H1N1 pneumonia patients by Nicolini A et al¹

shows that 84.5% of patients in their study presented with radiological finding of ground glass opacities, consolidation being the second most common with peribronchovascular and subpleural predominance and reticular opacities in 20% of patients. Bilateral distribution is documented in majority of patients. In contrast, our study also had higher percentage of ground glass opacities followed by consolidation. There were combinations of ground glass opacities and consolidation in our study which amounts to 64%. As in the study by Nicolini A et al¹ our study also had bilateral distribution of findings in HRCT as majority.

According to the study by Rohani P et al⁶, on chest radiological findings of patients with severe H1N1 pneumonia requiring intensive care, the common CT findings were Ground glass opacities (100%), consolidation (100%), and the nodular opacities (60%). Bilateral distribution is documented in 100% of study population with peribronchovascular and multifocal pattern in 80% were as in our study ground glass opacities were seen in majority of the patients. Bilateral distribution in our study group was 76%.

The finding in our study was almost similar to the study in 2013 by Amorim VB et al⁷, on Influenza A (H1N1) pneumonia: HRCT findings which shows that ground glass opacities in 85%, consolidation in 64%, combination of consolidation and Ground glass opacities in 58% with predominant Bilateral distribution (89%). Other findings include airspace nodules (25%), septal thickening (21%), crazy paving pattern (15%), air trapping and perilobar pattern of 3% each.

As mention above according to these studies.^{1,6,7,8,9,10} common findings include bilateral - ground glass opacities alone or with areas consolidation. Ground glass opacities with consolidation usually indication secondary bacterial infection and increased severity of disease. Other radiological findings include nodular opacities, pleural effusion and crazy paving pattern. In our study, the commonest finding was bilateral ground glass opacities with consolidation followed by pleural effusion which correspond to other studies. One patient with lymphadenopathy and one patient with emphysematous changes were there in our study. Crazy paving pattern is not presented in our study.

The consolidation is again studied.^{6,7,8,9,10} based on distribution, predominantly peri bronchial and sub pleural distribution are reported and the similar findings are seen in our study. In addition to the above findings, perihilar and mixed pattern are documented in our study.

In most of the studies, the lobar predominance is being documented as bilateral lower lobes, however few studies diffuse presentation with all lobes involvement is also been reported. The lower lobe predominance is not markedly seen in our study but the presentation is diffuse involving all lobes in our study.

Common radiological findings of other viral pneumonias as discussed in other studies are airway centric pattern of disease with varying degrees of bronchial wall thickening and tree in bud opacities with or without multifocal consolidation in Respiratory Syncytial Virus (RSV). Multifocal

Pneumonia or consolidation or both is the radiological finding of Adenovirus.¹¹ Likewise, bacterial and viral pneumonias can also be differentiated with the radiological features specific to the disease-causing organisms.

Severity of the H1N1 infection in regards with HRCT thorax findings can be analysed based on the oxygen requirement, mechanical ventilation and lobar involvement. However, there is no specific investigations to quantify the viral load of influenza virus.

However, the chest radiograph findings are not analysed in our study and the patient's recovery and follow up couldn't be documented as it is a retrospective study.

CONCLUSION

The HRCT Thorax can be useful tool for the diagnosis of H1N1 infection in appropriate clinical situation. The predominant findings in our study is bilateral diffuse ground glass opacities with consolidation and pleural effusion which is similar to the previously reported studies. However lower lobe predominance and presence of crazy paving pattern documented in previous studies in not seen in our patients.

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