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ORIGINAL ARTICLE

Chest radiological findings of influenza A H1N1 pneumonia

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KEYWORDS
Influenza H1N1 virus pneumonia;
Radiological findings;
Ground-glass opacity;
Consolidation;
Chest radiological score

Abstract
Objective: The objective of this study was to review chest radiographs (CXR) and chest computer tomography (CT) findings in patients with influenza A H1N1 virus pneumonia.
Materials and methods: Of ninety-eight patients with influenza A H1N1 infections seen in the General Hospitals of Villa Scassi, Genoa, and Sestri Levante from September 2009 to December 2009, twenty-eight developed pneumonia. The initial CXR were evaluated for radiological patterns: (ground-glass, consolidation, nodules, reticulation), distribution, and extent of the disease. Chest CT scans were reviewed for the same findings. A new radiographic score (CXR score) was used to evaluate the severity of the illness.
Results: The predominant radiological findings on chest CT in the patients at presentation were unilateral or bilateral multifocal ground glass opacities (84.5% of the patients).

Consolidation areas had a peribronchovascular and subpleural predominance and were found mainly in the middle and upper zones of the lung. Reticular opacities were found in about 20% of the cases. The most outstanding CXR and chest CT features of the disease were basal and axial alveolar consolidation and ground-glass opacities. The severity of disease as determinate by need for mechanical ventilation was greater in patients with a greater number of lobes involved and a higher CXR score.
Conclusion: Bilateral ground-glass opacities and areas of consolidation were the predominant radiological findings of influenza A (H1N1) virus pneumonia. Multifocal bilateral opacities and CXR score are strictly correlated with the severity of the illness.

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PALAVRAS-CHAVE
Pneumonia do vírus da gripe H1N1;
Resultados radiológicos;
Opacidades em vidro fosco;
Consolidação;
Pontuação radiográfica do tórax

Achados radiológicos do tórax da pneumonia da gripe A H1N1

Resumo
Objetivo: O objetivo deste estudo foi rever radiografias ao tórax (RXT) e tomografia computadorizada do tórax (TC) em pacientes com pneumonia pelo vírus gripe A H1N1.
Materiais e métodos: Dos noventa e oito pacientes com infecção pelo vírus gripe A H1N1 vistos nos Hospitais Gerais de Villa Scassi, Génova e em Sestri Levante, de setembro de 2009 a dezembro de 2009, vinte e oito desenvolveram pneumonia. Os RXT iniciais foram avaliados através de padrões radiológicos: (consolidação em vidro despolido, nódulos, reticulação), distribuição e extensão da doença. As TC do tórax foram revistas para os mesmos achados. Uma nova escala radiográfica (escala RXT) foi utilizada para avaliar a gravidade da doença.
Resultados: Os achados radiológicos predominantes na TC do tórax em pacientes na apresentação foram opacidades multifocais em vidro despolido (84% dos pacientes).

As áreas de consolidação tinham uma predominância peribroncovascular e subpleural e foram encontradas principalmente nas áreas médias e superiores do pulmão. Foram encontradas opacidades reticulares em cerca de 20% dos casos. As características mais notórias da doença na TC e RXT do tórax foram a consolidação basal e alveolar axial e as opacidades em vidro despolido. A gravidade da doença determinada pela necessidade de ventilação mecânica foi maior nos pacientes com um maior número de lóbulos envolvidos e com uma pontuação na escala RXT mais elevada.
Conclusão: As opacidades bilaterais em vidro despolido e as áreas de consolidação foram os achados radiológicos predominantes da pneumonia do vírus da gripe A (H1N1). As opacidades multifocais bilaterais e a pontuação da escala RXT estão estritamente correlacionados com a gravidade da doença.

Introduction

Influenza A viruses belong to the family Orthomyxovirus, with 16 varieties of hemagglutinin and 9 varieties of neuraminidase proteins used for subtyping. Influenza[1] A pandemics occurred three times in the 20th Century: H1N1 in 1918, H2N2 in 1957, and H3N2 in 1968. H1N1 re-emerged in 1977 to periodically circulate with A (H3N2) subtypes as ''seasonal flu''. A new influenza pandemic arrived in April 2009. This novel H1N1 virus was initially termed ''swine origin influenza virus'' but further studies revealed that it represents a quadruple reassortment of one human, one avian and two swine strains. Retrospective studies showed a virus similar to swine origin influenza virus that appeared in Thailand in 2000.[2]

Children and young adults are the most susceptible to this infection and high risk groups for complications are pregnant women, adults older than 65 years, children younger than 5 years, patients with underlying conditions such as chronic obstructive pulmonary disease (COPD), cardiovascular or neurological diseases, immunosuppression, hematological disorders, chronic liver diseases, chronic renal failure, metabolic diseases (especially diabetes mellitus and obesity).[2,3] Although patients with conditions that confer some degree of immunosuppression, such as asplenia, should not have increased risk of influenza-associated complications, they can be at high risk of secondary invasive infections such as pneumococcal or methycillin-resistant *Staphylococcus aureus* pneumonia.[2,3] The signs and symptoms are similar to those of ''seasonal flu'', except for the fact that a greater number of subjects develop gastrointestinal symptoms.[2,3] The most important complications are lower respiratory tract involvement, acute respiratory failure and acute lung injury or respiratory distress syndrome (ALI/ARDS) with refractory hypoxemia. Other severe complications include secondary invasive bacterial infections, septic shock, acute renal failure, reversible cardiac dysfunction, and the multiple organ failure syndrome. Moreover, worsening of underlying chronic diseases such as asthma, COPD or congestive heart failure may occur.[2–4] Non-specific laboratory features include: elevated lactate dehydrogenase levels, lymphopenia or leucopenia or leucocytosis, thrombocytopenia and increased creatinine-phosphokinase and transaminases levels. The diagnostic test of choice is RT-PCR; samples must be collected through nasopharyngeal aspirate, or nasopharyngeal or pharyngeal swab, or, in the case of pneumonia, through the lower respiratory tract.[3,5]

The radiological appearance has been described in previous studies and presents similar findings, but there is a quantitative difference between cases of mild or severe illness. The predominant findings consist of ground-glass opacities or areas of consolidation, or a mixed pattern of ground glass and areas of consolidation.[6] Bilateral opacities are common, with involvement of multiple lung zones. Findings in four or more zones and bilateral peripheral distribution occurred with significantly higher frequency in patients with poorer outcomes.[7] The aim of this study was to review radiological findings on chest X-ray (CXR) and on chest computed tomography (CT) of influenza A (H1N1)