H1N1 in Argentina: Co-infection and pregnancy - CT findings

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Learning objectives

To show common CT findings in patients referred to our institution between May and July 2009 with clinical and epidemiological suspicion of avian influenza virus A (H1N1) in association with risk factors as bacterial pneumonia co-infection and pregnancy.
Background

There are three types of influenza viruses: A, B and C. Influenza A (H1N1) individualized from 2009, is a pandemic infection caused by a variant of virus swine origin, known by the World Health Organization as H1N1/09, virus of the orthomyxoviridae family. This virus has a segmented RNA genome, and RNA -dependent RNA polymerase. The genetic material comes from an avian strain, two strains of pig and a human strain. Is considered a zoonotic infection transmitted from pigs to humans, with dissemination by interpersonal contact. The major glycoproteins in the wrapper, are the hemaglutinin antigen(HA) and neuraminidase(NA). The HA is responsible for adherence to the plasma membrane of host cells.

Influenza known since the time of Hippocrates, the term influenza was introduced in Italy at the beginning of the fifteenth century the epidemic was attributed to the influence of the stars. In the eighteenth century the French called it "L`Grippe". The great pandemic of 1918-19(H1N1) known as the "Spanish flu" killed more than 20 million dead. In 1930 identified as a specific virus causes influenza.\textsuperscript{1,2,3,4}.

In the H1N1 symptoms are similar to seasonal flu: hyperthermia(38-40 degrees), general decay, dry cough, nasal discharge, headache, chills, eye pain, loss of appetite, vomiting and diarrhea.

The interpersonal spread of the virus occurs very similar to seasonal flu, through flugge droplets and fomites of infected, with a high probability of infection and more extensive in time.\textsuperscript{7,8,9}

According to some investigations, the movement of live pigs between Eurasia and North America "facilitated the mixing of different swine influenza virus, which leads to the redistribution of many events related to the genesis of H1N1 on the (new)strain"\textsuperscript{5,6}

Seasonal flu can only infect cells with receiver A2-6 type found in the nasopharynx, H1N1/09 can also infect cells with A2-receptor type 3, with vulnerability of the alveolar epithelium. This aspect can explain why some patients have severe respiratory symptoms (respiratory distress syndrome).The severity is related to genetic variation in the immunologic system.\textsuperscript{10,11}

The virulence of the virus can change by mutation, then is genetically unpredictable.\textsuperscript{12}

The University of Hong Kong confirmed that the new H1N1 virus is "very unstable".\textsuperscript{13}

The damage of the bronchial epithelium is associated with dysregulation of inflammatory mechanisms based in genetic alterations with abnormal specific transcription and apoptosis in bronchial tissues with different degree of severity.\textsuperscript{14,15}

The most frequent causes leading to hospitalization and obituary were: pre-existing or concurrent disease and pregnancy. There is Increased vulnerability in the pregnant population with high morbidity and mortality rate, often producing early interruption of pregnancy.\textsuperscript{16,17}
Between May and July 2009 were presented at our institution 68 adults with clinical and epidemiological suspicion of avian influenza virus A (H1N1). In 25 cases co-infection as risk factors for bacterial pneumonia and pregnancy were present. Retrospectively we evaluated the chest CT findings in this group with an age range between 25-70 years (mean 45 ± 15 years) composed of 38 women (56%) and 30 men (44%). The Chest CT was performed with a double helical system (Elscint, Israel) without intravenous contrast and the following parameters: helix pitch of 2: 6.5 / 5 mm), with high axial resolution of 2 mm thickness each 5mm, making usual reading with double glazing. The most common finding on chest CT was the presence of bilateral ground glass opacity (GG) in 29 cases (12 associated with consolidation). Bilateral consolidations (BC) were observed in 10 cases (6 associated with pleural effusion). In 7 cases chest CT showed consolidation, ground glass opacity and pleural effusion, while in 9 cases CT was normal, showing pre-existing emphysema in 3 of them. Of the 7 pregnant patients, 3 had GG and BC; 2 GG only and 2 normal chest CT. There was 1 stillbirth.

In relation with the pulmonary bacterial co-infections in this series there was evidence of CT consolidation secondary to bacterial infection in 22 of 68 cases associated with GG in 12 cases and pleural effusion in 10 cases. Similar results were found in one study of 41 patients where the most common finding was the presence of bilateral GG, the second finding was BC. Pleural effusion was present in 25% of cases. The most frequent association was the presence of bilateral GG and consolidations in 10 patients. According to global experience, the highest rate of complications leading to hospitalization and death is seen in those patients with pre-existing-concurrent pulmonary disease and/or pregnancy. In a minority of cases, the H1N1 virus causes a more serious illness than seasonal influenza because high aggressiveness on the alveolar epithelium.
Fig.: Table

References: MRI, Argus Diagnóstico Médico - Buenos Aires/AR

Fig.: Axial CT Higt Resolution(HR), bilateral ground-glass pattern.
Fig.: Axial CT HR, ground-glass screen and condensation in the lower lobe, right lateral and posterior basal segments.

References: MRI, Argus Diagnóstico Médico - Buenos Aires/AR
Fig.: Axial CT HR, condensation in the right lower lobe anterior basal segment.

References: MRI, Argus Diagnóstico Médico - Buenos Aires/AR
Fig.: Axial CT HR, frosted glass condensation in patches and right pleural effusion

References: MRI, Argus Diagnóstico Médico - Buenos Aires/AR
Fig.: Axial CT HR, most condensation right pleural effusion.

References: MRI, Argus Diagnóstico Médico - Buenos Aires/AR
Fig.: Axial CT HR, showing condensation, right pleural effusion but frosted glass.

References: MRI, Argus Diagnóstico Médico - Buenos Aires/AR
Fig.: Axial CT (HR) with a predominant ground glass back

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Fig.: Axial CT (HR), ground-glass pattern, consolidation and pleural effusion
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Fig. 0: Axial CT High Resolution (HR), bilateral ground-glass pattern.

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Conclusion

In patients infected with avian influenza virus A (H1N1) and respiratory disease, chest CT disclosed in a significant number of cases of this series, a characteristic ground glass opacity pattern associated with bilateral consolidation and pleural effusion. This unusual phenomenon predisposes to bacterial coinfection pneumonia and severe forms of respiratory distress. The degree of damage depends on immunological factors and the affinity of this virus by the alveolar epithelium. There is increased vulnerability during pregnancy. The influenza A virus has high morbidity and mortality rate in the pregnant population and can produce early interruption of pregnancy.
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