Clinical opinion

Title: The Diagnosis of Pneumonia in a Pregnant Woman with COVID-19 Using Maternal Lung Ultrasound

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Abstract

Lung ultrasound examination has been demonstrated to be an accurate imaging method to detect pulmonary and pleural conditions. During pregnancy, there is a need for a rapid assessment of the maternal lung in patients suspected to have COVID-19.

We report our experience on lung ultrasound examination in the diagnosis of Sars-Cov-2 pneumonia in a pregnant woman. Typical ultrasound features of this pulmonary pathology, including diffuse hyperechoic vertical artifacts with thickened pleural line and “white lung” with patchy distribution, were observed. We suggest point of care lung ultrasound examination as a diagnostic imaging tool in pregnant women with suspected COVID-19.

Text

The novel coronavirus infection (COVID-19) is a global public health emergency. Since the first diagnosis in Wuhan (China), the infection has spread rapidly to the rest of the country and also to more than 25 countries around the world, as reported in the World Health Organization (WHO) European Region. The typical symptoms are fever, cough, change in the sense of smell, headache, diarrhea and in some patients it can cause severe acute respiratory syndrome.

Computed Tomography (CT) of the chest is the imaging method of choice in the diagnosis of COVID-19 infection. The hallmarks of COVID-19 infection on CT scan are bilateral, subpleural, ground-glass opacities with air bronchograms, ill-defined margins, and a slight predominance in the lower lobes and consolidative pulmonary opacities. Abnormal lung CT findings can be present even in asymptomatic patients, and lesions can rapidly evolve into a diffuse ground-glass opacity predominance or consolidation pattern within 1–3 weeks after onset of symptoms, peaking at around 2 weeks after onset. Chest X-Ray is able to reveal the disease only in advanced stages.
In pregnant women, diagnosis of COVID-19 pneumonia is particularly challenging. Although chest CT is not contraindicated in pregnancy and remains the gold standard technique for pulmonary pathologies, lung ultrasound (LUS) examination has been demonstrated to be an accurate imaging method to detect peripheral pulmonary and pleural conditions including pneumonia, with high accuracy (sensitivity higher than 90% and specificity higher than 95%), even in pregnancy.

The typical ultrasound findings of COVID-19 pneumonia are: 1) a patchy distribution of interstitial artifactual signs (single and/or confluent vertical artifacts, small white lung regions); 2) an extended distribution of before mentioned interstitial artifactual signs to multiple areas of the lung surface; 3) small subpleural consolidation with associated areas of white lung, following an agreed, tested and standardized images acquisition protocol. The acquisition protocol includes 14 scanning areas (three posterior, two lateral and two anterior) along paravertebral, mid-axillary and hemiclavear lines (NCT04322487).

In our Hospital, we studied the use of lung ultrasound to research findings of sonographic interstitial syndrome in a 23 weeks pregnant woman admitted for fever and cough on 10th March 2020 using a Wireless Ultrasound Probe Convex Color Doppler – C05C with a frequency of 3.5 MHz (ATL S.r.l., Milan, IT).

At admission, the pregnant woman was eupneic in spontaneous breathing in the ambient air. Her peripheral oxygen saturation was 98%. On auscultation, vesicular sounds were reduced bibasaly.

Ultrasonographic assessment was performed with the first operator scanning the patient with the probe and the second operator outside the room evaluating images and videos – in real-time – exploiting wireless technique, in order to reduce operators’ exposure to contamination (Video 1).

The obstetric ultrasound examination revealed a normally grown fetus with normal amniotic fluid and Doppler parameters.

At lung ultrasound examination the patient showed: 1) diffuse hyperechoic vertical artifacts with thickened pleural line and 2) “white lung”, with patchy distribution, on three out of fourteen scan...
sites previously predetermined (Figure 1b and 1d) (Video 1). Chest X-Ray (CXR), performed on the same day, was not suggestive for viral pneumonia (Figure 1a). Throat swabs for 2019-nCoV by real-time PCR confirmed the diagnosis of COVID-19 pneumonia.

Discussion

Point-of-care lung ultrasound examination could play a key role in the assessment of pregnant women with suspicion of 2019-nCoV infection. In particular, in this case, lung ultrasound findings were crucial to indicate anti-viral treatment in presence of substantially normal chest X-Ray.

It’s worth underlying that we decided to perform X-Ray because of different contribution, in terms of imaging findings, provided by X-Ray compared to lung ultrasound LUS. In particular, X-Ray allows us a panoramic view giving information also regarding thoracic – not only pulmonary – zones not detectable at ultrasound examination. On the other hand, ultrasound examination has a better sensitivity for pneumonia referring to focal alterations of peripheral airspace geometry of the lung. Moreover, CT scan was not performed as we did not need further information to plan the management and to start the treatment.

From the current clinical evidence, lung ultrasound patterns of subjects with COVID-19 pneumonia include a patchy distribution of interstitial artifactual signs (single and/or confluent vertical artifacts, small white lung regions). Subsequently, these patterns extend to multiple areas of the lung surface. The further evolution is represented by the appearance, still patchy, of small subpleural consolidation with associated areas of white lung. The evolution in consolidations, especially in a gravitational position, with or without air bronchograms, and their increasing extension along the lung surface indicate the evolution towards the phase of respiratory insufficiency.

Studies aimed at clarifying the diagnostic and prognostic role of lung ultrasound in COVID-19 are urgently needed, especially in pregnancy. The well-known advantages of lung ultrasound in terms
of portability, bedside evaluation, safety and possibility of repeating the examination during follow-up cannot be overlooked and should be exploited and implemented. Moreover, the possibility of performing lung ultrasound examination at the bedside minimize the need of transferring the patient, with a potential risk of further infection spreading within the healthcare personnel.
References:


Conflicts of Interest and Source of Funding: nothing to declare.

Figure legends

Figure 1

1a: Chest X-ray (posterior-anterior projection) of a pregnant woman at 23 week’s gestation, affected by COVID-19 pneumonia showing no pathological signs suggestive of pneumonia but only aspecific bronchial thickening. 1b: Transversal ultrasonographic scan performed along the paravertebral line on basal posterior zone of the right hemithorax showing a pattern of “white lung”. 1c: Transversal ultrasonographic scan performed along the paravertebral line on upper posterior zone of the right hemithorax showing a normal ultrasonographic pattern. 1d: Transversal ultrasonographic scan performed along the hemiclavear line on upper ventral zone of the right hemithorax showing a pattern of “white lung”. Ultrasonographic scans were performed with Wireless Ultrasound Probe Convex Color Doppler – C05C with a frequency of 3.5 MHz (ATL S.r.l., Milan, IT).