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IMAGE ARTICLE

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Chest-X-ray is a mainstay for follow-up in critically ill patients with covid-19 induced pneumonia

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Coronavirus disease (COVID-19), a highly infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), was first reported in Wuhan, Hubei Province, China, and rapidly spread worldwide. As of April 17th, the COVID-19 pandemic has spread to 185 countries with 2,167,955 reported confirmed cases and 146,055 deaths [1]. Since chest CT is crucial for the diagnosis and management of COVID-19 patients [2], our activity as radiologists has changed drastically with a high burden of non-enhanced chest CTs. A large number of articles are now available in the literature emphasizing the dominant position of CT, with few topics supporting the role of chest-x-ray in patient follow-up. We describe identification and follow-up by bedside chest radiography of a pneumothorax complicating COVID-19 induced pneumonia.

A 51-year-old man with a medical history of essential hypertension and obesity (BMI=37) complicated by sleep apnea, was admitted to the Intensive Care Unit. He suffered from flu symptoms with fever and cough over the previous 9 days recently worsened by an acute dyspnea (78% of blood oxygen saturation in ambient air). He was hemodynamically stable and showed symptoms of acute respiratory insufficiency with signs of exhaustion leading to an oro-tracheal intubation. Nasopharynx PCR was positive for SARS-CoV-2. Blood tests revealed C-reactive protein (267 mg/L) and Procalcitonine (0.38 µg/L) increase and a hyperleukocytosis (11 900/mm^3) with lymphopenia.

Chest CT was not performed due the alarming status of the patient at admittance. The initial baseline bedside chest X-ray displayed features of COVID-19 pneumonia [3] (bilateral ground glass opacities with consolidation and without substantiated evidence of another infection) with severe extent (>50% of pulmonary parenchyma) (Figure 1a). On day 6 after admission, during the 3rd session of ventral decubitus, the staff noticed marked respiratory failure and the new bedside chest X-ray revealed an extension of consolidations (critical extent >75% of pulmonary parenchyma) and a left complete pneumothorax (Figure 1b). A chest tube was then rapidly inserted allowing partial lung re-expansion (Figure 1c and 1d).

COVID-19 induced pneumonia is associated with thoracic complications especially in critically ill patients such as added bacterial infections, cardiac failure, pulmonary embolism and pneumothorax [4-6]. Currently, in the midst of a pandemic, it is neither reasonable nor achievable to follow patients with CT-scans, and some of the above mentioned complications can be diagnosed by a daily bedside chest X-ray. Improved efficiency of portable X-rays implies that radiology technicians and resuscitation staff be trained and use of digital systems be preferred for their known benefits.

In fact, we should take advantage of this COVID-19 crisis to settle daily technical issues regarding chest X-ray quality in general. As bedside chest radiography remains a major component of conventional radiology, it is time to improve its quality.

Indeed, we benefit from technical advances in digital radiography with flat panel detectors. First and particularly during this pandemic, the optimized ergonomics of portable devices render daily tasks easier and swifter with increased productivity and staff safety. Wireless flat panel detectors are easy to handle, to install behind the patient and to sanitize. Acquisitions are directly sent wirelessly to the touch-panel computer workstation warranting immediate evaluation of image quality and if necessary, repetition of the acquisition. Patient work list and acquired images are stored on the touch-panel computer workstation and can be sent directly to the picture archiving and communication system (PACS). Secondly, digital systems reduce radiation and simplify post-processing. In our daily practice, we systematically obtain “soft-tissue” and “hard” post-treatment filters (Figure 1c and 1d) enhancing contrast and gray-scale. The first favors parenchymal analysis and tracks complications, while the second better displays positioning of monitor devices such as chest, tracheal or nasogastric tubes, and catheters.

Bedside chest-X-ray is useful to screen potential thoracic complications in critically ill patients with COVID-19 induced pneumonia and thus initiate rapid management. It is also, as the main examination performed in intensive care units and in the immediate post-operative course, very informative for the resuscitation staff and for the surgeon. The COVID-19 crisis confirms that bedside radiography is an indispensable tool for patient management. After a period of neglect, bedside chest X-rays should now regain interest with the promotion of advanced digital technology, as well as enhanced training and raised awareness of radiology technicians.

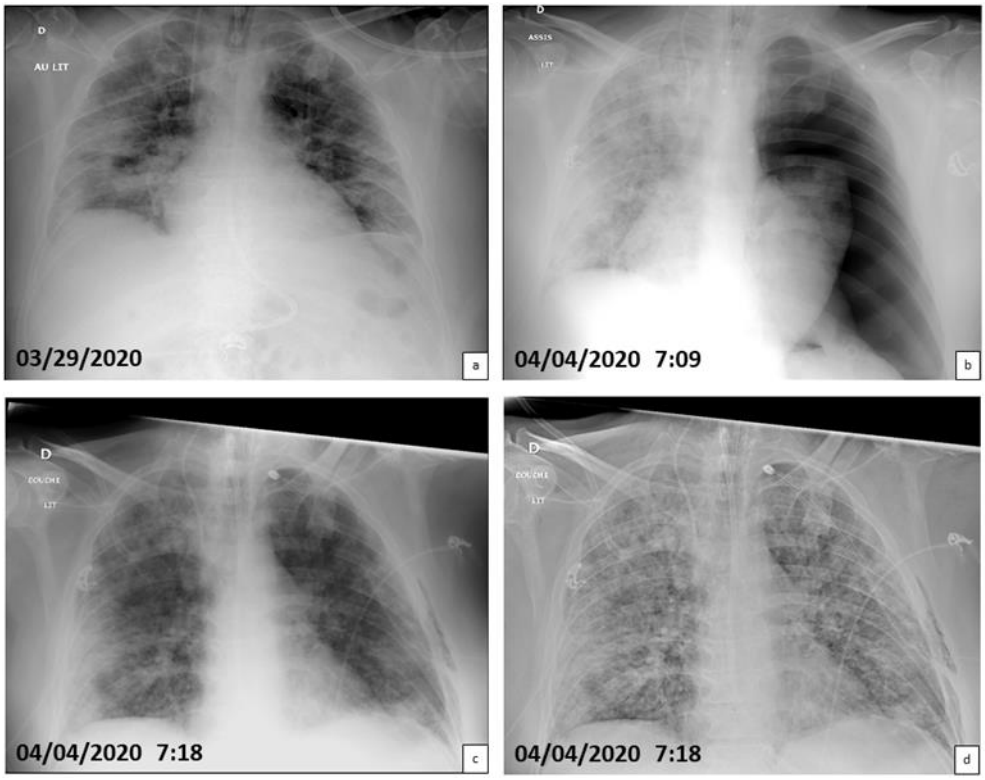

Figure 1. Complete pneumothorax in a 51-year-old COVID-19 patient. a: initial bed chest X-ray (day 9 since symptoms) showing lesions of COVID-19 pneumonia (bilateral ground glass opacities with consolidations). b: Chest X-ray showing a left complete pneumothorax with a collapsed lung. c: chest X-ray after successful drain placement, with "soft-tissue filter" used for parenchymal analysis, showing total expanded left lung d: same picture as in Figure 1c with "hard filter" the better contrast is useful for tubes screening (large arrows).

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