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Hochhegger B, Irion KL, Souza Junior AS, Rubin AS, Zanetti G. Which is your diagnosis? Radiol Bras. 2014 Set/Out;47(5):XI–XIII.

A 23-year-old, male drugs user presenting with dry cough and progressive dyspnea to medium/great stress. Pos-

teroanterior chest radiography and chest computed tomography were performed (Figure 1).

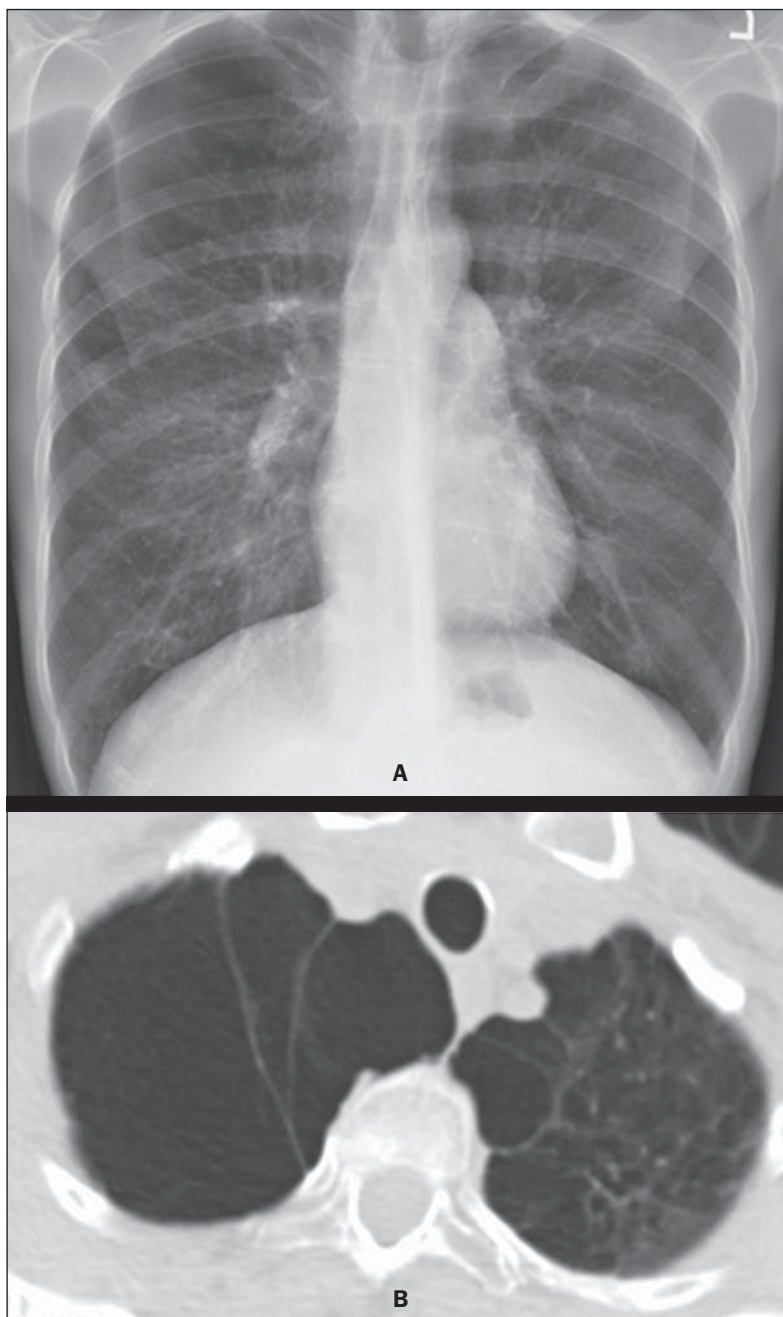


Figure 1. A: Posteroanterior chest radiographic image. **B:** Computed tomography – pulmonary parenchyma window. Section at the level of the upper lung lobes.

Image description

Figure 1. Posteroanterior chest radiography and chest computed tomography showing bullous emphysema in the upper portions of the lungs, predominantly at right.

Diagnosis: Bullous emphysema in a smoking cocaine (crack) user.

COMMENTS

The imaging evaluation of the respiratory system has been the object of a series of recent publications in the Brazilian radiological literature⁽¹⁻¹⁶⁾. Chest computed tomography (CT) has revolutionized the application of imaging methods in many aspects of pneumology and thoracic surgery. The use of CT in the investigation lung cancer, interstitial diseases and emphysema is already part of the routine in pneumological investigation. However, the potential of the method has been sub-utilized in cases of emphysema. As a routine, the use of CT remains restricted to the purpose of diagnostic confirmation and subjective analysis of the extent and type of emphysematous lesions⁽¹⁷⁻²⁶⁾.

Currently, multidetector CT is available in most diagnostic imaging centers. Such CT apparatuses have allowed chest CT scans with acquisition of all the images during a single breathhold. Such a technical feature has opened new avenues for the investigation of lung diseases. Objective measurements of the total pulmonary volume and of the volume of the lung affected by emphysema can be performed with high accuracy⁽²⁷⁻³⁶⁾.

The quantification of emphysema by CT densitometry^(27,37) is a process where areas of the lung with predetermined density values or with attenuation below a determined threshold are depicted in a solid color, so as the observer can immediately identify those areas with altered pulmonary density or emphysema. In 1995, It was suggested that a threshold corresponding to -950 UH was fixed to differentiate a healthy lung from an emphysematous lung (emphysema quantification)⁽³⁸⁾, so this value is most frequently utilized. With the introduction of helical CT, it became possible to calculate the actual volume (cm³) instead of the area (cm²), so the volumetric quantification of emphysema by CT was introduced. Such technique has allowed the early diagnosis as well as the monitoring of these patients^(21,28,31). Such pioneering studies have inspired many other authors who expanded the clinical application of CT beyond the subjective analysis of anatomical aspects on images. Nowadays, it is recognized that CT densitometry is more accurate and sensitive than the traditional pulmonary function tests and is considered the method of choice for noninvasive and accurate evaluation of pathological alterations in emphysema, demonstrating good correlation with histopathological results⁽³⁹⁾.

The use of illicit drugs may cause lungs injury by different mechanisms. One of such mechanisms is the intravenous injection of medicines originally intended for oral administration, causing pulmonary talcosis or emphysema.

In general, some drug users grind medicine tablets down, dissolve them with water and inject such a solution intravenously⁽⁴⁰⁻⁴²⁾. Such oral medications have in common the addition of an insoluble mean (talc, cellulose or starch) to bind medicinal particles together and act as a lubricant preventing tablets from sticking either to machinery or to each other during production^(40,41). Thus, the substance injection results in microscopic pulmonary emboli^(40,42). The particles may migrate to the interstitium, causing a foreign-body-type granulomatous reaction^(40,42). It seems that the talc directly injected in the vascular system is the most relevant mechanism in the development of emphysema. The physiopathological explanation is still unclear, but whatever the involved mechanism is, emphysema is an extremely relevant element in the physiopathology of some forms of pulmonary talcosis^(40,42).

At CT, the main difference between the inhalatory and intravenous (related to the use of intravenously injected oral drugs) forms of talcosis is the development of emphysema in the latter, predominantly affecting the lower lobes. The significantly increased prevalence of panacinar emphysema in the lower lung lobes is observed in intravenous drugs-addicted patients who inject metylphenidate (Ritalin)^(41,43,44). Such a disease pattern is similar to the emphysema described in patients with alpha-1 antitrypsin deficiency^(42,44). Emphysema is the only finding in some Ritalin users.

Barotrauma is another complication resulting from the habit of smoking crack or inhaling cocaine^(45,46). Such a condition may manifest as pneumothorax, pneumomediastinum, pneumopericardium or subcutaneous emphysema^(45,47). In cocaine users, increased intrathoracic pressure may be observed during the smoking act due to vigorous coughing or intentional production of a Valsalva maneuver to increase the drug absorption and maximize its effects⁽⁴⁶⁾. Overdistention of the alveoli may cause their rupture and escape of air into the interstitium and, eventually, to the mediastinum, producing pneumomediastinum^(45,48). Vigorous aspiration following cocaine inhalation may cause pneumomediastinum by a similar mechanism^(46,49). Barotrauma is generally diagnosed by chest radiography, but CT may be useful in the diagnosis in cases where radiography is not conclusive. In young individuals, the presence of air in the mediastinum should raise the suspicion of cocaine use in the absence of other etiological factors⁽⁴⁵⁾.

Emphysema has also been reported in smoked or inhaled drug users, generally affecting young men. Some studies have described the presence of severe bullous alterations associated with cocaine smoking. CT can identify bullae and centrilobular emphysema in the upper lung lobes, particularly in the periphery, sparing the central regions of the lungs^(45,47), as observed in the present case.

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