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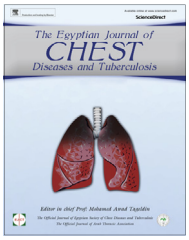

ORIGINAL ARTICLE

The use of multi-detector computed tomography and ultrasonography for evaluation of pleural lesions

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Abstract *Background and objective:* Multidetector CT (MDCT) and ultrasonography (US) are of increasing importance for assessment of many pulmonary disorders. Our aim was to evaluate their role in diagnosis of pleural diseases.

Methods: Patients from Tanta University Hospital who were suspected to have pleural lesions (symptoms, signs and/or suggestive chest X-ray) during one year period were enrolled in the study. US and MDCT were done for all of them, then data were reported and analyzed.

Results: Seventy-one patients were included, sixty of them had evident pleural lesions. Chest pain was the commonest presenting symptom. Malignancy represented 36.7% of pleural lesions, a percentage similar to lesions due to infection etiology. Free pleural effusions were the most common pleural lesions followed by pleural thickening. US was diagnostic in 72% of pleural lesions detectable by MDCT. Multiplanar reconstruction (MPR) images had an additional value than axial images in 39% of pleural lesions, mostly in cases of pleural thickening, free pleural effusion, pleural masses, encysted pleural effusions and pleural plaques. On the other hand, the MPR images had the same value as axial images in empyema and pneumothorax cases.

Conclusion: MDCT is an important noninvasive imaging tool in accurate detection and characterization of pleural lesions with complementary MPR images that solve many diagnostic problems. Ultrasonography is a safer alternative but with less diagnostic value.

Introduction

The pleura is derived embryologically from the mesenchyme [1]. It serves an important role in lung function in that it acts as a cushion for the lungs and allows for smooth movement of the lungs within the chest cavity [2].

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Pleural diseases (as pleural effusions, pneumothorax, pleural plaques, diffuse pleural thickening and pleural tumors) affect over 3000 subjects per million population each year. They can originate from a broad spectrum of pathologies.[3,4]. Pleural plaques are deposits of hyalinized collagen fibers in the parietal pleura. They are indicative of asbestos exposure and typically become visible twenty or more years after the inhalation of asbestos fibers, although latency periods of less than ten years have been observed [5].

Imaging of the pleura can be challenging and it plays an important role in the diagnosis and subsequent management of patients with pleural diseases. The presence of a pleural abnormality is usually suggested following a routine chest X-ray, with a number of imaging modalities available for further characterization [6].

Computed tomography (CT) may show abnormalities of the pleura at an earlier stage than do other imaging techniques. It is also useful in the distinction of pleural from parenchymal lung disease, in determining the precise location and extent of pleural disease, and in certain instances it permits characterization of tissue density within a lesion by means of analysis of attenuation coefficients [7].

Multislice (or multi-detector array) CT scanners are capable of acquiring several tomographic slices in a single rotation of the X-ray tube and detector assembly. It reduces examination times presenting advantages, particularly in examinations where voluntary or involuntary patient motion is a problem [8].

Multi-detector CT (MDCT) is currently considered as a better modality for the diagnosis of pleural lesions as it provides excellent image quality, it allows excellent visualization during the different stages of contrast enhancement, thereby facilitates detection of small pleural lesions and 3D multiplanar reformatted images can be used to solve different diagnostic problems and to help communicate findings to clinicians [9].

Trans-thoracic ultrasound (US) is an easily performable, feasible and reliable diagnostic tool, very helpful toward diagnosing pleural disorders. Lack of ionizing radiation and ability to be done at bedside have been emphasized as advantages of this diagnostic procedure [10]. Apart from having a higher sensitivity when confronted with the conventional radiography, the US is able to differentiate solid from cystic lesions [11]. Thus, it is able not only to detect a pleural effusion, but also it might be helpful in précising a point to perform aspiration.

The aim of this work was to assess the role of both multi-detector CT (MDCT) and trans-thoracic US in diagnosis and evaluation of pleural lesions.

Methods

The current study has been conducted during the period from October 2012 to October 2013. Patients who were clinically suspected to have or provisionally diagnosed as having pleural diseases during the study period were included in the study. Patients were selected from those attending to Tanta University Hospital, Egypt. Patients were first evaluated in the Pulmonology clinic of Chest Department and then referred to the radiologist.

Study design

We performed a prospective cross sectional study. It was conducted according to the guidelines of ethics committee of our university and was approved by our institutional ethics committee and review board; all patients gave us a written informed consent to be included and imaged in our study.

Inclusion criteria

- Presence of one or more of symptoms of pleural diseases as cough, dyspnea, talepnea, pleuritic or dull aching chest pain or chest heaviness, with or without palpitation, fever, weight loss, night fever or night sweat.
- Presence of one or more of signs of pleural diseases as unilateral bulge or retraction of the chest wall, unilateral decreased chest expansion, mediastinal shift, diminished tactile vocal fremitus, diminished vocal resonance, change in percussion note (tympanitic resonance, impaired note, dullness or stony dullness), diminished intensity of breath sound, or pleural rub.

All patients were submitted to

1. *Careful history taking*:

With emphasis on the onset, course and duration of the presenting complaint and the risk factors (e.g. asbestos exposure, T.B), and past history of previous operation or receiving chemotherapy or radiotherapy for any malignancy and its site.

2. *Thorough clinical examination*:
3. *Laboratory investigations*:

Routine laboratory investigations were done to all patients that included: complete blood picture, blood urea and serum creatinine.

Other investigations were needed in some cases to help diagnosis as tuberculin skin test, sputum analysis for tuberculosis, investigations for collagen diseases, liver function tests, or pleural effusion analysis (chemical, culture and sensitivity, adenosine deaminase, or cytological examination). In some cases, the diagnosis was confirmed by doing pleural biopsy and histo-pathological examination.

4. *Chest X-ray*:

For all cases in Postero-anterior view and for some cases in Lateral view.

5. *Ultrasonography (US)*:

It was done for all patients. Transthoracic gray-scale chest US examination was performed with a 3.5 MHz curvilinear probe that allowed visualization of the deeper structures, and the sector scan field allowed a wider field of view through a small acoustic window. The pleura was surveyed with the curvilinear probe. Once an abnormality has been identified, a high-resolution 7.5 MHz linear probe was used to provide detailed depiction of any chest wall, pleural, or peripheral lung abnormality.