Case 7479

Dual energy chest radiography facilitates pneumothorax detection

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Section: Chest imaging
Case Type: Clinical Cases
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Patient: 24 years, male

Clinical History:

A previously healthy 24 year old smoker presented to his primary care physician (General Practitioner) with left sided pleuritic chest pain. On examination there were reduced breath sounds on the left. Dual energy chest radiography identified a small, otherwise subtle left sided pneumothorax.

Imaging Findings:

A 24 year old man presented to his primary care physician (General Practitioner) with a one day history of left sided pleuritic chest pain. He did not have a cough or shortness of breath. He had not felt feverish nor had rigors. Although he was a regular smoker, he had no significant past medical history.

On examination he was slim and of average height. His trachea was central. There were reduced breath sounds on the left.

The patient was referred for plain chest radiography. At our institution we use dual energy chest radiography for all outpatient primary care referrals (we hope to introduce it for all departmental chest radiographs in the future).

A dual energy chest radiograph (DECXR) was performed. The soft tissue reconstruction image demonstrated a left apical pneumothorax. The pneumothorax was much more difficult to detect on the standard reconstruction image.

Discussion:

Dual energy techniques are being increasingly exploited in both digital plain radiography and computed tomography. These techniques rely on the differential absorption of higher and lower energy photons by different elements. In the case of dual energy radiography, structures containing calcium can be differentiated from those mainly containing carbon, hydrogen and oxygen (i.e. soft tissues). This allows the reconstruction of images either highlighting or suppressing bones and other tissues containing calcium [1].

There are two types of dual energy radiography equipment: single-exposure and double-exposure [2]. Single-exposure systems use two detectors separated by a thin copper plate. The detector behind the copper plate receives only the higher energy photons. More commonly a double-exposure technique is used (as in this case). Two images are acquired, one each at 60 and 120 kV. The time between the two exposures is small (200 msec), in order to reduce the likelihood of misregistration artefacts caused by movement or breathing.

Dual energy CXR is thought to only increase the dose slightly. One group reported an increase in dose of 14% for a typical combined PA and lateral CXR [3].

In summary, dual energy CXR increases the detection of pneumothoraces, nodules, bone lesions, pleural plaques...
and a variety of other chest diseases with only a small increase in the radiation dose.

**Differential Diagnosis List:** Left sided pneumothorax

**Final Diagnosis:** Left sided pneumothorax

**References:**


**Description:** The left apical pneumothorax is only just visible on the standard reconstruction (equivalent to a "non-dual energy" CXR. **Origin:**
**Figure 2**

**Description:** The left apical pneumothorax is much more conspicuous on the DE CXR soft tissue image owing to the subtraction of the overlying ribs. **Origin:**
Description: The DE CXR bone reconstruction image is useful to evaluate for bone abnormalities, as well as other calcium containing structures, such as pleural plaques. Origin:
**Figure 4**

**Description:** The left apical pneumothorax is only just visible on the standard reconstruction (equivalent to a \"non-dual energy\" CXR. **Origin:**
**Description:** The left apical pneumothorax is much more conspicuous on the DE CXR soft tissue image owing to the subtraction of the overlying ribs. **Origin:**