

Identification of Large Airway Collapse with Symptoms using Dynamic Chest Radiography

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A 56-year-old woman under investigation for Large Airway Collapse underwent CT with inspiratory/expiratory slices and dynamic chest radiography. Dynamic chest radiography is high temporal resolution, low ionising radiation imaging, in which sequential radiographs generate moving images of the thorax. The technology meets European safety and health requirements for thoracic imaging, and is Conformité Européenne (CE) marked.

During dynamic chest radiography acquisition, over 12 seconds, the patient undertook tidal breathing followed by a single deep breath in and out in a standing, lateral position. Tracheal diameter was analysed using proprietary software.

Dynamic chest radiography demonstrated that tracheal diameter, averaged across three measurement points on the visible trachea, went from 13.6mm at maximal inspiration to 3.1mm after forced expiration. Our findings corroborated those on CT, which demonstrated reduction of tracheal diameter from inspiration (18mm) to expiration (3.8mm). The discrepancy between measurements made on the two modalities may relate to variation in the extent of airway collapse day to day, or differences in respiratory-associated intrathoracic pressure change between the supine or standing positions. No change in tracheal diameter was detected on a dynamic chest radiograph carried out on an individual without CT evidence of large airway collapse. We were unable to comment on dynamic collapse of large bronchi using this lateral view. Dose area product for the dynamic chest radiograph was 36 mGy/cm², compared to 165 mGy/cm² for the CT study. A video of the dynamic chest radiograph is available online as a supplement.

To our knowledge, this is the first use of dynamic chest radiography to demonstrate tracheal collapse in a patient with large airway collapse, which is typically diagnosed using CT – involving high radiation levels – or bronchoscopy, which has limited patient acceptability. This case demonstrates the potential utility of dynamic chest radiography, which can acquire large field-of-view moving images of the thorax with low dose ionising radiation, in detection of large airway, specifically tracheal, collapse, highlighting the need for further research.