imaging, and should thus continue being utilised as the first line radiological investigation.

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Does plain radiography predict pneumothorax size?

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Three part question

In [a patient with a pneumothorax] are [plain chest x rays] reliable [in predicting volume of air in the chest]?

Clinical scenario

A 22-year-old male presents to you in Accident and Emergency complaining of sudden onset of shortness of breath and right sided pleuritic chest pain. He has clinical signs in keeping with a pneumothorax and is not currently tensioning. You request a plain posterior/anterior erect chest radiograph which shows a small right sided pneumothorax. After aspirating 200 ml of air, you repeat the chest radiograph which shows no improvement in the pneumothorax. Can you rely on the x ray?

Search strategy

Medline 1966 to 11/2006 using the OVID interface ["pneumothorax"[MeSH Terms] OR pneumothorax[Text

Word]] AND size[All Fields] Cochrane 11/07: "pneumothorax size"

Search outcome

Altogether 400 papers were found using MEDLINE, of which 4 were deemed to be relevant or of sufficient quality for inclusion. Guidelines published by the British Thoracic Society on the management of spontaneous pneumothorax in 2003 has a section relevant to this question.

Comment(s)

Although there are no large high quality trials considering this question, there seems to be no debate that a plain film erect or supine chest radiograph usually underestimates the size of a pneumothorax and is certainly unreliable. There are formulas using interpleural distances that do enhance reliability. Computed tomography (CT) scanning is considered the best investigation although very specialised investigations, such as plethysmography, are available. The lateral decubitus radiograph is probably as sensitive as CT scanning. It recognised that widespread use of CT scans for suspected pneumothorax is impractical however it is indicated if clinical suspicion is high or in the case of difficult to read x-rays such as in patients with emphysematous bullous disease. The British Thoracic Society has published guidelines on the management of spontaneous pneumothorax in 2003.

► CLINICAL BOTTOM LINE

Erect or supine chest x rays are not reliable in estimating the size of a pneumothorax.

Engdahl O, Toft T, Boe J. Chest radiograph—a poor method for determining the size of a pneumothorax. *Chest* 1993 Jan;**103**(1):26–9.

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Blaivas M, Lyon M, Duggal S. The management of chest tubes in patients with a pneumothorax and an air leak after pulmonary resection. *Acad Emerg Med* 2005 Sep;**12**(9):844–9.

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Table 3

Author, date and country	Patient group	Study type (level of evidence)	Outcomes	Key results	Study weaknesses
Engdahl O <i>et al</i> , 1993, Sweden	16 consecutive adults with spontaneous pneumothorax	Prospective case controlled cohort	correlation between plain chest radiography and CT scans in determining size of pneumothorax	$r = 0.71$ ($0.001 < p < 0.01$)	Small cohort. Only included spontaneous pneumothoraces—no other aetiology.
Collins CD <i>et al</i> , 1995, UK	19 adults. 20 pneumothoraces. Spontaneous (7), iatrogenic (13)	Prospective controlled cohort study	formula to accurately calculate percentage pneumothorax from a plain chest radiograph	$r = 0.98$ ($p < 0.0001$)	No trauma patients included. Small cohort. Formula not validated in a prospective clinical trial.
Blaivas M <i>et al</i> , 2005, USA	176 adults who presented with blunt trauma. They all had a focussed assessment with sonography (FAST) ultrasound scan and were sufficiently ill to justify a CT scan of their chest. 53 had pneumothoraces either on CT scan; or post thoracostomy (if the clinician reported hearing a rush of air after placing a chest tube).	Prospective single blinded study with convenience sampling	to compare the sensitivity and specificity of supine chest x rays in the detection of pneumothorax using CT as the gold standard	Chest radiography sensitivity 75.5% (95% CI 61.7% to 86.2%) specificity 100% (95% CI 97.1% to 100%). Ultrasound sensitivity 98.1% (95% CI 89.9% to 99.9%) specificity 99.2% (95% CI 95.6% to 99.9%)	only severely injured trauma patients, pneumothorax could have increased in size between investigations
Kelly AM <i>et al</i> , 2006, Australia	57 adult patients with spontaneous pneumothorax	Retrospective cohort review	Comparing two common methods to estimate the size of pneumothoraces on plain chest radiographs	They agree on smaller pneumothoraces but the Rhea method may significantly under-estimate the size of larger pneumothoraces	Small retrospective study. Did not compare either method to the accepted standard of a CT scan

CT, computed tomography