Predictors of abnormal chest CT after blunt trauma: a critical appraisal of the literature

CRD summary
This review found that abnormal conventional radiography or abnormal ultrasonography of the chest were the best predictors of chest injuries in blunt trauma patients. These conclusions were supported by the results, but should be interpreted with some caution due to the possibility of missing studies, potential for errors in the review process and possible methodological limitations of the included studies.

Authors' objectives
To identify and evaluate predictors that determine whether chest computed tomography (CT) is likely to reveal relevant injuries in adult blunt trauma patients.

Searching
PubMed, The Cochrane Library, DARE, Best Bets, NHS EED and Guidelines Clearing House were searched to 2008. Two online journals were handsearched. Full details of the search strategy were reported in an appendix. Reference lists of selected articles were screened. The review was restricted to studies published in English, French, Spanish, Dutch and German. Studies available only as abstracts were excluded.

Study selection
Studies that evaluated tests for the diagnosis of relevant chest injury (index test) against CT (reference standard) in a random or consecutive sample of more than five adults (≥16 years) with blunt trauma injury were eligible for inclusion. Eligible index tests were clearly defined patient characteristics, clinical evaluation, conventional radiography or ultrasonography and trauma mechanism. Non-helical CT with consecutive sections was considered an acceptable reference standard for diagnoses of pneumothoraces, haemothoraces and pulmonary contusion. For the diagnosis of fractures and mediastinal injuries, helical or multi-detector CT was required. Target conditions were aortic injury, diaphragm injury, pulmonary injury (pneumothorax, haemothorax, pulmonary contusion or laceration), tracheobronchial tree injury, oesophageal injury and rib fractures. Studies had to report sufficient data to allow construction of 2x2 tables of test performance.

Included studies evaluated patients with blunt chest trauma; various exclusion criteria were applied. Where reported, there was considerably variation in mean injury severity score (ISS) (range 9 to 56).

One reviewer screened studies for relevance. Two reviewers independently assessed studies identified as potentially relevant for inclusion. Disagreements were resolved through consensus.

Assessment of study quality
One reviewer assessed study quality using the 14-item QUADAS tool.

Data extraction
One reviewer extracted data to populate 2x2 tables of test performance for each index test evaluated. These data were used to calculate sensitivity, specificity, positive and negative likelihood ratios and the diagnostic odds ratios (DOR) with 95% confidence intervals (CIs).

Methods of synthesis
A narrative synthesis was presented.

Results of the review
Ten studies were included (n=3,799, range 27 to 1,873) and assessed 31 different predictors. Six studies were prospective, three were retrospective and one was both prospective and retrospective. Limitations identified by the QUADAS assessment included poor reporting of inclusion criteria, non-independent interpretation of tests and lack of
Most predictors were only evaluated in single studies. Neither age nor gender were significantly associated with the CT diagnosis. Abnormalities at physical examination (abnormal respiratory effort, need for assisted ventilation, reduced air entry, coma (GCS<8) and chest wall tenderness) and pelvic fractures were significant predictors of the CT diagnosis (DOR range 2.1 to 6.7) in single studies; chest wall tenderness showed no significant association in other studies.

Presence of any injuries at conventional radiography of the chest showed a stronger association in multiple studies (DOR 2.2 to infinity, eight studies). The most accurate predictor for chest injury at CT was chest ultrasonography (DOR 491 to infinity, four studies).

**Authors’ conclusions**
Abnormal conventional radiography or abnormal ultrasonography of the chest were the best predictors of chest injuries in blunt trauma patients. There was no evidence to suggest that CT could be omitted in patients without these criteria and whether these findings are beneficial for patients.

**CRD commentary**
The review addressed a clear question. Inclusion criteria were fully defined. The literature search was adequate, but restriction of the review to full text articles published in selected articles risked language and publication biases. Most of the review process was conducted by one reviewer and so there was a possibility of bias and error. Study quality was assessed using appropriate criteria and the results of the assessment were clearly presented. A narrative synthesis was appropriate given the small number of studies that assessed each index test.

The authors’ conclusions were supported by the results, but should be interpreted with some caution due to the possibility of missing studies, potential for errors in the review process and possible methodological limitations of the included studies.

**Implications of the review for practice and research**
**Practice:** The authors stated that the practice of using CT as a screening tool in practically all blunt trauma patients could not be rejected based on the evidence.

**Research:** The authors stated that large prospective studies on well circumscribed patient cohorts were needed to evaluate the role of physical examination, conventional radiography and ultrasound to optimise cost-effective use of trauma CT.

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Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.