Does this patient have an acute thoracic aortic dissection?

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Authors' objectives
To review the accuracy of clinical history taking, physical examination, and plain chest radiograph in the diagnosis of acute thoracic aortic dissection.

Searching
MEDLINE was searched from 1966 to 2000 for publications in the English language. The search terms included: 'physical examination', 'medical history taking', 'professional competence', 'reproducibility of results', 'observer variation', 'diagnostic tests', 'decision support techniques', 'Bayes theorem', 'sensitivity', 'specificity', 'thoracic aortic dissection', 'aortic aneurysm' and 'dissecting aneurysm'. The reference lists of the reviewed articles were also examined.

Study selection
Study designs of evaluations included in the review
Studies were eligible for inclusion if they described a series of 18 or more consecutive patients (diagnostic cohort). In all of the included studies, the patients were selected either retrospectively after confirmation of diagnosis by a reference standard study, or prospectively on the basis of the presenting clinical picture. Physicians performing the reference standard procedure were not blinded to the results of the clinical examination and vice versa.

Specific interventions included in the review
Studies that investigated clinical history taking, physical examination, plain chest radiograph, or a combination of findings, were eligible for inclusion. Studies were included if they reported the results of electrocardiograms (ECGs) as part of the overall clinical examination, but were excluded if they focused only on ECGs. COMPARED>> Acceptable means used to confirm diagnosis (i.e. ‘gold’ standard tests) were: surgical exploration, autopsy, aortogram, magnetic resonance imaging, computed tomography, or transoesophageal echocardiography.

Reference standard test against which the new test was compared
Acceptable means of confirmation of diagnosis (‘gold’ standard test) were: surgical exploration, autopsy, aortogram, magnetic resonance imaging, computed tomography, or transoesophageal echocardiography.

Participants included in the review
To be eligible for inclusion, studies had to have at least 18 patients with confirmed dissection of the thoracic area. Articles were excluded if more than 15% of their cohorts included trauma patients, patients with chronic thoracic dissection (defined as a dissection presumed to have occurred more than 14 days prior to presentation), or patients with abdominal aortic aneurysms. Articles were also excluded if the study selectively included patients with only proximal or distal dissections. The participants ranged in age from 10 to 97 years.

Outcomes assessed in the review
The outcome measures used in the review were sensitivity and the positive or negative likelihood ratios (LRs).

The clinical outcomes examined for clinical history included: history of hypertension, Marfan Syndrome, any pain, chest pain (including anterior and posterior), back pain, abdominal pain, sudden-onset pain, severe pain, ripping or tearing pain, migrating pain, and syncope.

The clinical outcomes examined for physical examination included: elevated blood-pressure, diastolic murmur, pulse deficit, pericardial rub, congestive heart failure, focal neurological deficit, shock, and new myocardial infarction on ECG.

The outcomes examined for plain chest radiograph included: abnormal aortic contour, pleural effusion, displaced intimal calcification, wide mediastinum and abnormal radiograph findings.
How were decisions on the relevance of primary studies made?
The author reviewed the abstracts, then retrieved the full texts of those articles that met the inclusion criteria.

Assessment of study quality
Detailed quality scores were not applied to each study. Instead, the author classified the studies into four levels of evidence. Level 1 studies were prospective, blinded examinations of a large number (greater than 100) of independently selected consecutive patients; level 2 studies used identical criteria to level 1 but included fewer than 100 patients; level 3 studies were large, prospective investigations that included non-independently selected patients; and level 4 studies were retrospective reviews of non-independently selected patients. The studies were categorised into levels of evidence by the author.

Data extraction
The author performed the data extraction process. For each of the components of the clinical examination, history taking, and radiograph, the sensitivity was calculated using published raw data. Data were extracted for the following categories: study identification; clinical setting and study dates; study designs; the number of patient episodes; age; gender; percentage of type A (aortic dissections involving the aorta proximal to the subclavian artery); and the level of evidence.

Methods of synthesis
How were the studies combined?
The sensitivity and LRs were pooled using a random-effects model and the 95% confidence intervals (CIs) were calculated (see Other Publications of Related Interest no.1). For LRs, a summary measure was reported only when there were more than two studies.

How were differences between studies investigated?
The author does not state how differences between the studies were assessed.

Results of the review
Twenty-one studies with 1,848 patients were included in the review. Four studies (n=215) included control groups. No level 1 or level 2 studies were located. One study met the level 3 criteria, and the remaining 20 studies were classified as level 4.

Accuracy of the clinical history.
Most patients with thoracic aortic dissection had severe pain (pooled sensitivity, 90%) of sudden onset (sensitivity, 84%). The absence of sudden pain onset lowers the likelihood of dissection (negative LR 0.3, 95% CI, 0.2, 0.5). However, the author states that the study design of the included studies precludes accurate assessment of the sensitivity and specificity of these features.

Accuracy of the physical examination.
On examination, 49% of the patients had elevated blood-pressure, 28% had a diastolic murmur, 31% had pulse deficits or blood-pressure differentials, and 17% had focal neurological deficits. The presence or absence of diastolic murmur does little to change the pre-test probability of dissection (positive LR 1.4, 95% CI: 1.0, 2.0; negative LR 0.9, 95% CI: 0.8, 1.0). However, pulse or blood-pressure differentials and neurological deficits increase the likelihood of disease: the positive LRs were 5.7 (95% CI: 1.4, 23.0) and 6.6 to 33.0, respectively.

Accuracy of the plain chest radiograph.
The plain chest radiograph results were usually abnormal (sensitivity, 90%). Hence, the presence of a normal aorta and mediastinum decreased the probability of dissection (negative LR 0.3, 95% CI: 0.2, 0.4), but no particular radiographic
abnormality was present consistently.

Accuracy of combinations of the findings.

Combinations of findings increased the likelihood of disease, but the absence of even multiple findings did not definitively exclude the diagnosis.

Authors' conclusions
The presence of pulse deficits or focal neurological deficits increased the likelihood of an acute aortic thoracic dissection in the appropriate clinical setting. Conversely, a completely normal chest radiograph result or the absence of pain of sudden onset lowered the likelihood. Overall, however, the clinical examination was insufficiently sensitive to rule out aortic dissection given the high morbidity of missed diagnosis.

CRD commentary
The review question was clearly stated. The author searched one database for English language publications and made no attempt to locate unpublished studies, thus it is possible that some studies may have been missed. The studies were categorised into levels of evidence; a more detailed scoring system to assess the quality of the studies is to be recommended. The author did, however, discuss biases which could lead to the overestimation of sensitivity.

A table containing information on the included studies was presented, but information regarding what 'gold' standards were used in each study was missing. The majority of the primary studies apparently included only patients with confirmed thoracic aortic dissection, and as such, are unlikely to be representative of the presenting population in which investigations would be applied. The author did not examine heterogeneity, thus summarising the results using a meta-analysis may have been inappropriate. The number of different 'gold' standards that may have been included present one potential source of heterogeneity.

In addition, the results from meta-analyses of LRs conducted on less than four studies should be considered with some caution. It should, perhaps, be more explicit in 'the bottom line' section of the review that the LRs presented for 'combinations of findings' are derived from one paper.

The results and conclusions of this review should be treated with caution given the possible heterogeneity and apparently poor quality of the evidence.

Implications of the review for practice and research
Practice: The author states that clinical history, examination and radiography can help rule in aortic dissection, but are not sufficiently sensitive to rule out the disease.

Research: The author states that, given the high, rapid mortality associated with undiagnosed thoracic aortic dissection, prospective independent studies of the clinical examination are needed to aid physicians in determining which aspects of the clinical examination ought to be relied upon to refer patients rationally for further diagnostic studies.

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Other publications of related interest
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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.