Does this patient with headache have a migraine or need neuroimaging?
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CRD summary
This review evaluated the usefulness of history and physical examination in identifying patients with headache who should undergo neuroimaging. The authors concluded that patients with the identified clinical features associated with significant intracranial abnormality should undergo neuroimaging. Given the limitations of the evidence presented, and the possibility that studies might have been missed, the results should be interpreted with caution.

Authors’ objectives
To evaluate the usefulness of the history and physical examination in identifying patients who should undergo neuroimaging and distinguishing patients with migraine from those with other headache types. The latter question, regarding distinguishing patients with migraine from those with other headache types, will not be considered here as it did not meet the DARE inclusion criteria.

Searching
MEDLINE was searched from 1966 to November 2005; the search terms were stated. In addition, the bibliographies of primary studies, review articles, and physical examination and neurology textbooks were checked.

Study selection
Study designs of evaluations included in the review
No inclusion criteria for the study design were stated.

Specific interventions included in the review
Studies assessing the usefulness of the history and physical examination in predicting the presence of significant intracranial pathology were eligible for inclusion. The included studies assessed the type and characteristics of the headache.

Reference standard test against which the new test was compared
Studies that used computed tomography (CT) or magnetic resonance imaging (MRI) as the reference standard were eligible for inclusion. The included studies that evaluated patients with thunderclap headache only looked for subarachnoid haemorrhage on imaging.

Participants included in the review
Studies of adults with nontraumatic headache were eligible for inclusion. Studies that only assessed patients with a specific underlying chronic disease were excluded. The included studies evaluated patients with various types of headache. Study populations in the review were classified as follows: category I for chronic headache; category II for new or changed headaches; category III for acute thunderclap headaches; category IV for studies of patients with headaches who had undergone CT scans; category V for high-risk patients. Patients were seen in out-patient, in-patient and emergency department settings. Where provided, the mean age of the participants ranged from 35 to 52 years across the included studies.

Outcomes assessed in the review
Studies reporting the usefulness of the diagnostic tests were eligible for inclusion. The outcomes included in the review were the prevalence of significant abnormality identified by CT scan and positive and negative likelihood ratios (LRs).

How were decisions on the relevance of primary studies made?
Two independent reviewers assessed studies for inclusion, and any disagreements were resolved by consensus with a third reviewer.
Assessment of study quality
Validity was assessed using published criteria. Each study was assigned a level of quality: level I referred to independent, blinded comparisons of components of the clinical examination with a ‘gold’ standard among 100 or more consecutive patients with headache; level II was the same as level I but with fewer patients; level III referred to independent, blinded comparisons of components of the clinical examination with a ‘gold’ standard among nonconsecutive patients with headache; level IV was not meeting the criteria for at least level III. Two independent reviewers assessed validity, and any disagreements were resolved by consensus with a third reviewer.

Data extraction
Two authors independently abstracted the data, and any disagreements were resolved by consensus with a third reviewer. Classification of the final neuroimaging diagnosis was made according to criteria proposed by McCrory et al. (see Other Publications of Related Interest), which were then dichotomised, in order to fit 2x2 tables: ‘significant intracranial abnormalities’ was classed disease positive, while ‘abnormalities possibly related to headache’ and ‘insignificant abnormalities’ were classed as disease negative. LRs were calculated for the specific clinical variables for each study. The prevalence of abnormality on neuroimaging was presented, along with its 95% confidence interval (CI), for each study.

Methods of synthesis
How were the studies combined?
Where two or more studies assessed the same clinical variable, summary LRs and 95% CIs were calculated using a random-effects model (DerSimonian and Laird) and weighted by the inverse of the variance. The pooled prevalence of abnormality on neuroimaging was presented, along with its 95% CI, for each category of participant.

How were differences between studies investigated?
Differences between the studies were presented in the tables and discussed in the text.

Results of the review
Eleven diagnostic accuracy studies (n=3,725), three of which were retrospective cohort studies, were included in the review.

One study was rated as level I in quality; all other studies were rated as level IV.

The pooled prevalence of abnormality on neuroimaging ranged from 1.2% (95% CI: 0.77, 1.8) in chronic headache to 43% (95% CI: 20, 68) in thunderclap headache.

Clinical features found to predict serious intracranial abnormality (with a pooled positive LR statistically significantly greater than 1) were cluster-type headache (LR 11, 95% CI: 2.2, 52), abnormal findings on neurologic examination (LR 5.3, 95% CI: 2.4, 12), undefined headache (i.e. not cluster, migraine or tension type; LR 3.8, 95% CI: 2.0, 7.1), headache with aura (LR 3.2, 95% CI: 1.6, 6.6), headache aggravated by exertion or a valsalva-like manoeuvre (LR 2.3, 95% CI: 1.4, 3.8), and headache with vomiting (LR 1.8, 95% CI: 1.2, 2.6). Clinical features that were not useful in predicting serious intracranial abnormality were headache with focal symptoms, worsening of headache, male sex, quick on-set headache, new on-set headache; headache with nausea, increased headache severity, and migraine-type headache.

Four clinical features had a pooled negative LR statistically significantly lower than one: normal neurologic examination (LR 0.71, 95% CI: 0.60, 0.85), headache not aggravated by valsalva-like manoeuvre (LR 0.70, 95% CI: 0.56, 0.88), absence of vomiting (LR 0.47, 95% CI: 0.29, 0.76), and headache of defined type (LR 0.66, 95% CI: 0.44, 0.97). However, the authors stated that that none of these LRs were low enough to be clinically useful for ruling out significant pathological conditions. No other clinical feature was useful for ruling out serious intracranial abnormality.

Authors' conclusions
There are several clinical features that are associated with significant intracranial abnormality, and patients with these features should undergo neuroimaging.

CRD commentary
The authors set out a clear objective at the beginning of the review, and broad inclusion criteria were defined for the intervention, participants, outcomes and reference standard. No inclusion criteria for the study design were presented. The authors searched only one database and made no apparent attempts to locate unpublished data, which increases the possibility of publication bias. Relevant studies might therefore have been missed. Appropriate methods were used to reduce the risk of error and bias in the study selection, validity assessment and data extraction processes. Methodological quality was assessed using appropriate criteria.

There were few details of the interventions, reference standards and study designs employed in the individual studies, which makes it difficult to determine the appropriateness of statistically combining the studies. Whilst the methods used to pool the studies appeared appropriate, few studies were pooled for several of the analyses. Furthermore, there were differences in headache type and participant characteristics across the pooled studies, and statistical heterogeneity did not appear to have been assessed. Whilst the authors' conclusions are supported by the evidence they present, the results should be interpreted with caution given the possibility that relevant studies might have been missed, the poor quality of the included studies, and the potential heterogeneity across studies.

Implications of the review for practice and research
Practice: The authors stated that to determine whether neuroimaging is indicated in patients presenting with headache, the clinician should classify the headache presentation to determine a pre-test probability of serious intracranial pathology, and then look for clinical features that significantly increase this probability. Patients presenting with thunderclap headache should undergo investigations regardless of associated clinical features, because of the high risk of subarachnoid haemorrhage. Patients with recurrent episodes of classic visual aura followed by headache do not require imaging, but patients with other types of aura (sensory or motor), or an aura that has changed in character or one that cannot be clearly described as typical of migraine, should undergo imaging. The authors presented an algorithm for determining whether a patient presenting with headache needs neuroimaging.

Research: The authors stated that future research should focus on the evaluation of patients presenting with a 'new headache'.

Bibliographic details
Detsky M E, McDonald D R, Baerlocher M O, Tomlinson G A, McCrory D C, Booth C M. Does this patient with headache have a migraine or need neuroimaging? JAMA 2006; 296(10): 1274-1283

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Other publications of related interest

This additional published commentary may also be of interest. Chessman AW, Detar DT. Review: history and physical examination can accurately identify migraine and the need for neuroimaging in patients with headache. Evid Based Med 2007;12:25.
**Indexing Status**
Subject indexing assigned by NLM

**MeSH**
Algorithms; Brain Diseases /diagnosis; Diagnostic Imaging; Diagnostic Techniques, Neurological; Female; Headache /etiology /physiopathology; Humans; Male; Medical History Taking; Migraine Disorders /diagnosis; Physical Examination

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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.