Is stress radiography necessary in the diagnosis of acute or chronic ankle instability?

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Authors' objectives
To determine the accuracy of stress radiography in the diagnosis of mechanical ankle instability.

Searching
MEDLINE was searched for English language publications from January 1966 to May 1997. Details of the search strategy were given. Bibliographies of retrieved studies were examined.

Study selection
Study designs of evaluations included in the review
Only clinical studies were eligible for inclusion in the review; cadaver studies and laboratory studies were excluded.

Specific interventions included in the review
No specific inclusion or exclusion criteria pertaining to the intervention were reported.

Stress radiography using either manually applied techniques or mechanical (Telos) were studied. Stress was applied both with and without accompanying local anaesthesia. Techniques of stress radiography included both talar tilt and anterior displacement. All stress radiography tests were performed before surgery.

Reference standard test against which the new test was compared
Only studies that used surgical exploration as the 'gold' standard for diagnosing lateral ligament rupture were eligible for inclusion in the review.

Participants included in the review
The search strategy was limited to studies of human subjects.

Primary studies included patients with acute ankle instability including ankle sprains, acute inversion injuries, and acute ankle injuries (time of injury to assessment from 1 to 7 days) or chronic ankle instability (time of injury to assessment of 6 months or longer). The age of patients, where reported, ranged from 12 to 58 years. The proportion of male participants, where reported, ranged from 48-100%.

Outcomes assessed in the review
No inclusion or exclusion criteria were specified in relation to the outcomes assessed in primary studies. The following outcome measures were used in included studies: stress radiographic findings; surgical findings; physical examination; ultrasound; peroneal tenographic findings; MRI; MR arthrography. The following measures of diagnostic accuracy were calculated: sensitivity; specificity; prevalence; positive predictive value; negative predictive value; likelihood ratio for positive test; and likelihood ratio for negative test.

How were decisions on the relevance of primary studies made?
The authors do not state how the papers were selected for the review, or how many of the reviewers performed the selection.

Assessment of study quality
The authors do not state that they assessed validity.

Data extraction
The authors do not state how the data were extracted for the review, or how many of the reviewers performed the data extraction.
The following data were extracted: Number and type of injury; mean age and sex of subjects; time from injury to examination; stress radiographic technique (including talar tilt in degrees, anterior displacement in mm with upper limits of normal); main outcome measures; results.

Methods of synthesis
How were the studies combined?
The studies were combined in a narrative review.

How were differences between studies investigated?
Differences between the studies were discussed in the text. Results were grouped by studies of acute and chronic ankle injury.

Results of the review
Eight studies with a total of 950 patients were included. These included: 7 case series assessing the use of stress radiography in detecting acute ligamentous damage (933 patients) and 1 case series (17 patients) assessing its use in chronic ankle instability.

There was variability in the values defined as normal for the talar tilt (TT) and the anterior displacement (AD) stress tests. For the TT test authors used 7, 10, and 11 degrees and 3 mm as upper limits of normal. For the AD tests authors defined 4 mm, 6 mm, and 7 mm as the upper limits of normal and one group defined a positive test as > 1 mm compared with the uninjured ankle.

Acute ankle injuries: 3 groups used manual techniques to apply stress with two studies reporting unsatisfactory results. 4 groups used a mechanical device with one study reporting unsatisfactory results. Results from 6 studies (823 patients): sensitivity ranged from 31% to 74%; specificity ranged from 0% to 100%; prevalence ranged from 46% to 100%; positive predictive values (PPV) ranged from 78% to 100%; negative predictive values ranged from 0% to 74%; likelihood ratio for positive test where estimations were possible ranged from 0.74 to 16.5; and likelihood ratio for negative test ranged from 0.3 to 0.8.

Chronic ankle injuries: it was not clearly defined whether the patients had chronic mechanical ankle instability or other causes of pain or giving way. Stress radiography was negative in 6 patients who had confirmed tears at surgery and in 3 patients who had normal ligaments at surgery. Sensitivity of stress radiography was 57% with likelihood ratio of 0.6.

Measures of diagnostic accuracy: The various reported measures of diagnostic accuracy were calculated mostly by the authors of the review. All papers reported relatively inadequate values regarding the sensitivity of stress views in diagnosing lateral ligament ruptures. In two studies they were especially poor for the AD test with values as low as 31% to 32%. All studies reported relatively low specificity, with several reporting specificity values as high as 100% for TT (3 studies) and 100% for AD (2 studies). Most studies reported relatively high PPV for TT testing (88% to 100%) and AD testing (78% to 100%), but relatively low negative predictive values for TT testing (4% to 74%) and AD testing (0% to 65%). The high PPV occur because of high prevalence (46% to 100%) of ruptured ligaments in a population that had sprains that were severe enough that surgery was being contemplated.

Authors' conclusions
The published data regarding talar tilt and anterior displacement stress radiography are too variable to determine accepted normal values compared with injured values. There are insufficient data for comparison of the use of mechanical versus manual techniques, or the use of local anaesthesia to facilitate the stress test. Because the treatment evolution of all acute ankle sprains is towards functional non operative treatment and because treatment does not depend on the degree of ankle instability on stress views, the talar tilt and anterior displacement stress X-rays have no clinical relevance in the acute situation. In the case of chronic instability, the large variability in TT and AD values in both injured and noninjured ankles precludes their routine use.
The review addressed a clear research question, inclusion/exclusion criteria were, however, poorly defined. In view of the differences between studies a narrative review was appropriate. Some relevant details of the primary studies and measures of diagnostic accuracy were clearly presented in tabular format.

By restricting the literature search to English language publications retrieved from one data base other relevant studies might have been omitted. In addition, no attempt to identify unpublished data was reported, and the potential impact of publication bias was not assessed. No details were given of methods used to select primary studies or to extract the data, and the validity of the primary studies was not assessed. It is therefore difficult to assess the extent to which methodological flaws in the review process or in the included studies may have prejudiced the findings of the review.

Results on chronic ankle instability were based on only 17 patients. The quality of reviews supporting non operative therapy for ankle sprains were not assessed.

Conclusions on chronic ankle instability must be cautious in view of the very small sample size. In view of the reported trend towards non operative management of ankle sprains, the current relevance of the topic reviewed is questionable.

**Implications of the review for practice and research**

Practice: The authors consider that stress X-rays are unnecessary in the clinical setting for evaluating either acute or chronic ankle instability.

Research: The authors do not state any implications for further research.

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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.