The reliability and validity of radiological assessment for patellar instability: a systematic review and meta-analysis

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CRD summary
This review found that some tests for the diagnosis of patellar instability showed reasonable inter- and intra-observer reliability and validity. There was insufficient evidence to determine the accuracy of tests for patellar instability. The authors' cautious conclusions acknowledged the methodological limitations of the included studies and are likely to be reliable.

Authors' objectives
To determine the discriminative validity and reliability of radiological assessment for patellar instability.

Searching
MEDLINE, AMED, CINAHL, EMBASE, Scopus and The Cochrane Library were searched to January 2010. A full search strategy was reported and included a diagnostic filter. SIGLE, NTIS, NRR and Current Controlled Trials were searched for unpublished studies. Reference lists of retrieved studies were screened. Authors were contacted to locate further unpublished studies. No language restrictions were applied.

Study selection
Studies that assessed the reliability, validity, sensitivity or specificity of magnetic resonance imaging (MRI), computed tomography (CT) or ultrasound measurements of the patellofemoral joints of patients following patellar dislocation, subluxation or instability were included.

Included studies assessed a variety of X-ray, MRI and CT findings. Where reported, mean age was 22.9 year in patients with patellar instability and 26.7 years in healthy controls.

Two reviewers independently assessed studies for inclusion. Disagreements were resolved through discussion or referral to a third reviewer if necessary.

Assessment of study quality
Two reviewers independently assessed study quality using the 13-item CASP (Critical Skills Appraisal Programme) appraisal tool for diagnostic accuracy studies. Disagreements were resolved through discussion or referral to a third reviewer.

Data extraction
One reviewer extracted data to calculate mean differences for discriminant validity studies, intra-class correlation coefficients (ICC) and kappa statistics for intra- and inter-observer reliability studies and sensitivity and specificity for accuracy studies. A second reviewer checked the extraction. Disagreements were resolved through discussion or referral to a third reviewer. Where necessary, authors were contacted for additional information.

Methods of synthesis
When one study assessed a specific measurement a narrative synthesis was presented. Data were pooled using fixed-effect models (heterogeneity absent, $I^2<10\%$) or random-effects models (heterogeneity present). Heterogeneity was assessed using $X^2$ and $I^2$ statistics. Publication bias was assessed using funnel plots based on the radiological measure recorded in the largest number of studies.

Results of the review
Twenty-seven studies (1,145 patients, 1,392 knees with patellar instability) were included in the review. Seventeen studies assessed validity and included a healthy control group (1,473 patients, 1,525 knees). Twelve studies did not clearly define their population. Eighteen studies did not clearly identify how they defined patients as healthy controls. Twenty-six studies accounted for all included patients. Only seven papers reported that assessors were blinded as to
whether patients were healthy controls or had patellar instability.

**Discrimination validity (10 studies):** There was good discrimination validity for radiographic measurement of patellar height using the Caton-Deschamps (two studies), Install and Salvati (two studies), patellar tilt (two studies), sulcus angle (three studies) and MRI methods (two studies) with significant differences between patients with patellar instability and healthy controls ($p<0.0001$). There was also a significant difference between groups for lateral patellar angle (two studies), but with substantial heterogeneity between studies ($I^2=89\%$). Congruence angle (four studies, $p=0.21$), lateral condyle height (two studies, $p=0.32$) and medical condyle height measurements (two studies, $p=0.34$) had poor discrimination, but with substantial heterogeneity across studies ($I^2=96\%$ to 100\%). Other findings were assessed only in single studies. There was no evidence of publication bias.

**Intra- and inter-observer reliability (11 studies):** Individual radiological findings were each assessed in individual studies. ICCs were generally high and ranged from to 0.17 to 0.98.

**Accuracy (five studies):** Individual radiological findings were each assessed in two studies or less. Estimates of sensitivity ranged from 30\% to 98\% and specificity ranged from 41\% to 100\%.

**Authors’ conclusions**

Some tests for the diagnosis of patellar instability showed reasonable inter- and intra-observer reliability and validity. There was insufficient evidence to determine the accuracy of tests for patellar instability. Included studies had methodological weaknesses.

**CRD commentary**

This review addressed a clear question. Inclusion criteria were defined, but there was a lack of clarity regarding control group; details were not specified and it appeared that all included studies had a healthy control group, but the authors stated that some included diseased controls. An extensive literature search was conducted without language restrictions and with attempts to locate both published and unpublished studies. Use of a methodological filter may have caused some studies to be missed in the electronic searches. Appropriate steps were taken to minimise bias and errors at all stages of the review.

Study quality was assessed using appropriate criteria for diagnostic accuracy studies. Very few details were presented on the participants in the included studies and this made it difficult to determine the generalisability of the review findings. Appropriate methods were used to pool data. The results of the review were clearly summarised with the help of tables.

The authors’ cautious conclusions acknowledged the methodological limitations of the included studies and are likely to be reliable.

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

**Practice:** The authors did not state any implications for practice.

**Research:** The authors stated that further studies were needed to evaluate the reliability and validity of these radiological outcomes using well-designed trials.

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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.