Efficacy of clinical methods to assess jawbone tissue prior to and during endosseous dental implant placement: a systematic literature review

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CRD summary
The authors concluded that evidence about the diagnostic accuracy of clinical methods used to assess the jawbone before and during dental implant placement was sparse. The authors’ conclusions appeared to be supported by the review, but the limited search and lack of adequate reporting of review methods made it difficult to comment on the reliability of the conclusions.

Authors’ objectives
To evaluate the diagnostic accuracy of clinical methods used to assess bone density, bone quantity and bone quality before and during dental implant placement.

Searching
PubMed was searched from 1966 to September 2005 for studies that had an abstract and were published in English. Search terms were reported. No language restrictions were applied. Reference lists of original studies and reviews were screened.

Study selection
Studies were eligible for inclusion if they evaluated the diagnostic accuracy of clinical methods used to assess bone density, bone quantity and bone quality before and during dental implant placement in adults (aged >19 years) and compared an index test with a reference standard test or measured the correlation between different clinical diagnostic methods.

Included studies evaluated a variety of different clinical methods (including periapical radiography, quantitative computed tomography, cutting resistance, panoramic radiography and surgeon’s assessment) in male and female patients and cadavers ranging in age from 19 to 94 years (where reported). Reference standards included morphometry of histologic slides of biopsy or cadaver specimens and morphometry from contact radiographs or microradiographs. Most studies reported the correlation between different diagnostic methods.

Three authors read all the abstracts and selected studies; any methods used to resolve disagreements were unreported.

Assessment of study quality
The validity of studies that compared an index with a reference test was assessed using a modified version of the QUADAS tool (details were reported). The authors did not state how the validity assessment was performed.

Data extraction
Data were extracted onto a standardised form. The authors stated neither how data were extracted for the review nor how many reviewers performed the data extraction.

Methods of synthesis
The studies were combined in a narrative synthesis.

Results of the review
The authors stated that seven studies were judged relevant.

Studies comparing an index test with a reference test (six studies; the number of patients exceeded 103 including at least 87 patients and 16 cadavers; the number of sites exceeded 185).

Methodological flaws included inadequate reporting of study characteristics (such as patient spectrum, selection criteria.
and test and reference test methods).

Three studies used pre-operative radiography as the index text. Only one study reported the percentage of correct diagnoses. It reported that periapical radiography plus reference images correctly assessed the trabecular pattern of the mandible in three categories at 58 per cent of sites; interobserver agreement was 0.35 and intraobserver agreement was 0.67. One study reported that bone mineral density measured using quantitative computed tomography was correlated with trabecular bone volume measured using contact radiography. One study reported that the trabecular pattern, classified into 5 grades using panoramic radiographs, was correlated with bone mineral density measured using quantitative computed tomography.

Three studies assessed jawbone tissue during endosseous dental implantation. One study reported that cutting resistance was correlated with bone area values. One study reported no correlation between peak insertion torque and bone volume or between Periotest values and bone volume. One study reported a correlation between four classes of bone density based on hand-felt drilling resistance and the amount of bone trabeculae assessed using morphology.

One study reported a strong correlation between Hounsfield units and bone quality, but did not make it clear which was the index test.

Authors' conclusions
Evidence about the diagnostic accuracy of clinical methods used to assess the jawbone before and during dental implant placement was sparse and insufficient to evaluate diagnostic accuracy methods.

CRD commentary
The review question was stated. Some inclusion criteria were broadly defined. Limiting the search to English-language publications listed in one database raised the possibility of publication and language bias and may have resulted in the omission of other relevant studies. Validity was assessed using appropriate criteria for diagnostic accuracy studies. Methods used to select studies, assess validity and extract data were not completely described, so any efforts were made to reduce reviewer errors and bias were unknown. It was not clear why details of one of the seven included studies were not presented in tables. In view of the differences between studies, a narrative synthesis was appropriate. The authors’ conclusions regarding the scarcity of evidence appear to be supported by the review, but the limited search and lack of adequate reporting of review methods made it difficult to comment on their reliability.

Implications of the review for practice and research
Practice: The authors did not state any implications for practice.

Research: The authors stated that there was a need for studies that evaluated the diagnostic accuracy of methods used before and during dental implant to assess the jawbone. Future studies should adhere to the Standards of Reporting of Diagnostic Accuracy statement.

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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.