CRD summary
The results of this review suggested that single-tooth implants alongside natural teeth led to short-term beneficial outcomes in implant survival. Methodological weaknesses precluded making a judgement about the reliability of the results. The authors’ conclusions should be interpreted with some caution.

Authors’ objectives
To evaluate the outcomes of single-tooth replacements by dental implants in the aesthetic zone where the adjacent teeth are natural, with a focus on immediate, early and conventional implant strategies.

Searching
MEDLINE via PubMed, EMBASE and Cochrane Central Register of Controlled Trials (CENTRAL) were searched from inception to 2008 for published studies in English, German, French, Spanish Italian and Dutch; search terms were reported. Reference lists of review articles and retrieved articles were searched.

Study selection
Longitudinal studies of patients who were treated with endosseous root-form dental implant-retained tooth replacements in the aesthetic zone neighboured by natural teeth were eligible for inclusion. Follow-up had to be at least one year. The aesthetic zone was defined as the region in the maxilla or the mandible ranging from the second premolar teeth to second premolar teeth (teeth 15 to 25 and teeth 35 to 45).

Four RCTs examined immediate or early implant placement. Two studies examined immediate implant loading. Another study evaluated different bone augmentation procedures before implantation. The outcome measures evaluated included implant survival, radiographically assessed changes in marginal peri-implant bone levels, aesthetics as evaluated by dental professionals, aspects of the peri-implant structures, patient satisfaction and complications (biological and technical). Follow-up periods in all studies ranged from one to five years.

Two reviewers applied the inclusion criteria independently and resolved any differences by discussion and, if necessary, a third reviewer.

Assessment of study quality
Two reviewers assessed methodological quality by using forms related to study design designed by the Dutch Cochrane Collaboration. The reviewers developed a form for the analysis of case-series, which appraised the descriptions of the study groups, interventions and outcomes, follow-up, blinding of outcome assessment and consideration of confounders or prognostic factors. The studies were assigned a score on the basis of the number of items fulfilled. For the case series analyses, each item was given a plus if methodologically acceptable; a study that received five or more pluses was deemed by the reviewers to be of acceptable quality.

Data extraction
Two reviewers independently extracted data on the outcomes specified (including assessment methods). In studies where follow-up was more than one year, follow-up was calculated as person-years. Any differences between the reviewers were resolved by discussion and, if necessary, a third reviewer.

Methods of synthesis
Summary survival rates, mean differences, relative risks and risk differences together with 95% confidence intervals (CIs) were estimated using random-effects models. Heterogeneity was assessed visually.
Results of the review
Nineteen studies (499 patients, 509 implants) were included in the review: five randomised controlled trials (RCTs); two clinical trials; and 12 case series.

Across the included studies, 14 implants did not survive (all of these failed less than six months after implantation). Survival rate was 95.5% (95% CI 93% to 97.1%). No differences were observed between immediate, early and conventional implant strategies.

A weighted meta-analysis of five studies that evaluated crestal bone changes at one year of follow-up found a mean marginal bone loss of 0.2mm (95% CI 0.034 to 0.36) after definitive crown installation. There were no statistically significant differences in bone level changes detected in the experimental and conventional study groups.

In one RCT, 66% of implants were deemed acceptable by a prosthodontist-rated objective rating index and 34% of the implants were judged to be of poor aesthetic quality. In a small case series (n=34) 3% of the implants were rated not satisfactory.

Peri-implant structures: One RCT reported a significantly higher acceptable clinical crown height in the early placement group than in the conventional group after two years of follow-up. In the conventional group two-thirds of the crowns were judged to be too short. A similar non-statistically significant trend was observed in a small clinical trial (n=20). No significant differences were found in gingival recession or marginal peri-implant mucosa in two other RCTs.

Biological complications included fistual formations, peri-implant mucositis and soft-tissue dehiscences. Technical complications included loosening of temporary abutments and temporary crowns and fractures of temporary crowns, resolved in most cases by tightening or recementing.

Cost information
None provided.

Authors' conclusions
Promising short-term results could be achieved for immediate, early and conventional single-tooth implants in the aesthetic zone with few biological and technical complications. However, there was little data on outcomes related to aesthetics, soft-tissue aspects and patient satisfaction. The question of whether immediate and single-implant strategies would lead to improved outcomes remained unresolved due to the paucity of well-designed controlled clinical studies.

CRD commentary
The review addressed a clear question and criteria relating to inclusion were stipulated. Relevant databases were searched, but restriction of the review to published studies in certain languages meant that there was a possibility of language and publication biases. Steps were taken to minimise reviewer bias and errors in all parts of the review. Although the authors stated that quality assessment was undertaken, no specific results of this were outlined in the review and some studies that did not attain particular quality scores were excluded from the review. Insufficient detail was provided on the methods used to synthesise the results of the studies. It may not have been appropriate to combine data in a meta-analysis derived from a combination of RCTs, controlled clinical studies and case series studies.

The authors' conclusions should be interpreted with some caution due to limitations in the quality assessment, the possibility of missed studies, pooling of studies with different designs and a lack of detail on statistical methods.

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

Research: The authors stated that further research should examine outcomes relating to aesthetics, patient satisfaction and soft tissue aspects and investigate placement and loading strategies in sufficiently powered RCTs.
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