A systematic review of the survival and complication rates of fixed partial dentures (FPDs) after an observation period of at least 5 years - II: combined tooth-implant-supported FPDs


CRD summary
This review assessed the long-term survival and complications of combined tooth-implant-supported fixed partial dentures (FPDs). The authors concluded that survival rates were lower than for solely implant-supported FPDs, but more longitudinal studies are required. This was generally a well-conducted review, but conclusions about the relative effect of reconstructions were based on indirect comparisons and are therefore not definitive.

Authors' objectives
To assess the 5- and 10-year survival of combined tooth-implant-supported fixed partial dentures (FPDs) and the incidence of biological and technical complications.

Searching
MEDLINE was searched to April 2004 for studies published in English in the dental literature; the search terms were reported. Bibliographies of previous reviews and all full-text articles were screened. Eight named relevant dental journals were searched (2001 to 2004).

Study selection
Study designs of evaluations included in the review
Controlled clinical trials and prospective and retrospective cohort studies with a mean follow-up period of at least 5 years were eligible for inclusion. The included studies followed up individual patients from about 1.3 to 13 years.

Specific interventions included in the review
Studies of FPDs were eligible for inclusion. Studies using FPDs and single crowns had to use FPDs in at least two-thirds of cases. The included studies used combined tooth-implant-supported FPDs with various types of commercially available implant systems (the types were reported). Most of the studies reporting the FPD design used metal-ceramic FPDs and most were screw retained; other studies used gold-acrylic designs. All procedures in the included studies were carried out in universities or specialist clinics.

Participants included in the review
Inclusion criteria for the participants were not specified. The patients in the included studies were aged from 17 to 83 years.

Outcomes assessed in the review
The studies had to examine all patients clinically at follow-up. Studies that assessed outcomes using patients' records, questionnaires or interviews were excluded. The review assessed survival of implant and FPD, success, and biological and technical complications. Survival was defined as FPD still in situ regardless of condition. Success was defined as FPD unchanged and no interventions required during follow-up. Biological complications included peri-implantitis, intrusion of abutment teeth and soft tissue complications. Technical complications included fractures of the implant, screw or abutment, fractures of the luting cement leading to loss of retention, fracture or deformation of the framework or veneers, and screw or abutment loosening. The outcomes were assessed at 5 and 10 years.

How were decisions on the relevance of primary studies made?
Two reviewers independently selected studies and resolved any disagreements through discussion. Inter-reviewer agreement was assessed.
Assessment of study quality
The authors did not state that they assessed validity, but they did extract data on drop-outs.

Data extraction
Three reviewers independently extracted the data using a data extraction form and resolved any disagreements through consensus. For each study, the numbers of events for FPDs and/or implants were extracted and the total exposure time calculated using various methods (the methods were reported). The reviewers then estimated the survival and complication rates (with 95% confidence intervals, CIs) after 5 and 10 years.

Methods of synthesis
How were the studies combined?
Pooled survival and complication rates were calculated using a Poisson regression model, with 95% CIs calculated from robust standard errors. Random-effects models were used where significant heterogeneity was found.

How were differences between studies investigated?
Heterogeneity was assessed using the Spearman goodness-to-fit statistic (taking P<0.05 to indicate significant heterogeneity).

Results of the review
Thirteen studies (555 patients, 538 FPDs supported by 1,002 oral implants) were included: 9 prospective studies and 4 retrospective studies.

Drop-outs: 10 studies reported drop-out rates. These ranged from 0 to 25%.

Implant survival (13 studies): estimated survival was 90.1% (95% CI: 82.4, 94.5; based on 8 studies with 932 implants) and 82.1% (95% CI: 55.8, 93.6; based on 6 studies with 143 implants) at 10 years. Significant heterogeneity was found (P<0.0001 at 5 years and P=0.0046 at 10 years) and a random-effects model was used for both meta-analyses. FPD survival (9 studies): estimated survival was 94.1% (95% CI: 90.2, 96.5; based on 5 studies with 115 FPDs) at 5 years and 77.8% (95% CI: 66.4, 85.7; based on 3 studies with 60 implants) at 10 years. No significant heterogeneity was found (P=0.72 and P=0.48).

Loss of tooth and implant abutments: 8 studies reported on these outcomes. At 5 years, the estimated loss of abutment teeth was 3.2% (95% CI: 1.5, 7.2; based on a random-effects model, P<0.025) and the estimated loss of implants was 3.4% (95% CI: 2.2, 5.3), based on 6 studies with 300 FPDs, 529 abutment teeth and 583 loaded implants. At 10 years, the estimated loss was 10.6% (95% CI: 3.5, 23.1) for abutment teeth and 15.6% (95% CI: 6.6, 29.5) for implants, based on 2 studies with 45 FPDs, 47 abutment teeth and 45 loaded implants.

Biological complications (3 studies).

The estimated rate of biological complications after 5 years was 11.7% (95% CI: 9.7, 14.7), based on a random-effects model (P<0.025) using data from 2 studies.

Technical complications.

Most of the studies did not report technical complications in detail. The most common technical complications were as follows.

Veneer fracture: 9.8% of 41 FPDs (1 study) and 9.1% at 10 years (1 study).

Loss of retention: 6.2% at 5 years (1 study) and 24.9% (95% CI: 7.9, 63.1) at 10 years (2 studies).

Connection-related complications: 3.6% at 5 years (1 study) and 26.4% (95% CI: 20.3, 33.9) at 10 years (2 studies).
Abutment fracture or abutment screw fracture: 0.7% across 2 studies.
Intrusion of abutment teeth: 5.2% at 5 years (5 studies).

**Authors’ conclusions**
Survival rates of implants and reconstructions in combined tooth-implant-supported FPDs were lower than rates reported for solely implant-supported FPDs (see Other Publications of Related Interest no.1). Solely implant-supported FPDs should therefore be preferred, but clinical and patient factors may lead to the selection of combined tooth-implant-supported reconstruction. More longitudinal studies are required.

**CRD commentary**
The review addressed a clear question in terms of the intervention, outcomes and study design, although the criteria were only explicit for study design. The search of one electronic database was supplemented with handsearches of several relevant journals, but limiting the search to English language publications might have resulted in the omission of some relevant studies and raises the possibility of language bias. No attempts were made to locate unpublished studies, thus raising the possibility of publication bias. Methods were used to minimise errors and bias in the study selection and data extraction processes. Validity was not formally assessed although drop-out rates were reported.

The studies were combined using a meta-analysis and some meta-analysis graphs were presented. The event rates for some outcomes varied across the studies and a meta-analysis was not appropriate for these situations. The authors correctly advised caution in interpreting the 10-year results (based on a small number of patients). This was generally a well-conducted review, but conclusions about the relative effect of reconstructions were based on indirect comparisons rather than direct comparisons within trials. Therefore, any conclusions drawn about the relative effects are not definitive.

**Implications of the review for practice and research**
Practice: The authors stated that the planning of prosthetic rehabilitation should preferentially include solely implant-supported FPDs.

Research: The authors stated that there is a need for more longitudinal studies of tooth-implant-supported FPDs.

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