A systematic review of the survival and complication rates of fixed partial dentures (FPDs) after an observation period of at least 5 years - IV: cantilever or extension FPDs


CRD summary
This review assessed the long-term survival and complications of cantilever fixed partial dentures (FPDs). The authors concluded that cantilever FPDs had lower survival and success rates than conventional end-abutment supported FPDs, and that biological and technical complications were common. The review was generally well conducted, but comparisons between treatments were based on indirect comparisons and so are not definitive.

Authors' objectives
To assess the long-term survival of cantilever 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 articles and reviews were screened and two journals (International Journal of Prosthodontics and the Journal of Prosthetic Dentistry) were handsearched (2001 to 2003).

Study selection
Study designs of evaluations included in the review
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 individuals from 2 to 23 years (mean 8.2 years).

Specific interventions included in the review
Studies of cantilever FPDs were included if they described the characteristics of the suprastructures used. Studies using FPDs and single crowns had to use FPDs in at least two-thirds of cases. In the included studies, interventions were undertaken by dental students, postgraduate students, private dentists and specialists. Most studies were set in institutions such as universities or specialised clinics. The mean number of cantilever extensions ranged from 1.1 to 6 across 7 studies. Most of the studies reporting the bridge design used gold-acrylic; other studies used metal-ceramic designs.

Participants included in the review
Inclusion criteria for the participants were not specified. The patients in the included studies were aged from 26 to 84 years.

Outcomes assessed in the review
The studies had to examine all patients at follow-up. Studies that assessed outcomes using patients' records, questionnaires or interviews were excluded. The review assessed survival, 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 caries, loss of pulp vitality and the progression of periodontal disease, while technical complications included fractures of the luting cement leading to loss of retention, fracture of abutment teeth, and fractures or deformations of the framework or veneers.

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 measured.
Assessment of study quality
The authors did not state that they assessed validity, but they did extract data on drop-outs.

Data extraction
Two reviewers independently extracted the data and resolved any disagreements through discussion. For each study, the numbers of events were extracted and the total exposure time calculated (the methods used were reported). The reviewers also estimated the failure rates per 100 FPDs and survival after 10 years.

Methods of synthesis
How were the studies combined?
Pooled survival and complication rates (with 95% confidence intervals, CIs) at 10 years were calculated using Poisson regression models, assuming a constant event rate (the methods used were reported). Random-effects models were used in the presence of significant heterogeneity (P<0.05); standard models were used otherwise.

How were differences between studies investigated?
Statistical heterogeneity was assessed using the Spearman goodness-to-fit statistic.

A subgroup analysis was used to examine the influence of the number of cantilever extensions (one or occasionally two versus two or three extensions) and type of veneer (ceramic versus acrylic).

Results of the review
Thirteen cohort studies (around 700 patients with 816 FPDs) were included: 3 three prospective studies and 10 retrospective studies.

Drop-outs: 9 studies reported drop-out rates. These ranged from 0 to 46%.

FPD survival (12 studies, 671 FPDs): the estimated 10-year survival rates ranged from 68.3 to 96.7% across studies. The estimated summary (standard model) 10-year survival rate was 81.8% (95% CI: 78.2, 84.9).

There was no statistically significant difference between studies using one or occasionally two cantilever extensions compared with the use of two or three extensions. The results were similar for ceramic and acrylic veneers.

Success (6 studies, n=391): the estimated 10-year success rates ranged from 38.6 to 73.5% across studies. The estimated summary (standard model) 10-year success rate was 63% (95% CI: 54.7, 70.2).

Biological complications.
Dental caries at abutments (3 studies, 305 abutments): the annual incidence rates ranged from 0.77 to 2.38%. The estimated 10-year cumulative rate (random-effects model) was 9.1% (95% CI: 6.3, 13).

Dental caries leading to loss of FPD (6 studies, 511 FPDs): the annual incidence rates ranged from 0 to 0.77%. The estimated 10-year cumulative rate (standard model) was 2.6% (95% CI: 0.7, 9.9).

Loss of abutment vitality (3 studies, 155 abutment teeth): the annual incidence rates ranged from 1.1 to 9%. Two studies using 12-unit FPDs reported substantially higher rates (3.5% and 9%). The estimated 10-year cumulative rate (random-effects model) was 32.6% (95% CI: 13.9, 64.9).

Recurrent periodontitis (7 studies, n=395): the estimated 10-year cumulative rate (standard model) of FPDs lost to recurrent periodontitis was 1% (95% CI: 0.3, 3).

Technical complications.
Loss of retention due to fracture of luting cement (7 studies, 404 FPDs): the annual incidence rates ranged from 0.3 to
5.7%. The estimated 10-year cumulative rate (random-effects model) was 16.1% (95% CI: 8.8, 28.4). Fracture of abutment teeth (6 studies, 573 abutment teeth): the annual incidence rates ranged from 0.33 to 0.68%. The estimated 10-year cumulative rate (standard model) was 2.9% (95% CI: 1.7, 5).

Fracture of abutment teeth leading to loss of FPD (4 studies, 306 FPDs): the annual incidence rates ranged from 0 to 0.68%. The estimated 10-year cumulative rate (standard model) was 2.4% (95% CI: 0.6, 9.8). Material complications (6 studies, 510 FPDs): the annual incidence rate of material fracture ranged from 0 to 2%. The estimated 10-year cumulative rate (random-effects model) of material complications was 5.9% (95% CI: 3.3, 10.4).

**Authors’ conclusions**

Cantilever FPDs had lower survival and success rates than conventional end-abutment supported FPDs. Biological and technical complications were common.

**CRD commentary**

The review addressed a clear question in terms of the intervention, outcomes and study design. The search was limited to English language publications in one electronic database and two journals, therefore some relevant studies might have been missed. 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 statistical heterogeneity was assessed. The event rates for some outcomes varied across the studies and a summary effect might not have been appropriate. However, potential reasons for differences between the studies were discussed and the influence of various factors on the results was explored. The conclusion about the relative effect of cantilever FPDs and conventional end-abutment supported FPDs (see Other Publications of Related Interest) was based on indirect comparisons rather than direct comparisons within trials. Therefore, any conclusions drawn about the relative effects are not definitive. The evidence presented appears to support the conclusions about the frequent occurrence of complications. The results were based on observational studies and the evidence is therefore relatively weak, but it is likely to represent the best evidence currently available.

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

The authors did not state any implications for practice or further research.

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