A systematic review of the survival and complication rates of implant supported fixed dental prostheses with cantilever extensions after an observation period of at least 5 years

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CRD summary
This review concluded that implant-supported cantilever fixed dental prostheses were reliable for the replacement of posterior missing teeth in partially edentulous patients. This was generally a well-conducted review, but there was potential for missing studies, samples were small, and study validity was not assessed, and so the findings should be interpreted with caution.

Authors' objectives
To assess the survival rates of short-span implant-supported cantilever fixed dental prostheses and the incidence of complications after five years or more.

Searching
MEDLINE was searched to December 2007 and the search terms were reported. Manual searches were undertaken in publications from 2005 to December 2007 of: Clinical Oral Implants Research; International Journal of Periodontics and Restorative Dentistry; Journal of Periodontology; and International Journal of Oral and Maxillofacial Implants. Reference lists of included studies were searched for additional studies. The search was limited to publications in English.

Study selection
Prospective or retrospective longitudinal cohort studies, or controlled studies reporting on implant-supported cantilever fixed dental prostheses, for a mean follow-up period of at least five years, were eligible for inclusion. A clinical examination had to be performed at the end of follow-up. Studies that reported patients' records, questionnaires, or interviews were excluded and, where multiple papers reported on the same population, the most recent paper was included.

Outcomes included five- and 10-year implant or prosthesis survival, which was defined as the implant still being present at follow-up examination; both technical (including implant fractures, veneer fractures, framework fractures, abutment or screw fractures, loss of retention, and screw loosening) and biological complications were assessed, as well as bone loss. The implants in the included studies were mostly solid screws, but hollow screws and hollow cylinders were also used. The prostheses were in both the upper and lower jaws and were screw retained in most of the studies; all possible cantilever extension designs were used. Where reported, the mean age of patients ranged from 42.9 to 61.9 years; one study was undertaken in private practice and the remainder were in university settings.

Two reviewers independently selected studies for inclusion in the review and disagreements were resolved by discussion.

Assessment of study quality
The authors did not state that they assessed study quality.

Data extraction
Two reviewers independently extracted implant and prosthesis survival and complication rates. Failure and complication rates were estimated by dividing the number of events (failures or complications) by the total exposure time (prosthesis or implant time) in years. Exposure time was calculated by multiplying the mean follow-up time by the number of implants or prostheses available for analysis. The mean differences were calculated for continuous outcomes. Disagreements were resolved by discussion and the authors were contacted for clarification or additional data, where necessary.

Methods of synthesis
Five- and 10-year estimates for survival and complication rates were pooled using a Poisson regression model with 95% confidence intervals. Heterogeneity was assessed using the Spearman goodness-of-fit statistic (p<0.05). Mean differences were pooled using the inverse-variance weighting method.

**Results of the review**

Five studies were included in the review, with at least 89 participants (range 14 to 28); two were prospective cohort studies, one was a retrospective cohort study, and two were retrospective controlled studies. The mean follow-up was five years in three studies and 9.4 and 10.5 years in the other two studies.

**Implant and prosthesis survival** (five studies): The survival rate for implants at five years was 98.5% (95% CI 97.1 to 99.3) and at 10 years was 97.1% (95% CI 94.3 to 98.5). The survival rate of implant-supported cantilever fixed dental prostheses at five years was 94.3% (95% CI 84.1 to 98.0) and at 10 years was 88.9% (95% CI 70.8 to 96.1). There was significant heterogeneity for comparisons of the survival rate of prostheses (p=0.02).

**Biological complications** (two studies): Five-year estimates for peri-implantitis were 5.4% (95% CI 2.0 to 14.2) for implants and 9.4% (95% CI 3.3 to 25.4) for prostheses with 10-year estimates for peri-implantitis of 10.5% (95% CI 3.9 to 26.4) at implant levels and 17.9% (95% CI 6.4 to 44.3) at prosthesis levels. There was no significant heterogeneity for these comparisons.

**Technical complications**: The most frequently reported complications at five years were: veneer fracture (10.3%; 95% CI 3.9 to 26.6; five studies); screw loosening (8.2%; 95% CI 3.9 to 17.0; four studies), loss of retention (5.7%; 95% CI: 1.9 to 16.5; two studies) and abutment or screw fracture (2.1%; 95% CI 0.9 to 5.1; five studies). There was significant heterogeneity for veneer fracture and abutment or screw fracture. Implant fracture was rare (five-year estimate 1.3%; 95% CI 0.2 to 8.3; four studies) and there were no reports of framework fracture. There was significant heterogeneity for this comparison (p=0.004).

**Radiographic bone level changes**: Non-significant differences in radiographic bone loss were observed at either the prosthesis, or implant levels, when comparing short-span implant-supported cantilever fixed dental prostheses with short-span implant-supported end-abutment fixed dental prostheses.

**Authors' conclusions**

Implant-supported cantilever fixed dental prostheses were a reliable treatment for the replacement of posterior missing teeth in partially edentulous patients and the most frequent complications included veneer fractures, screw loosening, and loss of retention. No detrimental effects on bone levels were observed around the implants in the proximity of cantilever extensions.

**CRD commentary**

This review addressed a clear research question and was supported by adequate inclusion criteria. The literature search for English-language publications was restricted to one database and to published studies, which means that language and publication bias could have been present and some studies may have been missed. The authors reported using methods designed to reduce bias and error in the selection of studies and the extraction of data. No assessment of study validity was reported, which makes it difficult to assess the reliability of the included data; all of the included studies had small samples. The statistical synthesis appeared to be appropriate. Heterogeneity was assessed and was present for some of the comparisons.

Generally this was a well-conducted review, but the findings are limited by the potential for missing studies, the small samples, and the lack of assessment of study validity, and should be interpreted with caution.

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

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

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