A systematic review of the 5-year survival and complication rates of implant-supported single crowns

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CRD summary
This review of implant dentistry concluded that although five-year survival rates for implants and implant-supported single crowns were high, biological and especially technical complications were common. The authors' conclusions reflected data from the included observational studies and appear reliable, although some consideration of study validity would have been helpful.

Authors' objectives
To evaluate the five-year survival of implant-supported single crowns and the incidence of technical and biological complications.

Searching
MEDLINE was searched from 1966 to July 2006 for studies reported in dental journals. Search terms were reported. In addition, 19 specified dental journals were handsearched from 1966 to July 2006. Studies reported in English or German were eligible.

Study selection
Prospective and retrospective cohort studies that evaluated the survival of implant-supported single crowns using clinical examination and that reported data separately for this group were eligible for inclusion. Studies had to have a mean follow-up of five years and had to describe the characteristics of the suprastructures. Survival was defined as the single crown remaining in situ with or without modification. The review also assessed biological and technical complications and aesthetics.

Where reported, the included studies evaluated one or more of five specified commercially available implant systems. Most studies evaluated metal-ceramic crown materials; others evaluated all-ceramic or gold-acrylic crowns. Most studies used cemented crowns; others used screw retained crowns. Most evaluated implants placed in a healed implant site. Most studies were conducted in universities or specialist clinics. Patients ranged in age from 13 to 94 years. The mean duration of follow-up ranged from five to 10 years.

Two reviewers independently selected studies and resolved disagreements by discussion.

Assessment of study quality
The authors did not state that they assessed validity. They reported drop-out rates.

Data extraction
Two reviewers independently extracted data onto a standardised form. Discrepancies were resolved through consensus. Numbers of events were extracted for outcomes of interest and failure rates, survival rates, complication rates and total exposure time of reconstructions were calculated for each study. Event rates for single crowns and/or implants were calculated. Event rates were calculated as the number of events divided by the total exposure time in years.

Methods of synthesis
Event rates per 100 years were pooled in a Poisson regression model with 95% confidence intervals (CI) calculated using robust standard errors. Heterogeneity was assessed using the Spearman goodness-of-fit statistic. If significant heterogeneity was found (p<0.05), random-effects Poisson model was used. Five and ten-year survival proportions were estimated using the relationship between event rates and survival times assuming constant event rates. Multivariable Poisson regression was used to examine the effect of crown material and crown design on events.

Results of the review
The review included 26 studies (1,558 inserted implants). Twenty-one studies were prospective and five were retrospective. All were published within the previous 10 years. Drop-out rates, where reported, ranged from 0% to 30% (21 studies).

**Survival:** Estimated 5-year survival rates for implants ranged from 90.5% to 100%. Survival rates for single crowns ranged from 89.6% to 100%. The estimated five-year survival rate was 96.8% (95% CI 95.9 to 97.6) for implants that supported single crowns and 94.5% (95% CI 92.5 to 95.9) for single crowns supported by implants. No significant heterogeneity was found. The estimated failure rate was 0.64 failures per 100 implant years (95% CI 0.49 to 0.84) for implants overall and 1.14 (95% CI 0.83 to 1.56) for single crowns. Estimated survival was significantly higher for metal-ceramic crowns than all-ceramic crowns (95.4% versus 91.2%, p=0.005).

**Biological and technical complications:** Estimates of peri-implantitis and soft tissue complications occurred adjacent to 9.7% (95% CI 5.1 to 17.9; 10 studies, random-effect model) of the single crowns after five years. Estimated bone loss greater than 2mm occurred in 6.3% (95% CI: 3 to 13; 10 studies) of implants over five years. There was no significant difference in bone loss between screw-retained and cemented crowns.

After five years the estimated cumulative incidence was 0.14 (95% CI 0.03 to 0.64; 10 studies) for implant fractures, 12.7% (95% CI 5.7 to 27; 13 studies) for screw or abutment loosening, 5.5% (95% CI 2.2 to 13.5; six studies) for fracture of the luting cement, 0.35% (95% CI 0.09 to 1.4) for screw or abutment fracture and 4.5% (95% CI 2.4 to 8.4) for ceramic or veneer fractures.

The estimated rate of crowns with an unacceptable appearance was 8.7% (95% CI 3.2 to 22.6).

**Authors’ conclusions**
Five-year survival rates for implants and implant-supported single crowns were high, but biological and especially technical complications were common.

**CRD commentary**
The review question was clearly stated. One database and many relevant journals were searched. Some attempts were made to reduce language bias. Appropriate methods were used to minimise reviewer error and bias during the selection of studies and extraction of data. It difficult to assess the quality of the evidence, as the only aspect of study validity that was addressed was drop-out rate. Methods used to pool data appeared appropriate. This was generally a well-conducted review, but there was no discussion of the limitations of evidence from observational studies. The authors’ conclusions reflected data from the included observational studies and are likely to be reliable.

**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 the development of standardised and reproducible aesthetic scores for the evaluation of teeth and peri-implant soft tissue.

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