
Abutment screw loosening in single-implant restorations: a systematic review

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CRD summary

The authors concluded that loosening of the abutment screw after single-implant tooth restoration was rare, regardless of implant-abutment connection geometry, provided proper anti-rotational features and torque were used. These conclusions appear to be supported by the data presented, but in view of the poor quality of the evidence, cautious interpretation is advisable.

Authors' objectives

To compare the incidence of abutment screw loosening associated with external and internal connection systems in single-implant tooth restorations.

Searching

PubMed, the Cochrane Central Register of Controlled Trials and DARE were searched from 1990 to September 2006. Search terms were reported. The PubMed 'related articles' function was also used. Five relevant journals were handsearched from 1995 to September 2006. The reference lists of relevant reviews and selected studies were scanned.

Study selection

Studies of single-implant tooth restorations were eligible for inclusion, provided they reported on single-tooth abutments with anti-rotational features and proper torque used (in external-hex connections). Studies were required to clearly report sample numbers (of both participants and single-implant restorations), to report mechanical complications involving abutment screw loosening as an outcome, and to have at least three years' mean follow-up.

The mean age of participants in the included studies ranged from 13 to 90 years (where reported). Most studies were conducted in a university setting. All used commercially available implant systems. The external-connection systems had similar geometry, while the internal systems were of three differing types (categorised as Straumann, Astra or Other). Mean duration of follow-up varied, ranging from three to ten years.

Studies were selected by two reviewers, with disagreements resolved by discussion.

Assessment of study quality

Studies were assigned to the following levels of evidence: randomised controlled trial (RCT) randomised at patient level, RCT with split-mouth design, prospective non-randomised controlled clinical trial, and 'other designs'. No further formal assessment of validity was reported.

It appears that the assessment was conducted by two reviewers working independently.

Data extraction

Data were extracted on event rates for the two groups (external versus internal connection). If it was unclear whether failures occurred in single crowns or in fixed partial dentures; all failures were attributed to single crowns. Total exposure time was calculated from the longest reported follow-up time, or from the reported minimum follow-up time if other data were unavailable. Three year complication-free rates for each study were calculated by survival analysis, assuming constant failure rates and that the number of failures per study followed a Poisson distribution for the calculated sum of implant years.

Data were extracted by two reviewers working independently.

Methods of synthesis

Data were combined to calculate pooled three-year complication-free rates (maximum-likelihood estimates), using

Tukey's biweight estimator, and 95% confidence intervals were calculated from the 95% confidence intervals of the event rates. Event rates between groups were compared, and the effect of study design (prospective versus retrospective) and type of internal connector system (Straumann, Astra or Other) were assessed in subgroup analyses.

Results of the review

Twenty-seven studies were included (reported in text as n=2,038 patients, 1,699 patients with single-implant restorations that were followed-up. However, there were discrepancies in reporting of sample numbers). None directly compared the two interventions of interest. Two studies were RCTs (n=27 patients), three were non-randomised controlled clinical trials (n=146 patients) and 22 used other designs (13 prospective and nine retrospective; n=1,865 patients, where reported). Patient drop-out rates ranged from nil to 42%, where reported.

The estimated complication-free rate after three years in the external-connection group was 97.3% (95% confidence interval (CI): 95.6% to 98.3%, 12 studies, n= 586 single-implant restorations followed-up).

The estimated complication-free rate after three years in the internal-connection group was 97.6% (95% CI: 96.5%, 98.3%, 15 studies, n=1,113 single-implant restorations followed-up).

Subgroup analyses did not substantially change any of the results.

Authors' conclusions

Loosening of the abutment screw after single-implant tooth restoration was a rare occurrence, regardless of the implant-abutment connection geometry, provided proper anti-rotational features and torque were used.

CRD commentary

The objectives and inclusion criteria were clear and relevant sources were searched for studies. However, the search was restricted to studies in English, so the review was subject to potential language bias. Also, it does not appear that specific attempts were made to find unpublished studies, so the review may also be prone to publication bias. No formal test for publication bias was reported. Steps appear to have been taken to minimise bias and error by having more than one reviewer conduct study selection, data extraction and validity assessment. However, the validity assessment only addressed levels of evidence and did not formally assess other aspects of the quality of individual studies.

Few details were provided about the clinical characteristics of study participants. Although appropriate statistical methods appear to have been used to combine studies, it was unclear what proportion of participants contributed data to the analyses, as there were unexplained discrepancies in sample numbers across study tables and the unit of analysis was single-implant restorations. This made the findings difficult to interpret. Differences between the studies were explored in subgroup analyses, but it is unclear whether there was any formal testing for statistical heterogeneity. The authors acknowledged the potential for bias in the review, in particular the poor design of the included studies and the lack of controlled studies comparing the interventions of interest.

The authors' conclusions appear to be supported by the data presented, but in view of the poor quality of the evidence, cautious interpretation is advisable.

Implications of the review for practice and research

Practice: The authors did not state any implications for practice.

Research: The authors stated that better-designed studies on single-implant restorations are needed, as currently there are no RCTs directly comparing the incidence of abutment screw loosening between external and internal connecting systems.

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This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.