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[Intervention Review]

# Interventions for replacing missing teeth: different types of dental implants

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## ABSTRACT

### Background

Dental implants are available in different materials, shapes and with different surface characteristics. In particular, numerous implant designs and surface modifications have been developed for improving clinical outcome. This is an update of a Cochrane review first published in 2002, and previously updated in 2003, 2005 and 2007.

### Objectives

Primary: to compare the clinical effects of different root-formed osseointegrated dental implant types for replacing missing teeth for the following specific comparisons: implants with different surface preparations, but having similar shape and material; implants with different shapes, but having similar surface preparation and material; implants made of different materials, but having similar surface preparation and shape; different implant types differing in surface preparation, shape, material or a combination of these.

Secondary: to compare turned and roughened dental implants for occurrence of early implant failure (before prosthetic loading) and occurrence of peri-implantitis.

### Search methods

We searched the following electronic databases: the Cochrane Oral Health Group's Trials Register (to 17 January 2014), the Cochrane Central Register of Controlled Trials (CENTRAL) (*The Cochrane Library* 2013, Issue 12), MEDLINE via OVID (1946 to 17 January 2014) and EMBASE via OVID (1980 to 17 January 2014). We placed no restrictions on the language or date of publication when searching the electronic databases.

### Selection criteria

We included any randomised controlled trial (RCT) comparing osseointegrated dental implants of different materials, shapes and surface properties having a follow-up in function of at least one year. Outcome measures were success of the implants, radiographic peri-implant marginal bone levels changes and incidence of peri-implantitis.

## Data collection and analysis

At least two review authors independently conducted screening, risk of bias assessment and data extraction of eligible trials in duplicate. We expressed results using fixed-effect models (if up to three studies were present in a meta-analysis) or random-effects models (when there were more than three studies) using mean differences (MD) for continuous outcomes and risk ratios (RR) for dichotomous outcomes with 95% confidence intervals (CI). We reported the following endpoints: one, three, five and 10 years after functional loading.

## Main results

We identified 81 different RCTs. We included 27 of these RCTs, reporting results from 1512 participants and 3230 implants in the review. We compared 38 different implant types with a follow-up ranging from one to 10 years. All implants were made of commercially pure titanium or its alloys, and had different shapes and surface preparations. We judged two trials to be at low risk of bias, 10 to be at unclear risk of bias and 15 to be at high risk of bias. On a 'per participant' rather than 'per implant' basis, we found no significant differences between various implant types for implant failures. The only observed statistically significant difference for the primary objective regarded more peri-implant bone loss at Nobel Speedy Groovy implants when compared with NobelActive implants (MD -0.59 mm; 95% CI -0.74 to -0.44, different implant shapes). The only observed statistically significant difference for the secondary objective was that implants with turned (smoother) surfaces had a 20% reduction in risk to be affected by peri-implantitis than implants with rough surfaces three years after loading (RR 0.80; 95% CI 0.67 to 0.96). There was a tendency for implants with turned surfaces to fail early more often than implants with roughened surfaces.

## Authors' conclusions

Based on the results of the included RCTs, we found no evidence showing that any particular type of dental implant had superior long-term success. There was limited evidence showing that implants with relatively smooth (turned) surfaces were less prone to lose bone due to chronic infection (peri-implantitis) than implants with much rougher surfaces (titanium-plasma-sprayed). These findings were based on several RCTs, often at high risk of bias, with few participants and relatively short follow-up periods.

## PLAIN LANGUAGE SUMMARY

### Interventions for replacing missing teeth: different types of dental implants

#### Review question

To compare the effects of different dental implants. These are implanted into bone and vary primarily in their shape, material and type of surface.

#### Background

Missing teeth can sometimes be replaced with dental implants into the jaw, as bone can grow around the implant. A crown, bridge or denture can then be attached to the implant. Many implant modifications have been developed trying to improve the long-term success rates of implants, and different types have been heavily marketed. More than 1300 types of dental implants are available, in different materials, shapes, sizes, lengths and with different surface characteristics or coatings.

#### Study characteristics

This review of existing studies was carried out by the Cochrane Oral Health Group and the evidence is current up to 17 January 2014. We searched scientific databases for randomised controlled trials (studies where people are randomly put into one of two or more treatment groups) comparing different types of dental implants in people who were followed up for at least one year.

We found 27 trials based in a wide range of countries - six in Italy; five in New Zealand, five in Sweden, three in the Netherlands, two in Korea, one in Turkey, one in Germany, one in Switzerland and three multicentre European trials. Most took place at university dental clinics or hospitals, four were run in private practice and, in the multicentre European trials, a few were also in private practice.

There were comparisons made of 38 implant types with different surface characteristics, shapes, degree of titanium (metal) purity and titanium alloys (mixtures of metal). The main outcome of the trials was failure of the implant to work.

#### Key results

The review found there was not enough evidence from trials to demonstrate superiority of any particular type of implant characteristic or implant system over another.

There was no evidence showing that any particular type of dental implant had greater long-term success. There was limited evidence showing that implants with relatively smooth surfaces were less prone to lose bone due to chronic infection (peri-implantitis) than implants with much rougher surfaces. However, the evidence suggests they may fail earlier than implants with roughened surfaces.

### **Quality of the evidence**

Two trials were at low risk of bias, 10 were at unclear risk of bias and 15 were at high risk of bias.

Most of the trials were underpowered, which means that there were not enough participants in the studies to be able to draw firm conclusions. Caution should be exercised when generalising the results of the included trials to ordinary clinical conditions.