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[Intervention Review]

Interventions for replacing missing teeth: alveolar ridge preservation techniques for dental implant site development

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ABSTRACT

Background

Alveolar bone changes following tooth extraction can compromise prosthodontic rehabilitation. Alveolar ridge preservation (ARP) has been proposed to limit these changes and improve prosthodontic and aesthetic outcomes when implants are used.

Objectives

To assess the clinical effects of various materials and techniques for ARP after tooth extraction compared with extraction alone or other methods of ARP, or both, in patients requiring dental implant placement following healing of extraction sockets.

Search methods

The following electronic databases were searched: Cochrane Oral Health's Trials Register (to 22 July 2014), the Cochrane Central Register of Controlled Trials (CENTRAL) (*The Cochrane Library* 2014, Issue 6), MEDLINE via Ovid (1946 to 22 July 2014), Embase via OVID (1980 to 22 July 2014), LILACS via BIREME (1982 to 22 July 2014), the metaRegister of Controlled Trials (to 22 July 2014), ClinicalTrials.gov (to 22 July 2014), the World Health Organization International Clinical Trials Registry Platform (to 22 July 2014), Web of Science Conference Proceedings (1990 to 22 July 2014), Scopus (1966 to 22 July 2014), ProQuest Dissertations and Theses (1861 to 22 July 2014) and OpenGrey (to 22 July 2014). A number of journals were also handsearched. Trial authors were contacted to identify unpublished randomised controlled trials. There were no restrictions regarding language and date of publication in the searches of the electronic databases.

Selection criteria

We included all randomised controlled trials (RCTs) on the use of alveolar ridge preservation techniques with at least six months of follow-up. Outcome measures were: changes in the bucco-lingual/palatal width of alveolar ridge, changes in the vertical height of the alveolar ridge, complications, the need for additional augmentation prior to implant placement, aesthetic outcomes, implant failure rates, peri-implant marginal bone level changes, changes in probing depths and clinical attachment levels at teeth adjacent to the extraction site, and complications of future prosthodontic rehabilitation.

Data collection and analysis

Two review authors extracted data independently and assessed risk of bias for each included trial. Corresponding authors were contacted to obtain missing information. Results were combined using random-effects models with mean differences (MD) for continuous outcomes and risk ratios (RR) for dichotomous outcomes, with 95% confidence intervals (95% CI). We constructed 'Summary of findings' tables to present the main findings.

Main results

A total of 50 trials were potentially eligible for inclusion, of which 42 trials were excluded. We included eight RCTs with a total of 233 extraction sites in 184 participants. One trial was judged to be at unclear risk of bias and the remaining trials were at high risk of bias. From two trials comparing xenograft with extraction alone (70 participants, moderate quality evidence), there was some evidence of a reduction in loss of alveolar ridge height (MD -2.60 mm; 95% CI -3.43 to -1.76) and width (MD -1.97 mm; 95% CI -2.48 to -1.46). This was also found in one trial comparing allograft with extraction (24 participants, low quality evidence): ridge height (MD -2.20 mm; 95% CI -0.75 to -3.65) and width (MD - 1.40 mm; 95% CI 0.00 to -2.80) and height. From two RCTs comparing alloplast versus xenograft no evidence was found that either ridge preservation technique caused a smaller reduction in loss of ridge height (MD -0.35 mm; 95% CI -0.86 to 0.16) or width (MD -0.44 mm; 95% CI -0.90 to 0.02; two trials (55 participants); moderate quality evidence). There was insufficient evidence to determine whether there are clinically significant differences between different ARP techniques and extraction based on the need for additional augmentation prior to implant placement, complications, implant failure, or changes in peri-implant marginal bone levels and probing depths of neighbouring teeth. We found no trials which evaluated parameters relating to clinical attachment levels, specific aesthetic or prosthodontic outcomes.

Authors' conclusions

There is limited evidence that ARP techniques may minimise the overall changes in residual ridge height and width six months after extraction. There is also lack of evidence of any differences in implant failure, aesthetic outcomes or any other clinical parameters due to the lack of information or long-term data. There is no convincing evidence of any clinically significant difference between different grafting materials and barriers used for ARP. Further long term RCTs that follow CONSORT guidelines (www.consort-statement.org) are necessary.

PLAIN LANGUAGE SUMMARY

Ways of keeping enough jaw bone to allow for dental implants after teeth have been taken out

Review question

The aim of this review is to assess the effectiveness of various materials and techniques for keeping enough bone in the jaw (alveolar ridge preservation) after teeth have been taken out (tooth extraction). These techniques are compared to tooth extraction alone or other methods of preserving the bone, or both, in patients that need dental implants after the tooth socket has healed.

Background

When a tooth has been taken out, the bone around the tooth socket shrinks. Artificial teeth can be used to replace missing teeth following extractions. However, loss of bone width and depth after tooth extraction can affect how successful the implant will be. This is especially the case when artificial teeth (crowns or bridges) need to be held in place by dental implants inserted into the bone of the jaw where the original teeth used to be. If the bone has shrunk too much following the loss of teeth, it makes it difficult or impossible to put dental implants into the jaw. This in turn leads to gum shrinkage.

A procedure known as socket preservation (ARP) may limit the shrinkage of bone following tooth loss although there is a need for evidence of its effectiveness. Several techniques and bone substitute materials can be used to fill the socket after tooth extraction. The socket may then be covered by gums or an artificial membrane and left to heal for several months. The aim is that the bone of the old tooth socket will have kept its shape and size allowing dental implants to be inserted to support crowns or bridges so that the patient's appearance is improved and they can eat, talk and socialise with confidence. It is also hoped that the rate of failure of dental implants will be improved.

Study characteristics

Authors from Cochrane Oral Health carried out this review and the evidence is up to date from 22 July 2014. Eight trials were included with a total of 233 extraction sites (teeth taken out) in 184 participants. Participants were adults aged 18 years or older, in good general health, needing one or more permanent teeth to be taken out and the consideration of the use of ARP (alveolar ridge preservation techniques) with the possibility of using dental implants at a later date.

The review looked at the effects of four techniques and materials used for preserving the tooth extraction socket.

Three studies compared socket preservation to tooth extraction alone, while five studies compared two or more different materials.

Key results

There is limited evidence that socket preservation (ARP) can reduce bone loss compared to tooth extraction alone to allow for dental implant placement.

There is no evidence that socket preservation makes any important differences to the look or lasting quality of crowns or bridges.

There is no convincing evidence of any significant difference between different materials and barriers used for socket preservation.

Quality of the evidence

The quality of the evidence is judged as low due to high risk of bias of the majority of the included studies. Some evidence of reporting bias is suspected, as only two of the included trials did not receive any industry support. Further long-term randomised controlled trials that follow CONSORT guidelines (www.consort-statement.org) are required.