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[Intervention Review]

Interventions for treating traumatised ankylosed permanent front teeth

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ABSTRACT

Background

Teeth that have suffered trauma can fuse to the surrounding bone in a process called dental ankylosis. Ankylosed permanent front teeth fail to erupt during facial growth and can become displaced, thus resulting in functional and aesthetic problems. Dental ankylosis is also associated with root resorption, which may eventually lead to the loss of affected teeth. Different interventions for the management of ankylosed permanent front teeth have been described, but it is unclear which are the most effective.

Objectives

To evaluate the effectiveness of any intervention that can be used in the treatment of ankylosed permanent front teeth.

Search methods

The following electronic databases were searched: the Cochrane Oral Health Group Trials Register (to 3 August 2015), the Cochrane Central Register of Controlled Trials (CENTRAL) (*The Cochrane Library*, 2015, Issue 7), MEDLINE via OVID (1946 to 3 August 2015), EMBASE via OVID (1980 to 3 August 2015) and LILACS via BIREME (1982 to 3 August 2015). We searched the US National Institutes of Health Trials Register (<http://clinicaltrials.gov>) and the WHO Clinical Trials Registry Platform for ongoing trials. No restrictions were placed on the language or date of publication when searching the electronic databases.

Selection criteria

We included randomised controlled trials (RCTs) comparing any intervention for treating displaced ankylosed permanent front teeth in individuals of any age. Treatments could be compared with one another, with placebo or with no treatment.

Data collection and analysis

Two independent review authors screened studies independently. Full papers were obtained for potentially relevant trials. Although no study was included, the authors had planned to extract data independently and to analyse the data according to the *Cochrane Handbook for Systematic Reviews of Interventions*.

Main results

No randomised controlled trials that met the inclusion criteria were identified.

Authors' conclusions

We were unable to identify any reports of randomised controlled trials regarding the efficacy of different treatment options for ankylosed permanent front teeth. The lack of high level evidence for the management of this health problem emphasises the need for well designed clinical trials on this topic, which conform to the CONSORT statement (www.consort-statement.org/).

PLAIN LANGUAGE SUMMARY

Interventions for treating permanent front teeth that have been damaged and then become fused to the bone

Review question

This review was carried out to assess how effective different treatments are for treating permanent front teeth that have been damaged and then fused to the bone (ankylosed front teeth).

Background

Sometimes teeth can fuse to the bone of the jaws after an injury to the tooth, such as when the tooth is knocked and pushed up into the jawbone. This fusion is called 'ankylosis'. Usually the roots of fused ('ankylosed') teeth are resorbed by the body and replaced by the surrounding bone. For some individuals, this can lead to the fused teeth falling out. These teeth do not grow with the normal growth of the jawbones, so can become gradually moved if the injury occurs during childhood. It is not clear which treatment is best for these fused teeth, which is why we have undertaken this review.

Study characteristics

Authors from the Cochrane Oral Health Group carried out this review of existing studies, and the evidence is up-to-date to 3 October 2015. There were no studies found that met the inclusion criteria for this review.

Key results and quality of the evidence

This review found that there is currently no high-level evidence available for comparing the effectiveness of different treatment methods for fused front teeth. Further research is needed provide evidence for different treatments and their relative effectiveness and safety.

BACKGROUND

Teeth that have suffered severe trauma can fuse to the surrounding bone during recovery, a process termed ankylosis ([Kawanami 1999](#)). These severe traumatic injuries include intrusion, where the tooth is pushed up into the jawbone, or avulsion and replantation, where the tooth is knocked out and replanted ([Andreasen 1995](#); [Andreasen 2006](#)). The five-year survival rate of ankylosed teeth is poor. Where this occurs the root is resorbed and replaced by the adjacent bone, which is termed replacement resorption. The speed of replacement resorption and loss of the tooth is related to the age of the patient ([Barrett 1997](#)). When dental ankylosis occurs in a growing child, the ankylosed tooth fails to erupt compared to adjacent teeth during vertical growth which alters alveolar development ([Campbell 2005b](#); [Kofod 2005](#); [Malmgren 2002](#)). Severe infraocclusion causes functional and aesthetic problems and can lead to tilting of the adjacent teeth if left untreated ([Takahashi 2005](#)).

Prevalence

The upper front teeth are the most frequently affected by trauma. [Soriano 2007](#) found prevalence of 10.5% of traumatic dental injuries to the permanent anterior teeth among a group of Brazilian schoolchildren. Similarly, the 2013 Children's Dental Health Survey in England, Wales and Northern Ireland found around 10% of children had experienced trauma to their incisors ([Children's Dental Health Survey 2013](#)).

Diagnosis

Clinically, 'ankylosis' is defined as a pathological fusion of the external root surface of the tooth with the surrounding bone and presents typical clinical signs. Lack of mobility and different percussion sound when compared with adjacent unaffected teeth are typical features ([Campbell 2005a](#); [Campbell 2005b](#)). Radiographic examination is considered to be of limited value in the early detection of ankylosis because of the two-dimensional nature of the image ([Campbell 2005b](#)). The observation of progressive infraocclusion during adolescent growth is another indicator ([Andreasen 1995](#)). Diagnostic data can be complemented by electronic devices (Periotest and digital sound wave) ([Campbell 2005a](#)).

Treatment options

Different interventions have been proposed for treating ankylosed permanent front teeth but there is uncertainty as to which intervention is most effective. This systematic review seeks to provide reliable evidence for the different treatment options available for ankylosed permanent front teeth.

The choice of treatment for displaced ankylosed teeth depends on the severity of infraocclusion and replacement resorption, the preference and experience of the clinician, and patient age (facial growth and dental development) and expectations ([Campbell 2005b](#)). Considering these factors, treatments can be summarised as follows.

1) Periodical follow-up

Periodical follow-up of the ankylosed teeth with possible composite build-up for any minor infraocclusion.

2) Repositioning of the ankylosed teeth

Interventions for ankylosis that preserve the crown include surgical dislodgement and repositioning. It involves the mechanical breakage of the bridge between the tooth and the surrounding bone and is said to permit the tooth to resume eruption. The tooth can be placed a few millimetres from its original position and a flexible splint is inserted for a few days ([Moffat 2002](#)). Another option is to insert an orthodontic appliance immediately after surgery instead of a splint ([Takahashi 2005](#)). Another treatment option is bone sectioning (osteotomy) around the root with immediate repositioning ([Medeiros 1997](#)).

Distraction osteogenesis has also been used to reposition displaced teeth. The ankylosed tooth and a bone segment are separated from the surrounding bone through osteotomy and a device is placed to perform slow movement, thereby correcting the tissue and positional deficiencies ([Nocini 2004](#)).

3) Autotransplantation

Autotransplantation of a premolar to the ankylosed tooth position may provide a long-lasting physiological and aesthetic solution ([Andreasen 1990a](#); [Andreasen 1990b](#); [Kinzinger 2003](#); [Kofod 2005](#); [Kristerson 1991](#)). It is recommended when the premolar root is less than three quarters developed (the first lower premolar is the preferred choice). In adolescents over 12 to 14 years, tooth transplantation may be no longer recommended ([Isaacson 2001](#); [Sapir 2008](#); [Small 2002](#)), due to a higher chance of complications associated with transplanted teeth with complete formed roots ([Andreasen 1990a](#); [Andreasen 1990b](#)).

4) Conventional prosthodontics and dental implants

Another option is to remove the ankylosed teeth and to insert dental prostheses or implants, which is more recommended for adults. Height of jawbones should be maintained for adequate aesthetics and function, so decoronation (crown removal beneath surrounding bone) is proposed as an alternative to conventional tooth extraction. Decoronation is justified by the following reasons: an implant will be planned in the future, jaw growth is not yet complete, tooth transplantation is orthodontically contraindicated, and heavily discoloured or malpositioned teeth are not aesthetically acceptable ([Sapir 2008](#)). This is usually indicated if transplant or orthodontic space closure is not feasible in a growing child ([Malmgren 2000](#)).

5) Extraction and orthodontic space closure

Orthodontic space closure after the early loss of the traumatised tooth may provide an aesthetic solution as well as rehabilitation of the alveolar bone ridge. Unfortunately, limitations such as the underlying malocclusion, dental and skeletal age, teeth involved (systemic health, periodontal status, tooth shape and size), the need for compensatory extractions or reshaping of teeth as well as cost and compliance limit this option to well selected cases ([Sapir 2008](#)).

OBJECTIVES

To evaluate the effectiveness of any intervention that can be used in the treatment of ankylosed permanent front teeth.

METHODS

Criteria for considering studies for this review

Types of studies

Only randomised controlled trials (RCTs) were considered in this review.

Types of participants

Any patient with ankylosis and displacement of permanent front teeth diagnosed by clinical and radiographic assessment. Both teeth with or without previous endodontic treatment were considered.

Types of interventions

All interventions for treating displaced ankylosed teeth were considered, including.

1. Implant-supported crowns after extraction or decoronation of the ankylosed teeth.
2. Fixed prostheses cemented to prepared teeth after extraction or decoronation of the ankylosed teeth.
3. Transplantation of other teeth after extraction of the ankylosed teeth.
4. Repositioning of ankylosed teeth after osteotomy followed or not by distraction osteogenesis, or after luxation.

Interventions would also be compared with attempt for conventional orthodontic treatment or follow-up with no specific treatment for ankylosis.

Types of outcome measures

Primary outcomes

- Tooth survival, expressed as the ratio between extracted and non-extracted teeth at specific time intervals. Regarding implant-supported crowns, failure can be defined as mobile implants, removal of stable implants dictated by progressive marginal bone loss or infection, implant fractures, or implants which were left 'sleeping' due to wrong alignment (Esposito 2005).
- Pain, discomfort or aesthetic complaints.
- Participant satisfaction.

Secondary outcomes

- Prevention and control of the resorption process.
- Degree of mobility and percussion sound, as assessed by conventional clinical exam or electronic devices.
- Complications during the therapy or thereafter. If possible, the severity of these complications would also be recorded.
- Direct costs for the use of different treatment interventions and dentist time.

Search methods for identification of studies

Electronic searches

For the identification of studies included or considered for this review, detailed search strategies were developed for each searched database. These were based on the search strategy developed for MEDLINE (see Appendix 1) but revised appropriately

for each database. The search strategy used a combination of controlled vocabulary and free text terms and was linked with the Cochrane Highly Sensitive Search Strategy (CHSSS) for identifying randomised trials (RCTs) in MEDLINE: sensitivity maximising version (2008 revision) as referenced in Chapter 6.4.11.1 and detailed in box 6.4.c of the *Cochrane Handbook for Systematic Reviews of Interventions* Version 5.1.0 (updated March 2011) (Higgins 2011). As the yield of references from EMBASE and LILACS was already small, no search filter for identifying randomised controlled trials was used for these two databases.

The following databases were searched:

- The Cochrane Oral Health Group Trials Register (to 3 August 2015) (Appendix 2);
- The Cochrane Central Register of Controlled Trials (CENTRAL) (*The Cochrane Library* 2015, Issue 7) (Appendix 3);
- MEDLINE via OVID (1946 to 3 August 2015) (Appendix 1);
- EMBASE via OVID (1980 to 3 August 2015) (Appendix 4);
- LILACS via BIREME (1982 to 3 August 2015) (Appendix 5).

No restrictions were placed on the language or date of publication when searching the electronic databases.

Searching other resources

We searched the following databases for ongoing trials:

- US National Institutes of Health Trials Register (<http://clinicaltrials.gov>) (to 3 August 2015) (see Appendix 6);
- The WHO Clinical Trials Registry Platform (<http://apps.who.int/trialsearch/default.aspx>) (to 3 August 2015) (see Appendix 7).

Only handsearching done as part of the Cochrane Worldwide Handsearching Programme and uploaded to CENTRAL was included (see the [Cochrane Masterlist](#) for details of journal issues searched to date).

We planned to cross check the reference lists of any clinical trials identified for additional trials published outside the handsearched journals. A search for existing meta-analyses and non-Cochrane systematic reviews was performed and their reference lists scanned for additional trials. We searched the reference lists of relevant articles and the review authors' personal database of trial reports. In future updates if eligible trials are found, we will contact investigators of included studies by electronic mail to ask for details of additional published and unpublished trials.

In order to enhance the sensitivity of the search methods, we also attempted to contact the corresponding authors of the other studies found by electronic mail to ask about additional published and unpublished trials. In that case, we considered the studies by using the 'types of participants', 'types of interventions' and 'types of outcome measures' criteria.

Data collection and analysis

Selection of studies

Two review authors (Raphael Freitas de Souza (RFS) and Tim Newton (TN)) independently assessed the abstracts of studies resulting from the searches. Full copies of all relevant and potentially relevant studies (i.e. those appearing to meet the inclusion criteria, or for which there were insufficient data in the

title and abstract to make a clear decision) were obtained. The full-text papers were assessed independently and in duplicate by two review authors and any disagreement on the eligibility of included studies would have been resolved through discussion and consensus or if necessary through a third party (Melissa Marchesan (MM)). All non-eligible studies were excluded; reasons for their exclusion were noted in the [Characteristics of excluded studies](#) table in Review Manager (RevMan) 5.1 ([RevMan 2011](#)).

Data extraction and management

We had planned to enter study details into the Characteristics of included studies table in RevMan 5.1. In future updates if studies are available, the review authors (RFS and TN) will collect outcome data independently and in duplicate using a pre-determined form designed for this purpose. The review authors will only include data if there is an independently reached consensus, any disagreements will be resolved by consulting with a third review author (Helen Travess (HT)).

The following details were planned for extraction from included studies:

- (1) Trial methods
 - (a) Method of allocation
 - (b) Masking of participants and outcomes
 - (c) Exclusion of participants after sequence generation and proportion of losses at follow-up.
- (2) Participants
 - (a) Demographic characteristics such as household income, education, ethnicity, and regional/rural origin, when available
 - (b) Source of recruitment
 - (c) Country of origin
 - (d) Sample size
 - (e) Age
 - (f) Gender
 - (g) Inclusion and exclusion criteria as described in the [Criteria for considering studies for this review](#) section
 - (h) Previous endodontic treatment of ankylosed teeth
 - (i) Periodontal ligament/root surface treatment before ankylosis and at the moment of the intervention.
- (3) Intervention
 - (a) Type of intervention
 - (b) Duration and length of time in follow-up.
- (4) Control
 - (a) Type of control - no specific treatment or sham procedure
 - (b) Duration and length of time in follow-up in the control group.
- (5) Outcomes
 - (a) Primary and secondary outcomes as described in the outcome measures section of this review.

We had also planned to record any sources of funding reported in the included trials. We had intended to use this information for assessing heterogeneity and the external validity of the trials.

Assessment of risk of bias in included studies

An assessment of the risk of bias in included studies would have been undertaken independently and in duplicate by two review authors (HT and MM) following the recommendations as described in Chapter 8 of the *Cochrane Handbook for Systematic*

Reviews of Interventions 5.1.0 ([Higgins 2011](#)). In future updates, any inconsistencies between the review authors will be discussed and resolved and if necessary a third review author will be consulted. Where uncertainty cannot be resolved, effort will be made to contact authors directly for clarification.

A specific tool for assessing risk of bias in each included study would have been adopted. This comprises a description and a judgement for each entry in a risk of bias table, where each entry addresses a specific feature of the study:

- (1) Random sequence generation (selection bias)
- (2) Allocation concealment (selection bias)
- (3) Blinding (performance bias and detection bias). In some instances it will not be possible to blind participants and researchers but we would expect that the outcome assessors and data analysts would be blinded
- (4) Incomplete outcome data (attrition bias)
- (5) Selective reporting (reporting bias)
- (6) Other bias

Each entry would have been assessed as at low risk of bias, high risk of bias, or unclear risk of bias (lack of information or uncertainty over the potential for bias). We had planned to summarise an assessment of the overall risk of bias involving the consideration of the relative importance of different domains.

Measures of treatment effect

The following procedures will be conducted if we found eligible trials in future updates.

For dichotomous data, the estimates of effect of an intervention will be expressed as risk ratios together with 95% confidence intervals. For continuous outcomes, mean differences and 95% confidence intervals will be used to summarise the data for each group where they are calculable from the data presented.

Assessment of heterogeneity

The review authors planned to assess clinical heterogeneity by examining the characteristics of the included studies: the differences between the types of participants, the interventions and the outcomes within and across the trials. We had planned to assess statistical homogeneity using a χ^2 test in addition to the I^2 statistic, where I^2 values over 50% indicate moderate to high heterogeneity ([Higgins 2003](#)) but no studies were included in this review.

Assessment of reporting biases

Reporting bias was not assessed due to insufficient studies. If we identify a sufficient number of included studies in future updates, we will attempt to assess publication bias using a funnel plot ([Egger 1997](#)).

Data synthesis

In future updates, if we include sufficient studies, we will use the fixed-effect and random-effects models as appropriate, for the synthesis and meta-analysis of any quantitative data. If we establish that there is heterogeneity between the studies, we may undertake a random-effects model as appropriate, but if the heterogeneity between the studies is significant, we may not undertake a meta-analysis. If there are too few clinically homogenous trials or insufficient data for pooling, we will present

the results of the individual trials and perform a descriptive analysis only.

Subgroup analysis and investigation of heterogeneity

In future updates if data are available, we will conduct analyses based on separate age groups ((1) less than 12 years, (2) 12 to 18 years, and (3) 18 or more years), gender and mature versus immature open apex teeth.

Sensitivity analysis

If data are available in future updates, the review authors plan to conduct sensitivity analyses to assess the robustness of their

review results by repeating the analysis after exclusion of trials with unclear or inadequate allocation concealment and unclear or lack of blinding.

RESULTS**Description of studies**

No studies were included in this review. We present the study selection process as a flow chart in [Figure 1](#).

Figure 1. Study flow diagram.

Results of the search

The search strategy retrieved 213 references to studies, which after de-duplication resulted in 204 potentially eligible studies. After examination of the titles and abstracts of these references, all but two were eliminated and excluded from further review. Those studies ([Akhare 2011](#); [Filippi 2006](#)) were excluded after examination of the full text copy.

Included studies

No study was eligible for inclusion in this review.

Excluded studies

We excluded the [Akhare 2011](#) and [Filippi 2006](#) studies because they did not match our inclusion criteria. The reasons for the exclusion were noted in the [Characteristics of excluded studies](#) table.

Risk of bias in included studies

No trials were included.

Effects of interventions

None of the studies retrieved in our searches met our inclusion criteria and therefore no data were available for analysis.

DISCUSSION

Several articles report interventions for the management of displaced ankylosed anterior teeth ([Filippi 2006](#); [Kinzinger 2003](#); [Kofod 2005](#); [Medeiros 1997](#); [Moffat 2002](#); [Sapir 2008](#); [Takahashi 2005](#)). There are some case reports and case series, as previously stated by [Campbell 2005b](#). However, we found no clinical trial to support clinical decision making for this oral health problem. The absence of clinical trials means that we cannot be confident about

which intervention is more effective or safer. Traumatic injuries to the anterior teeth are relatively common and can result in ankylosis ([Soriano 2007](#)). Thus, it is disappointing to acknowledge that even trials for possible exclusion by reasons associated with quality assessment were rare. We hypothesise that difficulties regarding the enrolment of participants might be one of the reasons for the absence of trials.

AUTHORS' CONCLUSIONS

Implications for practice

The lack of evidence from clinical trials regarding the management of displaced ankylosed anterior teeth poses a challenge for clinical practice. Clinicians should base their treatment planning on their experience associated with patients' preferences and perspectives.

Implications for research

Although some of the interventions for treating displaced ankylosed teeth were described several years ago, their relative effectiveness and safety remains unknown. The lack of high level evidence for the management of this health problem emphasises the need for well designed clinical trials to support clinical practice. It is important that primary variables, such as tooth survival and patient satisfaction, are assessed in future trials. Randomised controlled trials comparing two interventions and designed according to the CONSORT Statement (www.consort-statement.org) may provide useful answers.

ACKNOWLEDGEMENTS

The review authors would like to thank the Cochrane Oral Health Group for their help in developing this review.

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CHARACTERISTICS OF STUDIES

Characteristics of excluded studies [ordered by study ID]

Study	Reason for exclusion
Akhare 2011	Non-RCT.
Filippi 2006	Non-RCT; single intervention, no control.

RCT = randomised controlled trial

APPENDICES

Appendix 1. MEDLINE via OVID search strategy

- exp Ankylosis/
- (ankylos\$ or ancylos\$).mp.
- 1 or 2
- Tooth fractures/
- Tooth injuries/
- Tooth avulsion/
- (tooth and (injur\$ or fractur\$ or traum\$ or avuls\$ or dislodg\$ or sublux\$ or "knocked out")).mp.
- (teeth and (injur\$ or fractur\$ or traum\$ or avuls\$ or dislodg\$ or sublux\$ or "knocked out")).mp.
- or/4-8

Interventions for treating traumatised ankylosed permanent front teeth (Review)

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10.3 and 9

The above subject search was linked to the Cochrane Highly Sensitive Search Strategy (CHSSS) for identifying randomized trials in MEDLINE: sensitivity maximising version (2008 revision) as referenced in Chapter 6.4.11.1 and detailed in box 6.4.c of *The Cochrane Handbook for Systematic Reviews of Interventions*, Version 5.1.0 [updated March 2011]([Higgins 2011](#)).

1. randomized controlled trial.pt.
2. controlled clinical trial.pt.
3. randomized.ab.
4. placebo.ab.
5. drug therapy.fs.
6. randomly.ab.
7. trial.ab.
8. groups.ab.
9. or/1-8
10. exp animals/ not humans.sh.
11. 9 not 10

Appendix 2. Cochrane Oral Health Group Trials Register search strategy

From April 2014, searches were undertaken using the Cochrane Register of Studies and the search strategy below:

((ankylos* or ancylos*) AND (tooth or teeth)):ti,ab

Previous searches were undertaken in September 2009 and April 2012 using the Procite software and the search strategy below:

((ankylos* or ancylos*) and ((tooth or teeth) and (injur* or fract* or trauma* or avuls* or sublux* or dislodg* or "knocked out")))

Appendix 3. CENTRAL search strategy

- #1 MeSH descriptor Ankylosis explode all trees
- #2 (ankylos* in All Text or ancylos* in All Text)
- #3 (#1 or #2)
- #4 MeSH descriptor Tooth fractures explode all trees
- #5 MeSH descriptor Tooth injuries this term only
- #6 MeSH descriptor Tooth avulsion this term only
- #7 (tooth in All Text and (injur* in All Text or fractur* in All Text or traum* in All Text or avuls* in All Text or dislodg* in All Text or sublux* in All Text or "knocked out" in All Text))
- #8 (teeth in All Text and (injur* in All Text or fractur* in All Text or traum* in All Text or avuls* in All Text or dislodg* in All Text or sublux* in All Text or "knocked out" in All Text))
- #9 (#4 or #5 or #6 or #7 or #8)
- #10 (#3 and #9)

Appendix 4. EMBASE via OVID search strategy

1. exp Ankylosis/
2. (ankylos\$ or ancylos\$).mp.
3. 1 or 2
4. Tooth fractures/
5. Tooth injuries/
6. Tooth avulsion/
7. (tooth and (injur\$ or fractur\$ or traum\$ or avuls\$ or dislodg\$ or sublux\$ or "knocked out")).mp.
8. (teeth and (injur\$ or fractur\$ or traum\$ or avuls\$ or dislodg\$ or sublux\$ or "knocked out")).mp.
9. or/4-8
- 10.3 and 9

Appendix 5. LILACS search strategy

(ankylos\$ or ancylos\$ or anquilo\$ or ancilos\$)

AND

((tooth or teeth or dent\$) AND (fract\$ or injur\$ or lesoes or lesion\$ or fratur\$ or trauma or avuls\$ or dislodg\$ or desloca\$ or desaloja\$ or sublux\$ or "knocked out"))

Appendix 6. US National Institutes of Health (ClinicalTrials.gov) Search Strategy

ankylosis or ankylosed or ankylose
ancylosis or ancylosed or ancylose

Appendix 7. WHO International Clinical Trials Registry Platform Search Strategy

ankylosis AND teeth OR ankylosed AND teeth OR ankylose AND teeth

WHAT'S NEW

Date	Event	Description
26 January 2016	Amended	Minor edit (hyperlink).

HISTORY

Protocol first published: Issue 2, 2009
Review first published: Issue 1, 2010

Date	Event	Description
14 January 2016	Review declared as stable	This is an empty review containing no trials, and will not be updated until a substantial body of evidence on the topic becomes available.
10 December 2015	New citation required but conclusions have not changed	Review has been updated but no studies found for inclusion.
3 August 2015	New search has been performed	New search. No studies for inclusion.

CONTRIBUTIONS OF AUTHORS

Helen Travess (HT), Melissa Andréia Marchesan (MM), Raphael Freitas de Souza (RF) and Tim Newton (TN) were responsible for designing and co-ordinating the review.

TN and RF were responsible for screening search results, and screening retrieved papers against inclusion criteria.

In any future updates, RF and TN will be responsible for appraising the quality of the papers, extracting data from the papers, and obtaining and screening data on unpublished studies.

In any future updatesMM and TN will be responsible for entering data into RevMan.

In any future updates, HT and TN will be responsible for analysis and interpretation of data.

All the authors contributed to the writing up of the review.

HT conceived the idea for the review and is also the guarantor for the review.

DECLARATIONS OF INTEREST

None known.

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- Cochrane Oral Health Group Global Alliance, Other.

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DIFFERENCES BETWEEN PROTOCOL AND REVIEW

We had planned to contact investigators of included studies by electronic mail to ask for details of additional published and unpublished trials. As long as no study was included, we attempted to contact authors of studies (i.e. case series and narrative reviews) about our subject of interest by electronic mail, regardless of the study design.

INDEX TERMS

Medical Subject Headings (MeSH)

*Dentition, Permanent; Incisor [*injuries]; Tooth Ankylosis [*therapy]

MeSH check words

Humans