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Interventions for the treatment of keratocystic odontogenic tumours (Review)

Sharif FNJ, Oliver R, Sweet C, Sharif MO

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Interventions for the treatment of keratocystic odontogenic tumours.
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[Intervention Review]

Interventions for the treatment of keratocystic odontogenic tumours

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ABSTRACT

Background

The keratocystic odontogenic tumours (KCOTs) account for between about 2% and 11% of all jaw cysts and can occur at any age. They are more common in males than females with a male:female ratio of approximately 2:1. Although they are benign, KCOTs are locally very aggressive and have a tendency to recur after treatment. Reported recurrence rates range from 3% to 60%. The traditional method for the treatment of most KCOTs is surgical enucleation. However, due to the lining of the cyst being delicate and the fact that they frequently recur, this method alone is not sufficient. Adjunctive surgical treatment has been proposed in addition to the surgical enucleation, such as removal of the peripheral bone (ostectomy) or resection of the cyst with surrounding bone (en-bloc) resection. Other adjunctive treatments proposed are: cryotherapy (freezing) with liquid nitrogen and the use of the fixative Carnoy's solution placed in the cyst cavity after enucleation; both of which attempt to address residual tissue to prevent recurrence.

Objectives

To assess the available evidence comparing the effectiveness of interventions for the treatment of KCOTs.

Search methods

We searched the following electronic databases: the Cochrane Oral Health Group Trials Register (to 17 March 2015), the Cochrane Central Register of Controlled Trials (CENTRAL) (*The Cochrane Library,* 2015, Issue 2), MEDLINE via Ovid (1946 to 17 March 2015) and EMBASE via Ovid (1980 to 17 March 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

Randomised controlled trials comparing one modality of intervention with another with or without adjunctive treatment for the treatment of KCOTs. Adults, over the age of 18 with a validated diagnosis of solitary KCOTs arising in the jaw bones of the maxilla or mandible. Patients with known Gorlin syndrome were to be excluded.

Data collection and analysis

Review authors screened trials for inclusion. Full papers were obtained for relevant and potentially relevant trials. If data had been extracted, it would have been synthesised using the fixed-effect model, if substantial clinical diversity were identified between studies we planned to use the random-effects model with studies grouped by action provided there were four or more studies included in the meta-analysis, and we would have explored the heterogeneity between the included studies.

Main results

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

Authors' conclusions

There are no published randomised controlled trials relevant to this review question, therefore no conclusions could be reached about the effectiveness or otherwise of the interventions considered in this review. There is a need for well designed and conducted randomised controlled trials to evaluate treatments for KCOTs.

PLAIN LANGUAGE SUMMARY

What is the best treatment for a type of jaw bone cyst called a 'keratocystic odontogenic tumour'?

Review question

This review has been conducted to assess the effects of different interventions for the treatment of a particular type of cyst that occurs mainly in the lower jawbone, called a keratocystic odontogenic tumour (KCOT).

Background

KCOTs are non-cancerous but fast-growing cysts (closed sacs containing either fluid or air) that occur mainly in the lower jawbone. They develop from the remains of a tissue associated with tooth development called the dental lamina. They are quite rare and can occur at any age.

One of the main problems in treating KCOTs is that if they are removed by surgery, they tend to recur. New cysts may form from any cyst lining that remains after surgery. These recurring cysts grow at a rapid rate. Some reports have stated that 6 out of 10 of these cysts will recur after treatment. Treatment to prevent recurrence can lead to large amounts of bone surrounding the cyst having to be removed.This carries major risks (damage to the nerves in the face, and loss of form and function in the face). Currently uncertainty exists regarding the best treatment option.

Study characteristics

Authors from the Cochrane Oral Health Group carried out this review of existing studies and the evidence is current up to 17 March 2015. There were no studies found which met the inclusion criteria for this review.

Key results and quality of the evidence

This review revealed that there is no high quality evidence for the effectiveness of available treatments and there is therefore a need for further research to help clinicians and patients to make informed choices about treatment options.

BACKGROUND

Aetiology and incidence

The keratocystic odontogenic tumour (KCOT, odontogenic keratocyst (OKC)) was classified as a benign odontogenic tumour by the World Health Organization in 2005 (Barnes 2005). The KCOT was first described in the literature by Philipsen in 1956 (Philipsen 1956) and it was historically referred to as the odontogenic keratocyst (OKC) as well as a primordial cyst. KCOTs are benign but locally aggressive, it is generally accepted that they arise from the remnants of the dental lamina which persist in subepithelial tissues including bone after the completion of odontogenesis (Soskolne 1967). They most commonly occur as solitary lesions in the jaws of healthy individuals and show a high incidence of recurrence if not adequately removed. Molecular studies have supported the neoplastic concept of the KCOT as they have demonstrated evidence of allelic loss of several tumour suppressor genes in patients with KCOTs (Agaram 2004; Gomes 2009; Henley 2005; Malcic 2008). Other studies have also supported this concept and demonstrated epigenetic alterations of tumour suppressor genes such as methylation (Moreira 2009; Weber 2003).

Since the KCOT is a relatively uncommon lesion, epidemiological data vary considerably. KCOTs probably account for between about 2% and 11% of all jaw cysts and can occur at any age; many data suggest a bimodal age distribution around the third and sixth decades (Shear 2007). However, it has been suggested that in some of the later presenting cases they have been present but undiagnosed for many years (Browne 1975). They are more common in males than females with a male:female ratio of approximately 2:1 but this is closer to unity in white populations and greater than two in black patients (Shear 2007).

Clinical presentation

KCOTs are often asymptomatic and only become clinically evident after bony expansion or a secondary infection has occurred; unlike most other jaw cysts which expand by osmotic pressure, the KCOT expands due to increased epithelial turnover and bony expansion is not a common finding. They are commonly diagnosed after incidental finding on regular dental radiographs. Radiographically they can be seen as unilocular or multilocular radiolucencies. They can be mistaken for radicular or residual cysts and in cases where they occur over an unerupted tooth they can mimic dentigerous cysts. When they do cause symptoms these can be in the form of pain, swelling and discharge, often as a result of secondary infection. The majority (over 70%) occur in the mandible and half of all KCOTs occur at the angle of the mandible (Shear 2007).

Recurrence

One of the clinical features of the KCOTs that causes difficulty in management is their tendency to recur after treatment. Reported rates of recurrence range from 3% to 60% (Shear 2007). Many theories have been proposed to account for the high level of recurrence of these lesions. Firstly, the cyst lining is delicate and remnants can be left behind after surgical removal, satellite cysts (from odontogenic epithelial residues) or daughter cysts (from out pouching's of the main cyst lining) may develop into new cysts after removal.

Management

The traditional method for the treatment of most KCOTs is surgical enucleation (to remove the lesion whole from within the bone). For larger cysts, some surgeons undertake marsupialisation often later followed by enucleation. However, in relation to the KCOT, due to the lining of the cyst often being delicate and the fact that they frequently recur, this method alone is not sufficient. Adjunctive surgical treatment has been proposed in addition to the surgical enucleation, such as removal of the peripheral bone (ostectomy) or resection of the cyst with surrounding bone (en-bloc) resection (Ghali 2003). The latter would seem somewhat radical since significant reconstruction might be required for large lesions. Other adjunctive treatments have been proposed most notably cryotherapy (freezing) with liquid nitrogen (Schmidt 2003) and the use of the fixative Carnoy's solution (Stoelinga 2005) placed in the cyst cavity after enucleation; both of which attempt to address residual tissue to prevent recurrence.

Gorlin syndrome

Also known as Gorlin-Goltz syndrome and nevoid basal cell carcinoma syndrome, this rare autosomal dominant syndrome is characterised by multiple KCOTs and other clinical features including bifid ribs, hypertelorism, frontal bossing and multiple basal cell carcinomas of the skin (Gorlin 1960).

Why it is important to do this review

The Cochrane Oral Health Group undertook an extensive prioritisation exercise in 2014 to identify a core portfolio of titles that were the most clinically important ones to maintain on the Cochrane Library (Worthington 2015). Consequently, this review was identified as a priority title by the oral and maxillofacial surgery expert panel (Cochrane OHG priority review portfolio).

Although the KCOT is a relatively uncommon benign lesion, uncertainty exists regarding the optimal treatment modality. Some treatment options carry major risks and a significant number of patients require re-treatment which carries further risks. A Cochrane systematic review could help to inform on the strength and direction of available evidence regarding different treatment modalities.

OBJECTIVES

To assess the available evidence comparing the effectiveness of interventions for the treatment of KCOTs.

METHODS

Criteria for considering studies for this review

Types of studies

Randomised controlled trials comparing one modality of intervention with another with or without adjunctive treatment for the treatment of keratocystic odontogenic tumours.

Types of participants

Adults over the age of 18 with a validated diagnosis of solitary keratocystic odontogenic tumours arising in the jaw bones of the maxilla or mandible. Patients with known Gorlin syndrome were to be excluded as the management of these patients is different from those with non-Gorlin's KCOTs. It was appreciated that some Gorlin

syndrome patients may inadvertently be included in studies unless other checks are performed. Participants under the age of 18 were excluded as it is thought that most paediatric cases are linked to Gorlin syndrome and display mutations of the PTCH gene (Tkaczuk 2015).

Types of interventions

Any intervention compared to a different intervention (for example, enucleation compared with marsupialisation) or a surgical intervention alone compared to the same surgical intervention with an adjunctive therapy (for example ostectomy, cryotherapy or Carnoy's solution).

Types of outcome measures

Primary outcomes

1. Radiographic or clinical evidence of recurrence (validated).
2. The need for further surgery.

Secondary outcomes

1. Morbidity.
2. Surgical complications.
3. Quality of life (using validated questionnaires).
4. Hospital bed days and associated cost implications.

Adverse effects

Any unexpected/adverse events or outcomes were to be documented if identified.

Search methods for identification of studies

For the identification of studies included or considered for this review, we developed detailed search strategies for each database searched. These were based on the search strategy developed for MEDLINE (Ovid) 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 RCTs in MEDLINE: sensitivity- and precision-maximising version (2008 revision; Lefebvre 2011) The search of EMBASE was linked to the Cochrane Oral Health Group filter for identifying RCTs.

Electronic searches

We searched the following electronic databases:

- The Cochrane Oral Health Group's Trials Register (to 17 March 2015) (see Appendix 1);
- The Cochrane Central Register of Controlled Trials (CENTRAL) (*The Cochrane Library* 2015, Issue 2) (see Appendix 2);
- MEDLINE via OVID (1946 to 17 March 2015) (see Appendix 3);
- EMBASE via OVID (1980 to 17 March 2015) (see Appendix 4).

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, see Appendix 5 for details of the search terms used:

- US National Institutes of Health Trials Register (http://clinicaltrials.gov) (to 17 March 2015);
- The WHO Clinical Trials Registry Platform (http://apps.who.int/trialsearch/default.aspx) (to 17 March 2015).

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 contacted experts in the field to help identify unpublished literature and searched the reference lists of potential clinical trials in an attempt to identify studies not identified in the searches.

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Data collection and analysis

Assessment of search results

Two review authors (Mohammad O Sharif (MOS) and Richard J Oliver (RJO)) independently assessed the titles and abstracts of studies resulting from the searches. We obtained full copies of all relevant and potentially relevant studies, those appearing to meet the inclusion criteria, or for which there were insufficient data in the title and abstract to make a clear decision. MOS and RJO independently assessed the full text papers and would have resolved any disagreement on the eligibility of included studies through discussion and consensus. In the event that we did not reach a consensus, we would have contacted Fyeza NJ Sharif (FNJS) and, if the matter remained unresolved, then we would have organised discussion with the editors of the Cochrane Oral Health Group. We excluded all irrelevant records and noted the details of the studies and the reasons for their exclusion in the Characteristics of excluded studies table.

Data extraction

No studies were included in this review, however if studies are identified in the future we will use the following process for data extraction and management: MOS and RJO will independently enter extracted data into the Characteristics of included studies table in Review Manager 5.3 (RevMan 2014) and check for consistency. If necessary we will consult a third review author (FNJS) to resolve inconsistencies.

We will extract the following details in order to help us assess heterogeneity and the external validity of the trials.

- Patient information - age, sex, symptoms and duration, information on diagnosis verification.
- Intervention - the type of intervention and procedural information.
- Outcomes - recurrence, duration of follow-up, adverse effects.
- Study design - method of allocation, sample size, blinding of participants and outcomes, inclusion and exclusion criteria, also reporting of exclusion after randomisation and proportion of follow-up losses.
- Additional information - country of origin of the study, language of publication, date of publication and source of article (e.g. a database).

Assessment of risk of bias in included studies

MOS and RJO would have independently assessed the quality of the included studies and graded them using a simple contingency form following the domain-based evaluation described in the *Cochrane Handbook for Systematic Reviews of Interventions* 5.1.0. (Higgins 2011b). We would have compared and discussed the independent evaluations and resolved any disagreements.

An assessment of the overall risk of bias would have involved the consideration of the relative importance of different domains, and studies were to be categorised as low, high or unclear risk of bias.

The authors would have assessed the following domains as 'Yes' (i.e. low risk of bias), 'Unclear' (uncertain risk of bias) or 'No' (i.e. high risk of bias):

1. sequence generation;
2. allocation concealment;
3. blinding (of participants, personnel and outcome assessors);
4. incomplete outcome data;
5. selective outcome reporting;
6. free of other bias.

The authors would have then categorised the risk of bias according to the following:

- low risk of bias (plausible bias unlikely to seriously alter the results) if all criteria were met;
- unclear risk of bias (plausible bias that raises some doubt about the results) if one or more criteria were assessed as unclear; or
- high risk of bias (plausible bias that seriously weakens confidence in the results) if one or more criteria were not met.

The assessments for each included study would have been reported in the 'Risk of bias' tables in RevMan 5.3 (RevMan 2014).

Data analysis

No studies were included and so no data analysis was performed. If studies are identified in the future two review authors (MOS and RJO) will analyse the data and report them as specified in Chapter 9 of the *Cochrane Handbook for Systematic Reviews of Interventions* 5.1.0. (Deeks 2014). Analysis will be conducted at the same level as the allocation.

If appropriate we will convert data obtained from visual analogue scales and any categorical outcomes into dichotomous data prior to analysis. For continuous data the mean difference (MD) and 95% confidence intervals (CIs) will be calculated. Risk ratios (RRs) and their 95% CIs will be calculated for all dichotomous data.

If sufficient studies are available we will perform a subgroup analysis to determine differences in the outcomes of KCOT management in the mandible versus the maxilla.

If included studies are clinically and statistically homogeneous, we will pool data to provide estimates of the efficacy of the interventions and calculate the number needed to treat for an additional beneficial outcome (NNTB) and number needed to treat for an additional harmful outcome (NNTH) for the whole pooled estimates. In general for the synthesis of any quantitative data we will use the fixed-effect model but if there is substantial clinical diversity between the included studies we will use the random-effects model with studies grouped by action provided there are four or more studies included in the meta-analysis.

We will assess clinical heterogeneity by examining the characteristics of the studies, the similarity between the types of participants, the interventions and the outcomes as specified in the criteria for included studies. We will assess statistical homogeneity using a Chi^2 test and the I^2 statistic where I^2 values over 50% indicate substantial to considerable heterogeneity (Higgins 2003). If sufficient RCTs are identified, an attempt will be made to assess publication bias using a funnel plot (Sterne 2011).

In the event that there are insufficient clinically homogeneous trials for any specific intervention or insufficient study data that can be pooled, we will present a narrative synthesis.

RESULTS

Description of studies

The search retrieved 536 references to studies after de-duplication. After examination of titles and abstracts all but 12 were eliminated and excluded from further evaluation. We obtained full text copies of the remaining studies and translated four of them (Gerlach 1989; Jiang 2002; Koval 1989; Laffers 1997). All of these potentially eligible studies were subjected to further evaluation including examination of bibliographical references. This did not reveal any additional relevant studies.

Excluded studies

All of the studies identified as being potentially eligible were excluded from this review and the reasons for their exclusion are listed in the Characteristics of excluded studies table.

Risk of bias in included studies

If any studies had been included in this review we would have categorised risk of bias according to the following:

- low risk of bias (plausible bias unlikely to seriously alter the results) if all criteria were met;
- unclear risk of bias (plausible bias that raises some doubt about the results) if one or more criteria were assessed as unclear; or
- high risk of bias (plausible bias that seriously weakens confidence in the results) if one or more criteria were not met.

Effects of interventions

In view of the fact that no studies were identified, no data were available for analysis.

DISCUSSION

The present review sought high level evidence on the effectiveness of managing keratocystic odontogenic tumours by comparing the effectiveness of different interventions and adjuncts for their treatment. No eligible studies for inclusion were found.

AUTHORS' CONCLUSIONS

Implications for practice

There is a lack of evidence for interventions considered in this review topic and so this review was unable to assess the effectiveness of interventions for the management of KCOTs.

Implications for research

There is a need for well conducted RCTs. These should be designed and reported according to the Consolidated Standards of Reporting Trials (CONSORT) statement (Moher 2001). The planning phase should take into account the method of randomisation and justification of a sample size, it should allow for allocation concealment, blinding of the outcome assessor and reporting of reasons for patients that are lost to follow-up.

ACKNOWLEDGEMENTS

The review authors would like to acknowledge the assistance they have received from members of the Cochrane Oral Health Group. Thank you to Robert Ord for his correspondance and comments regarding this manuscript.

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Bodner 1996 *{published data only}*

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Cieslik-Bielecka 2008 *{published data only}*

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Gerlach 1989 *{published data only}*

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Jiang 2002 *{published data only}*

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Worthington 2015

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CHARACTERISTICS OF STUDIES

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Bell 2003	Not an RCT.
Bodner 1996	This study focused on radicular, residual and dentigerous cysts only.
Cieslik-Bielecka 2008	Not an RCT.

Study	Reason for exclusion
Gerlach 1989	Not an RCT.
Gomez 2005	This is an opinion letter.
Jensen 1988	Not an RCT.
Jiang 2002	Not an RCT.
Koval 1989	Not an RCT.
Laffers 1997	Not an RCT.
Mitchell 1992	This study focused on granulomas, peri-apical and residual cysts.
Salmassy 1995	Not an RCT.
Tan 2007	Not an RCT.

RCT = randomised controlled trial.

APPENDICES

Appendix 1. The Cochrane Oral Health Group's Trials Register Search Strategy

From May 2014, searches of the Cochrane Oral Health Group Trials Register for this review were undertaken using the Cochrane Register of Studies and the search strategy below:

#1 (odontogenic AND (tumor* or tumour* or cyst*)):ti,ab
#2 (keratocyst* or keratiniz* or keratinis*):ti,ab
#3 ((neogenic or primordial) AND cyst*):ti,ab
#4 cholesteatoma*:ti,ab
#5 (OKC or KCOT):ti,ab
#6 #1 or #2 or #3 or #4 or #5

Previous searches of the Cochrane Oral Health Group Trials Register were undertaken using the Procite software and the search strategy below:

("odontogenic tumor*" or "odontogenic cyst*" or keratocyst* or keratiniz* or keratinis* or "odontogenic tumour*" or "neogenic cyst*" or "primordial cyst*" or cholesteatoma* or OKC or KCOT)

Appendix 2. The Cochrane Central Register of Controlled Trials (CENTRAL) Search Strategy

#1 MeSH descriptor Odontogenic Tumors explode all trees
#2 MeSH descriptor Odontogenic Cysts explode all trees
#3 keratocyst*
#4 ((keratiniz* or keratinis*) and odontogenic and cyst*)
#5 (neogenic and cyst*)
#6 ("odontogenic tumour*" or "odontogenic tumor*" or "odontogenic cyst*" or "primordial cyst*")
#7 ((oral or mouth or dental or odontogenic or jaw*) and chloesteatoma*)
#8 (OKC or KCOT):ti,ab,kw
#9 ((keratiniz* or keratinis*) and odontogenic and tumor*)
#10 ((keratiniz* or keratinis*) and odontogenic and tumour*)
#11 (#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10)

Appendix 3. MEDLINE (Ovid) Search Strategy

1. exp Odontogenic Tumors/

2. exp Odontogenic Cysts/
3. keratocyst$.mp.
4. ((keratiniz$ or keratinis$) and odontogenic and (tumor$ or tumour$)).mp.
5. ((keratiniz$ or keratinis$) and odontogenic and cyst$).mp.
6. (neogenic and cyst$).mp.
7. ("odontogenic tumour$" or "odontogenic tumor$" or "odontogenic cyst$" or "primordial cyst$").mp.
8. ((oral or mouth or dental or odontogenic or jaw) and cholesteatoma).mp.
9. (OKC or KCOT).ti,ab.
10. or/1-9

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] (Lefebvre 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 4. EMBASE (Ovid) Search Strategy

1. exp Odontogenic Tumors/
2. exp Odontogenic Cysts/
3. keratocyst$.mp.
4. ((keratiniz$ or keratinis$) and odontogenic and (tumor$ or tumour$)).mp.
5. ((keratiniz$ or keratinis$) and odontogenic and cyst$).mp.
6. (neogenic and cyst$).mp.
7. ("odontogenic tumour$" or "odontogenic tumor$" or "odontogenic cyst$" or "primordial cyst$").mp.
8. ((oral or mouth or dental or odontogenic or jaw) and cholesteatoma).mp.
9. (OKC or KCOT).ti,ab
10. or/1-9

The above subject search was linked to the Cochrane Oral Health Group filter for identifying RCTs in EMBASE via OVID:

1. random$.ti,ab.
2. factorial$.ti,ab.
3. (crossover$ or cross over$ or cross-over$).ti,ab.
4. placebo$.ti,ab.
5. (doubl$ adj blind$).ti,ab.
6. (singl$ adj blind$).ti,ab.
7. assign$.ti,ab.
8. allocat$.ti,ab.
9. volunteer$.ti,ab.
10. CROSSOVER PROCEDURE.sh.
11. DOUBLE-BLIND PROCEDURE.sh.
12. RANDOMIZED CONTROLLED TRIAL.sh.
13. SINGLE BLIND PROCEDURE.sh.
14. or/1-13
15. (exp animal/ or animal.hw. or nonhuman/) not (exp human/ or human cell/ or (human or humans).ti.)
16. 14 NOT 15

Appendix 5. The US National Institutes of Health Trials Register (ClinicalTrials.gov) and WHO International Clinical Trials Registry Platform Search Strategy

keratocyst and odontogenic
odontogenic and tumour
odontogenic and tumor

WHAT'S NEW

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.

HISTORY

Protocol first published: Issue 4, 2010
Review first published: Issue 9, 2010

Date	Event	Description
5 November 2015	New citation required but conclusions have not changed	This is an empty review containing no trials, and will not be updated until a substantial body of evidence on the topic becomes available.
24 September 2015	New search has been performed	New search. No studies for inclusion. Modifications to background, plain language summary and types of participants sections.

CONTRIBUTIONS OF AUTHORS

Richard J Oliver (RJO): Conceived idea for the review, involved in design and writing of the protocol; registered contact author.
Christopher Sweet (CS): Conceived idea for the review and involved in design and writing of the protocol only.
Mohammad O Sharif (MOS) and Fyeza NJ Sharif (FNJS): Involved in designing, writing and co-ordinating the protocol and the review.

DECLARATIONS OF INTEREST

Richard J Oliver: No interests to declare.

Christopher Sweet: No interests to declare.

Mohammad Owaise Sharif: No interests to declare.

INDEX TERMS

Medical Subject Headings (MeSH)

Mandibular Diseases [surgery] [*therapy]; Maxillary Diseases [surgery] [*therapy]; Odontogenic Cysts [*surgery] [therapy]; Odontogenic Tumors [surgery] [*therapy]

MeSH check words

Adult; Female; Humans; Male