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## **Topical anaesthetic or vasoconstrictor preparations for flexible fibre-optic nasal pharyngoscopy and laryngoscopy (Review)**

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[Intervention Review]

# Topical anaesthetic or vasoconstrictor preparations for flexible fibre-optic nasal pharyngoscopy and laryngoscopy

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## ABSTRACT

### Background

Nasal pharyngolaryngoscopy (NPL) is performed as an outpatient and inpatient procedure on a daily basis, for a variety of indications. It frequently causes some degree of discomfort to the patient. Various different topical agents, which are intended to reduce this discomfort, are in common use. This review aimed to assess the effectiveness of the various agents.

### Objectives

To assess the effectiveness of topical preparations used to reduce discomfort and facilitate NPL in adults.

### Search methods

We searched the Cochrane Ear, Nose and Throat Disorders Group Trials Register; the Cochrane Central Register of Controlled Trials (CENTRAL); PubMed; EMBASE; CINAHL; Web of Science; BIOSIS Previews; Cambridge Scientific Abstracts; ISRCTN and additional sources for published and unpublished trials. The date of the most recent search was 14 April 2010.

### Selection criteria

Randomised controlled trials (RCTs) looking at the effect of topical anaesthetic or vasoconstrictor agents used reduce discomfort and facilitate NPL in adult patients.

### Data collection and analysis

Two review authors independently selected studies, extracted data and assessed risk of bias. We contacted trial authors for further information where necessary. The primary outcome measured was pain/discomfort. Secondary outcomes that were looked at included side effects of the topical medications, ease of the procedure and the quality of the view from the operator's perspective.

### Main results

We included eight RCTs (746 participants) in the review. The risk of bias in the studies was generally low. Five studies did not demonstrate any advantage in using a topical treatment prior to endoscopy. One study suggested that a vasoconstrictor alone should be used to reduce the general level of unpleasantness. Two studies did not compare treatment against placebo or no treatment, so it was not

possible to draw meaningful conclusions from them. There may be some unpleasant side effects from the use of topical preparations, such as unpleasant taste.

There was variation in the format of the outcome data and a lack of complete data; none of the included studies reported their results in a way that would allow pooling and we could not therefore perform meta-analysis.

### Authors' conclusions

The included studies do not demonstrate any evidence to support the use of topical treatments prior to the use of a fibre-optic nasal endoscope. Some go as far as to suggest that these agents should not be used due to cost and unpleasant side effects. Five studies did not demonstrate any advantage in terms of reducing pain or discomfort when using a topical treatment prior to endoscopy. The absence of demonstrable effect may be due to relatively small patient groups. It is therefore possible that there is a small effect of using these sprays. Further research using standardised reporting methods is needed.

## PLAIN LANGUAGE SUMMARY

### Topical anaesthetic or vasoconstrictor (blood vessel narrowing) preparations for flexible fibre-optic nasal pharyngoscopy and laryngoscopy

Topical medications are often applied to the inside of a patient's nose prior to examining the nose, sinuses and throat with a flexible nasopharyngolaryngoscope. The aim of this is to reduce any discomfort the patient may feel and also to improve the adequacy of the examination.

Types of preparation include lidocaine, phenylephrine and lidocaine, oxymetazoline, xylometazoline and cocaine and they are usually administered as a spray, although they may also be in the form of a solution which can be applied to cotton wool and placed in the nasal cavity, or as gels, pastes or creams.

We looked for randomised controlled trials comparing any of these topical treatments with placebo, no treatment or another topical treatment in adult patients undergoing nasal pharyngolaryngoscopy (NPL). We included eight studies in the review (with a total of 746 patients). It was not possible to combine data from any of the studies, therefore we assessed the individual study results. Five of the studies did not demonstrate any advantage, in terms of reducing pain or discomfort, of using a topical treatment prior to endoscopy. One of these suggested that a vasoconstrictor (xylometazoline) alone reduced the level of "general unpleasantness". Two studies did not compare the treatment against placebo or no treatment. A final study actually suggested an increase in pain with the use of topical agents. There may be some unpleasant side effects from the use of topical preparations, such as unpleasant taste.

Further standardised research is required.

## BACKGROUND

Nasal pharyngolaryngoscopy (NPL) is performed in order to examine the anatomy of the nasal cavity, the postnasal space, the pharynx and the larynx, when diagnosing benign and malignant disease, or looking for foreign bodies.

The procedure dates back to the early 20th century, when Hirschman performed the first successful endoscopy of the nose ([Hirschmann 1903](#)). A rod-lens optical system (rigid) was invented by Harold Hopkins in 1959, and Karl Storz further developed fibre-optic (flexible) endoscopy in 1960 after its initial patenting by John Logie Baird. Both methods are now an integral part of the

diagnosis of sinonasal, pharyngeal and laryngeal pathology. The increased brightness, magnification and the ability to take still and video images is a particular advantage ([Jaumann 1978](#)).

NPL is a very common procedure in both outpatient and ward settings. The number of procedures can vary from a handful in an otology clinic to several dozen per day in a head and neck cancer clinic. It may also be performed in patients admitted as emergencies, for example, with stridor or foreign bodies.

NPL has been recommended in situations where a diagnosis cannot be made from patient history and anterior rhinoscopy, and also

in patients with anatomic obstruction (Benninger 1997). Levine stressed the importance of nasal endoscopy by showing that, in a series of 150 patients, the procedure revealed pathology not seen on anterior rhinoscopy in 38.7% (Levine 1990). Hughes found that diagnostic accuracy was higher with endoscopic examination (85%) than anterior rhinoscopy (74%) (Hughes 1998). Fibre-optic pharyngolaryngoscopy can also be used to visualise dynamic anatomy, such as when assessing velopharyngeal dysfunction (Muntz 1992).

It is a procedure that is at best uncomfortable and at worst intolerable for the patient, sometimes making accurate assessment difficult. There are many different topical preparations for the relief of the perceived pain and discomfort of NPL, some of which are controlled drugs. Types of preparation include lidocaine, phenylephrine and lidocaine, oxymetazoline, xylometazoline and cocaine. Some of these will be found to provide better comfort than others, some will have more side effects and others will prove to be more costly.

Any method which reduces discomfort will help in the examination, diagnosis and treatment of patients' disorders. The local preparation used within a department is likely to be chosen on the basis of cost, availability, or for 'historical' reasons (i.e. has always been used); often with little evidence to support the choice. Other reasons for choosing a particular agent may be the onset of action and duration of effect, and studies should ensure that these agents have been used appropriately with regard to this.

The agent is usually administered by a spray (Cain 2002). It can also be in the form of a solution which can be applied to cotton wool and placed in the nasal cavity (Walshe 2002), and also as gels, pastes or creams. Studies have compared different preparations to placebo and to no treatment (Johnson 2003; Walshe 2002), but it remains unclear which is the best preparation to use, if any. Results vary: some studies report improvement in outcome measures such as pain, discomfort or ease of the procedure; others conclude that the use of topical preparations is unnecessary and may even be disadvantageous. There can also be a trade-off between using agents that may be beneficial to the patient in terms of reducing pain and discomfort but, for example gels and pastes, may obscure the image for the endoscopist.

This review aims to assess the evidence for the effectiveness of topical agents for improving the patient and clinician experience of nasal endoscopy. It will also look at the cost and side-effect profile of each preparation. This review will be restricted to flexible endoscopy, in order to include studies that have used endoscopes to examine the pharynx as well as the nasal cavity and sinuses.

## OBJECTIVES

To assess the effectiveness of topical agents in fibre-optic nasal endoscopy for:

1. relieving the pain and discomfort of the procedure;
2. minimising side effects;
3. improving passage of the endoscope;
4. maximising the chance of an adequate examination.

## METHODS

### Criteria for considering studies for this review

#### Types of studies

Randomised controlled trials (RCTs).

#### Types of participants

Adults (over 16) undergoing the procedure in an outpatient or ward setting.

#### Types of interventions

Any topical pharmacological agent (e.g. phenylephrine and lidocaine, cocaine, xylocaine (with or without epinephrine), oxymetazoline, xylometazoline) in the form of sprays, gels, pastes or creams. The following comparisons were studied:

- topical preparation versus other topical preparation;
- topical preparation versus placebo;
- topical preparation versus no treatment.

We planned to include comparisons of content of preparation, method of administration and dosage in any final data analysis. We included studies of flexible endoscopy. We excluded rigid endoscopy.

#### Types of outcome measures

##### Patient

##### Primary outcome measure

- Pain/discomfort

##### Secondary outcome measure

- Side effects of topical agent (pain, taste, choking/throat irritation, numbness, difficulty swallowing, bleeding, allergic reactions)

### Operator

- Ease of procedure
- Quality of view

We acknowledge the difficulty in assessing operator-based outcome measures due to their subjective nature. However, if studies offered a validated form of assessment, this was included in the review.

### Search methods for identification of studies

We conducted systematic searches for randomised controlled trials. There were no language, publication year or publication status restrictions. The date of the last search was 14 April 2010.

### Electronic searches

We searched the following databases from their inception for published, unpublished and ongoing trials: the Cochrane Ear, Nose and Throat Disorders Group Trials Register; the Cochrane Central Register of Controlled Trials (CENTRAL) (*The Cochrane Library* 2010, Issue 2); PubMed; EMBASE; CINAHL; LILACS; KoreaMed; IndMed; PakMediNet; CAB Abstracts; Web of Science; BIOSIS Previews; CNKI; ISRCTN; ClinicalTrials.gov; IC-TRP and Google.

We modelled subject strategies for databases on the search strategy designed for CENTRAL. Where appropriate, we combined subject strategies with adaptations of the highly sensitive search strategy designed by the Cochrane Collaboration for identifying randomised controlled trials and controlled clinical trials (as described in the *Cochrane Handbook for Systematic Reviews of Interventions* Version 5.0.2, Box 6.4.b. ([Handbook 2009](#))). Search strategies for major databases including CENTRAL are provided in [Appendix 1](#).

### Searching other resources

We scanned the reference lists of identified publications for additional trials and contacted trial authors where necessary. In addition, we searched PubMed, TRIPdatabase, NHS Evidence - ENT & Audiology and Google to retrieve existing systematic reviews relevant to this systematic review, so that we could scan their reference lists for additional trials. We searched for conference abstracts

using the Cochrane Ear, Nose and Throat Disorders Group Trials Register.

### Data collection and analysis

#### Selection of studies

We obtained the full text of studies which appeared loosely to meet the inclusion criteria. Two authors independently applied the inclusion criteria and resolved any differences over which studies to include by discussion or referral to a third party. We contacted study authors for clarification as necessary. The final decision rested with the lead author.

#### Data extraction and management

We documented data on standardised proformas. We extracted data so as to allow an intention-to-treat analysis. Where data were missing or unclear we contacted the study authors as necessary.

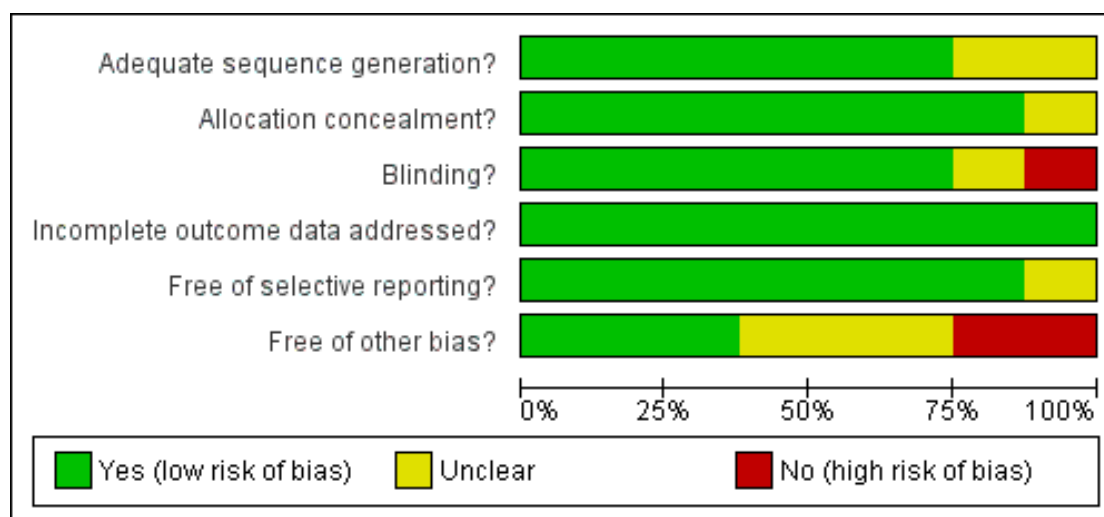
#### Assessment of risk of bias in included studies

The two authors independently undertook assessment of the risk of bias of the included trials, taking the following into consideration, as guided by the *Cochrane Handbook for Systematic Reviews of Interventions* ([Handbook 2009](#)):

- sequence generation;
- allocation concealment;
- blinding;
- incomplete outcome data;
- selective outcome reporting; and
- other sources of bias.

We used the Cochrane 'Risk of bias' tool in RevMan 5 ([RevMan 2008](#)), which involves describing each of these domains as reported in the trial and then assigning a judgement about the adequacy of each entry. This involves answering a pre-specified question whereby a judgement of 'Yes' indicates low risk of bias, 'No' indicates high risk of bias, and 'Unclear' indicates unclear or unknown risk of bias. The results of our assessments are presented in the 'Risk of bias' tables ([Characteristics of included studies](#)) and a 'Risk of bias' summary and graph ([Figure 1](#); [Figure 2](#)).

**Figure 1. Risk of bias graph: review authors' judgements about each risk of bias item presented as percentages across all included studies.**



**Figure 2. Risk of bias summary: review authors' judgements about each risk of bias item for each included study.**

	Adequate sequence generation?	Allocation concealment?	Blinding?	Incomplete outcome data addressed?	Free of selective reporting?	Free of other bias?
Cain 2002	+	+	-	+	+	-
Frosh 1998	+	+	+	+	+	+
Georgalas 2005	+	+	+	+	+	+
Leder 1997	+	+	+	+	+	-
Lennox 1996	?	?	?	+	+	?
Sadek 2001	+	+	+	+	+	+
Singh 1997	?	+	+	+	?	?
Smith 2002	+	+	+	+	+	?

## Data synthesis

The study data included in the review were not suitable for meta-analysis. We had planned to study the following comparisons:

- topical preparation versus other topical preparation;
- topical preparation versus placebo;
- topical preparation versus no treatment.

Given adequate data, we planned the following subgroup analyses:

- topical preparations containing decongestant only;
- topical preparations containing decongestant/local anaesthetic;
- different types of endoscope.

If in future updates of this review new studies are included with data that are comparable and of sufficient quality they will be combined to give a summary measure of effect, otherwise data will not be combined. Study results are likely to be presented as a visual analogue scale, and therefore the mean difference (MD) or the standardised mean difference (SMD) will be presented. If other measures, such as Likert pain scales, are used we will analyse these similarly. We plan a random-effects model to analyse the data. All statistical analysis will be carried out using Review Manager 5.0 (RevMan 2008) and we will seek statistical advice where necessary. We plan to use study quality in a sensitivity analysis.

## RESULTS

### Description of studies

See: [Characteristics of included studies](#); [Characteristics of excluded studies](#).

### Results of the search

The searches led to the identification of 155 articles. We read the abstracts and used these to exclude those studies that did not fulfil the review inclusion criteria. Initially 12 papers appeared to fulfil the inclusion criteria. However, following further examination of the papers only eight studies met the inclusion criteria and we analysed these studies in detail.

### Included studies

Eight studies are included in the review (Cain 2002; Frosh 1998; Georgalas 2005; Leder 1997; Lennox 1996; Sadek 2001; Singh 1997; Smith 2002). All were randomised controlled trials. Of these, six clearly stated that they were double-blinded and two were unclear or possibly unblinded. One of the studies had a cross-

over design (Singh 1997). Numbers of participants in the studies ranged from 60 to 152 patients (total 746). Seven of the studies were carried out in the UK and one in the US. All were carried out in adult patients (age range 17 to 91 years) undergoing endoscopy for diagnostic purposes in an otolaryngology clinic. The interventions used were all nasal sprays administered at varying lengths of time prior to endoscopy. The sprays used were cocaine, lidocaine, co-phenylcaine, tetracaine, ephedrine, xylometazoline and saline. In some studies there was an arm where no treatment was given. In one (Sadek 2001) lubrication was used in all arms of the study, and in others it was not clearly stated. In all studies visual analogue scores were used to record outcome measures. All studies recorded pain or discomfort. Other outcome measures used varied from study to study but included unpleasantness of taste, burning, choking, numbness, difficulty of swallowing and gagging.

Full study details are in the [Characteristics of included studies](#).

### Excluded studies

We excluded four studies following assessment of the full-text papers. One was found to use rigid rather than flexible endoscopy, one examined the use of lubrication rather than a drug preparation, and two were not randomised (see [Characteristics of excluded studies](#)).

### Risk of bias in included studies

See the 'Risk of bias' tables for the full assessments for each study ([Characteristics of included studies](#)) and the 'Risk of bias' summary and graph (Figure 1; Figure 2).

### Allocation

Participants were allocated using computer-generated random number tables in six of the eight studies. In the remaining two the method of randomisation was not clearly stated. Concealment was achieved by using sealed envelopes containing the tables or by having another person perform the allocation.

### Blinding

Blinding was described in seven studies. In four this was done by having the spray administered to the patient by another person. In three studies identical vials of spray were used. In studies where patients were randomised to receive no treatment the patients were not blinded to this but the endoscopists were.

### Incomplete outcome data

Due to the study design missing data were not expected. In all studies the patients attended on one occasion, underwent the test and graded their experience. Patients could not move from one treatment arm to another or leave the study part way through. Patients could not be lost to follow up or results not recorded as the design required a single attendance. As reported the studies do not appear to have any incomplete data.

### Selective reporting

There was no evidence of selective reporting in any of the included studies

### Other potential sources of bias

In two studies the endoscopies were carried out by more than one person. In a further three studies the methods section does not state whether more than one endoscopist carried out the procedure (unclear).

### Effects of interventions

Eight studies, with a total of 746 participants are included in the review (Cain 2002; Frosh 1998; Georgalas 2005; Leder 1997; Lennox 1996; Sadek 2001; Singh 1997; Smith 2002).

We sought information that was missing or requiring clarification by contacting the study authors, but only a few responded. Ultimately, the data were insufficient and incomparable preventing combination in meta-analysis. We have outlined the reasons for this below on a study-by-study basis.

Cain 2002 included 90 patients in total. The study had three treatment arms: co-phenylcaine, saline and no spray. However, they did not specify the number in each group. Furthermore, more than one endoscopist performed the procedures leading to potential confounding. No significant difference was found in participants' pain or discomfort during the procedure as a result of the interventions. This was also true for the ease of examination and quality of view as reported by the operator. However, no specific statistical figures were given in the paper. The numbers of participants would suggest that a significant difference should be detected if one existed, but without the statistical details, it is difficult to know for sure.

STUDY QUALITY: HIGH

Frosh 1998 had 82 patients in total, but again did not specify the number in each of the three treatment arms: lidocaine, saline and no treatment. Furthermore, ratios of antilogged means were reported with no reference to the non-transformed data. The mean pain score for lignocaine was significantly higher than that for the no spray group (95% confidence interval (CI) 1.01 to 4.67;  $P = 0.048$ ), but not the saline group (95% CI 0.51 to 2.19;  $P = 0.878$ ). Comparisons for unpleasantness of spray application (95% CI

4.29 to 14.7;  $P < 0.001$ ) and unpleasantness of spray taste (95% CI 4.99 to 14.74;  $P < 0.001$ ) were reported for lignocaine versus saline only. Both comparisons showed lignocaine to fare poorly. Again, there are a reasonable number of participants in the study, suggesting that the statistical findings are likely to be close to that which would be found in the general population.

STUDY QUALITY: HIGH

Georgalas 2005 compared the effect of co-phenylcaine and saline. There were 51 patients in the co-phenylcaine group and 47 in the saline group. Their outcome measures were pain and taste, as expressed on a 100 mm visual analogue scale (VAS). The authors found that co-phenylcaine had no effect on pain, but patients found taste significantly worse with co-phenylcaine. Data were reported after logarithmic transformation. However, we contacted the author who provided the original non-transformed data (this allows the calculation of standardised mean differences (SMDs) which are required in order to make comparisons between different studies). There was also an overall discomfort outcome measure, but this was deemed to be a reflection of the overall experience of the procedure rather than due directly to the passage of the endoscope, and was therefore not considered to be part of the defined outcome measures of this review. No significant difference was found between the two groups as far as the primary outcome (pain) was concerned (95% CI -0.49 to 0.39;  $P < 0.001$ ) but a VAS for bad taste scored significantly worse (95% CI -1.19 to -0.39;  $P < 0.001$ ) in the co-phenylcaine group.

STUDY QUALITY: HIGH

Leder 1997 carried out two separate experiments within their paper, of which only the first fulfilled the review criteria. One hundred and fifty-two patients were included. There were three interventions: tetracaine ( $n = 54$ ), ephedrine ( $n = 50$ ) and saline ( $n = 48$ ). The authors used a comfort-discomfort score based on an ordinal scale of 1 to 5. They found no difference in the outcome measure between the three sprays. During endoscopy, they used a sheath which increased the diameter of the device to 4.1 mm, whilst most of the other studies had used endoscopes with a 3.7 mm diameter, making a valid comparison not possible. Whereas the majority of studies all had a 10-minute interval between application of spray and start of procedure, this study used only a one-minute interval. Furthermore, although sufficient information was available to calculate SMDs, a valid combination of data was not possible due to the difference in the type of VAS between this and the Georgalas 2005 study. No significant differences in outcomes of comfort-discomfort between the treatment groups was identified. Standard deviations were reported rather than 95% CIs; tetracaine (mean 1.96, SD 0.93), ephedrine (mean 2.30, SD 0.93) and placebo (mean 2.40, SD 1.11).

STUDY QUALITY: HIGH

The study Lennox 1996 involved 80 patients and compared co-phenylcaine and cocaine, however the numbers in each group were not specified. The size of the scope and the time interval from application of spray to start of procedure was not stated.

The method of randomisation and blinding was not described. Furthermore, the spray was also applied to the oropharynx which may have been a confounding variable. No significant difference was found in pain scores between the two treatment groups. Mean scores and ranges were reported (co-phenylcaine: 1.28, 0 to 6; cocaine 0.95, 0 to 4;  $P = 0.36$ ).

STUDY QUALITY: LOW

[Sadek 2001](#) involved 100 patients who were evenly distributed ( $n = 25$ ) within four treatment arms: lignocaine/phenylephrine, xylometazoline, lignocaine and no intervention. Unfortunately, as lubrication was also used in this setting, we were unable to use the study to combine data due to this confounding variable. This study did not find any significant effect on pain but concluded that the administration of a vasoconstrictor reduced the level of "general unpleasantness". Results of statistical analysis for unpleasantness scores were reported by comparing the presence or absence of vasoconstrictor, rather than for all four groups individually. Means were 21.54 (no vasoconstrictor) and 12.30 (vasoconstrictor), with 95% CI 1.4 to 17.1 and  $P = 0.022$ . Similarly, for unpleasant taste, results were reported comparing the presence/absence of local anaesthetic. Mean levels were 1.48 (no local anaesthetic) and 5.06 (local anaesthetic), with 95% CI 0.5 to 6.61 and  $P = 0.022$ .

STUDY QUALITY: HIGH

[Singh 1997](#) included 60 patients in a study comparing cocaine and saline using a cross-over design. Outcomes (pain, ease of procedure) were reported as a VAS (0 to 5), but the analysis was made by grouping the VAS into two groups: VAS 0 to 2, and VAS 3 to 5, rather than using means. With cocaine, 51 (85%) patients reported a VAS between 0 to 2 and nine (15%) between 3 to 5. With saline, 50 (83.3%) reported a VAS between 0 to 2, and 10 (16.7%) between 3 to 5. No significant difference was found in pain scores between sides treated with cocaine or saline ( $P = 0.26$ ). Due to the nature of the study, a correlation analysis for septal deviation was performed, and again no significant difference was found ( $P = 0.41$ ). Regarding ease of procedure, for the cocaine side, 53 (88.3%) patients were found to have a VAS between 0 to 2, and seven (11.7%) a VAS between 3 to 5. For saline, this was 41 (68.3%) VAS 0 to 2, and 19 (31.7%) VAS 3 to 5.

STUDY QUALITY: MODERATE

[Smith 2002](#) conducted two experiments in their study. Only the second was suitable to be considered, in which cocaine and co-phenylcaine were compared in 84 patients. However, they did not give sufficient information to allow standardised mean differences to be calculated and therefore inclusion in meta-analysis was not possible. No significant difference was found in pain scores between the two groups ( $P = 0.2$ ). A description of taste was sought rather than any form of grading for its unpleasantness.

STUDY QUALITY: HIGH

There was insufficient information from the studies about the costs of the various agents. This, combined with the fact that we were unable to perform adequate combination of differences,

made a cost-effectiveness analysis impossible. For similar reasons, comparisons of content of preparation, method of administration and dosage were not possible.

## DISCUSSION

### Summary of main results

We included eight randomised controlled trials (746 participants) in this review. All studies were carried out in adult patients undergoing endoscopy for diagnostic purposes in an otolaryngology clinic and all interventions used were nasal sprays (cocaine, lidocaine, co-phenylcaine, tetracaine, ephedrine, xylometazoline and saline) administered varying lengths of time prior to endoscopy. Some studies included a no treatment arm, in some lubrication was used and in others this was not clearly stated. Visual analogue scores were used to record outcome measures in all studies and all measured pain or discomfort. Other outcome measures used varied from study to study but included unpleasantness of taste, burning, choking, numbness, difficulty of swallowing and gagging.

Of the included studies, five did not demonstrate any advantage in using topical treatments prior to endoscopy ([Cain 2002](#); [Georgalas 2005](#); [Leder 1997](#); [Sadek 2001](#); [Singh 1997](#)). Of these, one study suggested that the use of a vasoconstrictor (xylometazoline) alone reduced the level of "general unpleasantness" of the procedure, but that use of a local anaesthetic increased scores for unpleasant taste ([Sadek 2001](#)). Two studies did not make a comparison against placebo or no treatment, and therefore a conclusion on the benefit of topical agents cannot be drawn ([Lennox 1996](#); [Smith 2002](#)). An eighth study reported an increase in pain scores with the topical agent ([Frosh 1998](#)). However, the numbers of patients (from the studies which reported their figures) within the groups are moderate (between 25 and 54), which makes it difficult to determine whether the lack of effect demonstrated is due to inadequate numbers of patients or a real lack of effect. It is a great shame that meta-analysis of these results has not been possible as it may have helped to answer this question.

### Overall completeness and applicability of evidence

We identified several studies that looked into the question posed by this review. Although the general impression from the studies that fulfilled initial criteria for inclusion was that there was no difference between any of the topical agents and placebo/no spray, insufficient data within each study prevented combination of any of their results. As such, their applicability to clinical practice may be regarded as limited. Nonetheless, the general sentiment within

this group of studies is that topical agents at best confer no added benefit (Cain 2002; Georgalas 2005; Leder 1997; Sadek 2001; Singh 1997) and at worst cause unpleasant effects (Frosh 1998; Georgalas 2005; Sadek 2001).

There are a number of other topical agents available (e.g. adrenaline, benzocaine) which could be used for future studies and may demonstrate more favourable outcomes.

From the authors' experience, current practice in terms of application of topical agents to the nasal cavity prior to nasal pharyngolaryngoscopy is variable. However, those clinicians who routinely do so may consider omitting this step in the procedure.

### Quality of the evidence

The randomised controlled trials included in this review were well conducted, but due to methodological differences a meta-analysis was not possible. Reasons for this inability to combine data included inconsistent/inappropriate methodology, incomplete reporting of methods and results and differences in statistical analysis. Methodological inconsistencies included more than one endoscopist being used in one study, endoscopes of different sizes, different periods of time from application of agent to endoscopy, and inadequate reporting of numbers within groups.

### Potential biases in the review process

The main potential bias in this review was the inability to obtain missing information from the authors of most of the studies. Had this been possible, real differences may have been found in the combined results which were not apparent in the individual studies.

### Agreements and disagreements with other studies or reviews

A similar review was carried out in 2008 and also concluded that there was no significant difference when using topical local anaesthetic either with or without a vasoconstrictor (Nankivell 2008).

## AUTHORS' CONCLUSIONS

### Implications for practice

Although there were several randomised controlled trials identified, all either had methodological problems or reported insufficient information to allow satisfactory combination of results, making it difficult to draw specific conclusions. However, we can say that there does not appear to be any good evidence for the application of topical spray before nasal pharyngolaryngoscopy. It is possible that the failure of individual studies to detect a significant effect is a type 2 error. Had larger studies been undertaken, or a meta-analysis of smaller studies been possible, it may have been possible to reach more certain conclusions. Although we are unable to show this using meta-analysis, the majority of the studies we found did not show an advantage and, furthermore, they report unwanted effects such as foul taste, numbness and overall unpleasantness.

### Implications for research

Future randomised controlled trials in this area should follow and report appropriate methodology. Trial authors should follow the recommendations of the CONSORT statement (CONSORT 2010) in order to ensure that reporting is clear, that the method can be properly assessed and that the data are in a form that can be used in meta-analysis. It would be helpful if authors use similar scoring systems to one another so that comparison can be made between them. We would suggest visual analogue scores using a scale of 0 to 100 mm. Future studies should consider investigating the effects of other agents, such as adrenaline and benzocaine.

## ACKNOWLEDGEMENTS

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\* *Indicates the major publication for the study*

## CHARACTERISTICS OF STUDIES

### Characteristics of included studies [ordered by study ID]

#### Cain 2002

Methods	Double-blind, randomised controlled trial	
Participants	90 male and female adult patients undergoing flexible nasal endoscopy in a UK ENT outpatients department	
Interventions	Co-phenylcaine (lidocaine and phenylephrine) versus placebo (saline) versus no treatment	
Outcomes	Pain, overall discomfort (VAS scores)	
Notes	Numbers of patients in each group were not provided. The authors were unable to provide the data	
<i><b>Risk of bias</b></i>		
<b>Item</b>	<b>Authors' judgement</b>	<b>Description</b>
Adequate sequence generation?	Yes	"... table of computer-generated random numbers was used"
Allocation concealment?	Yes	"... randomized by nursing staff into one of three groups" with treatment given by nurses
Blinding? All outcomes	No	Incomplete as patients having no treatment were not blinded; the endoscopist was blinded, however
Incomplete outcome data addressed? All outcomes	Yes	All data appear present
Free of selective reporting?	Yes	-
Free of other bias?	No	More than one endoscopist performed the endoscopy

#### Frosh 1998

Methods	Double-blind, randomised controlled trial	
Participants	82 male and female adult patients undergoing flexible nasal endoscopy in a UK ENT outpatients department	

**Frosh 1998** (Continued)

Interventions	Xylocaine (lidocaine) versus saline (placebo) versus nothing
Outcomes	Unpleasantness of procedure, unpleasantness of taste of spray, pain of procedure, overall unpleasantness (VAS scores)
Notes	Data were skewed and were normalised using logarithmic transformation. Available data could not be used for meta-analysis

***Risk of bias***

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	"... a second doctor randomised the patient into three groups by means of numbers selected from random number tables placed in sealed envelopes."
Allocation concealment?	Yes	-
Blinding? All outcomes	Yes	Second doctor carried out administration of spray or no treatment. Patient unblinded when receiving no spray
Incomplete outcome data addressed? All outcomes	Yes	All data appear present
Free of selective reporting?	Yes	-
Free of other bias?	Yes	-

**Georgalas 2005**

Methods	Double-blind, randomised controlled trial
Participants	98 male and female adult patients (age range 22 to 91 years) undergoing flexible nasal endoscopy in a UK ENT outpatients department
Interventions	Co-phenylcaine versus saline (placebo)
Outcomes	Unpleasantness of taste of spray, pain of procedure, overall discomfort (VAS scores)
Notes	-

***Risk of bias***

Item	Authors' judgement	Description
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**Georgalas 2005** (Continued)

Adequate sequence generation?	Yes	"... randomly allocated, through the use of envelopes containing computer-generated random numbers, into one of the two study groups"
Allocation concealment?	Yes	-
Blinding? All outcomes	Yes	"Two identical vials labelled simply 'A' and 'B' were used for the administration of the co-phenylcaine spray and placebo."
Incomplete outcome data addressed? All outcomes	Yes	All data appear present
Free of selective reporting?	Yes	-
Free of other bias?	Yes	-

**Leder 1997**

Methods	Double-blind, randomised controlled trial
Participants	152 male and female adult patients (age range 18 to 86 years) undergoing flexible nasal endoscopy in a US ENT outpatients department
Interventions	2% tetracaine versus 3% ephedrine versus placebo
Outcomes	Discomfort VAS score
Notes	-

***Risk of bias***

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Assigned to groups using random number table
Allocation concealment?	Yes	-
Blinding? All outcomes	Yes	Identical atomisers used so that double-blind
Incomplete outcome data addressed? All outcomes	Yes	All data appear present
Free of selective reporting?	Yes	-

**Leder 1997** (Continued)

Free of other bias?	No	More than one endoscopist performed the endoscopy
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**Lennox 1996**

Methods	Randomised controlled trial
Participants	80 male and female adult patients (age range 18 to 70 years) undergoing flexible nasal endoscopy in a UK ENT outpatients department
Interventions	Cocaine versus co-phenylcaine
Outcomes	Pain of procedure (VAS score)
Notes	Numbers of patients in each group not stated

***Risk of bias***

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	Method of randomisation not stated
Allocation concealment?	Unclear	Not stated
Blinding? All outcomes	Unclear	Not stated
Incomplete outcome data addressed? All outcomes	Yes	All data appear present
Free of selective reporting?	Yes	-
Free of other bias?	Unclear	-

**Sadek 2001**

Methods	Double-blind, randomised controlled trial
Participants	100 male and female adult patients (age range 18 to 89 years) undergoing flexible nasal endoscopy in a UK ENT outpatients department
Interventions	Lidocaine and phenylephrine versus xylometazoline versus lidocaine versus nothing
Outcomes	Overall unpleasantness, pain, bad taste, burning, choking, numbness, difficulty swallowing (VAS scores)
Notes	-

**Sadek 2001** (Continued)

<i>Risk of bias</i>		
Item	Authors' judgement	Description
Adequate sequence generation?	Yes	"... randomly allocated using Shu's Number Generator"
Allocation concealment?	Yes	"... a different doctor did the preparations in another room"
Blinding? All outcomes	Yes	-
Incomplete outcome data addressed? All outcomes	Yes	All data appear present
Free of selective reporting?	Yes	-
Free of other bias?	Yes	-

**Singh 1997**

Methods	Randomised controlled trial
Participants	60 male and female adult patients (age range 17 to 83 years) undergoing flexible nasal endoscopy in a UK ENT outpatients department. All had previously undergone the procedure
Interventions	Cocaine versus saline (placebo)
Outcomes	Before procedure - apprehension for discomfort/pain and gag (VAS scores) After procedure - discomfort/pain and gag (VAS scores) for each side of nose
Notes	Randomised to receive one spray to one side of nose and one to other, therefore cross-over study

<i>Risk of bias</i>		
Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	"... instructions in a sealed and numbered envelope, so that 30 patients had cocaine sprayed in the right nostril and 30 in the left nostril." Method of randomisation not clearly stated
Allocation concealment?	Yes	-

**Singh 1997** (Continued)

Blinding? All outcomes	Yes	Treatment was “carried out by a doctor who was not carrying out the FTE.”
Incomplete outcome data addressed? All outcomes	Yes	All data appear present
Free of selective reporting?	Unclear	-
Free of other bias?	Unclear	-

**Smith 2002**

Methods	Double-blind randomised controlled trial
Participants	84 male and female adult patients (aged 22 to 78 years) undergoing flexible nasal endoscopy in a UK ENT outpatients department
Interventions	Cocaine versus co-phenylcaine
Outcomes	Discomfort/pain VAS score
Notes	-

***Risk of bias***

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	“... randomized using Microsoft Excel random number generator.”
Allocation concealment?	Yes	“... coded single-use trial metered spray bottle” used to conceal allocation
Blinding? All outcomes	Yes	-
Incomplete outcome data addressed? All outcomes	Yes	All data appear present
Free of selective reporting?	Yes	-
Free of other bias?	Unclear	-

VAS: visual analogue scale

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

Study	Reason for exclusion
Douglas 2006	ALLOCATION: randomised using computer-generated list PARTICIPANTS: adult patients attending Australian ENT outpatients department INTERVENTIONS: study examines patients undergoing rigid rather than flexible endoscopy
Johnson 2003	ALLOCATION: not randomised
Kasemsuwan 1996	ALLOCATION: cross-over study; double-blinded administration of solution but not randomised PARTICIPANTS: adult patients attending a UK ENT outpatients department INTERVENTIONS: type of endoscope (rigid or flexible) not mentioned in paper; no further information available from author
Pothier 2005	ALLOCATION: randomised using random number table PARTICIPANTS: sequential adult patients in a UK ENT outpatients department INTERVENTIONS: the study examined the use of lubrication rather than a drug

## DATA AND ANALYSES

This review has no analyses.

## APPENDICES

### Appendix I. Search strategies

CENTRAL	Cochrane Ear, Nose and Throat Disorders Group Trials Register	PubMed	EMBASE (Ovid)
<p>#1 ENDOSCOPY explode all trees (MeSH)</p> <p>#2 ENDOSCOPES explode all trees (MeSH)</p> <p>#3 endoscop* OR laryngoscope* OR pharyngoscop* OR pharyngolaryngoscop* OR oesophagoscop* OR oesophagogastroscop* OR oesophagogastroduodenoscop* OR esophagoscop* OR esophagogastroscop* OR esophagogastroduodenoscop* OR gastroscop* OR duodenoscop*</p> <p>#4fibrescop* OR fiberscop* OR fiberoscop* OR fibroscop* OR fiberendoscop* OR fibreendoscop*</p> <p>#4#1 OR #2 OR #3 OR #4</p> <p>#5 NOSE explode all trees (MeSH)</p> <p>#6 nose OR nasal* OR transnasal* OR intranasal* OR nasolaryn* OR nasopharyn* OR nasogastric*</p> <p>#7 #5 OR #6</p> <p>#8 #4 AND #7</p> <p>#9 nasendoscop* OR nasoendoscop* OR naso NEXT endoscop* OR nasolaryngoscop* OR naso NEXT laryngoscop* OR nasopharyngoscop* OR naso NEXT pharyngoscop*</p>	<p>nasendoscop* OR nasoendoscop* OR nasolaryngoscop* OR nasopharyngoscop* OR nasopharyngolaryngoscop* OR rhinoendoscop* OR rhinopharyngoscop* OR rhinolaryngoscop* OR "rhino laryngoscope" OR rhinopharyngolaryngoscop* OR pharyngolaryngoscop* OR "naso laryngoscope" OR "naso endoscopy" OR "naso endoscope" OR "naso pharyngoscope" OR "rhino pharyngoscope" OR "naso laryngoscopy" OR "rhino pharyngoscopy"</p>	<p>#1 "Endoscopy"[Mesh]</p> <p>#2 "Endoscopes"[Mesh]</p> <p>#3 (ENDOSCOP* [tiab] OR LARYNGOSCOP* [tiab] OR PHARYNGOSCOP* [tiab] OR LARYNGOPHARYNGOSCOP* [tiab] OR OESOPHAGOSCOP* [tiab] OR OESOPHAGOGASTROSCOP* [tiab] OR OESOPHAGOGASTRODUODENOSCOP* [tiab] OR ESOPHAGOSCOP* [tiab] OR ESOPHAGOGASTROSCOP* [tiab] OR GAS-TROSCOP* [tiab] OR DUODENOSCOP* [tiab] OR ESOPHAGOGASTRODUODENOSCOP* [tiab])</p> <p>#4 (FIBRESCOP* [tiab] OR FIBROSCOP* [tiab] OR FIBEROSCOP* [tiab] OR FIBRENDOSCOP* [tiab])</p> <p>#5 #1 OR #2 OR #3 OR #4</p> <p>#6 "Nose"[Mesh]</p> <p>#7 (NOSE [tiab] OR NASAL* [tiab] OR INTRANASAL* [tiab] OR NASOPHARYN* [tiab] OR NASOLARYN* [tiab] OR NASOGASTRI* [tiab] OR TRANSNASAL* [tiab])</p>	<p>1 exp Endoscopy/</p> <p>2 exp Endoscope/</p> <p>3 (ENDOSCOP* or LARYNGOSCOP* or PHARYNGOSCOP* or LARYNGOPHARYNGOSCOP* or OESOPHAGOSCOP* or OESOPHAGOGASTROSCOP* or OESOPHAGOGASTRODUODENOSCOP* or ESOPHAGOSCOP* or ESOPHAGOGASTROSCOP* or GAS-TROSCOP* or DUODENOSCOP* or ESOPHAGOGASTRODUODENOSCOP*).</p> <p>tw.</p> <p>4 (FIBRESCOP* or FIBROSCOP* or FIBEROSCOP* or FIBRENDOSCOP* or FIBRENDOSCOP*).tw.</p> <p>5 exp Nose/</p> <p>6 (NOSE or NASAL* or INTRANASAL* or NASOPHARYN* or NASOLARYN* or NASOGASTRI* or TRANSNASAL*).tw.</p> <p>7 4 or 1 or 3 or 2</p> <p>8 6 or 5</p> <p>9 8 and 7</p> <p>10</p>

(Continued)

OR nasopharyngolaryngoscop* OR naso NEXT pharyngolaryngoscop* OR rhinoendoscop* OR hinopharyngoscop* OR rhino NEXT pharyngoscop* OR rhinolaryngoscop* OR rhino NEXT laryngoscop* OR rhinopharyngolaryngoscop* OR rhino NEXT pharyngolaryngoscop* #10 #8 OR #9 #11 ANESTHESIA LOCAL single term (MeSH) #12 ANESTHETICS LOCAL explode all trees (MeSH) #13 VASOCONSTRICTOR AGENTS explode all trees (MeSH) #14 PAIN single term (MeSH) #15 PAIN-MEASUREMENT single term (MeSH) #16 pain NEAR relief #17 anaesthe* NEAR local* OR anaesthe* NEAR topical* OR anaesthe* NEAR surface OR anaesthe* NEAR gel* OR anaesthe* NEAR paste* OR anaesthe* NEAR spray* OR anaesthe* NEAR solution* #18 anesthe* NEAR local* OR anesthe* NEAR topical* OR anesthe* NEAR surface OR anesthe* NEAR gel* OR anesthe* NEAR paste* OR anesthe* NEAR spray* OR anesthe* NEAR solution* #19 #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18 #20 americaine OR amethocaine OR anaesthesin OR anesthesin OR articain* OR artiaine OR bensokain OR benzocaine OR bupivacaine OR butacaine OR buvacaina OR carbostesin OR carbocaine OR carticain* OR cincaïn OR cinchocain* OR citanest OR co NEXT phenylcaine OR cophenylcaine		GASTRI* [tiab] OR TRANSNASAL* [tiab]) #8 #6 OR #7 #9 #5 AND #8 #10 (NASENDOSCOP* [tiab] OR NASENDOSCOP* [tiab] OR (NASO [tiab] AND ENDOSCOP* [tiab]) OR NASOLARYNGOSCOP* [tiab] OR (NASO [tiab] AND LARYNGOSCOP* [tiab]) OR NASOPHARYNGOSCOP* [tiab] OR (NASO [tiab] AND PHARYNGOSCOP* [tiab]) OR NASOPHARYNGOLARYNGOSCOP* [tiab] OR (NASO [tiab] AND PHARYNGOLARYNGOSCOP* [tiab]) ) #11 (RHINOENDOSCOP* [tiab] OR RHINOPHARYNGOSCOP* [tiab] OR (RHINO [tiab] AND PHARYNGOSCOP* [tiab]) OR RHINOLARYNGOSCOP* [tiab] OR (RHINO [tiab] AND PHARYNGOLARYNGOSCOP* [tiab]) ) #12 #10 OR #11 #13 #9 OR #12 #14 "Anesthesia, Local"[Mesh] #15 "Nasal Decongestants"[Mesh] #16 "Nasal Decongestants"[Pharmacological Action] #17 "Pain"[Mesh] #18 "Pain Measurement"[Mesh] #19 (pain [tiab] AND relief [tiab])	(NASENDOSCOP* or NASENDOSCOP* or (NASO and ENDOSCOP*) or NASOLARYNGOSCOP* or (NASO and LARYNGOSCOP*) or NASOPHARYNGOSCOP* or (NASO and PHARYNGOSCOP*) or NASOPHARYNGOLARYNGOSCOP* or (NASO and PHARYNGOLARYNGOSCOP*)).tw. 11 (RHINOENDOSCOP* or RHINOPHARYNGOSCOP* or (RHINO and PHARYNGOSCOP*) or RHINOLARYNGOSCOP* or (RHINO and LARYNGOSCOP*) or RHINOPHARYNGOLARYNGOSCOP* or (RHINO and PHARYNGOLARYNGOSCOP*)).tw. 12 11 or 10 13 9 or 12 14 exp Local Anesthesia/ 15 Local Anesthetic Agent/ 16 exp Decongestive Agent/ 17 exp Pain/ or exp Pain Assessment/ 18 (pain and relief).tw. 19 ((Anaesthe* or Anesthe* or [tiab]) OR RHINOPHARYNGOLARYNGOSCOP* [tiab] OR (RHINO [tiab] AND PHARYNGOSCOP* [tiab]) OR PHARYNGOLARYNGOSCOP* [tiab])) 20 (AMERICaine or AMETHOCAINE or ANAESTHESIN* or ANESTHESIN* or ARTICAIN* or ARTIAINE or BENSOKAIN or BENZOCAINE or BUPIVACAINE or BUTACAINE or BUVA-CAINA or CARBOSTESIN or CARBOCAINE or CARTICAİN* or CINCAİN or CINCHOCAİN* or CITANEST or "CO PHENYLCAINE" or COPENYLCAINE
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(Continued)

OR cetacain* OR cocaine OR dalcaine OR dibucaine OR dolanaest OR etidocaine OR gerokit OR geriocaine OR lidocaine OR lignocaine		#20 ((ANAESTHE* [tiab] OR ANESTHE* [tiab]) AND (LOCAL* [tiab] OR TOPICAL* [tiab] OR SURFACE [tiab] OR GEL* [tiab] OR PASTE* [tiab] OR SPRAY* [tiab] OR SOLUTION* [tiab]))	or CETACAIN* or COCAINE or DALCAINE or DIBUCAINE or DOLANAEST or ETIDOCAINE or GEROKIT or GERIOCAINE or LIDOCAINE or LIGNOCAINE).tw.
#21 marcain* OR mepivacaine OR mesocaine OR novocaine OR nupercain* OR octocaine OR procaine OR prilocaine OR propitocaine OR propoxycaine OR propoxyprocaine OR sensorcaine OR scandicaine OR sovaine OR trimecaine OR ultracain* OR xylesthesin OR xylocaine OR xylocitin OR xyloneural		#21 (VASOCONSTRICT* [tiab] AND (AGENT [tiab] OR LOCAL* [tiab] OR TOPICAL* [tiab] OR SURFACE [tiab] OR GEL* [tiab] OR PASTE* [tiab] OR SPRAY* [tiab] OR SOLUTION* [tiab]))	21 (PHENYLEPHRINE or OXYMETAZOLINE or TETRACAIN* or XYLOMETAZOLINE).tw.
#22 phenylephrine OR oxymetazoline OR tetracaine OR xylometazoline		#22 (AMERICAINE [tiab] OR AMETHOCAINE [tiab] OR ANAESTHESIN* [tiab] OR ANESTHESIN* [tiab] OR ARTICAIN* [tiab] OR ARTIAINE [tiab] OR BENSOKAIN [tiab] OR BENZOCAINE [tiab] OR BUPIVACAINE [tiab] OR BUTACAINE [tiab] OR BUTACAINE [tiab] OR CARBOSTESIN [tiab] OR CARBOCAINE [tiab] OR CARTICAIN* [tiab] OR CINCAIN [tiab] OR CINCHOCAIN* [tiab] OR CITANEST [tiab] OR "CO PHENYLCAINE" [tiab] OR COPHENYLCAINE [tiab] OR CETACAINE* [tiab] OR COCAINE [tiab] OR DALCAINE [tiab] OR DIBUCAINE [tiab] OR DOLANAEST [tiab] OR ETIDOCAINE [tiab] OR GEROKIT [tiab] OR GERIOCAINE [tiab] OR LIDOCAINE [tiab] OR LIGNOCAINE [tiab])	22 (NAPHAZOLINE or METAOXEDRIN or METASYMPATOL or METAZON or "NEO SYNEPHRINE" or NEOSYNEPHRINE or PHENYLPROPANOLAMINE or NOREPHEDRINE or DEXATRIM or PROLAMINE or PROPAGEST or SYNEPHRINE or SYMPAETHAMIN or OXEDRINE or SYNEPHRIN or AMETOCAINE or AMETOP or ANETAINE or ANETHAINE or BUTETHANOL or BUTETHOL or DIMETHYLAMINOETHANOL or CONTRALGIN or CURTACAINE or DEANOL or DECICAIN* or DICAIN* or FISUCAIN or GINGICAIN or INTERCAIN or LANDOCAINE or LAUDOCAINE or MEETHOBALM or MENONASAL or METRASPRAY or MUCAESTHIN or NIPHANOID or PANTOCAINE or PONTOCAINE or REXOCAINE or TETOCAINE or TETRACAIN* or TONEXOL or UROMUCAESTHIN).tw.
#23 naphazoline OR metaoxedrin OR metasympatol OR metazon OR neo NEXT synephrine OR neosynephrine		#23 (MARCAIN* [tiab] OR MEPIVACAIN [tiab] OR MESOCAINE [tiab] OR NOVOCAINE [tiab] OR NUPERCAIN* [tiab] OR OCTO-	23 (MARCAIN* or MEPIVACAIN or MESOCAINE or NOVOCAINE or NUPER-
#24 phenylpropanolamine OR norephedrine OR dexatrim OR prolamine OR propagest OR synephrine OR symphaethamin OR oxedrine OR synephrin			
#25 ametocaine OR ametop OR anetaine OR anethaine OR butethanol OR butethol OR dimethylaminoethanol OR contralgin OR curtacaine OR deanol OR decicain* OR dicain* OR fissucain OR gingicain OR intercain OR landocaine			
#			
26 laudocaine OR meethobalm OR menonasal OR metraspray OR mucaesthin OR niphanoïd OR pantocaine OR pontocaine OR rexocaine OR tetocaine OR tetracain* OR tonexol OR uromucaesthin			
#27 #20 OR #21 OR #22 OR #23 OR #24 OR #25 OR #26			
#28 #19 OR #27			
#29 #10 AND #28			

(Continued)

		CAINE [tiab] OR PROCAINE [tiab] OR PRILOCAINE [tiab] OR PROPITOCAINE [tiab] OR PROPOXYCAINE [tiab] OR PROPOXYPROCAINE [tiab] OR SENSORCAINE [tiab] OR SCANDICAINE [tiab] OR SOVCAINE [tiab] OR TRIMECAINE [tiab] OR ULTRACAIN* [tiab] OR XYLESTHESIN [tiab] OR XYLOCAINE [tiab] OR XYLOITIN [tiab] OR XYLONEURAL [tiab]) #24 (PHENYLEPHRINE [tiab] OR OXYMETAZOLINE [tiab] OR TETRACAIN* [tiab] OR XYLOMETAZOLINE [tiab]) #25 (NAPHAZOLINE [tiab] OR METAOXEDRIN [tiab] OR METASYMPATOL [tiab] OR METAZON [tiab] OR "NEO SYNEPHRINE" [tiab] OR NEOSYNEPHRINE [tiab] OR PHENYLPROPANOLAMINE [tiab] OR NOREPHEDRINE [tiab] OR DEXATRIM [tiab] OR PROLAMINE [tiab] OR PROPAGEST [tiab] OR SYNEPHRINE [tiab] OR SYMPAETHAMIN [tiab] OR OXEDRINE [tiab] OR SYNEPHRIN [tiab] OR AMETOCAINE [tiab] OR AMETOP [tiab] OR ANETAINE [tiab] OR ANETHAINE [tiab] OR BUTETHANOL [tiab] OR BUTETHOL [tiab] OR DIMETHYLAMINOETHANOL [tiab] OR CONTRALGIN [tiab] OR CURTACAINE [tiab] OR DEANOL [tiab] OR DECICAIN* [tiab] OR DICAIN* [tiab] OR FISSUCAIN	CAIN* or OCTOCAINE or PROCAINE or PRILOCAINE or PROPITOCAINE or PROPOXYCAINE or PROPOXYPROCAINE or SENSORCAINE or SCANDICAINE or SOVCAINE or TRIMECAINE or ULTRACAIN* or XYLESTHESIN or XYLOCAINE or XYLOITIN or XYLONEURAL).tw. 24 21 or 20 or 15 or 14 or 22 or 18 or 16 or 19 or 23 25 24 and 13
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(Continued)

		[tiab] OR GINGICAIN [tiab] OR INTERCAIN [tiab] OR LANDOCAINE [tiab] OR LAUDOCAINE [tiab] OR MEETHOBALM [tiab] OR MENONASAL [tiab] OR METRASPRAY [tiab] OR MUCAESTHIN [tiab] OR NIPHANOID [tiab] OR PANTOCAINE [tiab] OR PONTOCAINE [tiab] OR REXOCAINE [tiab] OR TETOCAINE [tiab] OR TETRACAIN* [tiab] OR TONEXOL [tiab] OR UROMUCAESTHIN [tiab]) #26 #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21 OR #22 OR #23 OR #24 OR #25 #27 #13 AND #26	
Web of Science	BIOSIS (Ovid)	CINAHL (EBSCO)	ISRCTN (mRCT)
#1 TS=(ENDO- SCOP* or LARYNGOSCO- P* or PHARYNGOSCO- P* or LARYNGOPHARYNGO- SCOP* or OESOPHAGOSCO- P* or OE- SOPHAGOGAS- TROSCOP* or OESOPHA- GOGASTRODUODENO- SCOP* or ESOPHAGO- SCOP* or ESOPHA- GOGASTROSCOP* or GAS- TROSCOP* or DUODENO- SCOP* or ESOPHAGOGAS- TRODUODENOSCO- P*) #2 TS=(FIBRESCO- P* or FIBER- SCOP* or FIBEROSCO- P* or FIBROSCOP* or FIBEREN- DOSCO- P* or FIBREENDO- SCOP*) #3 #2 OR #1 #4 TS=(NOSE or NASAL* or INTRANASAL* or NASOPHARYN* or NASO-	1 (ENDOSCO- P* or LARYN- GOSCO- P* or PHARYNGO- SCOP* or LARYN- GOPHARYNGOSCO- P* or OESOPHAGOSCO- P* or OE- SOPHAGOGAS- TROSCOP* or OESOPHA- GOGASTRODUODENO- SCOP* or ESOPHAGO- SCOP* or ESOPHA- GOGASTROSCOP* or GAS- TROSCOP* or DUODENO- SCOP* or ESOPHAGOGAS- TRODUODENOSCO- P*). tw. 2 (FIBRESCO- P* or FIBER- SCOP* or FIBEROSCO- P* or FIBROSCOP* or FIBEREN- DOSCO- P* or FIBREENDO- SCOP*).tw. 3 (NOSE or NASAL* or IN- TRANASAL* or NASOPHARYN* or NASO- LARYN* or NASOGASTRI* or TRANSNASAL*).tw.	S1 (MH "Endoscopy+") S2 (MH "Endoscopes+") S3 TX ENDOSCO- P* or LARYN- GOSCO- P* or PHARYNGO- SCOP* or LARYN- GOPHARYNGOSCO- P* or OESOPHAGOSCO- P* or OE- SOPHAGOGAS- TROSCOP* or OESOPHA- GOGASTRODUODENO- SCOP* or ESOPHAGO- SCOP* or ESOPHA- GOGASTROSCOP* or GAS- TROSCOP* or DUODENO- SCOP* or ESOPHAGOGAS- TRODUODENOSCO- P* S4 TX FIBRESCO- P* or FIBER- SCOP* or FIBEROSCO- P* or FIBROSCOP* or FIBEREN- DOSCO- P* or FIBREENDO- SCOP* S5 S1 or S2 or S3 or S4 S6 (MH "Nose+")	nasendoscop% OR nasoendo- scop% OR nasolaryngoscop% OR nasopharyngo- scop% OR nasopharyngolaryn- goscop% OR rhinoendoscop% OR rhinopharyngoscop% OR rhinolaryngoscop% OR rhinopharyngolaryngoscop%  ((nose OR nasal%) AND (en- doscop%))

(Continued)

LARYN* or NASOGASTRI* or TRANSNASAL*) #5 #4 AND #3 #6 TS=(NASENDOSCOPI* or NASOENDOSCOPI* or (NASO and ENDOSCOPI*) or NASOLARYNGOSCOPI* or (NASO and LARYNGOSCOPI*) or NASOPHARYNGOSCOPI* or (NASO and PHARYNGOSCOPI*) or NASOPHARYNGOLARYNGOSCOPI* or (NASO and PHARYNGOLARYNGOSCOPI*)) #7 TS=(RHINOENDOSCOPI* or RHINOPHARYNGOSCOPI* or (RHINO and PHARYNGOSCOPI*) or RHINOLARYNGOSCOPI* or (RHINO and LARYNGOSCOPI*) or RHINOPHARYNGOLARYNGOSCOPI* or (RHINO and PHARYNGOLARYNGOSCOPI*)) #8 #7 OR #6 OR #5 #9 TS=((Anaesthe* or Anesthe* or Vasoconstrict*) and (LOCAL* or TOPICAL* or SURFACE* or GEL* or PASTE* or SPRAY* or SOLUTION*)) #10 TS=(pain AND relief) #11 TS=(AMERICAINE or AMETHOCAINE or ANAESTHESIN* or ANESTHESIN* or ARTICAIN* or ARTIAINE or BENSOKAIN or BENZOCAINE or BUPIVACAINE or BUTACAINE or BUVA-CAINA or CARBOSTESIN or CARBOCAINE or CARTICAIN* or CINCAIN or CINCHOCAIN* or CITANEST or "CO PHENYLCAINE" or COPHENYLCAINE or CETACAIN* or COCAINE or DALCAINE or DIBUCAINE or DOLANAEST or ETIDOCAINE or GEROKIT	4 1 OR 2 5 3 AND 4 6 (NASENDOSCOPI* or NASOENDOSCOPI* or (NASO and ENDOSCOPI*) or NASOLARYNGOSCOPI* or (NASO and LARYNGOSCOPI*) or NASOPHARYNGOSCOPI* or (NASO and PHARYNGOSCOPI*) or NASOPHARYNGOLARYNGOSCOPI* or (NASO and PHARYNGOLARYNGOSCOPI*)).tw. 7 (RHINOENDOSCOPI* or RHINOPHARYNGOSCOPI* or (RHINO and PHARYNGOSCOPI*) or RHINOLARYNGOSCOPI* or (RHINO and LARYNGOSCOPI*) or RHINOPHARYNGOLARYNGOSCOPI* or (RHINO and PHARYNGOLARYNGOSCOPI*)).tw. 8 6 OR 7 9 5 OR 8 10 exp Local Anesthesia/ 11 exp Pain/ or exp Pain Assessment/ 12 (pain and relief).tw. 13 ((Anaesthe* or Anesthe* or Vasoconstrict*) and (LOCAL* or TOPICAL* or SURFACE* or GEL* or PASTE* or SPRAY* or SOLUTION*)).tw. 14 (AMERICAINE or AMETHOCAINE or ANAESTHESIN* or ANESTHESIN* or ARTICAIN* or ARTIAINE or BENSOKAIN or BENZOCAINE or BUPIVACAINE or BUTACAINE or BUVA-CAINA or CARBOSTESIN or CARBOCAINE or CARTICAIN* or CINCAIN or CINCHOCAIN* or CITANEST or "CO PHENYLCAINE" or COPHENYLCAINE or CETACAIN* or COCAINE	S7 TX NOSE or NASAL* or INTRANASAL* or NASOPHARYN* or NASOLARYN* or NASOGASTRI* or TRANSNASAL* S8 S6 or S7 S9 S5 and S8 S10 TX NASENDOSCOPI* or NASOENDOSCOPI* or NASOLARYNGOSCOPI* or NASOPHARYNGOSCOPI* or NASOPHARYNGOLARYNGOSCOPI* or RHINOENDOSCOPI* or RHINOPHARYNGOSCOPI* or RHINOLARYNGOSCOPI* or RHINOPHARYNGOLARYNGOSCOPI* S11 TX naso OR rhino S12 TX laryngoscopy* OR pharyngoscopy* OR pharyngolaryngoscopy* S13 S11 and S12 S14 S9 or S10 or S13 S15 (MH "Anesthesia, Local") or (MH "Anesthetics, Local+") S16 (MH "Vasoconstrictor Agents, Nasal+") S17 (MH "Pain+") S18 TX pain AND relief S19 TX ANAESTHE* OR ANESTHE* OR Vasoconstrict* S20 TX LOCAL* OR TOPICAL* OR SURFACE* OR GEL* OR PASTE* OR SPRAY* OR SOLUTION* S21 AMERICAINE or AMETHOCAINE or ANAESTHESIN* or ANESTHESIN* or ARTICAIN* or ARTIAINE or BENSOKAIN or BENZOCAINE or BUPIVACAINE or BUTACAINE or BUVA-CAINA or CARBOSTESIN or CARBOCAINE or CARTICAIN* or CINCAIN or CIN-
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<p>or GERIOCAINE or LIDOCAINE or LIGNOCAINE)  #12 TS=(PHENYLEPHRINE or OXYMETAZOLINE or TETRACAIN* or XYLOMETAZOLINE)  #13 TS=(NAPHAZOLINE or METAOXEDRIN or METASYMPATOL or METAZON or "NEO SYNEPHRINE" or NEOSYNEPHRINE or PHENYL-PROPANOLAMINE or NOREPHEDRINE or DEX-ATRIM or PROLAMINE or PROPAGEST  or SYNEPHRINE or SYMPA-ETHAMIN or OXEDRINE or SYNEPHRIN or AMETOCALINE or AMETOP or ANETAINE or ANETHAINE or BUTETHANOL or BUTETHOL or DIMETHYLAMINOETHANOL or CONTRALGIN or CURTACALINE or DEANOL or DECICAIN* or DICAIN* or FIS-SUCAIN or GINGICAIN or INTERCAIN or LANDOCAINE or LAUDOCAINE or MEETHOBALM or MENONASAL or METRASPRAY or MU-CAESTHIN or NIPHANOID or PANTOCAINE or PONTOCAINE or REXOCAINE or TETOCAINE or TETRACAIN* or TONEXOL or UROMUCAESTHIN)  #14 TS=(MARCAIN* or MEPIVACAINE or MESOCAINE or NOVOCAINE or NUPERCAIN* or OCTOCAINE or PROCAINE or PRILOCAINE or PROPITOCALINE or PROPOXYCAINE or PROPOXYPROCAINE or SENSORCAINE or SCANDICAINE or SOVCAINE or</p>	<p>or DALCAINE or DIBUCAINE or DOLANAEST or ETIDOCAINE or GEROKIT or GERIOCAINE or LIDOCAINE or LIGNOCAINE).tw.  15 (PHENYLEPHRINE or OXYMETAZOLINE or TETRACAIN* or XYLOMETAZOLINE).tw.  16 (NAPHAZOLINE or METAOXEDRIN or METASYMPATOL or METAZON or "NEO SYNEPHRINE" or NEOSYNEPHRINE or PHENYL-PROPANOLAMINE or NOREPHEDRINE or DEX-ATRIM or PROLAMINE or PROPAGEST  or SYNEPHRINE or SYMPA-ETHAMIN or OXEDRINE or SYNEPHRIN or AMETOCALINE or AMETOP or ANETAINE or ANETHAINE or BUTETHANOL or BUTETHOL or DIMETHYLAMINOETHANOL or CONTRALGIN or CURTACALINE or DEANOL or DECICAIN* or DICAIN* or FIS-SUCAIN or GINGICAIN or INTERCAIN or LANDOCAINE or LAUDOCAINE or MEETHOBALM or MENONASAL or METRASPRAY or MU-CAESTHIN or NIPHANOID or PANTOCAINE or PONTOCAINE or REXOCAINE or TETOCAINE or TETRACAIN* or TONEXOL or UROMUCAESTHIN).tw.  17 (MARCAIN* or MEPIVACAINE or MESOCAINE or NOVOCAINE or NUPERCAIN* or OC-TOCAINE or PROCAINE or</p>	<p>CHOCAIN* or CITANEST or "CO PHENYLCAINE" or COPHENYLCAINE  or CETACAIN* or COCAINE or DALCAINE or DIBUCAINE or DOLANAEST or ETIDOCAINE or GEROKIT or GERIOCAINE or LIDOCAINE or LIGNOCAINE  S22 PHENYLEPHRINE or OXYMETAZOLINE or TETRACAIN* or XYLOMETAZOLINE  S23 NAPHAZOLINE or METAOXEDRIN or METASYMPATOL or METAZON or "NEO SYNEPHRINE" or NEOSYNEPHRINE or PHENYL-PROPANOLAMINE or NOREPHEDRINE or DEX-ATRIM or PROLAMINE or PROPAGEST  or SYNEPHRINE or SYMPA-ETHAMIN or OXEDRINE or SYNEPHRIN or AMETOCALINE or AMETOP or ANETAINE or ANETHAINE or BUTETHANOL or BUTETHOL or DIMETHYLAMINOETHANOL or CONTRALGIN or CURTACALINE or DEANOL or DECICAIN* or DICAIN* or FIS-SUCAIN or GINGICAIN or INTERCAIN or LANDOCAINE or LAUDOCAINE or MEETHOBALM or MENONASAL or METRASPRAY or MU-CAESTHIN or NIPHANOID or PANTOCAINE or PONTOCAINE or REXOCAINE or TETOCAINE or TETRACAIN* or TONEXOL or UROMUCAESTHIN  S24 TX MARCAIN* or MEPIVACAINE or MESOCAINE</p>
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TRIMECAINE or ULTRACAIN* or XYLESTHESIN or XYLOCAINE or XYLOITIN or XYLONEURAL) #15 #14 OR #13 OR #12 OR #11 OR #10 OR #9 #16 #15 AND #8	PRILOCAINE or PROPITOCALINE or PROPOXYCAINE or PROPOXYPROCAINE or SENSORCAINE or SCANDICAINE or SOVCAINE or TRIMECAINE or ULTRACAIN* or XYLESTHESIN or XYLOCAINE or XYLOITIN or XYLONEURAL).tw. 18 10 OR 11 OR 12 OR 13 OR 14 OR 15 OR 16 OR 17 19 9 AND 18	or NOVOCAINE or NUPERCALIN* or OCTOCAINE or PROCAINE or PRILOCAINE or PROPITOCALINE or PROPOXYCAINE or PROPOXYPROCAINE or SENSORCAINE or SCANDICAINE or SOVCAINE or TRIMECAINE or ULTRACAIN* or XYLESTHESIN or XYLOCAINE or XYLOITIN or XYLONEURAL S25 (S15 or S16 or S17 or S18 or s19 OR s20 OR s21 OR s22 OR s23 OR s24) s26 s9 AND s25	
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## HISTORY

Protocol first published: Issue 1, 2006

Review first published: Issue 3, 2011

Date	Event	Description
7 November 2008	Amended	Converted to new review format.

## CONTRIBUTIONS OF AUTHORS

VSS - Searching, selection of studies, data extraction, drafting of protocol/review, data analysis, data presentation.

SEMJ - Co-drafting of protocol, assistance with statistics, data analysis, data presentation.

## DECLARATIONS OF INTEREST

None known.

## DIFFERENCES BETWEEN PROTOCOL AND REVIEW

We have adopted the Cochrane Collaboration 'Risk of bias' tool for the assessment of study quality.

The methods section ([Types of interventions](#)) has been changed from that in the original protocol to make it clear that the review aimed to look specifically at pharmacological agents.

## INDEX TERMS

### Medical Subject Headings (MeSH)

\*Anesthesia, Local; \*Pharynx; Endoscopy [\*methods]; Fiber Optic Technology; Laryngoscopy [\*methods]; Randomized Controlled Trials as Topic; Vasoconstrictor Agents [\*administration & dosage]

### MeSH check words

Adult; Humans