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Review Article

Nasal and instrument preparation prior to rigid and flexible nasendoscopy: a systematic review

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Abstract

Background: Examination of the upper aerodigestive tract is an important part of ENT practice. The use of both flexible and rigid nasendoscopes is the most common way of achieving this in the out-patient setting. However, these procedures can cause pain or discomfort for the patient, and topical preparations have been used in an attempt to reduce this.

Objectives: The variability in current practice amongst those performing nasendoscopy may suggest an uncertainty as to what constitutes best practice for this procedure. A systematic review of the literature was undertaken in an attempt to clarify this.

Methods: A literature search of the Cochrane ENT group trials register, the Cochrane central register of controlled trials (CENTRAL), CINAHL (1982–2007), MEDLINE (1950–2007) and EMBASE (1974–2007) was performed. Reference lists of selected studies were scanned for additional research material.

Results: Eighteen studies relevant to this review were identified. The evidence suggests that local anaesthetic is not beneficial when performing flexible nasendoscopy, neither alone nor in combination with a vasoconstrictor. Water is better than lubricant for flexible endoscope passage and gives a superior optical outcome. Further research is required on the use of endosheaths for flexible and rigid nasendoscopy.

Key words: Endoscopy; Nose; Anaesthesia; Drug Administration; Topical

Introduction

Since the rod endoscope was developed by Hopkins and Storz in 1959[1] and the flexible nasendoscope was pioneered by Sawashima and Hirose in 1968,[2] nasendoscopy, both flexible and rigid, has become a common procedure in the ENT department. Nasendoscopy allows examination of the nasal passages and upper aerodigestive tract in an out-patient setting. The procedure can cause the patient substantial pain and discomfort. Owing to the frequency with which this procedure is performed, it is important to ensure best practice is followed.

Topical anaesthetic may be applied in an attempt to reduce the pain or discomfort of the procedure. Cocaine was initially used for this purpose, as well as for its vasoconstrictive effects, but has more recently been replaced by other local anaesthetics, such as lignocaine, as a result of its toxicity.[3,4] Phenylephrine has now become a popular vasoconstrictor for use in the nose prior to nasendoscopy.

We undertook a review of the literature to assess the evidence for the use of topical preparations in both flexible and rigid nasendoscopy.

Methods

Search strategy

We searched MEDLINE (1950–2007), EMBASE (1974–2007), CINAHL (1982–2007) and the Cochrane central register of controlled trials (CENTRAL), using the following terms: 'nasendoscopy', 'nasal endoscopy', 'flexible', 'rigid', 'topical', 'anaesthesia', and 'flexible fibreoptic endoscopy'.

We included the following studies: randomised, controlled trials; those of patients undergoing nasendoscopy (flexible or rigid); and those of topical treatment of the nose or endoscope prior to nasendoscopy. We excluded any study in which other procedures were performed in addition to nasendoscopy, e.g. nasal intubation.

Eighteen papers fitted the criteria and were included in the review (Table I).

Results

Flexible nasendoscopy

Local anaesthetics and vasoconstrictors. Eleven studies assessed the use of topical anaesthetic,

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TABLE I

STUDIES FITTING INCLUSION CRITERIA

Study	Randomisation	Pts (*n*)	Preparation	Rigid or flexible?	Data collection
Sadek *et al.*[7]	Double blind	100	Co-phenylcaine *vs* lignocaine *vs* xylometazoline *vs* nothing	Flexible	0–100 VAS
Frosh *et al.*[5]	Double blind	82	Lignocaine *vs* saline *vs* nothing	Flexible	0–100 VAS
Leder *et al.*[6]	Double blind	152	Tetracaine *vs* ephedrine *vs* saline *vs* nothing	Flexible	5-point scale
Kasemsuwan & Griffiths[13]	Double blind	20	Cocaine *vs* lignocaine + adrenaline	Flexible	3-point scale
Cain *et al.*[10]	Double blind	90	Co-phenylcaine *vs* saline *vs* nothing	Flexible	0–10 VAS
Jonas *et al.*[8]	Double blind	53	Lignocaine + oxymetazoline *vs* oxymetazoline	Flexible	0–10 VAS
Georgalas *et al.*[9]	Double blind	98	Co-phenylcaine *vs* saline	Flexible	0–100 VAS
Johnson *et al.*[12]	Double blind crossover	15	Cocaine *vs* xylometazoline *vs* saline	Flexible	5-point scale
Singh *et al.*[11]	Double blind	60	Cocaine *vs* saline	Flexible	5-point scale
Smith & Rockley[14]	Double blind	84	Cocaine *vs* co-phenylcaine	Flexible	0–10 VAS
Lennox *et al.*[15]	Unclear	80	Cocaine *vs* co-phenylcaine	Flexible	0–10 VAS
Pothier *et al.*[16]	Single blind	150	KY jelly *vs* no lubrication	Flexible	0–100 VAS
Pothier *et al.*[17]	Single blind	150	KY jelly *vs* water	Flexible	0–100 VAS
Winter *et al.*[18]	Double blind	100	Endosheath	Flexible	0–100 VAS
Vaz *et al.*[19]	Double blind	9	Endosheath	Flexible	2-way answer
Douglas *et al.*[21]	Double blind	30	Co-phenylcaine *vs* lignocaine	Rigid	0–100 VAS
Pothier *et al.*[22]	Single blind	50	Co-phenylcaine 1 min prior *vs* 10 min prior	Rigid	0–100 VAS
Walshe *et al.*[20]	Single blind	33	Brompton's solution *vs* co-phenylcaine	Rigid	0–10 VAS

Pts = patients; min = minutes

either alone or in combination with a vasoconstrictor, for flexible nasendoscopy.

Frosh *et al.*[5] studied the difference between xylocaine 5 per cent (lidocaine) spray, normal saline spray and no spray in a randomised double-blinded study of 82 consecutive patients. Visual analogue scales (VASs) were used to determine scores for the overall unpleasantness of the procedure, unpleasantness of receiving the spray, unpleasantness of the taste of the spray, and pain. The mean overall unpleasantness score was significantly higher in the xylocaine group compared with the normal saline and the no spray groups ($p = 0.013$ and $p = 0.001$, respectively). A similar pattern was seen for the mean of the pain score, although there was no statistically significant difference between the xylocaine and normal saline groups ($p = 0.88$). Both spray and taste unpleasantness were markedly worse for xylocaine compared with saline ($p < 0.001$). The authors concluded that the application of topical local anaesthetic prior to flexible nasendoscopy was of no benefit, and indeed may make the procedure more unpleasant overall for the patient.

Leder *et al.*,[6] in another double-blinded, randomised study, looked at the difference in discomfort scores of 152 patients undergoing flexible nasendoscopy with either local anaesthetic alone (tetracaine hydrochloride, $n = 54$), a vasoconstrictor alone (3 per cent ephedrine, $n = 50$) or a placebo solution (isotonic saline with a flavouring to give a medicinal taste and smell, $n = 48$). Patients scored the procedure between one and five, with one indicating no discomfort and five indicating severe discomfort. The mean discomfort scores were 1.96 (standard deviation (SD) 0.93) for tetracaine, 2.30 (SD 0.93) for ephedrine and 2.40 (SD 1.11) for the placebo solution. A further 50 patients then underwent the same procedure using the same study design, but were not given any topical preparation to the nose; they were found to have similar mean discomfort scores, of 2.18 (SD 0.90), compared with the previous three groups.

A similar study, by Sadek *et al.*,[7] again randomised and double-blinded, compared a vasoconstrictor (xylometazoline 0.1 per cent) with lignocaine (10 per cent). This study differed from that of Leder *et al.* in two respects – there was a control group randomised to receive no preparation, and a combination of local anaesthetic and vasoconstrictor was used (co-phenylcaine). One hundred patients were included in the study, 25 in each arm. From the general unpleasantness scores recorded, the only significant effect was the benefit due to vasoconstriction, with mean scores falling from 21.54 without vasoconstrictor to 12.30 with vasoconstrictor ($p = 0.022$; 95 per cent confidence intervals 1.4 and 17.1). The other significant finding was that mean levels of bad taste rose from 1.48 without lignocaine to 5.06 with lignocaine (95 per cent confidence intervals 0.5 and 6.61). These data suggest that the use of a vasoconstrictor alone is just as effective as combining it with a local anaesthetic, and that the reason general unpleasantness is not reduced by local anaesthetic may be because of the taste.

Nasendoscopy is a useful tool in the assessment of paediatric as well as adult patients. Jonas *et al.*[8] randomised 53 children into two groups to receive one of two solutions, either oxymetazoline 0.025 per cent ($n = 27$) or oxymetazoline 0.025 per cent plus lignocaine 2 per cent ($n = 26$). Administration of the

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solution was performed by a nurse practitioner, thus allowing blinding of both the endoscopist and the patient. Pre-, intra- and post-procedure anxiety assessments were performed by two independent pain specialists using a 10 point VAS. The endoscopist measured ease of procedure and quality of view. The study did not find any statistically significant differences between the two groups, regarding quality of view, ease of endoscopy, and pain and anxiety scores. The authors concluded that lignocaine was not able to reduce pain and anxiety any more than decongestant alone. They also suggested that the bitter taste and numbing of the patient's throat may be more unpleasant than the endoscopy itself.

The issue of bad taste leading to an increase in general unpleasantness for the patient has also been addressed by Georgalas *et al.*[9] in a prospective, double-blinded, randomised, controlled trial. Ninety-eight patients were randomly allocated to receive co-phenylcaine ($n = 51$) or normal saline ($n = 47$) prior to flexible nasendoscopy. Univariate parametric analysis (*t*-test assuming equal variances for pain and overall discomfort, and *t*-test with unequal variances for taste) showed no significant difference between the two groups for the overall unpleasantness of the procedure and for pain, and it showed significantly increased discomfort related to taste unpleasantness in the co-phenylcaine group ($t = 3.9$, $p < 0.001$).

Cain *et al.*,[10] too, concluded from their findings that there was no significant advantage in using co-phenylcaine over no nasal preparation before flexible nasendoscopy. Ninety patients undergoing flexible nasendoscopy were randomised (double-blinded) to one of three treatment arms: co-phenylcaine, placebo (normal saline) or nothing. The mean VAS scores (on a zero to 10 point scale) for pain in the three groups were 1.7, 2.2 and 2.1, respectively, whilst those for overall discomfort were 2.0, 2.4 and 1.9, respectively. These authors also showed that dispensing with a nasal preparation did not significantly affect the quality of view or ease of examination from the operator's perspective.

Is cocaine superior to other local anaesthetic–vasoconstrictor preparations? Cocaine as a topical preparation has been compared with saline placebo (Singh *et al.*)[11] and also with vasoconstrictor (Johnson *et al.*).[12] Singh *et al.* randomised 60 patients to receive 5 per cent cocaine sprayed in one nostril and saline in the other; half had cocaine in the left nostril, half in the right. Patients graded discomfort or pain on a five-point scoring system, with zero indicating no discomfort and five severe pain. Pain scores of zero to two were recorded for 51/60 (85 per cent) of the nostrils sprayed with cocaine and 50/60 (83 per cent) of those sprayed with saline. A similar split was found for pain scores between three and five, which were recorded for nine of 60 (15 per cent) nostrils sprayed with cocaine and 10/60 (16 per cent) of those sprayed with saline. This difference was not statistically significant ($p = 0.25$). Johnson *et al.* used slightly different methodology, in that 15 patients underwent flexible nasendoscopy on three separate occasions, each time receiving a different nasal preparation (4 per cent cocaine, 0.05 per cent oxymetazoline or saline). Patients graded pain on a scale of one (minimal discomfort) to five (severe discomfort). Mean scores for the three preparations were 2.0, 3.4 and 2.8, respectively. This study found the nasal discomfort scores for cocaine to be statistically significantly lower compared both with oxymetazoline and with saline ($p < 0.005$ and $p < 0.05$, respectively).

Cocaine has been compared with a preparation of local anaesthetic (4 per cent lignocaine) plus vasoconstrictor (1/1000 adrenaline) by Kasemsuwan and Griffiths.[13] Twenty-nine patients had 0.5 ml of 10 per cent cocaine applied to the right nostril and 0.5 ml of lignocaine plus adrenaline applied to the left nostril. Patients then underwent flexible nasendoscopy and graded the discomfort levels as mild, moderate or severe. Seventeen (85 per cent) of the subjects and nine (100 per cent) of the control group reported only mild discomfort for either preparation. Three (15 per cent) felt moderate discomfort with cocaine, two (10 per cent) moderate discomfort with lignocaine plus adrenaline, and only one subject felt severe pain, with lignocaine plus adrenaline.

Finally, cocaine and co-phenylcaine have been directly compared in two studies by Smith and Rockley[14] and Lennox *et al.*[15] The latter randomised 80 consecutive patients to receive either 10 per cent cocaine or co-phenylcaine prior to flexible nasendoscopy, then measured peak nasal inspiratory flow (PNIF) and asked the patients to score the painfulness of the procedure using a zero to 10 point VAS. Mean PNIF increased from 140 to 168 l/min with co-phenylcaine and from 122 to 150 l/min with cocaine ($p = 0.01$). There was no significant difference in pain scores between the two preparations. The authors concluded that co-phenylcaine had comparable local anaesthetic and vasoconstrictor properties to cocaine. Smith and Rockley enrolled 84 patients and applied either cocaine 10 per cent or co-phenylcaine topically in a double-blinded manner. Both solutions produced an increase in PNIF, from 134 to 164 l/min with cocaine and from 151 to 184 l/min with co-phenylcaine. Whilst these increases were statistically significant ($p < 0.0001$), again, there was no significant difference between the two agents.

Are there any advantages in lubricating the endoscope? Less research has been done on establishing the effectiveness of lubrication as regards either comfort for the patient or ease of passage for the endoscopist. Two studies by Pothier *et al.* have attempted to clarify these issues. The first was a prospective, single-blinded, randomised, controlled trial with 150 consecutive patients recruited.[16] One group underwent flexible nasendoscopy with no lubrication applied, while the other was examined with an endoscope coated with a lubricant (KY jelly, Johnson & Johnson, Maidenhead, UK). Patients were asked to

score the procedure using a zero to 100 VAS for both discomfort and pain. The nasendoscopist was also asked to score the procedure using a zero to 100 VAS for difficulty in endoscope passage and loss of image. There was no statistically significant difference between the two groups regarding discomfort or pain. The ease of passing the lubricated nasendoscope was significantly greater than that for the non-lubricated one ($p = 0.003$); however, image quality was significantly worse with lubrication ($p = 0.008$).

The second study by Pothier *et al.*[17] compared water as a lubricant to KY jelly, and again included 150 prospectively randomised patients undergoing flexible nasendoscopy with no topical preparation to the nose. In this study, patients were only asked to score pain, using the same VAS as the earlier study; the endoscopist was again asked to score ease of endoscope passage and loss of image clarity. Once again, there was no statistically significant difference in the pain levels reported by the two groups ($p = 0.96$). The group in which water was used as a lubricant were significantly easier to endoscope ($p = 0.03$) and had less loss of image clarity ($p < 0.001$).

Effect of endosheaths. Winter *et al.*[18] prospectively randomised 100 consecutive patients receiving flexible nasendoscopy to undergo the procedure with either a sheathed or an unsheathed endoscope, operated by a single clinician. All patients received 0.5 per cent lidocaine prior to the procedure. Patients scored the procedure on a 10 point VAS for comfort, whilst the clinician, on the same VAS, scored ease of endoscope passage and image quality. A number of procedures were video-recorded, and a consultant otolaryngologist assessed these images and scored them on a 100 mm VAS. There was no statistically significant difference in patient comfort between the two groups. Both the blinded and non-blinded clinicians found no difference between the images obtained from the two groups ($p = 0.787$).

Vaz *et al.*[19] assessed the optical quality of the nasendoscope, with and without an endosheath. Nine clinicians were initially shown a target through the nasendoscope, once sheathed and once unsheathed. They were then shown 10 views of the target through the endoscope, with the order in which the endoscope was sheathed or unsheathed being randomly assigned. The observing clinician was blinded to this procedure. There was no apparent difference in the spectrum of light emitted from the nasendoscope, with or without the sheath. However, the clinicians recorded significantly more correct answers than would be expected by chance ($p = 0.0005$).

Rigid nasendoscopy

Local anaesthetics and vasoconstrictors. Walshe *et al.*[20] randomised 33 patients to receive co-phenylcaine in one nostril and Brompton's solution in the other, prior to rigid nasendoscopy. In this study, Brompton's solution contained 10 per cent cocaine and an undisclosed quantity of adrenaline. Patients scored pain on a zero to 10 VAS, whilst the endoscopist marked the ease of view by scoring either two (full view), one (partial view) or zero (no view). There was no statistically significant difference between the two agents in either respect ($p = 0.6$ for pain and $p = 0.78$ for ease of view).

Douglas *et al.*[21] randomised 30 patients into two groups; the first received co-phenylcaine prior to rigid nasendoscopy and then two weeks later received 5 per cent lignocaine before a repeat endoscopy, while the second group received the sprays in the reverse order. The surgeon performing the rigid nasendoscopy scored the ease and quality of view of the upper airway on a zero to 100 VAS; the patients scored the procedure for pain on a similar VAS. Surgeons found the ease of obtaining a view significantly greater with co-phenylcaine than with lignocaine (mean VAS scores 84 and 77, respectively; $p < 0.01$). The pain scores were not significantly different between the two preparations (means 2.3 and 1.8, respectively). Interestingly, 19 out of the 30 patients recorded no pain on the VAS, although the authors felt that this was due to them using the manufacturer's recommended dosage of five sprays per nostril (not the two sprays used in some other studies).

Does timing of administration make a difference? A third study by Pothier *et al.*[22] has addressed the issue of timing of topical preparation prior to rigid nasendoscopy. A prospective, single-blinded trial randomised 50 consecutive patients to receive co-phenylcaine either one minute or 10 minutes prior to rigid nasendoscopy. After the procedure, patients were asked to score both pain and discomfort on a zero to 100 VAS, whilst the examiner scored ease of endoscopy and image clarity on a similar VAS. Results showed less discomfort when the nose was anaesthetised 10 minutes as opposed to one minute before the procedure (medians 39 and eight, respectively; $p = 0.02$), and less pain also (medians 29 and four, respectively; $p = 0.018$). The endoscopists also found it easier to pass the endoscope 10 minutes rather than one minute after co-phenylcaine preparation ($p = 0.001$), and there was also an improvement in image clarity after 10 minute preparation ($p < 0.001$).

Discussion

Cocaine is now seldom used to prepare the nose prior to nasendoscopy; it has been shown to be very similar in effect to co-phenylcaine but is considerably more toxic.

It has been shown that patients' discomfort on nasendoscopy is little improved by local anaesthetic. Studies have also shown that the overall experience of nasendoscopy is worse with the application of topical anaesthetic, largely due to the unpleasant taste.

Studies measuring patients' discomfort have also shown that lignocaine, when applied topically to the nose, is no better than a topically applied vasoconstrictor. Lignocaine and vasoconstrictors have also been shown to be no better than placebo, both individually and when combined (in the form of co-phenylcaine).

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Lubrication of the nasendoscope, prior to nasendoscopy, with a water-based lubricant has been shown to improve the ability of the endoscopist to insert the nasendoscope into the nose, but at the expense of image clarity. However, application of lubrication to the nasendoscope made no difference to the patient's experience of discomfort or pain.

Substituting water for a water-based lubricant has been shown to improve the nasendoscope image clarity, as well as to improve the ability of the endoscopist to pass the nasendoscope into the nose.

The effects of using an endosheath to cover a flexible nasendoscope are controversial, with the available studies differing in their conclusions.

No studies have assessed whether the use of topical decongestants or local anaesthetic is necessary for rigid nasendoscopy, However, it has been shown that topical vasoconstrictors improve the view of the nasal cavity. It has also been shown that application of a combination of vasoconstrictor and local anaesthetic 10 minutes before the procedure, rather than one minute before, results in a better experience for both the patient and the endoscopist.

Conclusions

The evidence suggests that local anaesthetic is not beneficial when performing flexible nasendoscopy, neither alone nor in combination with a vasoconstrictor.

Water is better than lubricant for ease of passing a flexible endoscope, and gives a superior optical outcome.

Further research needs to be done on the use of endosheaths for flexible and rigid nasendoscopy.

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