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Comparison of nebulized and sprayed topical anaesthesia for fibreoptic bronchoscopy

D. Keane, W.T. McNicholas*

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ABSTRACT: We compared the efficacy of nebulized (N) and sprayed (S) topical anaesthesia prior to fibreoptic bronchoscopy in a blinded study involving 54 patients aged 57±26 yrs (mean±SD). Cough frequency, recorded on cassette tape, was the index of efficacy. All patients received 100 mg lignocaine sprayed into the pharynx, or nebulized in random order prior to bronchoscopy, and all received intravenous diazepam sedation. Each patient received a further 100 mg of lignocaine solution through the bronchoscope onto the vocal cords and major airways during the procedure.

No significant difference was found in overall cough frequency between N and S groups (8.7±6.9 coughs·min^{-1} N *vs* 10.5±6.0 S), and cough frequency was also similar between N and S during the periods above and below the vocal cords. Furthermore, no differences were found in cough frequency between N and S among smokers, patients with asthma and COPD, and patients who had a biopsy procedure, although a trend was seen in all comparisons towards a lower cough frequency with the nebulized route. Most patients in the S group found the spray unpleasant, whereas only one in the N group complained.

We conclude that nebulized and sprayed lignocaine have similar efficacy as topical anaesthetics in fibreoptic bronchoscopy, but patient preference favours the nebulized route.

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Dept of Respiratory Medicine
University College,
*St. Vincent's Hospital
Dublin
Ireland

Correspondence: W. McNicholas
Dept of Respiratory Medicine
St. Vincent's Hospital
Elm Park, Dublin 4
Ireland

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Adequate topical anaesthesia of the upper airway, larynx and tracheobronchial tree is an important prerequisite to the successful performance of fibreoptic bronchoscopy under local anaesthesia. Techniques of topical anesthesia include direct instillation of anesthetic solution into the upper airway, transtracheal injection, local nerve block, and anaesthetic spray [1, 2]. The most common upper airway anaesthetic procedure in current use is a metered dose lignocaine spray, given in repeated dosages immediately prior to the procedure [3, 4].

In recent years, inhalation of nebulized lignocaine solution has been proposed as an effective means of achieving adequate anaesthesia of the upper and lower airways [5] and has the potential advantage of widespread dispersal of the anaesthetic throughout the airways [6], which might be expected to result in better patient tolerance of the procedure. We performed an observer blind comparison of nebulized and sprayed lignocaine prior to fibreoptic bronchoscopy, using cough frequency during the procedure as the method of assessing efficacy.

Methods

Fifty four patients undergoing elective fibreoptic bronchoscopy were randomly assigned to receive either nebulized (30 patients) or sprayed (24 patients) lignocaine. Patient details are given in table 1. All patients received 100 mg lignocaine, either by nebulizer (N) or spray (S). Nebulized patients received 2.5 ml of 4% lignocaine (Xylocaine; Astra Pharmaceuticals Ltd.) by mask at an airflow of 8 $l \cdot min^{-1}$, delivered *via* an Acorn nebulizer, which took an average of 10 mins to administer. Sprayed patients received 100 mg of lignocaine sprayed directly into the oropharynx and hypopharynx using a standard spray device which delivered 10 mg per spray (Xylocaine; Astra Pharmaceuticals Ltd.).

Table 1. – Clinical details of patients

	Nebulized	Sprayed
Age (mean±SD)	57±22	60±28
Sex - Male/Female	15/15	10/14
Smokers	9	11
Asthma/COPD	13	14
Suspected pathology:		
Neoplasm	17	17
Infection	4	3
Other	9	4
Biopsy during bronchoscopy	16	21

All other medications given before and during the procedure were similar in both groups. All patients received a premedication of intramuscular atropine 0.6 mg. No opiates were used, and all patients were sedated immediately prior to the procedure with intravenous diazepam 10–20 mg, the precise dose being calculated according to age, body weight and underlying respiratory status. During the procedure all patients had a further 100 mg lignocaine instilled through the bronchoscope according to a standard protocol of 40 mg on the vocal cords, 20 mg in the trachea, and a further 20 mg into each main bronchus. Thus patients in both groups received the same total dose of 200 mg lignocaine.

A transnasal approach was feasible in 50 patients, but 4 patients (two from each group) required a transoral approach, because of nasal obstruction. Each patient had 5 mls (containing lignocaine 100 mg) of lubricant gel (Instillagel; Farco Pharma GmbH) instilled locally into one nostril prior to passage of the bronchoscope. All bronchoscopies were performed by the same investigator (WMcN), who was unaware of the technique of anaesthetic premedication at the time of the procedure. Coughs were recorded through a microphone, suspended over the patient, onto a cassette tape recorder. All tapes were subsequently analyzed by the second investigator, who was also unaware of the method of anaesthesia. Cough frequency (coughs·min^{-1}) was counted in each patient, and was analyzed for the periods before and after passage of the instrument through the vocal cords. Data were analyzed using the Student's t-test for unpaired data, and a p value <5% was regarded as significant.

Results

Patients in each group were well matched in terms of age, sex, smoking history and suspected underlying pathology (table 1). No significant differences were found in overall cough frequency between the two groups (table 2), and cough frequency was also similar between the two groups during the period before and after passage of the bronchoscope through the vocal cords.

Table 2. – Analysis of cough frequency (coughs·min^{-1}).

	Nebulized	Sprayed
Overall	8.7±6.9	10.5±6.0
Phase 1	12.9±8.2	15.6±10.9
Phase 2	7.2±7.3	8.5±4.7
Smokers	7.4±4.3	11.1±6.5
Airflow obstruction	8.3±7.0	11.3±7.1
Biopsy procedure	9.1±6.4	10.6±6.2

Data are presented as mean±SD. Phase 1 period prior to and including passage through the vocal cords: Phase 2 remainder of the bronchoscopy. Cough frequency (overall) is separately represented for those patients in each group who smoked, had underlying obstructive airways disease, and/or had a biopsy procedure performed.

When the data were further analyzed separately for smokers, for patients with obstructive airways disease, and for those in whom a biopsy procedure was performed, no significant differences were found between the two groups. All analyses did, however, show some trend towards less cough with nebulized anaesthesia (table 2).

Patients were asked to comment on each form of anaesthesia. Almost all patients complained of the bitter taste of the sprayed anaesthetic and also of a tendency to gag during administration. Only one patient found the nebulized route unpleasant and complained of a smothering sensation.

Discussion

The main conclusion of this study is that nebulized and sprayed anaesthesia are of equal efficacy in suppressing cough during fibreoptic bronchoscopy. The method of intravenous sedation used has an excellent amnesic effect, and no patient in either group could recall the actual procedure itself. The choice of cough frequency as the method of assessing efficacy, however, has the advantage that the method should be largely independent of the patient's level of consciousness during the procedure.

The finding of better patient acceptance of the nebulized as compared to sprayed anaesthesia is in agreement with the previous findings of PALVA *et al*, who also compared nebulized and sprayed lignocaine prior to bronchoscopy [6]. These findings differ somewhat from those of KIRKPATRICK *et al* [4], who reported that a majority of normal subjects found nebulized lignocaine unpleasant. These authors did not, however, compare nebulized with sprayed lignocaine, and their study was not performed in conjunction with endoscopy. The better patient acceptance of nebulized as compared to sprayed anaesthesia presumably relates to the different formulation and concentration of lignocaine in the two routes. The lignocaine spray used also contains cetylpridinium, flavour, and propellant, whereas the nebulizer solution contains methylparaben and sodium hydroxide in addition to lignocaine.

A further potential advantage of the nebulized route is that it can be administered in the endoscopy waiting area by paramedical staff, thus reducing the time required by the endoscopist to prepare the patient for bronchoscopy. In some centres, where sprayed anaesthesia is also delivered by paramedical staff, such a timesaving may not be found. GOVE *et al* [7] have, however, previously demonstrated that nebulized anaesthesia resulted in a shorter bronchoscopy duration than sprayed anaesthesia.

Absorption of some portion of the anaesthetic is likely with both methods of delivery. LELORIER *et al* [8] found peak serum levels up to 3.79 μg·ml^{-1} in patients undergoing bronchoscopy who received total doses of lignocaine spray ranging from 400–1000 mg, and peak levels occurred 30–60 min after administering the anaesthetic. PATTERSON *et al* [9] found

similar peak serum levels, but reported a wide variability in the time of peak lignocaine levels, varying from 5–65 min after administration of the anaesthetic. In contrast, PALVA *et al* [6] found that peak serum lignocaine levels occured between 6 and 8 min after completing nebulized anaesthesia, and that serum levels up to 3.28 $\mu g \cdot ml^{-1}$ could be found following a standard dose of 400 mg lignocaine by ultrasonic nebulization. This difference in timing of peak serum lignocaine levels is of clinical relevance to bronchoscopy, since peak lignocaine levels could occur after the patient had left the bronchoscopy suite following lignocaine spray, but not following lignocaine nebulization.

The above studies [6, 8, 9] found peak serum lignocaine levels well below the potential toxic threshold of 6 $\mu g \cdot ml^{-1}$ [8], but the delayed peak level seen with sprayed anaesthesia may be of clinical relevance in patients with impaired clearance of the drug, such as those with hepatic or cardiac failure, where peak serum levels are likely to be highest. Toxic serum levels have been reported in patients with liver disease [9].

Our choice of benzodiazepine alone as sedation prior to bronchoscopy differs from the majority approach previously reported in a survey of U.K. bronchoscopists [3], where opiates were the agents most widely used, either alone, or in combination with a benzodiazepine. The recent introduction of the benzodiazepine reversal agent, flumazenil, together with new short acting benzodiazepines, however, make sole use of benzodiazepines more attractive. This attraction is emphasised by the fact that none of our patients could remember the actual bronchoscopy itself, whereas they could remember the nebulized or sprayed anaesthesia, which was given prior to sedation.

A practical advantage of the sole use of intravenous benzodiazepine sedation immediately prior to bronchoscopy is that this practice simplifies the transport of patients from the ward area to the bronchoscopy suite, since patients given an opiate some time before the procedure require transport by bed/trolley, whereas patients given no sedation can walk.

We conclude therefore that the clinical efficacy of nebulized and sprayed anaesthesia are similar, but the nebulized route has significant advantages in terms of better patient acceptance, and less potential for delayed toxic effects.

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