



## A comparative evaluation of three different methods used to achieve local anaesthesia for fiberoptic guided intubation under sedation

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### Abstract

**Background and Aim:** *Fiberoptic intubation is the gold standard technique for airway management in patients with difficult standard direct laryngoscopy, performed either awake or under sedation. The aim of sedation is to facilitate patient comfort and satisfaction, and to alleviate patient anxiety. Aim of this prospective randomized comparative study was to compare three different methods of topical anaesthesia under sedation, namely transcrioid injection, spray as you go, nebulisation of lignocaine with respect to intubation grading scale, severity scale, intubation time and complications in patients undergoing intubation.*

**Methodology:** *Ninety ASA grade 1 or 2 patients of either sex aged 20-50 yrs scheduled for elective surgery were equally divided into three groups (n=30), received 0.1% xylometazoline in both nostrils then 10% lignocaine by spraying the nares and posterior pharyngeal wall. Thereafter patients received 4ml of 4% lignocaine either by transcrioid injection in group A, or via spray as you go method in group B, or via nebulization 15 min prior to procedure in group C. Intubation time, intubation grading scale, grading of overall intubating condition, cough counts, stridor, extra local anaesthetic requirement and were recorded. Patients were asked to score the procedure using severity score. Patients were monitored continuously for vital parameters blood pressure, SpO<sub>2</sub>, ECG, pulse rate.*

**Results:** *Group A patients showed better severity scale (p<0.01), shorter intubation time, lower incidence of coughing and stridor, didnot require extra dose of local anaesthetic and were maintained PR, BP, SpO<sub>2</sub>. The endoscopist intubation grading scale and grading of overall intubating conditions were better in Group A (p<0.01) than Group B&C.*

**Conclusion:** *In conclusion transcrioid injection of local anaesthetic was safe, providing effective local anaesthesia and was preferred by both patient and endoscopist.*

**Keywords:** *Fiberoptic intubation, lignocaine.*

### Introduction

Fiberoptic intubation of trachea is an established technique for obtaining a secure airway in patients

for whom standard direct laryngoscopy is difficult or unsafe<sup>1</sup>. The principal patient's complains in fiberoptic intubation include sensation of

instrumentation through nose and larynx, pain and coughing while endoscopist ascribe difficulty in laryngeal visualization to secretion and inadequate local anaesthesia. The technical success of fiberoptic intubation and patient's tolerance depends on both operator experience as well as effectiveness of topical anaesthesia and obtundation of pharyngeal, laryngeal and tracheobronchial reflexes<sup>2,3</sup>.

Complete airway anaesthesia increases patient comfort and probability of success, decreases the response to intubation. Prior to intubation, while the upper airway is commonly anaesthetized by local lignocaine spray or gel, the modalities to anaesthetize larynx and lower respiratory tract include injection via fiberoptic bronchoscope, transcrioid injection and delivery via a nebulizer<sup>4-6</sup>.

Fiberoptic intubation can be performed either awake or under sedation. The aim of sedation is to facilitate patient comfort and satisfaction, and to alleviate patient anxiety, cough and to reduce complication<sup>7,8</sup>. Combined opiates and benzodiazepines or propofol are frequently used to achieve sedation during fiberoptic intubation. Due to rapid onset and amnestic properties propofol is an appealing agent for procedural sedation<sup>9,10</sup>.

Aim of our prospective randomized comparative study was to compare three different methods of topical anaesthesia under sedation, namely transcrioid injection, spray as you go, nebulization of lignocaine. The primary objective was to compare the intubation time of the techniques, complications and the secondary objectives were to assess the quality of airway anaesthesia, patient comfort.

### Material & Methods

After approval from ethical committee 90 adult patients of both sexes aged 20–60 years with ASA status I–II undergoing surgery under general anaesthesia, were randomly selected. Patients who did not provide consent, had an allergy to any study drug, pregnant, asthmatic, epileptic,

hemodynamically unstable or deranged coagulation profile were excluded from the study. After preanaesthesia checkup and a written informed consent, all patients were kept nil by mouth on the night before surgery. Routine investigations like hemogram, blood sugar, blood urea, serum creatinine, bleeding time, clotting time, chest x-ray, ECG were done.

In theatre all patients received injection glycopyrrolate 5ug/kg IV. 0.1% xylometazoline 2 drops were instilled in both nostrils. After checking patencies both nasal passages were lubricated with 2 ml of 2% lignocaine jelly. Posterior pharynx was anaesthetized with 4 sprays of 10% lignocaine and the patients were asked to gargle with the excess solution trickling down the throat. An intravenous access was established and monitoring instituted with pulse oximetry, ECG, SpO<sub>2</sub>, and noninvasive blood pressure.

The next step was aimed at achieving laryngo-tracheal anaesthesia prior to intubation. Group A (n=30) patients had 4 ml of 4% lignocaine injected through the cricothyroid membrane. Group B (n=30) patients had the intubating fibroscope inserted transnasally until just above the cords and 4 ml of 4% lignocaine was administered through suction channel. This was done in two steps: the first onto the vocal cords and the second into the trachea during inspiration. Group C (n=30) patients had 4 ml of 4% lignocaine delivered by nebulizer started 20 minutes before the procedure and took 10 minutes to complete. In each group additional 1-2 ml aliquots of 4% lignocaine was administered if required. After passing through the vocal cords the fibroscope was advanced until tracheal rings were in view, injection propofol 1 mg/kg IV was given to all patients and endotracheal tube was advanced.

Vital parameters were observed at 1,3,5,10 min interval. Intubation time was defined as the time from passing the flexible fiberoptic bronchoscope tip through the nostril to the first reading obtained by the capnograph after endotracheal intubation. Intubation grading scale by observer incidence of

cough, stridor, extra lignocaine dose were noted. Severity scale by patients recorded after procedure.

Intubation grading scale (observer)

0 = No coughing/gagging in response to intubation

1 = Mild coughing/gagging that did not hinder intubation

2 = Moderate coughing/gagging that interfered minimally with intubation

3 = Severe coughing/gagging that made intubation difficult

4 = Severe coughing/gagging, required additional local anaesthesia and/or other change in technique.

Severity scale (reported by patient)

Not unpleasant 1

Uncomfortable 2

Unpleasant 3

Most unpleasant 4

Intolerable 5

General anesthesia was achieved with propofol (2 mg/kg IV) and vecuronium bromide (0.1 mg/kg IV).

**Results**

Results were expressed as mean ± standard deviation. ANOVA test for demographic data, and hemodynamic parameters and Chi square test was applied for nonparametric data like intubation grading scale, severity scale, grading of overall intubating condition. Sample size was calculated to be 30 patients in each group to demonstrate a 40% difference in intubation time with a power of 0.8 and type 1 error of 0.05. To allow for study error and attrition, a total of 90 patients were included in this study.

All patients were demographically similar. Base line pulse was 78.40 ± 4.61 bpm in Group A, 80.73 ± 6.00 bpm in Group B and 78.53 ± 6.00 bpm in Group C. The maximum rise in pulse rate in Group A was 89.36± 6.24 bpm, in Group B was 101.10± 12.09 bpm and in Group C was 97.40± 12.23 bpm.

Base line MAP was 92.73± 5.64 mmHg in Group A, 94.46± 5.82 mmHg in Group B and 92.33± 7.32 mmHg in Group C. In Group A the MAP increased up to 99.33± 6.33 mmHg, in Group B was 107.42± 8.95 mmHg and in Group C was 102.70± 8.11 mmHg. During procedure heart rate and blood pressure were more stable in Group A as compared to Group B and Group C (Difference of mean>CD).

Intubation was successful in all patients. The mean intubation time for Group A (70.72±14.32 s) was shorter than that for Group B (127.83±33.30 s) & Group C (89.83±25.34 s) (P=0.029).

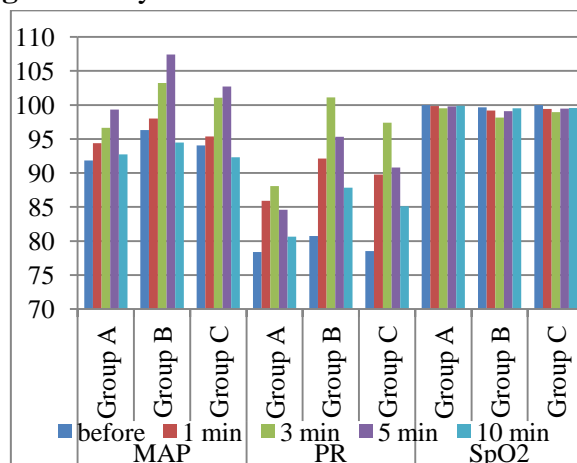
Ease of intubation was significantly better in Group A as compared to Group B and Group C. Grade 0 is showed by 18,4,6 patients in Group A,B,C respectively(p<0.01) showed by intubation grading scale. According to severity scale patients were more comfortable during procedure in Group A than Group C & Group B. Grade 1 is showed by 20,6,6 in Group A,B,C respectively(p < 0.01).

Mean cough count were significantly lower in Group A(11) than Group B(26) & Group C(23). Stridor was seen more in Group B(8) than Group C(2) & Group A(0). 1 patient in Group B and 1 patient in Group C required additional lignocaine during procedure.

**Table 1** Demographic data

Parameter	Group A	Group B	Group C
Age (Years)	36.13±11.23	36.20±9.20	33.20±9.23
Weight (Kg)	68.10±7.02	69.93±7.22	69.10±5.79

**Fig 1** hemodynamic variables



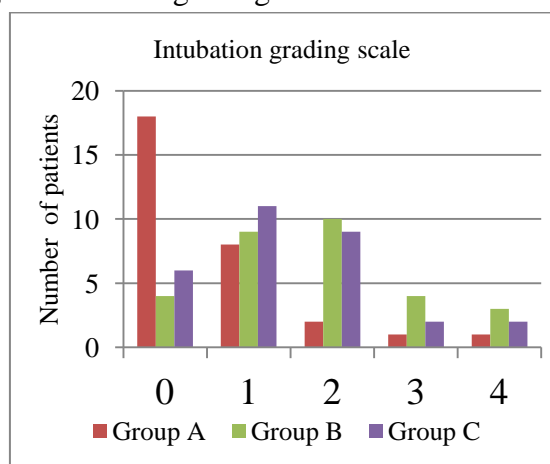
**Table 2** Intubation time

	Group A	Group B	Group C
Intubation Time (Seconds)	70.72±14.32	127.83±33.30	89.83±25.34

**Table 3** Intubation grading scale

Intubation grading scale	Group A (number of patients)	Group B (number of patients)	Group C (number of patients)
0	18	4	6
1	8	9	11
2	2	10	9
3	1	4	2
4	1	3	2

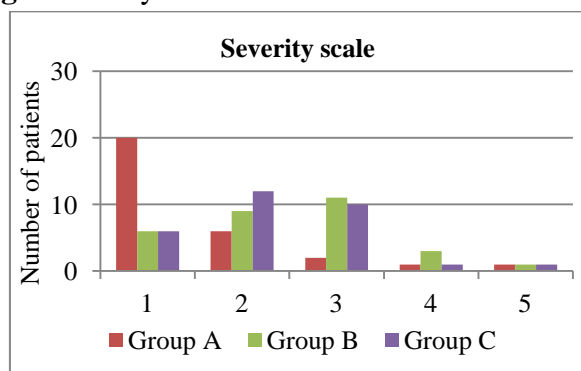
**Fig 2** Intubation grading scale



**Table 4** Severity scale

Severity Scale	Group A (number of patients)	Group B (number of patients)	Group C (number of patients)
1	20	6	6
2	6	9	12
3	2	11	10
4	1	3	1
5	1	1	1

**Fig 3** Severity scale



**Table 5** Complications

	Group A (number of patients)	Group B (number of patients)	Group C (number of patients)
Cough count	11	26	23
stridor	0	8	2
extra lignocaine	0	1	1

**Discussion**

Fiberoptic bronchoscope was designed and developed in 1966. The first fiberoptic nasotracheal intubation was performed with a fiberoptic choledoscope in a patient with still's disease<sup>11</sup>. The use of fiberoscope was expanded to various aspects of airway management such as confirmation of proper placement of single and double lumen tubes, evaluation of airway pathology preoperatively and in intensive care unit, difficult airway management in both adults and children. Lignocaine is most commonly used local anaesthetic agent for fiberoptic intubation and has a wide margin of safety and absorption from respiratory mucosa is known to be rapid<sup>12</sup>. The present work was carried out as a comparative, randomized, prospective study to evaluate and compare the three different methods used to achieve local anaesthesia for fiberoptic intubation under sedation in terms of subjective assessment by patients and endoscopist using intubation grading scale, severity scale, grading of overall intubating condition and objective measurement of cough, stridor, intubation time, any other complications and extra lignocaine required during procedure. In our study hemodynamic variables were comparable before the procedure. During procedure heart rate and blood pressure were more stable in Group A as compared to Group B and Group C (Difference of mean>CD). Difference between Group B and Group C was insignificant during entire procedure (Difference of mean<CD). SpO<sub>2</sub> was comparable between the groups. Kundra et al<sup>[13]</sup> reported the increase in heart rate and mean arterial pressure was significantly greater in the nebulization group than in the combined regional block group.

In our study, all patients were intubated successfully. The mean intubation time was significantly shorter in the transcrucoid group; similar to the findings of Gupta et al<sup>[5]</sup>, who reported a mean intubation time of 123±46.7s in a nerve block group and 200.4±72.4s in a nebulization group (P=0.047). Alka Chandra<sup>[14]</sup> et al in 2011 found that mean time to reach carina was significantly lesser in transcrucoid group (57.33±12.98s) as compared to spray as you go group (79.33±22.35s) during fiberoptic bronchoscopy (p<0.02). However, Reasoner et al<sup>[15]</sup> found no significant difference in intubation time between nerve block and topical anesthesia groups.

In our study, ease of intubation was better in transcrucoid group compared with other groups, similar to the studies of Webb et al.<sup>[4]</sup>, Sethi et al.<sup>[16]</sup>. However, Reasoner et al.<sup>[15]</sup> and Gupta et al.<sup>[5]</sup> found no significant difference in intubating conditions between groups. It should be noted that scale for evaluating intubating conditions was different in previous studies, so we could not directly compare their intubating conditions with those of our study.

Quality of anaesthesia was significantly better in Group A as evidenced by significantly higher patients (76.6%) showed procedure was not unpleasant (Grade 1). Similar to our study Graham et al<sup>[2]</sup> reported that the transtracheal injection of cocaine provided significantly superior patient comfort and less coughing episodes as compared with rest of the techniques. Mathur P et al<sup>[17]</sup> found that intubating conditions for nerve block group were better than nebulization group (p=0.001). Patient comfort assessed by cough severity (p=0.001) and intubation comfort scores (p=0.012), was higher in nerve block group than in nebulization group. However Lt Col Sethi et al<sup>[16]</sup> found that quality of laryngeal anaesthesia was significantly better in spray as you go method as evidenced by lower severity scale (p<0.05). Grading of overall intubating condition was better for spray as you go group (p<0.01).

The control of coughing is of paramount importance for the quality of fiberoptic intubation. We recorded cough counts during the procedure as the mean count per procedure. The total number of coughs was significantly less in transcrucoid group<sup>(11)</sup>. Stridor was uncommon during nasal passage of fiberoscope in all groups. However after intubation 8 patients in Group B and 2 patients in Group C developed stridor, which is a reflection of inadequate laryngotracheal anaesthesia with “spray as you go” technique. Extra lignocaine was required in one patient in Group B and one patient in Group C. Other complications like local swelling, hematoma, subcutaneous emphysema were not seen in any of three groups similar to studies of Webb et al<sup>[4]</sup>.

Similar to our study Alka Chandra et al<sup>[14]</sup> in 2011 found that the number of coughs in transtracheal group (4±0.98) was significantly lesser than spray as you go group (4.9±1.24) during fiberoptic bronchoscopy (p<0.05). Graham et al<sup>[2]</sup> found that transcrucoid group produced less cough count (p<0.01) and easier tracheal intubation.

However Lt Col Sethi et al<sup>[16]</sup> found that total number of coughs were significantly less in spray as you go group (12 patients) compared with transcrucoid (18 patients) and nebulization group (all patients) (p < 0.05).

### Conclusion

Fiberoptic guided intubation under sedation with transcrucoid injection of lignocaine can be recommended as a safe method of anaesthetizing the respiratory mucosa, which is well tolerated by patients and provides acceptable conditions for the endoscopist with negligible side effects as compared to nebulization of lignocaine or spray as you go method.

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