

ORIGINAL ARTICLES

COMPARISON OF THE EFFICACY OF TOTAL LARYNGEAL ANESTHESIA AND SIMPLE LOCAL ANESTHESIA DURING AWAKE FIBEROPTIC BRONCHOSCOPY

Asif Ullah Khan, Muhammad Khalid Azam Khan, Abdul Latif Khattak, Shazia Naz*, Syed Karamat Hussain Shah Bukhari, Muhammad Tahir Ibrahim

Combined Military Hospital Lahore/National University of Medical Sciences (NUMS) Pakistan, *Rangers Teaching Hospital, Lahore Pakistan

ABSTRACT

Objective: To compare the efficacy of total laryngeal anesthesia and simple local anesthesia during awake fiberoptic bronchoscopy.

Study Design: Quasi-experimental study.

Place and Duration of Study: Department of Pulmonology, Combined Military Hospital Lahore, from Jan to Jul 2020.

Methodology: A total of 70 patients, who were undergoing fiberoptic bronchoscopy were divided into two groups. Group-I patients were given topical anesthesia with 2% Lignocaine while group-II patients, in addition to topical Lignocaine, had 2% Lignocaine injected into bilateral internal laryngeal nerves for total laryngeal anesthesia. Assessment of efficacy of anesthesia was evaluated by Reasoner scale.

Results: In group-I, 26 (74.28%) patients showed mild or moderate cough and gagging during stage-1. Fifteen (42.85%) patients showed moderate cough and gagging that interfered with the procedure during stage-2 and 19 (54.28%) patients showed mild cough or gagging that did not interfere with the procedure in stage-3. In group-II, 17 (48.57%) patients exhibited mild cough or gagging during stage-1. Sixteen (45.71%) exhibited mild cough or gagging that did not interfere with the procedure during stage-2 with all the patients showing either no cough or mild cough and gagging that did not interfere with the procedure during stage-3. More patients of group-II 32 (91.42%) agreed to a repeat test if required medically as compared to group-I 28 (80%).

Conclusion: Patients undergoing fiberoptic bronchoscopy who underwent total laryngeal anesthesia and sedation, in addition to topical anesthesia experienced less cough and gagging than those receiving only local anesthesia.

Keywords: Awake bronchoscopy, Fiberoptic, Reasoner Scale, Sedation, Topical Anesthesia, Total Laryngeal Anesthesia.

How to Cite This Article: Khan AU, Khan MKA, Khattak AL, Naz S, Bukhari SKHS, Ibrahim MT. Comparison of The Efficacy of Total Laryngeal Anesthesia and Simple Local Anesthesia During Awake Fiberoptic Bronchoscopy. *Pak Armed Forces Med J* 2021; 71(6): 1911-1915.

Doi: <https://doi.org/10.51253/pafmj.v6i6.5476>

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INTRODUCTION

Flexible bronchoscopy is an essential procedure that is commonly employed in pulmonology to directly visualize the morphology, location and extent of tracheal and bronchial lesions as well as to carry out biopsy or cytological examinations.¹ It is essential for evaluation of pulmonary diseases, its diagnosis and management and carries good diagnostic yield with minimal inherent risk.² The working channel of the bronchoscope allows the placement of accessories that can be utilized in multiple diagnostic and therapeutic procedures.³ Therefore, it is critical for the evaluation of airway dynamics, visualization and management of obstructive lesions, getting fluid sample, obtaining endobronchial/transbronchial biopsy, suctioning, re-inflation, therapeutic wash out, application of medication

and guiding for difficult intubation.⁴ Owing to the benefits of enhanced safety, heightened brightness, better visualization and elevated patient satisfaction, this investigation is being increasingly adopted in clinical practice. However, it is an invasive procedure and may lead to various complications such as hemorrhage, cough, bronchospasm, pain and abnormal blood pressure amongst others.¹

For patient comfort and ease of procedure, awake bronchoscopy is performed with sufficient anesthesia. Anesthesia for effective bronchoscopy presents a significant ordeal as both the anesthetist and operator share the same working space i.e. the airway.⁵ Successful anesthesia must ideally satisfy four conditions, i.e. provide adequate anesthesia, must be safe, comfortable for the patient and easy for the physician. The procedure becomes even more easy and pleasant with sedation, which results in amnesia for the procedure that wears off in a short-duration so that the patient can be discharged from the recovery after few hours.

Correspondence: Dr Asif Ullah Khan, Department of Medicine, Combined Military Hospital Lahore Pakistan

Received: 13 Oct 2020; revision received: 15 Feb 2021; accepted: 23 Feb 2021

Since awake bronchoscopy may result in physical and psychological discomfort for the patient, a variety of techniques have been devised for airway anesthesia. Local anesthesia is preferable to general anesthesia because bronchoscopy is usually an outpatient procedure. The cricothyroid injection, nebulization, "spray as you go-technique" and applying topical lidocaine by means of a lollipop are some of the various methods of application of anesthesia. Topical anesthesia administered through nebulizer is usually associated with reduced dose of anesthetic agent compared with application through syringe.^{6,7} Nasal approach to the introduction of the scope also requires additional topical anesthetic application along with a vasoconstrictor to the nasal mucosa. Adequate sedation is also important especially in a patient who is apprehensive.⁸ Patients undergoing bronchoscopy who have been sedated have less cough, and experience less discomfort than those receiving only local anesthesia. Due to amnesia for the procedure, it becomes more acceptable for the patient and they agree to a repeat procedure, if required.⁹

Local anesthesia is in the form of topical spray of the pharyngeal and laryngeal mucosa in combination with "spray as you go" instillation of a local anesthetic on the vocal cords. Others favour the total laryngeal anesthesia that includes, in addition to topical spray, nerve block of the bilateral internal laryngeal nerves. It is postulated that this technique leads to lesser incidence of pain, cough and asphyxiation.⁵

More than half of the patients undergoing bronchoscopy are anxious at the beginning of the procedure and a quarter would have rather preferred general anesthesia, with only 67.5% agreeing to a repeat procedure if necessary, under the same conditions.¹⁰

Limited data has been reported in Pakistan. The purpose of this study was to compare the efficacy of total laryngeal anesthesia and simple local anesthesia during awake flexible bronchoscopy during different stages using the Reasoners scale. This would help to decide the more effective technique that should be adopted to administer anesthesia during awake fiberoptic bronchoscopy resulting in increased patient comfort and satisfaction.

METHODOLOGY

This quasi-experimental study was conducted at the department of pulmonology, Combined Military Hospital Lahore, from January to July 2020. The WHO sample size calculator was used for sample size estimation. The grade-2 level frequencies for two groups by

Sharma *et al.*¹¹ were used for calculating the sample size. Using a 5% significance level, with 95% power and anticipated population proportions of 0.067 and 0.333, a sample size of 56 was calculated.

Inclusion Criteria: The patients of either gender between 20-60 years of age, with a GCS of 15/15 and maintaining SpO₂ >90% on room air were included in the study.

Exclusion Criteria: Disoriented and unconscious patients, patients not maintaining oxygen saturation on room air, dyspneic patients with dyspnea grade >2 or patients with active hemoptysis were not included in the study.

In the present study, a total of 70 patients, undergoing fiberoptic bronchoscopy for various reasons, were selected by non-probability consecutive sampling technique. The study was approved by Ethical Committee. The procedure was carefully explained to the patients and informed consent was taken.

The selected patients were conveniently assigned to either of the two groups of 35 each. Group-I included those patients who were given topical anesthesia with 2% Lignocaine 1 ml sprayed into the throat by an atomizer, 1 ml was injected through the cricothyroid membrane and 1 ml was sprayed on the vocal cords by the "spray as you go" technique. Patients of group-II were topically anesthetized by 1ml 2% Lignocaine sprayed through the atomizer into the throat, 1 ml injected through the cricothyroid membrane and 5ml injected on each side around the internal laryngeal nerve by the landmark technique near the greater cornu of the hyoid bone.

Patient of each group also received viscous lignocaine gel applied to the nostril, which was the route of the procedure as well as 3 mg intravenous dornicum for sedation just before starting the procedure. During the procedure, assessment of quality of anesthesia was assessed by a 5 point scale, named as Reasoner scale 12,13:0- no coughing or gagging, 1-mild coughing or gagging that did not hinder the procedure, 2- moderate coughing and gagging that interfered with the procedure, 3- severe coughing and gagging that made the procedure difficult, 4-very severe coughing and gagging that required additional local anesthesia and delayed the procedure.

The scale was assessed at three stages of the procedure: stage-1= from the point of entering the nasal cavity to the visibility of vocal cords, stage-2 = from the point of visibility of the vocal cords to the point of

traversing them, stage-3 = from the point of traversing the vocal cords to the end of the procedure. After the procedure, the patients were kept in a recovery room for one hour after which the patients were asked whether they would be willing to do a repeat procedure if it was medically required.

All the data was entered and analyzed using Statistical Package for the social sciences (SPSS) version 20. Mean and standard deviation was used to describe the quantitative variables such as age. Frequencies and percentages were used to describe the categorical variables, such as gender, different Reasoner scale scores in both groups. The frequency of Reasoner scale scores in both groups at each of the three stages were compared by applying the chi-squared test. The *p*-value of ≤ 0.05 was considered significant.

RESULTS

During the study, a total of 70 patients were divided into two equal groups and were administered either topical anesthesia alone or total laryngeal anesthesia which included nerve block as well. Out of these 70 patients, 39 were male (55.7%) while 31 were female (44.3%). The age of the patients ranged from 23-55 years old with mean age of 36.2 years \pm 3.21 years.

At stage-I a greater number of patients from group-I reported a Reasoner score 2 (n=12, 43.29%) and score 3 (n=5, 14.29%), as compared to patients from group-II (score 2: n=8, 22.86%; score 3: n=0; *p*=0.031) (Table-I).

Table-I: Reasoner scale scores for both groups at stage-I (n=70).

	Group I	Group II	<i>p</i> -value
Score 0	4 (11.4%)	10 (28.57%)	0.031
Score 1	14 (40%)	17 (48.57%)	
Score 2	12 (34.29%)	8 (22.86%)	
Score 3	5 (14.29%)	-	

Similarly at stage-II a significantly greater proportion of patients from group I had a Reasoner score 2 (n=15, 42.86%) and score 3 (n=10, 28.57%), as compared to group-II (score 2: n=14, 40%; score 3: n=1, 2.86%; *p*=0.011) (Table-II).

Table-II: Reasoner scale scores for both groups at stage-II (n=70).

	Group I	Group II	<i>p</i> -value
Score 0	1 (2.86%)	4 (11.4%)	0.011
Score 1	9 (25.71%)	16 (45.71%)	
Score 2	15 (42.86%)	14 (40%)	
Score 3	10 (28.57%)	1 (2.86%)	

A similar trend was observed at stage-III as well. A significantly greater proportion of patients from group I had a Reasoner score 2 (n=9, 25.71%) and score

3 (n=1, 2.86%), as compared to group II (Score 2: n=0; Score 3: n=0; *p*=0.001) (Table-III).

Table-III: Reasoner scale scores for both groups at stage-II (n=70).

	Group I	Group II	<i>p</i> -value
Score 0	6 (17.14%)	17 (48.57%)	0.001
Score 1	19 (54.29%)	18 (51.43%)	
Score 2	9 (25.71%)	-	
Score 3	1 (2.86%)	-	

DISCUSSION

Fiberoptic bronchoscopy is a critical investigation for the diagnostic work-up and management of patients with an array of acute or chronic pulmonary diseases.¹² It provides superior visualization of the vocal cords and may be performed under local anesthesia and conscious sedation, and with the assistance of small tools like forceps can be utilized to obtain biopsies.¹³ Patient comfort is most important factor during bronchoscopy as incomplete topical anesthesia and poor cough control may lead to operator discontent and substandard procedure.¹⁴

In this study, we compared the efficacy of two different techniques used for providing anesthesia to patients undergoing fiberoptic bronchoscopy, in different stages, using Reasoner’s scale. Group-I patients were given topical lignocaine through the spray-as-you-go technique. From the nasal cavity to the vocal cords, patients in group-I reported having significantly higher scores on the Reasoner scale, with 12 patients (34.29%) having moderate coughing and five patients (14.29%) having severe coughing. In comparison, only eight patients (22.86%) in group-II had moderate coughing while none reported to have severe coughing (*p*=0.031). From the point of visibility of the vocal cords to the point of traversing them, the majority of patients in group-I had either moderate (n=15, 42.86%) or severe cough (10, 28.57%). This was significantly higher than the number of patients in group II having moderate (n=14, 40%) or severe cough (n=1, 2.86%; *p*=0.011).

From this point till the end of the procedure, a significantly greater number in group A had either moderate (n=9, 25.71%) or severe cough (n=1, 2.86%) as compared to no patients in group B having moderate or severe cough (*p*=0.001).

Group-I patients, in addition to the topical Lignocaine through the ‘spray-as-you-go’ technique, were also administered bilateral nerve block. More patients of group-II (n=32, 91.42%) agreed to a repeat test if required medically as compared to group-I (n=28, 80%). A study by Gotta *et al*,¹⁵ on anesthesia of the upper air-

way using local anesthesia and superior laryngeal nerve block showed that combination of nerve block and topical anesthesia provided excellent conditions were patient cooperation was required.

The results in our study showed that the patients were more comfortable undergoing fiberoptic bronchoscopy once they were administered topical anesthesia along with nerve blocks, exhibiting lesser side effects like coughing or gagging with smoother procedure due to lesser interferences.

Other international studies performed in this regard have yielded similar results. Madan *et al.*¹⁶ compared the cricothyroid injection with 'spray-as-you-go' methods for Lidocaine administration during flexible bronchoscopy, primarily the cough count from introduction of bronchoscope till it reaches carina and operator-rated overall procedure satisfaction on a visual analogue scale (VAS) between groups. Previous literature concluded that cricothyroid Lidocaine administration caused reduced cough and enhanced operator-rated procedure satisfaction during bronchoscopy, at a lesser cumulative Lidocaine dose.^{17,18}

A single-blinded study was carried out by Hamad *et al.*,¹⁹ to investigate the effect of trans-cricoid lignocaine injection with emphasis to ease of procedure and frequency of cough. The study declared that trans-cricoid Lignocaine resulted in marked improvement in the perceived ease of procedure and frequency of coughing during the procedure thus proving a safe adjunct for anesthesia in flexible bronchoscopy. Similarly, in a study by Webb *et al.*,²⁰ to compare trans-cricoid instillation of lignocaine vs "spray as you go" anesthesia technique for fiberoptic bronchoscopy, they found the trans-cricoid injection method to be more effective than the "spray as you go" method. Despite the fact that lower dose of Lignocaine was used, the duration of the bronchoscopy was shorter and the cough rate was lower, the rate being 3-56 coughs/min compared with 5-89 in the spray group ($t=2-24$, $p<0.05$). Similarly, study by Chandra *et al.*,¹⁷ found that patients given trans-cricoid anesthesia experienced lesser number of coughs than spray as you go technique during fiberoptic bronchoscopy ($p<0.05$). However, study by Sethi *et al.*,¹⁸ reported that the number of coughs to be lower in spray as you go technique as compared to trans-cricoid anesthesia ($p<0.05$).

In a study by Sharma *et al.*, on comparison of effectiveness of three different methods of local anesthesia administration where group A was given a cricothyroid injection, group B was given spray as you go anes-

thesia and group C was given nebulizer anesthesia; they found that ease of intubation ($p<0.01$) was significantly better in group A and mean cough count was significantly lower in group A compared to other groups.¹¹ In a similar study, Mathur *et al.*,²¹ reported that nerve block anesthesia for endoscopy yields better results than nebulization in terms of intubating conditions ($p=0.001$), patients comfort assessed by cough severity ($p=0.001$) and intubation comfort score ($p=0.012$). Conversely, Sethi *et al.*,¹⁸ found that quality of laryngeal anaesthesia to be significantly better in 'spray as you go' method as evidenced by lower severity scale ($p<0.01$).

LIMITATION OF STUDY

This study included a relatively small sample of only 70 patients. In addition, this was a single center study. Future studies should include a larger sample size and collect data from multiple centers. Local and regional studies on this topic are scarce and no previous local study could be found despite repeated searches. Our study can serve as a pilot study in this regard. Comparison of efficacy of various anesthetic agents or the same agent in different concentrations are further avenues that need to be explored however, they are beyond the scope of this study.

CONCLUSION

Patients undergoing fiberoptic bronchoscopy, who were administered total laryngeal anesthesia and sedation, in addition to topical anesthesia experienced less cough and gagging than those receiving only local anesthesia. Thus, bilateral nerve block should also be carried as an adjunct to topical spray-as-you-go method before fiberoptic bronchoscopy to make the patients comfortable and the procedure smooth without any interruptions.

Conflict of Interest: None.

Authors' Contribution

AUK: Conception of Design, data collection, MKAK: Proof reading and editing of manuscript, ALK: Data analysis and collection, writing of manuscript, SKHS: Overall supervision of the study, MTI: Data collection and analysis.

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Total Laryngeal Anesthesia

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