Section: Respiratory Medicine

Original Research Article

A STUDY ON ASSESSMENT OF ROLE OF EARLY BRONCHOSCOPY IN PATIENTS PRESENTED WITH ACUTE EXACERBATION OF COPD AT FORTIS HOSPITAL, NEW DELHI

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Abstract

Background: Chronic obstructive pulmonary disease (COPD) is characterized by persistent, progressive airflow limitation associated with enhanced inflammatory responses of the airways and lungs. Conventional phlegm-dispelling methods of COPD can alleviate the symptoms to some extent, but cannot fully drain the sputum and their curative effects are slow. Bronchoalveolar lavage is widely used in clinical practice, especially in patients with airway mucus hypersecretion, which can quickly and effectively remove the airway mucus and improve the airway ventilation. The aim of this study was to assess the therapeutic utility of fiberoptic bronchoscopy as an add-on therapy in patients with COPD with acute exacerbation. **Materials and Methods:** It is an analytical cross-sectional study involving 50 mild to moderate COPD patients, who were randomly distributed equally into Group 1 and Group 2. Group 1 was subjected to medical therapy according to GOLD recommendation of management plus ads on fiberoptic bronchoscopy after 72hrs of admission for bronchoalveolar lavage and Group 2 were given only medical therapy according to GOLD recommendation. **Result:** Cough score, sputum score, dyspnoea score and CAT score improved after bronchoscopy in group 1. It was observed that the CAT scores have significantly come down from a very high impact level to low level after bronchoscopy in group 1. **Conclusion:** Significant improvement in the outcome of patients who underwent bronchoscopy was noticed in terms of improved cough score, sputum score, dyspnea and CAT score.

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is characterized by persistent, progressive airflow limitation associated with enhanced inflammatory responses of the airways and lungs.[1] Its natural history is characterized by frequent exacerbations with an increase of cough, purulent sputum production, and dyspnea. COPD is one of the major causes of mortality and morbidity across the globe.[2] It is also an important economic burden on the patient and the health care infrastructure of the country.[3] Globally, COPD prevalence in 2020 was estimated to be 10.6%, which translates to 480 million cases, which are projected to increase by 112 million to a total of 592 million by 2050.[4] Non-invasive positive pressure ventilation (NPPV) is the treatment of choice for acute respiratory failure (ARF) in the case of exacerbations in COPD. Compared with standard medical therapy, it reduces the rate of endotracheal intubation (ETI) and the associated complications, as well as the mortality and length of stay in hospital.[5-7] At present, the conventional phlegm-dispelling methods of COPD include anti-inflammatory, phlegm-eliminating and antispasmodic drug therapies, and physical therapies of aerosol inhalation and high-frequency chest wall oscillation. Although these methods can alleviate

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the symptoms to some extent, they cannot fully drain the sputum and the curative effects are slow. Therefore, the clearance of airway secretions is critical in the treatment of COPD. Bronchoalveolar lavage is widely used in clinical practice, especially in patients with airway mucus hypersecretion, which can quickly and effectively remove the airway mucus, improve the airway ventilation and reduce the airway inflammation, thus improving the clinical effect on COPD. There are limited studies that assesses therapeutic utility of fiberoptic bronchoscopy as add-on therapy in patients with COPD with acute exacerbation.[8-9] Hence, our aim is to determine the role of fiberoptic bronchoscopy as an adjuvant to bronchoalveolar lavage in patients with acute exacerbation of COPD.

MATERIALS AND METHODS

It is a prospective analytical study conducted in department of Pulmonary and Sleep Medicine, Fortis Hospital, Vasant Kunj, New Delhi between November 2018 to October 2019. Total 50 mild to moderate COPD patients at their baseline assessment according to Global Initiative for Chronic Obstructive Lung Disease (GOLD) 2019 edition and admitted to hospital with acute exacerbation were selected. Sample size was calculated assuming the mean PH at 24 hours in group I (medical therapy plus add on fiberoptic bronchoscopy) as 7.28 with a standard deviation of 0.08 and in group II (Only medical therapy) as 7.22 with a standard deviations of 0.07, power 80% and 5% alpha error. The following formula was used for sample size calculation.[10]

$N = \frac{(u+v)^2(\sigma_1^2+\sigma_0^2)}{(\mu_1-\mu_0)^2}$ where,

N	= Sample size
$\mu_1 - \mu_0$	=Difference between the means (7.28 and 7.22)
σ_1, σ_0	=Standard deviations (0.08 and 0.07)
u	=one-sided percentage point of the normal distribution corresponding to 100 % – the power If the power is = 80%, u =0.84
v	=Percentage point of the normal distribution corresponding to the (two-sided) significance level for significance level = 5%, *v* = 1.96

As per the above-mentioned calculation, the required sample size was 23 in each group. To account for the non-participation rate of about 10%, another 2 subjects was be added to the sample. Hence the final required sample size was 25 subjects in each group. Patients were divided randomly into two groups. In Group 1 patients, we performed Fiberoptic Video Bronchoscopy for suctioning of retained secretions from airways along with ongoing medical management. In Group 2 patients were continued on ongoing medical management only. All patients included in the study were assessed on Day 0, Day 3, Day 5 and Day 7 for cough score, sputum score, dyspnoea score and CAT score.

Ethical considerations:

The study was approved by the institutional human ethical committee. Informed written consent was obtained from all the study participants and only those participants willing to sign the informed consent were included in the study. The risk and benefits involved in the study and the voluntary nature of participation were explained to the participants before obtaining consent. The confidentiality of the study participants was maintained.

Statistical methods:

Cough score, Sputum score, Dysponea score and CAT score were considered as primary outcome variables. Study groups (Group 1 Vs. Group 2) were considered as Primary explanatory variables. Descriptive analysis was carried out by mean and standard deviation for quantitative variables, frequency, and proportion for categorical variables. Non normally distributed quantitative variables were summarized by the median and interquartile range.

RESULTS

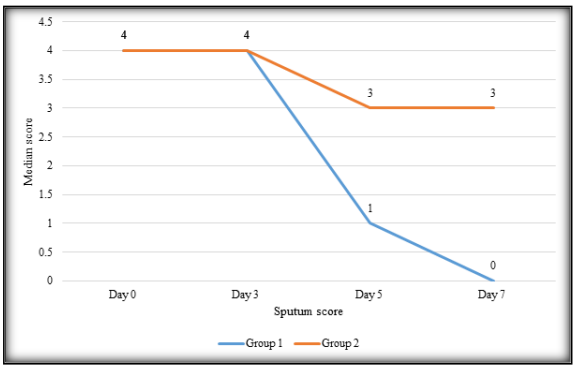

Figure 1: Trend line diagram of sputum score between the two groups at different follow-up time periods (N=50)

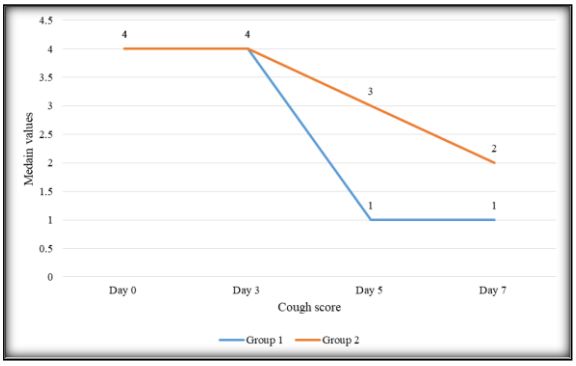

Figure 2: Trend line diagram of cough score between the two groups at different follow-up time periods (N=50)

The mean age of study participants was 63.16 ± 5.84 in group 1 and 65.12 ± 7.26 in another group (group

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2). Among group 1, 12 (48%) were male, whereas in group 2, 20(80%) were male. The median sputum score at day 0 and day 3 was similar (4) in both groups, but it declined sharply to 1 and then 0 on day 5 and 7 respectively in group 1, whereas it was 3 on day 5 and 7 in group 2. The median cough sore on day 0 was 4 (IQR 4,5) in group 1 and it was 4 (IQR 4,4) in group 2. The median cough score day 3 was 4 (IQR 3.5,5) in group 1 and it was 4 (IQR 4,4) in group 2. This score on day 5 was 1 (IQR 1,2) in group 1 and 3 (IQR 2.5,4) in group 2. The median cough score on day 7 was 1 (IQR 0,1) in group 1 and it was 2 (IQR 1.5,3) in group 2. The difference in the cough score at day 5 and day 7 between study groups was statistically significant (P-value <0.05). The median dyspnea score on day 0 was 4 (IQR 4, 5) in group 1 and it was 4 (IQR 3,4) in group 2. The median dyspnoea score on day 3 was 4 (IQR 4, 5) in group 1 and it was 4 (IQR 69 3,4) in group 2. The median dyspnoea score on day 5 reduced to 2 (IQR 1,2.5) in group 1 while it reduced to 3 (IQR 2,3) in group 2. The median dyspnoea score on day 7 further reduced to 1 (IQR 0,1) in group 1 and it was 2 (IQR 2,2.5) in group 2. The difference in the 72 dyspnoea score at day 5 and day 7 between study groups was statistically significant (P-value <0.001). The median CAT score on day 0 was 30 (IQR28,33) and 30 (IQR 28,32) in group 1 and group 2 respectively. The median CAT score on day 3 reduced to 28 (IQR 26,29) and 26 76 (IQR 26,28) in group 1 and group 2 respectively. The median CAT score on day 5 further declined to 8 (IQR 7,10) in group 1 and 20 (IQR 18,20) in group 2. The median CAT score on day 7 reached to 4 (IQR 2,5) in group 1 and 14 (IQR 12,16) in group 2. The difference in the CAT score at day 5 and day 7 between study groups was statistically significant (P-value <0.001). Average duaration of stay in hospital was 5 days in group 1 (interventional group), while it was 7 days in group 2 having medical management only.

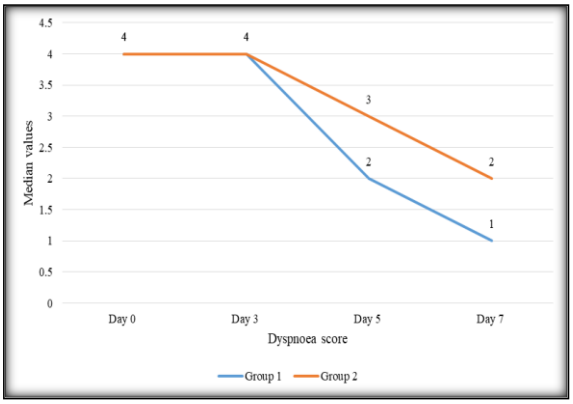

Figure 3: Trend line diagram of dyspnoea score between the two groups at different follow-up time periods (N=50)

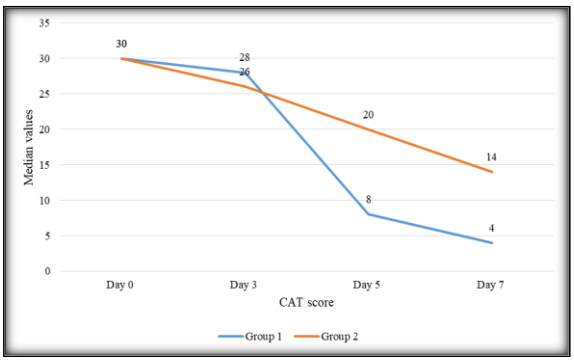

Figure 4: Trend line diagram of CAT score between the two groups at different follow-up time periods (N=50)

Table 1: Comparison of history of smoking and biomass fuel between study groups (N=50)

History of Smoking	Study groups		Chi-square	P-value
	Group 1 (N=25)	Group 2 (N=25)		
Yes	13 (52%)	13 (52%)	0.000	1.000
No	12 (48%)	12 (48%)		
History of Bio-Mass Fuel Exposure	**Study groups**		**Chi-square**	**P-value**
	Group 1 (N=25)	**Group 2 (N=25)**		
Yes	7 (28%)	3 (12%)	2.000	0.157
No	18 (72%)	22 (88%)		

DISCUSSION

Therapy can reduce COPD symptoms, frequency and severity of exacerbations, and improve health status and exercise tolerance.[11] For those maximized on pharmacotherapy with continued dyspnea or exacerbations or both, emerging bronchoscopic procedures may offer additional therapy in select patients.[12] Clearance of airway secretions is critical in the treatment of COPD and bronchoalveolar lavage using a bronchoscope for COPD patients complicated with respiratory failure can effectively improve the oxygenation of patients, and benefit treatment of the disease.[13] The current study aims to study the role of bronchoscopy in patients of COPD presented with acute exacerbation and do not improve after 72 hours of standard medical management according to Global Initiative of Chronic Obstructive Lung Disease (GOLD) strategy.

The mean age was 63.16 ± 5.84 in group 1 and it was 65.12 ± 7.26 in group 2. The difference in the age between the two groups was statistically not significant. Among group 1, 48% were male and 52% were female. Group 2 is predominantly male with 80% and 20% female. Mohamed, AS et al,[8] had a total of 40 patients divided into two groups

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each of 20 in their study with 65% male and 35% female patients, with a mean age of 47.55±11.56 years, a younger age range compared to our study. Song, RR et al,[9] study group had 54 in group A (bronchoscopy group) and 52 in group B (non-bronchoscopy) with ages in the range of 67.67±5.64 and 68.27±6.06 respectively with predominantly male patients in both groups. The age range is slightly older compared to our study population. In both groups, 52% had a history of smoking. In group 1, 28% had exposure to bio-mass fuel and in group 2, 12% were exposed to biomass fuel. The median cough score on day 0 and day 3 was 4 in both groups. After bronchoscopy on day 4 in group 1, the cough score went down to 1 on day 5 and day 7. It was 3 on day 5 in group 2 and 2 on day 7. There was a significant improvement in cough score among group 1 patient after the use of bronchoscopy. The median sputum score on day 0 and day 3 was 4 in both groups. After bronchoscopy use in group 1 on day 4, the median sputum score on day 5 was 1 in groups 1 and 3 in group 2. The median sputum score on day 7 was 0 in group 1 and 3 in group 2. The difference in the sputum score at day 5 and day 7 after bronchoscopy in group 1 on day 4 was statistically significant. The median dyspnoea score on day 0 and day 3 was 4 in both groups. The median dyspnoea score on day 5 was 2 in group 1 after bronchoscopy and it was 3 in group 2. The median dyspnoea score on day 7 was 1 in group 1 and it was 2 in group 2. The difference in the dyspnoea score at day 5 and day 7 after bronchoscopy on day 4 was statistically significant. It was observed that cough score, sputum score, and dyspnoea improved after bronchoscopy in group. The median CAT score on day 0 was 30 in both groups and it was 28 in group 1 on days 3 and 26 in group 2. After bronchoscopy on day 4, the median CAT score on day 5 was 8 in group 1 whereas it was 20 in group 2. The median CAT score on day 7 was 4 in group 1 and it was 14 in group 2. The difference in the CAT score at day 5 and day 7 was statistically significant. CAT is not a diagnostic tool but it can identify the health impairment of COPD patients and is better correlated with disease progression. The impact level of COPD on health status as determined by the CAT score is as follows. If CAT score is <10, impact level is low, 10-20 medium, 21-30 high, >=30 very high. It is observed that the CAT scores have significantly come down from a very high impact level to low level after bronchoscopy in group 1. Significant improvement in the outcome of patients who underwent bronchoscopy was noticed in terms of improved cough score, sputum score, dyspnea score and CAT score and average duration of stay in hospital. A randomized control trial by Zhihao Qiao in 2018 revealed that bronchoscopic sputum suction group showed shorter time of invasive ventilation, total time of ventilation and hospital stay, lower reintubation rate, VAP 134incidence and fatality rate, and higher weaning success rate than the general sputum suction group (all P < .05).[14] Another study by Rong-Rong Song et al in 2012 observed that application of fiberoptic bronchoscopy in patients with acute exacerbation of COPD during sequential weaning of invasive-noninvasive mechanical ventilation is effective in ICU. It can decrease the duration of mechanical ventilation and the length of ICU stayreduce the rate of reventilation.[9] In patients with acute exacerbation of emphysema phenotype COPD who are initially ineffective, bronchoscopy, alveolar lavage, and anti-contamination brush sampling guide anti-infective treatment can improve patient ventilation, and reduce glucocorticoid consumption.[15]

CONCLUSION

Significant improvement in the outcome of patients who underwent bronchoscopy was noticed in terms of improved cough score, sputum score and dyspnea in the current study. It is observed that the CAT scores have significantly come down from a very high impact level to low level after bronchoscopy in group 1.

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