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Study of Non-invasive positive pressure ventilation for acute respiratory failure due to Noncystic fibrosis bronchiectasis in north Indian patients

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Abstract
Bronchiectasis is a chronic condition in which the walls of the bronchial tubes are enlarged and permanently damaged. The thickened and damaged air passage due to inflammation allows mucus & bacteria to develop in the lungs. Non-invasive positive pressure ventilation (NIPPV) is the technique of delivering mechanical ventilation without endotracheal intubation or tracheostomy. This is increasingly being utilised in both acute and chronic conditions.
This study was done to assess the effectiveness of NIV as a therapeutic modality in Noncystic Fibrosis Bronchiectasis and to assess various factors determining its outcome in north Indian population. The study is conducted in HIMS in Department of Critical care for the patients included for the bronchiectasis. The total 50 patients were enrolled into the study.
Non-invasive positive pressure ventilation is an important development in managing patients with acute respiratory failure. However, it should always be remembered that even in conditions in which NIPPV has strong evidence of success; patients should be monitored closely for signs of treatment failure and should be promptly intubated before a crisis develops.

Keywords: bronchiectasis, Non-invasive positive pressure ventilation, Non-cystic fibrosis etc.

Introduction

Bronchiectasis is a condition wherein the bronchial tubes of the lungs are enlarged and permanently damaged, giving way for excess mucus and bacteria to build up in the lungs, causing infections. Bronchiectasis is a chronic condition in which the walls of the bronchial tubes are enlarged and permanently damaged. The thickened and damaged air passage due to inflammation allows mucus & bacteria to develop in the lungs. Eventually, the air passage gets infected & blocked. People who suffer from bronchiectasis will have periodic episodes of bad health characterised by temporary exacerbations; the period when breathing becomes difficult and lung health deteriorates. The disease is generally not curable. However, it can be treated and controlled so that the oxygen supply to the body is not cut off during an acute attack [1].

The severity of bronchiectasis in a patient may increase over a few weeks, whereas in some cases, the symptoms may quickly worsen in a matter of few days.

The most common cause of bronchiectasis is an infection in your lungs. This includes viral infections like the flu and bacterial infections like staphyloccal infection or tuberculosis. Additional causes of bronchiectasis include [2]:

- inhaling foreign objects or food
- breathing in stomach acid
- cystic fibrosis
- GERD (gastro-esophageal reflux disease)
- weakness in your immune system (e.g. HIV, uncontrolled diabetes)

Cystic fibrosis is a hereditary disease where mucus builds up in the lungs and other organs like the stomach. This results in repeated infections.

Chronic obstructive pulmonary diseases (COPD), chronic bronchitis, and emphysema also obstruct the lungs and raise your risk for bronchiectasis.

Bronchiectasis is a disease in which there is permanent enlargement of parts of the airways of the lung. Symptoms typically include a chronic cough with mucus production. Other symptoms include shortness of breath, coughing up blood, and chest pain. Wheezing and nail clubbing may also occur. Those with the disease often get frequent lung infections [3].

Bronchiectasis may result from a number of infective and acquired causes, including pneumonia, tuberculosis, immune system problems, and cystic fibrosis. Cystic fibrosis eventually results in severe bronchiectasis in nearly all cases. The cause in 10–50% of those without cystic fibrosis is unknown. The mechanism of disease is breakdown of the airways due to an excessive inflammatory response. Involved airways (bronchi) become enlarged and thus less able to clear secretions. These secretions increase the amount of bacteria in the lungs, result in airway blockage and further breakdown of the airways [4]. It is classified as an obstructive lung disease, along with chronic obstructive pulmonary disease and asthma. The diagnosis is suspected based on a person's symptoms and confirmed using computed tomography. Cultures of the mucus produced may be useful to determine treatment in those who have acute worsening and at least once a year [5].

Worsening may occur due to infection and in these cases antibiotics are recommended. Typical antibiotics used include amoxicillin, erythromycin, or doxycycline. Antibiotics may also be used to prevent worsening of disease. Airway clearance techniques, a type of physical therapy, are recommended. Medications to dilate the airways may be useful in some but the evidence is not very good. The use of inhaled steroids has not been found to be useful. Surgery,

while commonly done, has not been well studied. Lung transplantation may be an option in those with very severe disease. While the disease may cause significant health problems most people with the disease do well [6].

Non-invasive positive pressure ventilation (NIPPV) is the technique of delivering mechanical ventilation without endotracheal intubation or tracheostomy. This is increasingly being utilised in both acute and chronic conditions. Strong evidence supports the use of NIPPV for acute respiratory failure (ARF) to prevent endotracheal intubation (ETI) and to facilitate extubation in patients with acute exacerbations of chronic obstructive pulmonary disease, to avoid ETI in acute cardiogenic pulmonary oedema (ACPO), and in immunocompromised patients. Weaker evidence supports the use of NIPPV for patients with ARF due to asthma exacerbations, with postoperative ARF, pneumonia and acute lung injury/acute respiratory distress syndrome. NIPPV should be applied under close monitoring for signs of treatment failure and, in such cases, ETI should be promptly available. A trained team, at an appropriate location, with careful patient selection and optimal choice of devices can optimise the outcome of NIPPV.

This study was done to assess the effectiveness of NIV as a therapeutic modality in Noncystic Fibrosis Bronchiectasis and to assess various factors determining its outcome in north Indian population.

Methodology

The study is conducted in HIMS in Department of Critical care for the patients included for the bronchiectasis. The total 50 patients were enrolled into the study. All the patients are informed consents. All the patient's clinical history was collected.

Inclusion criteria

Patients positive for non-cystic fibrosis bronchiectasis.

Exclusion criteria

- Patients required for acute respiratory failure other than bronchiectasis.
- Patients who were admitted with ARF and required either Non-invasive Ventilation (NIV) or invasive mechanical ventilation (IMV)
- Patients having acute respiratory failure and managed with oxygen.

The diagnosis of bronchiectasis was based on computed tomographic scan of the thorax showing typical findings [13]. For etiology of bronchiectasis, all patients admitted under pulmonary medicine are routinely evaluated for ABPA, CF, connective tissue disease, mycobacterial infection, and immune deficiency.

At our centre, NIV is initiated using orofacial mask. We usually start NIV with inspiratory positive airway pressure (IPAP) of 8–10 cm of H2O and expiratory positive airway pressure of 4–6 cm of H2O. The patient is closely monitored for clinical stability/improvement, and IPAP is adjusted accordingly.

Results & discussion

The 50 patients referred for the bronchiectasis for acute respiratory failure were studied here. The total 41 patients were undergone for Non-invasive Ventilation (NIV) and 9 patients were undergone the Invasive Mechanical Ventilation (IMV).

Table 1

	Non-invasive Ventilation (NIV)	Invasive Mechanical Ventilation (IMV)
Number of Cases	41	9
Age (years)	32-61	34-64
Gender		
Male	30	8
Females	11	4
APACHE	8- 15	9 - 20
Associated COPD (no. of cases)	4	2
Reason for exacerbation, (no. of cases)		
Infective	30	8
Noninfective	11	4
Etiology, (no. of cases)		
Posttuberculosis	23	7
Idiopathic	8	2
ABPA	6	1
Immunodeficiency	4	1
Arterial blood gases at the time of admission:		
pH	7.21- -7.26	7.16-7.18
$PaCO_2$(mm Hg)	57- 95	61-102
PaO_2(mm Hg)	42-102	50-85
Bicarbonate(mm Hg)	24-36	22-35
Oxygen Saturation (%)	80-94	81-95
Days on Ventilation	0-3	2-10
Hospital Stay	6-10	5-11
Mortality Cases	5	2

Variables NIV (*n*=81) IMV (*n*=18) All patients (*n*=122) mean± SD 47.23±18.48 50.56±14.27 45.39±18.31

Our study results have shown that NIV as the "primary modality" of ventilator support is feasible for treatment of ARF among patients with non-CF bronchiectasis. The correction of various ABG parameters using NIV at various time intervals was comparable to that of IMV. Selection of mode of ventilator support during ARF among patients with structural lung disease is crucial for optimum outcome. For COPD, NIV remains the mode of the firstchoice. [7] Patients with bronchiectasis have similar clinical features as COPD, such as cough, breathlessness, and obstructive pattern onspirometry. Many of these patients develop hypoventilation and hypercapnic respiratory failure [8]. However, for management of ARF among patients with bronchiectasis NIV is not used routinely.

High rate of NIV use in our study was probably be due to two reasons. First, our hospital is a tertiary care centre and we have very good experience of NIV and Intensive Care Unit (ICU) backup, if required. Second, these patients had hypercapnic respiratory failure and there is enough evidence to support NIV use for correction of hypercapnia and respiratory acidosis [7, 9]. This might have led to use of NIV for bronchiectasis and respiratory failure. Studies have shown that insertion of endotracheal tube in patients with structural lung diseases such as bronchiectasis would result in complications [10]. The successful use of NIV as shown in this study highlights that in almost two-third of the patients with bronchiectasis and ARF the endotracheal intubation may be avoided. Phua *et al*. reported their experience with NIV for management of 31 patients of non-CF bronchiectasis with ARF [11]. One of the reasons for not using NIV in patients with bronchiectasis may be the presence of copious amount of sputum. Inability to handle respiratory secretions is one of the contraindications for NIV use. [7, 9] However, it should be noted that in this study none of the patients failed NIV due to excessive secretions. These results were consistent with the previous study in which also no patient failed NIV due to inability to handle respiratory secretions [11].

Conclusion

Non-invasive positive pressure ventilation is an important development in managing patients with acute respiratory failure. However, it should always be remembered that even in conditions in which NIPPV has strong evidence of success; patients should be monitored closely for signs of treatment failure and should be promptly intubated before a crisis develops.

References

1. https://www.philips.co.in/healthcare/philipshealthcareathome/respiratory-diseases/bronchiectasis.
2. https://www.apollohospitals.com/patient-care/health-and-lifestyle/diseases-and-conditions/bronhicectasis.
3. What Are the Signs and Symptoms of Bronchiectasis?. NHLBI. June 2, 2014. Archived from the original on 23 2016. Retrieved 10 August 2016.
4. McShane PJ, Naureckas ET, Tino G, Strek ME. Non-cystic fibrosis bronchiectasis. American Journal of Respiratory and Critical Care Medicine. 2013; 188(6): 647-56. doi:10.1164/rccm.201303-0411CI.PMID23898922.
5. Quality Standards for Clinically Significant Bronchiectasis in Adults. British Thoracic Society. July 2012. Archived from the original on. 2017. Retrieved 29 April 2017.
6. What Is Bronchiectasis? NHLBI. June 2, 2014. Archived from the original on, 2016. Retrieved 10 August 2016.
7. Bello G, De Pascale G, Antonelli M. Noninvasive ventilation. Clin Chest Med. 2016; 37:711-21.
8. Phua J, Ang YL, See KC, Mukhopadhyay A, Santiago EA, Dela Pena EG, *et al*. Noninvasive and invasive ventilation in acute respiratory failure associated with bronchiectasis. Intensive Care Med. 2010; 36:638-47.
9. Garpestad E, Brennan J, Hill NS. Noninvasive ventilation for critical care. Chest. 2007; 132:711-20.
10. Walaszek M, Kosiarska A, Gniadek A, Kolpa M, Wolk Z, Dobros W, *et al*. The risk factors for hospital-acquired pneumonia in the Intensive Care Unit. Przeglad epidemiologiczny. 2016; 70:15-20-107-110.
11. Phua J, Ang YL, See KC, Mukhopadhyay A, Santiago EA, Dela Pena EG, *et al*. Non-invasive and invasive ventilation in acute respiratory failure associated with bronchiectasis. Intensive Care Med. 2010; 36:638-47.