



The Egyptian Society of Chest Diseases and Tuberculosis
Egyptian Journal of Chest Diseases and Tuberculosis

www.elsevier.com/locate/ejcdt
www.sciencedirect.com



ORIGINAL ARTICLE

Impact of nitroglycerin infusion on weaning off hypertensive mechanically ventilated chronic obstructive pulmonary disease patients



M.S. Atta ^a, B.N. Mekhael ^b, A.M. Hassaan ^{b,*}

^a Department of Chest Diseases, Faculty of Medicine, Alexandria University, Egypt

^b Department of Critical Care Medicine, Faculty of Medicine, Alexandria University, Egypt

Received 7 June 2014; accepted 8 July 2014

Available online 27 August 2014

KEYWORDS

COPD;
GOLD;
MV;
Nitroglycerin;
SBT

Abstract *Introduction:* Mechanical ventilation (MV) weaning trial can be compared to a cardiac stress test where spontaneous ventilation is a form of an exercise and therefore hemodynamic compromise can occur during the weaning process in critically ill patients. The combined increase in arterial pressure and heart rate during unsuccessful weaning is quite suggestive of weaning failure of cardiac origin. Assessment and prediction of weaning failure from cardiac origin remain complicated in patients with chronic obstructive pulmonary disease (COPD). Recent data showed that COPD itself is a powerful independent risk factor for cardiovascular morbidity and mortality, suggesting that occult cardiac dysfunction could be frequent in patients with COPD. The immediate transition from positive pressure mechanical ventilation to spontaneous ventilation may generate significant cardiopulmonary alterations that are complex and mainly include the inspiratory fall in intrathoracic pressure, the increase in work of breathing, and the catecholamine discharge that occur during abrupt transfer from mechanical ventilation to spontaneous breathing. Therefore, it could be suggested that a treatment targeting the cardiovascular system decreasing the preload might help the heart to tolerate the critical period of weaning more effectively.

Methods: This study was carried on 60 adult male and female patients admitted to the Critical Care Medicine Departments in the Alexandria Main University Hospital and who fulfilled the diagnosis of acute exacerbation of COPD according to the Global initiative for chronic obstructive lung disease (GOLD) [1], and considered eligible for weaning after at least 24 h of invasive mechanical ventilation exhibiting systemic arterial hypertension during the start of spontaneous breathing trial. 30 of them were adult patients and served as the study group (Group I), and the other 30 were age-matched adults who served as the control group (Group II). Each group was subjected to spontaneous breathing trial (SBT) using a T-piece receiving FiO₂ the same as during mechanical ventilation. Control group underwent SBT alone while the nitroglycerin group underwent continuous nitroglycerin infusion started at the beginning of the SBT and titrated to maintain normal arterial

* Corresponding author.

E-mail addresses: dr_ahmedhassaan@yahoo.com,
dr_ahmedhassaan@hotmail.com (A.M. Hassaan).

Peer review under responsibility of The Egyptian Society of Chest Diseases and Tuberculosis.

<http://dx.doi.org/10.1016/j.ejcdt.2014.07.005>

0422-7638 © 2014 Production and hosting by Elsevier B.V. on behalf of The Egyptian Society of Chest Diseases and Tuberculosis.

Open access under [CC BY-NC-ND license](http://creativecommons.org/licenses/by-nc-nd/4.0/).

systolic blood pressure that is; 120–139 mmHg). Hemodynamic, oxygenation and respiratory measurements were performed on the start of SBT, and after a 2-h T-piece SBT.

Results: Compared to the start of SBT, systolic arterial blood pressure and mean arterial blood pressure decreased [from (Mean \pm SD) 150.33 \pm 14.26, 112.56 \pm 9.37 mmHg to 134.33 \pm 11.04, 92.78 \pm 5.81 mmHg, respectively] in the nitroglycerin group, while the opposite occurred in the control group as systolic arterial blood pressure and mean arterial blood pressure increased [from (Mean \pm SD) 144.67 \pm 13.58, 109.78 \pm 10.09 mmHg to 158.0 \pm 19.43, 114.73 \pm 10.82 mmHg, respectively]. Mixed central venous saturation ($S_{cv}O_2$) decreased significantly in the control group at the end of SBT [from (Mean \pm SD) 71.90 \pm 1.84 to 69.25 \pm 2.20%], while in the nitroglycerin group, $S_{cv}O_2$ did not change at the end in comparison to the start of SBT [from (Mean \pm SD) 71.63 \pm 1.75 to 71.12 \pm 1.65%]. Nitroglycerin infusion at the start of SBT enabled a successful weaning from mechanical ventilation in 90% of patients in comparison to a successful weaning from mechanical ventilation of only 63.3% in the control group.

Conclusions: Nitroglycerin infusion might facilitate the weaning off hypertensive COPD patients by alleviating the cardiovascular compromise occurring during liberation from MV.

© 2014 Production and hosting by Elsevier B.V. on behalf of The Egyptian Society of Chest Diseases and Tuberculosis. Open access under CC BY-NC-ND license.

Introduction

The worldwide chronic obstructive pulmonary disease (COPD) epidemic affects nearly 600 million people and accounts for more than 2.2 million deaths each year [1]. COPD is the fourth leading cause of death in the United States and is the only common chronic illness for which mortality rates continue to increase [2].

The Global Initiative for chronic obstructive lung disease (GOLD) defines COPD [3] as follows: “Chronic obstructive pulmonary disease (COPD) is a preventable and treatable disease with some significant extra-pulmonary effects that may contribute to the severity in individual patients. Its pulmonary component is characterized by airflow limitation that is not fully reversible. The airflow limitation is usually progressive and associated with an abnormal inflammatory response of the lungs to noxious particles or gases”.

Airflow obstruction makes COPD an even greater health burden because it independently contributes to the morbidity and mortality of coexisting chronic conditions, such as ischemic heart disease and heart failure [4]. Airflow obstruction and emphysema have been associated with impaired left ventricular filling [5].

Periods of acute worsening of this disease are termed as exacerbations. An exacerbation of COPD is defined as “an event in the nature course of the disease characterized by a change in the patient’s baseline dyspnea, cough and/or sputum that’s beyond normal day-to-day variation, is acute in onset, and may warrant a change in regular medication in a patient with underlying COPD” [3]. The principal identified causes of COPD exacerbations include bacterial [6], and viral infections [7], pollution events [8,9], cold weather [10], and interruption of regular treatment [11].

Chronic obstructive pulmonary disease (COPD) is a common co-morbidity in patients with heart failure, and vice versa “strengthens the hypothesis that pulmonary obstruction itself is a major risk factor for heart failure” [12]. The long-term risk of developing heart failure increased with reduced lung function as measured by forced expiratory volume (FEV1) by spirometry, findings which were not altered by age, prior heart disease, or cardiovascular risk factors (including smoking) [13].

Considerable negative intra-thoracic pressures developed at inspiration during airway obstruction or pulmonary dynamic hyperinflation or both increase venous return (that is, preload) and also effectively increase left ventricular after load [14,15]. Such increases may not be tolerated by spontaneously breathing patients with compromised heart function [14].

COPD is a powerful independent risk factor for cardiovascular morbidity and mortality, suggesting that occult cardiac dysfunction could be frequent in patients with COPD [16]. Weaning-induced acute cardiac dysfunction resulting in acute pulmonary congestion is a known cause or cofactor of weaning failure in predisposed COPD patients, particularly in those with pre-existing cardiac disease [17–20].

In COPD patients without obvious cardiac disease, a spontaneous breathing trial induced a significant left ventricular ejection fraction reduction not explained by a myocardial contractility decrease due to ischemia, thus implying a weaning-induced increase in the after load [21]. This increase in left ventricular after load should be higher in patients demonstrating systemic arterial hypertension, which is quite frequent in COPD patients during weaning failure [19,22].

Vasodilators decrease the pressure gradients for venous return and right and left ventricular ejection and can affect left ventricular performance in a manner similar to that of the increased intra-thoracic pressure [21]. Venous dilation reduces venous pressure and decreases ventricular preload. This reduces ventricular stress wall and oxygen demand by the heart, thereby enhancing the oxygen supply/demand ratio. A reduction in preload (reduced diastolic wall stress) also helps to improve subendocardial blood flow [23].

The efficacy of nitrates primarily arises from a decrease in left ventricular preload, manifested by a fall in pulmonary capillary wedge pressure, and from decreases in pulmonary artery, right ventricular, and right atrial pressures. In addition, the arterial-arteriolar dilating effects of nitroglycerin in congestive heart failure may result in a decrease in left ventricular after load or impedance to ejection, with a subsequent increase in stroke volume and cardiac output [24].

Therefore, it could be suggested that a treatment targeting the cardiovascular system decreasing the preload might help the heart to tolerate the critical period of weaning more effectively.

Download English Version:

<https://daneshyari.com/en/article/3400237>

Download Persian Version:

<https://daneshyari.com/article/3400237>

[Daneshyari.com](https://daneshyari.com)