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Brief Report

NONINVASIVE VENTILATION AS A TEMPORIZING MEASURE IN CRITICAL FIXED CENTRAL AIRWAY OBSTRUCTION: A CASE REPORT

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□ **Abstract—Background: Critical central airway obstruction (CAO) requires emergent airway intervention, but current guidelines lack specific recommendations for airway management in the emergency department (ED) while awaiting rigid bronchoscopy. There are few reports of the use of noninvasive ventilation (NIV) in tracheomalacia, but its use as a temporizing treatment option in fixed, malignant CAO has not, to the best of our knowledge, been reported. Case Report: An 84-year-old woman presented to the ED in respiratory distress, too breathless to speak and using her accessory muscles of respiration, with bilateral rhonchi throughout the lung fields. Point-of-care arterial blood gas revealed severe hypercapnia, and NIV was initiated to treat a presumed bronchitis with hypercapnic respiratory failure. Chest radiography revealed a paratracheal mass with tracheal deviation and compression. A diagnosis of critical CAO was made. While arranging for rigid bronchoscopic stenting, the patient was kept on NIV to good effect. Why Should an Emergency Physician Be Aware of This?: Recommendations for emergent treatment of life-threatening, critical CAO before bronchoscopic intervention are not well established. Furthermore, reports of NIV use in CAO are rare. We suggest that emergency physicians consider NIV as a temporizing measure for critical CAO while awaiting availability of bronchoscopy.** © **2018 Elsevier Inc. All rights reserved.**

□ **Keywords—central airway obstruction; noninvasive ventilation**

INTRODUCTION

Critical central airway obstruction (CAO) requires emergent airway intervention. Most guidelines for the management of CAO with impending respiratory failure recommend initial stabilization to focus on establishing a secure airway via awake endotracheal intubation, tracheotomy, laryngeal mask airway, or suspension laryngoscopy; with a high likelihood of requiring subsequent rigid bronchoscopy (1–3). The British Thoracic Society similarly recommends endobronchial tumor debulking for CAO due to intraluminal tumor (4). However, these current guidelines lack specific recommendations for airway management and oxygenation in CAO that is too distal for tracheotomy and too narrow for oral or nasal endotracheal intubation suitable for use in the emergency department (ED) while awaiting expertise and facilities for rigid bronchoscopy.

The role of noninvasive ventilation (NIV) in respiratory failure secondary to upper and central airway obstruction is not well elucidated. A review of the utilization of NIV in all-cause respiratory failure in children found an association with a significant decrease in respiratory effort and improvement in gas exchange for children with dynamic upper airway obstruction (5). NIV has been used in tracheomalacia to relieve symptoms, and as a temporizing measure before tracheal stenting in adult tracheomalacia (6,7). To our knowledge, NIV

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as a temporizing treatment option in fixed, malignant CAO has not been reported.

CASE REPORT

An 84-year-old woman with papillary thyroid carcinoma resected 8 years prior presented to the ED with sudden drowsiness, preceded by 2 weeks of worsening breathlessness. She had previously reported some coughing and wheezing during these episodes of dyspnea, but absence of any fever. She had no prior diagnosis of asthma or chronic obstructive pulmonary disease. At the onset of her symptoms, she was treated with antibiotics for a presumed chest infection by a general practitioner.

Initial examination at the ED revealed an agitated woman who was in respiratory distress, too breathless to speak and using her accessory muscles of respiration. Her first set of vital signs were blood pressure 204/106 mm Hg, pulse 130 beats/min, respiratory rate 32 breaths/min, and SpO_2 100% on a nonrebreather mask. There was use of her accessory muscles of respiration and distended neck veins. Examination of the chest revealed bilateral rhonchi throughout the lung fields without audible heart murmurs. Point-of-care arterial blood gas (ABG) done while on nonrebreather mask showed respiratory acidosis and hypercapnic respiratory failure: pH 7.18, PaO_2 291 mm Hg, $PaCO_2$ 122.3 mm Hg, and bicarbonate 45.8 mEq/L.

In view of the chest findings and respiratory acidosis, she was started on intravenous (i.v.) levofloxacin and commenced on NIV in bilevel positive airway pressure mode with nebulized salbutamol and ipratropium for presumed bronchitis with hypercapnic respiratory failure. The inspiratory and expiratory positive airway pressures were set at 22 cm H_2O and 5 cm H_2O, respectively, at an FiO_2 of 40%, and a minimum rate of 25 breaths/min. She was also given 10 mmol of i.v. magnesium sulfate 49.3%.

The chest radiograph that was obtained later showed right paratracheal soft tissue opacity, causing leftward deviation and compression of the trachea (Figure 1). The diagnosis was revised to CAO complicated by hypercapnic respiratory failure; i.v. dexamethasone was administered.

On re-examination after 1 h of NIV initiation, the patient appeared less agitated, with improvement in air entry into the lungs on auscultation. The expiratory stridor presumably caused by the lesion that was originally thought to be rhonchi from bronchitis had decreased in intensity. The repeat ABG showed an improving trend in the hypercapnic respiratory failure: pH 7.27, PaO_2 124 mm Hg, $PaCO_2$ 96.7 mm Hg, and bicarbonate 43.9 mEq/L at an FiO_2 of 40%. Considering the patient's clinical improvement, NIV was continued. Bearing in mind the high risk of airway compromise, she was admitted to the intensive care unit under both the cardiothoracic surgery and respiratory medicine services.

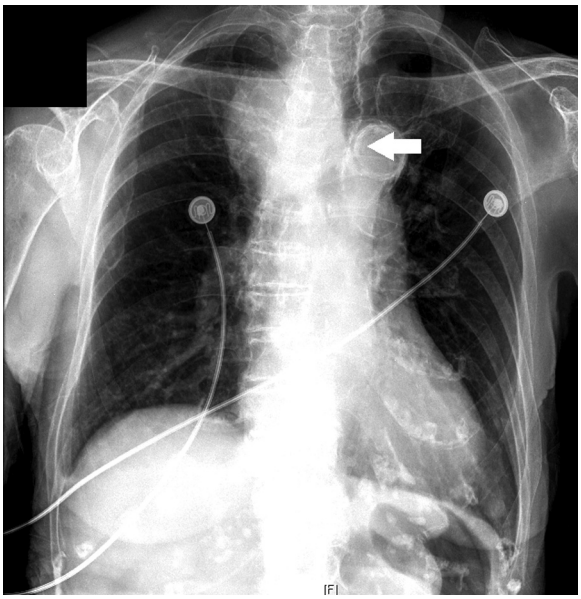

Figure 1. Anteroposterior radiograph showing right paratracheal soft tissue mass with leftward deviation and narrowing of the trachea (arrow).

The patient's condition continued to improve in the intensive care unit while on NIV. With inspiratory and expiratory positive airway pressures kept at 22 cm H_2O and 5 cm H_2O, respectively, at an FiO_2 of 40%, the repeat ABG showed: pH 7.36, PaO_2 186.2 mm Hg, $PaCO_2$ 72.3 mm Hg, and bicarbonate 35.4 mEq/L. She eventually underwent rigid bronchoscopy in the operating theater 13 h after her original presentation to the ED, which discovered a paratracheal lesion invading the airway with a 99% luminal stenosis < 1 cm above the carina. In the same setting, an endotracheal tube was inserted and a tracheal stent was deployed across the lesion (Figure 2). Staging showed an advanced nonresectable squamous cell carcinoma. The patient was palliated, transferred to the general ward after 2 weeks, and passed away after 10 days.

DISCUSSION

The management of CAO is complex and requires multidisciplinary involvement (1). While there is mention of airway interventions in patients who present with near-complete obstruction, most of the current literature and reviews revolve around the different bronchoscopic modalities as the definitive treatment (3,8–10). Specifically, in patients with impending respiratory failure from critical and fixed CAO where