

## Case Report

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## A Rare Case of Pneumomediastinum Due to Prolonged Use of N95 Facemasks During the Covid-19 Pandemic

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### ABSTRACT

This case and literature study aim to highlight a rare cause of pneumomediastinum in a health professional due to the long-term use of an N95 facemask during the pandemic. In our case, a twenty-eight-year-old female patient with mild intermittent asthma was presented to the emergency room with stinging pain in the anterior chest wall and parasternal areas. Laboratory tests and chest x-ray showed no significance, but pneumomediastinum was present on chest computed tomography. Pneumomediastinum is a rare complication in asthmatic patients. However, events that may cause alveolar and intrabronchial pressure increases can lead to pneumomediastinum. In conclusion, increased airway pressure due to prolonged use of N95 facemasks can lead to pneumomediastinum.

Our case is the first presented case in literature due to the development of pneumomediastinum in a health professional caused by the long-term use of N95 facemasks worn as personal protective equipment for Covid-19. Chest computed tomography imaging was sufficient for the differential diagnosis in our case with a normal chest radiogram. Physicians should consider that a health professional could develop pneumomediastinum after the long-term use of an N95 facemask, and a chest computed tomography scan is sufficient in diagnosing these cases.

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### Introduction

Mediastinal emphysema or pneumomediastinum is an uncommon situation defined as the existence of extra air in the mediastinal area with an incidence between 1 in 30 000 and 1 in 44 500 [1]. Events that may cause alveolar and intrabronchial pressure can lead to pneumomediastinum and subcutaneous emphysema [2]. Many causes are defined for pneumomediastinum: asthma as one of the common predisposing factors, Valsalva maneuvers, breath-holding, vomiting, respiratory infections, esophageal ruptures, illicit drug uses, and barotraumas [3]. Our case with a mild bronchial hyperreactivity background was presented due to the development of pneumomediastinum after the long-term use of an N95 facemask during the Covid-19 pandemic.

### Case Presentation

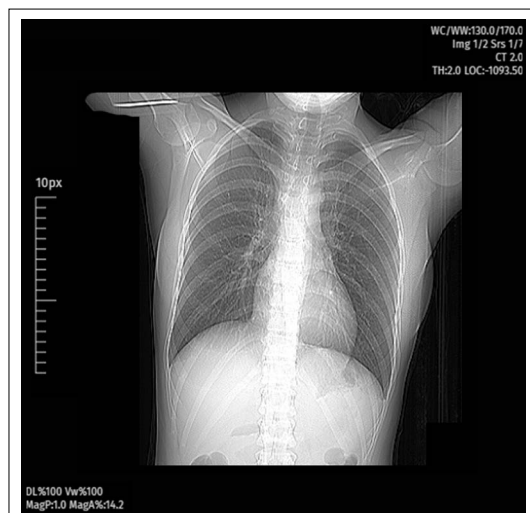
A twenty-eight-year-old female patient was admitted to the Emergency Room (ER) with a complaint of stinging pain in the anterior thoracic wall. She is a non-smoker dentist that complained of mild bronchial hyperreactivity and allergic rhinitis for the past few years. The family history revealed bronchial hyperreactivity in her mother and her mother's father. She had good effort capacity,

a stressful mood, a history of a panic attack ten years ago, and no current asthma or allergic rhinitis treatment.

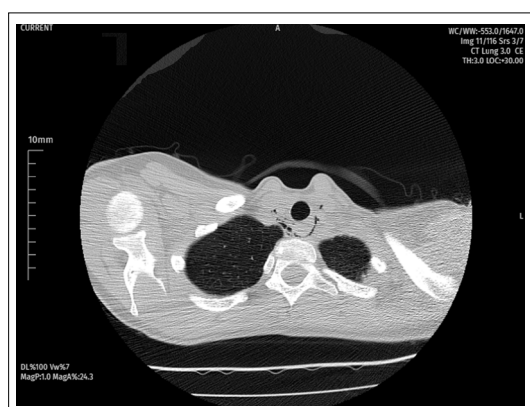
On 1.6.2020, with the start of the normalization process, she continuously used an N95 facemask for 10 hours on the first day of work. She only took off her facemask for 15-20 minutes during lunchtime and put it back on during the working days. At the 8th hour of continuous use of the N95 facemask, stinging pains started in the anterior chest wall and parasternal areas. The pain became prominent on the anterior chest wall while eating and drinking water in the evening. She also stated that she felt her bite descending the esophagus with pain in the retrosternal area. The pain subsided at night, but she was admitted to the Emergency Room (ER) the same day because of her fear of COVID-19.

On admission, her vital signs were blood pressure (BP) 141/70 mm Hg, pulse 103 bpm, respiration 22 bpm, saturation 98% without oxygen supplement, and temperature 36 ° C. The physical examination had no distinctive signs with normal breath sounds on auscultation. Complete blood count was generally in normal range with Eosinophil: 2.8% (0-4,5%), Total IgE: 182.28 kU/ L (0-150) and C-reactive protein (CRP) at 0.1mg / dL (0.0-0.9 mg/ dL). The electrocardiogram (ECG) examination revealed normal sinus rhythm.

The chest x-ray showed no pathology (Figure 1). However, pneumomediastinum was detected in the thorax computed tomography (CT) scan performed for chest pain (Figure 2, Figure 3), but no pneumothorax or subcutaneous emphysema was seen.



**Figure 1**



**Figure 2**



**Figure 3**

In conclusion, our case with mild intermittent asthma developed pneumomediastinum caused by the long-term use of an N95 facemask for personal protection against the Covid-19 pandemic. On the second day of admittance, (PCR) Sars Cov – 2 Antigen

test was negative, and anterior chest pain decreased gradually and then resolved till the morning of the third day of follow-up. No medication or painkillers were needed, as the patient denied taking any treatment. Her control visit to the pulmonary disease outpatient clinic revealed mild intermittent asthma and allergic rhinitis four days later. Budesonide/formoterol fumarate dihydrate, desloratadine, and mometasone furoate monohydrate were included in the treatment with indicated doses. A respiratory function test was not performed due to precautions during the pandemic. Signed patient consent was taken before the study.

## Discussion

Although the mediastinum is only a limited area within the thoracic cage, it is associated with a relatively large area, including the vascular bed in the neck, periaortic, and periesophageal regions. Therefore, in cases with pneumomediastinum, free air in the mediastinum may spread to all these areas where the mediastinum is in contact.

The current literature has reported rare cases of pneumomediastinum with tooth extractions, arthroscopy, trombone playing, scuba diving, lung infections with gas-producing microorganisms, and maximal expiratory pressure maneuver during pulmonary function tests [1, 2].

Asthma has been defined in between 8—39% of cases and is one of the most frequently reported factors [1, 3]. In a PubMed literature search, there have been only five cases reporting pneumomediastinum till now in the absence of positive pressure ventilation. Although pneumomediastinum is an unusual complication of asthma, it may result from increased intralveolar pressure during extreme coughs leading to peribronchial alveolar rupture [2]. In studies conducted with adults, Spontaneous pneumomediastinum is primarily seen in men (75%), those with asthma (28%), and smokers (28%), and the most familiar symptom usually is chest pain (78.1%). Other symptoms related to pneumomediastinum include shortness of breath, pressure in the chest, dysphagia, and sore throat [2,4]. In our case, there were complaints of stinging pain in the anterior chest wall after the long-term use of an N95 facemask.

N95 facemasks answer filtration necessities of small particles, suit firmly to the face, and are more effective than surgical masks in abbreviating exposure to viral infections. N95 facemasks consist of four principal layers, and also an air valve is installed on the exterior layer to improve breathing by decreasing expiratory air pressure [5]. However, long-term use of N95 facemasks can increase breathing air resistance caused by the mask material that filters particles in the air and by moisture trapped between filtering layers of the mask, which can lead to an increase in pressure [6]. Supporting this, wearing the N95 facemask in one study decreased ventilation by 23% and VO2 max by 13%, in which the differences were coherent with increased airway resistance [7]. As pneumomediastinum is attributed to a pressure gradient between the alveoli and the lung interstitium, this difference could cause alveolar rupture and escape air into the mediastinum.

Chest pain is one of the most frequent and serious medical emergencies. In such conditions, diseases such as severe aortic dissection, esophageal perforation, pneumothorax, pulmonary embolism, pericarditis, and pneumomediastinum should always be considered for differential diagnosis [8]. Therefore, pneumomediastinum should always be considered in asthmatic or bronchial hyperreactivity patients with chest pain, cough, and dyspnea.

Radiographic findings of pneumomediastinum mainly depend on the presence of air extending into the mediastinum that outlines the borders of typical anatomical structures [9]. Radiography of the chest and chest computed tomography scans are sufficient for diagnosing these cases. Radiolucency showing displacement of mediastinal pleura along the left heart can be monitored on the posteroanterior chest x-rays. In addition, radiolucency indicating subcutaneous emphysema can also be detected in the soft tissues of axillary and neck regions. However, on the lateral chest radiographs, radiolucency extends to the hilar pulmonary vessels, esophagus, and tracheal area [4].

In our case, a Thorax CT scan was performed after no pathological finding explained the chest pain on radiography. If there is no other sign of pneumothorax, it is challenging to differentiate pneumothorax from pneumomediastinum in the case of air accumulation in the pleural and medial pleural surface [9]. Chest X-rays play a significant role in evaluating common complications of asthma. However, a Thorax CT scan can help detect additional pathologies even if the chest radiography is normal.

As a result, long-term use of N95 facemasks can lead to pneumomediastinum complications. It should be considered that a patient with mild bronchial hyperreactivity with chest pain could develop pneumomediastinum after the long-term use of an N95 facemask [10].

#### **Conflict of Interest**

We wish to confirm that there are no known conflicts of interest associated with this publication. There has been no significant financial support for this work that could have influenced its outcome.

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