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Pneumoscrotum, a Rare Presentation of Barotrauma Following Noninvasive Positive Pressure Ventilation in Patients with Severe COVID-19 Pneumonia

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Abstract

Background: Patients with Coronavirus disease 2019 (COVID-19) pneumonia are at risk of hypoxemic respiratory failure. Hence, many patients may require noninvasive positive pressure ventilation (NIPPV) during their hospital course. Using mechanical ventilation such as bilevel positive airway pressure or a ventilator to provide NIPPV may result in adverse events, including barotrauma. **Case Report:** We reported two cases (40- and 43-years-old men) of severe COVID-19 pneumonia and hypoxemic respiratory failure who underwent NIPPV for respiratory support. These cases were complicated with barotrauma in their course of hospital admission that manifested with pneumoscrotum. **Conclusion:** In the cases of pneumoscrotum, it is crucial to understand its underlying etiology and origin since this clinical finding may be the outcome of life-threatening illnesses requiring urgent treatment.

[GMJ.2022;11:e2372] DOI:[10.31661/gmj.v11i.2372](https://doi.org/10.31661/gmj.v11i.2372)**Keywords:** Barotrauma; COVID-19; Noninvasive Ventilation; Pneumoscrotum

Introduction

Patients with Coronavirus disease 2019 (COVID-19) pneumonia are at an increased risk of hypoxemic respiratory failure and acute respiratory distress syndrome. Both conditions may raise the morbidity and death rate of patients, especially those who need mechanical ventilation (MV) [1]. Regarding respiratory failure, a significant number of patients with COVID-19 pneumo-

nia, particularly those with severe forms of the disease, may require invasive or noninvasive respiratory supportive measures to maintain oxygenation and ventilation [2, 3].

According to previous reports, up to 62% of patients with severe forms of COVID-19 pneumonia received noninvasive positive pressure ventilation (NIPPV) during their hospital course [2]. Although applied NIPPV and its efficacy in cases of COVID-19 pneumonia is debatable, it has advantages such as im-

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proved patient oxygenation and reduced work of breathing, resulting in a decreased need for endotracheal intubation, MV, and its associated complications such as ventilator-associated pneumonia, intensive care unit-acquired weakness, etc. [2, 3]. Nevertheless, similar to the invasive type, the use of noninvasive respiratory support methods might leave patients at risk for consequences, such as pulmonary barotrauma [1].

Pulmonary barotrauma, more commonly in the forms of pneumothorax, pneumomediastinum, and subcutaneous emphysema, is a complication of NIPPV in patients suffering from severe COVID-19 pneumonia [1].

We aim to introduce two cases with severe COVID-19 pneumonia who were complicated with barotrauma after using NIPPV and experienced pneumoscotum, a rare clinical finding. For both patients, SARS-Cov-2 infection was confirmed by reverse transcription polymerase chain reaction assay (nasopharyngeal swab test), and computed tomography of the lungs showed pneumonia.

Case Presentation

Case 1

A 43-year-old man went to the emergency department complaining of myalgia and increasing dyspnea. His clinical symptoms started around two weeks prior to admission. This patient had no prior medical and/or surgical history of significance. On admission, vital signs included blood pressure (BP) of 160/90 mmHg, respiratory rate (RR) of 22 breaths/minute, pulse rate (PR) of 100 beats/minute, and a room-air peripheral arterial oxygen saturation (SpO_2) of 62% (by finger pulse oximeter). Lung examination revealed bibasilar crackles. Considering hypoxemic respiratory failure, NIPPV using bilevel positive airway pressure [BiPAP] machine was started (the initial setting was as follows: inspiratory positive airway pressure [IPAP]: 16 cmH_2O ; expiratory positive airway pressure [EPAP]: 8 cmH_2O ; RR: 12 breaths/minute; spontaneous/timed [ST] mode). From the second day of admission to the end of the hospital course, NIPPV was delivered by a ventilator (initial setting:

pressure support ventilation [PSV] mode; the fraction of inspired oxygen [FiO_2]: 100%; pressure support [PS]: 20 cmH_2O ; positive end-expiratory pressure [PEEP]: 14 cmH_2O ; Flow trigger [F-trigger]: 3 liter/minute).

On the fifth day of hospitalization, when noninvasive ventilation (NIV) was delivered by a ventilator (setting: pressure-synchronized intermittent mandatory ventilation [P-SIMV] mode; FiO_2 : 100%; RR: 26 breaths/minute; pressure control (PC): 18 cmH_2O ; PS: 18 cmH_2O ; PEEP: 16 cmH_2O ; F-trigger: 3 liter/minute), the patient experienced chest pain, and his SpO_2 was dropped. At this time, patient's lung examinations revealed a decreased breath sound. Therefore, chest imaging was done (Figure-1). Besides, his chest and abdomen examinations were significant for subcutaneous crepitus. The other finding was scrotal enlargement suggestive of pneumoscotum (Figure-2). Patient's scrotal ultrasonography ruled out fluid accumulation. Moreover, medications, including dexamethasone (4 mg twice a day), imipenem (500 mg every 6 hours), and vancomycin (1 gr twice a day), were prescribed during the hospital course. Despite the efforts made, the patient showed no clinical improvement and due to respiratory distress, underwent endotracheal intubation and MV on the 10th day of admission. Unfortunately, he expired on the 15th day of admission.

Case 2

A 40-year-old man was admitted to the hospital with symptoms of fever, myalgia, active cough, and increasing dyspnea. He had no notable past medical and/or surgical history. His clinical symptoms started around two days before hospitalization. On admission, the patient's vital signs were as follows: BP of 120/80 mmHg, PR of 95 beats/minute, RR of 20 breaths/minute, body temperature of 38.5°C, and room-air SpO_2 of 90%. Examination of the lungs revealed bibasilar crackles. Medications, including dexamethasone (4 mg thrice a day) and tocilizumab (a total dose of 800 mg) were prescribed. However, regarding aggravation of the patient's dyspnea and tachypnea together with a decreased

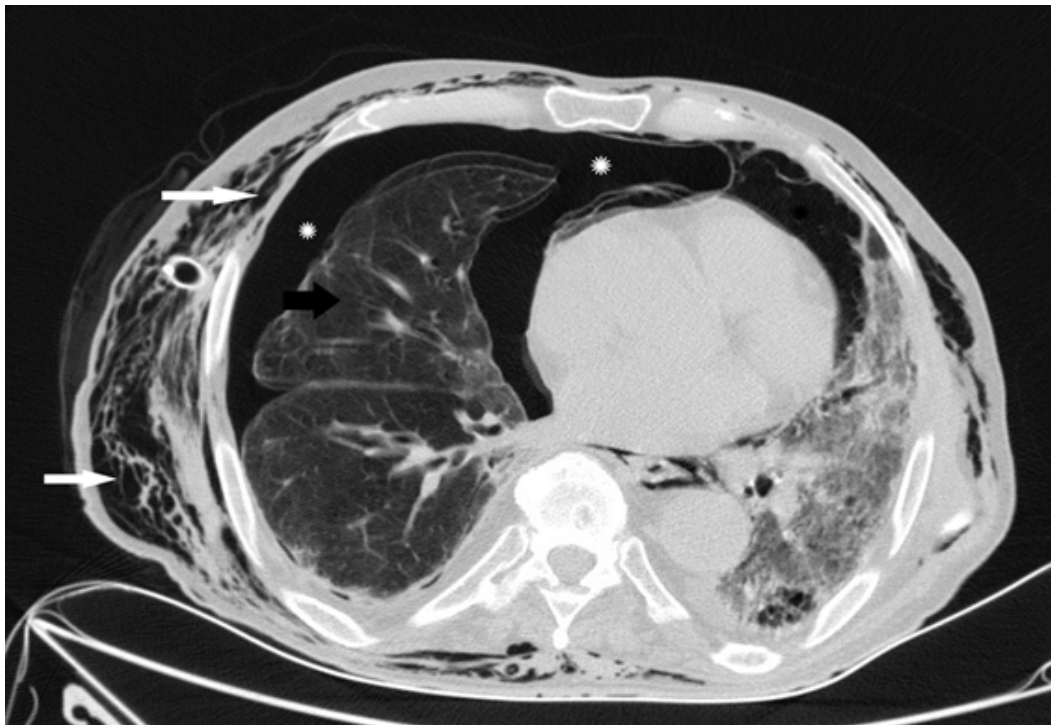


Figure 1. An axial computed tomography image of the chest showing collapsed lung (black arrow), subcutaneous air (white arrow), and pneumothorax (white asterisk). Also, chest tube and shift of mediastinum are seen.



Figure 2. Scrotal enlargement secondary to pneumoscrotum.

room-air SpO_2 to 78%, NIPPV using BiPAP machine was started on the third day of admission (the initial setting was as follows: IPAP: 16 cmH_2O ; EPAP: 8 cmH_2O ; respiratory rate: 14 breaths/minute; ST mode). The next day, the NIV delivery facility was changed to

the ventilator (PSV mode; PS: 14; PEEP: 12; F-trigger: 3).

On the 11th day of hospitalization, when he received NIPPV by ventilator (setting: P-SIMV mode; FiO_2 : 100%; RR: 16 breaths/minute; PC: 18 cmH_2O ; PS: 16 cmH_2O ;

PEEP: 16 cmH₂O; F-trigger: 3 liter/minute), chest examination revealed a unilateral decreased breath sound and subcutaneous crepitus. Chest imaging approved barotrauma. Similar to the previous patient, subcutaneous crepitus of the abdominal wall and pneumoscotum were present.

This case had a poor clinical response and underwent endotracheal intubation and MV due to hypoxemic respiratory failure and severe respiratory distress on the 17th day of hospitalization. Unfortunately, he expired on day 22 after hospitalization.

Ethical Approval

This work was approved by the Ethics Committee of Kerman University of Medical Sciences (Code: IR.KMU.AH.REC.1400.144). Also, written consent was obtained from their legal guardians for the publication of the article.

Discussion

We presented two male patients with severe COVID-19 pneumonia who underwent NIPPV due to hypoxemic respiratory failure, complicated with pulmonary barotrauma. These cases experienced pneumoscotum, an uncommon clinical finding.

Pneumoscotum is the medical term for the presence of air or gas in the scrotum [4]. This air or gas may come from intra- and extra-peritoneal compartments, or it may arise from local accumulation in the circumstances such as direct damage to the scrotum or local gas generation owing to bacterial infection [4]. Pneumoscotum can be seen in the forms of scrotal emphysema (i.e., a condition in which air is seen in the subcutaneous layer of the scrotal tissue) and pneumatocele (meaning the presence of air in the tunica vaginalis) [5]. Clinically, scrotal emphysema can lead to local pain and scrotum swelling accompanied by palpable crepitus [5]. While scrotal pneumatocele presents with a generalized scrotal swelling that results in inability of palpation of intra-scrotal structures by the examiner [5]. Based on its cause, pneumoscotum may occur in childhood or adulthood [4].

As previously mentioned, air that causes

pneumoscotum may originate from the abdominal cavity. For example, Akbulut *et al.* reported this clinical finding following endoscopic retrograde cholangiopancreatography (ERCP)-related duodenal perforation in a 19-year-old man, a living liver donor [6]. A similar case of pneumoscotum after ERCP-related duodenal perforation was reported by Khan *et al.* [7]. Edey *et al.* reported a 79-year-old man with similar clinical presentation after computed tomography pneumocolon [8]. Sunderland *et al.* [9] provided another instance of a similar problem after the transanal removal of a rectal polyp. The thoracic cavity is another possible source of pneumoscotum-causing air. For example, Humayun *et al.* [10] described a 37-year-old man with pneumoscotum as a symptom of tension pneumothorax owing to blunt thoracic trauma. Jandou *et al.* reported this clinical manifestation after the rupture of bullous emphysema in an 82-year-old man [11]. Firmanto *et al.* reported another similar case of pneumoscotum following pneumothorax [12].

Air movement into the scrotum can occur through the following routes: via the tunica vaginalis from an intra-abdominal source, via the inguinal canal from a retroperitoneal origin, and via the subcutaneous route by direct extension from the trunk (including chest) [11]. The latter route can explain how our patients presented with pneumoscotum following pulmonary barotrauma.

Conclusion

To the best of our knowledge, this paper was the first report on pneumoscotum after pulmonary barotrauma, secondary to NIPPV. When faced with pneumoscotum, it is crucial to establish its underlying etiology and origin since this clinical finding may be caused by life-threatening illnesses requiring immediate treatment.

Conflict of Interest

All authors declare that they had no conflict of interest.

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