

Biopolymer pneumonitis a differential diagnosis in covid-19 era: A case report and review of the literature

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Abstract

Background: The use of biopolymers became popular in the 40s in Europe and Asia with aesthetic purposes and extended in the 60s to the United States starting with two aesthetic approaches until nowadays. The first case report of pneumonitis due to biopolymers was in 1975, since then many complications with different outcomes were published. Here we present a case report of pneumonitis due to biopolymers with full recovery.

Case Summary: A 30-year-old man undergone multiple aesthetic procedures, including the injection of biopolymers in the lips, buttocks, and sclerotherapy for the presence of varicose veins, came to the emergency room with dizziness and dyspnea one day after the application of biopolymer in the buttocks. On physical examination the patient was afebrile, with tachycardia, tachypnea, and an SO₂ of 88%. Upon admission blood and image tests were performed, which showed respiratory alkalosis, reticular pattern, and elevated D-Dimer; given the COVID-19 pandemic, and due to the signs and symptoms, SARS CoV-2 infection was considered, and a PCR was performed with negative result, cause of the abrupt of presentation and high risk for pulmonary thromboembolism a CT angiography was performed, and the diagnostic impression was pneumonitis secondary to the use of biopolymers. We established oxygen support during hospitalization and corticosteroids for 28 days with full recovery.

Conclusion: This case highlights the ultimate importance of differential diagnosis for lung disease and the need to establish guidelines for treatment.

Keywords: Case report; biopolymer; pneumonitis; COVID-19; silicone; steroids.

Introduction

Biopolymers are substances with inherent characteristics of biocompatibility and biodegradation that make them useful in the biomedical, pharmaceutical, environmental, biocatalytic and bioelectronic fields. There are biopolymers that can be obtained naturally as the polysaccharides like cellulose, chitin/chitosan, starch and glycosaminoglycans, and proteins such as collagen, silk, and keratin; there also exist another group that includes synthetic substances such as liquid silicone [1, 2]. The use of biopolymers became popular in the 40s in Europe and Asia with aesthetic purposes and extended in the 60s to the United States starting with aesthetic approaches until nowadays [2, 3]. There are many reports of local and systemic adverse effects with the use of biopolymers for aesthetic purposes like granulomas, pneumonitis, and disfiguring nodules. Since the first case report of pneumonitis due to biopolymers there is a challenge in the diagnosis and treatment strategies

for this entity [3, 4]

Here we present a case report of pneumonitis due to biopolymers with full recovery.

Case Presentation

A 30-year-old man presented to the Emergency Department of our hospital complaining of dizziness and dyspnea on small efforts. One day before the symptoms started, in a beauty clinic, they applied to the patient biopolymer in the buttocks, 250 ml of biopolymer in each buttock, after that he presented a feeling of dizziness and dyspnea and due to the current COVID 19 pandemic, this infection was suspected and it was treated with dexamethasone, unknown dose, and it's only applied once ; Due to the persistence of symptoms, he came to the emergency department of this hospital.

He has undergone multiple aesthetic procedures, includ-

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ing the injection of biopolymers (unknown what type) in the lips five years ago, injection of biopolymers in the buttocks 6 months ago and sclerotherapy for the presence of varicose veins a month ago for aesthetic purposes.

A history of alcohol consumption at a rate of 76 grams of alcohol every seven days, and occasional cocaine consumption, approximately every 3 months, without specifying the amount, has 30 tattoos distributed throughout the entire skin and four perforations

The patient was afebrile, with tachycardia (heart rate 110 beats per minute), tachypnea (respiratory rate that ranged between 26 and 30 beats per minute) and an oxygen saturation by pulse oximetry of 88%; the trachea was central and the thorax had a symmetrical expansion, on palpation with adequate transmission of vocal vibrations, tympanic on percussion and with a normal respiratory murmur; there were hematomas on the buttocks, in the area where the biopolymer was applied.

Laboratory examinations. An arterial blood gas analysis was performed upon admission, which showed a respiratory alkalosis (pH 4.47, pCO₂ 30.4 mmHg, pO₂ 88.1 mmHg, HCO₃ 21.6 mmol / L, sO₂ 96.5%); and given to the current health context, COVID-19 pandemic, and the clinical features of the patient, it was considered an infection by this virus and a PCR was performed with negative result.

Due to the risk factors presented by the patient, an ELISA test for HIV was performed and reported negative, as well as the viral panel.

Imaging examinations. A chest X-ray was performed, as first approach, and it showed a reticular pattern, for the previously mentioned in laboratory examinations and the findings at the chest X-ray, a computed tomography angiography of the chest was performed whose diagnostic impression was pneumonitis secondary to the use of polymers (**Figure 1A**).

Pulmonary thromboembolism was also considered, due to the sudden onset of symptoms coupled with the presence of peripheral venous insufficiency a 9 points Wells' Criteria for Pulmonary Embolism High risk group with a 40.6% chance of pulmonary embolism and a 777 ug / L D-Dimer, but ruled out with the findings on the CT angiography of the chest. The first treatment before going to the emergency department was a dexamethasone injection, single dose, milligrams not indicated; that could help to the modulation of the inflammatory process triggered in the pulmonary parenchyma by the application of biopolymers. When the patient arrived at the emergency department started with ventilatory support through supplemental oxygen with nasal tips at a rate of 3 liters per minute, obtaining a saturation of 94%. At internal medicine department the treatment started with methylprednisolone 125 mg IV every 6 hours for four days, after that prednisone tablets, 25 mg every 24 hours for a week, then 10 mg every 24 hours for a week and then 5 mg for a week and at the end, discontinued. He was discharged without requiring the use of ventilatory support with supplemental oxygen.

The patient was discharged 12 days later with an arterial blood gas that shows a chronic respiratory alkalosis (pH 7.474, pCO₂ 29.5 mmHg, pO₂ 84.6 mmHg, HCO₃ 21.2 mmol / L, sO₂ 96.1%).

A month after a new CT angiography was performed and its diagnostic impression was pulmonary parenchyma with changes tending to resolution associated with small areas suggestive of fibrosis that condition pleural retraction (**Figure 1B**).

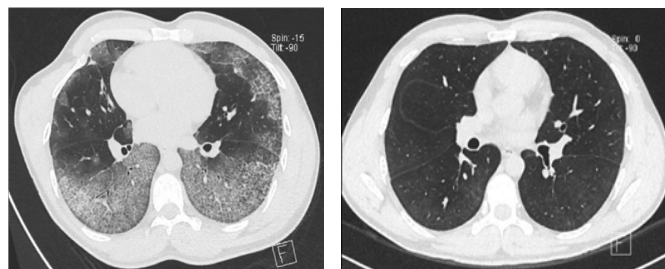


Figure 1: CT images. (A) Pulmonary parenchyma has a bilateral heterogeneous pattern due to the presence of ground-glass areas, predominantly in both lower lobes, in addition there is dilation of the lower lobe bronchi, as well as septal thickening. (B) The attenuation pattern is heterogeneous bilaterally where ground glass areas were found, predominated in lower lobes, showing resolution compared to the previous study.

Discussion

Biopolymers, often used to fill certain areas of the body, are not completely inert and can generate local or systemic complications, such as infection, necrosis, foreign body reaction, lymphadenopathy and febrile syndrome [3, 5, 8, 9]. Non-thrombotic pulmonary embolism is uncommon, and it frequently occurs with no clinical characteristics, that's why it requires peculiar diagnostic measures, as well as treatment options [3, 5, 6, 7]. Different components, whether ubiquitous in the human body, foreign bodies, or liquids, can be transported through the bloodstream and embolize the pulmonary circulation.

In contrast to pulmonary thromboembolism, the effects of non-thrombotic pulmonary embolism are not purely mechanical; these are also related to the nature of the embolic agent, which is why its pathogenesis is more complex [1, 3]. In 1987, Jean Chastre and his team described that injections of biopolymers are a risk factor at the respiratory level, since they are capable to induce acute pneumonitis, which can evolve, in some patients, to acute respiratory failure; in turn, pneumonitis can also be induced if there is a trauma in the site where it was applied, even though many years have passed since its application; there is latent pneumonitis, which is seen in patients who develop inflammation at the injection site. [3, 4, 5, 8]. There are reports of patients who died after injection of biopolymers due to severe pulmonary edema, which reinforces the theory that biopolymers induce acute pneumonitis [6, 8, 9, 10]. The application of a non-ubiquitous substance to the body in large quantities and directly to body tissues, under high pressure, results in tissue damage which, through inflammation, allows the substance to enter the bloodstream [2, 3]. Cases have been described where biopolymer embo-

lisms are deposited in the arterioles which increases pulmonary arterial pressure causing cor pulmonale. [6, 9]. Alveolitis in biopolymer pneumonitis is characterized by an increase in the number of macrophages, neutrophils, and eosinophils. [3, 4]. Acute pneumonitis consists of phagocytosis of the biopolymer carried out by macrophages, neutrophils, and lymphocytes, secondary to the liquid biopolymer reaching the alveolar space after pulmonary embolization, causing cell-mediated cellular inflammation. Schmid's group described that when macrophages phagocytose the biopolymer, an inflammatory response occurs, which activates endothelial cells, increasing capillary permeability, therefore modulating, and regulating the alveolar response [7].

Two types of post-injection pneumonitis have been described by biopolymers; an acute form which can occur from the application of the biopolymer until a few days after application and presents with sudden dyspnea, fever, mild to moderate hypoxemia, tachycardia and sometimes acute respiratory failure; X-rays typically show a bilateral alveolar pattern with an area of consolidation in patches, as is the case of the patient, which, given the current global health context, led to COVID-19 infection being considered first-instance within the differential diagnoses. The most common abnormalities seen biopolymer pneumonitis were the same as in COVID-19; ground glass opacities, vascular enlargement, bilateral abnormalities, lower lobe involvement, and posterior predilection, that's why the diagnosis of this entity was based on the antecedent of biopolymer injection and PCR negative for SARS CoV-2 [14].

The pulmonary histologic findings of COVID-19 are characterized by acute and organizing diffuse alveolar damage, while biopolymer pneumonitis characterized by silicon emboli, hemorrhage-congestion, acute pneumonitis, as is the case previously described, and diffuse alveolar hemorrhage. [8, 12-14]. There is also a latent form of pneumonitis which appears six months after the last biopolymer injection, usually presenting with inflammation of the injection site and moderate respiratory symptoms; the patient described in the case had a previous session of injections 6 months before, so it can be considered at a given time that he was predisposed to presenting pneumonitis [3]. The usual treatment is rest, high-flow oxygen, and mechanical ventilation in some cases; There is still no consensus regarding the use of corticosteroids, however there are several case reports where when started early are useful to reverse the clinical course in a favorable way; patients generally recover without sequelae, but there are reports where patients have presented pulmonary fibrosis. [4, 9, 10, 12, 13]. Although the clinical and imaging findings of pneumonitis due to biopolymers and COVID-19 are similar, treatment is quite different because use of steroids in the first case are crucial and high doses recommended while in COVID-19 is only recommended in severe cases with a standard dose [5, 9, 15].

Conclusion

The use of biopolymers has become widespread for aesthetic procedures, but it has many adverse reactions such as pneumonitis. The antecedent of biopolymer injection, clinical presentation and radiographic findings are essential for diagnosis and must be considered as a differential diagnosis in the

context of the current pandemic. This case highlights the ultimate importance of differential diagnosis for lung disease in the pandemic context and the need to establish guidelines for adequate treatment.

Conflict-of-interest statement

The authors declare that they have no conflict of interest.

Care Checklist (2016) statement

The authors have read the CARE Checklist (2016), and the manuscript was prepared and revised according to the CARE Checklist (2016).

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