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Biopolymers and acute respiratory distress syndrome associated with administration of biopolymers, a path to perfection or death: A Case report

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Abstract

Biopolymers are synthetic macromolecules that can cause multiple complications, both local and systemic, which can manifest immediately or years later. Complications of biopolymer administration are increasingly common. They can present as silicone embolization syndrome (SES), pneumonitis, diffuse alveolar hemorrhage, and in their most severe form as acute respiratory distress syndrome (ARDS).

Keywords: Biopolymers, Acute respiratory distress syndrome, Pneumonitis, Diffuse alveolar hemorrhage, Acute respiratory failure

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Introduction

Biopolymers in contact with receptor tissue can trigger an excessive local inflammatory reaction. While often considered benign and complication-free, lung damage secondary to their administration is a condition with high morbidity and mortality.

The mechanism of injury is based on two processes: First, increased pressure and local tissue damage favor the entry of the administered substance into the bloodstream, causing embolization to the lungs. Second, the material may distribute in the alveolar space, recruiting inflammatory cells and activating circulating antibodies that induce lung injury. [1-3]

Polymers used in injections can be non-biodegradable (high risk) or biodegradable (lower risk). Non-biodegradable substances like liquid silicone, PMMA, paraffin, and polyacrylamide are associated with severe complications such as migration, chronic inflammation, granulomas, and embolization. In contrast, biodegradable options like hyaluronic acid, polylactic acid, and calcium hydroxylapatite are safer when properly applied but can still cause necrosis or nodules if injected incorrectly. The highest risk occurs with illegal use or large-volume injections, particularly for buttock and breast augmentation, increasing the likelihood of systemic complications, infections, and permanent deformities. [4,5]

Due to its relevance and recent increase, we present a series of cases where, five years after biopolymer infiltration, pain, swelling, induration, and fever appeared at the application site.

Case 1

A 26-year-old transgender man with a history of breast implants and biopolymer injection in the gluteal region in 2018 and rhinoplasty, all without complications. On May 15, 2023, a new application of biopolymers was performed in the gluteal area.

The patient presented with an acute respiratory syndrome characterized by dyspnea and non-productive cough, attending the emergency department with hypoxemia and tachycardia. High-flow nasal cannula was applied with slight improvement, and methylprednisolone 60 mg every 24 hours was administered. The patient experienced dyspnea and accessory muscle use, requiring high-flow therapy. Due to poor evolution (ROX index 6), orotracheal intubation was performed, followed by bronchoscopy showing erythematous mucosa and clots. A bronchoalveolar lavage was performed. Imaging studies (Figure 1).

Clinical symptoms improved and ventilatory parameters normalized within 10 days until weaning was achieved.

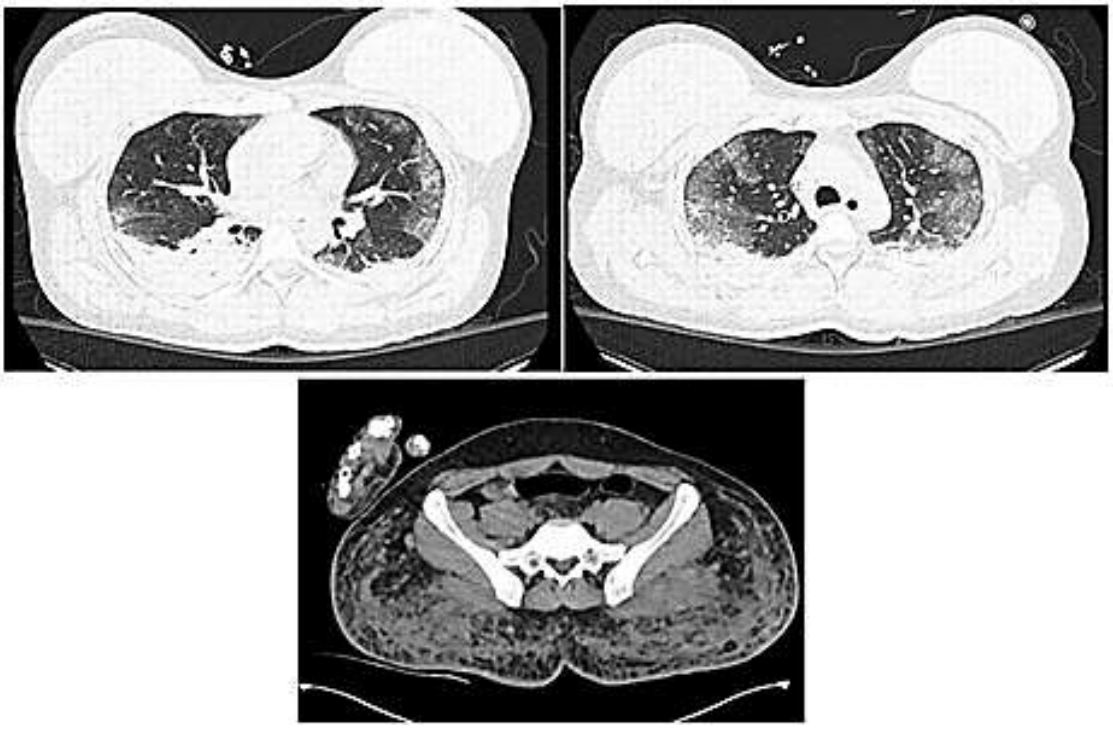

Figure 1: Simple chest CT, increased peripheral bilateral ground-glass opacity, thickening of interlobular septa, alveolar occupation, and air bronchograms in posterior segments of the lower lobes, related to consolidations. Associated with bilateral pleural effusion causing passive atelectasis of the parenchyma. Multiple nodular images with slight increased attenuation in the soft tissues of both gluteal regions and hips, associated with increased attenuation and trabeculation of the adjacent fat due to inflammatory changes.

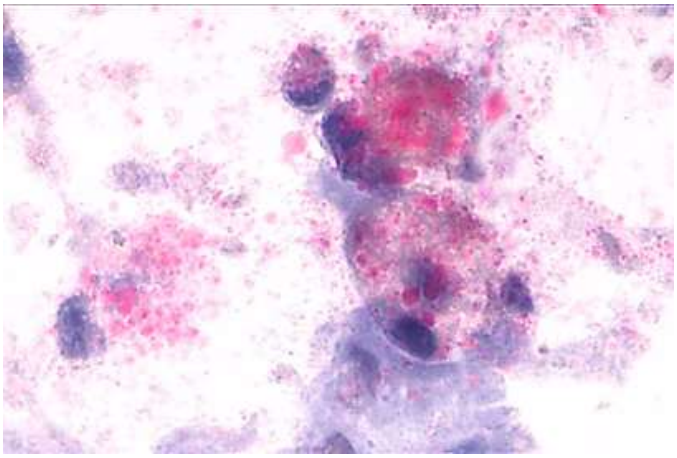

Figure 2: In cytological smears stained with oil red O, macrophages with lipid droplets in the cytoplasm (lipophages) are evident, showing an occupancy of 25% to 50% (type 2 lipophages). (Magnification 100x).

Case 2

A 32-year-old transgender man with a history of HIV diagnosed on March 16, 2023, via Western blot. Breast implants were performed in 2016, and biopolymers were injected in the gluteal region and leg in 2020 by non-medical personnel.

The patient presented with an acute respiratory syndrome characterized by dyspnea, non-productive cough, asthenia, adynamia, night sweats, and weight loss of approximately 15 kg in one month, being diagnosed with tuberculosis and starting specific treatment.

The patient attended the emergency department with hypoxemia and tachycardia. Prednisone, trimethoprim/sulfamethoxazole, and high-flow therapy were administered. Due to poor evolution (ROX index 6), orotracheal intubation was performed. Physical examination revealed inguinal adenopathies.

Macroscopic Description

Two lymph nodes are received in a formalin container. The largest measures 1.5 × 1 cm, and the smallest 1 × 0.8 cm. They have an ovoid shape, a smooth external surface with congested vessels, and a light brown color. On sectioning, both present a smooth, white surface with a soft consistency. The entire sample is included in a capsule.

Biopsy reported: Granulomatous lymphadenitis with oil material vacuoles.

Clinical symptoms improved and ventilatory parameters normalized within 15 days until weaning was achieved.

Figure 3: Non-contrast chest CT shows diffuse bilateral ground-glass opacities, predominantly in the lower lobes, coexisting with areas of lower density with a mosaic pattern. Diffuse micronodular pattern, with perilymphatic nodules observed. Multiple nodular images with slight attenuation increase in the soft tissues of both gluteal regions, associated with increased attenuation and trabeculation of the adjacent fat due to inflammatory changes.

Discussion

Acute pneumonitis commonly presents with dyspnea, chest pain, cough, fever, hypoxemia, and hemoptysis. Patients can progress to diffuse alveolar hemorrhage and ARDS. Symptoms such as fever, respiratory distress, alveolar hemorrhage, and bilateral pulmonary infiltrates are typical of biopolymer pneumonitis. [6,7]

The endocytosis of silicone and fat by alveolar macrophages can provoke an inflammatory response by increasing vascular permeability, activating endothelial cells, inducing the accumulation of activated neutrophils, and modulating immunoregulatory responses in the lungs. [8,9]

Histopathological studies were essential for confirming the diagnosis along with findings from tomography studies. Other organs such as the liver, kidneys, and brain can also be affected. [10]

In cases of acute lung injury following subcutaneous silicone injection, the diagnosis should be considered along with the finding of vacuolar inclusions in macrophage cytoplasm through bronchoalveolar lavage. [11,12]

The exact incidence is difficult to determine due to the unregulated use of biopolymers (e.g., liquid silicone, paraffin, polymethylmethacrylate [PMMA], and other synthetic materials). Some studies suggest that complications occur in up to 5-10% of cases when non-medical grade substances are used. The incidence is likely higher in non-medical or illegally performed injections, particularly for cosmetic enhancements (buttocks, breasts, face).

Reports show a latent period of months to years before complications appear, leading to underreporting. [13,14]

Conclusion

Biopolymer pneumonitis should be considered in cases of rapid hypoxemia progression to full-blown ARDS, associated with other symptoms such as fever and alveolar hemorrhage linked to procedures involving biopolymer injection.

References

1. Blanco J, Gaines S, Arshad J, et al. Silicone pneumonitis, diffuse alveolar hemorrhage and acute respiratory distress syndrome from gluteal silicone injections. Am J Emerg Med 2018; 36(12):2340.e3-2340.e4.

2. Eckle VS, Lambiris N, Grund D, et al. Akutes respiratorisches Versagen durch Silikon-Injektion [Acute Respiratory Failure after Silicone Injection]. Pneumologie 2019; 73(10):582-585.

3. Chen YM, Lu CC, Perng RP. Silicone fluid-induced pulmonary embolism. Am Rev Respir Dis 1993; 147(5):1299-1302.

4. Ellis LZ, Cohen JL, High W. Granulomatous reaction to silicone injection. J Clin Aesthet Dermatol 2012; 5(7):44-47.

5. Sivam S, Mackay C, Humphrey C, et al. Giant PMMA foreign body granulomas with imaging. J Cutan Aesthet Surg 2023; 16(3):256-258.

6. Singh J, Inaty H, Mukhopadhyay S, et al. Chronic Pulmonary Silicone Embolism from Breast Augmentation Is Not a Common Finding in Explanted Lungs. Pulm Med 2018; 2018:2987072.

7. Schmid A, Tzur A, Leshko L, et al. Silicone embolism syndrome: a case report, review of the literature, and comparison with fat embolism syndrome. Chest 2005; 127(6):2276-2281.

8. Pastor E, Andreu AL, Chiner E. Neumonitis aguda y síndrome de distrés respiratorio del adulto tras inyección subcutánea de silicona líquida. Arch Bronconeumol 2005; 41(12):702-703.

9. Chastre J, Basset F, Viau F, et al. Acute pneumonitis after subcutaneous injections of silicone in transsexual men. N Engl J Med 1983; 308(13):764-767.

10. Sanz-Herrero F, Casimiro-Calabuig E, López-Miguel P. Neumonitis aguda tras la inyección subcutánea de silicona líquida para mamoplastía en un transexual. Arch Bronconeumol 2006; 42(4):205-206.

11. Hariri LP, Gaissert HA, Brown R, et al. Progressive granulomatous pneumonitis in response to cosmetic subcutaneous silicone injections in a patient with HIV-1 infection: Case report and review of the literature. Arch Pathol Lab Med 2012; 136(2):204-207.

12. Males S, Joly V, Adle-Biassette H, et al. Silicone in HIV-1-infected patients: a cause of misdiagnosed granulomatous disease. Int J Infect Dis 2010; 14:e277-e279.

13. Montealegre G, Uribe R, Martínez-Ceballos MA, et al. ASIA syndrome symptoms induced by gluteal biopolymer injections: Case-series and narrative review. Toxicol Rep

2021; 8:303-314.

14. Vecino-Moreno MJ, Vivas ÁJ, Tobón GJ, et al. Lower limb arterial thrombosis due to biopolymer injection: A case report. Rev Colomb Reumatol 2024; 31(2):264-267.

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