Pulmonary Puzzle: Scleroderma Induced Cryptogenic Organizing Pneumonia – A Rare Case Report

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***Abstract*—Scleroderma, also known as systemic sclerosis, is a chronic autoimmune connective tissue disease characterised by skin thickening and organ fibrosis. Among the most serious complications are pulmonary manifestation, which can significantly affect the quality of life and prognosis. Cryptogenic Organising Pneumonia (COP) is a form of idiopathic diffuse Interstitial Lung Disease (ILD) that develops in response to a variety of unknown irritants. A 61-year-old female patient came to pulmonology department with the complaints of cough, worsening at night. The patients have no medical, social or family history. On physical examination, the patient had bilateral crepts. According to HRCT thorax, the patient was found to have cryptogenic organising pneumonia and hypersensitivity pneumonitis. In ANA profile, Scl- 70 shown to be strongly positive, which conclude systemic sclerosis and RA factor 14.9 IU/ml (<12 IU/ml). Patient was treated with IV antibiotics, corticosteroids and other supportive measures. Patient improved symptomatically and discharged with stable vitals. This case points out the connection between scleroderma and pulmonary complications, which is crucial for timely diagnosis, effective management and prevention of disease progression.**

***Abstract*—Scleroderma, Cryptogenic organising pneumonia, Fibrosis, Microvascular damage.**

I. INTRODUCTION

Scleroderma or Systemic sclerosis, is a chronic autoimmune connective tissue disease characterized by excessive collagen deposition, leading to skin thickening and fibrosis of internal organ. The exact cause of scleroderma is unknown, but involves a combination of genetic predisposition, environmental triggers and immune dysregulation (1).

The disease begins with an aberrant immune response where T cells, B cells and macrophages release pro-inflammatory cytokines such as TGF β and interleukin 6, which stimulate fibroblasts to produce excessive collagen and extra cellular matrix proteins. Autoantibodies, including anti- Scl-70 and anti-centromere antibodies, contribute to tissue injury (2). Endothelial damage places a central role causing an imbalance between vasoconstrictors like endothelin-1 and vasodilators such as nitric oxide, leading vasospasm, vascular remodelling and ischemia. This results in clinical manifestation like Raynaud's phenomenon, digital ulcers and pulmonary arterial hypertension (PAH) (3). Persistent fibroblast activation causes progressive fibrosis in the skin, lungs, kidneys, gastrointestinal tract and heart impairing tissue function. The combination of immune activation, vascular dysfunction and fibrosis underlines the multisystem involvement and clinical variability of scleroderma (4).

Cryptogenic Organising Pneumonia (COP), previously known as Bronchiolitis Obliterans Organising Pneumonia (BOOP), is a rare non-infectious inflammatory lung condition characterized by excessive fibroblast proliferation and granulation tissue formation within the distal airway, alveolar ducts and alveoli. Its underlying cause is unknown (cryptogenic). However, it can be associated with

certain exposures, autoimmune diseases, infection or drug toxicity [5].

Scleroderma induced COP involves a complex interplay between the autoimmune process of scleroderma and the abnormal repair response of lung tissue. In scleroderma systemic inflammation and immune dysregulation leads to endothelial damage and the release of pro-inflammatory cytokines such as TGF-β and IL-6, which plays a role in tissue fibrosis and activation of fibroblast [6]. When this inflammatory environment affects the lung, it triggers an inappropriate repair process in response to alveolar injury. As in COP, fibroblast proliferate excessively and form granulation tissue within the alveolar spaces known as Masson bodies. These plugs of fibroblast and collagen obstruct the alveoli and small airways impairing normal gas exchange and contributing to the patchy consolidations [7]. The inflammation in scleroderma leads to both vascular dysfunction and fibrosis. Although COP in scleroderma shares the typical features of organising pneumonia, it is thought that the combination of autoimmune induced inflammation, endothelial damage and abnormal wound healing contributes to the condition in affected individuals [8].

Diagnosing scleroderma induced COP requires a comprehensive approach that includes clinical, radiological and histopathological evaluation. In clinical evaluation, Patient with scleroderma often present with symptom such as persistent cough, shortness of breath, fatigue and low-grade fever. A chest X-ray may show patchy or bilateral consolidation typically in peripheral or peri-bronchial areas. High resolution CT scan (HRCT) is more sensitive in detecting COP, it typically reveals bilateral, patchy, ground-glass opacities and consolidation, often in peripheral and subpleural regions of lung. The pattern may mimic other forms of ILD, making clinical correlation necessary [9]. In pulmonary function test (PFT), typically shows a restrictive lung pattern with reduced forced vital capacity (FVC) and diffusive capacity for carbon monoxide (DLCO). Lung biopsies is the definite diagnosis, which show fibroblastic proliferation within the airway forming Masson bodies- polypoid collection of granulation tissues [10].

The first line treatment includes high- dose corticosteroid particularly prednisone. Most patients with COP show rapid improvement with corticosteroid treatment [11]. In cases of steroid resistant or intolerance, additional immunosuppressive medication may use. Drugs such as Azathioprine, Mycophenolate mofetil or cyclophosphamide can help modulate the immune response and reduce inflammation. Since COP in scleroderma may reflect a flare of systemic disease, controlling the underlying scleroderma is critical. Disease modifying treatments like Methotrexate, Mycophenolate or Rituximab may be considered depending on the degree of systemic involvement [12].

II. CASE REPORT

A 61-year-old female patient presented with complaints of cough worsening at night to pulmonology outpatient department. The patient was admitted for further evaluation. She has no medical, family or social history. She was conscious, oriented, afebrile, peripheral warmth present and chest shown bilateral fine crepts. She was able to move all limbs and GI was nontender. During admission she had a Pulse Rate (PR) of 82 beats/ min, Respiratory Rate of 22 breaths/min and Blood Pressure of 160/90mmHg. Her laboratory parameters showed an elevation in WBC (15,350 cells/cumm), Polymorphs (87.1%), RBS (176 mg/dL), HbA1c (6.8%), Serum Cholesterol (249 mg/dL) and ESR (25mmhr). Her ANA profile revealed Scl-70 strongly positive (107/ +++) and RNP/Sm borderline (8/+). Her HRCT showed multifocal confluent areas of airspace consolidations seen in both lings, in the lower lobes and predominant peripheral distribution. Few minimally enlarged privascular and paratracheal non calcified oval lymph nodes are seen of short axis 8-9mm, 5-6 nos, which shown an impression of Cryptogenic Organizing Pneumonia, hypersensitivity pneumonitis.

Patient was treated with INJ. MEROPENEM 1gm IV TDS for pneumonia, INJ. METHYLPREDNISOLONE 40mg IV TID as anti-inflammatory agent, NEBULIZATION WITH FORMOTEROL + BUDESONIDE P/N BD and NEBULIZATION WITH LEVOSALBUTAMOL + IPRATROPIUM BROMIDE as bronchodilators and anti- inflammatory action, T. ACEBROPHYLLIN + N-ACETYLCYSTEINE P/O 1-0-1 as mucolytic agent and INJ. PANTOPRAZOLE 40mg IV OD for preventing gastric irritation. On 3rd day, rheumatology consultation was done and advised INJ.

METHYLPREDNISOLONE 1gm in 100ml NS over 1 hour for 3 days, it was added after stopping INJ. METHYLPREDNISOLONE 40mg IV and added T. DOMPERIDONE 10mg 1-1-1 for vomiting. ON 5th day, the patient showed elevated BP (140/90mmHg) TAB. ENALAPRIL 2.5mg 1-0-0 was added to prevent future hypertensive emergency and renal crisis. INJ. HUMAN ACTRAPID added according to GRBS. Patient was symptomatically improved on 7th day with T. PREDNISOLONE, 30mg, 1-0-1, T. DOMPERIDONE 10mg 1-1-1, T. ACEBROPHYLLIN + N- ACETYLCYSTEINE 1-0-1, T. RABIPRAZOLE 20mg 1-0-0, T. ENALAPRIL 2.5mg 1-0-0, T. CALCIUM + VITAMIN D 500mg 1-0-1, T. CHOLICALCIFEROL 60K OD once weekly.

III. DISCUSSION

Cryptogenic organizing pneumonia (COP) is an idiopathic form of interstitial lung disease (ILD) that arises due to unknown triggers, often presenting with patchy lung inflammation and fibrosis. While COP is generally considered a distinct entity, its association with systemic diseases, including autoimmune disorders and granulomatous conditions like sarcoidosis, raises important diagnostic and therapeutic challenges [13].

A case report by Bingu Shiv Kiran Reddy et al present a case on Scleroderma associated with organising pneumonia: a rare case report. In this report, we highlight a case of an elderly female initially diagnosed with COP based on radiological and histopathological findings. Interestingly, following systemic steroid therapy, there was a notable decline in serum angiotensin-converting enzyme (SACE) levels, supporting a secondary diagnosis of sarcoidosis [14]. This suggests a potential overlap between COP and sarcoidosis, which is rarely reported in clinical literature. Given that sarcoidosis can present with a wide spectrum of pulmonary manifestations, including organizing pneumonia-like features, it is plausible that COP in some cases may be an early or atypical presentation of sarcoidosis rather than an entirely separate disease process [15].

Furthermore, COP has been linked to various autoimmune disorders, such as systemic sclerosis (SSc) and inflammatory arthritis. In systemic sclerosis, pulmonary involvement, particularly ILD and pulmonary hypertension, is a major contributor to mortality [16]. Similarly, inflammatory arthritis, including rheumatoid arthritis, may present with extra-articular complications like ILD, and COP is sometimes observed in these patients. However, it is exceedingly rare for organizing pneumonia to be the initial manifestation of an autoimmune disorder, making early diagnosis and differentiation crucial [17]. This report underscores the complexity of COP as a potential overlap syndrome with other systemic conditions [18]. Future research should focus on defining specific biomarkers and imaging characteristics to differentiate idiopathic COP from secondary forms linked to autoimmune or granulomatous diseases. A multidisciplinary approach involving pulmonologists, rheumatologists, and pathologists is essential to ensure accurate diagnosis and optimal patient outcomes [19].

IV. CONCLUSION

This case highlights the rare occurrence of cryptogenic organizing pneumonia (COP) as a pulmonary manifestation of scleroderma. While interstitial lung disease (ILD) is a well-documented complication of systemic sclerosis, COP as a presenting feature remains exceedingly uncommon. Early recognition of this overlap is crucial, as timely intervention with corticosteroids can lead to significant clinical and radiological improvement. This case underscores the importance of considering COP in scleroderma patients presenting with unexplained respiratory symptoms, emphasizing the need for a multidisciplinary approach to optimize diagnosis and management. Further research is needed to better understand the pathophysiological mechanisms linking COP and scleroderma and to refine treatment strategies for such patients.

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