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Case Study

AYURVEDIC MANAGEMENT OF NON-PRODUCTIVE COUGH IN SSC- INTERSTITIAL LUNG DISEASE

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ABSTRACT

Interstitial lung diseases (ILDs) encompass a diverse group of disorders that affect the lung parenchyma or interstitium, leading to inflammation and progressive scarring of lung tissue. This process results in thickening and stiffening of the lung tissue, impairing the lungs' ability to expand and fill with air. As occupational disorders rise in society, particularly conditions like ILD, there is an increasing need for preventive healthcare approaches. While current invasive diagnostic methods and therapeutic interventions offer certain benefits, they often come with drawbacks such as side effects and high costs. Ayurvedic medicine, with its holistic focus on prevention and individualized treatment, offers a promising alternative. By addressing underlying imbalances and promoting overall wellness, Ayurvedic remedies could provide a feasible and effective solution for managing symptoms of ILD and preventing its progression, aligning with modern healthcare's push towards more natural and sustainable care practices.

INTRODUCTION

Systemic sclerosis (SSc) is a complex, multifaceted disease marked by vasculopathy, autoimmunity, and fibrosis, impacting multiple organs with no definitive treatment. SSc leads to significant morbidity and mortality, primarily due to pulmonary complications, with interstitial lung disease (ILD) and pulmonary arterial hypertension (PAH) being the most common and debilitating forms of lung disease associated with the condition. Approximately 80% of patients with Systemic Sclerosis (SSc) develop lung fibrosis, while around 25% progress to progressive Interstitial Lung Disease (ILD), which has a high 10-year mortality rate of around 40%, making it a leading cause of morbidity and mortality in this patient population. [1]

Estimating the precise prevalence of ILD in Systemic sclerosis (SSc) is challenging due to the disease's insidious onset, with many patients remaining asymptomatic in the early stages, making early detection and accurate assessment difficult.[2] Previous autopsy studies have consistently demonstrated a near-universal presence of interstitial lung disease (ILD) in systemic sclerosis (SSc) patients, with reported prevalence rates spanning 74% to 100%.[3]

Interstitial Lung Diseases (ILDs) comprise a diverse group of conditions that affect the lung's parenchymal tissue, encompassing the alveoli, alveolar epithelium, capillary endothelium, and surrounding interstitial spaces, as well as the perivascular and lymphatic tissues, leading to inflammation, scarring, and impaired lung function in these critical structures.

ILD in systemic sclerosis (SSc) arises from a complex interplay of immune dysregulation, vascular damage, and fibrosis, which progressively affects lung function. The pathophysiology begins with immune dysregulation characterized by autoimmune activation. In SSc, autoantibodies such as anti-topoisomerase I, anti-centromere, and anti-RNA polymerase III are commonly present. These autoantibodies, along with activated T cells, B cells, and macrophages, release a variety of pro-inflammatory cytokines (e.g., IL-1, IL-6, TNF-α), leading to chronic inflammation in multiple organs, including the lungs.

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As inflammation progresses, vascular injury occurs, particularly affecting the pulmonary vasculature. Endothelial cell dysfunction is a key feature of SSc,[4] where endothelial cells become damaged, leading to a reduction in nitric oxide production and an increase in vasoconstrictors such as endothelin-1. This promotes endothelial cell proliferation, intimal thickening, and fibrosis in small blood vessels. This vasculopathy contributes to pulmonary hypertension and impaired blood flow, further exacerbating hypoxia and lung injury.

The hallmark of ILD in SSc is fibrosis,[5] which results from the excessive deposition of extracellular matrix, mainly collagen. This process is driven by the activation of fibroblasts, which are stimulated by pro-fibrotic cytokines such as transforming growth factor-beta (TGF-β). In response to chronic inflammation, fibroblasts differentiate into myofibroblasts, which secrete large amounts of ECM components and contract, leading to tissue stiffening and scarring. In the lungs, this fibrosis predominantly affects the interstitial spaces, leading to the progressive thickening of the alveolar septa, impaired gas exchange, and restrictive lung disease. The lung parenchyma loses its elasticity, reducing lung compliance and leading to decreased pulmonary volumes, particularly the forced vital capacity. Studies revealed that patients with systemic sclerosis (SSc), with up to 90% showing evidence of interstitial changes on high-resolution computed tomography (HRCT)[6] and 40-75% exhibiting pulmonary function test (PFT) abnormalities.[7]

Alongside fibrosis, chronic inflammation in the lungs continues to exacerbate the disease through the release of additional inflammatory mediators and matrix metalloproteinases (MMPs), which further promote ECM remodeling.[8] Over time, this leads to a vicious cycle of inflammation and fibrosis that progressively worsens lung function. Hypoxemia develops due to impaired oxygen exchange, and patients typically present with dyspnea, particularly on exertion. Additionally, pulmonary hypertension can develop as a consequence of both vascular damage and chronic hypoxia, further compromising pulmonary function and increasing the risk of right heart failure.[9] Overall, ILD in SSc results from a combination of immune-driven inflammation, endothelial injury, and excessive fibrosis, leading to progressive pulmonary dysfunction, impaired gas exchange, and respiratory compromise. The disease often results in restrictive lung disease, decreased lung volumes, hypoxemia, and pulmonary hypertension, significantly impacting patient survival and quality of life.

Non-productive cough in interstitial lung disease (ILD), particularly in systemic sclerosis (SSc), is a common symptom due to inflammation and fibrosis of the lung interstitium.[10] As the lung tissue becomes thickened and scarred, the ability to clear secretions is impaired, and irritation of the airway linings by inflammatory mediators (e.g., cytokines) can trigger coughing. This cough is typically dry, persistent, and worse at night or during exertion, without significant sputum production. It can be a result of both the restrictive lung process and micro aspiration associated with gastroesophageal reflux, which is common in SSc. The cough often reflects underlying lung injury and fibrosis rather than an infectious cause.

While fibrosis may develop over time in ILD, leading to irreversible lung damage, early-stage interventions can help manage symptoms, particularly dry cough, which severely impacts a patient's daily life and overall quality of life. Modern treatment focuses on symptomatic relief with costly interventions like lung transplantation, but offers limited curative benefits and poses risks of drug hazards and financial burdens on patients, particularly the middle and lower classes. In contrast, Ayurveda can yield promising results by providing symptomatic relief and slowing the disease's progression in ILD with minimal hazards, addressing the root cause and promoting holistic well-being, thereby ensuring a better quality of life and providing a valuable alternative to conventional treatment.

Case History

Presenting Complaints

A 48 years old patient, married, non-smoker, previously working as a wedding photographer came to the outpatient department of Roganidana department of our hospital, had complained of 6-month history of dry cough and hoarseness in voice and decreased appetite for 8 months. The patient visited a physician in his hometown who after conducting various diagnostic imaging referred him to a pulmonologist, suggested to take Spiral CT and diagnosed with Early ILD. He has started medicines such as dextromethorphan hydrobromide (one tablet twice a day), acebrophylline SR 200 (one tablet once a day), calcitriol (one capsule once a day), acetylcysteine 600 (one tablet once a day), and multivitamin (one tablet once a day). The patient got mild relief in coughing with these medications but only for a short duration. After 2 months period, the patient experiences a recurring non-productive cough that disrupts their sleep patterns and daily routine activities with more aggravation despite ongoing allopathic medication associated with anorexia. Since then, he had no considerable relief, therefore, he came for Ayurvedic treatment.

Clinical findings

Systemic examination

CVS- NAD

CNS- NAD

Respiratory system examination

Inspection

- B/L symmetrical chest
- No evidence of altered chest dimensions
- No deviation of trachea noted
- No evidence of muscle wasting
- No evidence of clubbing and cyanosis noted

Palpation

- No tenderness noted over costochondral region or chest wall
- No lymphadenopathy noted

Auscultation: B/L Crepitations over basal areas during deep and slow breathing

Percussion:

- Dullness and increased vocal fremitus over basal segments
- Decreased tactile fremitus in the lower lung field

Scleroderma - symptomatic since 2018

Investigations

ANA Profile (16/07/2021)

- Mi- 2+

Spirometry (18/11/2021)

- FVC :73
- FEV: 75
- PEF:101
- FEF 25-75: 63
- FEV/FVC: 106

Spiral CT scan – Thorax (10/02/2023)

- Subpleural ground glass opacity with interlobular septal thickening and reticulations in basal segment of bilateral lower lobes – Early ILD
- Mild bronchiectasis noted in bilateral lower lobes
- Sub centimetric perivascular, right and lower paratracheal lymph nodes noted

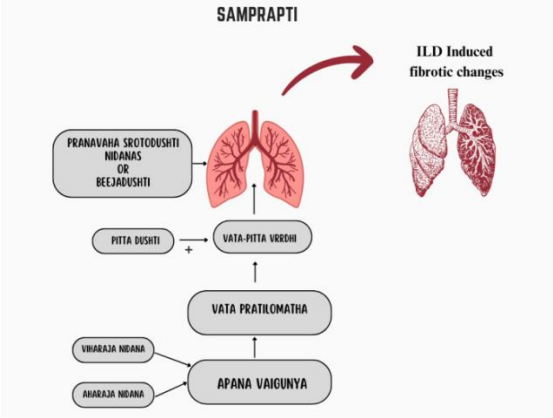
Diagnostic Assessment

The diagnostic evaluation of ILD in this patient with a history of scleroderma since 2018 includes both clinical examination and investigative findings. On auscultation, bilateral crepitations over the basal lung areas suggest interstitial involvement. Percussion revealed dullness and increased vocal fremitus over the basal segments, with decreased tactile fremitus in the lower lung fields, which may indicate pleural or interstitial changes. The patient's ANA profile (16/07/2021) showed a positive Mi-2+, supporting an autoimmune etiology. Spirometry (18/11/2021) demonstrated mildly reduced FVC (73%) and FEV1 (75%), suggesting restrictive lung disease, with preserved airflow (FEV/FVC ratio of 106%). A spiral CT scan (10/02/2023) revealed subpleural ground-glass opacities, interlobular septal thickening, and reticulations in the bilateral lower lobes, indicating early ILD, commonly seen in scleroderma-related ILD. Additional findings included mild bronchiectasis in the lower lobes and sub-centimetric perivascular lymph nodes in the right and lower paratracheal regions.

Samprapti ghataka

- ***Dosha –*** *Vata-pitta vrddhi, Kapha kshaya*
- *Vata (Udana, Prana, Apana), Pitta (Pachaka), Kapha (Kledaka)*
- ***Dushya –*** *Rasa kshaya, Mamsa kshaya*
- ***Agni*** *– Mandagni*
- ***Srotas*** *– Pranavaha srotas, Rasavaha srotas,*
- ***Adhishtana*** *– Pupphusa*
- ***Rogamarga –*** *Abhyantara*
- ***Vyadhi avastha*** *– Purana*
- ***Sadyasadyata-*** *Yapya*

This 48-year-old male patient may have a familial predisposition to *Beejadushti* (genetic or hereditary dysfunction), or his parents may have been exposed to *Nidanas* that led to the vitiation of *Pranavahasrotas.* These *Nidanas* could have resulted in *Khavaigunya* of the patient's *Pranavahasrotas.* Contributing factors include the patient's *Ahaaraja Nidanas* such as *Akala* (irregular eating) and *Pramitabhojana,* as well as *Viharaja Nidanas* like *Ratrijagarana d*ue to his profession, along with *Vegadharana* (suppression of natural urges e.g., urinary retention). Initially, this may have led to *Apana-vata dushti,* which impairs the normal function of *Apana vayu*, causing it to move in the opposite direction *(Pratiloma gati)*. The *Prakupita vayu* brings the *Pitta dosha* which stays in *Samana avastha* to the site of *Kapha* i.e., *Uras* (*Asayapakarsha gati)*, and causes *Soumya dhatu kshaya* there, particularly in the *Pupphusa.* This implies the *Rasavaha dhatu* and its *Srotas* that functions for the nutrient supply, respiration and oxygenation. Prolonged exposure to *Vatapitta vrddhi* causing disturbances in the *Rasavaha srotas* (channels carrying lymph and blood) also results in the *Soshana* of *Kapha.* This manifests as impaired gas exchange and lung stiffness, losing the elasticity, eventually leading to pulmonary fibrosis. As the tissue loses elasticity due to *Kapha Kshaya,* the normal flow of *Prana vayu* is obstructed locally. This obstruction (*Sanga*) causes *Vimarga gamana* entering the *Siras* (channels) of the *Gala* and *Kanta* (throat), manifesting as *Vatika Kasa* with associated symptoms such as *Swarabheda* (hoarseness of voice) due to thickening and fibrosis of the vocal cords in early interstitial lung disease (ILD), *Jeerna Anna Vega* (cough in the late phases of digestion), and *Ksheena Bala-Ojas* (weakness and depletion of vitality) due to reduced appetite.



Treatment Given

Treatment is the scientific process aimed at reversing the underlying pathology (*Sampraptivighatana)*. To alleviate symptoms and prevent recurrence of the disease, the patient requires interventions such as *Anulomana, Amapachana, Deepana, Dosha shamana,* and *Rasayana.* However, it is important to note that the *Khavaigunya* resulting from *Beejadushti* cannot be fully corrected.

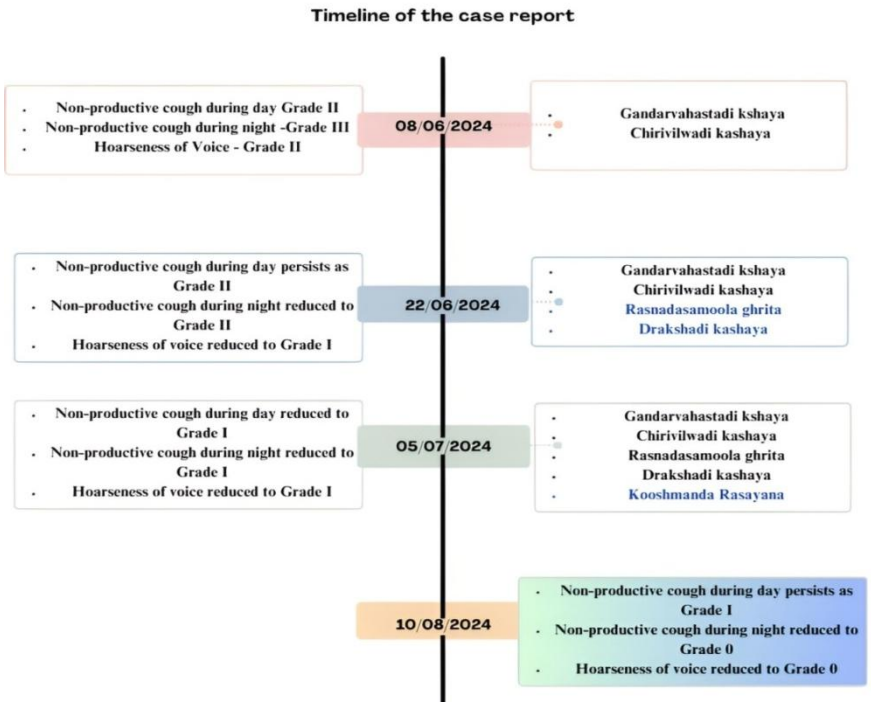
Table 1: Course of the treatment given

Sl.no	Medicine	Dosage and time of administration
Anulomana, Deepana, Pachana		
1	*Gandharvahastadi kashaya*	90ml, 6 am, 6pm before food
2	*Ciravilwadi kashaya*	90ml, 6 am, 6pm, before food
Snigdha brimhana* and *Srotomardava chikitsa* to relieve the *Sthanika vrddhi* and *Pratilomata* of *Vata dosha* causing *Vatika kasa		
3	*Rasnadasamoola ghritam*	Frequently
4	*Drakshadi kashaya pana*	Frequently
Rasayana chikitsa		
5	*Kooshmanda rasayana*	2 tsp BD before food

Changes Before and After Treatment

- Assessment of symptoms using the Cough Symptom Score as an indicator of severity.[11]
- Hoarseness of voice was assessed and evaluated using GRBAS Score[12]

Fig 1: Timeline of Case report



DISCUSSION

Interstitial Lung Disease (ILD) refers to a group of lung disorders characterized by inflammation and fibrosis of the lung tissue, specifically the interstitial space, which is the tissue surrounding the air sacs (alveoli). This fibrosis disrupts the normal structure and function of the lungs, leading to symptoms like

shortness of breath, cough, and reduced oxygen exchange.

According to the principles of Ayurveda, the structural and functional defect observed in this case results from *Vata pratilomata,* or the impaired function of *Vata.* This condition gives rise to a variety of associated symptoms. The underlying cause of *Vata pratilomata* in this instance is primarily related to imbalances in *Apana vata* and *Udana vata,* which should be addressed first to reverse the clinical issue.

For this reason, we have selected *Gandharva hastadi Kashayam* and *Chirivilwadi Kashaya* as the first-line treatments. *Gandharvahastadi Kashayam* is known for its *Vata*-pacifying properties, along with its ability of *Agnideepana* and *Malasodhana.*[13]

Additionally, *Chirivilwadi Kashaya,* which possesses *Deepana* (appetizer), *Pachana* (digestive), and *Vatanulomana* (normalizes *Vata*) actions, has been included to further support the treatment. The formulation contains *Ushna virya* and *Katu pradhana dravyas,* which primarily act on *Pitta* and are effective in pacifying *Apana vata,* particularly in the lower abdomen. This combination promotes *Pachana* and *Deepana,* ensuring digestive and metabolic balance.

Further treatment includes *Rasnadasamoola ghritam,* which is administered after the patient reaches *a Nirama-avastha*. This formulation aids in the *Anulomana* of *Prana, Udana* and *Apana vata,* while also acting as a *Vyadhipratyanika cikitsa.* The medicinal ingredients, such as *Dashamula,* are *Tridoshahara* and others like *Rasna, Eranda,* and *Vriddharu* are particularly *Vata*-pacifying in nature. *Rasnadasamoola ghritam* also has actions that alleviate symptoms like *Kasa* and *Swasa* and is known for its anti-inflammatory and pain-relieving properties.[14]

To pacify *Vata-pitta vrrdhi, Drakshadi Kashaya* is given as a frequent drink. The formulas *Tikta* and *Madhura* tastes possess *Agnideepana* and *Pachana* properties, aiding in the treatment of *Agnimandhya.*

For its *Rasayana* properties, we have included *Kooshmanda Rasayana,* as referenced in *Ashtanga Hridaya* under *Kasa Chikitsa*[15] and in the *Raktapittadhikara* of *Bhaisajya Ratnavali.* This formulation is beneficial for a wide range of conditions such as *Kasa, Hidhma, Jwara, Swasa, Raktapitta, Kshata,* and *Kshaya. Kooshmanda* has several therapeutic actions, including *Ura-Sandhana Janana.* It is specifically indicated for chest-related ailments and has shown inhibitory effects on histamine release [16] due to antigen-antibody reactions, thus aiding in conditions like asthma. All components of *Kooshmanda Rasayana* are *Ushna veerya* with *Laghu guna,* which synergistically enhance the rejuvenating effects on the *Pranavaha Srotas.*

Along with these medicines, strict guidelines regarding diet and lifestyle have been provided. As a result, significant symptomatic improvement was observed in the patient, as evidenced by the reduction in CSS (Cough Severity Score) and GRBAS (Grade, Roughness, Breathiness, Asthenia, Strain) scores. Both scores showed a marked decrease in severity, indicating significant symptomatic relief from the treatment.

CONCLUSION

Current modern treatment for Interstitial Lung disease (ILD) offer only limited benefits. Conventional treatment approaches typically involve medications with anti-inflammatory effects, such as corticosteroids and immunosuppressive drugs, along with cytotoxic agents like azathioprine and cyclophosphamide, and anti-fibrotic medications. Most of the strategies focus on suppressing immune and inflammatory responses. However, no pharmacological therapy has been definitively proven to alter or reverse the inflammatory process in ILD.

This case study shows that non-productive cough induced by ILD can be effectively managed with Ayurvedic medicines, following a thorough assessment of both the patient and the disease based on Ayurvedic principles. The treatment approach is rooted in understanding the fundamental factors such as *Dosha* and *Dushya.* Initially, the focus is on restoring the balance of *Vata dosha,* followed by addressing the involvement of other *Doshas* in the disease process. The patient's treatment plan includes *Anulomana, Amapachana, Deepana, Dosha Sodhana* and *Rasayana Chikitsa* to alleviate symptoms and prevent disease recurrence. This case clearly illustrates how the patient's overall well-being improved with relatively short-term Ayurvedic management, lasting approximately two months.

Patient Testimony

"I had been suffering from a severe, dry cough, especially during the night, which disturbed my sleep and left me feeling exhausted. Along with this, I experienced hoarseness of voice and occasional loss of appetite, making daily life quite difficult. After seeking treatment at the outpatient clinic and following the prescribed regimen for two months, I noticed a significant improvement. The cough has reduced to a mild intensity, and I no longer experience hoarseness or loss of appetite. This improvement has greatly enhanced my overall quality of life, allowing me to sleep better and regain my energy and well-being."

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