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CASE STUDY

# Artificial Intelligence-guided High-resolution Computer Tomography Assessment in Bilateral COVID-19 Pneumonia of Standalone Ayurveda Successful Case Study

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**ABSTRACT**

Population exposure to COVID-19 has been troubling people extensively with the involvement of upper respiratory tract symptoms characterized by dyspnea on rest, nasal congestion, pain on cough, mild fever, constipation, insomnia and uneasiness. Patients with multiple system involvements, ages, and compromised immunity from lower socio-economic strata are all to be considered. Open demand for hospitals with all the facilities yet not too expensive has a huge surge in patients trying to get admission, this is no secret. A 73-year old retired patient with all the above intense symptoms showing ground-glass bilateral lung involvement was refused admission. High-resolution computer tomography (HRCT) showed 80% parenchymal involvement; fortunately, he was not on any medication, but oxygen saturation was <70%. Financially, he was not able to afford admission and preferred Ayurveda management, which he was always taking. The patient was advised Ayurveda medication, followed telephonic instructions, and overcame anxiety and fear. By the 2nd week, mild fever and constipation were controlled, but persistent coughing and lethargy still troubled the patient. Prayers, *Shavasana*, and *Pranayama* were advised to be continued as before. In the 2nd week, from 80%, HRCT showed 64% and a significant reduction in symptoms, and by 4 weeks, HRCT was 8%. The evidence attached from major hospitals before, during, and after Ayurveda management also showed a downward trend, enhancing patients confidence and well-being. The HRCT guided by artificial intelligence was necessary to demonstrate results, decreased symptoms, and significant results that Ayurveda alone could benefit patients much. The reverse transcriptase polymerase chain reaction conducted after therapy was negative. The patient provided support to publish the case.

## 1. INTRODUCTION

Epidemics were known to ancient seers. *Charaka Samhita* records the pandemic as "*Janapadodhwamsa*," meaning mass destruction of the population due to pollution caused by infection being spread through polluted air, water, and close proximity. *Sushruta Samhita* describes infectious diseases, etiological factors, prevention, pathology, and management. It is well recorded as a condition that needs to be controlled if not lead to many ailments. The microbial infection, referred to as A*upasargika roga,* was known. *Pratishyaaya* (URTI) can manifest due to both short and chronic incubation periods. *Samhitas* explain that upper respiratory conditions, when neglected, lead to *kasa*, *shwasa*, and many other serious conditions, such as tuberculosis, wasting, and many other disorders.

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Pratishyaaya manifests due to *kaphaja krumi* (*Krumi* means that which attacks, invades, infects, spreads) and microbiologists named in the Vedic period where Sushruta has described *Nidana Parivarjan* move away or stop causative factors, and it includes close contact, sharing of clothes, cosmetics, breathing air, etc. '*Aupasargajanya vyadhi*' due to transmission. Droplet infection due to all the above reasons. Do not share masks or any clothing, aprons, instruments, equipment or any hospital materials that can carry viruses. Sneezing, a major symptom that is recognized as having short or chronic incubation has been known to have ailments culminating in diseases of the lungs, heart, and digestive system as well. Prevention of seasonal ailments, which spread to the whole community, and more drastic symptoms in people with compromised immunity.[1]

The gold standard for any patient with COVID-19 symptoms—reverse transcriptase polymerase chain reaction (RT-PCR)—is usually done and more investigative reports follow. Moreover, if symptoms are intense, high-resolution computer tomography (HRCT) is advised.[2] The pandemic of viral infections undergoing intense mutations has been a challenge and applying artificial intelligence (AI) in diagnosis, prognosis, and management results in CORADS reporting, and data system classification, and chest computed tomography involvement scores. AI has played a crucial role in molecular research, drug development, diagnosis, treatment, statistics, prognosis, and all aspects of COVID-19.[3] The patient and his family members were ready to undergo any sort of report, but there was no admission. If possible, today people want to return to normal life as long COVID-19 has become too common. It is a common method to prescribe antibiotics for bacterial pneumonia or antiviral if it is viral pneumonia or it could be fungal pneumonia, prescribe over- the-counter medications as per symptoms, advise a lot of fluids, and rest until it is diagnosed (bacterial, viral, or fungal). The patient was rejected admission due to age, financial incompetence, and the HRCT was too much of a risk (HRCT attached).

Patients try prevention of any viral or bacterial infections through Ayurveda combined with yoga practices and get promising results.[4] It is evident that people prefer inexpensive natural medicines and favor to keep away from antibiotics as much as possible, as more awareness and education about antibiotic-resistant situations are becoming well-known facts. As virus mutations may hamper biomedicines acting on the COVID-19 virus, people are looking out for methods to enhance immunity for prevention or early cure naturally.[5]

## 2. CASE HISTORY

Patient details: male patient aged 73 years, being a pensioner and economically not promising. Hence, he could not afford allopathic intensive care, so the patient decided to take Ayurveda. When the patient was found to be breathing heavily and having dyspnea without exertion, apart from this, the doctors checked oxygen saturation, which was 70% and 80% of the chest showed involvement in HRCT.

This is not a known case of diabetes, hypertension, or any other morbidity. Bp and pulse were reported as normal after returning home. However, he was anxious about bilateral involvement of the lungs.

The patient's anxiety and fear were after seeing the reports, but he had been under Ayurveda therapy for some simple ailments, such as joint pain, fever, headache, and sleeplessness. Hence, he wanted to take Ayurveda. The patient, being orthodox, had been doing puja, prayers, and meditation for many years, so he was willing to restart simple yoga and diet advice was not much of an issue.

But taking Ayurveda and yoga as medications and getting back to a normal life is most important and preferred.

Reports of HRCT were taken when symptoms were intense. Apart from Ayurvedic medicines, regimens and yogasanas, such as *Bhujangasana, Marjalasana, Puja,* and *Vishnu Sahasranama* were counseled and meticulously followed by patients.

## 3. RESULT

The patient got a very favorable reduction in symptoms. Some additional changes were made weekly based on the response mentioned in Table 3. A good response is observed in patients, which is also due to good patient care and the attitude of the family.

Medications from reputed drug companies were prescribed as Tablet Bresol, Tablet Septilin, Bhasma mixture, Prandhara, Trishun, Syrup Geri forte, and Giloy tablets (Table 2).

The patient's age and lung involvement as seen in a computed tomography scan have been utilized as attachments taken from a reputed hospital (Table 1).

## 4. DISCUSSION

*Sameera Pannaga Rasa* is a *Kupipakwa Rasayana* prepared from *Kajjali, Shuddha Haritala, Manashila, and Gauripashana)*.[6] *Parada* embodies *Rogaghnata, Rasayana*, and *Yogavahi* properties. *Gandhaka* is *Rasayana, Kushthghna, Kandughna,* aiding *Twak* and *Raktagata Vikara*[7] *Haratala*, with *Katurasa* and *Katu Vipaka*, is *Kapha Vatahara, Kandughna,* and *Kushtaghna*, useful in *Kushta, Visarpa,* and *Jwara. Manahshila's Katu, Tikta Rasa,* and *Madhura Vipaka* offer *Rasayana, Lekhana, Kasahara, Shwasahara, Kandughna, Varnya, Vishaghna,* and *Kaphavatagna* properties for *Shwasa, Pandu,* and *Visharoga.*[8] *Gauripashana's Tikta Rasa* and *Katu Vipaka, Snigdha*, *Tridoshahara, Kledakaraka, Kushtahara, Shothahara,* and *Shwasahara* help in *Gulma, Pandu, Udara, Shleepada, Phiranga, Sandhivata,* and *Jwara*.[9] *Abhraka Bhasma* is *Pranavaha*srotas *Balya* and *Rasayana* thus strengthens the *Moolasthana–Phuphusa,* and *Hrudaya*. *Tankhana* has *Katurasa*, *Ushnaveerya*, *Kapha Vishlesha*, *Kasahara*, and *Swasahara* properties that check the symptoms of pneumonia. Synergistically, they act by the virtue of *Sheegratwa, Vatabhakshana, Agnivardhana, Kapha shodhana, Srotoshodhana, Vishatva, Vatanulomana,* and *Ubhayabhaga Shamana.*[10]

In order to stop transmission, lockdown period-termed as "*Nidana Parivarjan*" Prophylaxis is to keep people healthy. Physical, mental, and spiritual well-being needs to be considered by advising yoga, including *Omkara, Pranayama*, meditation, simple activities if possible, gardening, cooking, painting, etc., and keeping away from others. Continuing accustomed food habits to maintain health should include more seasonal species, adequate liquids, regular timings of food intake, and avoiding snacking and junk food. The daily routine suggested by the government needs to be followed.

## 5. CONCLUSION

The AI-guided HRCT helped in the assessment of bilateral COVID-19 pneumonia, and the condition is managed successfully by Ayurveda and Yoga along with diet and lifestyle modifications. The AI helped not only in the diagnosis and prognosis of the condition but also in the assessment of the results of the treatment. Ayurveda has explained the microbial infection, its transmission, prevention, and cure. The same strategy is employed here to manage the condition successfully. Ayurveda always propagates the overall well-being of the health seeker in terms of physical, psychological, social, and spiritual well-being. Measures are taken to combat the condition from all angles, like medicines and diet, treating the doshas involved and resulting in physical health, yoga, pranayama, and omkara, in psychological and spiritual well-being, and lifestyle modifications in balancing the social life of the health seeker. The AI-guided HRCT score from before treatment to after treatment has been evidence for the success of Ayurveda treatment in bilateral COVID-19 pneumonia.

### 5.1. Limitation of Study

As the case report is single but unique, it has been reported.

## 6. ACKNOWLEDGMENTS

None.

## 7. AUTHORS' CONTRIBUTIONS

All the authors contributed equally to the design and execution of the article.

## 8. FUNDING

Nil.

## 9. ETHICAL APPROVALS

This study does not require ethical clearance as it is a case study.

## 10. CONFLICTS OF INTEREST

Nil.

## 11. DATA AVAILABILITY

This is an original manuscript, and all data are available for only review purposes from the principal investigators.

## 12. PUBLISHERS NOTE

This journal remains neutral with regard to jurisdictional claims in published institutional affiliations.

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**Table 1:** Observation of the symptoms

| Symptoms | April 28, 2021 | May 05, 2021 | May 24, 2021 | May 28, 2021 |
|---|---|---|---|---|
| Cough | +++ | ++ | + | - |
| Greenish white sputum | ++ | + | - | - |
| Fever | +++ | ++ | + | - |
| Fatigue | ++++ | ++ | + | - |
| Constipation | +++ | - | - | - |
| Insomnia | +++ | - | - | - |

-Absent, +mild symptoms, ++moderate symptoms, +++severe symptom.

**Table 2:** Treatment protocol adopted in this case

| Date | Treatment |
|---|---|
| April 28, 2021 | 1. Septilin tablets 2–2–2<br>2. Bresol tablet 2–2–2<br>3. *Sameera Pannaga* rasa (1 mg)+*Abhraka Bhasma* (10 g)+50 g *Talisadi churna*–1/4 teaspoon once a day with honey (40 days)<br>4. *Pranadhara* - Application on forehead<br>5. Giloy tablets ½ teaspoon four times a day with honey<br>6. Tulsi juice<br>7. Trishun tablet 1–1–1<br>8. Geriforte syrup 10 ml+equal water after food<br>9. Hot ginger water to sip, (alternatively) Cumin powder in hot water to sip<br>10. Honey water+coriander powder<br>11. Diet-Porridge |
| May 05, 2021 | 1. Septilin tablets 2–0–2<br>2. Bresol (6) tablet - 2–0–2<br>3. *Sameera Pannaga* rasa (1 mg)+*Abhraka Bhasma* (10 g)+50 g *Talisadi churna*—1/4 teaspoon once a day with honey<br>4. Giloy tablets ½ teaspoon four times a day with honey<br>5. Tulsi juice<br>6. Geriforte syrup 10 mL+equal water after food<br>7. Hot ginger water to sip<br>8. *Omkara, Pranayama* |
| May 24, 2021 | 1. Septilin tablets 2–0–2<br>2. Geriforte syrup 10 mL+Equal water after food<br>3. Hot ginger water to sip<br>4. Milk with pinch of turmeric powder<br>5. Light food<br>6. *Omkara, Pranayama, Bhujangasana, Marjalasana, Shavasana*<br>7. *Puja, Vishnu Sahasranama* |
| May 28, 2021 | 1. Light food<br>2. *Omkara, Pranayama, Bhujangasana, Marjalasana, Shavasana*<br>3. *Puja, Vishnu Sahasranama* |

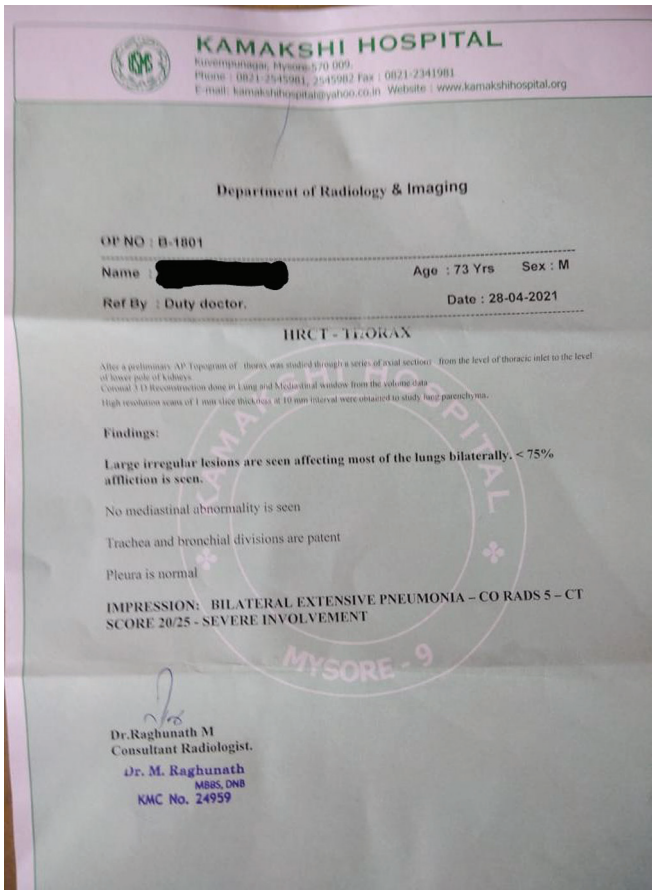
**Table 3:** HRCT reports as per dates

| April 28, 2021 | % Damage | May 05, 2021 | % Damage | May 24, 2021 | % Damage |
|---|---|---|---|---|---|
| Right upper lobe | 5 | Right upper lobe | 3 | Right upper lobe | Nil |
| Left upper lobe | 5 | Left upper lobe | 3 | Left upper lobe | Nil |
| Middle | 1 | Middle | 2 | Middle | Nil |
| Right lower lobe | 5 | Right lower lobe | 4 | Right lower lobe | 0.5% |
| Left lower lobe | 4 | Left lower lobe | 4 | Left lower lobe | 1.5% |
| 75% lesions | | Ground glass opacities | | 10% ground glass opacities | |
| Large irregular lesions | | Multifocal patchy | | Few patchy | |
| Total score | 20/25 | | 16/25 | | 2/25 |

HRCT: High-resolution computer tomography

## SUPPLEMENTARY FILES

### REPORT 1



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Department of Radiology & Imaging

OP NO : B-1801
Name : [redacted] Age : 73 Yrs Sex : M
Ref By : Duty doctor. Date : 28-04-2021

HRCT - THORAX

After a preliminary AP Topogram of thorax was studied through a series of axial sections from the level of thoracic inlet to the level of lower pole of kidneys
Coronal 3 D Reconstruction done in Lung and Mediastinal window from the volume data
High resolution scans of 1 mm slice thickness at 10 mm interval were obtained to study lung parenchyma.

**Findings:**

**Large irregular lesions are seen affecting most of the lungs bilaterally. < 75% affliction is seen.**

No mediastinal abnormality is seen

Trachea and bronchial divisions are patent

Pleura is normal

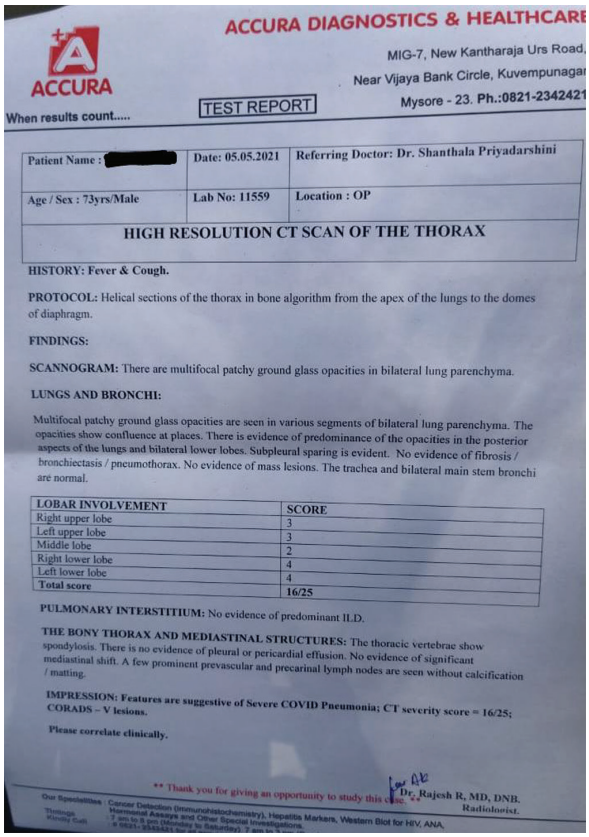
**IMPRESSION: BILATERAL EXTENSIVE PNEUMONIA – CO RADS 5 – CT SCORE 20/25 - SEVERE INVOLVEMENT**

Dr.Raghunath M
Consultant Radiologist.
Dr. M. Raghunath
MBBS, DNB
KMC No. 24959

MYSORE - 9

**BEFORE TREATMENT**

### REPORT 2



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TEST REPORT

| | | |
|---|---|---|
| Patient Name : [redacted] | Date: 05.05.2021 | Referring Doctor: Dr. Shanthala Priyadarshini |
| Age / Sex : 73yrs/Male | Lab No: 11559 | Location : OP |

**HIGH RESOLUTION CT SCAN OF THE THORAX**

**HISTORY: Fever & Cough.**

**PROTOCOL:** Helical sections of the thorax in bone algorithm from the apex of the lungs to the domes of diaphragm.

**FINDINGS:**

**SCANNOGRAM:** There are multifocal patchy ground glass opacities in bilateral lung parenchyma.

**LUNGS AND BRONCHI:**

Multifocal patchy ground glass opacities are seen in various segments of bilateral lung parenchyma. The opacities show confluence at places. There is evidence of predominance of the opacities in the posterior aspects of the lungs and bilateral lower lobes. Subpleural sparing is evident. No evidence of fibrosis / bronchiectasis / pneumothorax. No evidence of mass lesions. The trachea and bilateral main stem bronchi are normal.

| LOBAR INVOLVEMENT | SCORE |
|---|---|
| Right upper lobe | 3 |
| Left upper lobe | 3 |
| Middle lobe | 2 |
| Right lower lobe | 4 |
| Left lower lobe | 4 |
| Total score | 16/25 |

**PULMONARY INTERSTITIUM:** No evidence of predominant ILD.

**THE BONY THORAX AND MEDIASTINAL STRUCTURES:** The thoracic vertebrae show spondylosis. There is no evidence of pleural or pericardial effusion. No evidence of significant mediastinal shift. A few prominent prevascular and precarinal lymph nodes are seen without calcification / matting.

**IMPRESSION: Features are suggestive of Severe COVID Pneumonia; CT severity score = 16/25; CORADS – V lesions.**

**Please correlate clinically.**

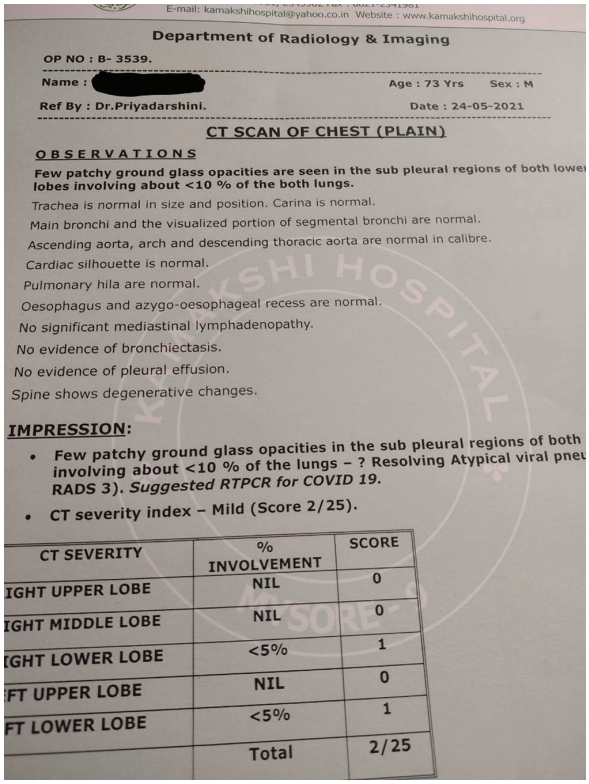
** Thank you for giving an opportunity to study this case. **

Dr. Rajesh R, MD, DNB.
Radiologist.

Our Specialities : Cancer Detection (Immunohistochemistry), Hepatitis Markers, Western Blot for HIV, ANA, Hormonal Assays and Other Special Investigations.
Timings : 7 am to 8 pm (Monday to Saturday) 7 am to 2 pm (Sunday)

**BEFORE TREATMENT**

### REPORT 3



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Department of Radiology & Imaging

OP NO : B- 3539.
Name : [redacted] Age : 73 Yrs Sex : M
Ref By : Dr.Priyadarshini. Date : 24-05-2021

CT SCAN OF CHEST (PLAIN)

**OBSERVATIONS**

**Few patchy ground glass opacities are seen in the sub pleural regions of both lower lobes involving about <10 % of the both lungs.**

*Trachea* is normal in size and position. Carina is normal.
*Main bronchi* and the visualized portion of segmental bronchi are normal.
*Ascending aorta*, arch and descending thoracic aorta are normal in calibre.
*Cardiac silhouette* is normal.
*Pulmonary hila* are normal.
*Oesophagus* and azygo-oesophageal recess are normal.
*No significant mediastinal lymphadenopathy.*
*No evidence of bronchiectasis.*
*No evidence of pleural effusion.*
*Spine shows degenerative changes.*

**IMPRESSION:**

- **Few patchy ground glass opacities in the sub pleural regions of both lungs involving about <10 % of the lungs – ? Resolving Atypical viral pneumonia (CO RADS 3). *Suggested RTPCR for COVID 19.***
- **CT severity index – Mild (Score 2/25).**

| CT SEVERITY | % INVOLVEMENT | SCORE |
|---|---|---|
| IGHT UPPER LOBE | NIL | 0 |
| IGHT MIDDLE LOBE | NIL | 0 |
| IGHT LOWER LOBE | <5% | 1 |
| FT UPPER LOBE | NIL | 0 |
| FT LOWER LOBE | <5% | 1 |
| | Total | 2/25 |

**AFTER TREATMENT**