

Lung Nodule and Pulmonary Fibrosis at First Evaluation in Smoker Undergoing a Smoking Cessation Program

Aldo Pezzuto^{1,*}, Antonella Tamaro², Gerardo Salerno³, Marina Borro² and Elisabetta Carico⁴

¹Cardiovascular-Respiratory Science Department, Sant'Andrea Hospital-Sapienza University, Via di Grottarossa, 1035/39, 00189; Rome, Italy

²Department of Neurosciences, Mental Health and Sensory Organs [NESMOS], Sapienza University of Rome, Via di Grottarossa 1035, 00189 Rome, Italy

³Diagnostic Science Department, S Andrea Hospital-Sapienza University, Via di Grottarossa, 1035/39, 00189; Rome, Italy

⁴Clinical and molecular medicine Department, Sapienza University, Via di Grottarossa, 1035/39, 00189; Rome, Italy

Abstract: Smoking is the most significant avoidable risk factor. Responsible for a wide range of diseases such as cardiovascular diseases and acute or chronic respiratory diseases.

It is frequently associated with interstitial pulmonary diseases and notably, it can be a cause of idiopathic pulmonary fibrosis.

In this report, lung nodules and idiopathic pulmonary fibrosis were presented in a heavy smoker.

Keywords: Smoking, Pulmonary fibrosis, Lung nodule.

INTRODUCTION

Tobacco smoke is the leading avoidable cause of mortality worldwide, causing over 5 million deaths annually [1].

A complex mixture of more than 4,000 substances, tobacco smoke induces a chronic condition, increases the risk of death from many types of cancer and causes alterations of multiple organs. These compounds include gaseous and liquid substances such as carbon monoxide (CO), nitrogen monoxide, hydrocarbon, and nicotine, which are responsible for smoking addiction [2].

Idiopathic pulmonary fibrosis (IPF) is a chronic diffuse interstitial lung disease of unknown origin, characterized by inflammation and fibrosis of the lung parenchyma. It is reported an association of smoking with interstitial lung diseases and IPF [3].

Moreover, lung nodule is frequently associated with tobacco smoking with about 30% of probability [4].

Herein we presented a case of patient who was diagnosed IPF during a check for a smoking cessation program.

CASE PRESENTATION

On May 10, 2022 a 72-year-old male presented to the outpatient service for smoking cessation, willing to stop smoking. He complained of shortness of breath, exertional dyspnea, and dry cough.

His respiratory rate was 22 breaths per minute and his pulse rate was 90 beats per minute. The oxygen hemoglobin saturation was 92% at room temperature.

The patient was a current (active?) smoker with a pack-years of 30, a Fagestrom dependence test of 5 indicating a moderate level of nicotine dependence, and 12 ppm of exhaled carbon monoxide (normal limit=7). The patient denied any recent travels or sick contacts.

INVESTIGATIONS

Baseline investigations included blood test, nasal and pharyngeal swab test, and spirometry.

The full blood picture revealed an $11.5 \times 10^3/\mu\text{l}$ of white cell count with neutrophilia ($9.9 \times 10^3/\mu\text{l}$ normal

*Address correspondence to this author at the Sant'Andrea Hospital, Sapienza University, Rome, Via Grottarossa 1035; Tel: ++390633775959; E-mail: pezzutoaldo@libero.it

reference range 2500-8000/ μ l), and 11 mg/dl of C-reactive protein (CRP).

The oral and nasopharyngeal swab test for rRT-PCR Covid-19 detection was negative.

Investigations regarding viral, bacterial, and atypical bacteria serological were reported negative. Immune screening was also negative for anti-nuclear antibodies.

Computed tomography with contrast medium performed 10 days after the clinical onset, showed ground glass opacity with honeycomb and lung nodules that were more pronounced in the upper lobes (Figure 1). The spirometry was performed by body plethysmography as follows: briefly, flow dynamic volumes were measured with the pneumotacographic method and volumes and resistances with the plethysmographic method. It revealed a restrictive pattern: FEV1 <50% of predicted, FVC <65% of predicted, TLC <65% of predicted with an increased level of resistances (120%) 6 minutes walking test (WT) was also performed, during which the oxygen saturation and the distance covered were recorded showing a low peripheral oxygen saturation during 150 m of walking (SpO2 89%).



Figure 1: Left upper lobe: interstitial lung disease and lung nodule.

TREATMENT AND OUTCOME

The patient underwent smoking cessation by varenicline capsule with the following schedule dosage: 0.5 mg per day for three days, then 0.5 mg twice a day for 4 days, increasing the dosage up to 1 mg twice per day. An oxygen support with nasal cannulae was started as needed, and an antibiotic (clarithromycin) was used.

The patient quit smoking one month after the beginning of the therapy.

Patient's symptoms quickly improved after smoking cessation with a reduction of cough and exertional dyspnea. The radiological picture did not change.

DISCUSSION

This is an interesting case of a patient who presented at the outpatient service for smoking cessation, complaining of dyspnea and cough, and occasional finding of nodule.

Cigarette smoking is associated with the risk of developing interstitial lung diseases and smoking status affects the clinical manifestations of pulmonary fibrosis. Notably smoking increases mortality in IPF compared with never smokers [5].

There is a strong relationship between smoking habit and idiopathic pulmonary fibrosis IPF with OR 2.3 in current smokers and 1.6 in former smokers. Notably patients with a pack-year major than 20 are more susceptible to developing idiopathic pulmonary fibrosis [3].

Smoking along with environmental exposure has been hypothesized to affect the development of idiopathic pulmonary fibrosis through different pathways, inducing oxidative stress and stimulating fibroblasts growth factors [6]. The management of the disease includes a respiratory functional evaluation characterized by a restrictive pattern and respiratory failure on exertion [7, 11]. The use of plethysmography is important to determine bronchial flows and static volumes that could reveal a restrictive pattern [7, 11].

Concerning lung nodules, it is well known that heavy smokers who are older than 55 years are candidates for screening programs.

We know from the literature that screening programs using LDCT as technique to detect lung nodules are very important in preventing lung cancer and favor an early diagnosis [8, 9].

Smoking cessation is very important to slow down the progression of the disease as long as it may hinder the development of resting respiratory failure [10].

Although smoking cessation is not sufficient to slow the progression of the disease, nevertheless it is essential to reduce the inflammatory component and to achieve rapid improvement in symptoms.

ETHICAL APPROVAL

Informed consent was obtained by the patient.

FUNDING

No funding received.

DECLARATION OF INTERESTS

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

REFERENCES

- [1] Unverdorben M, Mostert A, Munjal S, van der Bijl A, Potgieter L, Venter C, *et al.* Acute effects of cigarette smoking on pulmonary function. *Regul Toxicol Pharmacol* 2010; RTP. 2010; 57(2-3): 241-6. <https://doi.org/10.1016/j.yrtph.2009.12.013>
- [2] Tonini G, D'Onofrio L, Dell'Aquila E, Pezzuto A. New molecular insights in tobacco-induced lung cancer. *Future Oncol.* 2013 May; 9(5): 649-55. <https://doi.org/10.2217/fon.13.32>
- [3] Baumgartner KB, Samet JM, Stidley CA, Colby TV, Waldron JA. Cigarette smoking: a risk factor for idiopathic pulmonary fibrosis. *Am J Respir Crit Care Med.* 1997 Jan; 155(1): 242-8. <https://doi.org/10.1164/ajrccm.155.1.9001319>
- [4] Maci E, Comito F, Frezza AM, Tonini G, Pezzuto A. Lung nodule and functional changes in smokers after smoking cessation short-term treatment. *Cancer Invest.* 2014 Oct; 32(8): 388-93. doi: 10.3109/07357907.2014.919308. Epub 2014 Jun 18. PMID: 24941266. <https://doi.org/10.3109/07357907.2014.919308>
- [5] Kishaba T, Nagano H, Nei Y, Yamashiro S. Clinical characteristics of idiopathic pulmonary fibrosis patients according to their smoking status. *J Thorac Dis.* 2016 Jun; 8(6): 1112-1120. <https://doi.org/10.21037/jtd.2016.03.89>
- [6] Lee CT, Feary J, Johannson KA. Environmental and occupational exposures in interstitial lung disease. *Curr Opin Pulm Med.* 2022 Sep 1; 28(5): 414-420. <https://doi.org/10.1097/MCP.0000000000000894>
- [7] American Thoracic Society. Idiopathic pulmonary fibrosis: diagnosis and treatment. International consensus statement. American Thoracic Society (ATS), and the European Respiratory Society (ERS). *Am J Respir Crit Care Med.* 2000 Feb; 161(2pt): 646-664. <https://doi.org/10.1164/ajrccm.161.2.ats3-00>
- [8] van Riel SJ, Sánchez CI, Bankier AA, Naidich DP, Verschakelen J, Scholten ET, de Jong PA, Jacobs C, van Rikxoort E, Peters-Bax L, Snoeren M, Prokop M, van Ginneken B, Schaefer-Prokop C. Observer Variability for Classification of Pulmonary Nodules on Low-Dose CT Images and Its Effect on Nodule Management. *Radiology.* 2015 Dec; 277(3): 863-71. <https://doi.org/10.1148/radiol.2015142700>
- [9] Naidich DP, Bankier AA, MacMahon H, Schaefer-Prokop CM, Pistolesi M, Goo JM, Macchiarini P, Crapo JD, Herold CJ, Austin JH, Travis WD. Recommendations for the management of subsolid pulmonary nodules detected at CT: a statement from the Fleischner Society. *Radiology.* 2013 Jan; 266(1): 304-17. <https://doi.org/10.1148/radiol.12120628>
- [10] Pezzuto A, Carico E. Effectiveness of smoking cessation in smokers with COPD and nocturnal oxygen desaturation: Functional analysis. *Clin Respir J.* 2020; 14(1): 29-34. <https://doi.org/10.1111/crj.13096>
- [11] D'Ascanio M, Viccaro F, Calabrò N, Guerrieri G, Salvucci C, Pizzirusso D, Mancini R, De Vitis C, Pezzuto A, Ricci A. Assessing Static Lung Hyperinflation by Whole-Body Plethysmography, Helium Dilution, and Impulse Oscillometry System (IOS) in Patients with COPD. *Int J Chron Obstruct Pulmon Dis.* 2020 Oct 21; 15: 2583-2589. <https://doi.org/10.2147/COPD.S264261>

Received on 04-11-2022

Accepted on 28-11-2022

Published on 05-12-2022

DOI: <https://doi.org/10.12974/2312-5470.2022.08.03>

© 2022 Pezzuto *et al.*

This is an open access article licensed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/3.0/>) which permits unrestricted, non-commercial use, distribution and reproduction in any medium, provided the work is properly cited.