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The Association between COPD and corPulmonale , A complex Relationship

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Abstract: Chronic Obstructive Pulmonary Disease (COPD) and cor pulmonale exhibit a complex, intertwined relationship. COPD-induced chronic hypoxemia and hypercapnia lead to pulmonary vasoconstriction and increased pulmonary artery pressure, ultimately resulting in right ventricular hypertrophy and failure, defining cor pulmonale. This condition significantly worsens the prognosis of COPD patients. Understanding the pathophysiology, early diagnosis, and management strategies targeting both COPD and pulmonary hypertension are crucial to improving outcomes in this vulnerable population. This abstract highlights the key aspects of this association, emphasizing its clinical significance and the need for integrated approaches to care.

Key Words: COPD, cor pulmonale, association, preventive measures, development, right ventricular enlargememt.

Introduction: COPD is major health issue worldwide and in Uzbekistan. Globally around 392 million individuals are affected with COPD and it is the fourth leading cause of death which accounts for 3.5 million deaths anually. COPD (Chronic Obstructive Pulmonary Disease) it is the progressive disorder of lungs which is characterized by obstruction of airways,inflammation and difficulty in breathing. Types of COPD include chronic bronchitis, emphysema and non reversible Asthma. Smoking which is the leading cause of COPD accounts for about 75% of cases. Other causes include air pollution, genetic predisposition,respiratory infections and occupational exposures such as asbestos or silica.

COPD and cor pulmonale are two interrelated complications that set significant challenges to healthcare proffesionals. COPD is one of the substantial risk factor for developing cor pulmonale which is right sided heart ventricular enlargement and failure due to increased pulmonary resistance of lungs. As COPD results in shortness of breath, coughing , wheezing , cyanosis it leads to chronic hypoxemia which leads to chronic vasoconstriction which further results in increasing pulmonary resistance. Normally pulmonary vascular resistance is one - tenth of resistance of systemic arteries . As the pulmonary vascular resistance increases, the pulmonary artery pressure rises and then the right ventricular work increases leading to right ventricular enlargement and further failure. The prevalence of cor pulmonale in COPD patients has been reported about 20 to 91%.

Globally COPD is the fourth leading cause of death and it accounts for 6% of total deaths according to a recent analysis of 2022.The severity of cor pulmonale is correlated with hypoxemia, hypercarbia and the degree of airways obstruction. Moreover there are several moderate cases accompanied by COPD associated PH < 40 mm hg which do not progress rapidly. Although the 4 year survival rate of COPD is 75% the survival rate drops to 50% when COPD is complicated by Pulmonary Hypertension.

Cor pulmonale in COPD is generally known to occur due to loss of vascular bed and chronic hypoxic pulmonary vasoconstriction due to alveolar wall destruction . However a recent study says that in some patients with COPD pulmonary vascular alterations includes components that are primary lesions of the pulmonary artery . And these alterations are similar to remodelling that occurs in pulmonary arterial hypertension.

Also lifelong smokers have a 50% probability of developing COPD and further cor pulmonale.

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Purpose of Study: To determine the association between COPD and Cor pulmonale .Identifying preventive measures to prevent development of right ventricular enlargement and failure in patients with COPD. Comparative studies among different patients of COPD and effective treatment strategies for increasing the life expectancy.

Materials and Methods:A cohort study was performed on 160 patients with diagnosis of COPD out of which 88 (55%) were males with an average age of 48.5 years and 72 (45%) were females with an average age of 50.2 years. The diagnosis of COPD in these patients was made on the basis of clinical history, physical examination , various signs and symptoms and through various lung function tests such as spirometry and peak flow. Regular monitoring through follow up of all these patients were done to check on for the development of cor pulmonale. These patients were subdivided further into groups according to the severity of the disease. The severity of the COPD is classified according to GOLD (Global Initiative for Chronic Obstructive Lung Disease) staging system which is based on FEV1(forced expiratory volume) from spirometry and patients symptoms. Group 1 consists of 32 patients (20%) with Mild (GOLD 1) COPD (FEV1>=80%) predicted , out of which 14 (43%) were males and 18 (56%) were females. Group 2 with moderate(GOLD 2) COPD FEV1>=50-79% predicted which consists of 48 (30%) out of which 20 (41%) were females and 28(59%) were males. Group 3 with severe(GOLD3) FEV1 30-49% predicted consists of 50 (31%) patients out of which 14 (28%) were females and 36 (72%)were males . Group 4 very severe (GOLD 4) FEV1 <30% predicted consists of 30 (18%)patients out of which 12 (40%) were females and 18 (60%)were males. The diagnosis of cor pulmonale due to COPD is done through clinical evaluation, (peripheral edema , jugular venous distension)electrocardiogram , chest Xray , pulmonary function tests ,which include spirometry , lung volume measurements DLCO (diffusion capacity of the lung for carbon monoxide) right heart catheterization , various blood tests , CT scans , MRI , Doppler echocardiography , ventilation / perfusion scan .

Results: In group 1 patients which were having Mild (GOLD) 1 COPD did not shown the development of cor pulmonale there were no significant hypoxia or pulmonary hypertension. But 1 patient which was 58 years old has developed acute cor pulmonale which was due to pulmonary embolism which was further managed by anticoagulants through thrombolytic treatment. In group 2 patients which were having moderate COPD (GOLD2) with moderate obstruction shown that a very few individuals out of which 5 females and 7 males just began to develop mild hypoxia was began but pulmonary pressures were normal. Hypoxia in these patients was managed through oxygen therapy. In group3 GOLD severe COPD developed out of 50 around 32 patients developed severe pulmonary hypertension out of which 10 were females and 22 were males . In these patients severe obstruction along with chronic hypoxia was diagnosed which further lead to pulmonary vasoconstriction and increased pulmonary artery pressure. Pulmonary Hypertension accelerates cor pulmonale. In these patients right ventricular hypertrophy was diagnosed through echocardiography and on chest X ray enlarged heart and prominent pulmonary artery were marked. In group 4 GOLD very severe COPD almost all patients developed cor pulmonale as they were having persistent hypoxia , significant pulmonary hypertension , right ventricular hypertrophy and eventually right heart failure. Peripheral edema , jugular venous distension, hepatomegaly and ascites were also developed in some individuals . ECG shown right axis deviation and bnp levels were elevated suggestive of right sided heart failure .

Conclusion: As a result of study it can be concluded that risk of developing cor pulmonale and severity of COPD are in direct proportion. Also among the individuals patients with chronic bronchitis shown more risk of development of cor pulmonale compared to emphysema and bronchiectasis. GOLD 4 patients were at highest risk of development of cor pulmonale which also if could diagnosed early can be cured through non invasive ventilation and lung transplantation in severe cases. GOLD 3 patients with moderate COPD were at moderate risk they mainly developed pulmonary hypertension which could be managed by vasodilators like sildenafil and calcium channel blockers . GOLD 2

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patients with moderate COPD were at low risk of development of cor pulmonale they mainly had hypoxia which could me managed by treating underlying COPD and oxygen therapy. GOLD 1 patients were at very low risk of development of Cor pulmonale it is rare in them .

To decrease mortality and incidence of cor pulmonale in end stage COPD (GOLD4) low flow oxygen is advised to patients for maximum number of hours although it is not more comfortable for patients. It increases the SpO2 and decreases the rate of respiratory alkalosis. Also in stage 3 and 4 pulmonary rehabilitation helps to improves exercise tolerance , dyspnea and quality of life.

References:

1. Mekontso Dessap A, Boissier F, Leon R, et al. Prevalence and prognosis of shunting across patent foramen ovale during acute respiratory distress syndrome. *Crit Care Med*. 2010 Sep. 38(9):1786-92.Z. Vitenberga *et al.*
2. Тогаева, Б., Ташкенбаева, Э., Абдиева, Г., Хайдарова, Д., & Абдуллаев, З. (2021). COVID-19 YURAK QON TOMIR KASALLIKLARI BOR BEMORLARDA KECHISHI. *Журнал кардиореспираторных исследований*, *2*(2), 47-50.
3. Voelkel NF, Quaife RA, Leinwand LA, et al. Right ventricular function and failure: report of a National Heart, Lung, and Blood Institute working group on cellular and molecular mechanisms of right heart failure. *Circulation*. 2006 Oct 24. 114(17):1883-91.
4. Davronovna X. D., Negmatovna T. E. КЛИНИЧЕСКАЯ ХАРАКТЕРИСТИКА ТЕЧЕНИЯ И КРИТЕРИИ ДИАГНОСТИКИ ХРОНИЧЕСКОЙ ОБСТРУКТИВНОЙ БОЛЕЗНИ ЛЕГКИХ У БОЛЬНЫХ С ПНЕВМОНИЕЙ COVID-19 //JOURNAL OF BIOMEDICINE AND PRACTICE. – 2023. – Т. 8. – №. 4.
5. Weitzenblum E, Chaouat A. Cor pulmonale. *Chron Respir Dis*. 2009. 6(3):177-85.
6. Джуракулова, Ф. Р., & Абдуллаева, З. А. (2024). ИЗУЧИТЬ ВЛИЯНИЕ ПРОТИВОВИРУСНОЙ ТЕРАПИИ НА ВОЗНИКНОВЕНИЕ ИЛИ ПРОГРЕССИРОВАНИЕ НАРУШЕНИЯ РИТМА СЕРДЦА У БОЛЬНЫХ ПЕРЕНЕСШИХ COVID-19: Джуракулова Фируза Рахмоновна, Абдуллаева Зарина Абдурашидовна. *Лучшие интеллектуальные исследования*, *22*(3), 154-162.
7. Абдуллаева, З. А., & Ташкенбаева, Э. Н. (2024). ИЗУЧЕНИЕ ИЗМЕНЕНИЯ ПОКАЗАТЕЛЕЙ ЭХОКГ И ЭКГ У БОЛЬНЫХ С НАРУШЕНИЯМИ РИТМА СЕРДЦА ПОСЛЕ ПЕРЕНЕСЕННОГО COVID-19: Абдуллаева Зарина Абдурашидовна, Ташкенбаева Элеонора Негматовна, Ёрбулов Лазиз Салим угли. *Лучшие интеллектуальные исследования*, *22*(3), 146-153.
8. Mukumova S. A. et al. Comparative Assessment of Clinical and Immunological Features of Chronic Obstructive Pulmonary Disease and its Combination with Covid-19 //International Journal of Alternative and Contemporary Therapy. – 2024. – Т. 2. – №. 1. – С. 23-28.
9. Das SK, Choupoo NS, Saikia P, Lahkar A. Incidence proportion of acute cor pulmonale in patients with acute respiratory distress syndrome subjected to lung protective ventilation: a systematic review and meta-analysis. *Indian J Crit Care Med*. 2017 Jun. 21(6):364-75.
10. Абдуллаева, З. А., & Аблятифов, А. Б. (2024). ЧАСТОТА ВСТРЕЧАЕМОСТИ АРИТМИЙ НА ФОНЕ ПЕРЕНЕСЕННОГО COVID-19. *ОБРАЗОВАНИЕ НАУКА И ИННОВАЦИОННЫЕ ИДЕИ В МИРЕ*, *37*(6), 19-26.
11. Salim o'g'li, Y. L., Universiteti, S. D. T., & Tibbiyot, A. Z. A. S. D. (2024). VIRUSLI PNEVMONIYA O'TKAZGAN BEMORLARDA OTKIR KORONAR SINDROMNING KLINIK

Volume: 4 Issue: 4 | Apr–2025 ISSN: 2720-6866
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KECHISHI XUSUSIYATLARI: Yorbulov Laziz Salim o'g'li, Djurakulova Firuza Raxmonovna, Abdullayeva Zarina Abdurashidovna. *Лучшие интеллектуальные исследования*, *22*(3), 163-169.

12. Abdullayeva Zarina Abdurashidovna, Tashkenbaeva Eleonora Negmatovna, Pulatov Zukhriddin Bakhriddinovich, & Ne'matov Xumoin Ne'matovich. (2022). THE COURSE OF CARDIOVASCULAR COMPLICATIONS IN PATIENTS WITH COVID-19. *Galaxy International Interdisciplinary Research Journal*, *10*(3), 270–276. Retrieved from https://www.giirj.com/index.php/giirj/article/view/2126
13. Абдуллаева, З. А., Неъматов, Х. Н., & Насырова, З. А. (2022). Сердечно-сосудистые осложнения на фоне перенесенного COVID-19. *Central Asian Journal of Medical and Natural Science*, *3*(2), 17-21.
14. Халилов, Н. Х., Маджидова, Г. Т., & Абдуллаева, З. А. (2021). ОСОБЕННОСТИ КЛИНИЧЕСКОГО ТЕЧЕНИЯ ИБС У ЛИЦ МОЛОДОГО ВОЗРАСТА. *POLISH SCIENCE JOURNAL*, 132.
15. D. A. Vakhlamov and V. A. Vakhlamov, "Priority8, no. 4, pp. 11-17, 2016.
16. W. MacNee, "Pathophysiology of cor pulmonale in chronic obstructive pulmonary disease. Part One," *American Journal of Respiratory and Critical Care Medicine*, vol. 150, no. 3, pp. 833-852, 1994.
17. W. MacNee, "Pathophysiology of cor pulmonale in chronic obstructive pulmonary disease. Part two," *American Journal of Respiratory and Critical Care Medicine*, vol. 150, no. 4, pp. 1158-1168, 1994.
18. M. Miniati, S. Monti, G. Basta, F. Cocci, E. Fornai, M. Pistolesi, and R. Scatena, "Soluble receptor for advanced glycation end products in COPD: relationship with emphysema and chronic cor pulmonale: a case-control study," *Respiratory Research*, vol. 12, no. 1, p. 60, 2011.
19. S. M. Kawut, H. D. Poor, M. A. Parikh, K. Hueper, M. Barr, A. S1, pp. 1-9, 2014.