Prognosis of Covid-19 according to Pneumonia Types

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Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

Short Research Article

ABSTRACT

Background: Pneumonia is defined infection affecting lower respiratory tracts and lung parenchyma. According to morphology in pneumonia imaging; categorized as lobar, bronchopneumonia (lobular), and interstitial pneumonia. Covid 19 is a severe disease that causes lung damage.
Aims: In this study, it was aimed to relate patients hospitalized in Covid 19 wards with prognosis and mortality according to pneumonia types.
Study Design: This study was done between 1 August and 30 September 2021 in Ersin Arslan Training and Research Hospital Covid Wards. The patients were examined retrospectively.
Methodology: The study included with positive PCR test, 18 age and more than, with lung involvoment in CT. Patients' age, gender, pneumonia types according to CT, how many lobes affected in the lung, rate of involvement of each lobe, admission in Intensive-care and mortality were analyzed. Chi Square Test was used in the statistical analysis of the data.
Results: A total of 243 patients were evaluated. The mean age was 56.7±2.02. In the patients 45.6% were male and 54.4% female (±0.06). 76.5% of the patients had a history of chronic disease (most often hypertension). According to the types of pneumonia in CT; it was 51.8% lobular, 44.8% interstitial and 3.4% lobar. In CT, it were affect five lobes 68.7%, four lobes 10.6%, three lobes 9%, two lobes 3.7%, and one lobe 8% in the lung. In the study, 20.9% of the patients were admitted to the Intensive-care unit and 11.5% died.
Conclusion: In patients hospitalized in wards; Covid-19 is more often in females. Although it is more often in the 40-60 ages, the 20-40 ages range is related with intensive care admission. A history of chronic disease is related with a poor prognosis. More than 50% involvement of 2 lobes

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in lobar pneumonia, 3 lobes in lobular pneumonia and only 1 lobe in interstitial pneumonia is related with intensive care. Interstitial pneumonia is related with a poor prognosis according to pneumonia types in Covid-19.

1. INTRODUCTION

The Covid 19 pandemic, which caused tens of thousands of deaths, is the disease of severe viral infection. Pneumonia is defined infection affecting lower respiratory tracts and lung parenchyma. Bacteria, viruses, fungi, aspiration and chemical exposure can cause pneumonia. SARS-CoV-2 virus is has the feature of spread while being asymptomatic [1]. Upper and lower respiratory tract involvement is the most common feature [2]. Extensive damage to the alveoli, consistent with acute respiratory distress syndrome (ARDS), has been reported in severe Covid-19 [3]. Pneumonia is classified according to etiology, anatomical, clinical, origin and immunity. It is defined etiologically infection and non-infectious causes, according to the clinic as typical and atypical, originally communal or hospital. Anatomically, the types of pneumonia are lobar, interstitial, lobular or bronchopneumonia. Lobular pneumonia is inflammation of the distal minor or terminal bronchi. Lobar type is an intense consolidation determined clinically and radiologically. Various radiological findings are encountered in Covid-19 viral pneumonia. It can be affected together lobular, lobar and interstitial in lungs. In this study, it was aimed to examine the prognosis of viral pneumonia according to anatomical types in Covid 19.

2. MATERIALS AND METHODS

This study was done in Ersin Arslan Training and Research Hospital Covid-19 wards to cover the dates August-September 2021. The study included with positive Covid Polymerase Chain Reaction (PCR) test, 18 age and more than, with lung involvoment in computerized tomography (CT). It was excluded negatives PCR test, younger than 18 ages, patients without pneumonia and no CT recordings. A total of 243 patients compatible with these criteria were evaluated retrospectively. Patients' ages, gender, pneumonia types according to CT (Fig. 1), how many lobes of the lung affected, the rate of involvement of each lobe, length of hospitalized stay, admission in Intensive-care and mortality were analyzed. Chi Square Test was used in the statistical analysis of the data.
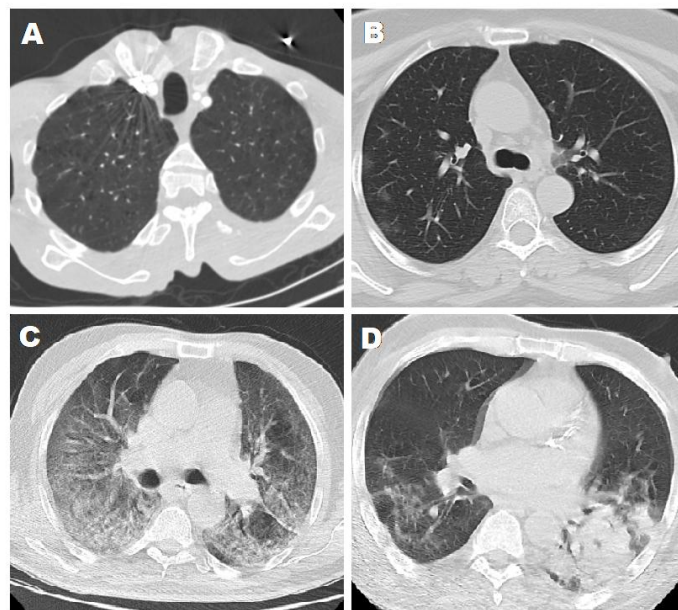
Fig. 1. Types of pneumonia by anatomical classification
Types of pneumonia according to lung involvement on CT
A. CT image of normal lung parenchyma B. CT image of lobular pneumonia
C. CT image of interstitial pneumonia D. CT image of lobar pneumonia

3. RESULTS

A total of 243 patients were evaluated. The mean age was 56.7 ±2.02. In the patients %45.6 were male and 54.4% female (±0.06). 76.5% of the patients had a history of chronic disease (hypertension, diabetes mellitus, chronic obstructive pulmonary disease, coronary artery disease). Age ranges of the patients; It was 16.8% 20-40 years, 43.2% 41-60 years and 40% more than 60 (Table 1).

According to the types of pneumonia in CT; It was 51.8% lobular, 44.8% interstitial and 3.4% lobar. In CT, it were affect five lobes 68.7%, four lobes 10.6%, three lobes 9%, two lobes 3.7%, and one lobe 8% on the lungs. In the study, 20.9% of the patients were admitted to the Intensive-care unit and 11.5% died. Covid 19 (86% mutational) in patients admitted in hospital wards; it is more often in the age range of 46-60 years and in female.There was no statistical significance of mortality in male and female (p<0.2). Admission to Intensive-care unit were more than in 20-40 ages.(p<0.02). According to pneumonia types; in lobar pneumonia (2 lobes) is involvement of more than 50% of each lobe is related with intensive care admission (p<0.02). In lobular pneumonia, more than 50% involvement of three lobes (p<0.001), more than 50% involvement of four lobes (p<0.004), and any rate five lobes are related with admission of intensive care (p<0.0001). Involvement of more than 50% of the four and five lobes of the lungs is related with mortality in lobular pneumonia (p<0.0002). In interstitial pneumonia, any rate involvement of the four and five lobes of the lungs is related with admission of intensive care (p<0.0001) and more than 50% involvement of four lobes and any rate involvement of five lobes are related with mortality (p<0.04). Accordingly, even a low rate of involvement of five lobes is related with mortality in interstitial pneumonia (Table 2).

Table 1. Distribution of study by age and gender

	n	SD	%95 CI
Age			
20-40	41	0.49	0.06
40-60	105	0.37	0.04
>60	97	0.49	0.06
Gender			
Male	111		
Female	132	0.49	0.06
Comorbidity			
Yes	186	0.42	0.05
No	57		

Table 2. Statistical analysis according to admission to intensive care and mortality

		Intensive-care		Mortality	
	n	p<	ODDS	p<	ODDS
20-40 ages	41	**0.02**	1.238		
Comorbidity					
Yes	186	**0.001**	2.256	**0.003**	1.296
No	57				
Pnomonia types		**p<**	**ODDS**	**p<**	**ODDS**
Lobar Pneumonia					
Affected >50% of 2 lobes		**0.02**	4.275		
Lobular Pneumonia					
Affected >50% of 3 lobes		**0.001**	8.968		
Affected <50% of 4 lobes		0.06	2.478		
Affected >50% of 4 lobes				**0.0001**	5.135
Affected <50% of 5 lobes		**0.0006**	0.434		
Affected >50% of 5 lobes		**0.001**	0.748	**0.0002**	0.357
Interstitial pneumonia					
Affected >50% of 1 lobe		**0.001**	0.513		
Affected <50% of 4 lobes		**0.0001**	0.415		
Affected >50% of 4 lobes				**0.0001**	0.225
Affected <50% of 5 lobes		**0.0001**	2.669	**0.04**	0.928
Affected >50% of 5 lobes				**0.0002**	2.713

4. DISCUSSION

According to this study; in patients hospitalized in wards, Covid-19 is more often in females. Although it is more often in the 40-60 ages, the 20-40 ages range is related with intensive care admission. A history of chronic disease is related with a poor prognosis. In Covid 19, little ground glass densities and interstitial variety are seen in CT in the early period and infiltration with consolidation in the progressive period. It is characterized by ground-glass densities in multiple lobes that typically affect the periphery on the lungs [4,5]. However, these tomographic findings are not specific to Covid 19, bacteria, mycoplasma, chlamydia and other viral infections can also cause it [6]. Therefore, CT and clinical findings should be compatible with each other. In the study, clinical complaints of all patients were compatible with Covid 19 and infection parameters similar. Admission to the intensive care unit was due to respiratory distress in almost all of the patients. Acute respiratory distress syndrome was mostly caused to mortality. Covid 19 causes severe lung damage, and the most important finding in patients is pneumonia. According to morphology in pneumonia imaging; categorized as lobar, bronchopneumonia (lobular), and interstitial pneumonia [7]. In the study, those were found as lobular, interstitial and lobar, from most to least. Although lobar pneumonia (affected of 2 lobes) was related with intensive care, it was not related with mortality. 3 lobes involvement in patients with comorbidities were related with intensive care in lobular pneumonia. Affected 4 and 5 lobes of lung were related with intensive care and mortality in both interstitial and lobular pneumonia. However, even if less than 50% of the 5 lobes of the lung were affected in interstitial pneumonia, it was found to be related with mortality. Therefore, it was understood that interstitial pneumonia than lobular had a poor prognosis.They with mild illness in Covid-19 admission to hospital with low fever and asthenia without pneumonia [8]. In severe cases, dyspnea and hypoxemia occur early [9] and progress rapidly to ARDS. In this study, it was observed that especially in patients with interstitial pneumonia, respiratory distress was more pronounced, and admission to the intensive care unit was earlier (5-8 days). It was found that although less lung lobes were affected in interstitial pneumonia, more intensive care was needed. Because of the disease was more severe in interstitial involvement. ARDS and sepsis were the most common causes of death.

Chronic disease history is an important role in the course of the disease. According to some studies, cardiovascular diseases such as hypertension have been reported to increase the incidence and severity of Covid-19 infection [10]. In the study, hypertension was the most common comorbid disease. A history of concomitant chronic disease was observed in most of the patients over 60 years of age, especially in admission to the intensive care unit. Acute interstitial pneumonia is thought to be due to inflammatory activation in the alveolar epithelium and late fibroblast activity [11]. This condition is similar to ARDS. This study showed that interstitial involvement was related with a poor prognosis. So much so that even if it affects only 1 lobe of the lung, it was observed who admitted to the intensive care unit. The involvement of 1 and 2 lobes of the lung in lobular pneumonia was not related with intensive care and mortality. In lobar pneumonia, although the involvement of 1 lobe is not related with intensive care, involvement of more than 50% of 2 lobes is related with intensive care.

5. CONCLUSION

In patients hospitalized in wards; Covid-19 is more often in females. Although it is more often in the 40-60 ages, the 20-40 ages range is related with intensive care admission. A history of chronic disease is related with a poor prognosis. More than 50% involvement of 2 lobes in lobar pneumonia, 3 lobes in lobular pneumonia and only 1 lobe in interstitial pneumonia is related with intensive care. Interstitial pneumonia is related with a poor prognosis according to pneumonia types in Covid-19.

CONSENT

As per international standard or university standard, patients' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

Republic of Turkey Ministry of Health 2021-09-18T22_38_39 numbered and Gaziantep University Medical Ethics Committee 2021/322 numbered approval have been received.

COMPETING INTERESTS

Author has declared that no competing interests exist.

REFERENCES

1. Lauer SA, Grantz KH, Bi Q, et al. The incubation period of coronavirus disease 2019 (covid-19) from publicly reported confirmed cases: estimation and application. Ann Intern Med. 2020;172: 577-82.

2. Hu B, Guo H, Zhou P, Shi Z-L. Characteristics of SARS-CoV-2 and COVID-19. Nat Rev Microbiol. 2020;6: 1-14.

3. Maiese A, Manetti AC, La Russa R, et al. Autopsy findings in COVID-19-related deaths: A literature review. Forensic Sci Med Pathol. 2021;17(2):279–296.

4. Pan Y, Guan H. Imaging changes in patients with 2019-nCov. Eur Radiol. 2020; 30(7):3612-3613.

5. Jin YH, Cai L, Cheng ZS, et al. A rapid advice guideline for the diagnosis and treatment of 2019 novel coronavirus (2019-nCoV) infected pneumonia (standard version). Mil Med Res. 2020;7(1):1-23.

6. Koo HJ, Lim S, Choe J, et al. Radiographic and CT Features of Viral Pneumonia. Radiographics. 2018;38:719-39.

7. Reynolds JH, McDonald G, Alton H, et al. Pneumonia in the immunocompetent patient. Br J Radiol. 2010;83:998–1009.

8. Ge H, Wang X, Yuan X, Xiao G, Wang C, Deng T, Yuan Q, Xiao X. The epidemiology and clinical information about COVID-19. Eur J Clin Microbiol Infect Dis. 2020;39:1011–1019.

9. Li X, Liu M, Zhao Q, Liu R, Zhang H, Dong M, Xu S, Liu J, Zhao H, Wei S, et al. Preliminary recommendations for lung surgery during COVID-19 epidemic period. Thorac Cancer. 2020;11:1372–1374.

10. Zhao M, Wang M, Zhang J, Ye J, Xu Y, Wang Z, Ye D, Liu J, Wan J. Advances in the relationship between coronavirus infection and cardiovascular diseases. Biomed Pharmacother. 2020;127(110230).

11. Vourlekis JS. Acute interstitial pneumonia. Clin Chest Med. 2004;25(4):739-47.

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