



Research Article

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CT-SEVERITY ANALYSIS OF COVID-19 PNEUMONIA IN RHEUMATIC MUSCULOSKELETAL DISEASES ROMATİZMAL KAS-İSKELET SİSTEMİ HASTALIKLARINDA COVID-19 PNÖMONİSİNİN BT-ŞİDDET ANALİZİ

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Öz

Amaç: Bu çalışma, kas-iskelet sistemi tutulumlu romatizmal hastalıkları (RH) olan hastalarda covid-19 pnömonisinin radyolojik şiddetini vurgulamayı amaçlamaktadır.

Materyal ve Metot: Toplam 342 Polimeraz Zincir Reaksiyonu (PCR) pozitif hasta geriye dönük olarak incelendi. Hastalar RH varlığı açısından iki gruba ayrıldı. Akciğer bilgisayarlı tomografi (BT) şiddet skorları, demografik özellikler, hastaneye yatış, yoğun bakım ünitesi (YBÜ) gereksinimi, hastanede kalış süresi RH ve RH olmayan grup arasında karşılaştırıldı. BT görüntülerinde tipik ve atipik bulgular, her iki hasta grubundaki görülme sıklıkları ile birlikte tanımlandı.

Bulgular: Yaş ve kadın cinsiyet, RH grubunda RH olmayan gruba göre anlamlı olarak daha yüksekti ($p=0,001$, $p=0,041$). BT-şiddet skorunun ortalaması RH grubunda RH olmayan gruba göre daha yüksekti, ancak fark istatistiksel olarak anlamlı değildi ($p=0,081$). YBÜ'ye nakil ve ölüm oranları RH grubunda RH olmayan gruba göre daha yüksek bulunurken, hastanede yatış oranları ve kalış süreleri arasında fark saptanmadı ($p=0,002$, $p=0,036$, $p=0,280$, $p=0,168$). Her iki grupta da buzlu cam opasiteleri, üst üste bindirilmiş konsolidasyon ve kaldırım desenleri en yaygın tipik bulgulardı. Covid-19 pnömonisi için atipik BT bulguları, RH grubunda RH olmayan gruba göre daha yüksek bulundu.

Sonuç: Kronik inflamasyon ve immüno-supresif ilaçların kullanımı RH hastalarında enfeksiyonlara karşı hassasiyete neden olmaktadır. Bu çalışmada, RH'li hastalarda mortalite ve YBÜ gereksinimlerinin daha yüksek olduğu bulundu. Benzer şekilde, RH grubunda atipik akciğer BT bulgularının daha yaygın görülmesi, bu hasta grubunda covid-19 pnömonisinin tanı ve ayırıcı tanısında özellikle önemli olabilir.

Anahtar Kelimeler: Pnömoni, tomografi, koronavirus, romatizmal hastalıklar.

Abstract

Objectives: This study aims to focus on the radiological severity of covid-19 pneumonia in patients with rheumatic musculoskeletal diseases (RMD).

Materials and Methods: A total of 342 Polymerase Chain Reaction positive patients were retrospectively reviewed. The patients were divided into two groups in terms of the presence of RMD. Chest Computed Tomography (CT) severity scores, demographic characteristics, hospitalization, intensive care unit (ICU) requirement, length of stay at the hospital were compared between RMD and non-RMD groups. Typical and atypical findings on CT images were identified with their incidence in both groups of patients.

Results: Age and female gender were significantly higher in the RMD group ($p=0.001$, $p=0.041$). The average CT-severity score was higher in the RMD group, but the difference was not statistically significant ($p=0.081$). ICU transfer and mortality rates were higher in the RMD, whereas no difference was found in hospitalization rates and length of stay ($p=0.002$, $p=0.036$, $p=0.280$, $p=0.168$). Ground glass opacities, superimposed consolidation, and crazy paving patterns were the most common typical findings seen on both groups. Atypical CT findings for covid-19 pneumonia were found to be higher in the RMD group than in the non-RMD group.

Conclusion: Chronic inflammation and the use of immunosuppressive drugs constitute a vulnerability to infections in RMD patients. In this study, mortality and ICU requirements were found to be higher in patients with RMD. Similarly, the higher rate of atypical chest CT findings in the RMD group may be of particular importance in the diagnosis and differential diagnosis of covid-19 pneumonia in this patient group.

Keywords: Pneumonia, tomography, coronavirus, rheumatic diseases.

Introduction

Since 2019 December, several cases of covid-19 have been reported in Wuhan, China, then spread worldwide within a few months and became a global public health emergency.¹ Although the most common symptoms of covid-19 infection are fever, cough, dyspnea, and myalgia/fatigue, headache, hemoptysis, sputum production, diarrhea, hemoptysis, chest pain, vomiting, sore throat can also present. Similar to the symptom diversity, clinical severity and prognosis vary from asymptomatic disease to acute respiratory distress syndrome and multiple organ dysfunction.² Due to the wide range of presentation and prognosis of the disease, determining the co-morbid diseases' effect on the severity of the covid-19 infection has become one of the most important aims of the studies. In this context, the prevalence of rheumatic diseases who are receiving immunosuppressive medication and determining the radiological severity of pulmonary involvement for covid-19 patients with rheumatic musculoskeletal diseases (RMD) should be clarified. Although there have been several reports concerning the prevalence and clinical severity of RMD among covid-19 patients; the severity and radiological involvement patterns and Chest Computed Tomography (CT) scoring of covid-19 infected patients with RMD have not been clarified yet.³⁻⁵

Endogenous and exogenous risk factors may exist for the increased infection risk in RMD. The clinicians may consider the patients with RMD might be more prone to covid-19 infection and more severe disease than the general population because of the immune system dysregulation, accompanying co-morbidities, use of immunosuppressive medications, apart from the well-known poor prognostic factors.^{3,4} However, some of the anti-rheumatic drugs seemed to be promising on treatment for covid-19 pneumonia (chloroquine, hydroxychloroquine) and the management of the cytokine storm and ARDS at the time of the study (IL-6 inhibitors)^{6,7}

Our aim in this study is - beyond determining the prevalence of covid-19 infection in patients with RMD - to compare the clinical course and severity of chest CT scoring and pulmonary involvement patterns in patients with confirmed covid-19 pneumonia between with and without the RMD. We hypothesized that the CT severity scores are higher and intensive care unit (ICU), hospitalization requirements are higher in RMD patients than non-RMD covid-19 patients.

Materials and Methods

Patient Selection

In this retrospective study, patients who were diagnosed with covid-19 at our hospital in a five months period between March-July 2020 were reviewed. Real-time reverse transcription-polymerase chain reaction (RT-

PCR) tests for nasopharyngeal/oropharyngeal swabs specimens were used for the diagnosis of covid-19. Medical histories, demographic characteristics, the requirement of hospitalization or not (if yes, length of stay), medication, and the severity of radiological involvement were recorded. Patients were divided into two categories according to the presence of a history of rheumatic musculoskeletal diseases (RMD/non-RMD). Outpatients and the one(s) that did not require antiviral therapy were classified as mild, hospitalized patients as moderate, and those in need of an intensive care unit as severe disease.

Radiological Evaluation

Radiological assessment of patients included unenhanced Chest CT imaging with covid-dedicated scanning protocols in two scanners (128-MDCT Siemens Somatom Definition; 16-MDCT Toshiba Alexion): supine, end-inspiration acquisition; slice thickness, 1.0-1.5 mm; tube voltage, 120 kV; tube current, 200-300mAs; multiplanar reconstructions with mediastinal and lung parenchymal windows settings. All images were evaluated by one European board-certified radiologist with five years of experience and one radiologist with 29 years of experience separately. Radiologists were blinded to clinical data, and discrepancies were resolved with consensus. Multifocal ground-glass opacities (GGO), consolidation, GGO with superimposed consolidation, consolidation predominant pattern, crazy paving pattern, and melted sugar sign were considered as typical; pleural and/or pericardial effusion, cavity, pulmonary nodule, nodular pattern, lymphadenopathy, peribronchovascular distribution, halo and/or reverse halo sign, three-in-bud sign, bronchiectasis, airway secretions, pulmonary emphysema, pulmonary fibrosis, isolated pleural thickening, and pneumothorax were considered as atypical findings for covid pneumonia.⁸ Patients were categorized as “normal”, “typical for covid”, “atypical for covid” and “not covid”. A scoring system for typical and atypical categories similar to the Xie et al. was used; each lung was divided into three zones bordered by the levels of the carina and the inferior pulmonary veins.⁹ Each zone was scored according to the involvement ratios; 0 for 0% involvement, 1 for <25% involvement, 2 for 25-49% involvement, 3 for 50-74% involvement, and 4 for ≥75% involvement. A total score between 0 and 24 was obtained per patient. Radiological severity scores were then sub-grouped into mild (1-8), moderate (9-16), and high severity (17-24) classes.⁹ These classes were considered as radiological severity of covid-pneumonia, hence correlated with the presence of rheumatic disease, the use of immunosuppressive medication, and clinical severity of the disease. Severity scores were not calculated for “normal” and “not covid” categories; hence they were not correlated with clinical features.

Statistical Analysis

Data analysis was performed by using IBM SPSS Statistics version 17.0 software (IBM Corporation, Armonk, NY). Continuous variables were expressed as mean ±SD. Student t-test was used for demographic and

continuous variables. Categorical variables were presented as the number and percentage. Categorical variables were

Results

In our cohort, a total of 342 patients were found to have the diagnosis of covid-19 within the timeframe of this study. The patients were aged between 47 and 83 years. Of the 342 PCR confirmed covid-19 patients, 164 (47.95%) were men and 178 (52.04%) were women. RMD represents 2.63% (n=9) of all the confirmed covid-19 patients admitted to our hospital within the timeframe of this study. Five female and one male patient had a history of Rheumatoid Arthritis (RA); 1 female patient had a history of RA+SjS (Sjögren Syndrome); 2 female patients had a diagnosis of gout. Hypertension was the most prevalent concomitant disease (4 out of 9). In order of frequency, hypertension, diabetes mellitus, and congestive heart failure were the most common concomitant co-morbidities. Four patients had stopped their anti-rheumatic medication several years ago, while the other five patients were already receiving their medications. Three patients were receiving conventional synthetic (cs-), whereas no patient was priorly receiving biological (b-) disease-modifying anti-rheumatic drugs (DMARDs). Demographic data, medical histories, RMD types, previous medications, and co-morbid diseases of the patients are summarized in Table 1.

Covid-19 manifestations, hospitalization/ICU requirements, length of hospital stay, radiological-clinical severity, medications they received during this period, and the outcome are summarized in Table 2. Methylprednisolone 4 mg was continued to be administered in case-3 and case-9. All of the patients temporarily withdrew DMARD medication during the entire hospitalization. Eight of the nine patients with RMD (7 with CT-confirmed covid-19 pneumonia and 1 with a normal chest CT scan) required hospitalization (88.90%), and five of them had transferred to ICU due to severe respiratory complications (55.60%). Three of the patients in ICU have died; case-1 had CHF, and chest CT findings were compatible with mild pulmonary involvement, whereas the latter two cases (cases-5 and 6) were of severe and moderate involvement, respectively. Five patients were discharged from the hospital, and none of them required re-hospitalization.

The RMD patients were significantly older and the female gender was significantly higher than non-RMD patients. Although there was no significant difference in hospitalization and length of stay at the hospital; the mean length of stay and hospitalization frequencies were higher in the RMD group than the non-RMD group. ICU requirement and mortality were significantly higher in the RMD group (p=0.002 and 0.036, respectively). The comparison of variables between groups was summarized in Table 3.

Radiological evaluation of the novel-coronavirus disease was performed based on the Chest CT findings. Sixty patients who did not obtain chest CT at hospital admission were not included in the analysis. A total of 402 CT

scans belonging to the remaining 282 patients were retrospectively evaluated (Figure 1). All patients with RMD had chest CT. Seven of them had typical; 2 of them had atypical covid-19 pneumonia findings at chest CT. Chest CT severity scores were calculated for a total of 7 RMD and 166 non-RMD patients within “typical for covid” and “atypical for covid” groups. Although the mean chest CT severity score of RMD patients was found to be higher than non-RMD patients, the difference did not reach the statistical significance level ($p=0.081$). Amongst the severity score calculated for seven RMD patients, radiological and clinical severity correlate only in two patients (2/7, 28.6%).

Typical and atypical CT features for covid-19 pneumonia were evaluated separately in both groups of patients. Multifocal GGOs and crazy paving patterns are the most common typical findings seen in more than half of the patients in both RMD and non-RMD groups (figure 2). On the other side, atypical CT features for covid are found to be seen more commonly in rheumatic patients; eight of the nine RMD cases compared to only 102 of the 273 non-RMD patients have at least one atypical feature. Peribronchovascular distribution of GGOs, pulmonary nodule, and isolated pleural thickening are the most common atypical CT features in both groups (figure 3). The distribution of CT results and features among RMD and non-RMD patients were summarized in Table 4.

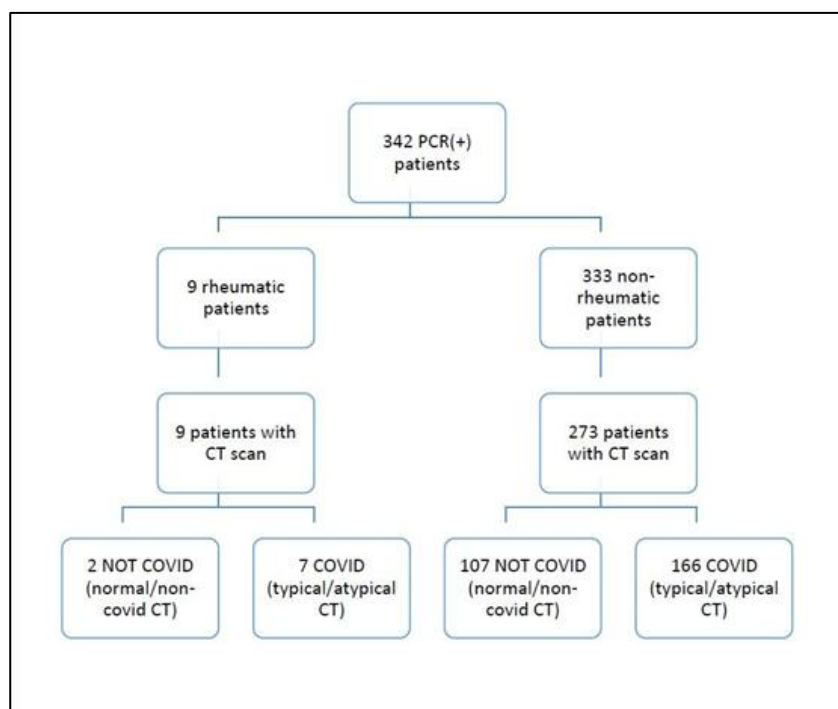
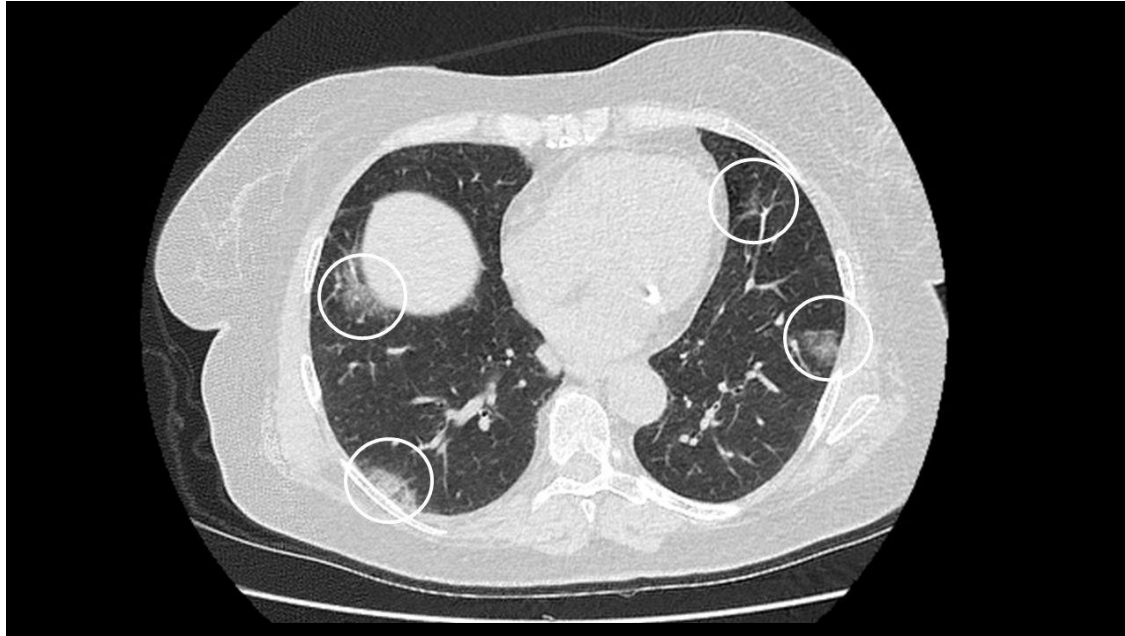
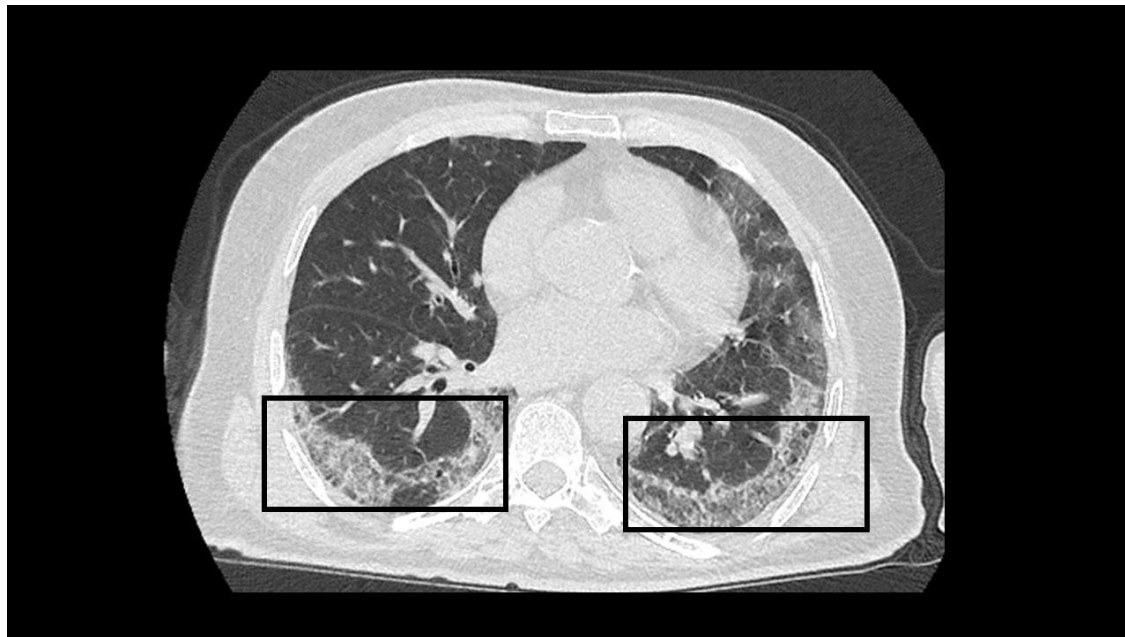


Figure 1. Study flow-chart



2a



2b

Figure 2. Typical CT findings for covid-19 pneumonia. Multifocal ground-glass opacities (circles) are demonstrated in a 68-years old female RMD patient (2a). A crazy paving pattern (rectangles) formed by ground-glass opacities with superimposed interlobular septal thickening and intralobular septal thickening is shown in a 73-years old male non-RMD patient (2b).



3a



3b

Figure 3. Atypical CT findings for covid-19 pneumonia. Peribronchovascular distribution of ground-glass opacities (circles) and vascular enlargement (thick arrow) is demonstrated in an 83-years old female RMD patient (3a). Isolated pleural thickening (thick arrow) and pulmonary nodule (circle) are shown in a 62-years old female non-RMD patient (3b).

Table 1. Demographic Data and Medical History of Patients with Rheumatic Musculoskeletal Diseases

Cases	Age	Gender	Rheumatic disease	Course of Rheumatic disease	Co-morbid diseases	Rheumatic medicine	Additional medicine
1	79	F	RA	8 years	CHF, AF	None	Rivaroxaban Metoprolol Furosemide
2	83	F	Gout	8 years	CAD, CHF	None	Ranolazine Acetylsalicylic acid Furosemide Atorvastatin
3	62	F	RA	2 years	HT, DM	Leflunomide 10mg/d Methylprednisolone 4mg/d	Gliclazide Perindopril Vildagliptine
4	77	F	RA	6 years	HT, CAD	None	Olmesartan Metoprolol Clopidogrel
5	66	F	RA	>8 years	-	HCQ 2x200 mg Prednisolone 5 mg/d Azathioprine 150 mg/d	-
6	64	F	Gout	3 months	HT, DM, CAD	Colchicum Dyspert 1g/d	Rosuvastatin Nebivolol Clopidogrel Sitagliptin Metformin Insulin aspart Losartan potassium+ Hydrochlorothiazide
7	47	F	RA, SjS	3 years	-	None	-
8	67	M	RA	>8 years	-	Methylprednisolone 4 mg/d	-
9	68	F	RA	>8years	HT	Methylprednisolon 4 mg/d Methotrexate 15 mg/week	Perindopril/indapamide

(F: Female, M: Male, RA: Rheumatoid Arthritis, SjS: Sjögren's Syndrome, CHF: Congestive heart failure, AF: Atrial fibrillation, CAD: Coronary artery disease, DM: Diabetes Mellitus, HT: Hypertension)

Table 2. Clinical Characteristics of Patients with Rheumatic Musculoskeletal Diseases During Covid-19 Infection

	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7	Case 8	Case 9
Covid-19 manifestations	Dyspnea, Fever	Asymptomatic	Fever	Diarrhea	Dyspnea	Fever, Diarrhea	Fever, anosmia	Fever	Asymptomatic
RT-PCR	+	+	+	+	+	+	+	+	+
Clinical S.	Severe	Severe	Moderate	Mild	Severe	Severe	Mild	Severe	Moderate
Radiological S.	5 (mild)	N/A	7 (mild)	6 (mild)	19 (severe)	12 (moderate)	N/A	16 (moderate)	5 (mild)
Medication (during covid-19)	HCQ, Oseltamivir, Favipravir, Moxifloxacin, Meropenem, Piperaciline-Tazobactam	HCQ, Oseltamivir, Moxifloxacin, Piperaciline, Ceftriaxone	HCQ, Oseltamivir, Moxifloxacin, Piperaciline, Ceftriaxone, Prednisolone	HCQ	HCQ, Oseltamivir, Moxifloxacin, Piperaciline-Tazobactam, Meropenem, Azitromycine, Ritonavir LMWH	HCQ, Oseltamivir, Moxifloxacin, Piperaciline, Meropenem, Favipravir, Ritonavir	HCQ, Oseltamivir	HCQ Piperaciline-Tazobactam Favipravir, LMWH Moxifloxacin	HCQ, Oseltamivir, Moxifloxacin, Prednisolone
Hospitalization	YES	YES	YES	YES	YES	YES	NO	YES	YES
Length of Stay	30 d	33 d	13 d	2 d	9 d	6 d	-	9 d	4 d
ICU Admission	YES	YES	NO	NO	YES	YES	NO	YES	NO
Outcome	Deceased	Recovery	Recovery	Recovery	Deceased	Deceased	Recovery	Recovery	Recovery

(Clinical/Radiological S.: severity, RT-PCR: Reverse transcription-polymerase chain reaction, HCQ: Hydroxychloroquine, LMWH: Low molecular weight heparin, ICU: Intensive care unit, d: days)

Table 3. Comparison of Radiological and Clinical Severity Between Patients with and without Rheumatic Musculoskeletal Diseases

	RMD (n=9)	Non-RMD (n=273)	p value
Age(mean \pmSD)	68.32 \pm 10.31	47.74 \pm 19.22	0.001*
Male/Female (n)	1/8	129/144	0.041**
Mean Severity Score (MSS) (mean \pmSD)***	10 \pm 5,71	6.25 \pm 4,01	0.081*
Hospitalization (n, %)	8 (88.89%)	184 (67.40%)	0.280**
ICU (n, %)	5 (55.56%)	30 (10.99%)	0.002**
Mean Total LOS (days) (mean \pmSD)****	13.20 \pm 11.23	8.17 \pm 8.02	0.168*
Exitus (n, %)	3 (33.33%)	22 (8.06%)	0.036**

(RMD: Rheumatic musculoskeletal diseases, LOS: Length of Stay, ICU: Intensive care unit)

* Student t-test,

** Chi-square test

*** Severity scores were only calculated in “typical for covid” and “atypical for covid” groups (RMD=7, non-RMD=166)

**** Length of Stay (days) was calculated for hospitalized patients (RMD=8; non-RMD=184)

Table 4. Covid-19 Related Chest CT Features of Patients with and without Rheumatic Musculoskeletal Diseases

		RMD (n=9)	Non-RMD (n=273)
CT Findings	Normal	1 (11.11%)	94 (34.43%)
	Typical for covid	6 (66.67%)	142 (52,02%)
	Atypical for covid	1 (11.11%)	24 (8.79%)
	Not covid	1 (11.11%)	13 (4.76%)
Typical CT Features for Covid-19	Multifocal GGOs	7 (77.78%)	127 (46.52%)
	Crazy paving pattern	5 (55.56%)	82 (30,04%)
	GGO superimposed with consolidation	4 (44.44%)	79 (28.94%)
Atypical CT Features for Covid-19	Peribronchovascular distribution of GGOs	5 (55.56%)	54 (19.78%)
	Pulmonary nodule	4 (44.44%)	49 (17,95%)
	Isolated pleural thickening	4 (44.44%)	75 (27.47%)

(RMD: Rheumatic musculoskeletal diseases, GGO: Ground glass opacity)

Discussion

In the relevant study, we aimed to evaluate the pulmonary involvement patterns on chest CT in patients with covid-19 infection concomitant with RMD. Secondly, we purposed to compare the chest CT scores, hospitalization, ICU requirement, and mortality of RMD and non-RMD covid-19 patient groups. We reported nine patients with RMD; 7 RA, and two gout arthritis. Of the nine patients with RMD, only one of them was male, whereas the male and female distribution was nearly equal in the whole study population, similar to prevalence reports of previous studies.¹⁰ Hospitalization and chest CT severity scores did not differ among RMD/non-RMD groups, while ICU transfer and mortality rates were higher for patients with RMD than the non-RMD group. Pulmonary involvement patterns on chest CT examination were different between RMD and non-RMD groups regarding atypical CT features for covid-19 pneumonia that is more common in the former one. On the other hand, multifocal GGOs, crazy paving patterns, and GGOs with superimposed consolidation are commonly seen as typical features that are equally seen in both groups.

RA and most of the RMD are known to be associated with the increased risk of respiratory infection and its complications, including viral diseases such as influenza and herpes zoster virus.¹¹⁻¹³ The increased risk of infections is related to disease activity, disease damage, co-morbidity, and treatment.¹³⁻¹⁵ On the other hand, there has been no evidence that the risk of respiratory or life-threatening complications from covid-19 is increased in patients with RMD.^{16,17} Reports indicate that the prevalence of covid-19 infection is similar to the general population in patient groups with RMD.^{18,19} Similar to the previous reports, RA was found to be the most common RMD in our study group.¹⁷ We have found its prevalence was 2.63% among patients with covid-19 infection, which is higher than the estimated prevalence of RA in our country (0.56%) but similar to the RMD prevalence reported by D'Silvia.^{20,21} The overestimated the prevalence of the patients with RMD within the covid-19 infected patient group might support the possible facilitative effect of rheumatic diseases regarding covid-19 infection. Similarly, the significantly higher age in RMD patients than the non-RMD group may be related to the higher ICU requirement and the increase in mortality, but the number of patients is insufficient for these comments.

Results regarding the severity and course of covid-19 in people with RMD differ due to the genetic background of study populations, methodology, applied treatments, co-morbidities, disease activities, and undoubtedly the progress of the pandemic. Fredi et al. had compared covid-19 infected patients with RMD with age, gender-matched patients without RMD (n=117) and found no difference regarding the disease symptoms, length of stay in the hospital. The authors reported that poor clinical outcome is related to age and the co-morbidities rather than the presence of RMD.¹⁷ Similar to our results, D' Silva et al have reported a higher percentage of ICU requirement in their study population.²¹ Although it's not statistically significant, the rate of hospitalization in the RMD group is higher than the non-RMD group (88.8%-67.4%, respectively; p=0.280) in our study. Cheng

et al. reported one of the first reports about RMD cases with covid-19 which were all hospitalized.³ Moreover, as a result of the dynamic pandemic process, the hospitalization criteria have been updated along with the spread of the disease and the health care policies. In our study, the mortality rate was found to be $\sim 1/3$, which is higher than the previous reports.^{21,22} By all odds, it is not possible to isolate RMD from age and other co-morbid diseases with our sample size. Further studies with large cohorts should be required to assess the independent risk and severity of covid-19 infection for RMD.

Covid-19 infection possesses an exaggerated immune system response and cytokine storm resulting in a series of severe respiratory and life-threatening complications. Hence, it is not surprising that the patients receiving b-DMARDs or cs-DMARDs are not at higher risk than the overall general population.¹⁶ Nevertheless, a recent meta-analysis has shown that patients on b-DMARD treatment have a higher risk of infection than those on cs-DMARD.²³ In our case series, three patients were receiving cs-DMARDs and none with b-DMARDs. The severity of the disease was severe in one of them, who is eventually died in ICU. The other two patients had mild-moderate clinical and radiological severity and were discharged after treatment. Due to the low number of patients, we cannot state comment on the medication's effect on the covid-19 disease severity and prognosis. As seen in Table 2, all patients received HCQ treatment. Although chloroquine (CQ) and hydroxychloroquine (HCQ) have been suggested as potential antiviral agents in covid-19, both are not superior to standard care.¹⁴

Chest X-ray (CXR) is an essential diagnostic tool in pulmonary disorders. Nonetheless, a chest CT scan is recommended in the covid-19 guidelines in patients with multiple symptoms or co-morbidities.²⁴ Practically, a CT scan of the chest, which is the best diagnostic imaging modality in covid-19 related pneumonia (Lie Bingjie et al.), has become the best available diagnostic tool in covid-19 pandemics.²⁵ Yet, few papers in the literature evaluate the covid-19 infected patients with RMD, mostly only with CXR. Fredi et al. had scored CXR of covid-19 infected patients with RMD in their case-control study.¹⁷ They have concluded that pulmonary involvement does not differ according to RMD in covid-19 infected patients. Since GGOs are mostly undetectable on CXR, this conclusion may not be sufficient without an evaluation with chest CT. Similarly, in studies of Borghesi et al. and Acharya et al., chest CT was found to be superior to CXR in the diagnosis of covid-19 pneumonia.^{26, 27} Moreover, lung complications are common in RMD and mostly cause different patterns of interstitial pneumonia (IP).²⁸ Thin slice high-resolution CT imaging is the imaging method of choice in the diagnosis of interstitial lung diseases (ILD).²⁹ Even though a CXR has abnormal findings, it may not be enough to differentiate covid-19 pneumonia from ILDs. Furthermore, radiologists' evaluation of chest CT scans of rheumatic patients, especially with an unknown history of lung involvement, might be challenging. The baseline ILD pattern can hide or replace covid-19 pneumonia-related findings or might worsen the severity of the lung involvement in covid-19 infected patients with RMD.

Radiological findings in patients with RMD might differ from non-RMD ones. This study has shown that most common CT findings “typical for covid” pneumonia does not differ from non-rheumatic ones. Multifocal GGOs followed by a crazy-paving pattern, and GGOs with superimposed consolidation were depicted as the most common CT features in both groups of patients. Although there are only a few articles evaluating patients with RMD for covid-19 pneumonia, this finding has been supported in the study of Ye C, et al.²². On the other hand, we have found a higher incidence of atypical CT features for covid-19 in patients with RMD compared to non-RMD ones. Peribronchovascular distribution of GGOs, isolated pleural thickening, and pulmonary nodules were the most common atypical CT features in both groups. The reason for this could be that the involvement of the lungs is due to the chronic inflammatory nature of the RMD. This idea had also been supported in the study of Ye C, et al.²² with the emphasis on the possibility of interstitial lung disease development in the future.

It has been an important approach during the covid-19 pandemic to evaluate and report the ratio of pulmonary parenchymal involvement. We have conducted a semi-quantitative evaluation for CT-scoring, but our results did not fit well with clinical severity indices. Tekcan et al. had explained, partly, this difference with an emphasis on the effect of multifactorial parameters, including but not only the percentage of parenchymal involvement on initial chest CT examination on prognosis.³⁰ Moreover, severity scores of covid-19 pneumonia did not differ among RMD and non-RMD patients in our study. Still, the difference between mean scores might indicate more severe disease progression in patients with rheumatic musculoskeletal diseases.

The small number of RMD patients we detected in our screening greatly limits our data to generalize. We couldn't be able to report the most recent disease activity and previous interstitial lung disease status of our patients. However, we know that 4 of 9 patients were not under any treatment for RMD. This may be one of the reasons, though not all, for our overestimated prevalence of RMD among our cohort. Inevitably, up-to-date reports documenting the covid-19 disease with the co-morbidity of RMD were all case reports or retrospectively designed studies which is the sole option under pandemic conditions. Therefore, these findings should be verified with larger cohorts.

Patients with RMD should be handled as a special patient population regarding chronic systemic inflammation and wide use of anti-inflammatory drugs. It should be kept in mind that these features might affect the diagnostic processes as well as the clinical progress of covid-19 infection. In future studies, a detailed examination of semi-quantitative chest CT involvement patterns in patient populations, such as RMD, will contribute to the literature with a unique nature.

Ethical considerations

Approval from both the Institutional Ethical Committee (issue no: 15345988-7, date: 06/07/2020) and The Government of Health (form no:2020-06-01T21_25_10) was obtained before the study.

Conflict of interest

The authors declare no conflict of interest.

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