

# COVID-19 IMPACT ON SENIOR PATIENTS WITH CARDIOVASCULAR DISEASE. ROLE OF COMPLEX GERIATRIC EVALUATION IN REHABILITATION

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**Abstract.** According to recent data, pre-existing cardiovascular pathology is among the factors associated with increased mortality in COVID-19. The potentiation of the precursors of fragility and the increase the risks of physical, cognitive and emotional decline have been precipitated especially in the most vulnerable segment – elderly people. The present paper refers to the top comorbidities that predispose the elderly to moderate-severe forms of COVID-19. In these situations, geriatric reassessment is required to assess the complex impact of the infection on the pluripathology of the elderly, especially in terms of cardiovascular, cognitive and last but not least, quality of life point of view. Cardiovascular re-evaluation will also allow a complex therapeutic re-evaluation of these patients, with the reconciliation of previous therapeutic regimens according to the post-COVID-19 situation. We could concluded that cardiovascular disease, obesity, fragility, cognitive or psycho-emotional disorders, in the context of SARS-COV2 infection, lead to the induction of an acute status of systemic inflammation, predisposing the elderly to severe disease. The post-COVID-19 recovery of these patients remains an open topic for research, as cases of "post-COVID syndrome" require a holistic, diversified and individualized therapeutic approach.

**Key words:** COVID-19, cardiovascular disease, comorbidities, elderly

**Rezumat.** Potrivit datelor recente, patologia cardiovasculară preexistentă se numără printre factorii asociați cu creșterea mortalității în COVID-19. Potențarea precursorilor fragilității și creșterea riscurilor de declin fizic, cognitiv și emoțional s-au precipitat în special în segmentul cel mai vulnerabil – persoanele în vârstă. Lucrarea de față se referă la principalele comorbidități care predispun vârstnicii la forme moderat-severe de COVID-19. În aceste situații se impune reevaluarea geriatrică pentru a evalua impactul complex al infecției asupra pluripatologiei vârstnicilor, mai ales din punct de vedere cardiovascular, cognitiv și nu în ultimul rând, al calității vieții. Reevaluarea cardiovasculară va permite și o reevaluare terapeutică complexă a acestor pacienți, cu reconcilierea regimurilor terapeutice anterioare în funcție de situația post-COVID-19. Am putea concluziona că bolile cardiovasculare, obezitatea, fragilitatea, tulburările cognitive sau psiho-emoționale, în contextul infecției cu SARS-COV2, conduc la inducerea unui status acut de inflamație sistemică, predispunând vârstnici până la boală severă. Recuperarea post-COVID-19 a acestor pacienți rămâne un subiect deschis de cercetare, deoarece cazurile de „sindrom post-COVID” necesită o abordare terapeutică holistică, diversificată și individualizată.

**Cuvinte cheie:** COVID-19, boli cardiovasculare, comorbidități, vârstnici

## INTRODUCTION

In the context of biological aging, to senior patients, a multitude of conditions that make them more susceptible to the disease add up. There exists, however, variability in the means of response to pathological phenomena. In this sense, it seems that a number of factors, such as age segment, degree of fragility or individual resilience play an important role. Therefore, the evolution or prognosis of senior patients, regardless of associated comorbidities, can

sometimes be difficult to predict, even under a standard, well-known therapeutic approach [1, 2].

Moreover, the phenomenon of a new disease - such as the COVID-19 pandemic - with a treatment in the experimental stage, makes it difficult to predict the evolution of the elderly patient and is a challenge for clinicians, requiring them to reconsider how to evaluate and approach [3, 4].

The COVID-19 pandemic had an important resonance globally, but by far

the most vulnerable segment was the elderly population. In this new context of the disease, the potentiation of the precursors of fragility and the increase of the risks of physical, cognitive and emotional decline have precipitated. With measures to prevent the spread of the disease and restrict access to health services, the following have worsened: depression, sleep disorders, the risk of falling, pain, stigma and self-stigmatization. Conversely, factors varied, such as: quality of life with its subsidiary elements (e.g. access to a proper diet, access to physiotherapy / physiotherapy programs, control of the acute pain component), physical condition, and vitamin D production [5].

According to statistics, the highest mortality rate due to COVID-19 was recorded in elderly patients. Apparently, the highest percentages were reported at the beginning of the pandemic, in outbreak areas such as Lombardy or Madrid. Also, early data in 2019 from China signaled an increased predisposition to severe forms of disease and mortality, including in the young elderly which associated significant comorbidities. Preliminary descriptive reports of the evolution of patients with COVID-19 in the US, showed that the fatality was 10-27% in the elderly over 85 years, followed by 3-11% in those between 65-84 years [6-8].

The same data did not report deaths among young people under 19 years of age. Also, the most severe results were later related, also among the elderly, to prolonged hospitalizations in ICU wards.

The present paper refers to the top comorbidities (mainly cardiovascular damage) that predispose the elderly to moderate-severe forms of COVID-19 and which, in turn, are strongly affected by viral infection and/or its treatment. In these situations, geriatric reassessment is required to assess the complex impact of the infection on the pluripathology of the elderly, especially in terms of

cardiovascular, cognitive and last but not least, quality of life point of view.

Subsequent research, relying on longer experiences, will investigate the feasibility of these perspectives, as modern medicine is, according to more sensitive predictions, at the confluence of fundamental changes in the epidemiological future.

### **Cardiovascular damage - risk factor that predisposes the elderly to moderate and severe forms of COVID-19 pathology**

According to recent data, pre-existing cardiovascular pathology is among the factors associated with increased mortality (10.5%) in COVID-19, followed by diabetes (7.3%), chronic respiratory failure (6.3%), hypertension (6%), neoplasm (5.6%) and the group without associated comorbidities (0.9%) [9].

The same data show that cardiac biomarkers, such as HS troponin, can be detected at the onset of symptoms and have prognostic value. The continuous increases in troponin, together with the high level of cytokines predict the need for hospitalization in the ICU department and tracheal intubation, also predisposing to vascular complications. Increased NTproBNP may predict the risk of myocarditis or heart failure [9-11].

The older the age segment, the more numerous and forceful the cardiovascular consequences of COVID-19 are.

The pathogenic mechanisms by which viral infection affects the cardiovascular system are direct cardiac injury / stress, attachment of viral antigen to T cells, endothelium and inflammation.

SARS-Cov-2 has an early impact on the heart and metabolic abnormalities that characterize elderly patients.

In the subsequent stages of the infection, the storm of harmful cytokines exacerbates the pro-inflammatory state, leading to cardiovascular events and organ failure [1-14].

A US study from March 2020, included in a review that looked at the characteristics

of patients with cardiovascular comorbidities and COVID-19 pathology, showed that the highest rate of cardiovascular events (60.4%) was recorded in the age segment over 80 years, with a much higher incidence in women (68.3%) [15-17].

Other data suggest the direct impact of SARS-Cov 2 infection on the myocardium, by using the angiotensin 2 conversion enzyme receptor to enter the cell. The infection can cause myocardial injury, acute coronary syndrome or cardiac arrhythmias and can be associated with haemostatic disorders and elevated troponin levels.

Procoagulant status results in venous thromboembolism, myocardial infarction or, in the case of an additional hemostatic disorder, disseminated intravascular coagulation [15,18-20]. Coagulation disorders appear to be triggered by an inflammatory response that leads to endothelial and hemostatic activation, with an increase in von Willebrand factor and tissue factor.

Researchers warn clinicians about certain drugs used in the treatment of COVID-19 that have cardiovascular side effects [15]. Thus, drugs used to counteract the invasion / replication of the virus, such as antimalarials (chloroquine / hydroxychloroquine), protease inhibitors (lopinavir / ritonavir) and macrolides (azithromycin) may prolong the corrected QT interval (QTc) and increase the risk of polymorphic ventricular tachycardia. In addition, chloroquine and hydroxychloroquine, which have been shown to be effective in antiviral therapy, also appear to predispose to sinoatrial or atrioventricular block and ventricular arrhythmias.

The cytokine storm triggered by the viral infection induces hyperactivation of the cardiac sympathetic system, increasing electrical instability of the heart [21] and predisposes to arrhythmic events, including malignant ventricular arrhythmias. IL-6 promotes the prolongation of QTc both directly, by modulating the ion channels of cardiomyocytes, and indirectly,

by increasing the bioavailability of concomitant drugs that prolong QT. Also, plasma TnT levels in patients with COVID-19 were significantly correlated with both plasma levels of high-sensitivity C-reactive proteins and of NT-proBNP [13, 22, 23].

### **Evaluation of cardiovascular complications of COVID-19 pathology and cardiovascular rehabilitation**

The most common cardiovascular complications recorded during / after COVID-19 infection are: various arrhythmias, heart failure with decreased ejection fraction, and severe myocarditis with systolic dysfunction. For these reasons, after curing the viral infection, elderly patients need a careful and complex cardiovascular reassessment to detect possible cardiac sequelae (laboratory tests, ECG, 24-hour ECG, echocardiogram, cardiopulmonary exercise tests and / or cardiac MRI). These investigations will also evaluate the evolution of pre-existing and neglected cardiovascular diseases during COVID-19 infection.

Cardiovascular re-evaluation will also allow a complex therapeutic re-evaluation of these patients, with the reconciliation of previous therapeutic regimens according to the post-COVID-19 situation. A variable period of post-infection rest, depending on the symptoms and complications, will reduce the risk of post-infection heart failure, secondary to myocarditis [13].

In the presence of a newly diagnosed cardiac pathology or worsening of the pre-existing one, specific cardio-respiratory rehabilitation programs will be developed in collaboration with specialists in the field, in order to improve cardiac and respiratory functions, but also to improve the physical abilities and quality of life of the patient.

### **Assessment of cognitive impairment and psychological complications of COVID-19 pathology and psychological rehabilitation**

The current literature cites a directly proportional relationship between the severity of COVID-19 forms and the severity of cognitive impairment in the elderly. Stress acts on the rough hypothalamic-pituitary axis and generates an increase in the concentration of glucocorticoid hormones and subsequently, an increase in the resistance to them, which seems to stimulate the storm of pro-inflammatory cytokines, just like the SARS viral material. The results show a severity of COVID-19 forms in those with cognitive impairment, but also a worsening of cognitive impairment in the elderly with COVID-19 [8, 24, 25].

The main neuro-cognitive complications of COVID-19 infection are: prolonged confusional states with mental problems, periods of delirium, prolonged states of anxiety and depression, psychosis and dementia. These situations can be prevented or improved by an effective communication of the medical staff with the patient in the acute period. Ensuring a social and family contact with the help of modern technologies helps the elderly patient to overcome the moments of great psychological stress in this phase of the disease.

In the post-COVID-19 period, elderly patients require careful neuro-cognitive reassessment to identify those with psychological adverse reactions as a result of their COVID-19 experiences. Active monitoring (continuous review) should be performed for those with psychological symptoms below the threshold. Psychotherapy and consideration of

behavioral cognitive therapy focused on trauma, as well as cognitive processing therapy are useful for those with moderate to severe symptoms of acute stress disorder [13, 26]. Particular importance will be given to the social reintegration of the patient in his familial and home environment, in order to ensure a quality of life as close as possible to that before the COVID-19 infection.

### **CONCLUSIONS**

Comorbidities such as cardiovascular disease, obesity, fragility, cognitive or psycho-emotional disorders associated with increased serum inflammatory cytokines, in the context of SARS-COV2 infection, lead to the induction of an acute status of systemic inflammation, predisposing the elderly to severe disease.

Also, conditions favored by pandemic restrictions such as isolation, poor diet, chronic stress, lack of physical activity, obesity and sleep disorders, in the context of activated proinflammatory cytokines, lead to worsening of common diseases such as cardiovascular disease, immune-senescence, fragility, insulin resistance, sarcopenia and to the promotion of a chronic inflammation status.

In our experience, chronic cardiovascular treatment has been neglected, patients not keeping in touch with the attending physician or family doctor. These cases subsequently required hospitalization in the Geriatrics Clinic, for therapeutic scheme readjustment.

The post-COVID-19 recovery of these patients remains an open topic for research, as cases of "post-COVID syndrome" require a holistic, diversified and individualized therapeutic approach.

### ***Conflicts of interest***

The authors declare no conflicts of interest.

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