DOI 10.51231/2667-9507-2023-002-01-42-48

Review of different types of post-COVID-19 complications

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Abstract

COVID-19 infection has rapidly expanded across the world causing millions of cases worldwide. Despite acute illness, both transient and long-term complications of infection with SARS-CoV-2 requires more and more attention. COVID-19 illness produces numerous long-term complications involving practically all organs and biological systems: respiratory, cardiovascular, neurological, digestive and others. The aim of this paper was to describe some widely occurred complications in post-COVID period. Knowledge and awareness about post-COVID complications should be increased among patients and health care professionals in order to provide proper prevention and management of the complications declared after SARS-CoV-2 infection.

KEYWORDS: COVID-19 infection; post-COVID complications; proinflammatory cytokines; viral shedding; hyperinflammatory acute response

Introduction

The emergency of coronavirus disease 2019 (COVID-19) has resulted in an unimaginable global threat, thus in 12 March 2020 the World Health Organization (WHO) has declared COVID-19 as a pandemic.

Modern guidelines suggest that in mild cases infected people manifest the symptoms at around five to six days from the onset and moderate COVID-19 illness requires 10 days of isolation [1,2].

Despite that the average duration of viral load is from 12-to-20 days, there is evidence that viral shedding in SARS-CoV-2 is extended in the feces in comparison with respiratory discharge. Immunosuppression and aggravated disease also prolong viral shedding; still there are not weighty proofs about interrelationship between viral shedding and infection duration. Another interesting fact is that after the contagious period shreds of viral genome may not transmit infection, though they may provoke enhanced immune reactivity possibly explaining the symptoms perseverance in COVID-19-free patients. Even more so, after viral clearance, immune system still remains hyperactive similar to long lasting weakness after infectious mononucleosis. Various late complications are reported in COVID-19 patients.

In accordance with NICE guideline, signs and symptoms in post-COVID-19 patients are prolonged for more than 12 weeks and are not interpreted as an alternative diagnosis. The term – long COVID-19 refers to both – ongoing and post-COVID-19 [3].

Materials and Methods

In this review, we focus on different complications of COVID-19 infection occurring during post-Covid period among survivors.

Discussion

In general, the most vulnerable system in COVID-19 infection, including the post-covid period is respiratory system [4]. Promptly after the onset of the infection of the alveolar walls undergo damage triggering leukocyte recruitment, microangiopathic changes and consequent thrombosis. Proinflamatory cytokine release provokes uncontrolled inflammation, edema and hyaline membranes formation – these changes altogether show up like ground glass opacity in CT scans or X-ray of lungs [5]. Despite

the immune response, renin-angiotensin-aldosteron system, kinin-kallikrein system and furthermore activation of coagulation system are major determinants of worsening the clinical outcome [6]. Further development of lung fibrosis is among most frightening complications of post-covid period [5,7]. Standard post-covid pulmonary manifestations are dyspnea, lung fibrosis, residual ground-glass opacity, abnormality in alveolar gas exchange, pneumonia and pulmonary embolism [8,9,10]. The longest respiratory manifestations are declared even after 4 months from COVID-19 recovery [10,11].

Miscellaneous complications – moderate headache, weight loss, alopecia, anosmia and ageusia are declared in some cases even after 3 months from recovery [11].

Cardiovascular complications are mostly related to tachycardia and palpitations, – other types of cardiac arrhythmias as well as myocardial injury, chest pain and hypertension are also detected. These symptoms are reported in patients even after 3 months from hospital discharge [12,13,14].

Some data reveals correlation between acuteness of respiratory symptoms and central nervous system complications [15].

COVID-19 patients show such numerous neurological complications as anxiety and depression episodes, memory and cognitive dysfunction, post-traumatic stress disorder and sleeping disorders even after 4 months after post-hospital discharge [16,17,18]. Musculoskeletal complications like generalized pain, arthralgia, muscle pain, tiredness and lowering of exercise endurance as a sequelae of COVID-19 infection. Reduced physical activity and tiredness are assigned to lung injury and dyspnea majorly observed among the patients [12,19].

Another disorders such as encephalopathy and delirium are reported to develop after extubation, related to either mechanical ventilation or long-lasting sedative treatment. Encephalopathy may recoup soon or may get prolonged for several weeks.

Pre-existing disorders like epilepsy, subarachnoid hemorrhage, dementia and epilepsy may boost the chances of neurocognitive violations. Older age, immunosuppressive conditions may also contribute to increased risk of nervous diseases complications [20].

One more reason – medical intervention can also trigger brain damage. E.g., dexamethasone, may lead to such neuropsychiatric consequences like psychosis, hypomania, several types of sleep disorders and cognitive deficits development [21].

What distinguishes COVID-19 infection from other types of respiratory viruses is its special ability to induce more prominent micro-, macro angiopathies and enhanced thrombi formation rather than in other types of acuter respiratory distress syndrome cases. The mechanism of the above mentioned is considered to be severe hypoxic and inflammatory injury with initialization of coagulation cascade, platelet activation. This results in several mediators release, direct endothelial damage, P-selectin and von Willebrand factor synthesis increase [22,23,24]. Complement system activation together with other immune responses such as antibody synthesis may also contribute to these

disorders [25]. Hypercoagulable state may become long-lasting in post-COVID-19 period; high D-dimer levels can point out fibrin formation and its furthermore lyses in this state. Patients undergoing immobility after COVID-19 acute period are considered to have higher risks of hypercoagulability, endothelial damage and thromboembolic complications.

Digestive system complications such as diarrhea nausea, vomiting, and acute liver failure are among those, that can last even up to 3 months.

Secondary infections in post-covid period can affect clinical outcome and convalescence of the patient [26]. Immunological dysregulation and immunosuppression precedes multi organ damage and hyperinflammatory acute response [27]. Secondary infections are not assessed to be reason of permanent organ dysfunction though [28].

Endocrine glands – pancreas, hypothalamus and pituitary, thyroid, adrenal glands, testes, and ovaries have been found to express ACE2 and TMPRSS2. Various publications concentred on the aggravation of preexisting endocrine diseases by COVID-19 infection. Hyperglycemia can directly rise glucose concentrations in airway secretion. Glycaemic control has been appeared to be essential to avoiding long hospital stays. Morbidity and mortality due to COVID-19 infection are increased by the presence of diabetes in infected patients [29].

Conclusion

Information relating to SARS-CoV-2 detection and viral load at different time points of infection will help the clinical interpretation of long-term symptoms of COVID-19. Similarly, there is a need for further studies to provide evident data on the association between viral shedding and long-term COVID-19.

Thus, some of these post-COVID-19 complications may need long-term follow-up and management.

Acknowledgements

Society of Rheology, 405133029; Popularization of Rheology Science Program (PRSP).

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