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Cardiac patients and COVID-19: what the general practitioner should know

Pacjenci kardiologiczni a COVID-19 – co lekarz rodzinny wiedzieć powinien

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Abstract

The pandemic of COVID-19 (coronavirus disease 2019), a disease caused by the novel coronavirus SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2), presents medicine with previously unknown challenges. Primary healthcare facilities and general practitioners face a number of problems related to the current epidemiological situation. The gravity of the situation affects not only patients who are suspected of or diagnosed with COVID-19. New threats and organisational restrictions must also be taken into consideration when providing medical care to other patients, especially those with chronic diseases, requiring regular monitoring. Even though COVID-19 presents as a mild respiratory disease in the majority of patients, it may pose a serious risk to health and life in the elderly population and individuals with underlying health concerns. The presence of previously diagnosed cardiovascular diseases is associated with an especially poor prognosis in patients with COVID-19. The aims of the paper are to present the cardiovascular symptomatology of COVID-19 and the potential effect of SARS-CoV-2 infection on the laboratory cardiac markers, discuss the impact of cardiac disorders on the course of COVID-19, and summarise the current expert statement on the controversies surrounding the treatment with angiotensin converting enzyme inhibitors and angiotensin receptor blockers during the COVID-19 pandemic. In addition, attention is drawn to the fact that cardiac patients can use telemedicine to get advice from specialists, so that continuity of care is ensured while adhering to the rules of epidemiological safety.

Keywords: 2019-nCoV, cardiovascular system, COVID-19, SARS-CoV-2, telemedicine, hypertension

Streszczenie

Pandemia COVID-19 (*coronavirus disease 2019*), choroby wywołanej przez nowego koronawirusa SARS-CoV-2 (*severe acute respiratory syndrome coronavirus 2*), stawia przed współczesną medycyną niespotykane dotychczas wyzwania. Placówki podstawowej opieki zdrowotnej i lekarze rodzinni stykają się z szeregiem problemów spowodowanych obecną sytuacją epidemiologiczną. Nie dotyczą one jedynie pacjentów z podejrzeniem bądź rozpoznaniem COVID-19. Również opieka nad innymi osobami, zwłaszcza obciążonymi schorzeniami przewlekłymi, wymagającymi regularnej kontroli, musi obecnie uwzględniać nowe zagrożenia i ograniczenia organizacyjne. Choć u większości zarażonych COVID-19 przebiega pod postacią łagodnej infekcji dróg oddechowych, to dla osób starszych i obciążonych dodatkowymi schorzeniami choroba ta może stanowić istotne zagrożenie dla zdrowia i życia. Obecność wcześniej rozpoznawanych chorób układu sercowo-naczyniowego wiąże się ze szczególnie złym rokowaniem u pacjentów z COVID-19. Celem pracy jest przedstawienie symptomatologii COVID-19 ze strony układu sercowo-naczyniowego, potencjalnego wpływu infekcji wirusem SARS-CoV-2 na laboratoryjne markery sercowe, omówienie wpływu schorzeń kardiologicznych na przebieg tej choroby oraz przedstawienie obecnego stanowiska ekspertów wobec kontrowersji dotyczących stosowania w okresie pandemii COVID-19 inhibitorów konwertazy angiotensyny i blokerów receptora dla angiotensyny. Chcemy również zwrócić uwagę czytelników na możliwości wykorzystania porad telemedycznych w celu zapewnienia ciągłości opieki nad chorym kardiologicznym z zachowaniem bezpieczeństwa epidemiologicznego.

Słowa kluczowe: 2019-nCoV, układ sercowo-naczyniowy, COVID-19, SARS-CoV-2, telemedycyna, nadciśnienie tętnicze

INTRODUCTION

The confrontation of the contemporary global world with the pandemic caused by a novel coronavirus (severe acute respiratory syndrome coronavirus 2, SARS-CoV-2) has presented us with unprecedented challenges. The Chinese experience shows that epidemiological tools can be effective in combating the epidemic, but the rapidly growing number of infected individuals in countries of the Old World increases the risk of every healthcare professional coming into contact with the disease caused by the coronavirus SARS-CoV-2, called COVID-19 (coronavirus disease 2019). According to the data of the European Centre for Disease Prevention and Control (ECDC), as of 31 March 2020 there were a total 777,798 confirmed cases of COVID-19 (European Union: 386,282) including 37,272 deaths (European Union: 26,110)⁽¹⁾.

SYMPTOMATOLOGY OF COVID-19 AND SYMPTOMS INVOLVING THE CARDIOVASCULAR SYSTEM

The clinical presentation of SARS-CoV-2 infection includes elevated body temperature ($\geq 37.3^{\circ}\text{C}$), found in 94% of hospitalised patients, as well as typical respiratory symptoms: cough (79%) and expectoration of mucus (23%)⁽²⁾. However, patients may also seek medical attention because of less specific symptoms, including those indicative of a cardiovascular disease, such as heart palpitations or a feeling of heaviness in the chest⁽³⁾. Nearly 12% of patients admitted to hospital with COVID-19 presented with symptoms of myocardial damage (defined as an increase in high-sensitivity troponins above the normal limit, abnormalities in electrocardiogram or echocardiography)⁽⁴⁾. Most of these patients required treatment in intensive care units, and myocardial involvement was associated with an increased risk of death⁽²⁾. Post-mortem findings also indicate myocardial damage secondary to SARS-CoV-2 infection⁽⁵⁾.

EFFECTS OF EXISTING CARDIAC DISORDERS ON THE COURSE OF COVID-19

A number of studies have shown that in addition to acute cardiac damage due to the cardiotropic activity of the virus, another factor contributing to poorer prognosis in COVID-19 is the presence of previously diagnosed cardiovascular disorders. In patients hospitalised with COVID-19, pre-existing coronary artery disease causes a 21-fold increase in the risk of death, while in patients with arterial hypertension and diabetes the risk is increased 3-fold. The disorders have a significantly greater prevalence in COVID-19 patients compared to the general population. Higher mortality rates in this group are associated not only with acute respiratory failure, but

also with the development of cardiovascular complications including exacerbation of symptoms of heart failure and arrhythmia, increased prevalence of myocardial infarction, and elevated risk of sudden cardiac arrest (up to 3%)⁽⁶⁾. The above data indicate that cardiac patients are at a particularly high risk of severe clinical course of SARS-CoV-2 infection and death from the disorder. Based on the current state of knowledge there is no effective causal treatment for COVID-19, and a vaccine is a considerable time away from being ready for public use. Consequently, the only way to reduce spread of the disease is to adhere to the rigorous regime of safety procedures during the pandemic. Especially the elderly and patients with cardiovascular diseases should avoid leaving the house during this time, try to minimise contact with people (social distancing), and stay away from public places and gatherings.

LABORATORY CARDIAC MARKERS AND COVID-19

Elevated troponin levels associated with COVID-19 may be a marker of cardiovascular involvement and thus a risk factor for more severe clinical course of the coronavirus infection. A meta-analysis of four observational studies shows that an increase in the level of high-sensitivity troponin outside the normal range occurs in patients with a more severe clinical course of COVID-19, who require management in the intensive care unit, and is associated with a higher mortality. Consequently, rising troponin levels determined during hospitalisation are a predictor of unsuccessful treatment outcome⁽⁷⁾. An elevated D-dimer concentration is, next to old age, one of the strongest risk factors for unfavourable prognosis in patients hospitalised with COVID-19. D-dimer levels exceeding 1 $\mu\text{g/mL}$ on admission have been found to cause an up to 20-fold increase in the risk of death⁽⁶⁾.

ACEI/ARB AND THE RISK OF COVID-19 – CONTROVERSIES

Angiotensin converting enzyme 2 (ACE2) is attached to the cell membranes of a variety of cells including pulmonary alveoli. The enzyme plays an important role in the functioning of the cardiovascular system, but also in the development of hypertension and diabetes. On the other hand, coronaviruses are known to use ACE2 as a receptor for infection (an observation made both during the 2002/2003 epidemic caused by SARS-CoV and the current pandemic triggered by SARS-CoV-2). SARS-CoV-2 develops primarily in alveolar endothelial cells, which explains the occurrence of respiratory symptoms in infected individuals. ACE2 secretion is greater in patients with cardiovascular diseases compared to the healthy population, which may be responsible for the more severe course of COVID-19 in this group. An increased

secretion of ACE2 is also attributed to the blockade of the renin–angiotensin–aldosterone system (RAAS) via commonly used angiotensin converting enzyme inhibitors (ACEI) and angiotensin receptor blockers (ARB)⁽⁸⁾. Consequently, there are reasonable concerns about “sensitising” the pulmonary tissue to SARS-CoV-2 through the use of these drugs, and hence their contributory effect on a more severe clinical disease presentation of COVID-19⁽³⁾. These concerns are based in part on the observation that patients requiring intensive care units stay tend to have a higher blood pressure compared to individuals receiving treatment in general hospital wards⁽²⁾. However, there is no scientific evidence for a link between ACE2 activity and mortality associated with COVID-19. The studies by Chinese authors cited above^(2,4,6) fail to specify how many patients with arterial hypertension were treated with RAAS blockers. Therefore, no conclusive relationship can be established between the RAAS blockade and the outcomes of COVID-19 treatment. As a rule, drugs of this group are used primarily in the elderly population, having a greater number of comorbidities, i.e. a population normally associated with a higher mortality rate. The results of experimental studies in animal models are ambiguous. It needs to be noted, though, that one of the studies successfully advanced the opposite thesis that the administration of ARB protects lungs against injury in mice⁽⁹⁾. Consequently, based on the current state of knowledge, it is not possible to establish any direct links between ACE2 activity and the invasiveness of SARS-CoV-2⁽¹⁰⁾. On the other hand, there is a body of solid scientific evidence showing a beneficial effect of RAAS blockers on the outcomes of patients with heart failure, hypertension and recent myocardial infarction. Consequently, the European Society of Cardiology⁽¹¹⁾ and the European Society of Hypertension⁽¹²⁾ clearly and firmly advise against the discontinuation of drugs targeting the RAAS system in patients at a risk of infection or infected with SARS-CoV-2. If concerns are voiced by patients in the context of information published in generally available resources or on the Internet, they should be promptly addressed. Patients should be informed about well-documented benefits of using these drugs in order to dispel any doubts there might be about their potentially harmful effects, which so far are only speculative in nature and require scientific validation. Patients should also be given clear information that the risk of disease complications is markedly higher in the population of cardiac patients, and cardiovascular complications (such as exacerbation of symptoms of heart failure), are routinely treated with drugs inhibiting RAAS activity. In cases involving increased patient concerns about taking the drugs, a change in the treatment regimen may be considered for the duration of the pandemic only in cases of arterial hypertension, provided that the change in therapeutic modality offers a chance to obtain adequate pressure control after the

discontinuation of ACEI/ARB. However, this therapeutic option is absolutely contraindicated in patients with left ventricular systolic dysfunction or symptoms of heart failure. The coming weeks are expected to bring new observations, opinions and conclusions regarding this controversial topic.

TELEMEDICINE DURING COVID-19 PANDEMIC

It needs to be highlighted that cardiac patients require regular medical care provided not only by primary care physicians, but also specialists. During the COVID-19 pandemic, patients should be protected from potential exposure to SARS-CoV-2 by avoiding visits to their healthcare facilities. However, in many cases treatment can be continued based on telemedicine tools. The National Health Fund allows this form of providing outpatient healthcare services to patients followed-up in a given healthcare facility, in accordance with the established care plan and the patient's clinical condition. Experts of the Polish Cardiac Society strongly recommend the use of telemedicine during the period of the COVID-19 pandemic. The experts' statement is outlined in the communication⁽¹³⁾ available on the website of the Section of Non-invasive Electrocardiology and Telemedicine (<https://senit.pl/node/184>). The authors of the paper encourage readers to become familiar with the experts' statement and guidelines for the implementation of telemedicine services. In view of the current unprecedented challenges for the healthcare system, telemedicine is expected to develop rapidly as a useful tool for the implementation of new models of cardiac care. One such concept is currently being piloted within the framework of the AMULET study co-financed by the National Centre for Research and Development under the STRATEGMED programme by a consortium led by the Military Institute of Medicine in Warsaw⁽¹⁴⁾.

CONCLUSIONS

The ongoing pandemic of coronavirus disease is a great challenge for the contemporary world, fraught with unknowns because of the unknown nature of the novel virus. However, available studies of patient series provide evidence that COVID-19 poses a particularly serious threat to individuals with cardiac diseases. Patients with cardiovascular disorders have a more severe clinical course of COVID-19 and higher mortality rates. These unfavourable outcome statistics are attributable to direct damage to the heart caused by the virus, but mostly they are due to the infection-induced exacerbation of symptoms of chronic diseases. Reports on COVID-19 are fresh, and relate primarily to the Chinese population. Unified data on the course of COVID-19 in the European population are yet to be revealed. Long-term

cardiovascular implications of the disease are largely unknown, either. At present, there is no answer to the question whether convalescents may experience permanent damage to the heart muscle. If this happens, patient follow-up and cardiac monitoring (including a follow-up cardiac echo) are required.

The only definite recommendation that can be given today to this population of patients is strict adherence to the epidemiological regime with a focus on social distancing and keeping away from gatherings. It must be stressed that RAAS blockers are a group of drugs improving patient outcome in a number of cardiac disorders. Consequently, it is advisable to exercise far-reaching restraint in making decisions about their discontinuation. Each case must be considered individually, taking into account the most current evidence and expert statements in line with the principles of evidence-based medicine (EBM).

Conflict of interest

The authors declare no conflict of interest.

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