Editorial (English version)

Does SARS-COV-2, COVID-19 pandemic flirt with cardiovascular disease?

Several studies conducted in hospital settings showed that hypertension, myocardial disease, arrhythmias, acute coronary syndromes and thromboembolic diseases have been found to be associated with severe forms of COVID-19 and high mortality (1-2). Indeed, during the COVID-19 pandemic, there has not only been an increase in out-of-hospital cardiac arrests, but also a worsening of its short-term outcome of cardiovascular disease (CVD) (3). The mechanism by which COVID-19 influences CVD is not well understood. The cardiovascular expression of COVID-19 probably involves dysregulation of the ACE/ACE2 system secondary to the binding of SARS-CoV-2 to the ACE2 receptor expressed particularly in the heart and blood vessels (2). SARS-CoV-2 directly infects cardiomyocytes depending on ACE2 and cathepsin (4-5). These effects can be inhibited by remdesivir. It has also been proved that SARS-CoV-2 can target the endothelial cells. Plaque instability with coronary spasm or microthrombi, the cornerstone of acute coronary events, is possibly attributable to advanced systemic inflammation. This excessive inflammation is secondary to immune activation as well as alterations in immunometabolism, described as a cytokine storm (IL-6, IL-17, and CRP). Pulseless electrical activity and/or asystole account for the etiology of in-hospital cardiac arrest. Unlike stable COVID-19 patients who rarely show arrhythmias, critically ill patients and those with high cardiac damage markers show a high incidence of prolonged QT interval and arrhythmias such as atrial fibrillation and ventricular tachycardia (6-7). Recent data affirm that cardiac hypocontractility and increased hypersensitivity to arrhythmias encountered during COVID-19 pandemic are based on the fact that SARS-CoV-2 genes code for K+ channels and dysregulate the action potential and transmission of Ca^{++} in cardiac muscle cells. On the other hand, the excessive systemic inflammation encountered during COVID-19 infection can additionally modulate the activity of many ion channels, particularly the K^+ and Ca^{++} ones. The use of mexiletine, a Na^+ channel blocker agent, remains questionable (8). All the above mechanism is likely to have influenced the approach of the cardiovascular patient. Routine cardiac imagining (transthoracic, transesophageal, and stress echography) should not be performed in positive or suspect COVID-19 patients in whom test results are implausible to modify management approach. Nuclear cardiology and cardiac magnetic resonance should be executed in unambiguous indications. Physical exercises, including stress tests, should be avoided, better deferred in suspect- or positive patients due to the increased risk of spreading the virus. Alternative diagnostic methods as appropriate should be preferred. The careful search for a few cardiovascular events is encouraged without forgetting to eliminate other non-CVD comorbidities linked to SARS-CoV-2 infection (9-10). Recently, a population-based study mentioned that adenovirus and mRNA vaccines against SARS-CoV-2 in adults have been linked to scanty increased risk of myocarditis. In contrast, SARS-CoV-2 infection was associated with a substantially increased risk of hospitalization or death from myocarditis, pericarditis and arrhythmia (11). The collision between SARS- Cov-2 and CVD, a barely explored territory, has yet to reveal all its secrets. Much remains to be discovered.

Keywords: cardiovascular disease, COVID-19, high mortality, mechanism

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Editorial (French version)

La pandémie à SARS-COV 2, COVID-19 flirte-t-il avec la maladie cardiovasculaire

Plusieurs études menées en milieu hospitalier ont montré que l'hypertension, les maladies du myocarde, les arythmies, les syndromes coronariens aigus et la maladie thromboembolique s'associent à des formes sévères de la pandémie à COVID-19 et à une mortalité élevée (1-2). Au cours de la pandémie de COVID-19, il y a eu non seulement une augmentation des arrêts cardiaques hors hôpital, mais aussi une aggravation de pronostic à court terme des maladies cardiovasculaires, MCV (3). Le mécanisme par lequel l'infection à SARS- Cov-2 influence la MCV n'est pas bien compris. L'expression cardiovasculaire de la COVID-19 implique probablement une dérégulation du système ACE/ACE2 secondaire à la liaison du SARS-CoV-2 par le récepteur ACE2 exprimé notamment au niveau du cœur et des vaisseaux. Le SRAS-CoV-2 infecte directement les cardiomyocytes en fonction de l'ACE2 et de la cathepsine (4-5). Ces effets peuvent être inhibés par le remdesivir. Il a également été prouvé que SARCoV-2 peut cibler les cellules endothéliales. L'instabilité de la plaque avec spasme coronarien ou microthrombi, la pierre angulaire des événements coronariens aigus, peut être attribuable à une inflammation systémique avancée. Cette inflammation excessive est secondaire à une activation immunitaire ainsi qu'à des altérations de l'immunométabolisme, décrites comme une tempête de cytokines (IL-6, IL-17, CRP). L'activité électrique sans pouls et/ou l'asystolie expliquent l'étiologie de l'arrêt cardiaque à l'hôpital. Contrairement aux patients COVID-19 stables qui présentent rarement des arythmies, les patients gravement malades et ceux présentant des marqueurs de lésions cardiaques élevés présentent une incidence élevée d'intervalle QT prolongé et d'arythmies telles que la fibrillation auriculaire et la tachycardie ventriculaire (6-7). Des données récentes affirment que l'hypocontractilité cardiaque ainsi que l'hypersensibilité accrue aux arythmies rencontrées lors de la pandémie à COVID-19 sont basées sur le fait que les gènes du SRAS-CoV-2 codent pour les canaux K^+ et dérèglent l'action et la transmission potentielles du Ca^{++} dans les cellules musculaires cardiaques, d'une part. D'autre part, l'inflammation systémique excessive rencontrée lors de la pandémie à COVID-19 peut en outre moduler l'activité de nombreux canaux ioniques, en particulier les canaux K^+ et Ca^{++}. L'utilisation de la mexilétine, un inhibiteur des canaux Na^+, reste discutable (8). Tout ce qui précède est susceptible d'avoir influencé l'approche du patient cardiovasculaire. L'imagerie cardiaque de routine (échographie transthoracique, transœsophagienne et d'effort) ne doit pas être effectuée chez les patients positifs ou suspects de COVID-19 chez lesquels les résultats des tests ne sont pas plausibles de modifier l'approche de prise en charge. La cardiologie nucléaire et la résonance magnétique cardiaque doivent être exécutées dans des indications non ambiguës. Les exercices physiques, y compris les tests d'effort, doivent être évités ou mieux différés chez les patients positifs ou suspects de COVID-19 en raison du risque accru de propagation du virus. Des méthodes de diagnostic alternatives, le cas échéant, doivent être préférées. La recherche attentive de quelques événements cardiovasculaires est encouragée sans oublier d'éliminer les autres comorbidités non cardiovasculaires liées à COVID-19 (9-10). Récemment, une étude basée sur la population a mentionné que les vaccins à adénovirus et à ARNm contre le SRAS-CoV-2 chez les adultes ont été associés à un faible risque accru de myocardite. En revanche, l'infection par le SRAS-CoV-2 était associée à un risque considérablement accru d'hospitalisation ou de décès par myocardite, péricardite et arythmie (11). La collision entre COVID-1 et la MCV, un territoire à peine exploré, n'a pas encore livré tous ses secrets. Beaucoup reste à découvrir.

Mots-clés: COVID-19, maladies cardiovasculaires, mécanisme, mortalité élevée

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