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Position Stand: Return to Sport in the Current Coronavirus Pandemic (SARS-CoV-2 / COVID-19)

Positionspapier "Return to Sport" während der aktuellen Coronavirus-Pandemie (SARS-CoV-2 / COVID-19)

POSITION STAND

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The current corona virus pandemic already counts among the greatest world-wide crises and is an extreme challenge not only for health systems but for society as a whole. Added to this is that fact that the pattern of disease associated with a SARS-CoV-2 infection has only been partly elucidated in its pathogenesis, which applies especially for possible late sequelae (19).

It is known that serious-to-fatal disease courses can be expected primarily in persons with prior diseases and in the elderly. Athletes are not considered a risk group for a serious course of SARS-CoV-2 according to current knowledge. That does not, however, rule out that athletes may suffer infection with SARS-CoV-2, and there are examples in organized sports that a larger number of team members may be affected (1, 16) and that more serious courses are possible even in otherwise fit and initially healthy athletes. The degree to which contact situations in sports per se lead to a higher prevalence of SARS-CoV-2-infected persons is unclear, since no systematic data have been obtained thus far (13). Due to the scope of the CV-pandemic, it is of central importance that general preventive measures be heeded, including maintenance of social-distancing in the population and also in the specific situation of sports. A corresponding position paper has already been published (24).

One important aspect is the fact that an infection with SARS-CoV-2 is known to be associated with severe acute and probably also chronic damage to health. This raises the question especially for affected competitive athletes of how reintegration in the sport can be accomplished with an acceptable risk after an infection (7). This also applies in light of the fact that it is presently not clear whether mild or even asymptomatic courses may be detrimental to athletic load tolerance and performance capacity. This position paper presents an initial guideline for procedures in the clarification of sports fitness and reintegration in competitive sports after recovery from a SARS-CoV-2 infection. Given the lack of an adequate data base on this new disease and especially the lack of scientific knowledge on the sport-specific aspects of the disease, we understand this position paper as an initial expert consensus on the question of conception of the safest possible return of the athlete to competitive sports after an infection with SARS-CoV-2.

Clinical Picture

The clinical picture of a SARS-CoV-2 infection is highly variable and ranges from completely symptom-free to a lethal course (22,31). According to the current status, the organ manifestations and symptoms of a SARS-CoV-2 infection rest in part on a pronounced inflammatory reaction up to cytokine storm (4,22,30). In addition, impaired coagulation impairments can be observed with increased thrombophilia and the danger of pulmonary or central embolisms (5). As described in systematic records and/or case reports, not only the lungs, but also the cardiovascular system, the central and peripheral nervous system, skeletal muscle, as well as the liver and kidneys (15,32) are affected in the acute phase. ACE2 receptors are expressed also in endothelial cells, so that patients with COVID-19 especially with cardiovascular complications have been found to have viral elements and inflammatory cells, including apoptosis in various organs, especially heart, intestines and lungs (27). The corresponding complications are, in fact, more to be expected in risk persons, but serious symptoms and courses may occur even in young persons. In a subgroup of infected medical personnel (mean age 39 years; mean treatment in hospital 7 days), 2.5% required respiration (28).

There is increasing evidence of sequelae detrimental to health of patients who survive a serious course. The best documented of these to date are changes in the lungs, particularly the occurrence of fibrotic changes (8). These diseases or damages secondary to a SARS-CoV-2 infection can also have high relevance for sports participation and especially for the athletic and physical load tolerance of those affected, particularly in high-performance sports. Significant effects on athletic performance capacity thus cannot be ruled out. The prevalence to which these are to be expected and may arise even in initially bland infection processes is, however, still unclear (7).

Organ-Specific Complications and Symptoms

Lungs

The most frequent organ involvement in a SARS-CoV-2 infection affects the lungs. According to WHO (29), pneumonia occurred in 20% of all positive-tested cases in China with a severe (14%) or even critical course (6), characterized by pulmonary infiltrates in more than 50% of the lung and a fall in oxygen saturation below 94%. The typical radiological ›

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Box 1 – Case Categories

A) Positive SARS-CoV-2 test WITHOUT signs of infection or symptoms.
B) Positive SRS-CoV-2 test WITH symptoms like fever with temperature above 38°C, cough, pain in muscles and extremities, headache, impaired sense of taste or smell, etc.) but WITHOUT confirmed pneumonia.
C) Infection with SRS-CoV-2 WITH confirmed pneumonia.
D) Infection with SARS-CoV-2 WITH suspected or confirmed myocarditis with/without pulmonary involvement with/without other symptoms.

Box 2 – History and Physical Examination

History
Severity of the course, exercise-dependent complaints such as Angina pectoris, cough and/or dyspnea, in each case exercise-induced, fever, dizziness, muscle pains, rapid fatigue, duration of fever, headache, anosomia, dysgeusia, mood swings, past and current medication, sport history.

Physical Examination
Lymph node status, lymphatic ring, heart rate, blood pressure, cardiac auscultation, pulmonary percussion and auscultation, abdominal palpation, pulse and vascular status, body temperature, basic neurological examination..

Box 3 – Laboratory Analytics

Basic laboratory (I)
Differential blood count, C-reactive protein, transaminases, CK, creatinine, urinary status.

Expanded laboratory (II)
Like (1), additionally depending on clinical picture and previous findings: ferritin, cardiac hsTroponin I or T, NT/proBNP, D/dimeres, IL-6, procalcitonin, antibody status for SARS-CoV-2, SARS-CoV-2-PCR from throat smear, etc.

image usually showed bilateral initially peripheral "ground glass"-like infiltrates (33). Cases have been described of pulmonary fibrosis which developed even in the acute phase (8). It is known from the previous SARS epidemic in 2002-2003 that the affected patients showed lowered diffusion capacity and reduced performance capacity in a 2-year follow-up. (20). Severe changes in the lungs in six divers after COVID-19 disease have been described in a yet unpublished report from the emergency ward of Innsbruck University hospital which may prohibit continuation of diving (11). It must be noted with respect to the athletic exercise capacity that even slightly restrictive changes may limit maximum ventilation and/or disrupt respiratory economy. Exercise capacity is probably limited especially by impaired gas exchange as a result of diffusion impairment. A resultant potential long-term consequence is the development of right-heart load.

Therefore, depending on the clinical arrangement (see Figure 1), spirometry and ergometry with measurement of oxygen saturation should be performed in clarifying sports fitness. Previous spirometric findings which are available for many athletes from earlier annual examinations enable better interpretation of even subtle changes. After concurrent pneumonia, we recommend spiroergometry with blood gas analysis wherever possible and, if appropriate, measurement of the diffusion capacity. Particular attention should be paid in spiroergometry to the parameters of respiratory efficiency (breath equivalents).

Cardiovascular System

Possible involvement of the myocardium in a SARS-CoV-2 infection is especially important for athletes (23). Myocarditis is among the leading causes of sudden cardiac death in sports among athletes younger than 35 (2). The main cause is a virus infection of the upper respiratory tract and the gastrointestinal tract (6). Cases of fulminant myocarditis within a COVID-19 disease with severe course have been described (15). In severe courses, a marked elevation of the troponin values (23) correlating with the prognosis has also been observed (23). The question remains open whether the risk of myocarditis exists in a mild course or even for asymptomatic SARS-CoV-2-positive patients. The occurrence of serious myocarditis in the reconvalescence phase and cases of sudden cardiac death in COVID-19 patients treated as outpatients have been documented (14). However, at the present time, it is unclear how high the overall risk of myocarditis is in connection with a SARS-CoV-2 infection.

For this reason, we recommend a resting ECG even in symptom-free SARS-CoV-2 –positive athletes. Symptomatic athletes with and without pneumonia should also undergo echocardiography and an exercise ECG. If there is evidence of myocardial involvement in the sense of an elevated troponin value or conspicuous findings in the examinations cited above, the indication for cardio-MRT should be liberally made (10). In the case of justified suspicion or confirmed myocarditis, there are Guidelines from specialist societies (8,21) for the decision concerning return to sports. However, their aptness for COVID-19-associated myocarditis is still open, but certainly should not be expanded at the present time.

In addition to myocardial involvement, other cardiovascular manifestations have been described in COVID-19. These include acute coronary syndrome, myocardial infarction as well as thrombo-embolic events in the periphery and the lungs (15). Thus, the pulmonary vascular bed also appears to be directly affected in addition to the pulmonary tissue, in a SARS-CoV-2 infection. On the one hand, this affects the endothelium directly in the sense of an infection of endothelial cells and also endotheliitis. This could also be one cause of the high prevalence of (pulmonary) venous thromboembolisms, which are observed especially in the later phase of a SARS-CoV-2 infection (9).

Other Organ Manifestations and Symptoms

In one study, about one-third of those affected showed neurological symptoms like headache, dizziness, impaired sense of taste and smell, and central thrombo-embolic complications with stroke have been reported(12, 17). Some case reports also describe the onset of a Guillian-Barré Syndrome or other neurological inflammatory processes (26). The risk of persistent neurological symptoms or damage in patients with COVID-19, like the underlying pathophysiology, is still unknown.

As in other virus infections, an infection with SARS-CoV-2 may lead to complaints in the skeletal musculature (3). 43% of the hospitalized SARS-CoV-2 patients reported by Sun et al. (2020) complained of muscle pain. Moreover, there is evidence of the risk of markedly prolonged reconvalescence with

pronounced symptoms of fatigue and prolonged drop in performance after an infection (3, 28).

Decision Concerning Reintegration in Sports

According to current information, the complex and still only incompletely understood disease picture of a COVID-19 disease requires that athletes undergo medical evaluation after an infection with SARS-CoV-2 prior to returning to competitive sports (7). This appears logical, especially in light of the specific pulmonary and also possible cardiac involvement. The extent to which the necessary procedure differs from the corresponding recommendations in other completed virus infections is still unclear.

Due to the great individual variance in course of a SARS-CoV-2 infection, a differentiated procedure appears logical in the decision concerning return-to-sport. In estimating a possible return, we suggest first categorization into four categories A-D of the cases based on the clinical symptoms and pulmonary and cardiac findings (Box 1). Depending on further symptoms, additional conspicuous findings or other organ systems, the individual course and/or the invasiveness of the therapy or medications applied (e.g. hydroxychloroquine with potential prolongation of the QT/time), recommendations based on the algorithm should be individually adapted with respect to the duration of sports pause and additional diagnostic measures required.

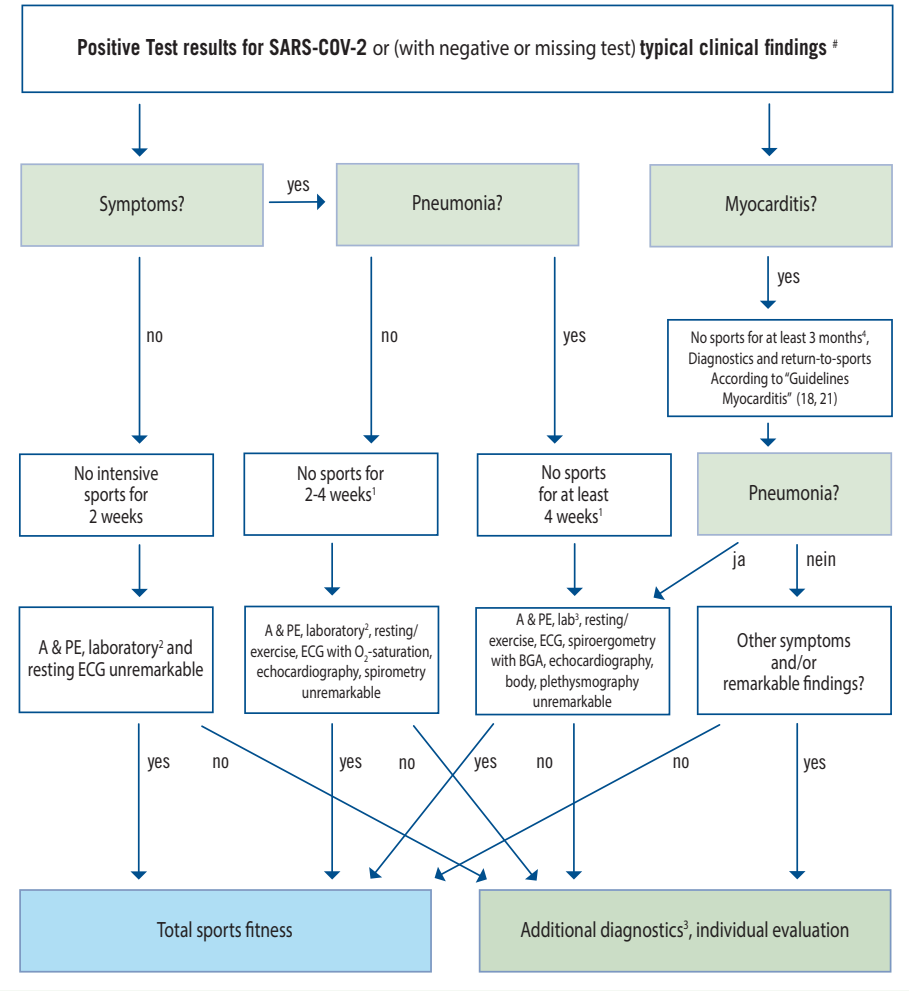

Abbildung 1

Decisional algorithm for return-to-sports in SARS-CoV-2 infection, #where possible. Proof of SARS-CoV-2 infection; [1]=Adaptation of sports pause based on thorough symptom history, additional conspicuous findings in other organ systems, the individual course and/or invasiveness of therapy applied; [2]=scope of laboratory tests by case constellation (see also Box 3); [3]=where appropriate consultation with experts of other disciplines (e.g. neurology, pulmology); [4]=following criteria should be met for return to sports after myocarditis: normalized systolic function (echocardiography), serum markers (for myocardial damage, inflammation, heart failure) in normal range, no clinically-relevant arrhythmias in the long-term and stress-ECG (18,21). A=anamnesis, PE=physical examination, see also Box 2).

In addition to findings and diagnoses obtained during acute treatment and the clinical course, a thorough history with respect to COVID-19-typical symptoms should be made at the time of estimating sports fitness. Both the history and the subsequent physical examination should be based on a standardized protocol (Box 2). In addition to basic laboratory, additional laboratory variables should be determined depending on the case cluster (Box 3).

We consider establishment of a patient registry with additional biobanking for COVID-19 cases in sports both meaningful and necessary for the further development of an evidence-based return-to-sport concept for athletes. These recommendations may be valid only for a short time in light of developing knowledge. They will be reworked as required or by 01.08.2020 at the latest.

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