COVID-19, Inflammatory Heart Disease, and Vaccination in the Athlete and Highly Active Person: An Update and Further Considerations

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Members of the Community and Athletic Cardiovascular Health Network (CATCHNet) and the writing group for the Canadian Cardiovascular Society/Canadian Heart Rhythm Society Joint Position Statement on the Cardiovascular Screening of Competitive Athletes provided previous guidance on the cardiovascular return-to-play (RTP) recommendations for athletes and highly active persons following COVID-19 infection. 1 A significant accumulation of evidence has occurred, and the pandemic has evolved with new variants and the availability of highly effective vaccinations. This document aims to provide an update to these previous recommendations for the sports clinician regarding cardiovascular RTP and new guidance on vaccination.

Background

Initial concern stemming from uncertain cardiac effects of the SARS-CoV-2 virus (COVID-19) resulted in the recommendation for cardiac screening RTP protocols for athletes and highly active persons (hereafter referred to as “athletes”) before resumption of sport after infection.1,2 The rationale for initial protocols was the observed cardiac injury, defined in terms of elevated cardiac troponin (cTn) levels or cardiac imaging abnormalities, in nonathlete populations following predominantly moderate to severe disease, and the concern this represented an increased risk for the development of myocarditis, even after asymptomatic or mild infection. The extent of recommended RTP cardiac screening varied significantly across organizations, with extensive screening inclusive of cardiac magnetic resonance (CMR) imaging in select populations. This working group recommended a pragmatic approach of initial restriction from moderate- to high-intensity exercise for at least 7 days, followed by medical evaluation and clinically indicated cardiac testing.3 These recommendations were largely based on expert opinion. Since publication, robust observational data detailing the prevalence of cardiac involvement and—to a lesser extent—outcomes, have been reported.4 Furthermore, changes in the dominant variant, widespread vaccination, and reduced quarantine...
requirements have changed the pandemic landscape, necessi-
tating updated guidance.

COVID-19 Cardiac Involvement in Athletes

Several large registries of collegiate and professional athletes
undergoing dedicated RTP cardiac screening have demonstrated a prevalence of reported cardiac involvement ranging
from 0.6% to 0.7% in those without primary CMR screening
and up to 2.3% to 3.0% in those with a primary screening
CMR performed. This cardiac involvement, defined
predominately by CMR tissue abnormalities, with or without
the presence of established clinical criteria for myocarditis,
remains of uncertain clinical significance. Importantly, no
adverse cardiac events definitively related to COVID-19 have
been reported in competitive athletes. The presence of car-
diopulmonary symptoms, particularly chest pain, on return to
exercise may increase the likelihood of cardiac involvement.
Overall, nonsevere COVID-19 in young otherwise healthy
athletic populations appears to be associated with a low risk of
cardiac involvement. Cardiac abnormalities identified in ath-
letes undergoing systematic RTP screening regardless of
symptom status require further evaluation to determine their
clinical significance. This includes comparison with appro-
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Updated RTP Cardiovascular Screening
Recommendations

We continue to recommend against the need for routine
cardiac testing or screening before returning to exercise after
COVID-19 infection (Fig. 1). This recommendation is sup-
ported by observational data from large athlete registries. Ath-
letes whose initial infectious course is uncomplicated and
without cardiac or other symptoms that would otherwise
warrant evaluation may return to sport without medical
evaluation or clearance. Cardiac symptoms as part of acute
infection that are suggestive of a clinical diagnosis of inflam-
matory heart disease (ie, pericarditis or myocarditis) require
detailed medical evaluation and clinically indicated cardiac
testing before returning to exercise.

Return to Exercise Post-COVID

Previous recommendation was to avoid moderate- to high-
intensity exercise after COVID-19 infection for 7 days,
regardless of the presence of symptoms or severity of symp-
toms. The high reported prevalence of asymptomatic or
mildly symptomatic athletes, in addition to a low reported
prevalence of inflammatory heart disease, and an increased
infectivity rate of novel variants, such as Omicron, suggest
that a shorter duration of restriction may suffice. Furthermore,
public health guidance in many Canadian jurisdictions has
reduced quarantine requirements after a positive test.
Pragmatically, athletes may be advised to avoid moderate- to
high-intensity exercise for the duration of quarantine if
asymptomatic or mildly symptomatic. Upon the completion
of quarantine, assuming their symptoms—apart from anosmia
or ageusia—have resolved, athletes may return to exercise in
a graded fashion, accounting for the duration of time away from
sport and severity of COVID-19 symptoms (Fig. 1). Athletes

Cardiac Evaluation for the Symptomatic Post-
COVID Athlete

The presence of symptoms suggestive of inflammatory
heart disease should prompt appropriate cardiac evaluation
(Box 1). Athletes with such symptoms should refrain from
vigorous-intensity exercise until evaluation can be
completed. A detailed history and physical examination
should be the first step. In athletes for whom clinical concern
for inflammatory heart disease exists, appropriate initial
testing may include a 12-lead electrocardiogram (ECG), in-
flammatory or cardiac biomarkers, and cardiac imaging with
transhrocardiac echocardiography as the first line. CMR should
be considered in athletes with suggestive cardiac testing ab-
normalities or in those with a high index of clinical suspicion
based on symptoms but with unremarkable initial cardiac
testing. CMR abnormalities should be interpreted within the
context of the updated imaging criteria. Exercise testing, in
the form of maximal-effort exercise stress test or cardiopul-
monary exercise test, may be considered in those with exer-
tional symptoms for whom overt inflammatory heart disease
has been ruled out. Exercise testing may assist in the diag-
nostic evaluation by provoking potential causative cardiac
abnormalities such as exercise-induced arrhythmias or
ischemia, depending on the age of the athlete.

Postacute Sequelae of SARS-CoV-2 in Athletes

Prolonged or chronic multisystem effects of COVID-19,
defined as postacute sequelae of SARS-CoV-2 infection
(PASC), appear relatively infrequently in young competitive
athletes. The prevalence is poorly characterized in other
groups such as Masters athletes. However, when present,
symptoms may be debilitating and heterogeneous in nature.
Potential PASC-related cardiovascular symptoms, defined by
the absence of objective abnormalities on standard diagnostic
testing, include—but are not limited to—exercise intolerance,
dyspnea, and tachycardia. Symptoms lasting more than 1
month since onset of acute infection require further clinical
evaluation, particularly if these symptoms are impairing
athletic performance. Athletes with PASC should be referred
for appropriate multidisciplinary PASC clinics for evaluation
and ongoing management.

Vaccination and Vaccine-Associated Myocarditis
in Young Athletes

Myocarditis is a rare complication following COVID-19
mRNA vaccination. Although no data on the risk of
vaccine-associated myocarditis exist in the athlete population
specifically, there appears to be an increased incidence in
young persons, particularly in the male population, receiving

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the mRNA vaccines. This risk is present for both doses but higher after the second dose. The reported incidence in the young male population (aged 12 to 29 years) is 1 in 10,000 to 25,000, and in young female population (aged 12 to 29 years) is 1 in 90,000 to 240,000. Existing data on the risk of vaccine-associated myocarditis, compared with myocarditis related to COVID-19 infection, suggest that the relative risk is lower with the Pfizer mRNA vaccine but may be similar with the Moderna mRNA vaccine in those below the age of 40 years. However, the absolute risk of vaccine-associated myocarditis is low, and the majority of cases appear to be mild and self-limited. Furthermore, despite false reports circulating online, there have been no documented cases of vaccine-related sudden cardiac arrest in athletes. The benefit of COVID-19 vaccination in terms of reduction of hospitalization, admission to intensive care units, mortality, and cases of multisystem inflammatory syndrome in children (MIS-C) continues to outweigh the risk of vaccine-associated myocarditis. Furthermore, preliminary data suggest that vaccination may reduce symptoms of PASC in infected.

No cardiac evaluation is required for RTP following COVID-19 vaccination. Athletes who develop clinical signs suggestive of vaccine-induced myocarditis should undergo appropriate cardiovascular evaluation and follow contemporary RTP guidelines, which include 3 to 6 months of exercise restriction during the acute inflammatory phase. Myocarditis after immunization is a reportable adverse event and should be reported to the appropriate public health authority.

Summary and Guidance

Based on the current state of knowledge, we suggest the following pragmatic guidance for medical practitioners involved in the cardiovascular care of athletes and highly active persons:

- Athletes should avoid moderate- to high-intensity exercise during their quarantine period, in concordance with their local health authority recommendations, and...
may return to sports upon completion of quarantine, assuming their symptoms—apart from anosmia or ageusia—have resolved.

- Athletes with suspected or confirmed COVID-19 infection who are asymptomatic or mildly symptomatic, and without cardiopulmonary symptoms, do not require routine cardiac screening or testing.

- The presence of symptoms suggestive of inflammatory heart disease that occur either with initial infection or during RTP should prompt an appropriate cardiac evaluation, and athletes should be advised to avoid moderate- to high-intensity exercise until evaluation is complete.

- Evaluation of athletes with symptoms concerning for inflammatory heart disease should include a detailed history and physical evaluation, 12-lead ECG, inflammatory and cardiac biomarkers, and transthoracic echocardiography. CMR should be used in those with abnormalities on initial cardiac testing or in those with a continued high index of suspicion despite unremarkable first-line testing.

- COVID-19 vaccination is recommended in all athletes, as the benefit of vaccination exceeds the risks, including that of vaccine-associated myocarditis.

- Athletes diagnosed with myocarditis, related either to COVID-19 infection or vaccination, should be restricted from moderate- to high-intensity exercise and follow contemporary sports cardiology myocarditis recommendations regarding further evaluation and RTP.

- In all sport settings, cardiac safety of participants is optimized by the implementation of an appropriate emergency action plan or protocol ensuring rapid access to defibrillators and training specific to the management of cardiac emergencies in such environments.

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References


Supplementary Material

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