Return to Sports post COVID: Associated Cardiac Risks

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Disclosure:
I do not have a relevant financial relationship
Objectives

- Recognize common cardiac injury from COVID
- Identify best tests and imaging modalities to identify various forms of cardiac injury
- Understand current cardiac testing algorithm for competitive athletes returning from COVID
- Review return to play guidelines post COVID
COVID-19 affects multiple organ systems

Heart Disease
- Myocardial injury
- Cardiac arrhythmias
- Sudden cardiac death

Digestive System
- Acute kidney injury
- Gastrointestinal complications

Reproductive System
- Male: Impaired fertility
- Female: Adverse pregnancy outcomes

Urinary System
- Acute kidney injury
- Renal failure

Neurological System
- Cerebrospinal fluid infection
- Neurological symptoms

Psychology
- Anxiety, fear, anger, frustration

Immune and hematology Systems
- Septic shock
- Disseminated intravascular coagulation
- Hemaphagocytosis
COVID-19 causes cardiovascular complication

Etiology of Myocardial injury?

- 20% (increased N-terminal pro-B-type natriuretic peptide (NT-proBNP) and cardiac troponin I (cTnI) levels (7-36%)
- ACE-2 dependent infection within the myocardium versus cytokine storm mediated by T-helper cell?
Myocarditis

- Common viruses are more likely to cause myocarditis (heart muscle inflammation): Influenza, Mono, Coxsackie & Parvo

- Estimated that 1-5% of ALL acute viral infections affect the myocardium

COVID-19 Myocardial Pathology Evaluation in Athletes With Cardiac Magnetic Resonance (COMPETE CMR)

Myocarditis is a leading cause of sudden cardiac death among athletes and may occur without antecedent symptoms. Coronavirus disease 2019 (COVID-19)-related cardiac magnetic resonance (CMR) abnormalities have been described in 78% of mostly ambulatory adults, creating concerns over COVID-19–related myocarditis in athletes. A report of 26 COVID-19–positive collegiate athletes revealed late gadolinium enhancement (LGE) in 46%, with 4 (15%) meeting modified Lake Louise criteria for myocarditis. However, without an athletic comparator group it is difficult to discern whether LGE represents healing myocarditis or athletic remodeling, because inferoseptal right ventricular insertion LGE is common among athletes. We report the findings of a larger CMR study to evaluate the prevalence and extent of cardiovascular pathology among COVID-19–positive collegiate athletes, with comparison with athletic and healthy control groups.

- Prevelance of myocarditis in collegiate athletes after COVID-19 is modest (3%)

- Focal LGE isolated to the inferoseptal RV insertion present in 22% of COVID-19+ athletes, compared to an identical LGE pattern in 24% of athletic controls.

- Focal inferoseptal RV insertion LGE is common in athletes, may represent remodeling from athletic training, and should not be conflated with myocarditis.
Most of the athletes had mild (49%) or moderate (28%) symptoms during the acute COVID infection or were asymptomatic (17%).

None had severe symptoms or required chest radiography or hospital admission.

Cardiac MRI performed at a median of 15 days after a positive COVID test was consistent with myocarditis in only two athletes (1.4%) based on updated Lake Louise criteria.
Abnormal screening results were identified in 30 athletes (3.8%)

- troponin, 6 athletes [0.8%]
- ECG, 10 athletes [1.3%]
- echocardiography, 20 athletes [2.5%]
- Necessitating additional testing; 5 athletes (0.6%) ultimately had cardiac magnetic resonance imaging findings suggesting inflammatory heart disease (myocarditis, 3; pericarditis, 2).
Current Guidelines

Screening for Cardiac Involvement in Athletes Recovering From COVID-19 - American College of Cardiology (acc.org)

Coronavirus Disease 2019 and the Athletic Heart: Emerging Perspectives on Pathology, Risks, and Return to Play - PubMed (nih.gov)

- History and physical remains central to any evaluation of the athlete; symptoms should guide appropriate workup

- Asymptomatic and mildly symptomatic athletes probably do not need as much testing as first thought; longitudinal data will guide further recommendations.

- Those with moderate or worse symptomatology, cardiac testing (electrocardiogram [ECG], high-sensitivity troponin, echocardiogram) is still recommended at this time prior to RTP
Coronavirus Disease 2019 and the Athletic Heart: Emerging Perspectives on Pathology, Risks, and Return to Play | Infectious Diseases | JAMA Cardiology | JAMA Network

Figure 1. Proposed Coronavirus Disease 2019 (COVID-19) Return-to-Play Algorithm for Athletes in Competitive High School Sports

- Positive COVID-19 test results
  - Age <15 y
    - Asymptomatic: Rest and no exercise for 10 d from positive test
    - Mild symptoms: Rest and no exercise for 10 d from symptom onset and must have full resolution of symptoms
    - Moderate symptoms (with or without CV symptoms): nonhospitalized
    - Severe symptoms: hospitalized
      - Follow-up with general pediatric after resolution of symptoms 10 to 14 d of convalescence after symptom resolution before consideration of RTP
      - RTP CV testing unnecessary, can be considered on an individual basis
      - Consider formal CV risk stratification with ECG, hs-cTn, echocardiogram
      - With RTP, slow and graded resumption of activity per athletic trainers
      - RTP
  - Age ≥15 y with pubertal development
    - Follow RTP algorithm as per the adult competition athlete (Figure 3)
      - New CV symptoms develop
        - New symptoms concerning for MIS-C
          - Clinical evaluation with ECG, hs-cTn, echocardiogram
            - Inpatient CV evaluation if MIS-C is present
              - Yes: Follow RTP guidelines based on myocarditis
              - No: Consider alternative pathology
            - CMR if positive or previously tested
              - No: Consider exercise testing and extended ambulatory rhythm monitoring
              - Yes: Follow RTP guidelines based on myocarditis
Current Guidelines- RTP Adult

Coronavirus Disease 2019 and the Athletic Heart: Emerging Perspectives on Pathology, Risks, and Return to Play | Infectious Diseases | JAMA Cardiology | JAMA Network
Take Home Lesson

- **Moderate symptoms** (systemic symptoms with fever or cardiorespiratory symptoms) should be medically evaluated with an ECG, cTn, and echocardiogram after completing the rest period before returning full activity.

- Athletes with no or mild symptoms do not need extensive testing and can gradually proceed to full activity after an appropriate length of quarantine.