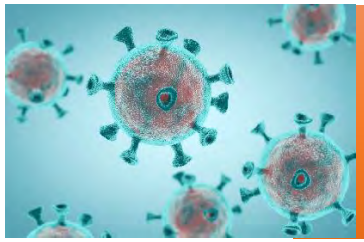


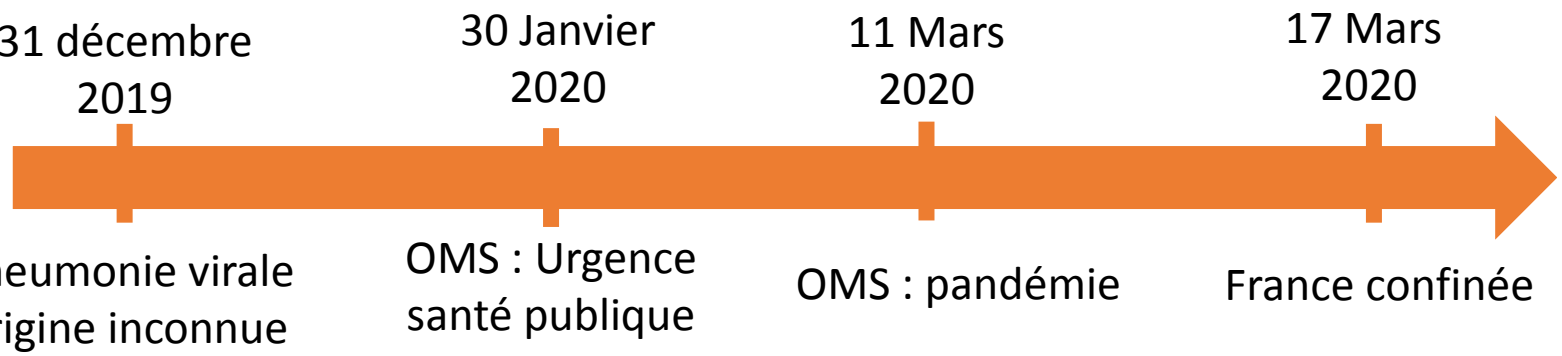
COVID ET SPORT

Reprise du sport après un COVID

Dr Christophe HEDON

CHU Montpellier

- Pas de conflit d’intérêt



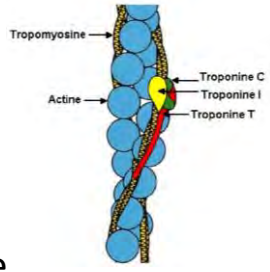
The New York Times

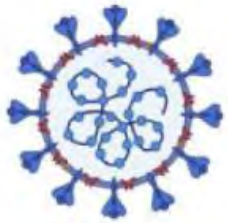
A Heart Attack? No, It Was the Coronavirus

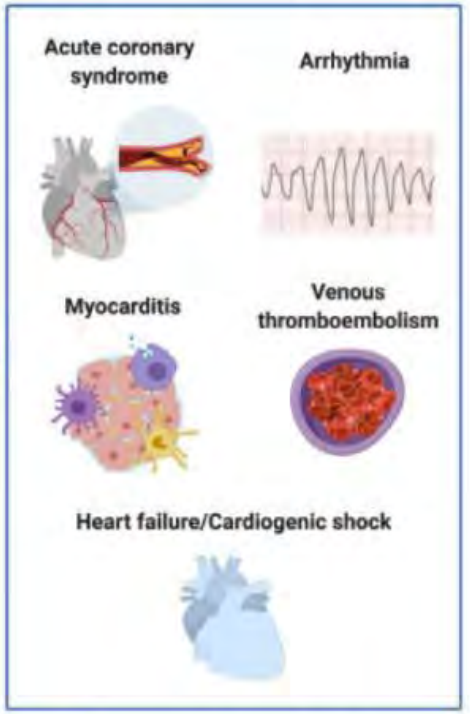
Cardiologists are seeing infected patients whose worst symptoms are not respiratory, but cardiac.

Lésions myocardiques ?

- 27% ↗ TnT compatible avec une lésion myocardique
- Associée à une mortalité plus élevée (même chez les patients sans MCV sous-jacente)
- Fréquence des arythmies plus élevée

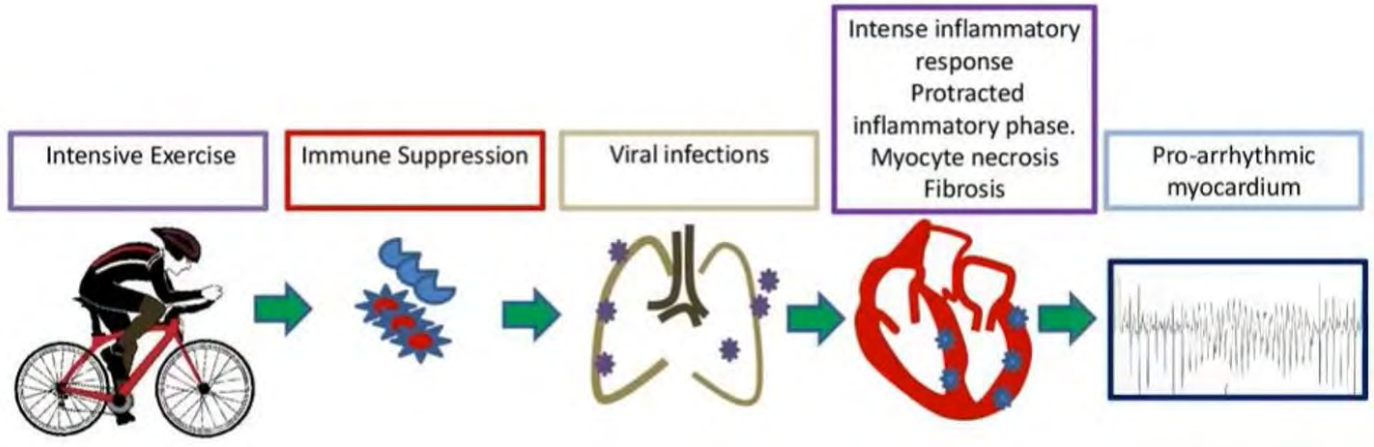






T. Guo et al. Cardiovascular implications of fatal outcomes of patients with coronavirus disease 2019 (COVID-19), JAMA Cardiol. (2020)

SARS COV2, myocardite et sport



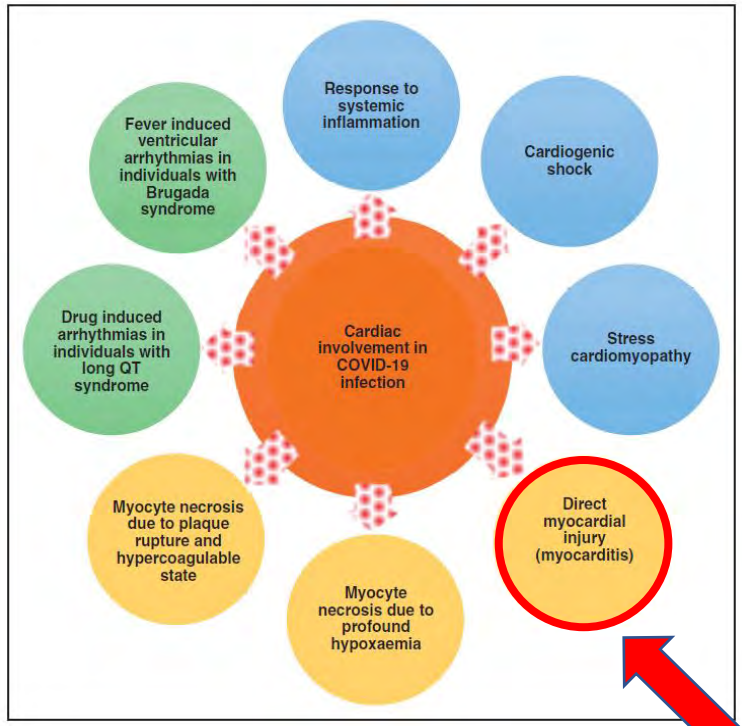
<u>Myocardite aigue</u>

5 à 15% des morts subites chez le jeune athlète

<u>Séquelle myocardite</u>

Surveillance ++ si cicatrice fibreuse en IRM

Finocchiaro et al. *J Am Coll Cardiol*. 2016



Bhatia et al. Eur J Prev Cardiol. 2020

?

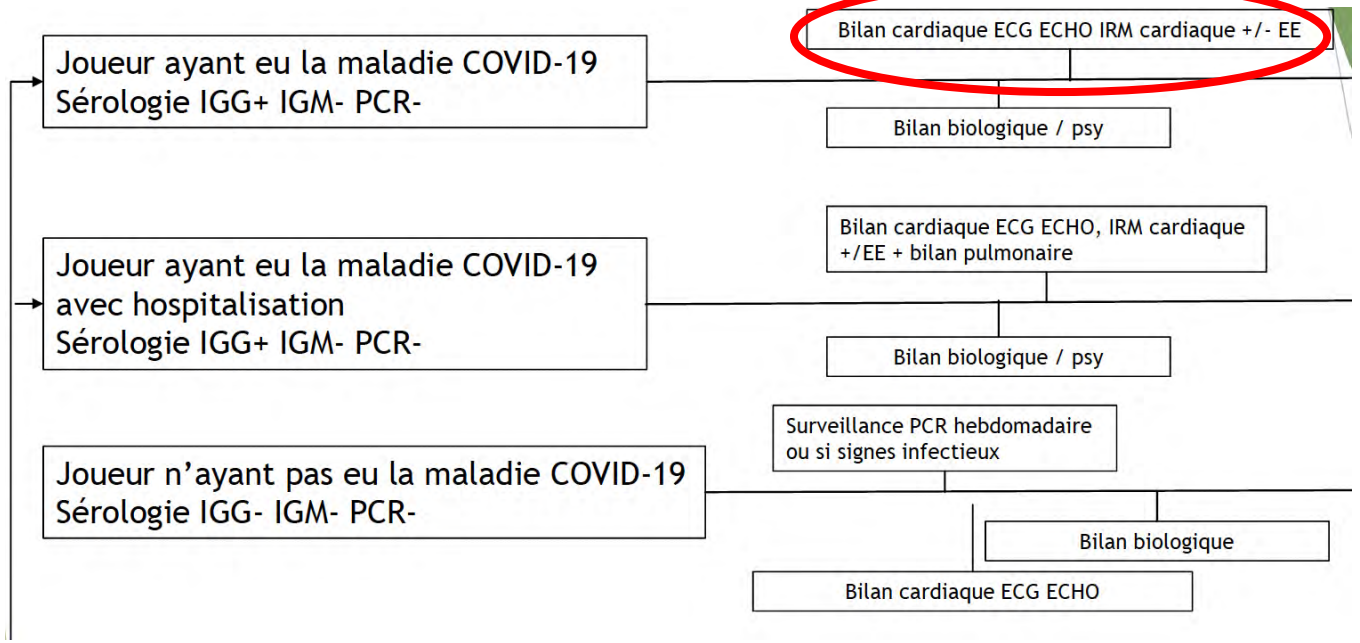
- Proportion exacte de myocardite ?
- Tropisme cardiaque plus important avec COVID19 ?
- Forme asymptomatique ?
- Evolution vers une séquelle ?

Avril/Mai 2020

Fédérations

FFHANDBALL

AMCFP



Avril/Mai 2020

Mai 2020

Fédérations

Viewpoint

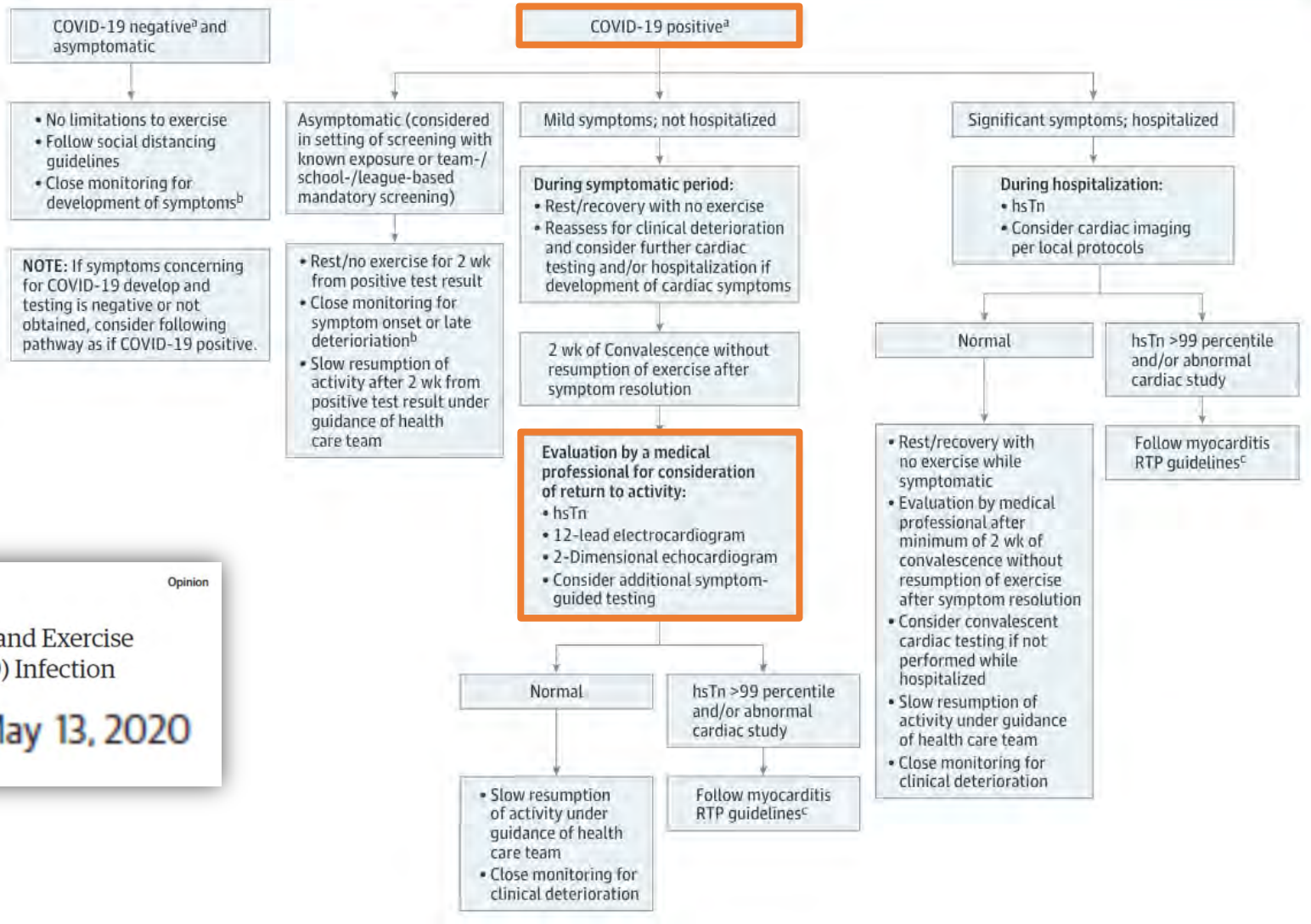
Opinion

VIEWPOINT

A Game Plan for the Resumption of Sport and Exercise After Coronavirus Disease 2019 (COVID-19) Infection

JAMA Cardiology Published online May 13, 2020

Figure. COVID-19 Return-to-Play Algorithm for Competitive Athletes and Highly Active People



Avril/Mai 2020 — Mai 2020 — Mai 2020

Fédérations — Viewpoint — Reco ministère

Interrogatoire
Ex clinique
ECG de repos
± ETT
± Ep effort
± IRM cardiaque

Interrogatoire
Ex clinique
ECG de repos
ETT
Ep effort
± IRM cardiaque

Avril/Mai 2020 — Mai 2020 — Mai 2020 — 2021

Fédérations — Viewpoint — Reco ministère — Publications

JAMA Cardiology | Original Investigation

Prevalence of Inflammatory Heart Disease Among Professional Athletes With Prior COVID-19 Infection Who Received Systematic Return-to-Play Cardiac Screening

Matthew W. Martinez, MD; Andrew M. Tucker, MD; O. Josh Bloom, MD, MPH; Gary Green, MD; John P. DiFiori, MD; Gary Solomon, PhD; Dermot Phelan, MD, PhD; Jonathan H. Kim, MD, MSc; Willem Meeuwisse, MD, PhD; Allen K. Sills, MD; Dana Rowe, BA; Isaac I. Bogoch, MD; Paul T. Smith, MD; Aaron L. Baggish, MD; Margot Putukian, MD; David J. Engel, MD

Mars 2021

JAMA Cardiology | Original Investigation

Prevalence of Clinical and Subclinical Myocarditis in Competitive Athletes With Recent SARS-CoV-2 Infection

Results From the Big Ten COVID-19 Cardiac Registry

Curt J. Daniels, MD; Saurabh Rajpal, MBBS, MD; Joel T. Greenshields, MS; Geoffrey L. Rosenthal, MD; Eugene H. Chung, MD; Michael Terrin, MD; Jean Jeudy, MD; Scott E. Mattson, DO; Ian H. Law, MD; James Borchers, MD; Richard Kovacs, MD; Jeffrey Kovan, DO; Sami F. Rifat, MD; Jennifer Albrecht, PhD; Ana I. Bento, PhD; Lonnie Albers, MD; David Bernhardt, MD; Carly Day, MD; Suzanne Hecht, MD; Andrew Hipskind, MD; Jeffrey Mjaanes, MD; David Olson, MD; Yvette L. Rooks, MD; Emily C. Somers, PhD; Matthew S. Tong, DO; Jeffrey Wisinski, DO; Jason Womack, MD; Carrie Esopenko, PhD; Christopher J. Kratochvil, MD; Lawrence D. Rink, MD; for the Big Ten COVID-19 Cardiac Registry Investigators

Mai 2021

Circulation

Juillet 2021

ORIGINAL RESEARCH ARTICLE

SARS-CoV-2 Cardiac Involvement in Young Competitive Athletes

Nathaniel Moulson, MD*; Bradley J. Petek, MD*; Jonathan A. Drezner, MD; Kimberly G. Harmon, MD; Stephanie A. Kliethermes, PhD; Manesh R. Patel, MD; Aaron L. Baggish, MD; for the Outcomes Registry for Cardiac Conditions in Athletes Investigators†

Bilan systématique sans IRM initiale

789 Professional athletes testing positive for COVID-19 underwent systematic return-to-play cardiac screening: troponin blood test, ECG, resting TTE

759 Athletes with normal test results

Review of studies by league and/or team-affiliated cardiologists
Clinical assessment by team physicians

Graduated resumption of physical activity and return to play

30 Athletes with ≥1 abnormal test results
- 15 TTE
- 6 ECG
- 5 Troponin
- 3 ECG and TTE
- 1 TTE and troponin

Review of studies by league and team-affiliated cardiologists
Clinical assessment by team physicians
Consultation with cardiac specialists
Case-by-case determination of downstream testing plan

30 Athletes received additional testing
- 15 Cardiac magnetic resonance imaging and stress echocardiography
- 12 Cardiac magnetic imaging
- 3 Stress echocardiography

25 Athletes with no cardiac pathology identified; graduated resumption of physical activity and return to play

5 Athletes with inflammatory heart disease diagnosed per AHA/ACC guidelines
- 3 With myocarditis
- 2 With pericarditis

329 (41.7%) aΣ or pΣ
19 days (3-156 days) after Test +

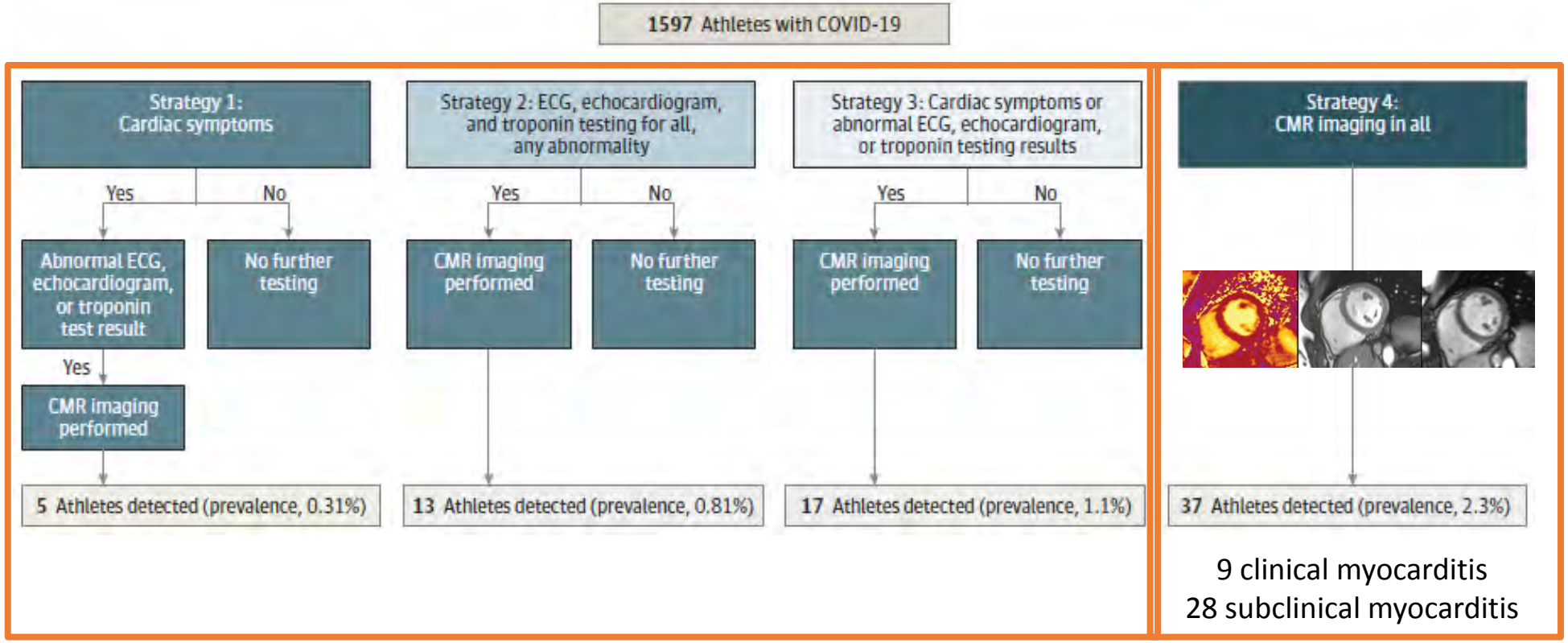
anormalies = 3,8%

Pathologie inflammatoire ? = 0,7%

Martinez et Al. JAMA Cardiol 21; mar 4

IRM orientée ou systématique

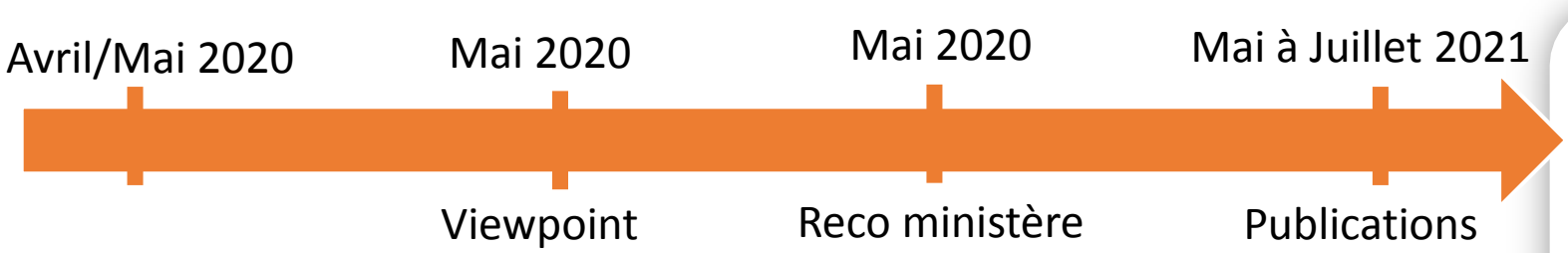
Big Ten Conference cardiac testing including CMR im. for all athletes with COVID-19 comparison of screening approaches



Cardiac pathology ? 0,3%	**Cardiac pathology ? 0,81%**	**Cardiac pathology ? 1,1%**	**Cardiac pathology ? 2,3%**

(0 à 7,6% selon les centres)

Daniels JAMA Cardiol 21; may 27



EDITORIAL

Return to Play for Athletes After COVID-19 Infection
The Fog Begins to Clear

James E. Udelson, MD; Ethan J. Rowin, MD; Barry J. Maron, MD

Published Studies of Cardiac Screening in Athletes With Positive C-19 Test

Characteristic	Study									
	Rajpal et al[2]	Vago et al[4]	Małek et al[5]	Starekova et al[6]	Clark et al[7]	Martinez et al[8]	Moulson et al[9]	Hendrickson et al[10]	Daniels et al[11]	Total
Publication date, mo and y	September 2020	December 2020	January 2021	January 2021	February 2021	March 2021	April 2021	May 2021	May 2021	NA
Athlete type	College	Professional and elite	Professional and elite	College	College	Professional	College	College	College	NA
No. of athletes with COVID-19 reported	26	12	26	145	59	789	3018	137	2461	6673
Women, No. (%)	11 (42)	10 (83)	21 (81)	37 (26)	37 (63)	12 (1.5)	957 (31.7)	44 (32.1)	812 (33.0)	1941 (29.1)
Men, No. (%)	15 (58)	2 (16)	5 (19)	108 (74)	22 (37)	777 (98.5)	2061 (68.3)	93 (67.9)	1649 (67.0)	4732 (70.9)
Asymptomatic, No. (%)	14 (54)	2 (17)	6 (23)	24 (16.6)	13 (22)	329 (41.7)	887 (29.4)	25 (18.2)	NA	1300[a] (31.9)
CMR imaging performed, No. (%)[b]	26 (100)	12 (100)	26 (100)	145 (100)	59 (100)	27 (3.4)	317 (10.5)	5 (3.6)	1597 (64.8)	NA
Time to CMR imaging, mean (SD), median (interquartile range), or median (range), d	24 (10)[c]	17 (17-19)[d]	32 (22-62)[d]	15 (11-194)[e]	21 (13-37)[d]	19 (17)[c]	33 (18-63)[d]	22 (11)[c]	22 (10-77)[e]	NA
Prevalence of myocarditis by CMR imaging, No./total No. tested (%)	4/26 (15)	0/12	0/26	2/145 (1.4)	2/59 (3)	3/27 (11)	15/317 (4.7)	0/5	37/1597 (2.3)	63/2214 (2.8)[f]
Prevalence myocarditis diagnosed in full cohort, No./total No. tested (%)	4/26 (15)	0/12	0/26	2/145 (1.4)	2/59 (3.4)	3/789 (0.4)	15/3018 (0.5)	0/137	37/2461 (1.5)	63/6673 (0.94)[g]
Prevalence of nonmyocarditis findings on CMR imaging, No./total No. tested (%)[h]	8/26 (31)	0/12	5/26 (19)	2/145 (1.4)	1/59 (1.7)	2/27 (7.4)	10/317 (3.1)	0/5	81/1597 (5.1)	NA

Udelson JAMA Cardiol 21; may 27

Ou pas !

- Variabilité d'acquisition et d'interpretation selon les centres
- Veritable signification des ces lésions ?
- Critères de Lake Louise établies en cas de suspicion clinico-biologique de myocardite
- RT plus fqmt retrouvées chez Athlètes

Systematic cardiac screening before returning to play in athletes after SARS-CoV-2 infection

CHU Montpellier
Clinique du Millénaire Montpellier
Rennes - Bretagne
INSEP Paris
Dijon
Nîmes
Toulouse
St Etienne
Metz
Nice

Athlete cardiac screening after SARS-CoV-2 infection

N=554

Mars 2020 à Juillet 2021

Soumis, en cours de révision

Systematic cardiac screening before returning to play in athletes after SARS-CoV-2 infection

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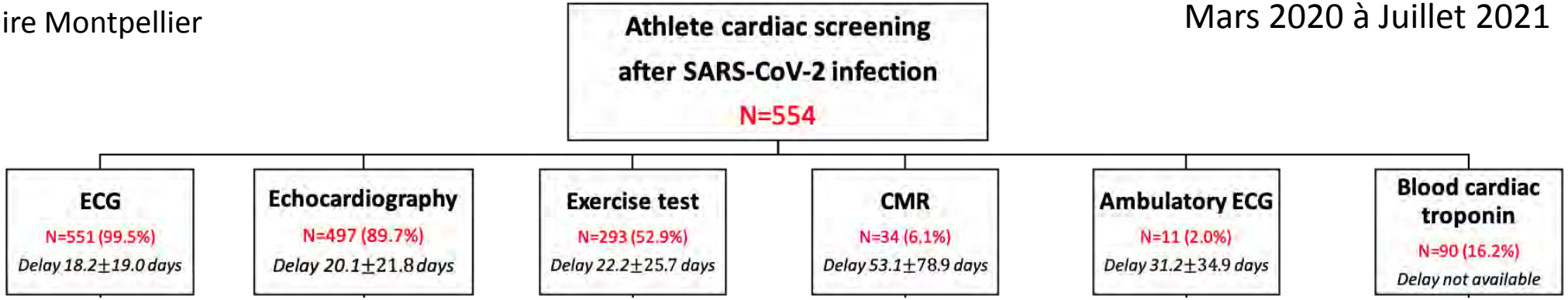
Mars 2020 à Juillet 2021



Soumis, en cours de révision

Systematic cardiac screening before returning to play in athletes after SARS-CoV-2 infection

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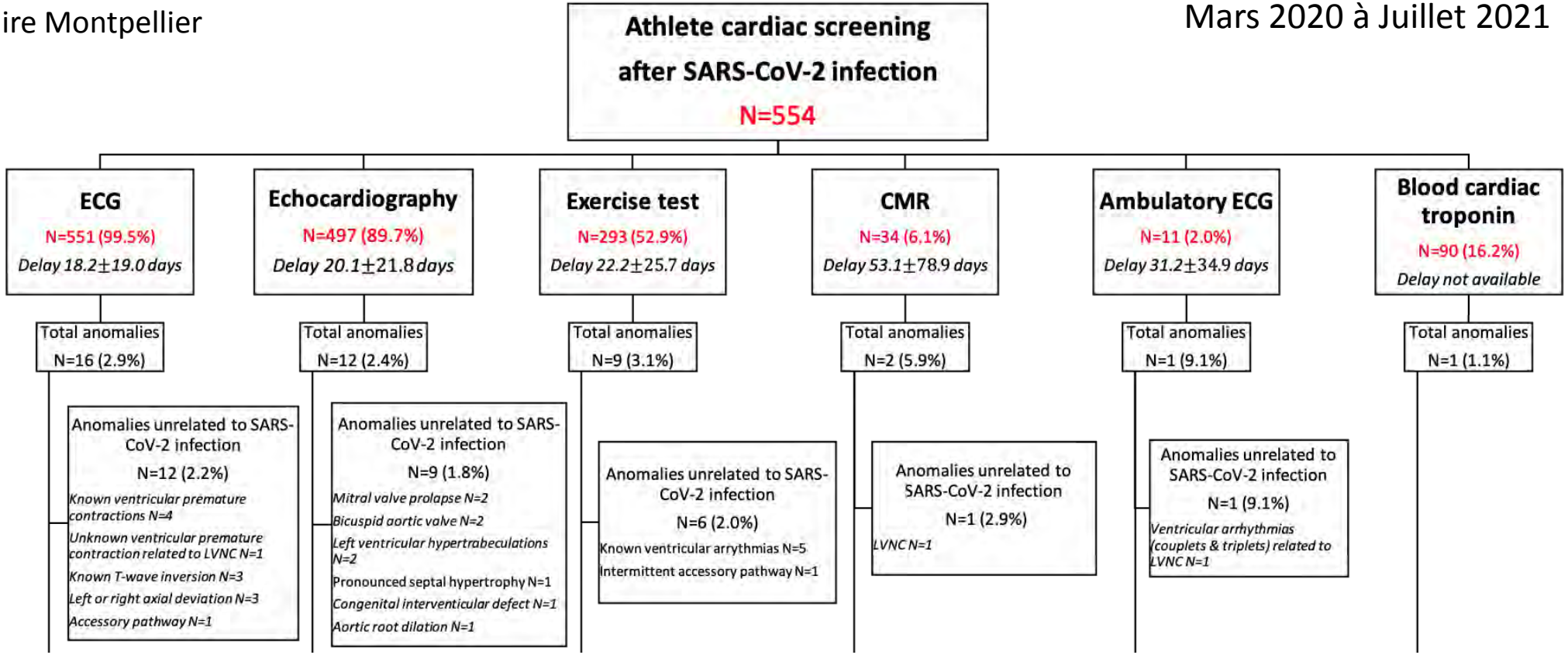
Mars 2020 à Juillet 2021



Soumis, en cours de révision

Systematic cardiac screening before returning to play in athletes after SARS-CoV-2 infection

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Mars 2020 à Juillet 2021

Athlete cardiac screening after SARS-CoV-2 infection
N=554

ECG	Echocardiography	Exercise test	CMR	Ambulatory ECG	Blood cardiac troponin
N=551 (99.5%)	N=497 (89.7%)	N=293 (52.9%)	N=34 (6,1%)	N=11 (2.0%)	N=90 (16.2%)
Delay 18.2±19.0 days	*Delay 20.1±21.8 days*	*Delay 22.2±25.7 days*	*Delay 53.1±78.9 days*	*Delay 31.2±34.9 days*	*Delay not available*
Total anomalies N=16 (2.9%)	Total anomalies N=12 (2.4%)	Total anomalies N=9 (3.1%)	Total anomalies N=2 (5.9%)	Total anomalies N=1 (9.1%)	Total anomalies N=1 (1.1%)
Anomalies unrelated to SARS-CoV-2 infection N=12 (2.2%) *Known ventricular premature contractions N=4* *Unknown ventricular premature contraction related to LVNC N=1* *Known T-wave inversion N=3* *Left or right axial deviation N=3* *Accessory pathway N=1*	Anomalies unrelated to SARS-CoV-2 infection N=9 (1.8%) *Mitral valve prolapse N=2* *Bicuspid aortic valve N=2* *Left ventricular hypertrabeculations N=2* Pronounced septal hypertrophy N=1 *Congenital interventricular defect N=1* *Aortic root dilation N=1*	Anomalies unrelated to SARS-CoV-2 infection N=6 (2.0%) Known ventricular arrythmias N=5 Intermittent accessory pathway N=1	Anomalies unrelated to SARS-CoV-2 infection N=1 (2.9%) *LVNC N=1*	Anomalies unrelated to SARS-CoV-2 infection N=1 (9.1%) *Ventricular arrhythmias (couplets & triplets) related to LVNC N=1*	
Potential link with SARS-CoV-2 infection N=4 (0.7%) *T wave inversion N=3* *Ventricular premature contractions N=1*	**Potential link with SARS-CoV-2 infection N=3 (0.6%)** *Segmental wall motion N=2* *Pericardial effusion N=1*	**Potential link with SARS-CoV-2 infection N=3 (1.0%)** *Exercise induced ventricular arrhythmias N=3*	**Potential link with SARS-CoV-2 infection N=1 (2.9%)** *Late gadolinium enhancement N=1*	**Potential link with SARS-CoV-2 infection N=0**	**Potential link with SARS-CoV-2 infection N=1 (1.1%)** *Troponin elevation N=1*

Soumis, en cours de révision

	Total population N=554	Asymptomatic N=195 (35.2%)	Moderate symptoms <14 days without cardiac symptom N=253 (45.7%)	Moderate symptoms >14 days without cardiac symptom N=84 (15.2%)	Cardiac symptoms N=22 (4.0%)	p*
ECG, N (%)	**551 (99.5%)**	**192 (98.5%)**	**253 (100%)**	**84 (100%)**	**22 (100%)**	**0.22**
Normal n (%)	535 (97.1%)	186 (97.9%)	247(97.6%)	82 (97.6%)	20 (90.9%)	0.22
Anomalies unrelated to SARS-CoV-2 n (%)	12 (2.2%)					
Pathological T-wave inversion n (%)	3 (0.5%)	1	1	0	1	0.17
Ventricular premature contractions n (%)	1 (0.2%)	0	1	0	0	1.00
Echocardiography, N (%)	**497 (89.7%)**	**175 (89.7%)**	**227 (89.7%)**	**74 (88.1%)**	**21 (95.5%)**	**0.86**
Normal n (%)	485 (97.6%)	172 (98.3%)	220 (96.9%)	73 (98.6%)	20 (95.2%)	0.54
Anomalies unrelated to SARS-CoV-2 n (%)	9 (1.8%)					
Segmental wall motion anomalies n (%)	2 (0.4%)	0	1	1	0	0.47
Pericardial effusion n (%)	1 (0.2%)	0	1	0	0	1.00
Exercise test, N (%)	**293 (52.9%)**	**98 (50.2%)**	**146 (57.7%)**	**31 (36.9%)**	**18 (81.8%)**	**<0.0001**
Normal n (%)	284 (96.9%)	95 (96.9%)	140 (95.9%)	31 (100%)	18 (100%)	0.84
Anomalies unrelated to SARS-CoV-2 n (%)	6 (2.0%)					
Exercise induced ventricular arrhythmias n (%)	3 (1.0%)	2	1	0	0	0.75
CMR N (%)	**N=34 (6.1%)**	**12 (6.2%)**	**13 (5.1%)**	**5 (6.0%)**	**4 (18.2%)**	**0.14**
Normal n (%)	32 (94.1%)	12 (100%)	11 (84.6%)	5 (100%)	4 (100%)	0.72
Anomalies unrelated to SARS-CoV-2 n (%)	1 (2.9%)					
Late gadolinium enhancement n (%)	1 (2.9%)	0	1	0	0	1.00
Ambulatory ECG, N (%)	**N=11 (2.0%)**	**4 (2.1%)**	**6 (2.4%)**	**0**	**1 (4.5%)**	**0.35**
Normal n (%)	10 (90.9%)	4 (100%)	5 (83.3%)	0	1 (100%)	1.00
Anomalies unrelated to SARS-CoV-2 n (%)	1 (9.1%)					
Blood cardiac troponin, N (%)	**N=90 (16.2%)**	**39 (20.0%)**	**42 (16.6%)**	**4 (4.8%)**	**5 (22.7%)**	**0.005**
Normal n (%)	89 (99.9%)	38 (97.4%)	42 (100%)	4 (100%)	5 (100%)	0.53
Troponin elevation n (%)	1 (1.1%)	1	0	0	0	0.53

Soumis, en cours de révision

Athlete No.	Sexe, age, sport	SARS-CoV-2 infection symptoms	Cardiac symptom	ECG	Echocardiography	Exercise test	CMR	Ambulatory ECG	Cardiac troponin	Sport participation status
1	Male, 23, Rugby	Moderate >14 days	Chest pain, dyspnea)	D3, aVF, V1-V2-V3 T-wave inversion	Normal	Normal	Normal	Not performed	Not performed	Return-to-play
2	Male, 32, Football	Asymptomatic	No	Anterior T-wave inversion	Normal	Normal	Normal	Not performed	Not performed	Return-to-play
3	Male, 21, Handball	Moderate <14 days	No	Inferolateral T-wave inversion	Normal	Normal	Inferolateral subepicardial LGE	Normal	Normal	3 months sport contraindiction
4	Male, 21, Rugby	Moderate <14 days	No	2 venticular premature contractions	Normal	Normal	Not performed	Not performed	Not performed	Return-to-play
5	Female, 20, Tennis	Moderate >14 days	No	Normal	Doubt about segmental hypokinesia	Normal	Normal global and segmental LV kinetics. Small physiological pericardic effusion	Not performed	Not performed	Return-to-play
6	Female, 24, Tennis	Moderate <14 days	No	Normal	Doubt about segmental hypokinesia	Normal	Normal global and segmental LV kinetics. Small physiological pericardic effusion	Not performed	Not performed	Return-to-play
7	Male, 22, Rugby	Moderate <14 days	No	Normal	Doubt about small pericardic effusion	Normal	Normal	Not performed	Normal	Return-to-play
8	Male, 15, Football	Asymptomatic	No	Normal	Normal	Ventricular premature contractions decreasing during effort	Not performed	Not performed	Not performed	Return-to-play
9	Male, 18, Football	Asymptomatic	No	Normal	Normal	Ventricular premature contractions decreasing durant effort	Not performed	Not performed	Not performed	Return-to-play
10	Male, 40, athletisme	Moderate <14 days	No	Normal	Normal	Ventricular and supraventricular premature contractions	Normal	Normal	Not performed	Return-to-play
11	Male, 24, Football	Asymptomatic	No	Normal	Normal	Normal	Not performed	Not performed	hs-cTnT 46 and 48 ng/l (N<34ng/l)	Return-to-play

11 athlètes (2,0%) avec au moins un examen anormal pouvant avoir un lien potentiel avec le COVID

1 athlète > restriction temporaire au sport

Aucun évènement
FU 376±125 jours

Soumis, en cours de révision

Protocole ASCCOVID/ LNR

1 - **Questionnair**e Clinique standardisé

2 - **ECG de repos**

3 - **BIOLOGIE** standardisé et SEROLOGIE standardisée avec sérothèque

4 - **EPREUVE D'EFFORT MAX CARDIOLOGIQUE**

5 - **IRM Cardiaques HR** = facteur pronostic et stratégie de suivi, non suspensive pr reprise entraînement

- **COVID -** (groupe témoin)
- **COVID +** (avec et sans signes cardiologiques)

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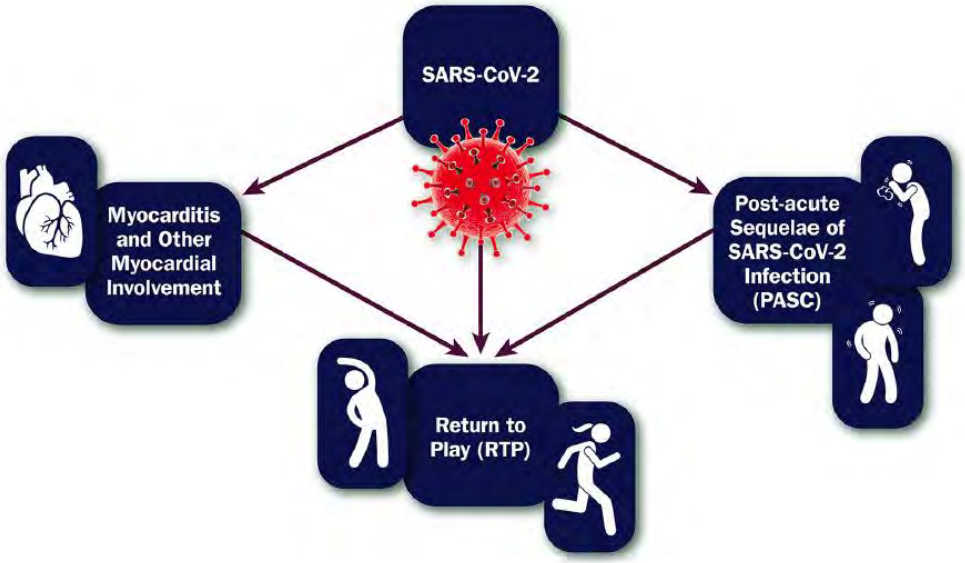
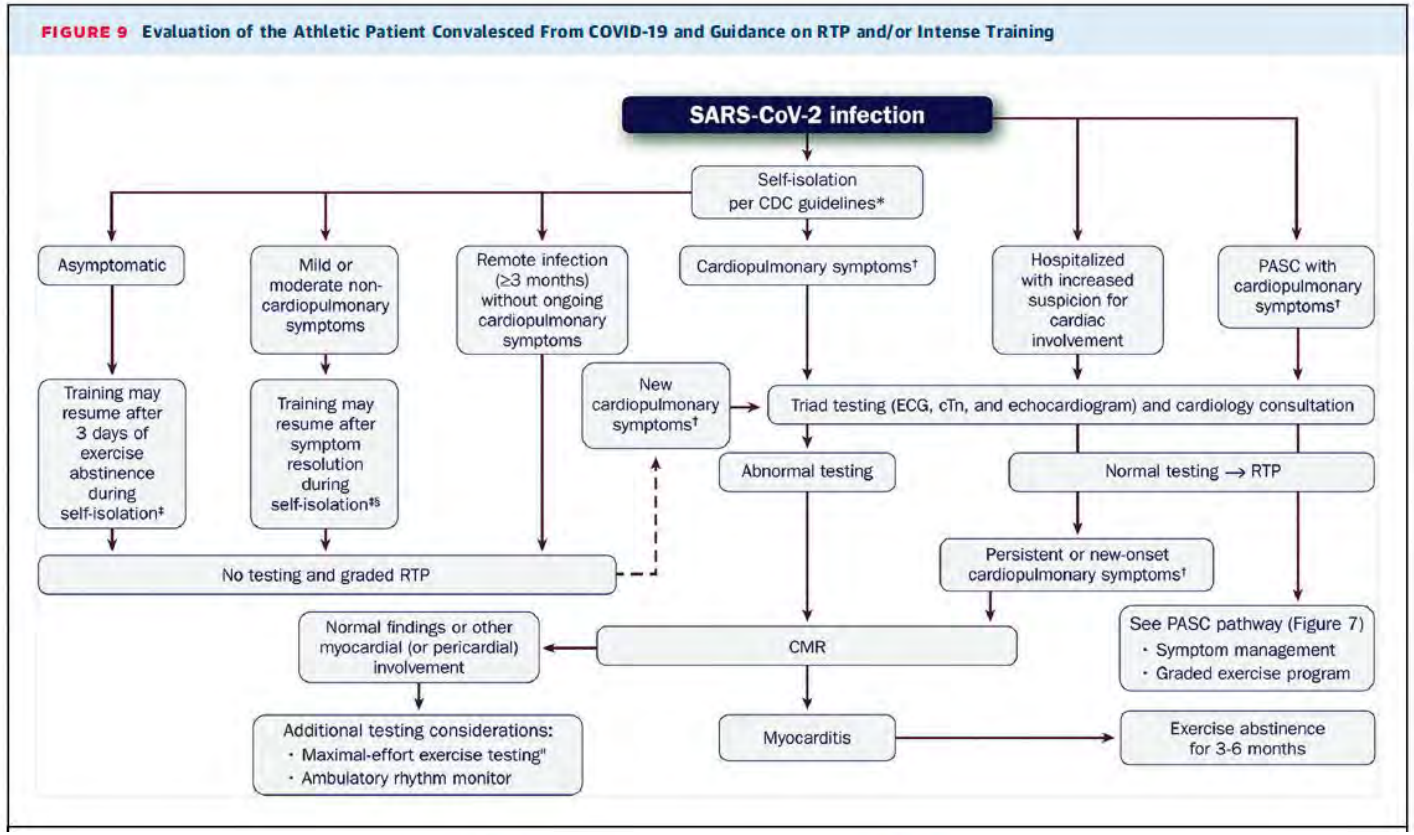
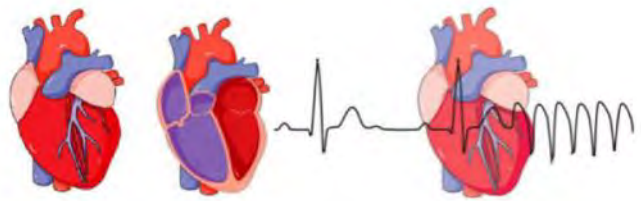
EXPERT CONSENSUS DECISION PATHWAY

2022 ACC Expert Consensus Decision Pathway on Cardiovascular Sequelae of COVID-19 in Adults: Myocarditis and Other Myocardial Involvement, Post-Acute Sequelae of SARS-CoV-2 Infection, and Return to Play

A Report of the American College of Cardiology Solution Set Oversight Committee







Gluckman et al. JACC May 2022

Conclusion
Reprise du sport après un COVID

- Asymptomatique → Reprise J3
- Symptômes non CV → Reprise à l'arrêt des sp
- Symptômes CV ou hospitalisation → Pas de sport

PAS DE BILAN

BILAN – Cs cardio
Triade ECG ETT tropo

→ Normal : Reprise

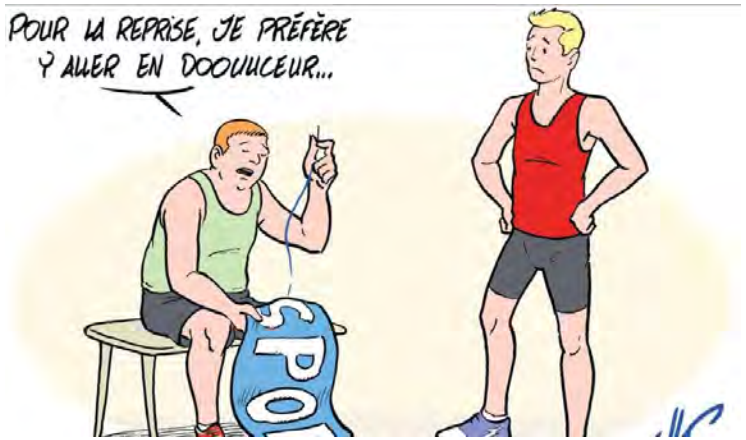
↓ aNl

IRM orientée

↓ Nle

Ep effort
Holter

→ Myocardite : Pas de sport 3 à 6 mois



Gluckman et al. JACC May 2022