Cardiac sequel of COVID -19

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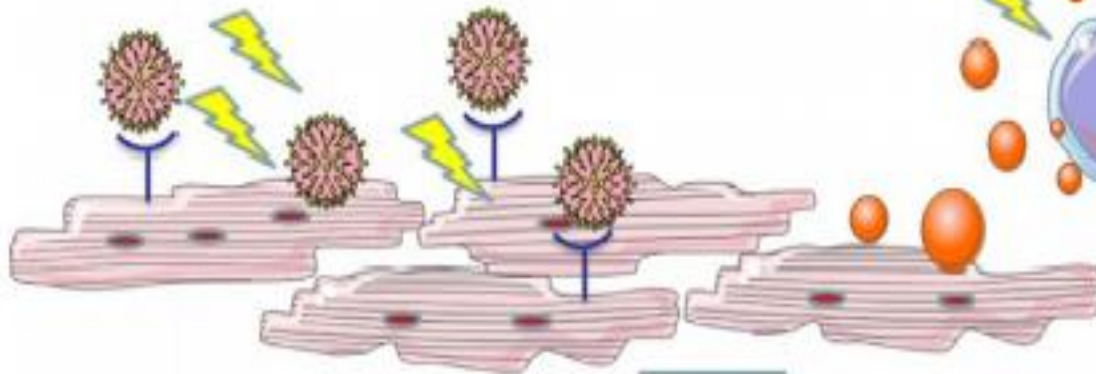
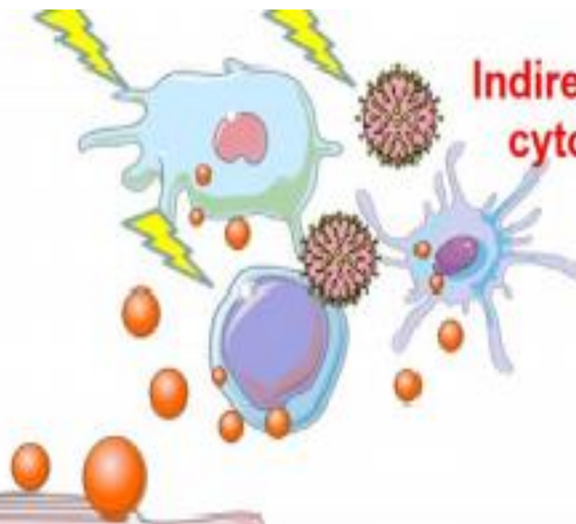
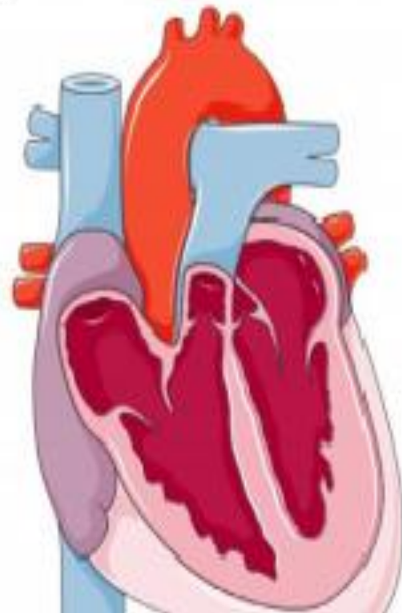
Clinical Cardiac Presentations during COVID-19

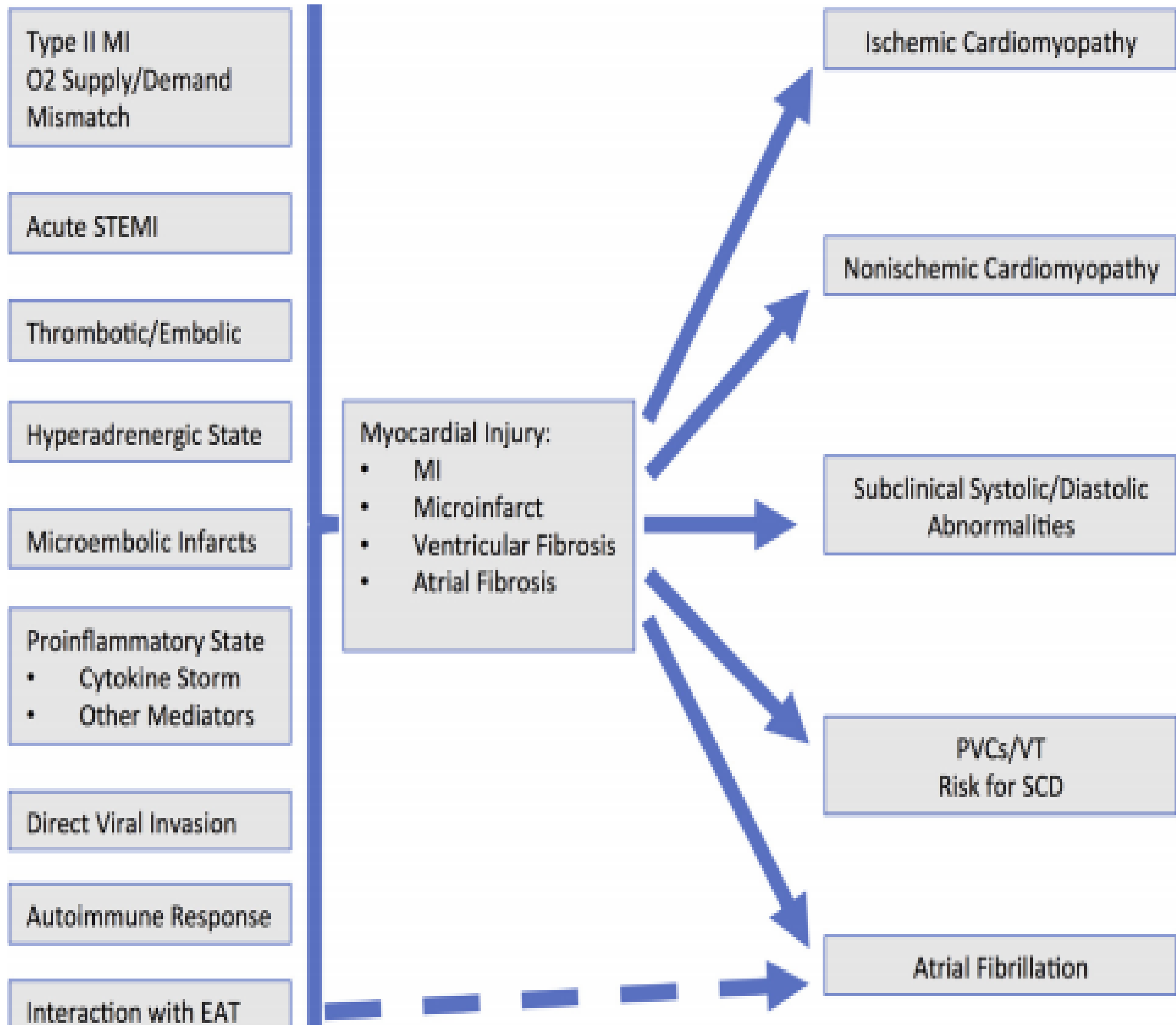
No symptoms

- troponin elevation (20% ICU patient)
- asymptomatic cardiac arrhythmia
- abnormalities on cardiac imaging

Symptomatic heart disease


Direct damage
of SARS-CoV2
Indirect damage of
cytokine storm
Downregulation of ACE2
Microvascular dysfunction
Pericyte injury
Hypoxemia
Release of cytokines (IL6...)
Hyperinflammation
Insulin resistance
Coagulopathy
Myocarditis
Myocarditis
Heart failure
Metabolic effect
Arrhythmia
Thromboembolism


Type II MI
O2 Supply/Demand
Mismatch
Acute STEMI
Thrombotic/Embolic
Hyperadrenergic State
Microembolic Infarcts
Proinflammatory State
• Cytokine Storm
• Other Mediators
Direct Viral Invasion
Autoimmune Response
Interaction with EAT
Myocardial Injury:
• MI
• Microinfarct
• Ventricular Fibrosis
• Atrial Fibrosis
Ischemic Cardiomyopathy
Nonischemic Cardiomyopathy
Subclinical Systolic/Diastolic
Abnormalities
PVCs/VT
Risk for SCD
Atrial Fibrillation

Post COVID syndrome

- *Returning ,new or ongoing symptom…….*

acute:

three weeks after fist being infected

chronic:

extended beyond 12 weeks…

- Prevalence of ***cardiac*** post covid syndrome:

dyspnea:26%

chest pain:19%

palpitation:20%

Outcomes of CMR in patients recently recovered from covid

100 patient recovered from COVID

(60% mild symptom , median f/u 60 day)

active inflamation (60%)

(edema,increase relaxation time)

JAMA Cardiol. 2020;5(11):1265-1273.

Outcomes of CMR in patients recently recovered from covid

100 patient recovered from COVID

(60% mild symptom , median f/u 60 day)

active inflamation (60%)

(edema,increase relaxation time)

abnl CMR (70%)

(32% LGE, 70% Elevated T1,60% T2)

Abnl LV voloume and LV EF

pos hs Trop (60%)

JAMA Cardiol. 2020;5(11):1265-1273.

Case 1

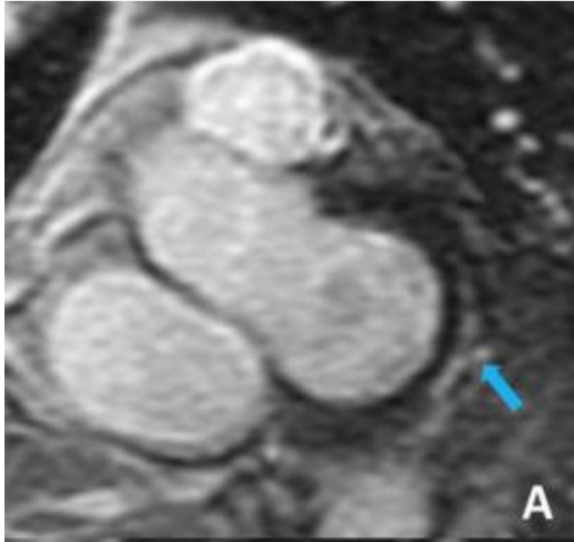
- *62 Y/0 man*
- *Presented lethargy ,fatigue ,dyspnea*
- *V/S: HR:90, BP:130/70, O2 sat:90%, Temp:38.5*
- *Lab: lymph:700,CRP:12, **Trop: NL***
- *ECG: **Sinus tachycardia***
- *CT: GGO, air bronchogram*
- *Treatment: Remdesivir, Anti biotic*

She was well …..

- ***6 month later*:**
  - fatigue, mild dyspnea, no cp

Complete work up:

- lab data(CRP, Troponin…)
- CT
- CT angiography
- **CMR(inferolat , mid wall LGE, T2 hypersensitivity)**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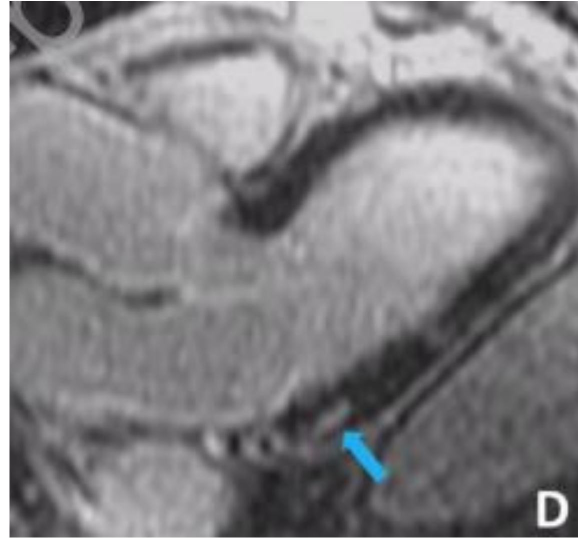
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Dx :Myocarditis

Interesting finding in this case:

- in admission:
  - nl finding (lv size and EF)
  - NL injury biomarkers (trop)
- ***6 mo later:***
  - Abnl inflammatory CMR findings

Case 2

- 42 Y/O women
- Malaise , cough , fever (no severe)
- Treated at home….

- ***3 weeks later:***
  - Exhausted
  - HR:60-170
  - Standing more than 5 minutes…dizziness ,palpitation

- ***DDX:***

  Anxiety

  Anemia

  Hyperventilation

  Infection

  Hyper thyroidism

  myocarditis

  CAD

  PTE

- *Lab data : NL inflammatory markers*
- *PFT:NL*
- *Holter BP:NL*
- *Holter rhythm :NL*
- *CMR:NL*

- ***Abnl 10 min. standing test:***

  exaggerated HR increase

DX: POTS Syndrome

initial hypotension results in hyper adrenergic response

HR<30 or >120 (after 10 min standing)

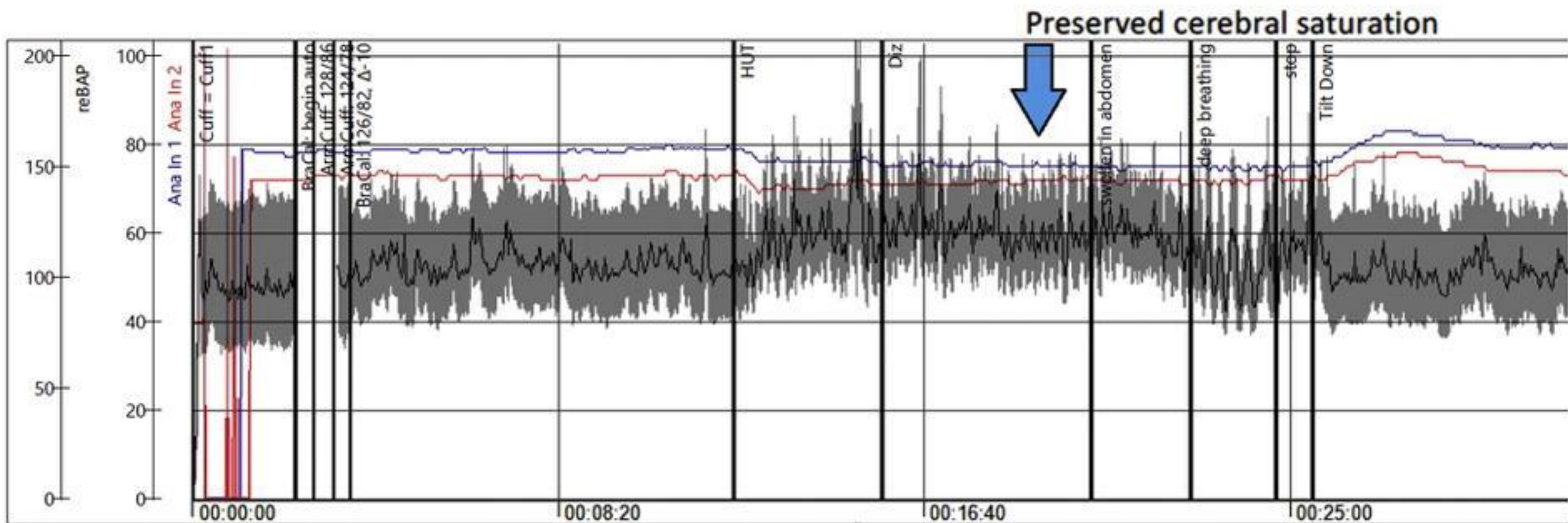
Without: *Orthostatic hypotension*

With : *vertigoes*

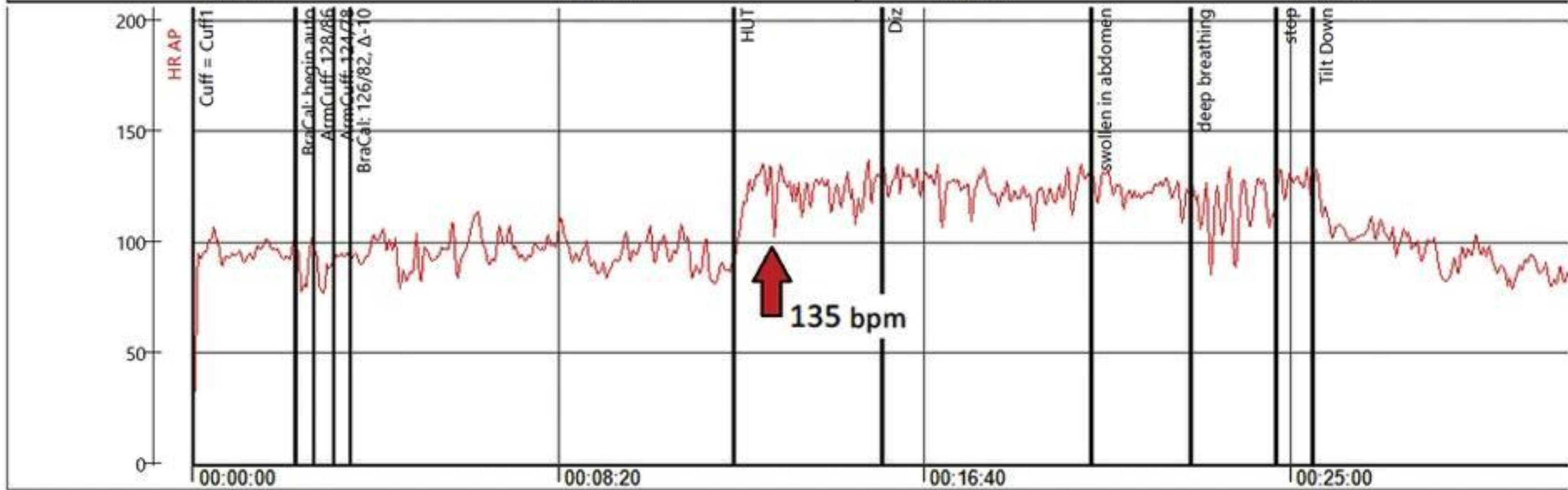
palpitation

weakness

palpitation



Preserved cerebral saturation
reBAP
Ana In 1
Ana In 2
Cuff = Cuff1
BraCal: begin auto
ArmCuff: 128/86
ArmCuff: 124/78
BraCal: 126/82, Δ-10
HUT
Diz
swollen in abdomen
deep breathing
step
Tilt Down
00:00:00
00:08:20
00:16:40
00:25:00



HR AP
Cuff = Cuff1
BraCal: begin auto
ArmCuff: 128/86
ArmCuff: 124/78
BraCal: 126/82, Δ-10
HUT
Diz
swollen in abdomen
deep breathing
step
Tilt Down
135 bpm
00:00:00
00:08:20
00:16:40
00:25:00

- ***POTS Treatment:***

  volume expanding

  compressive stock

  Beta blockers

  Ivabradine

Case 3

- 42 y/o women
- Mild COVID symptom (Fever , anosmia)

- ***<u>One month later</u>:***

  chest pain in activity

  Trop :neg.

  ECG:T inverted in precordial leads

- ***DDX:***

  Obstructive CAD

  Pleura pericarditis

  Active Myocarditis

  Emboli

  RV strain (PHTN)

- Lab data : NL inflammatory markers
- CT angiography : NL

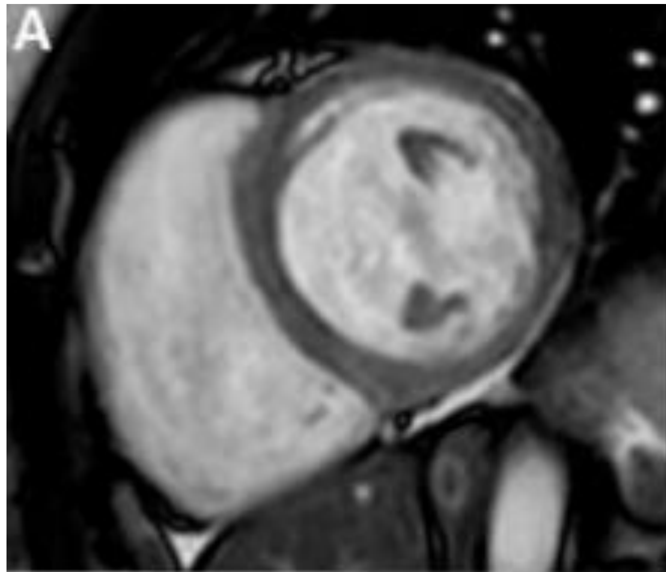
- ***CMR*** :

NL Volume and function

NL inflammatory findings, LGE negative

but

sub endocardial diffuse significant perfusion defect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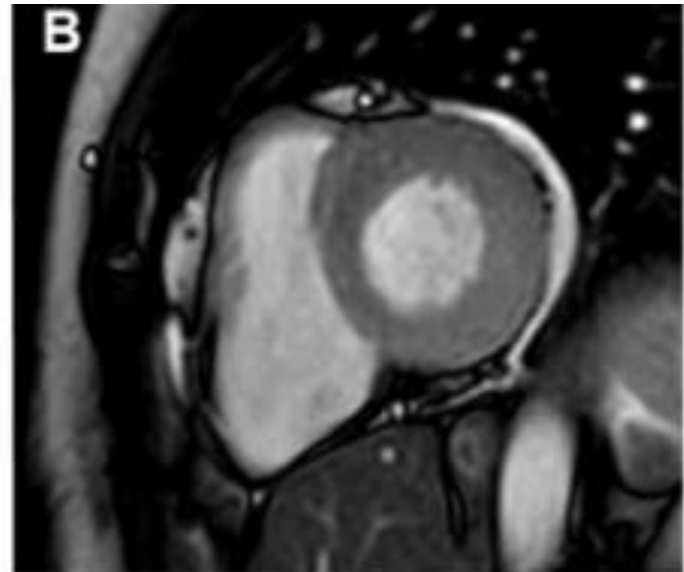
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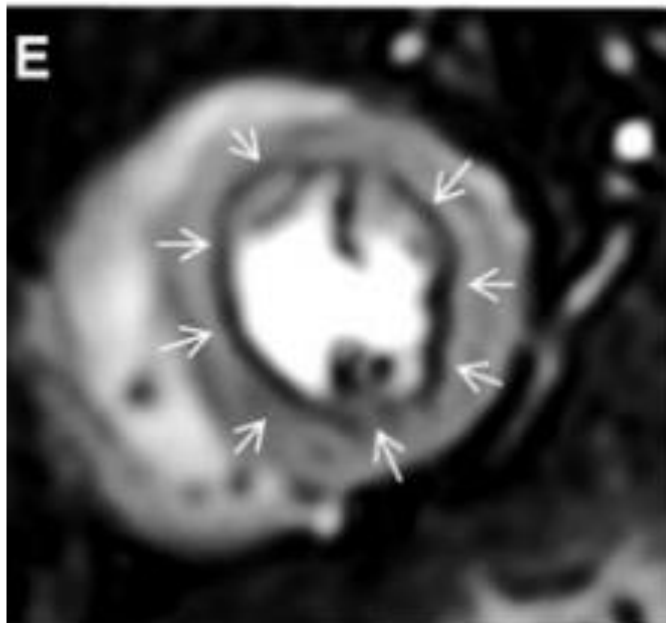
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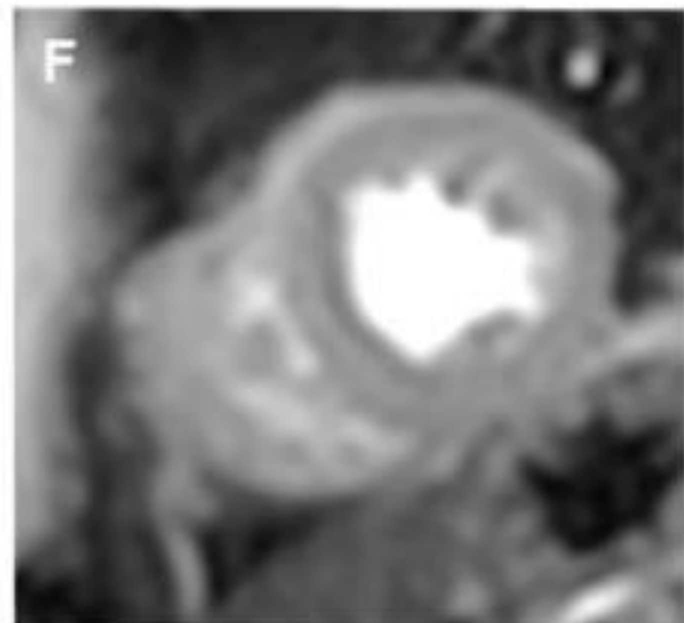
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DX : ***Subendocardial Ischemia***

- Microvascular Ischemia:

(endothelial dysfunction, injury, micro thrombosis)

- Treatment:

  ASA

  Atorvastatin

  nitrate

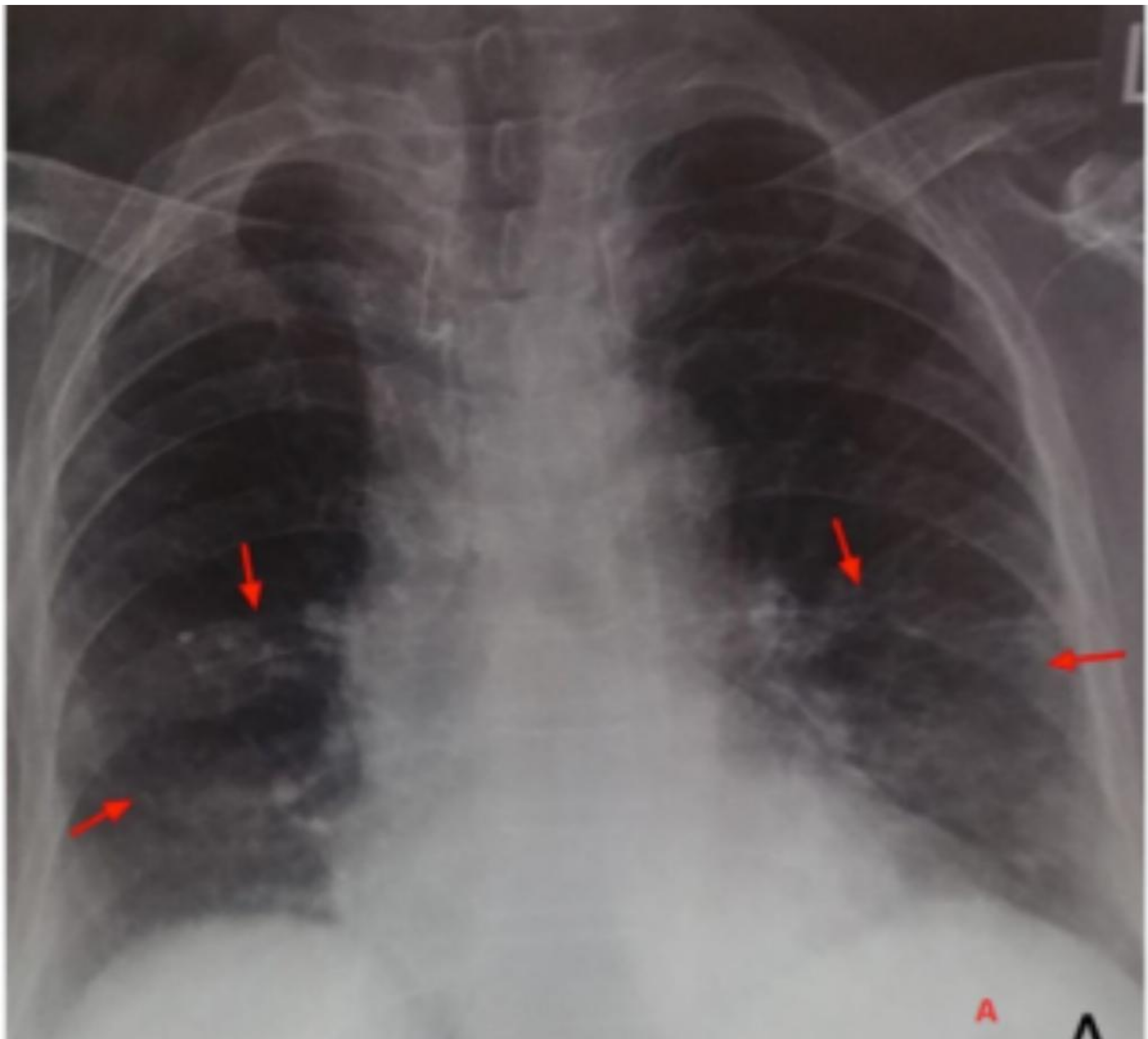
  ranolazine

Case 4

- A 55 y/o lady was healthy
- Symptoms: Fever, dyspnea, chest pain
- V.S: BP: 100/70; HR: 105; RR: 22; O2 sat: 77%
- Lab. Data: CRP:30 Lymph: 700 IL-6: 18 Trop: neg. ProBNP: **5000** D-dimer: 210
- CT: GGO
- Echo: **Nl**
- Rx: ABT; Remdesivir; Dexamethasone; **BiPAP**

- After 18 days on discharge….patient clinically improved with **sat 92% at rest**

- After **Two months**:
  - **Symptoms:** dry cough, fatigue, dyspnea
  - **O2 sat:** 89% (at rest)
  - **Ph.Ex:** elev. JVP, RV heave, lung: diffuse fine crackle, lower extremities: symmetric and Nl size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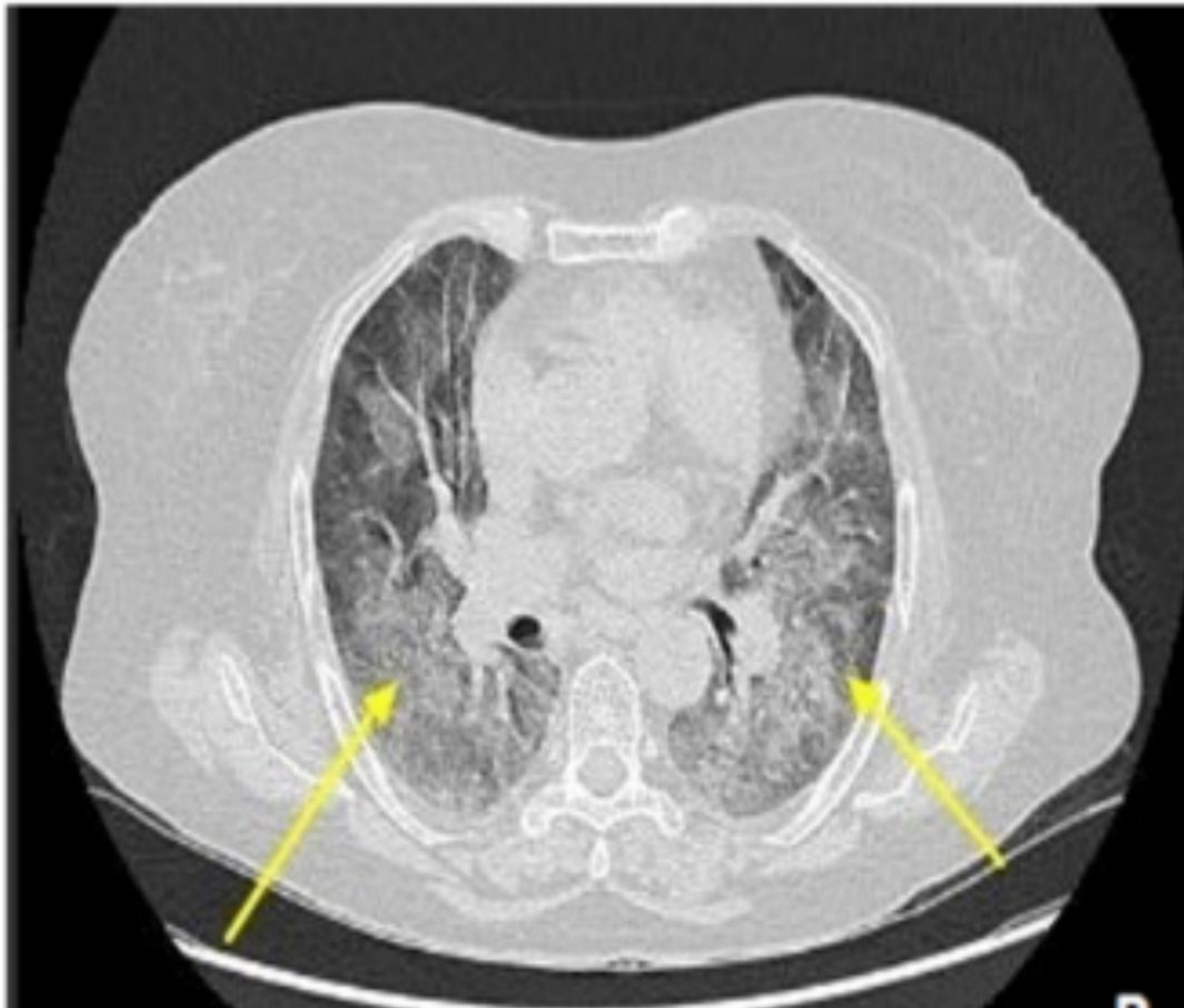

- Echo Finding:
  - Nl LV size and function
  - Grade I DD
  - RV: mod. dilation and dysfunction
  - TRG: 50
  - SPAP: 60
  - IVC: dilated, <50% collapse

- Dx:

Pulmonary Arterial Hypertension

(2 mo. After COVID)

Post COVID Cardiac Envolvement

Ischemia

Myocarditis

Emboli

Takotsubo cardiomyopathy

PHTN

Micro vascular dysfunction

New and Late presentation of myocarditis

POTS

Decon**ditioning**

Recommendation

- *Cardiac visit 2 week after severe acute phase*
- *Cardiac rehabilitation for starting activity*
- *Do not relate all post covid symptom to deconditioning*
- *Physician should be aware of Returning ,new or ongoing symptom…….*

Recommendation

- *Physical activity post acute phase:*

at least >2 months after active myocarditis

and

after NL finding in echo

holter

CMR

(*NO competitive a*ctivity if LGE in CMR)