Covid 19 and Myocarditis

Helena Wang-Flores, DO, MHSA
Department of Emergency Services
Division of Children's Emergency Services
Michigan Medicine

1

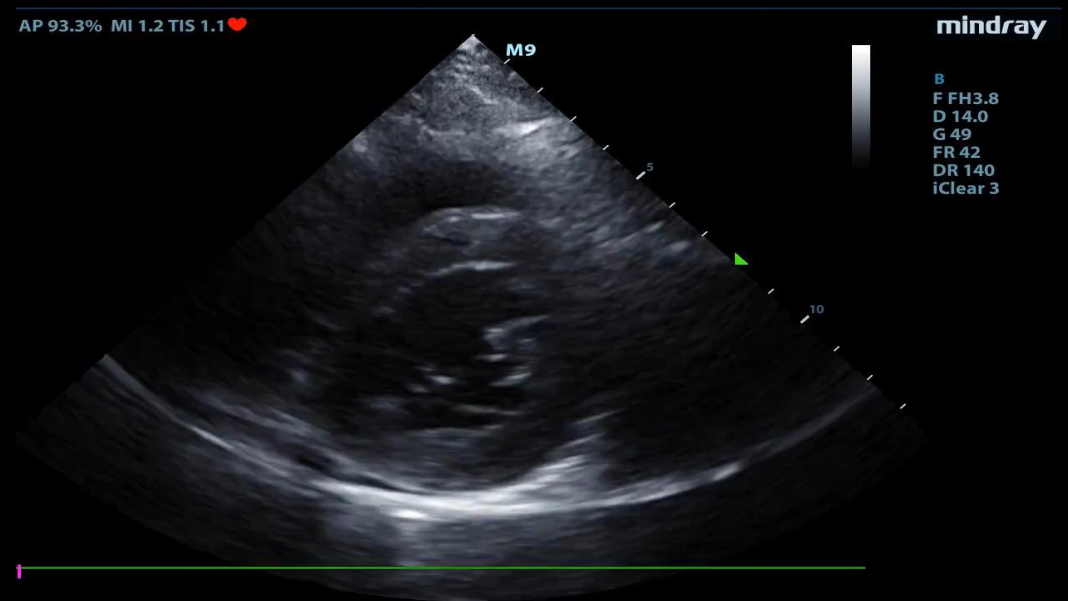
- No disclosures

2

Your Case presentation:

- 15 Y/O M, chief complaint of chest pain
- 3 days ago received 2nd dose of mRNA COVID vaccine
- 2 days ago had low grade fevers and headache
- Today awoke with substernal aching pain
- Tachycardic to 110s
- Overall non-toxic appearing

3

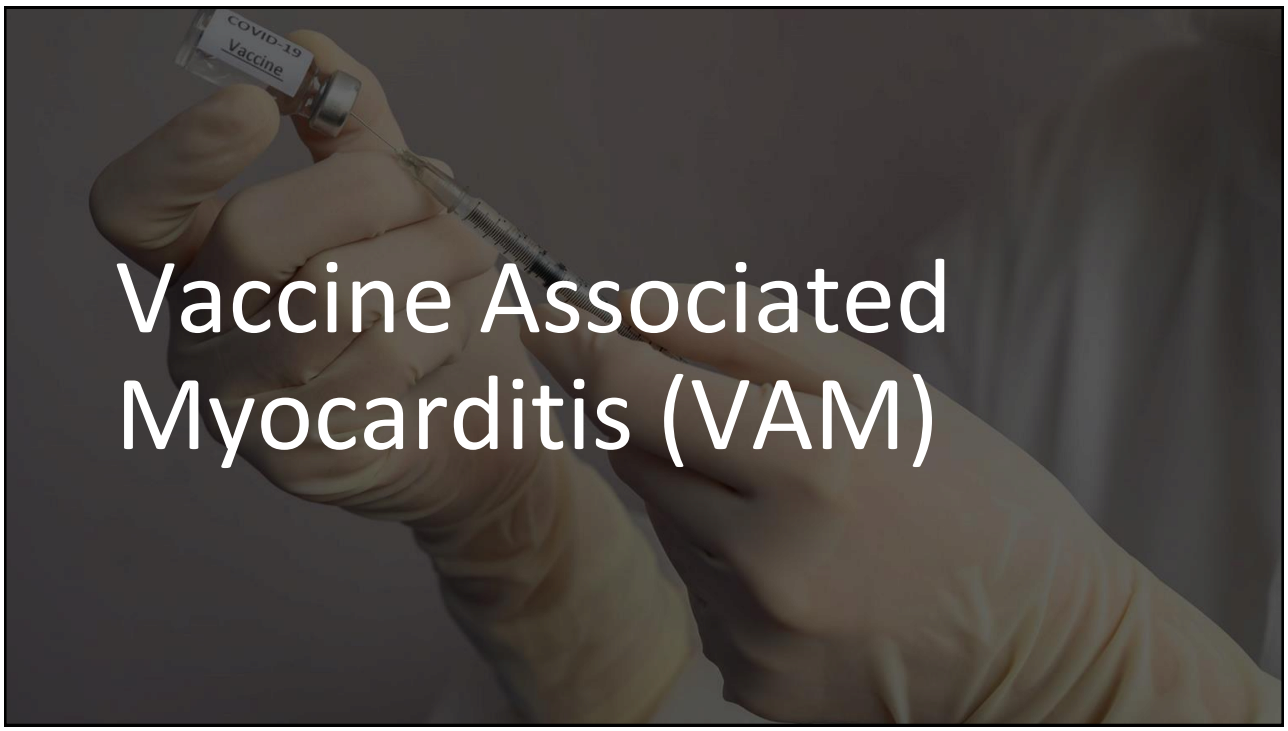


4

Case Conclusion

- Troponin 6881 pg/ml (ref 0-19)
- Admitted for post-vaccine myocarditis
- Cardiology-based echo showed 34% ejection fraction
- Treated with NSAIDS and gradually had improvement in pain
- 3 days later he was discharged with downtrending trops and normal function on serial echos

5



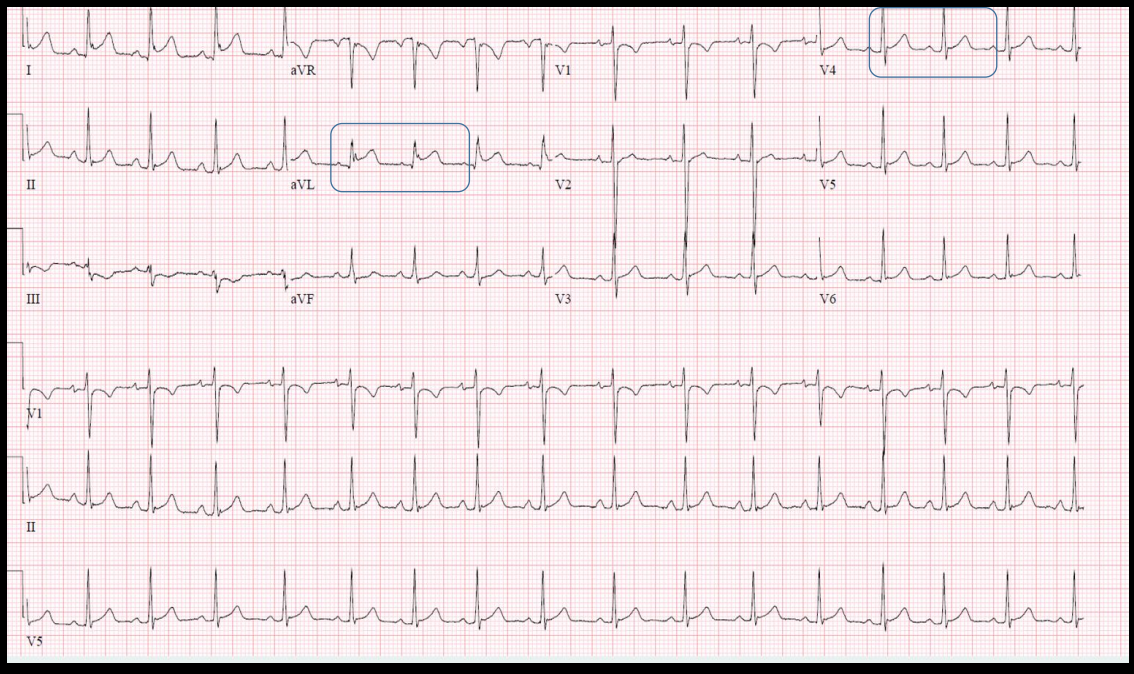
Vaccine Associated Myocarditis (VAM)

6

Case presentation:

- 14 Y/O male awoke with chest pain , worsened by the early morning
- Dyspnea with activity and at rest.
- He is 2 days post second Covid vaccine with some mild fatigue symptoms occurring
- Vitals stable: HR:90, BP: 124/72, Temp :37, sats 99%
- Noted increased Troponin
- EKG with ST elevations

7



8

More Labs:

CBC: nl

Crp: 11.4 (.0-.06mg/dl)

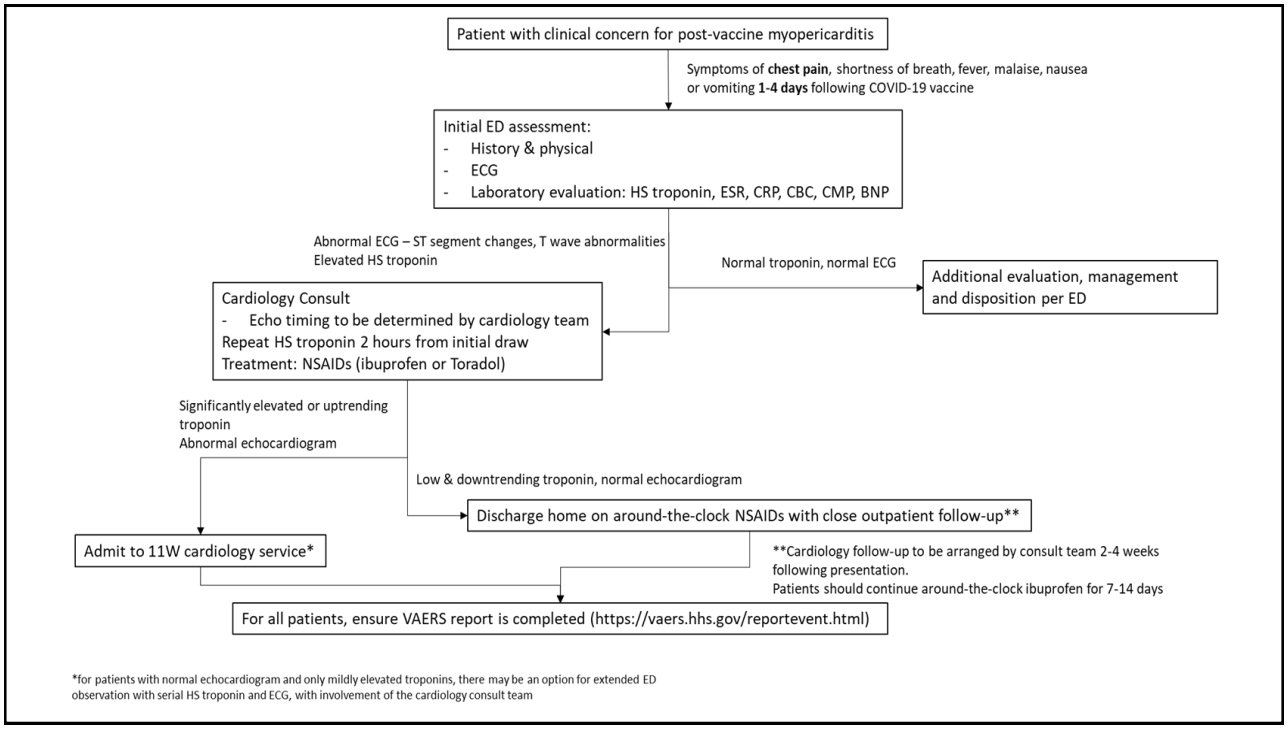
ESR:31 (0-15mm)

BNP : 9 (0-100pg/dl)

Troponin: max 1540,then down trended.

POCUS echo US: no effusion, good contractility

9



10

Circulation
Volume 145, Issue 5, 1 February 2022; Pages 345-356
https://doi.org/10.1161/CIRCULATIONAHA.121.056583

American Heart Association.

ORIGINAL RESEARCH ARTICLE

Clinically Suspected Myocarditis Temporally Related to COVID-19 Vaccination in Adolescents and Young Adults: Suspected Myocarditis After COVID-19 Vaccination

Dongngan T. Truong, MD, MS; Audrey Dionne, MD; Juan Carlos Muniz, MD; Kimberly E. McHugh, MD, MSCR; Michael A. Portman, MD; Linda M. Lambert, APRN; Deepika Thacker, MD; Matthew D. Elias, MD; Jennifer S. Li, MD; Olga H. Toro-Salazar, MD; Brett R. Anderson, MD, MBA, MS; Andrew M. Atz, MD; C. Monique Bohun, MB BCh; M. Jay Campbell, MD, MHA; Maryanne Chrisant, MD; Laura D'Addese, MD; Kirsten B. Dummer, MD; Daniel Forsha, MD; Lowell H. Frank, MD; Olivia H. Frosch, MD; Sarah K. Gelehrter, MD; Therese M. Giglia, MD; Camden Hebson, MD; Supriya S. Jain, MD; Pace Johnston, MD; Anita Krishnan, MD; Kristin C. Lombardi, MD; Brian W. McCrindle, MD, MPH; Elizabeth C. Mitchell, MD; Koichi Miyata, MD; Trent Mizzi, MD; Robert M. Parker, DO; Jyoti K. Patel, MD; Christina Ronai, MD, MSEd; Arash A. Sabati, MD; Jenna Schauer, MD; S. Kristen Sexson Tejtel, MD, PhD, MPH; J. Ryan Shea, MD; Lara S. Shekerdemian, MB ChB, MD, MHA; Shubhika Srivastava, MD, MBBS; Jodie K. Votava-Smith, MD; Sarah White, MD; Jane W. Newburger, MD, MPH

11

Table 1. Centers for Disease Control and Prevention Case Definitions for Probable and Confirmed Cases of COVID-19 Vaccine-Associated Myocarditis

Probable case	Confirmed case
≥1 new or worsening symptom	≥1 new or worsening symptom:
Chest pain, pressure, or discomfort	Chest pain, pressure, or discomfort
Dyspnea or shortness of breath	Dyspnea or shortness of breath
Palpitations	Palpitations
Syncope	Syncope
AND ≥1 new finding of:	AND
Elevated troponin	Histological confirmation of myocarditis
Abnormal ECG or rhythm monitoring consistent with myocarditis	OR
Abnormal ventricular systolic function or wall motion abnormality on echocardiogram	Elevated troponin AND cardiac MRI findings consistent with the original or revised Lake Louise criteria for myocarditis[14]
Cardiac MRI findings consistent with the original or revised Lake Louise criteria for myocarditis[14]	AND no other identifiable cause of the symptoms and findings
AND no other identifiable cause of the symptoms and findings	

Adapted from Gargano et al[11] with permission. Copyright © 2021, Centers for Disease Control and Prevention. COVID-19 indicates coronavirus disease 2019.

12

White 66.2%

Male 90.6%

Teen 12-16y 52/5%
16≦20y 47.5%

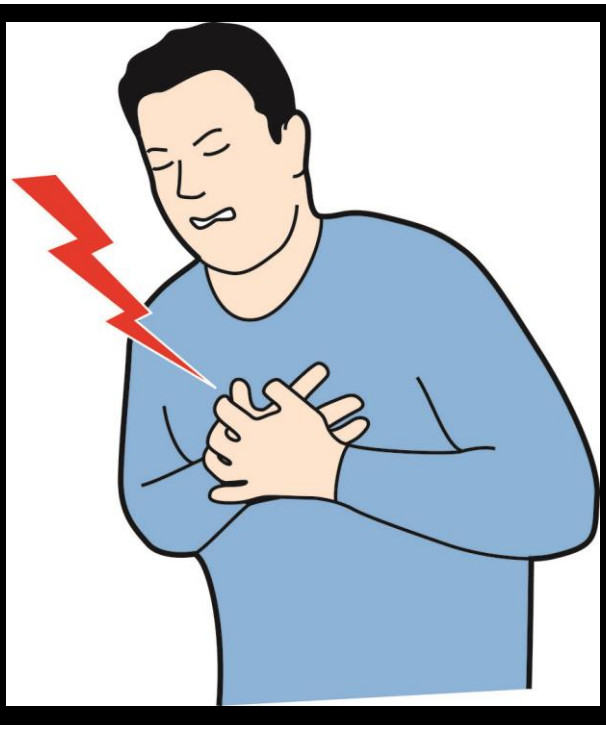
13

Chest pain 99.3%

Fever 30.9%

Shortness of breath 27.3%

Headache, myalgias, vomiting, fatigue, palpitations, rash, diarrhea, conjunctivitis

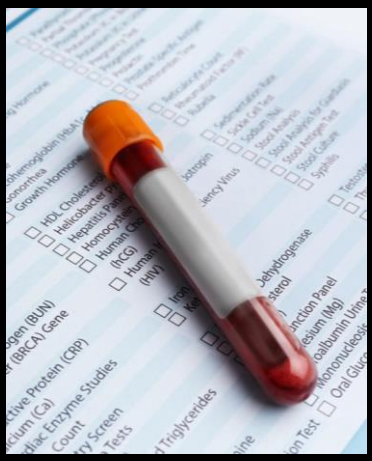


14

97.9% ST-T wave abnormalities/elevations

Elevated troponin

Echo



15

18.7% ICU

1.4% Pressors

No ECMO

ALOS 2 days

16

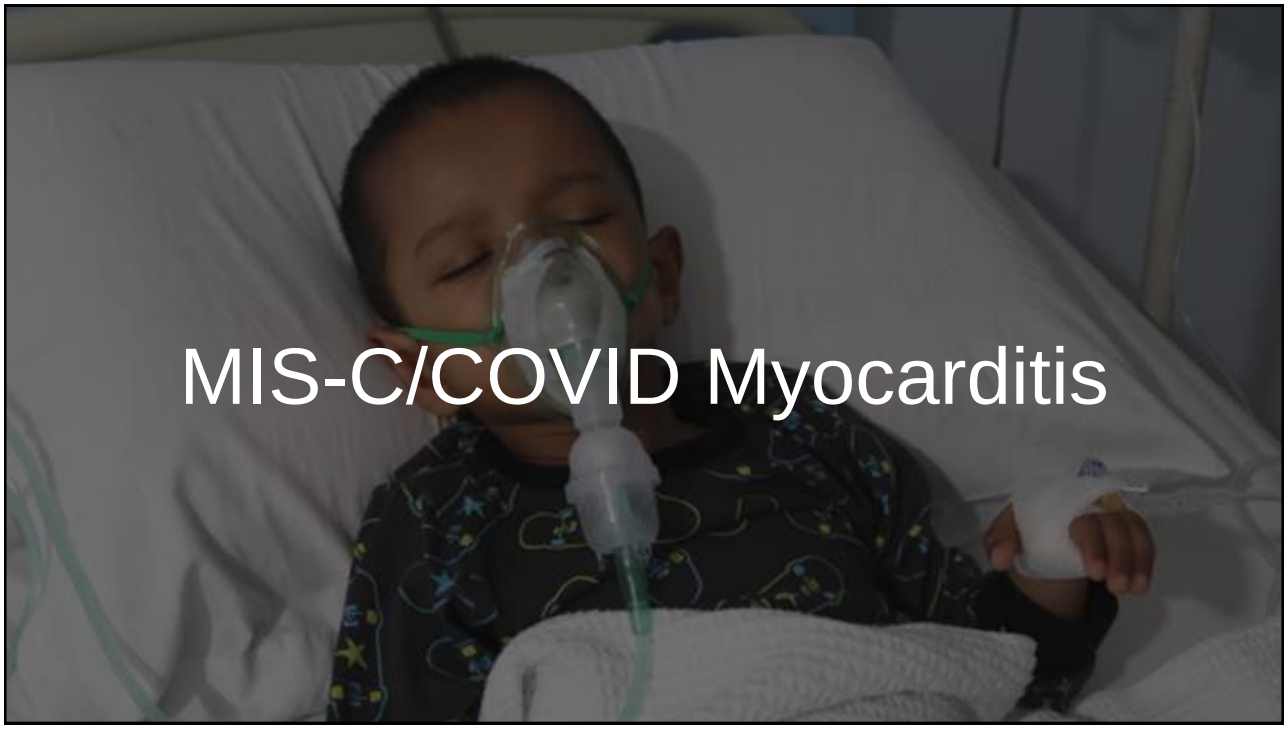
- NSAIDS
- Steroids
- IVIG
- Colchine
- Anakinra
- No treatment

17

Vaccine Related Myocarditis

- Symptoms usually present within a week after vaccine
- No patients died
- Most have a benign course
- Repeat echos show normal function

18



19

Case Presentation

12yo male HA, neck pain, nausea, diarrhea, fatigue

- 2yo sister sick with URI 2 weeks ago, home covid neg

T 38.9, HR 122, BP 85/59, Sats 98% on RA

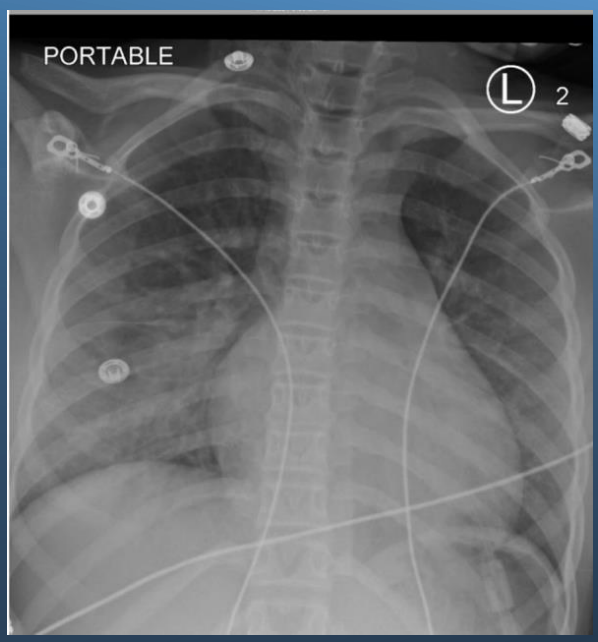
PE: ill appearing, Lungs: CTA, Heart: tachy, Abd: RUQ discomfort, soft, Ext: no edema

20

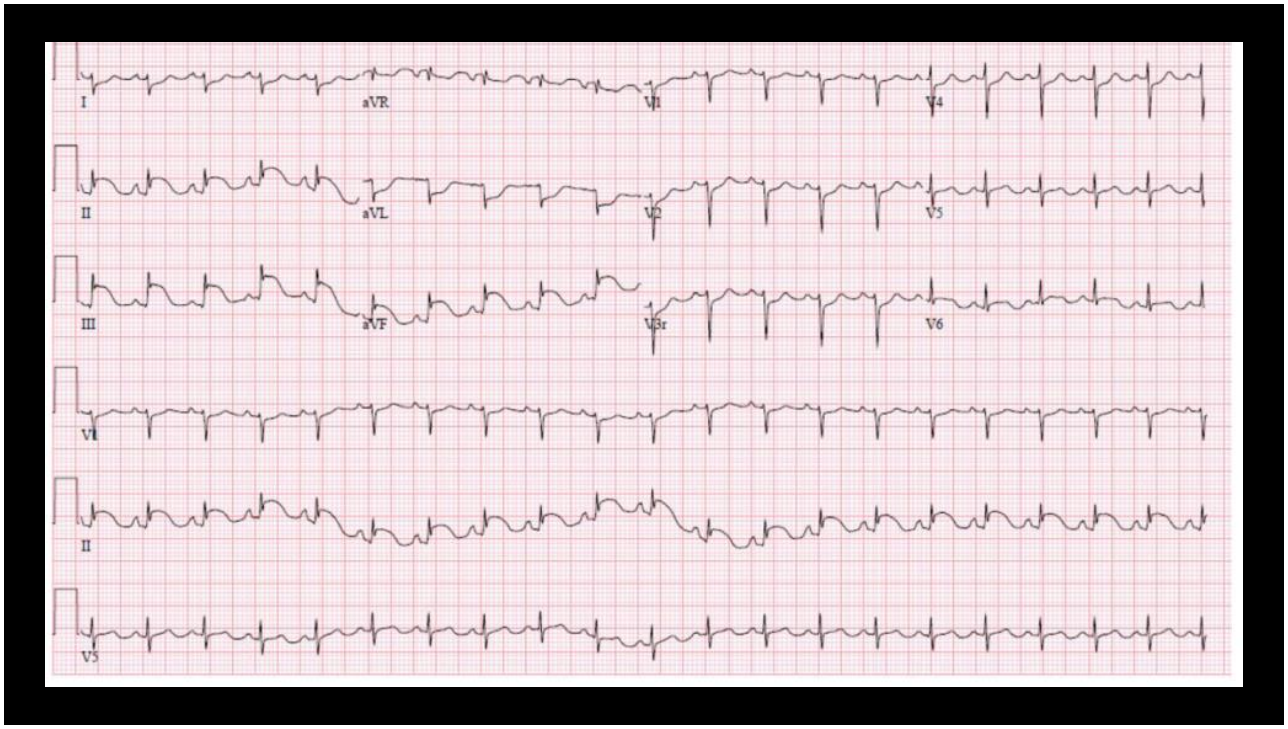
Labs:

- AST 371
- CRP 4.6
- HnTrop: 28

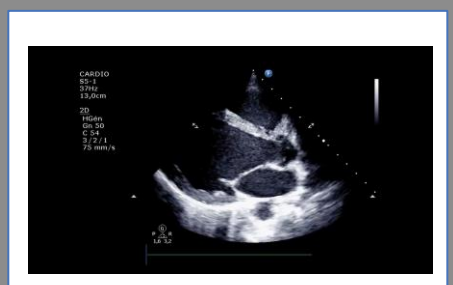
21

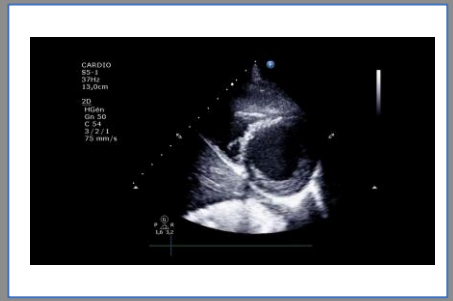


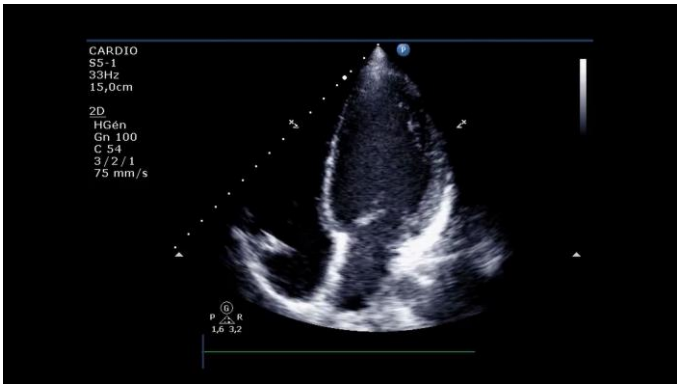
22


I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3r
V6
V1
II
V5

23


CARDIO
S5-1
33Hz
13,0cm
2D
HGén
Gn 50
C 54
3/2/1
75 mm/s


CARDIO
S5-1
33Hz
13,0cm
2D
HGén
Gn 50
C 54
3/2/1
75 mm/s


CARDIO
S5-1
33Hz
15,0cm
2D
HGén
Gn 100
C 54
3/2/1
75 mm/s
P R
1,6 3,2

24

- < 21yr
- Fever > 24h
- Inflammation
- Multisystem
- No other diagnosis
- Recent or current COVID OR recent exposure (4 weeks)

25

Last updated with cases reported to CDC on or before March 1, 2022*

TOTAL MIS-C PATIENTS MEETING CASE DEFINITION*	TOTAL MIS-C DEATHS MEETING CASE DEFINITION
7,459	63

*Additional patients are under investigation. After review of additional clinical data, patients may be excluded if there are alternative diagnoses that explained their illness.

Total Cases
79,346,678

Total Deaths
965,336

As of 3/14/20222

26

Patient Profile

- Median age 9
  - 50% 5-13yrs
- 58% Hispanic or African American
- 60% male
- 68% present in shock

27

Risk

- 15.7 times higher with COVID 19
- 37 times higher <16yr
- 7 times higher 16-39yrs
- Males >females

Boehmer TK, Kompaniyets L, Lavery AM, et al. Association Between COVID-19 and Myocarditis Using Hospital-Based Administrative Data — United States, March 2020–January 2021. MMWR Morb Mortal Wkly Rep 2021;70:1228–1232. DOI: http://dx.doi.org/10.15585/mmwr.mm7035e5exte

28

MIS-C

- 50-70% Myocarditis
- 47% vasopressors
- 41% decreased left ventricular function
- 12% coronary artery aneurysms
- 3% ECMO

Son MBF et al (2021) Multisystem inflammatory syndrome in children—initial therapy and outcomes. NEJM. https://doi.org/ 10.1056/nejmoa2102605

29

TABLE 3 Comparison Between Patients With C-VAM and MIS-C

	C-VAM (n = 63)	MIS-C (n = 16)	P
Age, y	15.6 ± 1.8	13.3 ± 4.3	.05
Wt, kg	73.3 ± 19.4	57.1 ± 20.8	.01
Troponin, ng/mL	8.78 ± 9.15	0.67 ± 1.10	<.0001
C-reactive protein, mg/L	37.0 ± 35.4	151.1 ± 119.5	.002
Intensive care length of stay	2.5 ± 1.5	6.6 ± 4.6	.004
LVEF % (echocardiography)	60.9 ± 6.5	45.1 ± 9.5	<.0001
LGE, n (%)	49 (88)	3 (20)	.0005
Myocardial edema,[a] n (%)	47 (83.9)	4 (28.6)	<.0001

Data are reported as mean ± SD, unless specified. LVEF, left ventricular ejection fraction.

- As of present, most Vaccine related myocarditis has been self limited and recovery has been very good.

30

Back to the case

- On arrival to PICU she became hypotensive again
- Started on epi drip
  - PVC's
  - V-Tach Arrest
- Started on ECMO
- Steroids, IVIG
- HD 3 – gases looked better, started milrinone
- HD 5 & 6 – echo showed improving function
- HD 7: weaned ECMO

31

Comparison of MIS-C Related Myocarditis, Classic Viral Myocarditis, and COVID-19 Vaccine related Myocarditis in Children

Trisha Patel, MD[1,2]
Michael Kelleman, MSPH[1]
Zachary West, MD[1,2]
Andrew Peter, MD[1,2]
Matthew Dove, MD[1,,2]
Arene Butto, MD[1,2]
Matthew E. Oster, MD, MPH[1,2]

[1]Emory University School of Medicine, Atlanta, GA
[2]Children's Healthcare of Atlanta, Atlanta, GA

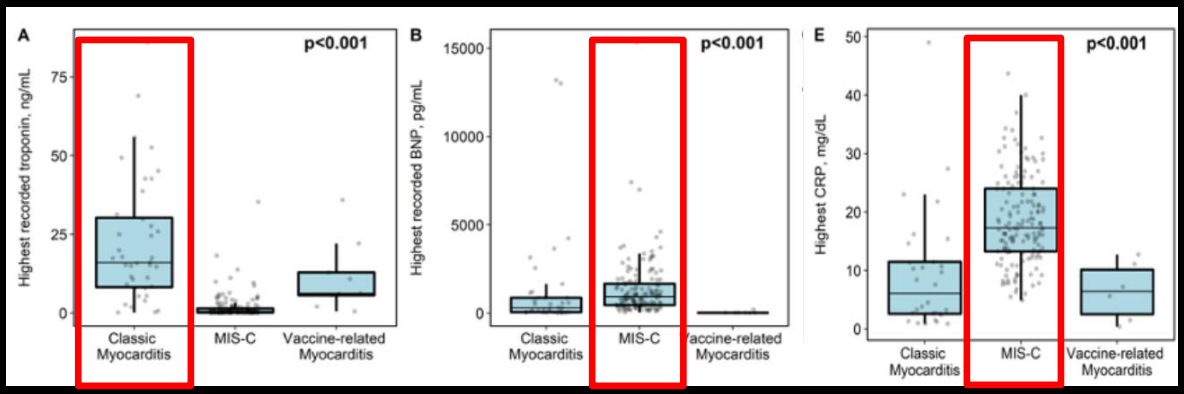
32

Classic vs Vaccine vs COVID Myocarditis

- 201 patients
  - 43 classic
  - 149 COVID
  - 9 Vaccine

Patel T, et al. Comparison of MIS-C Related Myocarditis, Classic Viral Myocarditis, and COVID-19 Vaccine related Myocarditis in Children.

33



troponin BNP CRP

Patel T, et al. Comparison of MIS-C Related Myocarditis, Classic Viral Myocarditis, and COVID-19 Vaccine related Myocarditis in Children.

34

Patient Profile

	Classic	MIS-C	Vaccine Associated
Age	7.5	14.7	15.5
Male	72.1	63.1	100
African American **White**	53.5 18.6	58.1 16.9	11.1 66.7

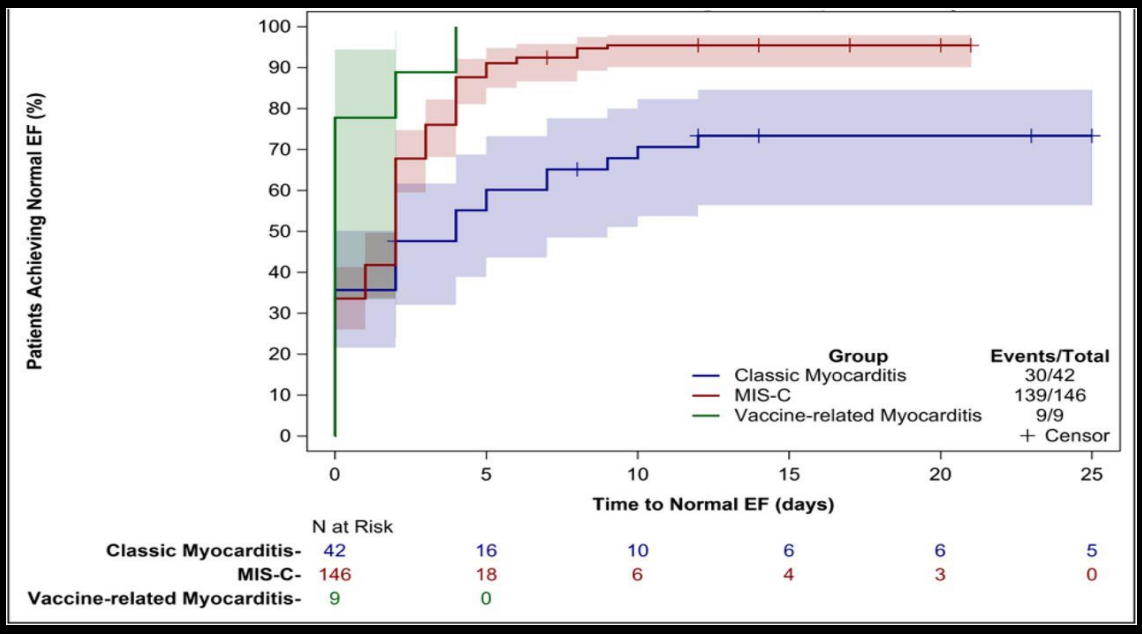
Patel T, et al. Comparison of MIS-C Related Myocarditis, Classic Viral Myocarditis, and COVID-19 Vaccine related Myocarditis in Children.

35

	Classic	MIS-C	Vaccine Associated
Chest Pain	76.2%	10.7%	100%
EF < 55%	58%	42%	22%
Vasopressors	42%	52%	22%
ECMO	21%	2%	0
Normal EF at Discharge	70%	93%	100%
HF meds 3mos post discharge	45%	0.7%	0

Patel T, et al. Comparison of MIS-C Related Myocarditis, Classic Viral Myocarditis, and COVID-19 Vaccine related Myocarditis in Children.

36



37

Conclusions

- Vaccine related myocarditis is rare as is MIS-C
  - Most common in white, teen males
- Patients with myocarditis related to COVID are more sick with longer ICU stays.
- Preliminary data suggests that patients with classic viral myocarditis are the sickest.
- Long term effects still unknown

38

Thank you to Athina Sikavitsas, DO and Timothy Visclovsky, MD

39

Thank you!

Questions?

40

References

- Boehmer TK, Kompaniyets L, Lavery AM, et al. Association Between COVID-19 and Myocarditis Using Hospital-Based Administrative Data — United States, March 2020–January 2021. MMWR Morb Mortal Wkly Rep 2021;70:1228–1232. DOI: http://dx.doi.org/10.15585/mmwr.mm7035e5exte
- Buitrago, DH, Munoz, J, Finkelstein, ER, Mulinari, L. A case of fulminant myocarditis due to COVID-19 in an adolescent patient successfully treated with venous arterial ECMO as a bridge to recovery. *J Card Surg*. 2022; 1- 5. doi:10.1111/jocs.16313
- Chin, S.E., Bhavsar, S.M., Corson, A. *et al.* Cardiac Complications Associated with COVID-19, MIS-C, and mRNA COVID-19 Vaccination. *Pediatr Cardiol* (2022). https://doi.org/10.1007/s00246-022-02851-x
- Marshall, M., Ferguson, I. D., Lewis, P., Jaggi, P., Gagliardo, C., Collins, J. S., Shaughnessy, R., Caron, R., Fuss, C., Corbin, K., Emuren, L., Faherty, E., Hall, E. K., Di Pentima, C., Oster, M. E., Paintsil, E., Siddiqui, S., Timchak, D. M., & Guzman-Cottrill, J. A. (2021). Symptomatic Acute Myocarditis in 7 Adolescents After Pfizer-BioNTech COVID-19 Vaccination. *Pediatrics*, *148*(3), e2021052478. https://doi.org/10.1542/peds.2021-052478
- Patel T, Kelleman M, West Z, et al. Comparison of MIS-C Related Myocarditis, Classic Viral Myocarditis, and COVID-19 Vaccine related Myocarditis in Children. medRxiv 2021.10.05.21264581; doi: https://doi.org/10/1101/2021/10.05.21264581
- Truong DT, Dionne A, Muniz JC, et al. Clinically Suspected Myocarditis Temporally Related to COVID-19 Vaccination in Adolescents and Young Adults: Suspected Myocarditis After Covid-19 Vaccination. *Circulation.* 2022;45:345–356. DOI: 10.1161/CIRCULATIONAHA.121.056583
- Wu, E.Y., Campbell, M.J. Cardiac Manifestations of Multisystem Inflammatory Syndrome in Children (MIS-C) Following COVID-19. *Curr Cardiol Rep* **23,** 168 (2021). https://doi.org/10.1007/s11886-021-01602-3

41