Overview of Myocarditis and Pericarditis
ACIP COVID-19 Vaccines Work Group
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Disclaimer

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What are Myocarditis and Pericarditis?

- **Myocarditis**: Inflammation of the myocardium (the heart muscle)
- **Pericarditis**: Inflammation of the pericardium (the lining around the heart)
- **Myopericarditis**: When both myocarditis and pericarditis are present
# Myocarditis diagnosis

## Probable

1. **Symptoms**
   - Chest pain/pressure/discomfort
   - Dyspnea/shortness of breath
   - Palpitations

2. **Abnormal testing**
   - Elevated troponin
   - Electrocardiogram (ECG or EKG) findings
   - Decreased function on echo or MRI
   - MRI findings consistent with myocarditis

3. **No other identified cause**

## Confirmed

1. **Symptoms**
   - Chest pain/pressure/discomfort
   - Dyspnea/shortness of breath
   - Palpitations

2. **Abnormal testing**
   - Biopsy
   - Elevated Troponin AND MRI findings consistent with myocarditis

3. **No other identified cause**

*Cases with individuals who lack the listed symptoms but who meet other criteria may be classified as subclinical myocarditis (probable or confirmed)*
Pericarditis diagnosis

- Must have 2 of:
  - Chest pain
  - Pericardial rub audible by stethoscope
  - Abnormal ECG findings (New ST-elevation or PR-depression)
  - Pericardial effusion on echocardiogram or MRI

Epidemiology of myocarditis

**Children**
- Annual incidence 0.8 per 100,000
  - In 15-18yo, 1.8 per 100,000 in 2015-2016
- 66% male
- Median LOS 6.1 days

**Adults**
- Gradual decrease in incidence with age
- 76% male

Causes of traditional myocarditis

**Figure 1** | Common causes of myocarditis. Viral infection is the most common aetiology, but several other aetiologies of myocarditis have also been implicated.
Treatment of myocarditis

- Supportive care is mainstay of therapy
- Directed care for arrhythmias, decreased heart function, congestive heart failure
- Role of anti-inflammatory medicines unclear
- In severe cases (rare), can consider mechanical support or heart transplant
- Exercise restriction while the heart recovers

Early reports of myocarditis after mRNA COVID-19 vaccine: United States

- **Marshall et al** – 7 healthy males 14-19yo within 4 days of 2nd mRNA vaccine
  - All with abnormal troponin, ECG, and MRI
  - Treatment with NSAIDs alone in 3, IVIG/steroids in 4
  - All discharged to home after 2-6 days in the hospital (median 4)

- **Rosner et al** – 5 males 19-39yo within 4 days of 2nd dose of vaccine, 1 24yo male 7 days after 1st dose
  - All with abnormal troponin and MRI findings, varying ECG findings
  - Treatment with NSAIDs or colchicine in 4, beta-blockers in 2, steroids in 1
  - All discharged to home after 2-4 days in the hospital (median 3)
  - Note: Spike protein antibodies **negative** in patient who presented after 1st dose
Early reports of myocarditis after mRNA COVID-19 vaccine: International

- **Larson et al** – 8 males 22-56yo (4 in U.S., 4 in Italy); 7 within 4 days of dose 2, 1 with onset 2 days after dose 1 (had hx of prior SARS-CoV-2 infection)
  - All with abnormal troponin, echo, and MRI; 7/8 with abnormal ECG
  - Treatment with NSAIDs or colchicine in 4, steroids in 2, no treatment in 3
  - All discharged home with resolution of symptoms and preserved ejection fraction

- **Israeli Ministry of Health** - 148 myocarditis cases occurring within 30 days of mRNA vaccine
  - 27 cases out of ~5.4 million first doses
  - 121 cases out of ~5 million second doses
  - Mostly in men aged 16-30 (particularly 16-19)
  - Most were in the hospital up to 4 days
  - 95% of cases considered mild

Larson et al. Circulation. 2021
Summary

- Myocarditis is rare, but is not a new disease
- Treatment largely supportive
- Myocarditis after mRNA vaccines:
  - Most commonly males, <30 years old, within a few days after 2nd dose
  - Early data of acute outcomes of myocarditis after mRNA vaccines have been good
  - No long-term data available yet
Thank you!

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For more information, contact CDC
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