COVID 19 Myocarditis

By

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Outline

• Introduce Myocarditis

• Discuss how we make a clinical diagnosis of Myocarditis

• Discuss COVID Myocarditis in hospital in patients

• Discuss COVID myocarditis in non hospitalised patients
Introduction

• Pre COVID, Myocarditis made up around 0.04% of admissions to hospital in the UK pre COVID.

• It has diverse causes:
  • Infection (usually viral, but can be any type of infection)
  • Drug induced
  • Autoimmune / inflammatory diseases
  • Hormone related
What is Myocarditis and How does it present?

• Heart muscle (Myocardial) inflammation

• In viral disease, most commonly affects younger men

• Typically presents to hospital in 3 ways:
  • New Chest pain (“acute coronary syndrome” like)
  • Heart failure (fluid overloading / shock)
  • Arrhythmia (palpitations / sudden death)

• It can occur with no symptoms in milder forms
Making the Diagnosis in Acute “in Hospital” Presentations

- Blood tests
  - Troponin elevation

- ECG – Often abnormal and often shows ST elevation

- Echocardiogram – Often normal

- Patients will often have a coronary angiogram which would likely show no flow limiting coronary disease

- Where available, cardiovascular magnetic resonance is then the non invasive “test of choice” to make the diagnosis

- Some countries routinely do a cardiac biopsy. Many only do it in severe presentations.
Cardiovascular MRI in Myocarditis

• Fairly new technique ("mainstream" in many 1st world countries in the last 10 years).

• Assessment of:
  • Myocardial T2 pre gadolinium contrast
  • Myocardial T1 pre contrast and Myocardial late enhancement post gadolinium injection with extracellular volume.
COVID MYOCARDITIS IN HOSPITALISED PATIENTS
Covid 19 Myocarditis – ACS Presentation with large troponin rise

Cine Image

T2: Pre Contrast Inflammatory Imaging

Post Contrast Inflammatory and Scar Imaging
Fulminant myocarditis in COVID-19 – Cardiogenic Shock
Patterns of myocardial injury in recovered troponin-positive COVID-19 patients assessed by cardiovascular magnetic resonance


Discussion

Multi-organ involvement in COVID-19 is recognized, with many patients having troponin release indicative of acute myocardial injury. Here, in a multicentre study across six acute hospitals, we show that myocardial injury during acute COVID-19 infection requiring acute hospital admission is associated with a CMR abnormality in approximately half of patients, with three patterns of injury being observed: non-infarct, myocarditis-pattern injury (27%), ischaemic pathology (22%), and non-ischaemic non-specific scar (5%). Dual pathology with ischaemic and non-ischaemic features was observed in 6%. The different
COVID MYOCARDITIS IN NON HOSPITALISED PATIENTS
CONCLUSIONS AND RELEVANCE In this study of a cohort of German patients recently recovered from COVID-19 infection, CMR revealed cardiac involvement in 78 patients (78%) and ongoing myocardial inflammation in 60 patients (60%), independent of preexisting conditions, severity and overall course of the acute illness, and time from the original diagnosis. These findings indicate the need for ongoing investigation of the long-term cardiovascular consequences of COVID-19.
"We did expect high uptake, but we didn't expect that much of a focus," said Eike Nagel, MD, PhD, of University Hospital Frankfurt in Germany, who was the senior author on the German MRI paper. "A lot of papers get downloaded 10 times, maybe 20 times; this paper got downloaded 550,000 times."

Myocarditis is the top concern around COVID-19 for college athletics, due to the risk it poses for cardiac arrhythmia and sudden cardiac death.
HOWEVER....

- Twitter debate...
- Statistics in the paper don’t make any sense
- Methodology very odd
- Stats re-done
## COVID and CMR Myocardial Involvement

<table>
<thead>
<tr>
<th>First Author / Yr</th>
<th>Patient Cohort</th>
<th>Controls</th>
<th>Overall LV function</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Puntmann 2020</td>
<td>100 patients 33% hospitalised / 67% Community</td>
<td>Yes (n=50)</td>
<td>Normal</td>
<td>78% abnormal CMR with 60% on going inflammation</td>
</tr>
<tr>
<td>Rajpal S 2020</td>
<td>26 College Athletes</td>
<td>No</td>
<td>Normal</td>
<td>15% acute myocarditis and 30% prior myocarditis</td>
</tr>
<tr>
<td>Huang 2020</td>
<td>26 Patients</td>
<td>Yes</td>
<td>Normal</td>
<td>54% myocardial oedema and 31% LGE.</td>
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<tr>
<td>Clark 2021</td>
<td>59 Athletes</td>
<td>Yes (athletic and non athletic)</td>
<td>Normal</td>
<td>3% myocarditis</td>
</tr>
<tr>
<td>Daniels 2021</td>
<td>1597 Athletes</td>
<td>No</td>
<td>Normal</td>
<td>0.31% clinical myocarditis 2.3% if add CMR to work up</td>
</tr>
<tr>
<td>Joy 2021</td>
<td>149 HCPs</td>
<td>Yes</td>
<td>Normal</td>
<td>No difference between controls and patients</td>
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</tbody>
</table>
Why Has this Divergence in Findings Happened? – This is an Opinion Slide..

• Changes in mindset

• Limitations using T1 and T2 mapping MRI techniques in:
  • Milder disease with lower pre test probability
  • Younger patients, particularly females
  • Faster heart rates
  • Focal disease
Conclusions

• Myocarditis has many causes including COVID 19.

• Around 27% of COVID in patients with a positive troponin will have myocarditis.

• Community COVID myocarditis incidence is unclear with very divergent data to date.

• The majority of patients appear to have a good prognosis with COVID myocarditis.