Case Study: Long Haul COVID

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Clinical Case Scenario

- 65 y/o male
- Pre-diabetes, not on any medications
- Never smoker
COVID-19 Presentation

• Presented to the ER at Emory Johns Creek Hospital
• Symptoms began 2 weeks prior to presentation
  • Cough
  • Fevers
  • Loss of smell and taste
  • Nausea
  • Dyspnea
  • Chest pain
Acute COVID-19

• In the ER –
• Awake, alert and oriented x3
• Mild use of accessory muscles with any exertion or speaking
• T 36.4, HR 99 regular, BP 166/73, RA sats 84-86% improved to 92% on 5L supplementation
• Bilateral rales noted
• S1 S2 reg with no murmurs
• No skin rash
Acute COVID-19 – Chest Xray

• COVID PCR positive on Day 1
Acute COVID-19- Day 2 hospital stay

- Worsening oxygen requirements- 40L/50%
- Transferred to ICU
### Acute COVID-19- Hospital Course Labs

<table>
<thead>
<tr>
<th></th>
<th>Day 1</th>
<th>Day 2</th>
<th>Day 3</th>
<th>Day 4</th>
<th>Day 5</th>
<th>Day 6</th>
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<tr>
<td>WBC</td>
<td>9.6</td>
<td>7.8</td>
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<td></td>
<td>624</td>
<td></td>
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<tr>
<td>D-dimer</td>
<td>405</td>
<td>321</td>
<td>865</td>
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<tr>
<td>CRP</td>
<td>68</td>
<td>108</td>
<td>82</td>
<td>46</td>
<td>20</td>
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<tr>
<td>Fibrinogen</td>
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<td>573</td>
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<td>703</td>
<td>519</td>
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<tr>
<td>BNP</td>
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<tr>
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<td>322</td>
<td>361</td>
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<tr>
<td>Pro cal</td>
<td>0.12</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Na</td>
<td>132</td>
<td>133</td>
<td>135</td>
<td>134</td>
<td>138</td>
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</table>
Acute COVID-19 Care

- CTX and Azithromycin x 3 days
- Remdesivir x 5 days
- Dexamethasone/methyl-prednisolone 60 mg x 7 days
- Convalescent plasma on Day 5
- Improvement in O2 status
- Discharged on Day 8, with 2L O2 on exertion and during sleep
Acute COVID-19 – Day 15

• Presented to an OSH with worsening hypoxemia and shortness of breath
• SARS 2 COV PCR positive
• High flow O2 up to 15L
• Another 8 days hospital stay with supportive care
• CT PE protocol negative, worsening infiltrates noted
• Solumedrol 20 mg iv Q 8 hours for OP versus fibro proliferative phase of ARDS
• Transition to 40 mg daily PO prednisone for 2 weeks and taper
• Discharged Day 22 on 4L O2 supplementation
# Acute COVID-19 - Second Hospitalization

<table>
<thead>
<tr>
<th></th>
<th>Day 15</th>
<th>Day 16</th>
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<th>Day 18</th>
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<tr>
<td>D-dimer</td>
<td>603</td>
<td>344</td>
<td>252</td>
<td>&lt;215</td>
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<tr>
<td>CRP (mg/L) (0-8)</td>
<td>50.8</td>
<td>18.3</td>
<td>11.3</td>
<td>5.2</td>
<td>3.3</td>
<td></td>
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<tr>
<td>Fibrinogen</td>
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<td></td>
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<tr>
<td>Pro BNP</td>
<td>149</td>
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<td></td>
<td></td>
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<tr>
<td>LDH</td>
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<tr>
<td>Pro calc (ng/ml)</td>
<td>&lt; 0.1</td>
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<tr>
<td>Na</td>
<td>134</td>
<td>134</td>
<td>135</td>
<td>134</td>
<td>138</td>
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</tbody>
</table>
Post Acute COVID Syndrome

• Seen in our Post COVID clinic on Day 62 post diagnosis of COVID
• Completed his course of steroids just prior to coming to our clinic
• Breathing slightly better, with significant lingering cough- spasms
• Dyspnea with exertion, chest pain, chest tightness, and palpitations
• Still requiring O2 at 2-3 L with exertion, drops to mid 80’s on exertion
• Sense of smell and taste not back as yet
• Symptoms of “brain fog”- inability to find words, and decreased memory
• Severe fatigue- unable to do anything on certain days
• Weight loss and loss of appetite- slowly improving
• Unable to resume job due to O2 requirements and symptoms
• Decline in quality of life
Post Acute COVID Syndrome –
Day 62 post diagnosis of COVID

- Chest X ray
- Labs- CBC with diff, CMP and BNP
- Inflammatory markers – D-dimer, Fibrinogen, CRP
- 6MW test – showed persistent exercise desaturation with significant tachycardia on mild levels of exertion, required 2L supplementation
- Montreal Cognitive Assessment (MOCA) score 26/30
- Echocardiogram- Normal LV function with estimated PASP of 30 mmHg
Post Acute COVID Syndrome –
Day 62 post diagnosis of COVID

- Persistent bilateral airspace opacities
- Persistent O2 requirement

- Prednisone
  - 50 mg x 10 days
  - 40 mg x 10 days
  - 30 mg x 10 days
  - Taper over another 2 weeks
  - Bactrim PJP prophylaxis
Post Acute COVID Syndrome – Day 120 post diagnosis of COVID
Post Acute COVID Syndrome –
Day 120 post diagnosis of COVID

- Persistent memory difficulties
- Taste sensation still not back to normal
- Improved functional tolerance and off O2
- Persistent fatigue- still unable to return to work
- 6MW showed no exercise desaturation
- PT referral for continued rehab
- Referral to Neuropsychological testing
- CT chest and PFT
Didactic: Long Haul COVID
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Post-Acute Sequelae of SARS-CoV-2 infection (PASC)

- Persistent symptoms 3wks or more after infection
- Multi-organ symptom presentation
- Lack of consensus of definition
Epidemiology

- Unclear if it’s related to severity of initial symptoms
- Approximately 10-30% of all patients have prolonged symptoms
- 65% return to previous level of health after 14-21 days.
- 125/134 (93%) patients had persistent sx after 2 months
  - 19-84yo (average age 40)
  - All hospitalized
  - 20% required MV
  - Women:men 4:1
Long-term effects of COVID-19

58% Fatigue
1% Hypersomnia
7% Chills
12% Weight loss
11% Pain

44% Headache
27% Attention Disorder

21% Cough
23% Angina
6% Blindness

25% Hair Loss
15% Hearing Loss

19% Nausea
16% Malignant

12% Organ Failure
19% Joint Pain
11% Pyrexia

5% Pulmonary Infection
10% Pulmonary Vascular

4% Pulmonary embolism
3% Laterality
1% Blindness

12% Cognitive Disorders
19% Osteoarthritis

0.4% Malignant

% of long-term effects of COVID-19

0 10 20 30 40 50 60 70

ECHO
Project

Emory University School of Medicine
Symptoms

• Fatigue (58%)
• Headaches (44%)
• Attention disorder (27%)
• Hair loss (25%)
• SOB/DOE (24%)
• Joint pains
• Chest pain
• Brain fog (suggestive of myalgic encephalomyelitis/chronic fatigue syndrome-ME/CFS)
• GI issues
• 44% had worsened QoL
Post-Acute Sequelae of SARS-CoV-2 infection (PASC)

- Similar elements to Lyme infection with chronic fatigue and nonspecific pain syndromes.
- “disease of the nervous system” – WHO
- PASC symptoms similar to post-MERS, post-SARS, and post-ARDS
- Difficult to differentiate between post critical illness syndrome vs. PASC
- Inflammation related? Immune mediated?
Patterns and syndromes

• Dyspnea NOS
• Organizing pneumonia and pulmonary fibrosis
• Chronic pain syndromes
• Brain fog/memory loss
• Postural orthostatic tachycardia syndrome (POTS)
• Autonomic dysfunction
Dyspnea NOS

• Dyspnea in light of normal imaging, PFTs, TTE and VTE workup
• No hypoxia or desaturations
• May be associated with airway inflammation given response to ICS/SABA
  • Despite lack of obstruction or bronchodilator response on PFTs
• May be associated with inappropriate tachycardia
Organizing pneumonia/pulmonary fibrosis

• May occur in 5-10% of patients
• Related to post infectious organizing pneumonia that can lead to fibrosis.
• Seems responsive to 1mg/kg/day prednisone for 1 month
Chronic pain syndrome

• Headaches, nonspecific chest pain, pleurisy, myalgia and arthralgias
• May be secondary to continued cytokine activation, though no consistent elevation in inflammatory markers seen
• Txt: NSAIDs and occasionally prednisone
Brain fog/memory loss

- Memory loss
- Word finding difficulties
- Difficulties concentrating
- Unclear how much of is directly related to COVID infection vs. critical illness
- Possible encephalomyelitis
  - Autoimmune related?
  - Antigen activation?
- Txt: ?
POTS

• CC: light headedness, fainting, and tachycardia associated with positional changes (laying to standing)
  • Tachycardia without hypotension with postural changes.

• Dx: Orthostatics or tilt-table tests

• Txt: Beta-blockers?
Autonomic dysfunction

• Related to cytokine storm resulting in sympathetic activation, alternating with vagal stimulation resulting in anti-inflammatory response

• CC: dyspnea, hypertension, and tachycardia

• Dx: hx

• Txt:
  • Education and lifestyle changes
  • Exercise
  • Hydration and salt intake
  • Medications: fludrocortisone, midodrine, clonidine, or methyldopa
Post-COVID Clinic

- Started in 08/2020
- Every Wednesday (EMUH) and Friday (Emory Executive Park)
- Average age: 50.9yrs
- 63.4% females
- Visits at 1, 3, 6, and 12 months after infection, as well as prn.
- All patients receive
  - MOCA screening,
  - PROMIS surveys for fatigue, cognition, and dyspnea
  - Screening labs for inflammation
  - PFTs and 6MW
## Symptoms

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dyspnea</td>
<td>78.30%</td>
</tr>
<tr>
<td>Fatigue</td>
<td>50.00%</td>
</tr>
<tr>
<td>Cough</td>
<td>43.50%</td>
</tr>
<tr>
<td>Brain Fog</td>
<td>40.20%</td>
</tr>
<tr>
<td>Palpitations</td>
<td>25.00%</td>
</tr>
<tr>
<td>Chest Pain</td>
<td>19.60%</td>
</tr>
<tr>
<td>Arthralgias</td>
<td>18.50%</td>
</tr>
<tr>
<td>Myalgias</td>
<td>14.10%</td>
</tr>
<tr>
<td>Anxiety</td>
<td>10.90%</td>
</tr>
<tr>
<td>Depression</td>
<td>8.70%</td>
</tr>
</tbody>
</table>
Severity of disease

### Severity of illness

- **Mild**: 45%
- **Moderate**: 36%
- **Severe**: 19%

### Hypoxia

- **Yes**: 56%
- **No**: 44%

### Treatment Summary

<table>
<thead>
<tr>
<th>Treatment</th>
<th># of pts</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remdesivir and steroids</td>
<td>36</td>
<td>42.90%</td>
</tr>
<tr>
<td>None</td>
<td>27</td>
<td>32.10%</td>
</tr>
<tr>
<td>Steroids</td>
<td>14</td>
<td>16.70%</td>
</tr>
<tr>
<td>Remdesivir, steroids and interferon beta</td>
<td>1</td>
<td>1.20%</td>
</tr>
<tr>
<td>Monoclonal abs</td>
<td>1</td>
<td>1.20%</td>
</tr>
<tr>
<td>Remdesivir, steroids convalescent plasma</td>
<td>1</td>
<td>1.20%</td>
</tr>
<tr>
<td>Remdesivir, steroids, convalescent plasma</td>
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<td>1.20%</td>
</tr>
<tr>
<td>Hydroxychloroquine and steroids</td>
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<td>1.20%</td>
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<tr>
<td>Remdesivir</td>
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<td>1.20%</td>
</tr>
<tr>
<td>Convalescent plasma</td>
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<td>1.20%</td>
</tr>
</tbody>
</table>
Montreal Cognitive Assessment
Treatment
Treatment

• Best intervention seems to be time
• ICS and SABA for bronchospasm and as empiric txt for sob/ doe
• Prednisone for 2-4wks for pulmonary infiltrates consistent with organizing pneumonia
• Screening, treatment and titration of anticoagulation for DVT/PE
• Beta-blockers for idiopathic tachycardia and POTS
• Possible use of antihistamines in patients with autonomic dysfunction
• Referral to neurology vs. neuropsychiatry for brain fog and memory loss
Consultants

- Alexis Cutchins (cardiology)
- Kelly Kayson (rheumatology)
- Leslie Ann Cassidy (rheumatology)
- Samir Belagaje (neurology and rehab medicine)
- Angelica Silva (neurology)
- Michelle Haddad (neuropsychology)
POST-COVID CLINIC

FOR ALL PATIENTS WITH DOCUMENTED COVID-19 INFECTIONS WHO REQUIRE CONTINUED CARE FOR LINGERING SYMPTOMS

WHAT
To provide follow up care for patients who are recovering from COVID-19 infection

WHERE
Emory Executive Park
1605 Chantilly Dr. NE

Emory Midtown Hospital
550 Peachtree St. NE

TO REFER PATIENTS: CALL THE NUMBER BELOW OR PLACE MESSAGE TO "PULMONARY ADMIN" IN EEMR WITH TITLE "COVID CLINIC" IN THE SUBJECT LINE.

Questions?
Alex.d.truong@emory.edu
Adventemia.doit@emory.edu

REFERRALS: CALL 404-778-3261