COVID-19: Virology, Current Controversies and Getting Back to Patient Care

Thursday, April 30
8:30 – 9:30 PM ET

Agenda

- COVID-19, Advocacy, and Getting Back to Practice – David W. Parke II, MD
- Clinical Virology Update: SARS-COV2 and COVID-19 – James Chodosh, MD
- PPE and Risk Mitigation in the Clinic – Steven Yeh, MD
- Current Controversies and the Need for Evidence – Gary Holland, MD
- Case-based Discussions – Panel
Clinical Virology Update: SARS-COV2 and COVID-19

James Chodosh, MD
Cornea and External Disease
Department of Ophthalmology
Harvard Medical School

James Chodosh, MD, MPH
Cogan Professor of Ophthalmology, Harvard Medical School

Howe Laboratory – Viral Pathogenesis Unit
Massachusetts Eye and Ear
Massachusetts General Hospital
Shriners Hospitals for Children – Boston
Brigham and Women’s Hospital
Dana-Farber Cancer Institute
“Corona” virus

The corona appearance on electron microscopy is due to the projecting “spike” protein from the viral envelope.

The horseshoe bat – most likely reservoir for SARS-CoV-2
SARS-CoV-2

- A “beta” coronavirus with ~70% sequence identity with SARS-CoV, less with MERS and other human coronaviruses
- Positive sense single stranded RNA genome (like dengue virus, west nile virus, and rhinoviruses)
- The spike protein binds to angiotensin-converting enzyme 2 (ACE-2), expressed in nasopharynx, lung, kidney, GI tract (and possibly conjunctiva)
SARS-CoV-2 in human lung tissue

SARS-CoV-2 also infects heart, brain, GI tract, kidney and causes coagulopathy leading to thrombotic stroke.
SARS-CoV-2 Symptoms (CDC)

Symptoms may appear 2-14 days after exposure to the virus. People with these symptoms or combinations of symptoms may have COVID-19:

- Cough
- Shortness of breath or difficulty breathing

Or at least two of these symptoms:

- Fever
- Chills
- Repeated shaking with chills
- Muscle pain
- Headache
- Sore throat
- New loss of taste or smell

*Elderly individuals may show only lethargy and confusion


RT-PCR vs. Serology

<table>
<thead>
<tr>
<th>RT-PCR</th>
<th>IgM</th>
<th>IgG</th>
<th>Clinical interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>-</td>
<td>-</td>
<td>Early infection,* or unable to mount Ab response</td>
</tr>
<tr>
<td>+</td>
<td>+</td>
<td>-</td>
<td>Early infection (first 1-2 weeks)</td>
</tr>
<tr>
<td>+</td>
<td>+</td>
<td>+</td>
<td>Active infection</td>
</tr>
<tr>
<td>+</td>
<td>-</td>
<td>+</td>
<td>Active, late, or recrudescent / recurrent infection**</td>
</tr>
<tr>
<td>-</td>
<td>+</td>
<td>-</td>
<td>Early infection, false positive, or false negatives</td>
</tr>
<tr>
<td>-</td>
<td>+</td>
<td>+</td>
<td>Recovery phase or false negative RT-PCR</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>+</td>
<td>Past infection</td>
</tr>
</tbody>
</table>

*Infection may be asymptomatic, presymptomatic, or symptomatic

**Patients may remain RT-PCR positive for 5 weeks after onset or show late shedding after resolution
<table>
<thead>
<tr>
<th></th>
<th>Surgical Mask</th>
<th>N95 Respirator</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Testing and Approval</strong></td>
<td>FDA cleared</td>
<td>NIOSH approved</td>
</tr>
<tr>
<td><strong>Intended Use and Purpose</strong></td>
<td>Fluid-resistant</td>
<td>Protects wearer from particles</td>
</tr>
<tr>
<td><strong>Face Seal Fit</strong></td>
<td>Loose-fitting</td>
<td>Tightly-fitting</td>
</tr>
<tr>
<td><strong>Fit Testing Requirement</strong></td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>User Seal Check Requirement</strong></td>
<td>No</td>
<td>Yes: Sealed each time the respirator is donned or put on</td>
</tr>
<tr>
<td><strong>Filtration</strong></td>
<td>Does not provide the wearer with a negligible level of protection from inhaled airborne particles</td>
<td>At least 95% filtration</td>
</tr>
<tr>
<td><strong>Leakage</strong></td>
<td>Face seal may leak, may allow particles to escape</td>
<td>Most leaks occur under nose or around edges of respirator</td>
</tr>
<tr>
<td><strong>Use Limitations</strong></td>
<td>Single-use, may be re-used if properly disposed of</td>
<td>Single-use only, may be re-used if cleaned and decontaminated</td>
</tr>
</tbody>
</table>


---

**Protects others** and **Protects you**
PPE and Risk Mitigation in the Clinic

Steven Yeh, MD
Uveitis and Vitreoretinal Surgery
Emory Eye Center
Emory University School of Medicine

Factors Influencing PPE:
Exposure, Durability, Appropriateness and Fit

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>MRSA</th>
<th>Tuberculosis</th>
<th>COVID-19</th>
<th>Ebola</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposure</td>
<td>Contact, Skin, Surfaces</td>
<td>Aerosols, Droplet nuclei</td>
<td>Contact, Surfaces, Respiratory Droplets, AGPs</td>
<td>Direct Contact – Blood, Fluids of Symptomatic Pts</td>
</tr>
</tbody>
</table>

- **PPE**
- **Preferred PPE – Use**
  - Face shield or goggles
  - N95 or higher respirator
  - If respirator is not available, use the first line of defense, like a face mask.
- **Acceptable Alternative PPE – Use**
  - Face mask
  - N95 or higher respirator as preferred or acceptable alternative.

- **Isolation gown**
- **One pair of clean, nontoxic gloves**

Dhs.Wisconsin.gov
www.emory.edu
www.cdc.gov
## AAO Interim Guidance: Patient and Provider PPE

<table>
<thead>
<tr>
<th>Asymptomatic patient, Urgent visit</th>
<th>Respiratory Symptoms, Non-PUI, Non-COVID-19, Urgent/Emergent Condition</th>
<th>High-risk for COVID-19, PUI / COVID-19, Urgent/Emergent Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Standard precautions</td>
<td>• Patient: Mask</td>
<td>• High-risk for COVID-19  → Send to ER or hospital for COVID-19 management</td>
</tr>
<tr>
<td>• No speaking at slit lamp</td>
<td>• Provider: Mask, Gloves, Gown, Eye Protection</td>
<td>• **Covid-19 testing and management take precedence over eye disease</td>
</tr>
<tr>
<td>• Patient: Mask</td>
<td></td>
<td>• Patient: Mask</td>
</tr>
<tr>
<td>• Provider: Mask / Eye Protection</td>
<td></td>
<td>• Provider: N95 Mask, Gloves, Gown, Eye Protection</td>
</tr>
</tbody>
</table>

**Note:** For H/O prior COVID-19+ (convalescent), exact duration for viral transmission unknown.  
• CDC allows return to work 14 days after acute illness, no symptoms 7 days, afebrile x 72 hours  

www.aao.org

## Environment and Equipment: Tips and Reminders for PUI/COVID-19 Care

- Be mindful of the space and equipment landing locations.
- Any equipment / consumables in a patient area (PUI, COVID-19) are considered contaminated.
- Discard or meticulously disinfect (“Dirty” and “Clean” tables often outside inpatient rooms).
- Alert nursing staff and critical care team about dilation and exam time if consulted.
- Additional set of hands outside the room can be extremely helpful for disinfection & procedures.
Clinic Risk Mitigation: Clinic, Staff, Environment

**Clinic / Crowd Management**
- Assessment of respiratory symptoms and COVID-19 status prior to appointment
- Symptom screening +/- temp monitoring
- Increase waiting room space

**Staff**
- Virtual meetings
- Continue to stress leave of absence for fever, respiratory symptoms
- Judicious PPE use

**Environment Precautions**
- Droplet and fomite precautions for surfaces
- Disinfection protocol for slit lamps and equipment
- Large breath shields
- Imaging devices, VF analyzer (Check manufacturer’s guidelines / statements)

“[Redacted product] are not designed to be sterile or sterilized and as such as we do not describe a method of sterilization.”

Operating Room Considerations

**Preoperative**
- All patients screened for fever, respiratory symptoms, COVID-19+ contacts
- Preop COVID-19 testing for non-emergent surgery when there is a local/ regional SARS-CoV2 presence (ASA guidelines 4/29/20)
- Higher perioperative morbidity and mortality associated with COVID-19
- Weigh urgency of surgery with risk

**Operative**
- Adjudication / Sign-off for PUI / COVID-19+ by ASC or hospital leadership, dependent on status of overall health system
- ASA intubation precautions, low-flow O2 by nasal cannula
- Limit number of individuals in the room
- PPE often determined by risk and nature of the procedure
Challenges Remain: Protecting Health Care Providers with a Global PPE Shortage

"...the tragedy in Italy reinforces the wisdom of many public health experts: the best outcome of this pandemic would be accused of being overprepared."
Current Controversies and the Need for Evidence

Gary N. Holland, MD
Department of Ophthalmology
David Geffen School of Medicine at UCLA
UCLA Stein Eye Institute

Recurring Questions

- Why have AAO guidelines changed over the past 8 weeks?
- Why can’t the AAO be more specific in its recommendations?
- Why are various centers and professional groups following different policies?
Recurring Questions

• Why have AAO guidelines changed over the past 8 weeks?
• Why can’t the AAO be more specific in its recommendations?
• Why are various centers and professional groups following different policies?
  o Specific recommendations depend on multiple factors, including prevalence of disease in a given region, and local availability of PPE.
  o These factors vary markedly from one part of the country to another. Practical decisions must be made; for example, balancing risk against the need to preserve limited PPE supplies for those who need them most.
  o These factors have been changing constantly, resulting in a reassessment of risk.
  o AAO guidelines cannot supersede the policies of local hospitals or institutions.

Controversies
Controversies

In the medical community, different approaches to the pandemic are less about strongly held, opposing views and more about uncertainty and confusion.

Two current topics of concern:
- **Resumption of surgery.**
  - What was the goal of not operating until now, and why are we starting now, if there is still a risk of infection? Why is there such an emphasis on an incremental approach to resuming surgery?
  - How can one protect him- or herself? Do some procedures pose a greater risk to the surgeon than others?

- **The future and what we should expect.**
  - What measures do we use in the clinic, as volume increases? When can we stop wearing masks?
  - How do we use antibody tests?

Uncertainties

- In the medical community, different approaches to the pandemic are less about strongly held, opposing views and more about uncertainty and confusion.
- Two current topics of concern:
  - **Resumption of surgery.**
    - What was the goal of not operating until now, and why are we starting now, if there is still a risk of infection? Why is there such an emphasis on an incremental approach to resuming surgery?
    - How can one protect him- or herself? Do some procedures pose a greater risk to the surgeon than others?
  - **The future and what we should expect.**
    - What measures do we use in the clinic, as volume increases? When can we stop wearing masks?
    - How do we use antibody tests?
Resumption of Surgery

• Practical considerations.
  o Initial shut-down allowed facilities to establish procedures for infection control, preserve supplies, and determine what resources should be diverted to care of COVID-19 patients.
  o Patient care cannot be delayed indefinitely.
  o Economic and employment considerations.
  o We must continue to employ strict infection control measures, which preclude high surgical volumes for now; new requirements will slow turnover (e.g. 20-minute shut-down of operating rooms after an aerosol-generating procedure).

• Risk to surgeons and OR staff.
  o Assume all patients are SARS-CoV-2-infected.
  o We do not yet know whether there are unique risks associated with some procedures.
The Future

• “Beyond the Peak”
The Future

• “Beyond the Peak”
  o Continue to see smaller outbreaks.

Commentator Tomas Pueyo on Medium.

The Future

• “Beyond the Peak”
  o Continue to see smaller outbreaks.
    ▪ Commentator Tomas Pueyo on Medium.
    
  o A possible second surge in the fall, if re-opening is not managed well by society.

The Future

• We and our patients will be wearing masks for a long time to come.
• Rigorous cleaning of rooms and equipment.
• We must establish strategies for maintaining social distancing, even as volumes increase.
  o Separate the distance between chairs in the waiting room.
  o Ask people to wait outside until their appointment times.
The Future

• The only sure end-points for these measures:
  o An effective vaccine that is widely available.
  o Sufficient herd immunity from continued spread of infection.
  o Neither will occur soon.

• Antibody testing.
  o Helpful for identifying the extent of infection in various populations.
  o The idea that a positive test means the provider or the patient does not need to wear a mask is premature.
    ▪ Reliability of many current tests is uncertain.
    ▪ Unknown whether the antibodies convey lasting immunity.
Need for Evidence

- Modes of transmission.
  - Can infection be transmitted via tears? Or acquired through the eye?
  - Is the viral material found on surfaces infectious? For how long?
- Potential for aerosolization of virus by various procedures.
- Spectrum of disease manifestations.
  - Does the severity of disease depend on route of inoculation or amount of exposure?
- Immunity.
  - Is immunity post-infection long-lasting, or can a person be re-infected?
- Sensitivity and specificity of various antibody tests.
  - What are the clinical implications of a negative or positive test?
Case-Based Discussion
Charles Zacks, MD
Rachel Lieberman, MD

Case 1: Managing a Cataract Patient
With a History of COVID-19
Case 1: Managing a Cataract Patient With a History of COVID-19

• 80 year old man with visually significant cataracts OU ~20/80 OU
• Mild dementia, largely dependent on his wife for ADLs
• Hx of COVID-19 pneumonia, hospitalized a month ago
  o Pt’s previously lived with his wife, who recently succumbed to the disease
  o Pt survived, and has been in a rehabilitation facility.
• Pt. is now ready for d/c, but poor vision interferes with independent living
• When would you operate?
• What are the preoperative considerations?

Case 1: Managing a Cataract Patient With a History of COVID-19

• Reasons to proceed with cataract surgery
  o Discharge from rehabilitation hospital may depend on better vision
  o Transportation for ASC and postop visits may be easier before discharge
  o Pt may need assistance with postoperative medicines
• Reasons to temporize
  o Pt’s general health may be sub-optimum now, better later
  o Pt’s social situation may improve with surrogate care givers at home, or placement
  o The rehabilitation facility bed may be needed for another COVID-19 survivor
Case 1: Managing a Cataract Patient
With a History of COVID-19

• What are the considerations re preoperative COVID-19 testing?
• What are the considerations re anesthesia choice?
• Considerations re planning the second eye surgery
  o If patient is an emmetrope?
  o If patient is a high myope?

Discussion
Case 2: Macula-On Retinal Detachment

*With Fever and Cough*

- 72 year old pseudophakic female with history of high myopia
- C/o floaters and a “curtain” OS that began 2 days ago
- Patient endorses subjective fever and a cough that worsened over a week

- Where do you evaluate the patient?
Case 2: Macula-On Retinal Detachment
*With Fever and Cough*

- Evaluate in a hospital setting
- Mac-on RD is considered emergent, but the retina surgeon has discretion
  - Consider temporizing or alternative measures
- Get buy-in from the entire team prior to the OR
- Plan for surgery in a facility that can handle COVID patients

Case 2: Macula-On Retinal Detachment
*With Fever and Cough*

- OR considerations for COVID-19 + patients
  - Dedicated OR for positive patients
  - Empty the OR of nonessential personnel and equipment
  - Use separate OR carts for airway/equipment/medications
  - Keep a runner outside of OR for drugs/equipment
  - Use separate (negative pressure) room for intubation/extubation
  - PPE: N95 mask, eye protection, boot covers

- What are considerations for this patient?
- Can treatment be delayed pending COVID test results?
Case 2: Macula-On Retina Detachment
*With Fever and Cough*

Discussion

Case 3: Temporal Scalp Pain
*And a Sick Family Member*
Case 3: Temporal Scalp Pain
And a Sick Family Member

• 78 year old woman presents to the ER with generalized weakness and temporal pain when she brushes her hair

• Lives with her 50 y/o son who is COVID-19 +
  o Mild respiratory illness, no fever
  o Doing well in self quarantine

• What do you need to know
• How do you proceed?

Precautions in the ER?
  o Pt qualifies as a Person Under Investigation

Vision 20/40 OU, fundus exam unremarkable

Lab testing?
  o Sedimentation rate (ESR) = 75mm/h
  o C Reactive Protein (CRP) = 4.0 mg/dl
  o Coronavirus testing?
  o Other?

Start Prednisone for presumed temporal arteritis?
Case 3: Temporal Scalp Pain
And a Sick Family Member

Discussion

Case 4: Endophthalmitis
While COVID-19 + in the ICU
Case 4: Endophthalmitis

While COVID-19 + in the ICU

• 89 year old female patient with clinical signs of endophthalmitis
  o Intubated in the ICU for 2 weeks with hypoxic respiratory failure
  o COVID-19+
  o *S. aureus* bacteremia

• How do you handle this?

• PPE for bedside procedure: N95, gown, gloves, eye protection, shoe covers
  o Use monitor for donning/doffing
  o Prepare for procedures step-by-step
  o Bring all equipment with you
  o Consider specimen handling
  o Decontaminate equipment

• What are our concerns for this patient?
• Do you dilate other eye?
Case 4: Endophthalmitis
While in the ICU with COVID-19

Discussion

Additional Resources

- AAO – Important coronavirus updates for ophthalmologists
  www.aao.org/headline/alert-important-coronavirus-context

- American College of Surgeons: www.facs.org/covid-19

- WHO: www.who.int/emergencies/diseases/novel-coronavirus-2019

- CDC: www.cdc.gov/coronavirus
Q&A