

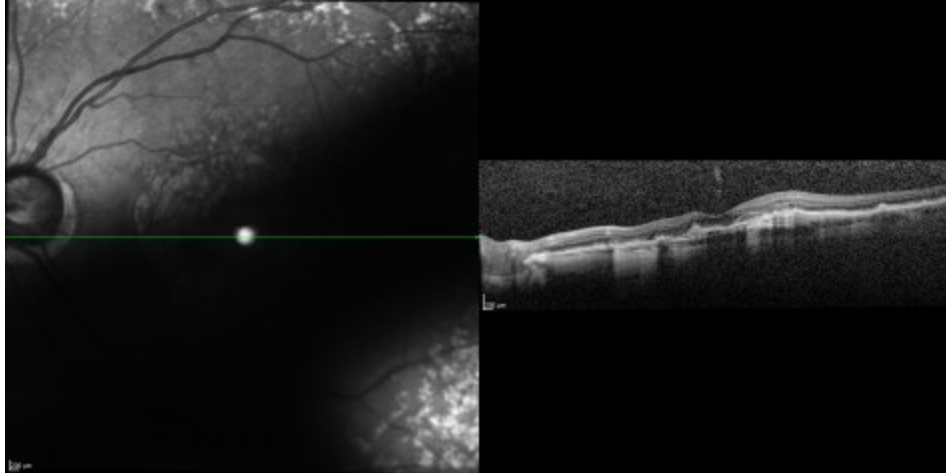
TECHNICAL TACTICS

CORONA FOG

JUNE 29, 2020 TIM BENNETT <http://eye-pix.com/corona-fog/>

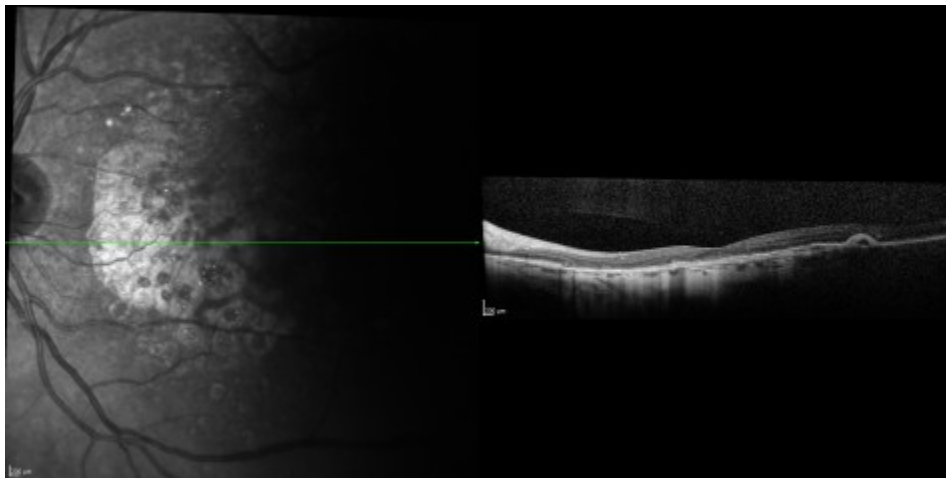
In the past month or so we've increased our testing volume after limiting patient visits during a government mandated stay-at-home order during the COVID 19 pandemic. As we've ramped back up, we've changed our procedures to limit the risk of transmitting the virus. We've instituted stringent cleaning protocols, and installed breath shields on some instruments. All clinical personnel now wear PPE (masks, goggles, gloves) and all patients are required to wear masks while in the clinic. We've adapted to this "new normal" pretty quickly and our testing volume is almost back to pre-pandemic levels.

Another part of our new normal is a novel clinical finding that seems to be related to the COVID 19 pandemic. Prior to the pandemic, I hadn't observed this finding. As our numbers increased, I started noticing artifacts that I couldn't immediately identify in IR fundus images using the Spectralis OCT. I'm wondering how many others in the field have noticed the same thing.

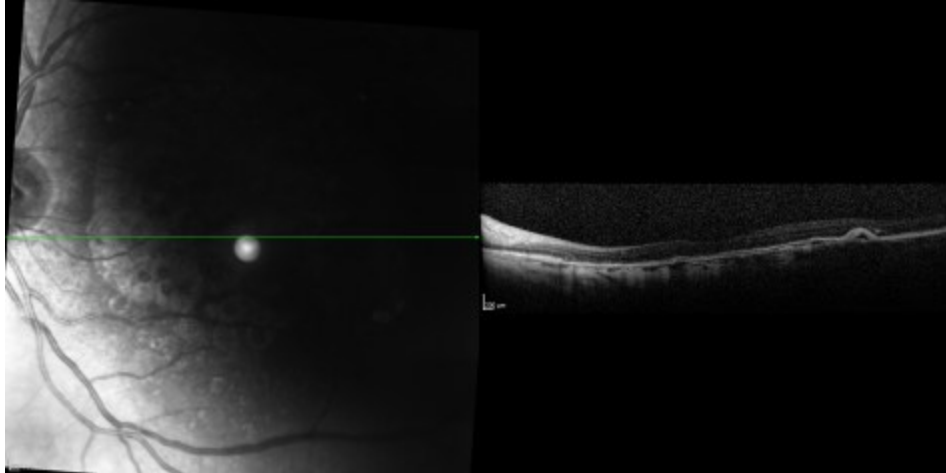


Prominent dark shadow in the infrared fundus image on the left made it challenging to get a good quality OCT image.

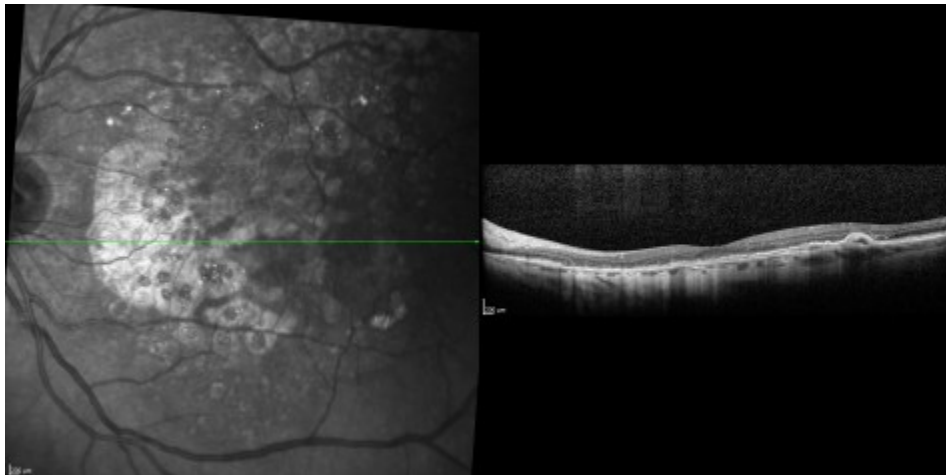
This patient came in two weeks ago. Here you see what appears to be vitreous hemorrhage or debris causing a dark shadow that obscures the view in the IR image. I really struggled to get good images. The OCT was adequate, but the accompanying IR fundus image was poor. Those of you that use the Spectralis know that any structure or pathology that is out of focus will typically appear dark because of the confocal pinhole that blocks scattered light from reaching the sensor. So it's not uncommon to have a compromised view like that if there are media opacities such as dense cataracts, corneal opacities or vitreous pathology, so I didn't think much of it at first.



But then just two patients later I saw a similar artifact. This time it changed in appearance while I was imaging and got progressively worse. I had the patient sit back and re-positioned.



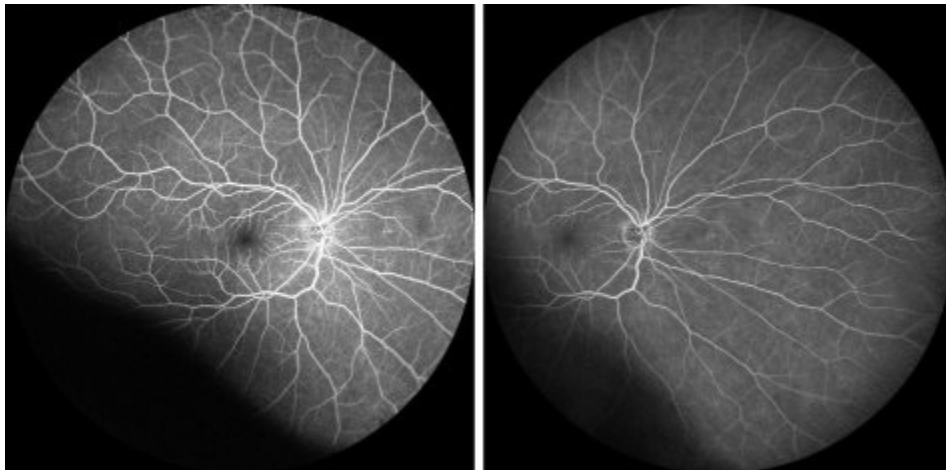
That seemed to improve the view, but within seconds it deteriorated again and got worse. It almost looked as if I were watching a vitreous hemorrhage occur live. I had the patient sit back yet again, waited several seconds, and resumed imaging. The artifact disappeared again!



Finally, I looked around the device at the patient's face to see if there was anything I was missing. And then I noticed it, the patient had an ill-fitting mask and was fogging the lens with her breath! The position of the mask forced her breath directly onto the lens surface of the Spectralis. Because of the confocal nature of the Spectralis, the pinhole aperture causes the artifact to appear dark rather than just a simple fogging seen with a slit lamp, fundus camera, or any other non-confocal device.



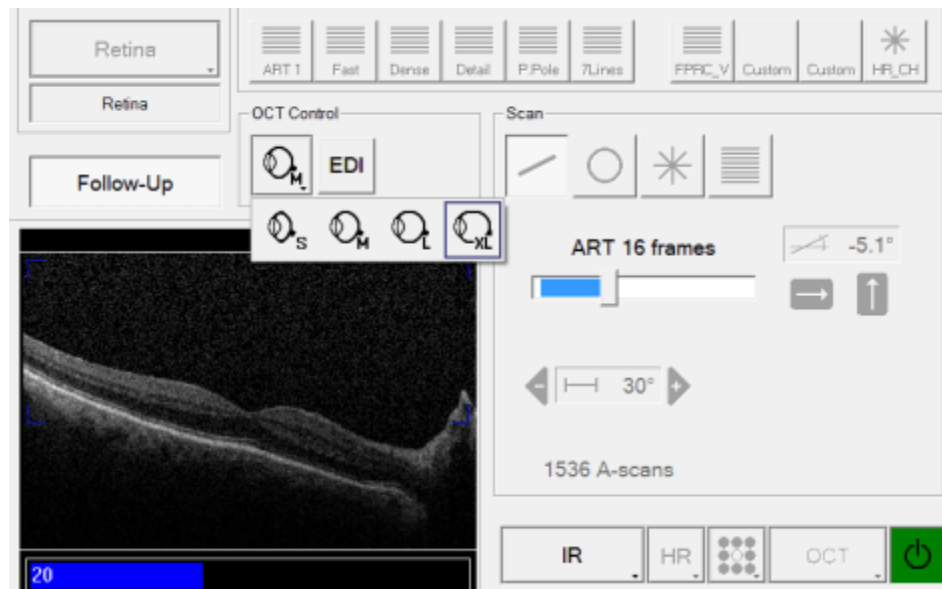
I asked a few of my astute imaging colleagues about this and a few had seen it but were initially stumped as well. Collectively we now believe we are seeing a new artifact related to patients wearing masks. One of my colleagues thought it was more prominent with the SPECTRALIS 102 degree wide angle lens. That may be because of the different working distance from the patient (closer).



Shadowing on a Spectralis fluorescein angiogram with 102 wide angle lens from breath fog. Image courtesy Gary Miller, CRA, OCT-C, FOPS

Looking back I realized that I had struggled with many patients during the peak of the lockdown. We were only seeing urgent/emergent patients at that time and were not routinely dilating patients in the interest of efficiency. So I assumed the darker fundus images were related to working with smaller pupils. It dramatically effects the confocal fundus image, but not always the OCT image because that component of the device is not confocal. The fogging seems to be more common with certain mask types or on days with high humidity.

Now when it occurs, I often just ask the patient to sit back for a few seconds until the fog clears and then resume imaging. Or we sometimes tape the top of the mask to the patient's nose and cheeks to direct their breath down or to the side.



Changing the OCT working distance to the XL setting may reduce the fogging by changing the angle/distance from the patient's mask.

Another trick is to change the OCT working distance (XL setting) as if you were trying to capture a longer eye. That effectively changes the angle between the patient's mask and the front element.

My colleague Gary Miller and I have been unsuccessfully trying to come up with a catchy name for this finding. Here are a few of our attempts, but they're all pretty lame.

- Corona Fog
- Pandemic haze
- Mask mist
- COVID condensation
- Masquerade artifact

Here are the current recommendations from Heidelberg on cleaning optical surfaces in their devices. These recommendations seem pretty universal and would likely be similar to those from other manufacturers as well.

SPECTRALIS Cleaning and Disinfection Quick Guide

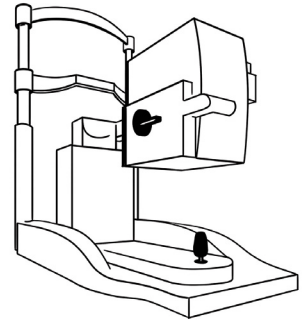
Heidelberg Engineering recommends to clean the device after each use and disinfect the device before and after each examination.

Where can I find instructions on how to clean/disinfect my SPECTRALIS?

The SPECTRALIS Product Family Hardware Manual fully addresses the cleaning and disinfection of both optical and non-optical surfaces. The SPECTRALIS Product Family Hardware Manual can be downloaded from our website:

<https://business-lounge.heidelbergengineering.com/redirect/service-support/user-manuals/>

You will be forwarded to the Business Lounge login page. Please log in with your Business Lounge user account to access the User Manuals page.



How should I clean/disinfect the optical surfaces of my SPECTRALIS?

Important Note:

- Always use special cleaning products for optics or pure alcohol, such as ethanol or isopropanol, with a minimum alcohol level of 99%.
- Never use cleaning products that contain methanol.
- Never use cleaning tissues or disinfectant wipes to clean the lens.
- Always use a microfiber cloth for cleaning.
- Never apply pressure while wiping.
- A scratched lens might lead to artifacts in images.
- When the device is not in use, protect the objective with the objective cover, and protect the device with the dust cover.



Cleaning:

- Remove the objective lens from the SPECTRALIS.
- Remove particles of dust and/or dirt with an air bulb.
- Clean the objective lens with gently circling movements using a dry microfiber cloth.

Disinfection:

- To disinfect the optical surfaces, use isopropyl alcohol with an alcohol level of 70% or ethanol with an alcohol level of 80%.
- To ensure decontamination, follow appropriate infection control guidelines regarding surface disinfectant contact times.
- At the end of contact time, check whether remnants of the disinfectant are visible on the optical surface.
- If there are remnants of the disinfectant, clean the optical surface by
 - using a clean, dry microfiber cloth to clean the objective lens with gentle circular movements.
 - trying to add a few drops of pure alcohol, such as ethanol, or isopropanol.



How should I clean/disinfect the non-optical surfaces of my SPECTRALIS?

Important Note:

- Clean and disinfect the non-optical surfaces of the device with a moist, not wet, cloth.
- Do not use products containing acetone or hydrogen peroxide.
- When the device is not in use, protect the objective with the objective cover, and protect the device with the dust cover.



Cleaning:

For cleaning, any standard cleaning product appropriate for plastic and metal surfaces which does not contain acetone or hydrogen peroxide may be used.

Disinfection:

In the USA, Heidelberg Engineering recommends Metrex CaviWipes® or other EPA registered disinfectants with comparable active substances. Outside the USA, Heidelberg Engineering recommends Descosept AF wipes, mikroqid® AF wipes, or comparable wipes with antibacterial, antiviral, and antifungal effects. Follow the instructions of the disinfectant wipes manufacturer. Do not use products containing acetone or hydrogen peroxide.

How should I clean/disinfect my SPECTRALIS touch panel?

Clean the touch panel with a moist, well wrung out microfiber cloth. Use a mild detergent for cleaning the touch panel.

Please do not use detergents containing organic solvents, e.g. acetone, or hydrogen peroxide when cleaning and disinfecting the touch panel as that may damage the touch panel's coating.

Otherwise, the same disinfecting instructions for non-optical surfaces (above) can be followed.