The COVID-19 Red Eye: An Algorithm for Differential Diagnosis and Management

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INTRODUCTON

As of October 5th, 2020, the world had recorded 36 million confirmed cases of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), with 237,302 of them in the Caribbean and 4,887 in Trinidad and Tobago. [1, 2] Novel coronavirus disease (COVID-19) can have various presentations not in keeping with its more common respiratory natural course. An uncommon presentation which has been reported originates in the eye in the form of keratoconjunctivitis.[3] Other presentations include myalgia, fatigue, sputum production, headache, haemoptysis, diarrhoea and loss of taste or smell.[4]

Why is conjunctivitis or redness of the eyes an important sign during this COVID-19 pandemic?

The involvement of the eye in this current COVID-19 pandemic should not be overlooked. In fact, an ophthalmologist was one of the first persons to recognize the outbreak of COVID-19. On December 30, 2019, Dr. Li Wenliang highlighted his findings to fellow doctors suggesting the emergence of a SARS-like illness in Wuhan, China, where he worked. He died on February 7, 2020, aged 33 years, after becoming infected with SARS-CoV-2.[5]

There are several published reports which suggest that SARS-CoV-2 can cause conjunctivitis. It may present as an early sign of the infection, or during the hospitalization period of those with more severe COVID-19. A review of data from 1,099 patients across 552 hospitals in China, published in the New England Journal of Medicine, reported the incidence of this unusual presentation as 0.8%.[6] Another case series reported ocular symptoms in 12 of 38 (31%) hospitalized patients in Hubei province, China. These symptoms included, hyperemia, chemosis, epiphora, or increased secretions. Of those patients with ocular manifestations, 16% tested positive for SARS-CoV-2 on reverse transcription polymerase chain reaction (RT-PCR) by conjunctival and nasopharyngeal swab.[7]

One case report by Cheema et al out of Canada, noted a patient who presented with symptoms of keratoconjunctivitis with lymphadenopathy as the initial presentation of COVID-19. This patient was initially diagnosed and managed as adenoviral

keratoconjunctivitis, but subsequently developed acute pharyngitis for which a nasopharyngeal swab was performed. Her nasopharyngeal swab was positive of SARS-CoV-2 and RT-PCR on her initial eye swab which was sent for gonococcal/chlamydial assessment was also positive for the novel coronavirus.[8]

Inflammation of the conjunctiva is not only thought to be a potential sign of SARS-CoV-2 infection, but the conjunctiva and, more specifically, the tears, may be a potential source of infection. The virus has been isolated in eye swabs in patients confirmed positive by nasopharyngeal swab.[8,9] Angiotensin-converting enzyme 2 (ACE2) receptors have been found to be integral in the virulence of this coronavirus. These receptors have been found in the conjunctiva and cornea.[9,10]

Viral conjunctivitis is a common, self-limiting, relatively low-risk diagnosis among differentials of the acute red eye. However, some of the other life or sight-threatening diseases associated with acute red eye such as acute angle closure glaucoma, corneal ulceration, acute iritis or scleritis, may be missed due to the concern of spreading the coronavirus. This trend has already been noticed in other fields. For example, a significant decline in the incidence of cancer has been noted, likely due to decreased screening when compared to pre-pandemic data.[11] In these unprecedented times, it is important to identify those patients with acute red eye who require further evaluation whether for SARS-CoV-2 or another potentially harmful condition, while minimizing exposure of health care workers.

Consider the following:

- Novel coronavirus (2019-nCoV) is a potentially life-threatening condition. According to the World Health Organization, globally there have been 1,054,868 COVID- 19 related deaths.
- Routine examination by the ophthalmologist utilizing slit lamp biomicroscopy, involves close face-to-face contact between patient and examiner (40-50cm). This places the ophthalmologist at high risk of exposure. Dr Li Wenliang, a Chinese ophthalmologist, who is remembered today as a 'whistleblower', died of 2019-nCoV.[12]
- Telemedicine and specifically teleophthalmology, involves the use of electronic communications and software to provide clinical services to patients without an in-person visit.
- Viral conjunctivitis (including that associated with 2019-nCoV) is self-limiting and usually runs a mild course, making it appropriate for remote consultation by telemedicine.
- Acute red eye has many differentials, some of which can result in significant morbidity if missed. Health care professionals should be confident in assessment of the acute red eye and make appropriate referrals to ophthalmology.

In light of the above considerations an assessment algorithm was formulated by doctors at the Port-of-Spain General Hospital eye clinic (Figure 1). This algorithm highlights specific symptoms associated with the acute red eye, which may indicate a high probability of a sight or life threatening diagnosis, requiring further assessment. Those patients deemed to have uncomplicated viral conjunctivitis can be reviewed via telemedicine, while those highly suspicious for SARS-CoV-2 are also swabbed and isolated. This algorithm was reviewed by nursing staff and the Port of Spain General Hospital Accident & Emergency Department physicians to obtain feedback and found to be easy to follow.

In conclusion, the acute red eye is a common condition. Not all patients presenting with red eye will have conjunctivitis. However, for those who do have conjunctivitis, SARS-CoV-2 must be a serious consideration. The ophthalmologist may not be the first health care professional evaluating such a patient. The Port of Spain General Hospital Eye Clinic's acute red eye assessment algorithm may be a valuable tool in diagnosis and management, in a primary care or accident and emergency setting. Our algorithm provides a safe process for both patient and health care professional.

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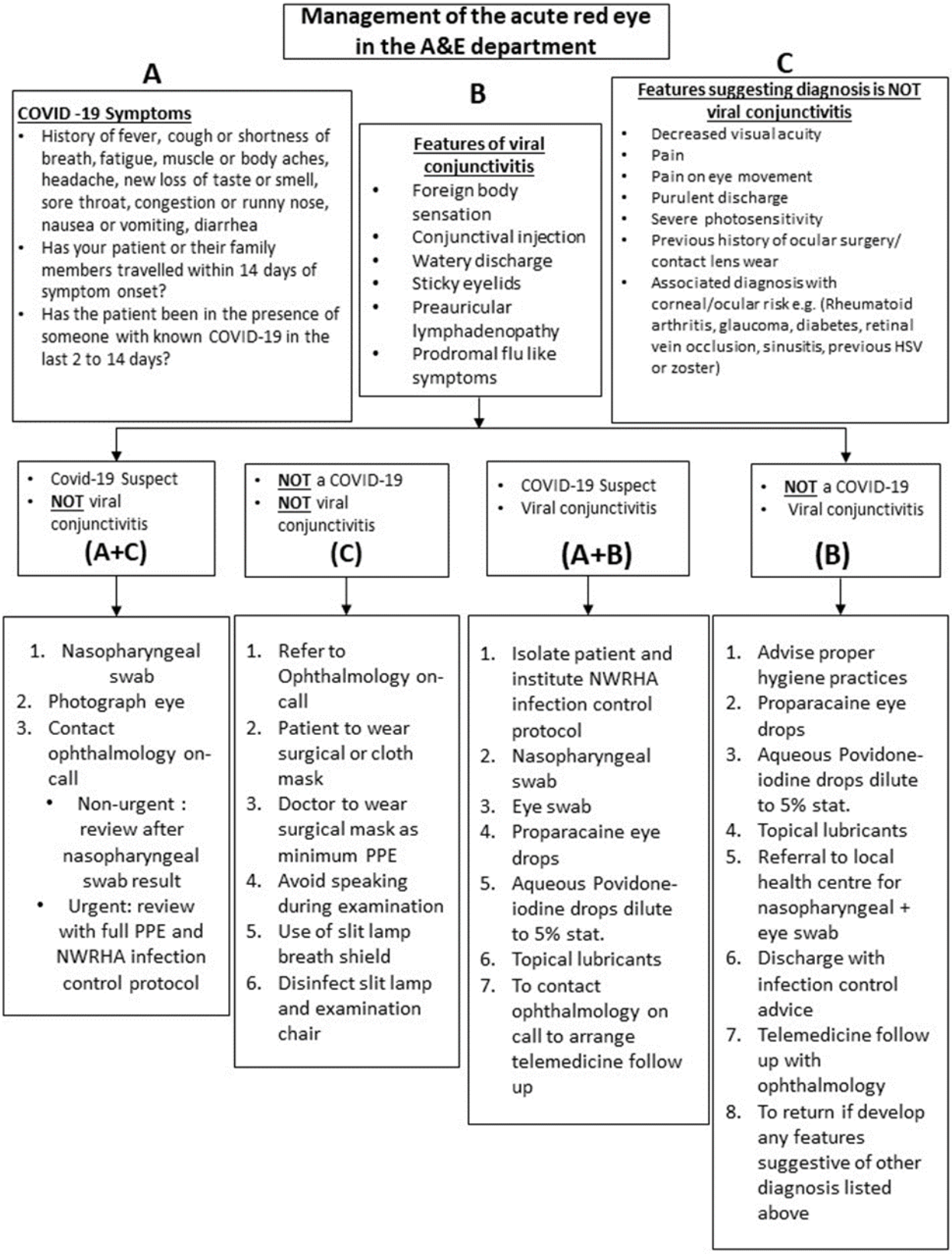
Figure 1.


Management of the acute red eye in the A&E department
A
COVID -19 Symptoms
• History of fever, cough or shortness of breath, fatigue, muscle or body aches, headache, new loss of taste or smell, sore throat, congestion or runny nose, nausea or vomiting, diarrhea
• Has your patient or their family members travelled within 14 days of symptom onset?
• Has the patient been in the presence of someone with known COVID-19 in the last 2 to 14 days?
B
Features of viral conjunctivitis
• Foreign body sensation
• Conjunctival injection
• Watery discharge
• Sticky eyelids
• Preauricular lymphadenopathy
• Prodromal flu like symptoms
C
Features suggesting diagnosis is NOT viral conjunctivitis
• Decreased visual acuity
• Pain
• Pain on eye movement
• Purulent discharge
• Severe photosensitivity
• Previous history of ocular surgery/ contact lens wear
• Associated diagnosis with corneal/ocular risk e.g. (Rheumatoid arthritis, glaucoma, diabetes, retinal vein occlusion, sinusitis, previous HSV or zoster)
• Covid-19 Suspect
• NOT viral conjunctivitis
(A+C)
1. Nasopharyngeal swab
2. Photograph eye
3. Contact ophthalmology on-call
• Non-urgent : review after nasopharyngeal swab result
• Urgent: review with full PPE and NWRHA infection control protocol
• NOT a COVID-19
• NOT viral conjunctivitis
(C)
1. Refer to Ophthalmology on-call
2. Patient to wear surgical or cloth mask
3. Doctor to wear surgical mask as minimum PPE
4. Avoid speaking during examination
5. Use of slit lamp breath shield
6. Disinfect slit lamp and examination chair
• COVID-19 Suspect
• Viral conjunctivitis
(A+B)
1. Isolate patient and institute NWRHA infection control protocol
2. Nasopharyngeal swab
3. Eye swab
4. Proparacaine eye drops
5. Aqueous Povidone-iodine drops dilute to 5% stat.
6. Topical lubricants
7. To contact ophthalmology on call to arrange telemedicine follow up
• NOT a COVID-19
• Viral conjunctivitis
(B)
1. Advise proper hygiene practices
2. Proparacaine eye drops
3. Aqueous Povidone-iodine drops dilute to 5% stat.
4. Topical lubricants
5. Referral to local health centre for nasopharyngeal + eye swab
6. Discharge with infection control advice
7. Telemedicine follow up with ophthalmology
8. To return if develop any features suggestive of other diagnosis listed above

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