

Case Report

Transient Myopic Shift and Coronavirus Disease-2019: A Case Report

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ABSTRACT

Since the emergence of coronavirus disease-2019 (COVID-19) and its declaration as a global pandemic, multiple ophthalmic manifestations secondary to this infection have been reported, ranging from conjunctivitis to more serious and vision impairing manifestations. In this case report, we present a case of transient myopic shift observed after COVID-19 infection, in an ophthalmology specialty hospital in Beirut, Lebanon, with a discussion of the possible causes based on literature review.

Keywords

COVID-19; SARS-COV-2; Pandemic.

INTRODUCTION

Since the beginning of the coronavirus disease-2019 (COVID-19) pandemic, the literature has been enriched with both pulmonary and extra-pulmonary manifestations of severe acute respiratory syndrome coronavirus-2 (SARS-COV-2) infection. Multiple ophthalmic manifestations secondary to this novel viral infection have been reported ranging from simple conjunctivitis to retinal vascular occlusions.¹ In this case report, we will be presenting a case of transient myopic shift observed after COVID-19 infection.

CASE PRESENTATION

A 25-year-old male patient, known to our facility, presented to the Advanced Eye Care Hospital, Beirut, Lebanon, on 11/12/2020, with new onset of blurry vision for distance of 3-weeks duration. Patient has no past medical history and denies the use of any medication during the past few weeks. He reported having a seropositive COVID-19 infection on the first week of November 2020 with mild symptoms that were completely resolved within 10-days. A glimpse about the history of the patient reveals that he is a known myope with a previous manifest refraction of; OD: -4.50+0.50×180 20/20, OS:-4.75+0.50×165 20/20. Visual acuity was measured by an optometrist in the hospital using a phorop-

ter. The patient underwent a refractive surgery (Laser-Assisted In Situ Keratomileusis) at our facility on the 10th of April 2020 with a smooth and uncomplicated recovery. One month post LASIK, the patient's autorefractometry results were OD: -0.50+0.50×168, OS: +0.75 +0.25×8 with an uncorrected visual acuity of 20/20 in both eyes.

On December 2020, about 3-weeks after his symptoms resolved, the patient presented complaining of a progressive decrease of distance vision where examination showed an uncorrected visual acuity for far of OD: 20/150++ and OS 20/30--. Manifest refraction done: OD: -2.00 +1.25×10 20/40 and OS: -0.50 +0.50×175 20/20-. Cycloplegic refraction *via* a phoropter using cyclopentolate 1% showed: OD: -1.75 +1.00×10 20/20 and OS: -0.50 +1.00×170 20/20-. Slit lamp examination using direct illumination revealed bilateral superficial punctate keratitis with lenticular changes suggestive of lens swelling, more prominent in the right eye compared to the left one. Fundus exam using a 90D lens was insignificant and intraocular pressure, measured via Goldmann applanation tonometry, was normal. The patient was put on extensive lubrication and told to return one week later.

On follow-up, patient's symptoms started to improve with an uncorrected visual acuity of 20/40 in the right eye and 20/20 in the left eye. Manifest refraction repeated for the right eye:

-1.50 +1.00×15 20/20. Slit lamp examination showed decreased superficial punctate keratitis bilaterally as well as the lenticular changes previously seen in the right eye with complete resolution of the left lenticular changes. The remaining of the ophthalmic exam was insignificant. The patient was prescribed topical loteprednol 0.5% twice per day for one month in addition to extensive use of artificial tears and was instructed to follow-up within one month.

The patient was lost to follow-up and didn't show up to our facility until 3-months later on 26/3/2021. His uncorrected visual acuity was significantly improved reaching 20/25 in the right eye and remaining 20/20 in the left eye as in the previous exam. Cycloplegic refraction for the right eye yielded the following: -0.25 +0.50×10 20/20. Slit lamp examination was within the normal limits and showed complete resolution of the lens swelling in both eyes with improved tear film in both eyes. The rest of the ophthalmic exam was normal. The patient was instructed to keep using preservative free artificial tears at least four times per day.

RESULTS

No images using the slit lamp nor specialized lenticular or anterior segment imaging were obtained since at the time of presentation, we did not expect the case to be related to any sequelae of the COVID-19 infection. The build-up of the theory and thus this case were presented in the aforementioned parts.

DISCUSSION

Several references and studies have illustrated multiple causes of transient myopic shifts. These include the development of nuclear sclerotic cataracts, lens swelling secondary to metabolic changes as in diabetes and galactosemia, medication related, and nearwork-induced transient myopia.²

Refractive changes to myopia can be explained by the development of a nuclear sclerotic cataract, independently whether there was any previous refractive error.³ Diagnosis is made through slit lamp examination, and correction of this refractive error is made through cataract extraction surgery.

Several researches have been conducted to study the effect of blood glucose level on the refractive power of the eye, the earliest being done by Duke-Elder in 1925, which demonstrated that variations in blood sugar may induce myopic or hyperopic changes.⁴ Mechanism of myopia include osmotic changes affecting lenticular hydration secondary to plasma glucose dysregulation. Hyperglycemia in lens causes shunting of glucose metabolism into aldose reductase pathway causing sorbitol accumulation.⁵ The latter is osmotically active and is weakly permeable through lens membranes, leading to its accumulation in the lens. This creates an osmotic gradient between lens and aqueous humor resulting in lenticular swelling and thus a shift to myopia.

Many case reports have illustrated a relationship between transient myopia and medications like tetracycline,⁶ sulfonamides (acetazolamide and topiramate), cold and flu medications,⁷ celoxo-

cib⁸ and insulin.⁹ This can be further explained by three proposed mechanisms. The first is related to lenticular swelling causing increased refractive power of the lens,⁹ the second is attributed to swelling and rotation of the ciliary body causing increased lens curvature thus forward displacement and rotation of the lens iris diaphragm,^{7,10} and the third proposed mechanism is explained by the persistent contraction and spasm of the ciliary muscles leading to relaxation of zonular fibers and increased refractory power of the lens.⁹

An observation of transient myopic shift in a patient with Dengue fever secondary to infection with flavivirus has been reported.¹¹ The patient was found to have new onset myopic shift few days after the onset of fever, with further investigations using anterior segment optical coherence tomography and ultrasound biomicroscopy showing anterior bowing of the lens and suprachoroidal effusion.¹¹ The proposed mechanism may be related to a virus induced inflammatory process causing dysregulation in capillary protein permeability. This induces accumulation of proteins in the extravascular space resulting in suprachoroidal effusion thus anterior displacement of lens-iris diaphragm, along with ciliary body edema,^{12,13} leading to increased lens thickness and ultimately myopic shift.

In a separate case series, hospitalized patients with nephropathia epidemica were assessed for ophthalmic manifestations, out of which 8.1% were found to have transient myopic shift.¹⁴ Imaging modalities such as ultrasound and keratometry were recruited and showed that myopic change is caused by variations in three parameters: lens position, in specific anterior displacement of lens iris diaphragm, thickness of lens by steepening the anterior and posterior curvatures, and corneal curvature by steepening of the corneal surface.¹⁴ Evidence suggest that the Puumala virus multiplies in the endothelial cells,¹⁵ causing modification in permeability of vessels and thus edema of the ciliary body, as well as changes in osmolarity of the aqueous and the lens.¹⁴ All these changes can explain the myopic changes observed in these patients. Changes in refraction have been reported to be bilateral, while asymmetry was observed in renal manifestations.

In this case report, the patient presented with blurry vision few weeks after COVID-19 recovery. Refraction measurements at presentation compared to previous measurements revealed a new onset of bilateral myopic shift which was more prominent in the right eye that could not be explained by lenticular changes suggestive of cataract, nor by the recent use of medications around the period of his presentation. We reviewed the literature in an attempt of finding any association between COVID-19 infection and myopic changes; however, no case reports nor explanations related to this observation were reported. In our case report, we raise the assumption of the existence of a relationship between transient myopic shift and a recent infection with COVID-19 through a mechanism that is yet to be determined based on further similar observations, detailed imaging of lens and anterior segment, and closer follow-ups. Proposed associations may be attributed to events that accompany COVID-19 infection, like transient hyperglycemia, autonomic dysregulation or inflammation causing alterations in lens-iris diaphragm. We cannot confirm that

COVID-19 infection and its systemic manifestations are behind such an observation since the patient presented post recovery and our data collection was done retrospectively with limited investigations and supportive imaging data.

LIMITATIONS

Limitations of this report include the scarcity of similar cases and the non-availability of imaging to further support a certain hypothesis about the pathophysiology. The main aim of this paper is to draw attention on ocular manifestations of COVID-19 and shed lights on the importance of investigations upon similar presentations in order to confidently draw conclusions about myopic shifts and COVID-19 infection.

CONCLUSION

In this paper, we present the case of a 25-year-old male patient who came for blurry vision post COVID-19 infection and was found to have a transient myopic shift, which could not be explained by any known cause of myopic shift. Further similar observations with closer clinical follow-up and detailed imaging are highly needed to confidently draw a link between COVID-19 infection and myopic shifts.

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AVAILABILITY OF MATERIAL AND DATA

All work was done using Advanced Eye Care Hospital assets; data is confidential to the hospital.

CONSENT

The consent of the patient has been obtained prior to initiating this case report, with data provided being confidential.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

REFERENCES

- Honavar SG, Sen M, Sharma N, Sachdev MS. COVID-19 and eye: A review of ophthalmic manifestations of covid-19. *Indian J Ophthalmol.* 2021; 69(3): 488-509. doi: 10.4103/ijo.IJO_297_21
- Ong E, Ciuffreda KJ. Nearwork-induced transient myopia: A critical review. *Doc Ophthalmol.* 1995; 91(1): 57-85. doi: 10.1007/BF01204624

BF01204624

- Lin H-Y, Chang C-W, Wang H-Z, Tsai R-K. Relation between the axial length and lenticular progressive myopia. *Eye (Lond).* 2005; 19: 899-905. doi: 10.1038/sj.eye.6701690
- Duke-Elder WS. Changes in refraction in diabetes mellitus. *Br J Ophthalmol.* 1925; 9(4): 167-187. doi: 10.1136/bjo.9.4.167
- Gabbay KH. The sorbitol pathway and the complications of diabetes. *N Engl J Med.* 1973; 288: 831-836. doi: 10.1056/NEJM197304192881609
- Edwards TS. Transient myopia due to tetracycline. *JAMA.* 1963; 186(1): 69-70. doi: 10.1001/jama.1963.63710010026022a
- Zeng R, Li Y-P, Chen C-L, et al. Non-prescription cold and flu medication-induced transient myopia with uveal effusion: case report. *BMC Ophthalmol.* 2019; 19(1): 136. doi: 10.1186/s12886-019-1137-7
- Kingston E, Darian-Smith E, Brothers A, Bank A. Medication induced transient myopic shift. *AMJ.* 2021; 14(3): 80-83. doi: 10.35841/1836-1935.14.3.80-83
- Kaimbo DKW. Transient drug-induced myopia. *SAJ Case Reports.* 2014; 1: 105. doi: 10.18875/23757043.1.105
- Bovino JA, Marcus DF. The mechanism of transient myopia induced by sulfonamide therapy. *Am J Ophthalmol.* 1982; 94(1): 99-102. doi: 10.1016/0002-9394(82)90199-4
- Fang HM, Ng OT, Agrawal R. Myopic shift in a patient with dengue fever. *Ocul Immunol Inflamm.* 2021; 1-3. doi: 10.1080/09273948.2021.1985523
- Ikeda N, Ikeda T, Nagata M, Mimura O. Pathogenesis of transient high myopia after blunt eye trauma. *Ophthalmology.* 2002; 109(1): 501-507. doi: 10.1016/S0161-6420(01)00995-2
- Kim SI, Cha YJ, Park SE. A case report on the change of the refractive power after a blunt trauma. *Korean J Ophthalmol.* 2008; 22(1): 53-57. doi: 10.3341/kjo.2008.22.1.53
- Kontkanen M, Puustjärvi T, Lähdevirta J. Myopic shift and its mechanism in nephropathia epidemica or puumala virus infection. *Br J Ophthalmol.* 1994; 78(12): 903-906. doi: 10.1136/bjo.78.12.903
- Cosgriff TM. Mechanism of disease in Hantavirus infection: Pathophysiology of hemorrhagic fever with renal syndrome. *Rev Infect Dis.* 1991; 13(1): 97-107.