Evaluation the Eye Defects Post Covid-19

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Abstract
Background : Covid-19: During a very short period of time following its outbreak, the illness COVID-19 has reached pandemic levels. Via direct contact with an infected person's secretions or by inhaling droplets containing SARS-CoV-2, it is mostly spread from person to person. Whether the virus can spread through tears is a subject of debate. Having an exposed eye surface can make it easier to contract respiratory illnesses and spread them. Purpose: to evaluate the intra ocular pressure (I.O.P), retinal thickness and macula thickness in patients after infected of corona virus. Methods: in all, 100 eyes of post-covid-19 patients and 50 eyes of subjects from control groups were enrolled our study BCVA, intra ocular pressure (IOP) measurement, OCT images, including retinal thickness and macula thickness. For statistical analysis, parameters each eye from subject individual were taken. Result: in the measurement parameter, I.O.P ($p<0.05$) is strong significant with covid-19 but no significant correlation in retinal and macula thickness ($p=0.62$). were observed. Conclusion: optical coherence tomography (O.C.T) examination did not detect any significant changes in retina thickness and macula thickness due to COVID-19. While non-contact tonometer examined find significant change in intra ocular pressure (I.O.P) due to COVID-19.
Keywords: COVID-19; optical coherence tomography; macula; retina; COVID-19; SARS-CoV-2.

1. Introduction

In December 2019 Wuhan, Hubei province, People's Republic of China, saw the first detection of the new coronavirus known as SARS-CoV-2. Although COVID-19 is primarily characterized by respiratory symptoms, a number of extrapulmonary symptoms have also been reported. They include gastrointestinal, cardiovascular, neurological, dermatological, renal, and ophthalmic problems, among others [1, 2, 3]. It has been established in the literature that ACE2 is a SARS-CoV-2 receptor. This is important from an ophthalmological perspective since the choroid and the retina both contain ACE and ACE2 receptors [4]. With a low prevalence of symptoms relating to the anterior portion of the eye, such as dry eyes, foreign-body sensation, conjunctivitis, redness, and hazy vision, ocular disorders during the course of COVID-19 infection are rather infrequent [5]. There haven't been many investigations done to evaluate the microvascular findings in COVID-19 patients' choroid and retina. A noninvasive imaging method that enables the creation of detailed images of the retina is optical coherence tomography (OCT). Due to the development of OCT angiography, retinal and choroidal vasculature can now be seen for a number of years without the need of contrast [6,7]. Recent scientific publications describe anomalies in individuals after SARS-CoV-2 infection compared to a control group, including an increase in RNFLT, retinal vessel enlargement, and lower vessel density of the superficial and deep retinal capillary plexus. With the aid of optical coherence tomography, this study evaluated the I.O.P, retinal thickness and macula thickness in a group of post-COVID-19 participants in an effort to detect the presence of potential ophthalmological problems.

2. Materials and methods

The College of Medicine/Al-Nahrain University University's bioethical council gave its approval to this cross-sectional study. this study enrolled 50 patients and 100 eyes. The patients were after being infected with the coronavirus and classified as mild, moderate, or severe. Adult patients with a history of symptomatic SARS-CoV-2 infection, confirmed by a positive test result via PCR of a nasopharyngeal swab sample, and a recovery time of 1-4 months. Patients aged under 30, patients with a history of symptomatic SARS-CoV-2 infection without a positive PCR test result; with severe general conditions, including acute respiratory distress syndrome (ARDS), myocarditis, cardiac arrhythmia, respiratory insufficiency, and kidney or multiple organ failure; or unable to take part in the study or suffer any chronic diseases were excluded. Examinations were performed after isolation due to COVID-19 disease or after hospitalization in the ophthalmology department of the Baghdad teaching hospital. For each patient a detailed medical history including ophthalmic data, systemic

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diseases, ocular symptoms, and hospitalization, The PCR result was either provided by the patient before examination or was available in their medical history from the hospital. The control group consisted of healthy students and employees of the same Hospital in Baghdad without a history of symptoms indicating COVID-19 infection and with a negative PCR test result. Both groups underwent complete ophthalmic examination, including a visual acuity test, which was measured in a logMAR scale, intra ocular pressure (IOP) measurement, slit-lamp examination, and OCT of the macula and retina. intra ocular pressure (I.O.P) is measured with a non-contact (air-puff) tonometer, which measures the time it takes for a given force of air to flatten a specific portion of the cornea. No anesthetic drops are required because the tool does not make contact with the patient's cornea. Except at the extremes of intraocular pressure, these devices' readings are quite similar to those acquired by Goldman applanation tonometry. scan each from retinal thickness and macula thickness were examined by O.C.T (Nidek, made in Japan, 2020). The light used most frequently is near-infrared light, which can penetrate tissue up to several hundred microns thick. order to detect any abnormalites macula thickness, and retinal thickness. The arithmetic average was taken from all measurements. the intra ocular pressure (I.O.P), retinal thickness and macula thickness were analyzed in comparison to those of the control group.

3. Results

This study comprised 50 patients and 100 eyes were included in the study group, for age (30-80) years while 25 patients and 50 eyes were included in the control group. In all, 25 men and 25 women who had been infected with COVID-19 participated in the analysis. While the control group consisted of 13 and 12 males and females, respectively. The mean age ±SD of participants was (53.44 ± 10.912). There was no difference in the age of men vs. that of women in our study.

The COVID-19 group was divided into 26 patients who suffered from only fever (mild), and 14 patients unhospitalized and reported anosmia and ageusia (moderated). and oxygen was supplemented to 10 patients (severe). (Table 1).

Table 1 Qualitative demographic data
numbers eye
covid-19 100
control 50
gender male female
covid-19 25 25
control 13 12
type of covid-19 mild moderate severe
26 14 10

the mean was I.O.P(18.37 ± 4.244) non-contact tonometer revealed changes in I.O.P in 25 patients: 11% of patients with mild corona suffered high I.O.P while 18% of patients with moderated corona suffered high I.O.P and all patients with severe corona is high I.O.P (figure 1) the I.O.P is significant with covid-19 (p<0.01). (Table 2).

Table 2 correlation between covid-19 & I.O.P			
		COVID-19	Glaucoma
COVID-19	Pearson Correlation	1	.628**
	Sig. (2-tailed)		0.000
	N	50	100
Glaucoma	Pearson Correlation	.628**	1
	Sig. (2-tailed)	0.000	
	N	50	100
**. Correlation is significant at the 0.01 level (2-tailed).			

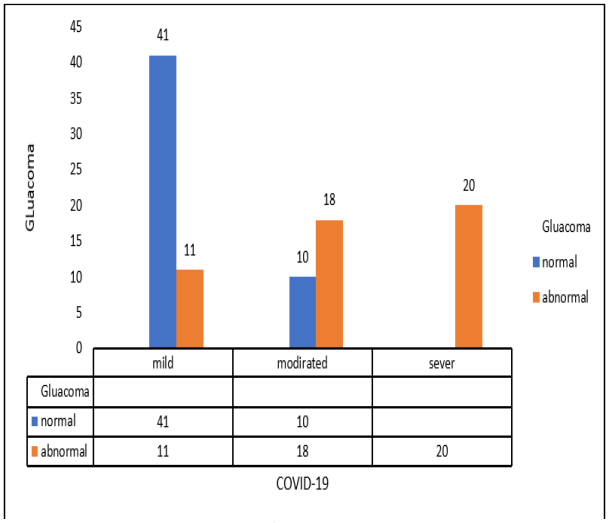

Figure (1) The number of patients with mild, moderated and sever of covid-19 who developed I.O.P.

In O.C.T examination not an occurrence of any abnormalities in the retina and macula. except one patient present was found to have abnormal retinal thickness and macula thickness. (figure2,3). the retinal thickness and macula thickness are not significant with covid-19 (p=0.390) (Table 3,4).

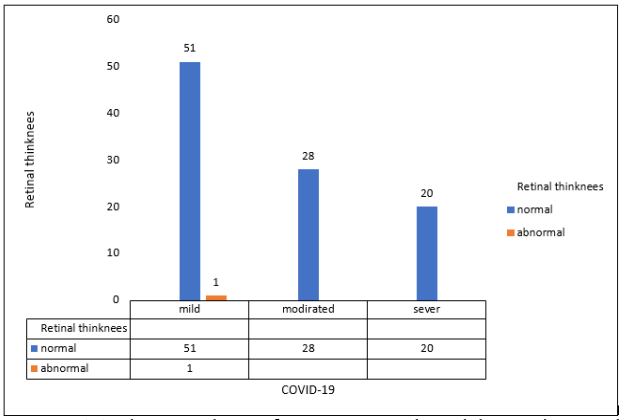

Figure (2) The number of patients with mild, moderated and sever of covid-19 who developed retinal thinknees.

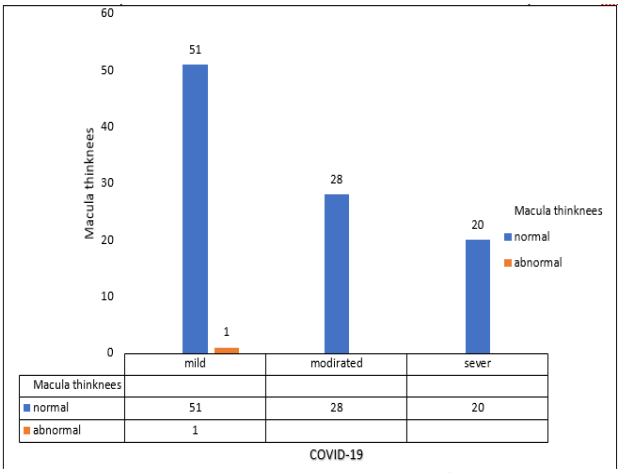

Figure (3) The number of patients with mild, moderated and sever of covid-19 who developed macula thinknees.

Table 3 relation between covid-19 & Retinal thinknees			
		COVID-19	Retinal thinknees
COVID-19	Pearson Correlation	1	-0.087
	Sig. (2-tailed)		0.390
	N	50	100
Retinal thinknees	Pearson Correlation	-0.087	1
	Sig. (2-tailed)	0.390	
	N	50	100

Table (4) relation between covid-19 & Macula thinknees			
		COVID-19	Macula thinknees
COVID-19	Pearson Correlation	1	-0.087
	Sig. (2-tailed)		0.390
	N	50	100
Macula thinknees	Pearson Correlation	-0.087	1
	Sig. (2-tailed)	0.390	
	N	50	100

4. Discussion

As the COVID-19 epidemic began, reports of numerous problems that are not just respiratory-related have been recorded. The SARS-CoV-2 virus has been found in the tears of infected patients, and it is known to cause ocular-surface disorders like chemosis, epiphora conjunctival congestion, mild eyelid edema, a burning sensation in the eye, a feeling of a foreign body in the eye, and episcleritis. The frequency of these ocular findings has been found to vary greatly across studies [5,8,9,10,11]. Several of these symptoms were seen in our study as well, and they are comparable to those of prevalent ocular disorders with viral causes. Furthermore, there is significant debate about whether SARS-CoV-2 affects the retina and choroid in light of the fact that ACE2, a viral receptor, has been discovered in these tissues [12,13,14].

In a recent study, Ílen Ferreira Costa, et. al. In this study, individuals who recovered from COVID-19 with a mean recovery time of 82 36.4 days from the disease's inception had their ocular findings reviewed. identified mean tonometry varying from 12.00 to 14.37 mmHg The intraocular pressure (IOP) was statistically different when comparing severe and critical groups.[15]. We found this in our study as well There are theories on whether SARS-CoV-2 produces asymptomatic ocular microangiopathic disease because of the higher risk of blood clotting abnormalities seen during COVID-19 infection [16]. In a recent study, Mojtaba Abrishami, et. al. in this investigation there were 60 healthy controls (120 eyes) and 30 cases (60 eyes). In total, 17 (28.3%) eyes in the patient group showed at least one abnormal finding indicated by macular SD-OCT imaging including hyperreflective lesions in different retinal layers, and their OCT findings resembled those with pachychoroid spectrum. There were no statistically significant variations in retinal layers or thickness. Moreover in a study performed on 156 eyes of post-COVID-19 patients and 98 eyes of subjects from a control group. BCVA, intraocular pressure (IOP) measurement, fundus examination, and OCT images, including macular thickness, and OCT-RNFL were performed for both groups. The writers explained There were no discernible variations in the assessed parameters, including central macular thickness ($p = 0.249$) and RNFL ($p = 0.104$). this is what our study proved.[17,18] Additionally, Gozde Aksoy Aydemıra et. al. may 2021 This study included 60 eyes of 60 subjects; 35 of them were in the COVID-19 group and the remaining 25 were in the control group. Patients with the diagnosis of COVID-19 that had a negative result after treatment were included in the study The mean value of central macular thickness was significantly higher in the

COVID-19 group than in the control group (p = 0.02) [19]. Despite these findings of the SARS-CoV-2 infection altering the retinal capillary microvasculature, our study did not find any variations in central macular thickness or RNFL thickness between the study and control groups. The scope of our investigation has a number of restrictions. The main drawback is the variable disease severity, which could have affected the findings. Also, we did not have access to the findings of tests conducted before the condition manifested itself. As a result, we were unable to determine if the measurements of OCT and I.O.P changed following the COVID-19 infection. Also, we were unable to check individuals while they were infected, so some visual symptoms might have gone unnoticed. However, given that we have not observed any changes in OCT in 1-4 months, it is also plausible to believe that these patients did not have abnormalities before to the disease, and if there were any changes during infection, they would have occurred during infection rather than prior to the disease.

5. Conclussion

To conclude, in our study, we did observe intraocular pressure disturbances caused by COVID-19. However, OCT imaging did not detect any abnormalities in the retinal thickness or macula thickness. It is challenging to say with certainty whether SARS-CoV-2 is accountable for any changes in the choroidal or retinal vasculature in light of the numerous investigations that have already been published and provided data from OCT, I.O.P., and fundoscopic inspection. Hence, additional research involving more patients is required, with a particular emphasis on the disease's active stage.

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