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Risk and Assessment of COVID-19 in a Retina Ophthalmologic Setting

Abdulaal M[2], Robertson JA [1,3], Moore MT [1,4] and Coney JM[1*]

[1]Retina Associates of Cleveland Inc., USA

[2]University Hospitals, USA

[3]University of Wisconsin-Madison, USA

[4]The University of Maryland, USA

1. Abstract

Objective/Purpose: To evaluate risks and impacts of COVID-19, SARS-CoV-2, on a private retina practice in Ohio and share initial strategies and guidelines to maintain a sustainable and safe practice.

Design: A retrospective analysis was performed using outpatient clinic logs for patients seen during the first 10 weeks of 2020 and for 10 weeks during the COVID-19 pandemic.

Methods: The number of visits, intravitreal injections and surgeries were analyzed for before and during the COVID-19 pandemic. Measures conducted initially to reduce the spread of COVID-19 and maintain pre-pandemic clinical care levels were discussed.

Results: During the first month, there was a 57% decrease in the average number of visits (1147 SD±168, P= 0.001). Visit numbers steadily increased, especially after initiating COVID-19 testing to staff, to reach 2010 visits per week by the end of the study. Surgical cases saw a 40% drop in the first month post-pandemic. Mostly the decrease of surgeries was with epiretinal membrane peel surgeries (60% decrease). Surgical case numbers in the following weeks improved reaching similar averages by the end of the study, 43 *vs.* 39.8 (SD±11 cases, respectively) per week. Similarly, intravitreal injections during the first month of the pandemic averaged 852 (SD±122) per week and by the last 4 weeks of the study, the number of injections averaged 972 (SD±142) per week. During the pandemic, 69% (149) of employees received the antibody test. Five employees tested positive and were required to take 2019-nCoV RT-PCR test. Only one tested positive and was immediately quarantined for two weeks.

Conclusion: The decrease in visits and surgeries during the early stages of the pandemic was reversed by the completion of the study. Initiation of frequent, rapid and early COVID-19 testing to staff, in addition to implementing preventive measurements in clinics, were essential to establish a safe clinical environment.

2. Introduction

The COVID-19 pandemic, which is caused by the novel coronavirus SARS-CoV-2, was first reported in China on December 31, 2019 [1]. It is the newest and one of the most contagious pathogens in the last 10 years which is mainly transmitted through direct or indirect contact of infected people or contaminated surfaces [2]. Respiratory droplets (>5 µm) produced by talking and coughing are inhaled into the lungs and is the primary source of transmission [2]. Early studies showed that

***Corresponding author:** Coney JM, Partner at Retina Associates of Cleveland, Inc. 3401 Enterprise Parkway, Suite 300; Cleveland, Ohio 44122, USA, Fax: 216-831-1959; Tel: 216-831-5700; Email: retina@retina-assoc.com

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SARS-CoV-2 could present at the surface of the eye [3]. Additionally, a recent report demonstrated that the ocular surface tissue from non-SARS-CoV-2 does express specific cell surface-associated receptors that facilitate viral entry [4]. These new findings add more evidence that the eye can be a source of both transmission and infection in asymptomatic/ symptomatic carriers [4]. Ophthalmologists, particularly retina specialists, are at high risk to be exposed to the COVID-19 virus. On March 18, the American Academy of Ophthalmology issued a statement recommending all ophthalmologists to immediately cease providing any treatment other than urgent care. However, many retina specialists continued office appointments for acute issues and intravitreal treatments for sight-threatening retinal conditions that require frequent follow-ups and long-term management. Additionally, many of the retinal surgeries are considered urgent such as retinal detachments, endophthalmitis and complications from diabetic retinopathy. Any delay in the management of these eyes can result in permanent loss of vision. This paper reviews our experience at a private retina practice in Northeast Ohio. We propose the measures that can be taken in order to reduce the spread of the virus and maintain a similar clinical care level to the period before the pandemic. Institutional Review Board (IRB) approval was obtained.

3. Risks of COVID-19 Transmission in Outpatient Eye Clinics

Since COVID-19 is a highly contagious pathogen, multiple studies demonstrated the presence of the virus in the ocular surface with a potential risk of transmission. Ophthalmologists have been infected during routine visit [5]. Retina outpatient clinics face unique challenges to provide a safe and comprehensive medical care for patients during the pandemic. Age-related macular degeneration and diabetic retinopathy were the two main causes for retina-based appointments according to a large database study of electronic medical records from retina practices in the United States [6]. Most of these patients are elderly with multiple comorbidities. This group of patients belong to the high-risk population of COVID-19 [7]. Furthermore, many of the retinal conditions are sight-threatening and require frequent visits and treatments. Treatments such as laser therapy and intravitreal injections require close proximity with patients. For all these reasons, non-pharmaceutical interventions (NPI), hygiene recommendations and personal protective equipment (PPE) are essential to contain the viral spread.

4. Recommended Protocols in Outpatient Clinics

Patient Triage and Workup

Retina Associates of Cleveland, Inc. owns and operates out of 27 offices. Thirteen of those offices are the main offices, while fourteen are satellite offices. During the government shutdown (March 23 to May 1, 2020), only the main thirteen offices were used. All routine follow-up appointments were rescheduled unless the patients were experiencing new symptoms or complaints that required an urgent exam. However, patients that required treatment or urgent follow-ups were contacted and their appointments were kept after updating them about the new safety measures being taken. Patients in need of a retina consultation were asked triage questions by phone before scheduling the appointment. Any patient that experienced positive symptoms, like fever, runny nose, cough, loss of smell, loss of taste, diarrhea, or was exposed recently within 14 days to COVID-19 positive contacts, were asked to reschedule the appointment.

All patients in the clinic were asked to have their temperature checked, use hand sanitizer and to wear a face mask. Patients were not permitted to bring a guest to the appointment unless they required wheelchair assistance, suffered from dementia, were under the age of eighteen, or required a language translator. The waiting areas were redesigned to apply the six feet social distancing requirements mandated by the state of Ohio. Sneeze guard shields were installed in the reception area. A recent study showed that the survival of SARS-CoV-2 is 4 hours on copper up to 24 hours on cardboard, 3

days on steel and 1 day on plastic [8]. Therefore, it is crucial to perform appropriate sanitation of the potentially contaminated surface. In between patients, exam rooms were thoroughly disinfected. Physicians and technicians wore face masks and gloves during the entire workday. Telemedicine and remote appointments were started initially for 11 patients in the early stages of the pandemic. However, due to the nature pathology of the retinal complaints that require a comprehensive ophthalmic and fundus exam to rule out any serious and sight threatening conditions we decided to see patients in need of retinal evaluation in the clinic.

Test for Healthcare Providers

Recent studies showed that up to 80% of COVID-19 patients are asymptomatic or mildly symptomatic [9]. To decrease any chance of spreading the disease in the clinics among staff members and patients, all employees were offered COVID-19 antibodies test, even if they were asymptomatic. All COVID-19 antibodies tests were performed using Rapid lateral flow immunoassay (LFIA) devices to provide a quick and accurate testing [10]. The sensitive and specific antibody assay is 96.1% and 96.7% respectively [11]. All antibody tests were performed by a physician assistant and an observer to verify results. Any positive samples were confirmed by the 2019-nCoV RT-PCR test. Out of the 216 employees, sixty-nine percent (149 employees) voluntarily received the antibody test during the first two months of the pandemic. Five staff members tested positive for the antibodies and were required to take 2019-nCoV RT-PCR test. Of those five employees, only one tested positive for the virus who was working also in the emergency room as physician assistant and was immediately sent to quarantine for two weeks.

Respiratory Protection and Eye Protection

All staff members were required to wear a surgical or cloth face mask at all times in order to reduce the viral load and prevent a potential viral spread by asymptomatic COVID-19 carriers. All surgical face masks should be discarded by the end of the day and all cloth face masks are sanitized on a daily basis. All slit lamps devices were provided with plastic breath shields. For healthcare workers that are involved in intravitreal injections, KN95 face respirators were required due to the nature of these procedures that require close proximity with patients. Eye protective shields were made available, but not mandatory.

5. Recommended Protocols in the Outpatient Surgery Center

Surgery Scheduling and Sanitation

All patients who required surgical treatment were asked triage questions by phone before scheduling the surgery. All patients were required to perform COVID-19 PCR testing within one week of the scheduled surgery. All patients also were asked to bring one family member with them on the day of surgery. They were asked to wait outside of the building during the surgery and they were notified to pick up the patient after the procedure when ready to be transported into the car with assistance by the nurse. All surfaces that can be contaminated during the preparation of surgery were cleaned by sodium hypochlorite or ethanol (70%). Surgical teams in the operating rooms were assigned to specific rooms to limit any risk of virus exposure. Standard surgical techniques and precautions were adhered to. All physician assistants and surgical assistants were required to wear surgical face masks at all time.

Impact on Outpatient Clinic Workflow

A retrospective analysis of the outpatient clinic log was done via the electronic medical records (MDI, Nextech, Tampa, FL, USA). The number of in-person clinic visits in the period 10 weeks before and 10 weeks during the COVID-19 pandemic were collected. In the first 10 weeks of the year 2020, the average number of in-person clinic visits was 2205 (SD±250) per week. However, in the first month of the pandemic, there was a dramatic decrease in the average number of visits by 57% (1147 SD±168, P= 0.001; Mann-Whitney U test) compared to the pre-pandemic period. During the second month of the study, the number of visits steadily increased, especially after initiating COVID-19 testing to staff members. The number of visits in the last week of May was similar to the average number before the pandemic (2010 weekly

visits) (Figure 1).

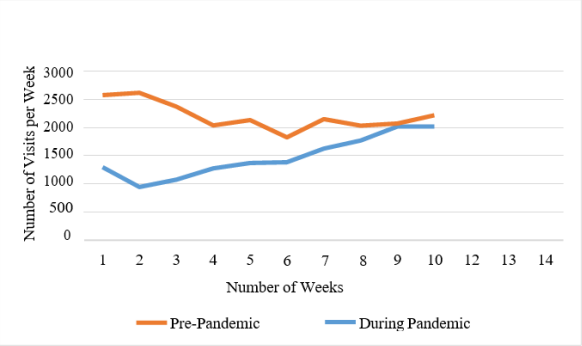

Figure 1: Comparison in the Number of In-person Visits Pre-pandemic and During COVID-19 Pandemic. Pre-pandemic, January 1st-March 15th, 2020, an average of 2,205 (SD±250) in- person clinical visits a week were conducted. During the pandemic, March 16th- May 31st, 2020, an average of (1147 SD±168, P= 0.001; Mann-Whitney U test) in-person visits were conducted.

In the first 10 weeks of 2020, the average number of intravitreal injections was 1025 (SD±112) per week. Despite the marked reduction during the in-person visits over the first month of the pandemic, the average number of weekly intravitreal injections dropped by 17% (852 SD±122 injections, P= 0.03 Matt-Whitney U test). Additionally, at week five of the pandemic, the number of intravitreal injections increased and matched the average number of injections before the pandemic (1024 injections).

By the end of the study, the average number of intravitreal injections for the entire 10 weeks during the pandemic was 972 (SD±142 injections, P=0.6), which represents only a 5% decrease compared to the period before the pandemic (Figure 2).

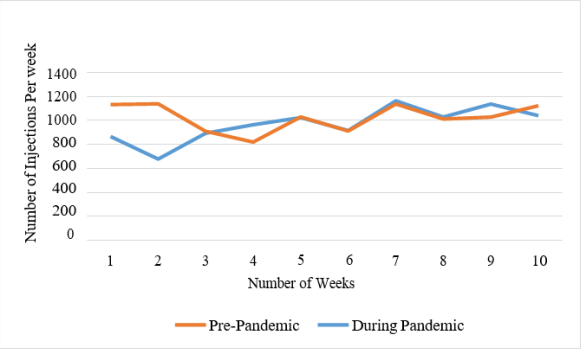

Figure 2: Comparison in the Number of Intravitreal Injections Between Pre-pandemic and During Pandemic. Intravitreal injections dropped 17% (852 SD±122 injections, P= 0.03 Matt-Whitney Utest) during the first 10 weeks of the COVID-19 pandemic, March 16th-May 31st, 2020. Compared to the pre-pandemic, January 1st- March 15th, 2020, weekly average of 1025 (SD±112) per week.

Impact on Operative Workflow

Overall, the entire practice experienced an average decrease of 40% in the number of surgical cases per week in the first month of the pandemic (P=.0.3 Matt-Whitney U test). Surgeries performed during the government shutdown on March 23rd until the end of April were considered essential surgeries, such as retinal detachments, vitreous hemorrhages and macular holes. Some surgeries that may typically not be considered essential were argued as essential if it had a significant impact on the patients' day to day activities. These decisions were up to the discretion of the physician and medical director of the surgical center.

Similar to the outpatient practice pattern, despite the initial reduction in the surgical cases during the first month of the pandemic, it was noted that there was a positive trajectory in the number of surgical cases in the following weeks. The number of surgeries in the last week of May was similar to the average number of cases before the pandemic, 43 *vs.* 39.8 (SD±11 cases, respectively) per week (Figure 3).

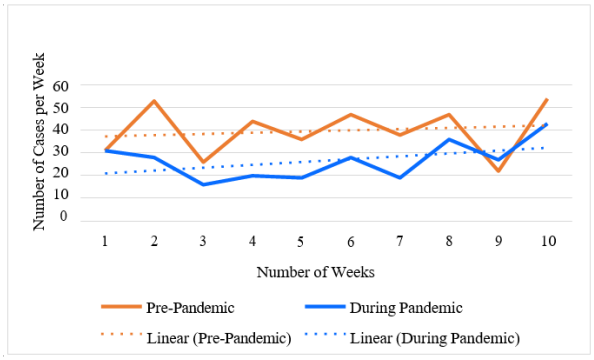

Figure 3: Comparison in the Number of Surgical Cases Pre-pandemic and During COVID-19 Pandemic. The practice saw a 40% decrease in the number of surgical cases during the pandemic,March 16th- May 31st, 2020 (P=.0.3 Matt-Whitney U test). Average number of cases before the pandemic, January 1st-March 15th, 2020, 43 *vs.* 39.8 (SD±11 cases, respectively) per week.

The surgical practice varied before and during the pandemic. The most common causes of surgeries during the whole study period were as follows: retinal detachments, epiretinal membrane (ERM) and vitreous hemorrhages. The average number of retinal detachment repair surgeries in January and February was 58.5 (SD±0.7) cases per month. In the first two months of the pandemic, the average number of retinal detachment

surgeries decreased to 51 (SD±0) cases per month, which represents a 25% decrease compared to the pre-pandemic period. Similarly, the number of vitreous hemorrhage surgeries declined by 35% in the first two months of the pandemic. However, the majority of re-scheduled surgeries were ERM peels, a profound reduction (60%) in the average number, during the pandemic compared to prior (17.5 SD±6.3 *vs.* 43.5 SD±0.7 cases per month respectively) (Figure 4). However, the surgery numbers increased in all categories to match their average numbers before the pandemic in the last month of the shutdown (Figure 4).

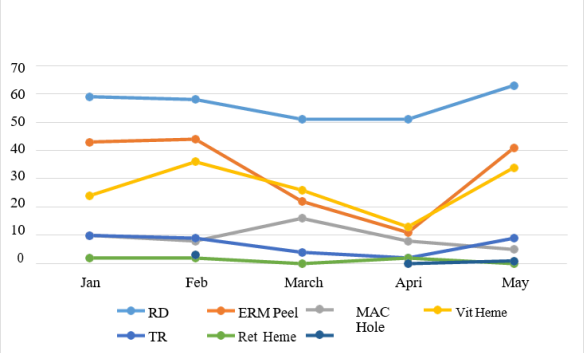

Figure 4: Number of Top Five Causes of Surgery During the Period of the Study. Retinal Detachment (RD) repairs averaged 58.5 (SD±0.7) cases per month in the first 2 months of 2020. RD repairs decreased to 51 (SD±0) during the first two months of the pandemic.

Vitreous hemorrhage (Vit Heme) surgeries declined 35% during the pandemic. Epiretinal Membrane Peel (ERM Peel) surgeries dropped 60% during the pandemic (17.5 SD±6.3 *vs.* 43.5 SD ±0.7 cases per month respectively), primarily due to rescheduling.

6. Discussion

We have presented our retina practice's early experience during the COVID-19 pandemic by documenting how and to what extent the outpatient and surgical workflow have been altered. Overall, our report has highlighted the significant decrease in our outpatient census in the early phase of the pandemic with a concomitant gradual increase in the visits afterwards. Although the initial number of outpatient visits declined in the early stages of the pandemic by 54%, the average number of intravitreal injections did not change in a similar pattern. This represents the importance of patients' triage and prioritizing patients that require more urgent treatment, especially in the early period of the pandemic. More importantly, this gave us an insight on how patients prioritize their eyesight. They cautiously attended their follow-up appointments to maintain their intravitreal injections to preserve their vision. This was surprising since the majority of patients are elderly and are considered to have the greatest risk of mortality if they contracted the virus. Similarly, most of the surgical procedures in the early stages of the pandemic were performed for more urgent cases such as retinal detachment repairs and blinding diabetic vitreous hemorrhages, with a significant decline in ERM peels. However, the overall number of surgical cases started to increase to match the numbers before the pandemic.

Several studies shows that the median early SARS-CoV-2 humoral response and IgM detection is 5 days after symptom onset and IgG is detected at a median of 14 days after symptom onset [12]. WHO and CDC does not recommend the use of antibody testing solely for the diagnosis of COVID-19 infection. However, it is used mainly to evaluate populations and for people who are at risk to be exposed to the virus especially among health care providers [13,14]. The most common rapid diagnostic tests (RDTs) currently are using a lateral flow assay (LFA) technology. The lateral flow immunoassay works via capillary action whereby the sample can be taken from finger prick or a blood drop. Compared to RT-PCR assays, the detection of antibody assays are often faster, less expensive, easy-to-use and accessible to staff without laboratory training [12]. The initiation of frequent, rapid and early COVID-19 testing to the staff members in addition to implementing clear sanitation and applying preventive measurements in all clinics were essential to establish a safe clinical environment while optimizing care.

Although we instituted a virtual telehealth option for our patients, it was underutilized and not as helpful in evaluating retina conditions. Only 11 patients took advantage of this option. Implementing this technology for elderly patients with retinal complaints has its limitations, including adequate internet and broadband access, hearing difficulties and smartphone or computer access. Additionally, most of the retinal complaints necessitated comprehensive fundus exams that cannot be

achieved with virtual visits. All patients with valid complaints or concerns, where triaged for an in-office appointment.

Our early evaluations have demonstrated no notable increased rates of morbidity along with our patients, with no known transmission of COVID-19 between patients and providers. Although there is a steady increase of COVD-19 cases in Northeast Ohio, we did not see any increase of COVID-19 cases within the staff. This could be due to the health protocols put in place. We plan to continue to closely monitor outpatient clinic and operative workflows daily during the coming months to help identify subtle spikes in COVID-19 positivity that might portend a future surge.

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