**Research Article**

# A Prospective Review of Patients Receiving Intravitreal Anti-VEGF: How are we doing during the SARS-Cov-2 Pandemic?

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## Abstract

**Objective:** During the SARS-CoV-2 pandemic, service provision of Anti-Vascular Endothelial Growth Factor (anti-VEGF) therapy is continued to prevent severe visual loss. As the majority of the patients requiring intravitreal anti-VEGF are elderly and vulnerable, we aim to assess the safety and efficacy of the delivery of anti-VEGF therapy.

**Method:** A prospective data collection of 337 patients who attended the nurse led injection clinics in the UK during the lockdown period from 30 March 2020 to 1 June 2020. A follow up of all of the attended patients was conducted to assess for diagnosis of SARS-CoV-2.

**Results:** 182 (54%) were female and 155 (46%) male. Majority (95%) were Caucasian and 5% were Asian ethnicity. The indication for anti-VEGF injection include wet age related macular degeneration (wet AMD) (70.9%), Diabetic Macular Oedema (DMO) (17.2%), and Retinal Vein Occlusion (RVO) (11.9%). Mean age was 78.84±9.76 for wet AMD, 67.63±3.26 for RVO and 59.28±14.54 for DMO. More wet AMD patients reported subjective deterioration of vision compared to RVO and DMO (40.2% *vs.* 37.5% *vs.* 22.4%) [P=0.04]. Chronic Obstructive Pulmonary Disease (COPD) is more common in the wet AMD group as compared to other groups (P=0.03). Five patients from the study group were tested for SARS-CoV-2, none were positive.

**Conclusion:** Delivery of anti-VEGF therapy is safe with the current precautionary measures despite caring for a vulnerable group of patients. Majority of the wet AMD patients are continuing to attend intravitreal injection appointments.

## Introduction

The Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) is an enveloped RNA β-coronavirus believed to have originated from bats and transmitted to humans *via* an unknown intermediate host. Due to its high infectivity the SARS-CoV-2 managed to spread rapidly across multiple countries in a short period of time in early 2020, posing a global threat to public health [1-3]. The international pulmonologist's consensus on COVID-19 reports incubation between 2 to 14 days following exposure, with most cases occurring within 5 days. Most common clinical features include fever, fatigue, dry cough, myalgia, dyspnea, anosmia and loss of taste. Although a majority of the infected patients do not require hospitalisation, 10-20 % of patients are admitted to ICU, up to 10% of patients require intubation with up to 5% mortality rate. Risk factors include elderly, male and persons with multiple medical comorbidities such as chronic pulmonary disease, cardiovascular disease, diabetes and chronic kidney disease [4]. According to Raznaq et al, cardiovascular diseases put patients at highest risk for complications with SARS-CoV-2. The most deprived patients are almost twice more likely to be admitted to ICU. Black, Asian and Minority Ethnic population have higher mortality rates with 1.5 times more likely in Indian populations, 2.8 times higher in Pakistani populations, 3 times higher in Bangladeshi populations and 4.3 times higher in black African populations [5]. This analysis may however be confounded by other factors such as patient comorbidities, multiple long term conditions, housing challenges, the use of public transport to their essential work, and the appropriate use of personal protective equipment at workplace. According to a survey data of resident physicians in New York, specialties at highest risk of contracting the SARS-CoV-2 are anaesthesiology, emergency medicine and ophthalmology [6]. The close proximity during an ophthalmic examination on a slit lamp, frequent exposure to ocular discharge, and the utilisation of reusable equipment such as tonometer, lenses, and indirect ophthalmoscope explains the risk to Ophthalmologists [2,6]. Nonetheless, ophthalmologists are continuing to treat patients with sight threatening conditions to prevent undesirable long-term outcomes including irreversible sight loss.

In this study we aim to assess the safety of the delivery of anti-VEGF therapy during the duration of lockdown in the UK and to assess the potential consequences of vulnerable patients attending clinic appointments during the pandemic.

During the study period, certain precautions have been put in place in the eye clinic to minimise risk to patients and staff including:

- The reduction in the number of individuals in the waiting

area (visitors encouraged not to attend; staggered and deferred routine patient appointments).

- Anti-VEGF appointments triaged accordingly and continued.

- Temperature and symptom monitoring on arrival.

- Patients provided with surgical facemask on arrival. Technique of appropriate use demonstrated. Patients are advised not to touch their masks unnecessarily.

- Meticulous hand sanitation.

- Regular sanitisation of 'high touch' surfaces including door handles, surfaces and instrumentation.

- Two meters distancing between all individuals in the waiting area with plastic guards at reception counters.

- The use of fluid resistant facemasks for all staff in the department.

- The use of gloves when administering topical eye drops.

- The use of FFP-3 masks and face guard by nurse injectors during administration anti-VEGF therapy.

- Letters sent to all patient advising to defer appointments if they have signs and symptoms of SARS-CoV-2, recent foreign travel or exposed to symptomatic individuals or individuals diagnosed.

- All patients were advised risk and benefits of attending the clinic during the pandemic.

## Methods

We conducted a prospective study of 337 patients who attended the nurse led injection clinic in Outpatient Eye Clinic, Royal Blackburn Hospital, East Lancashire Teaching Hospital NHS Trust during the lockdown period in the UK from the 30 March 2020 to 1 June 2020. A proforma was used to collate demographic detail, evidence of SARS-CoV-2 symptomology, reasons for anti-VEGF therapy, and systemic comorbidities including immunosuppression. Sunquest ICE web-based service was used four weeks following their attendance to determine if these patients have been tested for SARS-CoV-2, the reasons for their test, and their outcome.

Statistical analysis was performed to analyse the data, descriptive data was presented as mean ± Standard Deviation (SD) whilst quantitative data was expressed as a percentage. Chi-squared test was used to compare all the categorical variables and One-way ANOVA was used to compare the continuous variables between three different sample groups. The level of significance was set at 2-tailed $P<0.05$.

## Results

### Demographic detail

During the study period, 432 appointments were sent out with an attendance rate of 78.0%. The remaining 95 patients deferred anti-VEGF treatment.

Of all 337 patients who attended:

- 182 (54%) were female and 155 (46%) were male with a mean age of 74.14±13.51 years old.

**Table 1:** All patients who attended the nurse administered injection clinic in East Lancashire Teaching Hospital NHS Trust.

| Demographic: | All (n=337) |
|---|---|
| Age | 74.14±13.51 |
| Gender, n (%): | |
| Male | 155 (46) |
| Female | 182 (54) |
| Ethnicity, n (%) | |
| White | 320 (95) |
| Asian | 17 (5) |
| Vision LogMAR (Right eye), Mean (SD) | 0.460±0.362 |
| Vision LogMAR (Left eye), Mean (SD) | 0.446±0.353 |
| Diagnosis, n (%): | |
| Wet AMD | 239 (70.9) |
| DMO | 58 (17.2) |
| RVO | 40 (11.9) |
| Is The Injected Eye The Better Eye, n (%): | |
| Yes | 95 (28.2) |
| No | 181 (53.7) |
| NA (Injection in both eyes) | 45 (13.4) |
| Equal VA in both eyes | 16 (4.7) |
| Those with BE injection, better eye VA worse / = 1.0, n (%) | 2 (0.6) |
| Those with BE injection, better eye VA better / = 0.2, n (%) | 9 (2.7) |
| Worse Than /= 1.0 Vision In Better Eye, n (%) | 4 (1.2) |
| Better than/=0.2 in better eye, n (%) | 15 (4.5) |
| Visual Symptom, n (%): | |
| Stable | 213 (63.2) |
| Recent deterioration | 124 (36.8) |
| Which Eye, n (%): | |
| Left | 141 (41.8) |
| Right | 151 (44.8) |
| Both | 45 (13.4) |
| Systemic Disease, n (%): | |
| HTN | 129 (38.3) |
| Diabetes | 108 (32.0) |
| COPD | 38 (11.3) |
| Asthma | 35 (10.4) |
| Bronchiectasis | 5 (1.5) |
| Heart Failure | 16 (4.7) |
| Recent Hospital Admission | 14 (4.2) |
| Previous Pneumonia | 18 (5.3) |
| Immunocompromised | 6 (1.8) |

- A majority of 320 (95%) were Caucasian and 17 (5%) Asian ethnicity.

- Mean Visual Acuity (VA) on LogMAR VA chart was 0.460±0.362 for the right eye and 0.446±0.353 for the left eye.

**Table 2:** Comparison between patients with wet AMD, RVO and DMO.

| | All | Wet AMD | RVO | DMO | P Value |
|---|---|---|---|---|---|
| | n=337 | n= 239 | n=40 | n=58 | |
| Age | 74.14±13.5 | 78.84±9.76 | 67.63±13.26 | 59.28±14.54 | <0.001 |
| Gender: | | | | | <0.001 |
| Male | 155 (46.0) | 94 (39.3) | 24 (60) | 37 (63.8) | |
| Female | 182 (54.0) | 145 (60.7) | 16 (40) | 21 (36.2) | |
| Ethnicity | | | | | <0.001 |
| White | 320 (95.0) | 236 (98.7) | 37 (92.5) | 47 (81.0) | |
| Asian | 17 (5.0) | 3 (1.3) | 3 (7.5) | 11 (19.0) | |
| Vision LogMAR (Right eye) | 0.460±0.362 | 0.522±0.371 | 0.317±0.306 | 0.314±0.286 | <0.001 |
| Vision LogMAR (Left eye) | 0.446±0.353 | 0.501±0.364 | 0.343±0.369 | 0.297±0.218 | <0.001 |
| Is The Injected Eye The Better Eye: | | | | | <0.001 |
| Yes | 95 (28.2) | 81 (33.9) | 6 (15) | 8 (13.8) | |
| No | 181 (53.7) | 121 (50.6) | 29 (72.5) | 31 (53.4) | |
| NA (Injection to both eyes) | 45 (13.4) | 26 (10.9) | 1 (2.5) | 18 (31.0) | |
| Equal VA in both eyes | 16 (4.7) | 11 (4.6) | 4 (10) | 1 (1.7) | |
| Those with BE injection, better eye VA worse/ = 1.0 | 2 (0.6) | 2 (0.8) | 0 | 0 | 0.662 |
| Those with BE injection, better /= 0.2 | 9 (2.7) | 2 (0.8) | 0 | 7 (12.1) | <0.001 |
| Worse Than /= 1.0 Vision In Better Eye | 4 (1.2) | 4 (1.7) | 0 | 0 | 0.435 |
| Better than/=0.2 in better eye | 15 (4.5) | 12 (5.0) | 1 (2.5) | 2 (3.4) | 0.709 |
| Visual Symptom: | | | | | 0.0421 |
| Stable | 213 (63.2) | 143 (59.8) | 25 (62.5) | 45 (77.6) | |
| Recent deterioration | 124 (36.8) | 96 (40.2) | 15 (37.5) | 13 (22.4) | |
| Which Eye: | | | | | <0.001 |
| Left | 141 (41.8) | 106 (44.4) | 17 (42.5) | 18 (31.0) | |
| Right | 151 (44.8) | 107 (44.8) | 22 (55) | 22 (37.9) | |
| Both | 45 (13.4) | 26 (10.9) | 1 (2.5) | 18 (31.0) | |
| Systemic Disease | | | | | |
| HTN | 129 (38.3) | 77 (32.2) | 38 (95) | 14 (24.1) | <0.001 |
| Diabetes | 108 (32.0) | 41 (17.2) | 9 (22.5) | 58 (100) | <0.001 |
| COPD | 38 (11.3) | 34 (14.2) | 2 (5) | 2 (3.4) | 0.0272 |
| Asthma | 35 (10.4) | 30 (12.6) | 1 (2.5) | 4 (6.9) | 0.0964 |
| Bronchiectasis | 5 (1.5) | 5 (2.1) | 0 | 0 | 0.352 |
| Heart Failure | 16 (4.7) | 12 (5.1) | 2 (5) | 2 (3.4) | 0.875 |
| Recent Hospital Admission | 14 (4.2) | 13 (5.4) | 0 | 1 (1.7) | 0.201 |
| Previous Pneumonia | 18 (5.3) | 15 (6.3) | 2 (5) | 1 (1.7) | 0.379 |
| Immunocompromised | 6 (1.8) | 5 (2.1) | 0 | 1 (1.7) | 0.71 |

The indication for intravitreal anti-VEGF therapy include wet AMD (70.9%), Diabetic Macular Oedema (DMO) (17.2%), followed by Retinal Vein Occlusion (RVO) (11.9%). 95 (28.2%) patients received injection in their 'better eye', 181 (53.7%) in their 'worse eye', and 45 (13.4%) received intravitreal treatment to both eyes. The remaining 4.7% had equal VA in both eyes. Of the 95 patients who received injection to their 'better eye', 4 (4.2%) had VA worse than or equal to 1.0 LogMAR, and 15 (15.8%) had VA better or equal to 0.2 LogMAR. Of the 45 patients who received intravitreal anti-VEGF to both eyes, 2 (4.4%) patients have VA worse or equal to 1.0 LogMAR in their better eye and 9 (20%) have VA better or equal to 0.2 LogMAR in their better eye. In terms of visual symptoms, 213 (63.2%) reported stable vision and 36.8% reported recent deterioration of vision subjectively. In terms of systemic comorbidities, over one-third (38.3%) of the patients have hypertension, 32.0% have diabetes, 11.3% COPD, 10.4% asthma, 1.5% bronchiectasis, 4.7% heart failure, 5.3% previous pneumonia and 1.8% immuno-compromised as shown in Table 1.

## Comparing patients with wet AMD *vs.* RVO *vs.* DMO

Mean age was 78.84±9.76 years for wet AMD patients, 67.63±13.26 years for RVO patients and 59.28±14.54 for DMO patients. 98.7% of wet AMD patients were Caucasian as compared to 92.5% RVO and 81.0% DMO (P<0.001) as shown in Table 2. In terms of gender distribution, there were more female in the wet AMD group as compared to RVO and DMO groups (60.7% *vs.* 40.0% *vs.* 36.2%) [P<0.001]. 33.9% AMD patients received injection in their better eye as compared to 15% RVO and 13.8% DMO (P<0.001). More patients in the wet AMD group reported subjective deterioration of vision as compared to the RVO and DMO groups (40.2% *vs.* 37.5% *vs.* 22.4%) [P=0.04]. The incidence of hypertension was the highest in the RVO group (95.0%) followed by wet AMD (31.9%) and DMO (24.1%) [P<0.001].

## Comparing ethnicity

We had a total of 320 Caucasians and 17 Asians during the duration of study. Mean age was 74.74±13.27 years for Caucasians and 62.77±13.26 years for Asians (P<0.001). Most of the Caucasian patients received treatment for wet AMD (73.8% *vs.* 17.6%) whereas most of the Asian patients received treatment for DMO (64.7% *vs.* 14.7%) [P<0.001] as shown in Table 3. Only 29.4% Caucasian patients had diabetes as compared to 82.4% Asian patients (P<0.001).

## SARS-CoV-2

13/337 (3.9%) patients attended the clinic with symptoms including 10 patients with long-standing cough and three with shortness of breath, none of which was tested nor diagnosed with SARS-CoV-2. Five patients from the study group were tested for SARS-CoV-2 due to various reasons as shown in Table 4, none of which was tested positive. Patient no. 2 in Table 4 had unfortunately developed pneumonia with clinical evidence of SARS-CoV-2 despite three negative swabs, three weeks following his visit to our clinic. The patient subsequently recovered and was discharged home. We note that none of the patients who attended on the same day were tested nor diagnosed with SARS-CoV-2. The likelihood of acquiring infection from our clinic is therefore minimal.

## Discussion

During the pandemic, the Royal College of Ophthalmologists (RCOphth) produced clinical guidance for the management of ophthalmology services, with the aim of prioritising patients with sight or life threatening conditions and to defer routine appointments and surgeries. With regards to anti-VEGF treatment, patients should continue to receive treatment especially those with wet AMD. Anti-VEGF appointments for patients with DMO and RVO should be deferred unless they have active proliferative retinopathy [7]. The Bright Focus Foundation and American Macular Degeneration Foundation have also advised patients to attend their anti-VEGF appointments as missing injections will lead to poorer visual outcomes [8,9].

As a majority of our patients receiving anti-VEGF therapy are elderly and vulnerable it is vital that measures are put in place to ensure the safety of all of the patients and staff in the eye clinic. It is also important that both clinicians and patients can balance the risk of life-threatening infections such as the SARS-CoV-2 versus the risk of sight threatening condition like wet AMD and, therefore, patients

should be triaged accordingly. With regards to Personal Protective Equipment (PPE), the American Academy of Ophthalmology has recommended the use of N95 mask (or a surgical mask if in short supply) and eye protection for the injector, and a surgical mask for the patient due to the close-proximity of the procedure [10,11]. An ophthalmology department in Hong Kong that has gone through the largest outbreak of Severe Acute Respiratory Syndrome (SARS) in the world in 2003 has also recommended the use of eye protection, surgical mask, gown and gloves as a universal precautionary measure during the outbreak [12]. During the course of our study, we have implemented precautions outlined in the 'introduction' section to maximise the safety of the delivery of anti-VEGF therapy during the outbreak. As SARS-CoV-2 is shown to have a significant environmental resistance and is able to survive in different biological fluids and secretions, appropriate virucidal disinfection wipes should be used to clean 'high touch' surfaces in the department [13,14]. Further, viral RNA is found in conjunctival secretions of patients with SARS-CoV-2 despite having no ocular manifestation [15]. Geller and colleagues recommended the use of povidone-iodine or a combination of chlorhexidine with ethanol and cetrimide against the SARS-CoV [16]. Other alcohol-based solutions like isopropanol or ethanol are also recommended agents. [13,16] During the course of our study, surfaces were cleaned with 'Sani-Cloth AF Universal Wipes' (product code: XP00391) by PDI containing Didecyldimethylammonium chloride, which has proven to be effective against the coronavirus [17,18].

We noted that the rate where patients choose to defer their appointment due to the pandemic is higher in the DMO and RVO patient group as compared to the wet AMD group. Only (98/172) 57.0% patients from the DMO and RVO patient group attended anti-VEGF therapy as recommended by clinicians as compared to (239/260) 91.9% patients from the wet AMD group. In total, (22.0%) patients deferred their anti-VEGF appointment. Reasons include patient anxiety and fear, being a nursing home resident as well as the lack of transport due to relatives and friends not being able to bring them into the hospital. Strict lockdown measures were advised by the government to reduce the risk of acquiring infection especially for those with significant comorbidities, resulting in patients deferring their appointments and hospital avoidance. 88 out of 95 patients who deferred their appointments received a telephone call consultation. The remaining seven cancelled and reappointed. Phone consultations include assessment of subjective visual function and latest macular Optical Coherent Tomography (OCT). Wet AMD patients with active disease are advised to attend their appointments to prevent severe visual loss. Patients with stable wet AMD were given option to defer their appointments. Patients willing to attend will be given an appointment accordingly. Others are given the option of further telephone consultations. None of the patients who attended during the study had severe visual deterioration. Nonetheless, patients with high risk of visual loss who did not attend their clinic appointment were given reassurance by the medical retina team of the precautions in place.

Patients in the DMO group have significantly higher proportion of minority ethnic population as compared to the two other groups (Table 3) [P<0.001]. Both these risk factors are associated with higher morbidity and mortality rates from SARS-CoV-2 [4]. As a result,

**Table 3:** Comparison between ethnicity.

| | All | Caucasian | Asian | P Value |
|---|---|---|---|---|
| | n=337 | n=320 | n=17 | |
| Age | 74.14±13.51 | 74.74±13.27 | 62.77±13.26 | <0.001 |
| Gender: | | | | 0.112 |
| Male | 155 (46) | 144 (45) | 11 (64.7) | |
| Female | 182 (54) | 176 (55) | 6 (35.3) | |
| Vision LogMAR (Right eye) | 0.460±0.362 | 0.465±0.361 | 0.368±0.369 | 0.297 |
| Vision LogMAR (Left eye) | 0.446±0.353 | 0.453±0.357 | 0.321±0.238 | 0.134 |
| Diagnosis: | | | | <0.001 |
| Wet AMD | 239 (70.9) | 236 (73.8) | 3 (17.6) | |
| DMO | 58 (17.2) | 47 (14.7) | 11 (64.7) | |
| RVO | 40 (11.9) | 37 (11.6) | 3 (17.6) | |
| Is The Injected Eye The Better Eye: | | | | 0.442 |
| Yes | 95 (28.2) | 91 (28.4) | 4 (23.5) | |
| No | 181 (24.0) | 169 (52.8) | 12 (70.6) | |
| NA (Injection to both eyes) | 45 (13.4) | 44 (13.8) | 1 (5.8) | |
| Equal | 16 (4.7) | 16 (5) | 0 | |
| Those with BE injection, better eye worse / = 1.0 | 2 (0.6) | 2 (0.6) | 0 | 0.744 |
| Those with BE injection, better or = 0.2 | 9 (2.7) | 0 | 9 (52.9) | 0.483 |
| Worse than /= 1.0 In better eye | 4 (1.2) | 4 (1.3) | 0 | 0.215 |
| Better than /=0.2 in b eye | 15 (4.5) | 14 (4.4) | 1 (5.8) | 0.769 |
| Visual Symptom: | | | | 0.028 |
| Stable | 213 (63.2) | 198 (61.9) | 15 (88.2) | |
| Recent deterioration | 124 (36.8) | 122 (38.1) | 2 (11.8) | |
| Which Eye: | | | | 0.515 |
| Left | 141 (41.8) | 132 (41.3) | 9 (52.9) | |
| Right | 151 (44.8) | 144 (45) | 7 (41.2) | |
| Both | 45 (13.4) | 44 (13.8) | 1 (5.8) | |
| Systemic Disease | | | | |
| HTN | 129 (38.3) | 123 (38.4) | 6 (35.3) | 0.795 |
| Diabetes | 108 (32.0) | 94 (29.4) | 14 (82.4) | <0.001 |
| COPD | 38 (11.3) | 37 (11.6) | 1 (5.8) | 0.471 |
| Asthma | 35 (10.4) | 34 (10.6) | 1 (5.8) | 0.532 |
| Bronchiectasis | 5 (1.5) | 5 (1.6) | 0 | 0.604 |
| Heart Failure | 16 (4.7) | 15 (4.7) | 1 (5.8) | 0.821 |
| Recent Hospital Admission | 14 (4.2) | 14 (4.4) | 0 | 0.378 |
| Previous Pneumonia | 18 (5.3) | 18 (5.6) | 0 | 0.315 |
| Immunocompromised | 6 (1.8) | 5 (1.6) | 1 (5.8) | 0.189 |

more patients with DMO defer or cancelled their appointments to reduce their risk of acquiring the infection. As for wet AMD patients, we observed that the majority of the patients are still attending their clinic appointments despite the ongoing pandemic. Patients with wet AMD are also in the more vulnerable age group (78.84±9.76) as compared to RVO (67.63±13.26) and DMO (59.28±14.54). About one-third (33.9%) of wet AMD patients received injections in their 'better eye' as compared to RVO (15.0%) and DMO (13.8%)

[P<0.001]. More patients from the AMD group have VA of worse than 1.0 LogMAR in their better eye (P=0.44). Subjectively, more patients from the wet AMD group reported 'recent deterioration of vision' as compared to the RVO and DMO group (40.2% *vs.* 37.5% *vs.* 22.4%) [P=0.04]. This is likely due to the fear and anxiety of visual loss especially during the course of the pandemic.

In East Lancashire Hospital NHS Trust, we serve an estimated population of 461,866. Approximately 376,182 (81.5%) of the

**Table 4:** Patients tested for SARS-CoV-2 PCR.

| No. | Ethnicity | Age | Gender | LogMAR BCVA | | Diagnosis | Treated eye | Systemic Comorbidities | Reasons for testing |
|---|---|---|---|---|---|---|---|---|---|
| | | | | RE | LE | | | | |
| 1 | W | 65 | M | 0.6 | 0.1 | Wet AMD | R | Hypertension | Admitted with Chest Pain |
| 2 | W | 84 | M | 0.3 | 0.4 | Wet AMD | L | Pancreatic Ca | Pneumonia |
| 3 | A | 52 | M | 0.1 | 0.3 | DMO | L | Kidney Failure | Pre-dialysis swab |
| 4 | W | 69 | F | 0.5 | 0.6 | Wet AMD | R | NIDDM | District nurse required for home visits |
| 5 | W | 84 | M | 0.5 | 0.4 | Wet AMD | R | Myeloma, Pacemaker | Unwell |

population are Caucasian, 77,615 (16.8%) are Asian (Pakistani, Indian, Bangladeshi, Chinese) and 8,069 (1.7%) others [19]. As Caucasians have the highest risk and a genetic predisposition of developing AMD followed by Chinese and Hispanics, we can see a higher number of Caucasian in the wet AMD group (98.7%) as compared to Asians (1.3%) [P<0.001] [20]. On the other hand, the DRIVE UK study has shown that minority ethnic communities with non-insulin dependent diabetes are more likely to develop diabetic retinopathy and sight threatening maculopathy as compared to Caucasians [21]. Almost 1 in 5 who attended during the course of study in the DMO group is minority ethnic (19.0% *vs.* 81.0%) as compared to patients in the RVO (7.5% *vs.* 92.5%) and AMD group (1.3% *vs.* 98.7%) [P<0.001]. Although patients are younger in the DMO group as compared to the wet AMD group, they have more systemic comorbidities making both vulnerable groups of patients.

As symptomatology of SARS-CoV-2 are vague and common, we had patients that attended the eye clinic with symptoms such as long-standing cough or shortness of breath. As smoking is a risk factor for wet AMD, there was a fair amount of patients with COPD in the wet AMD group as compared to other groups (14.2% *vs.* 5.0% *vs.* 3.4%) [P=0.03]. It is vital that these patients are aware that they should not be excluded from receiving treatment provided that their symptoms are not new. We communicated this information through leaflets and telephone calls. It is also difficult to pinpoint asymptomatic carriers of the infection and super spreaders of the infection hence universal precaution is necessary to maximise the safety of our vulnerable patients whilst receiving treatment.

Due to the crisis, temporary coding and managerial systems have been put in place to ensure that all patients receive a telephone consultation should they choose to defer their appointments due to the pandemic. An ongoing study is being carried out to assess the visual outcomes as a result of delay in anti-VEGF treatment, to further contribute to available data. Surgical facemasks, similar to other clinical wastes can act as fomites spreading infection if not used appropriately. To combat this, we ensure that all patients attending the eye clinic are given clear instructions on the use of facemasks whilst in the department and a safe disposal of facemask on exit. Furthermore, the use of facemasks in all departments can lead to national supply shortages and hence the applicability of this practice can be argued. Nonetheless, our measures have proven to be safe with no infectivity within the department during the period of study, especially when a safe distance cannot be maintained between two people during an intravitreal injection.

## Conclusion

None of the patients in our study contracted SARS-CoV-2 during the lock down period. Our study has shown the safety of anti-VEGF therapy with the current precautionary measures despite caring for a vulnerable group of patients. Therefore, patients should be reassured to attend injection appointments to prevent further visual loss and to maintain independence.

### What was known before

- SARS-CoV-2 is highly infectious.

- Missing or delaying anti-VEGF is associated with poorer visual outcomes.

- Minority ethnic population in the UK is at a higher risk of SARS-CoV-2 and their associated complications.

### What this study adds

- There is no incidence of SARS-CoV-2 as a result of the current precautionary measures in the eye department.

- Majority of wet AMD patients are still attending anti-VEGF appointments notwithstanding the pandemic.

- DMO and RVO groups comprise of higher proportion of minority ethnic patients and hence these groups of patients were more cautious in attending the hospital for their appointment.

- Telephone consultation, may be adopted as another option to help with the increasing capacity of the medical retina service alongside with virtual clinics.

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