DOI:10.14744/bej.2021.59244
Beyoglu Eye J 2022; 7(1): 47-53

Original Article

The effects on intravitreal anti-VEGF injections of Covid-19 pandemia in Eastern Black Sea Region of TURKEY

Dilek Uzlu, Hidayet Erdol, Mehmet Kola, Murat Gunay

Department of Ophthalmology, Karadeniz Technical University, Faculty of Medicine, Trabzon, Turkey

Abstract

Objectives: To compare the number of intravitreal anti-vascular endothelial growth factor (anti-VEGF) injections performed during 2020 with that in the same period in 2019.

Methods: The study investigated anti-VEGF injections performed in 2019 and 2020. Injections performed on 923 eyes of 858 patients were evaluated. The patients were treated for diabetic macular edema (DME), age-related macular degeneration (AMD), and retinal vein occlusion (RVO). Injections, new cases, and patients who either completed or did not complete three loading doses in 2019 and 2020 were first compared. The same comparisons were then performed between the pandemic period in 2020 and the same period in 2019.

Results: While 2070 injections were performed on 670 eyes in 2019, 1478 injections were applied to 253 eyes in 2020 (p=0.001). The number of naive eyes was 163 in 2019 and 83 in 2020. During the pandemic period in 2020, 967 injections were performed on 181 eyes, compared with 1721 injections on 532 eyes in the same period in 2019 (p=0.001). While 86.5% of patients completed three injections in 2020, the rate was 78.9% for the same period in 2019 (p=0.025).

Conclusion: The COVID-19 pandemic caused a significant decrease in the number of patients presenting to the hospital, and delays occurred in treatment protocols. However, patients admitted to the hospital during this period adapted better to the loading doses. In conclusion, the pandemic caused significant disruption to treatment, and this will inevitably result in anatomical and functional worsening in the eye.

Keywords: COVID-19 lockdown, pandemic, anti-VEGF, intravitreal injection

Introduction

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) first emerged as a public health threat in China in December 2019, from where it spread rapidly across the world, causing an enduring pandemic (1). The first confirmed case of COVID-19 in Turkey was reported on March 11, 2020. The Turkish government introduced restrictions and lockdowns to limit the spread of coronavirus 2 on March 16, 2020. Working hours were readjusted, schools were temporarily closed, and flexible working arrangements were introduced. Elective procedures in hospitals were stopped, except for emergencies. Although restrictions were partially relaxed as the number of cases decreased following peaks, they were still in force at the time of writing in 2021.

How to cite this article: Uzlu D, Erdol H, Kola M, Gunay M. The effects on intravitreal anti-VEGF injections of Covid-19 pandemia in Eastern Black Sea Region of TURKEY. Beyoglu Eye J 2022; 7(1): 47-53.

Address for correspondence: Dilek Uzlu, MD. GOz Hastaliklari Anabilim Dali, Karadeniz Teknik Universitesi, Tip Fakultesi, Trabzon, Turkey
Phone: +90 554 793 56 40 **E-mail:** dilenkh@hotmail.com

Submitted Date: May 25, 2021 **Accepted Date:** November 27, 2021 **Available Online Date:** February 18, 2021

Intravitreal injections of anti-vascular endothelial growth factor (VEGF) agents are widely used as a standard for patients with retinal diseases, such as age-related macular degeneration (AMD), diabetic macular edema (DME), retinal vein occlusion (RVO), and choroidal neovascularization (CNV) (2). In retinal diseases due to AMD, DME, RVO, myopic CNV, etc., intravitreal anti-VEGF treatment should be performed based on specific algorithms, and patient compliance with treatment is very important in terms of preserving visual function. Treatment that is not applied properly will be inadequate and adversely affect visual function (3–6). During the COVID-19 pandemic, restrictions on elective cases in hospitals, travel restrictions and fear of going to the hospital, and travel difficulties among patients scheduled for anti-VEGF therapy caused disruptions in the application of planned anti-VEGF injections. The majority of these patients are regarded as at high risk of COVID-19 infection morbidity, as they are generally elderly with various underlying medical conditions such as diabetes, hypertension, and cardiovascular diseases.

Turkish and international ophthalmology associations have published many guidelines and recommended that these patients be treated in strict compliance with precautions aimed at preventing contamination. These have warned health workers and hospitals to manage their workflow and minimize the risk of coronavirus transmission (7–13). During this period, ophthalmologists, who normally worked in close physical proximity to patients, developed various methods to protect themselves during both examination and surgical procedures in emergency cases and cases in which postponement of treatment was not an option (14).

The purpose of this study was to determine differences in the number of injections performed by evaluating the real-life data and comparing the numbers and characteristics of the patients attending our hospital, a tertiary regional center in the Black Sea region of Turkey, during the COVID-19 outbreak, with those in the previous year. The primary aim of the study was to assess the impact of the COVID-19 pandemic and to compare the numbers of intravitreal injections, new patients, and patients completing three injections (loading dose) during the epidemic in 2020 with the same period in 2019. We also evaluated the whole of 2020 and 2019 and compared the same parameters over the two 12-month periods.

Methods

The study was carried out retrospectively by reviewing the records of patients who received injections for DME, AMD, and RVO between January 2019 and December 2020. Faculty ethics committee approval was obtained for the study. Informed consent was obtained from all recruited patients, and the study was conducted in compliance with the principles of the Declaration of Helsinki.

All intravitreal injections were performed during the day in the operating room following requisite sterilization. In our clinic, intraocular pressures were measured 1 h after the injections, and 4 × 1 antibiotics and 4 × 1 steroid drops were prescribed, after which the patients were sent home. Intravitreal injections were continued in the same way they were applied during the COVID-19 pandemic. However, we endeavored to reduce the risk of virus transmission by allowing 10–15 min to elapse between patients. As it is standard for the patient to wear a mask and bonnet during injection, these were also employed during the study period.

This study first compared the numbers of injections, including the whole years 2019 and 2020. Sub-analysis was performed involving a comparison by months. However, to evaluate the effects of the pandemic on injection rates, the period between March 16 and May 31, when the lockdown was applied, and then the period between March 16 and December 31, including the time of partially relaxed restrictions, were evaluated.

All statistical analyses were performed using the Statistical Package for the Social Sciences, version 21 software (IBM Corp., SPSS for Windows. Armonk, NY, USA). Distributions were assessed for normality using the Kolmogorov–Smirnov test. Numerical variables are presented in the text and tables as mean±standard deviation or median (minimum–maximum) values, depending on the data distribution. Categorical variables are presented as numbers (n) and percentages (%). The Chi-square test was used to compare categorical variables. Numbers of injections, numbers of naive patients, numbers of patients who completed three loading doses, and the numbers of patients undergoing switch were compared. Statistical significance was set at $p \leq 0.05$.

Results

This study involved reviewing the file records of all patients who received an intravitreal anti-VEGF injection in our clinic in 2019 or 2020. A total of 3548 (mean 3.84±2.4, range 1–14) injections were applied to 923 eyes of 858 patients over the 2 years. In terms of years, 2070 injections were applied to 670 eyes in 2019 and 1478 injections to 253 eyes in 2020. Of the 858 patients, men were 472 (55%) and women were 386 (45%). Patients' mean age was 66.31±9.36 years. Diagnoses of AMD were present in 266 of the patients undergoing injection, DME in 429, and RVO in 120. In 2019, 881 bevacizumab, 444 ranibizumab, and 745 aflibercept injections were performed. In 2020, 623 bevacizumab, 363 ranibizumab, and 492 aflibercept injections were performed. Sixty-six patients (7.6%) received bilateral intravitreal injections. Patients' demographic characteristics are shown in Table 1.

Table 1. Clinical and demographic characteristics of the patients

Total number of patients	858		
Gender (F/M)	386/472		
Age (year)	66.31±9.36		
Total number of treated eyes	923		
2019	670		
2020	253		
Total number of intravitreal injections	3548		
2019	2070		
2020	1478		
Diagnosis (number of patients)			
AMD	266		
DME	429		
RVO	120		
Other	43		
Drug (number of injections)	Bevacizumab	Ranizumab	Aflibercept
2019 (2070)	881	444	745
2020 (1478)	623	363	492

The number of treated eyes decreased by 66.3% (670 vs 253) in 2020 compared with 2019, while the number of injections decreased by 28.6% (1478 vs 2070) (p<0.001). A total of 246 (26.6%) eyes during this period were treated for the first time (naive eyes). The number of naive eyes was 163 in 2019 and 83 in 2020 (p=0.009). Of the newly treated eyes, 196 (79.6%) completed three loading doses, and 50 (20.03%) did not complete all three doses. The anti-VEGF agent was switched in 218 (23.6%) eyes during the 2 years, 137 (20.4%) in 2019, and 81 (32.0%) in 2020 (p=0.0002).The number of eyes completing three loading doses was 131 (80.3%) in 2019 and 65 (78.4%) in 2020 (p=0.72). The mean number of injections was 3.08±1.66 in 2019 and 5.84±1.24 in 2020 (p=0.001). In addition, the mean number of eyes injected per month decreased from 55.83 in 2019 to 21.08 in 2020 (p=0.001). Another remarkable finding is that the proportion of previously treated patients decreased significantly in 2020 (75.6% vs 67.2%) (p=0.008). A further important finding is the number of naive patients, which rose significantly from 24.3% to 32.8% in 2020 (p=0.009) (Table 2).

Only 9 injections could be administered in the lockdown period in 2020 (March 16–May 31) compared with 480 in 2019 (p=0.0001). Of these 9 eyes, 1 was a new eye and 8 belonged to patients who had previously started treatment.

During the pandemic period (of approximately 9 months, March 2019–December 2020), including lockdown, 967 in-

Table 2. Comparison of the properties of the injected eyes for the whole year and the pandemic era

Parameters	**2019**	**2020**	**p**	**March2019–December 2019**	**March 2020–December 2020**	**p**
	670 eyes	**253 eyes**		**532 eyes**	**181 eyes**	
	2070 IVI	**1478 IVI**		**1721 IVI**	**967 IVI**	
Previously treated	507 (75.6)	170 (67.2)	0.008	399 (75.0)	114 (63.0)	0.001
Naïve eyes	163 (24.3)	83 (32.8)	0.009	133 (25.0)	67 (37.0)	0.002
Three loading doses						
Completed	131 (80.3)	65 (78.4)	0.72	105 (78.9)	58 (86.5)	0.19
Noncompleted	32 (19.7)	18 (21.6)	0.72	28 (21.1)	9 (13.4)	0.19
Switch	137 (20.4)	81 (32.0)	0.0002	99 (18.6)	46 (25.4)	0.049
Mean IVI number	3.08±1.66 (1–9)	5.84±1.24 (1–7)	0.001	3.23±1.34 (1–6)	5.34±1.87 (1–5)	0.001

IVI: Intravitreal injection.

jections (5.34±1.87) were administered to 181 eyes in 2020. Of these, 46 eyes (25.4%) were switched, 67 (37%) were new eyes, the number of patients completing three loading doses was 58 (86.5%), and 9 eyes (13.4%) did not complete the course of injections. In the same period in 2019, 1721 injections (3.23±1.34) were applied to 532 eyes, with switches being applied to 99 (18.6%). There were 133 new eyes (25%), and the number of patients who completed three loading doses was 105 (78.9%) (Table 2).

The mean monthly number of injections was 50.6±9 in 2019 and 17.2±8.5 in 2020. However, considering that only 9 eyes were injected from March 16 until May 31 (the lockdown period), the mean monthly number of injections for 2020 reached 22.62±8.3 in the 7-month period in which restrictions were relaxed after June. Accordingly, the number of eyes injected decreased by 55.4% based on the average monthly value compared with the previous year. The number of monthly injections decreased significantly in all months except August, since March 2020, when the pandemic started to affect Turkey ($p<0.05$) (Fig. 1, Table 3).

Discussion

Intravitreal anti-VEGF injections in diseases such as AMD, DME, and RVO require a specific treatment protocol, and the disruption of treatment adversely affects the functional visual prognosis (15, 16). During the COVID-19 pandemic, patients were reluctant to return to the hospital due to fear of contracting the disease. Except for emergencies, patients generally hesitated to present to hospitals either because of restrictions or because of fear of virus transmission. In addition, the measures adopted by national governments due to the pandemic, the implementation of restrictions on units other than those providing COVID services, and the reduction in the number of actively working personnel also led to a decrease in elective patient admissions. Due to the chaos that ensued early in the pandemic, many ophthalmology associations recommended that anti-VEGF injections be classified in the emergency category and that injections should proceed with the adoption of the requisite preventive measures (for both staff and patients). Accordingly, we

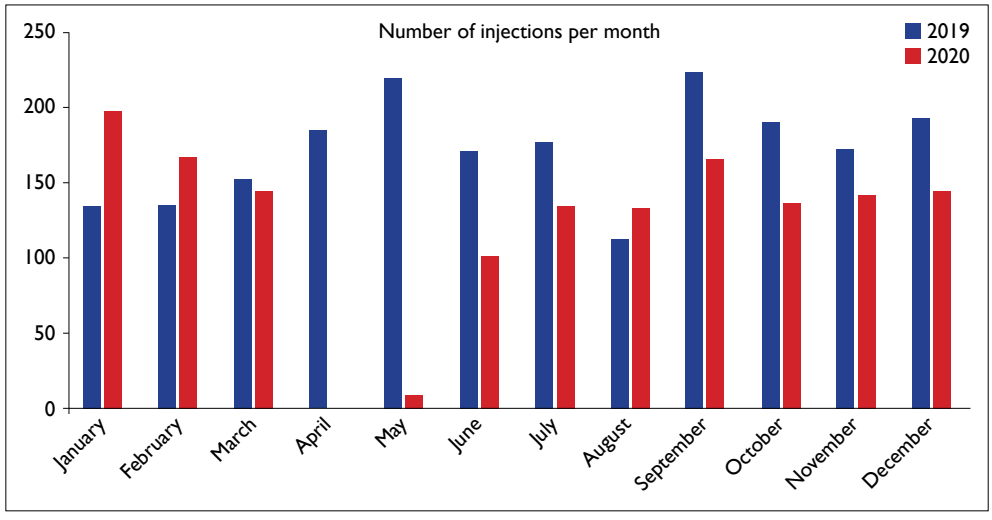

Figure 1. Comparison of the number of injections per month between 2019 and 2020.

Table 3. Comparison of the number of injections per month between June 1–December 31 after the relaxing of restrictions

Months	Number of IVI (2019–2020)	Chi-square	p
June 2019–June 2020	171–102	17.4	0.001
July 2019–July 2021	177–134	5.9	0.015
Aug 2019–Aug 2020	113–133	1.62	0.202*
Sept 2019–Sept 2020	223–166	8.35	0.004
Oct 2019–Oct 2020	191–137	8.89	0.003
Nov 2019–Nov 2020	173–142	3.05	0.081*
Dec 2019–Dec 2020	193–144	7.12	0.008

*Nonsignificant.

also classified these patients in the emergency category and continued to administer intravitreal injections. However, the development of these procedures and communication with patients lasted approximately 1.5–2 months. In terms of protection measures, Korobelnik et al. (14) created a guide for anti-VEGF injections during the COVID-19 pandemic and described which steps should be taken to reduce the risk of transmission of the infection to ophthalmologists and patients.

Patient admission to hospitals, except for emergency cases, was significantly affected during the pandemic, both in Turkey and in many other countries. A study published in Germany reported no change in the proportion of other emergency surgeries between the 2 years (Chi-square = 3.617, p=0.057) from 2019 to 2020 (17). Due to the high risk of visual impairment, no intravitreal anti-VEGF injections were postponed (all were administered in a timely manner) for subjects with AMD during the pandemic if patients were willing to attend their Intravitreal Operative Drug Administration center. Nevertheless, the authors observed a significant decrease in the number of urgent intravitreal anti-VEGF injections at the inpatient unit from 2019 to 2020 (7.9% vs 1.3%, Chi-square = 3.985, p=0.045). This may be attributable to generally more difficult access to eye care in Germany due to the pandemic.

Due to the precautionary measures and restriction of travel introduced on March 16, 2020, in Turkey, hospital visits were not possible except for emergencies, and therefore treatment had to be delayed or discontinued. This resulted in inadequate treatment of diseases (AMD, DME, and RVO) due to the disruption in the relevant algorithms. A study of patients with AMD reported that the number of injections performed during the restriction period (March–May 2020) decreased significantly from 238.3 to 47.6 compared with the same period in the previous year (p=0.04). A decrease in the number of injections and greater intervals between them have been reported even after the normalization period (18). In our clinic, only 9 injections were performed in the lockdown period, compared with 480 in the same period in 2019. In addition, after June, the number of monthly injections was generally lower than that in the previous year, except for August.

A study from Jordan reported a delay of 60.97±24.35 days in planned injection times during the restriction period, and therefore the deterioration in patients' visual function was inevitable (19). An analysis of the number of injections performed in the restriction period in Italy in March 2020 and in March 2019 reported 1322 injections in 2019 but only 620 in 2020, the difference (a 53.1% decrease) being statistically significant (p<0.008) (20). The same study also determined a 76.7% reduction in all surgical procedures, a 66.9% decrease in emergency interventions, and a 97.2% decrease in elective surgeries.

A study from Israel compared 4-year data for intravitreal injections (bevacizumab, ranibizumab, and aflibercept) performed between March 15 and April 14 with the same period in 2020 during the COVID-19 pandemic. A 58% reduction was reported in the number of injections expected to be performed (21). Similarly, another study from Portugal reported a 33% decrease in the number of intravitreal injections in January–April compared with the previous period (22).

Analysis revealed a 37.2% decrease in the number of injections (829 vs 520) in our clinic between January 1 and May 31 (including a normal period and the lockdown period), but as normal injection application continued from January 1 to January 15 in 2020, the decrease in that period appears not to be particularly great. However, only 9 injections were performed from March 16 to May 31 in 2020, compared with 480 in the same period in the previous year (p=0.001). In conclusion, the number of injections performed in this extraordinary period was lower than planned in almost all published articles, and, as a result, the clinical status of many patients has deteriorated (20–24).

The disruption of the treatment algorithms during this period may adversely affect visual function. A previous study evaluated 303 eyes of 263 patients who received treatment between April and July 2020. Of these eyes, 168 (55.5%) were naive, the remainder consisting of patients who had commenced treatment previously. The mean interval between first and last injections in patients who had previously received treatment was 19.1±10.6 weeks. The most important reason for this was described as the travel restriction imposed during the epidemic. A delay in treatment was found to cause a significant decrease in visual function in both the naive group and the group that had previously received treatment for AMD (p=0.0002), DME (p=0.005), and RVO (p=0.007). Travel restrictions and fear of transmission of COVID-19 have resulted in a delay in patients receiving appropriate treatment algorithms (25). In addition, other studies have emphasized that delays in treatment may cause various ethical problems (25).

Only 9 injections were performed in the lockdown period (March 16–May 31) in our clinic, much fewer than in the previous year. However, even in the period after May 31, when the relaxing of restrictions started, there was a decrease in the number of injections in all months except for August compared with the previous year. The number of injections performed during this period was 967 (9 injections were performed between March 16 and May 31), representing a decrease of 43.8% compared with the previous year. Another noteworthy issue during the pandemic

was that although the previously treated patients disrupted their treatment algorithms, new patients adhered more strictly to their treatment regimens. The rate of new patients in this period was 53.59%, and the rate of completion of three loading doses was 86.5%. Another important finding is the number of naive patients, which rose significantly from 24.3% in 2019 to 32.8% in 2020 (p=0.009). We attribute this to the fact that previously treated patients failed to attend due to fear of virus transmission in the COVID-19 pandemic. In addition, the average number of injections per eye was significantly higher than in the previous period (5.34±1.87 vs 3.23±1.34). This may be due to patients being more conscious of their disease and exhibiting greater adaptation to the treatment algorithms.

Another remarkable feature of the patients we evaluated during the pandemic period was that the switch rate (25.4% vs 18.6%) was higher than that in the previous year. As the number of new patients was higher in the 2020 pandemic period and treatment was initiated with bevacizumab (off-label), as required by regulation in Turkey, patients who had completed the three loading doses were switched to approved anti-VEGF drugs.

The limitations of this study are that the data were examined retrospectively and it is a single-center study.

In conclusion, under stressful circumstances such as the pandemic, great organization is essential if appropriate treatment is to be provided and to avoid ethical problems. In critical situations or a resurgence COVID-19, the contact information of the patients must be readily available and they should be informed about the importance of the treatment algorithms to ensure better planning and effective measurement.

Disclosures

Ethics Committee Approval: The study was also approved by the Karadeniz Technical University, Faculty of Medicine Ethics Committee (Number: 2021/223).

Peer-review: Externally peer-reviewed.

Conflict of Interest: None declared.

Authorship Contributions: Involved in design and conduct of the study (DU, HE); preparation and review of the study (HE, DU, MG, MK); data collection (HE, DU, MK, MG); and statistical analysis (HE).

References

1. Comune C, Laezza MP, Giunta P, D'Andrea L, Cennamo G. Management of anti-VEGF intravitreal treatment at University Hospital Federico II of Naples during COVID-19 pandemic lockdown. Ther Adv Ophthalmol 2020;12:2515841420966861.
2. Lanzetta P, Loewenstein A; Vision Academy Steering Committee. Fundamental principles of an anti-VEGF treatment regimen: optimal application of intravitreal anti-vascular endothelial growth factor therapy of macular diseases. Graefes Arch Clin Exp Ophthalmol 2017;255:1259–73. [CrossRef]
3. Sun JK, Wang PW, Taylor S, Haskova Z. Durability of diabetic retinopathy improvement with as-needed ranibizumab: open-label extension of ride and rise studies. Ophthalmology 2019;126:712–20. [CrossRef]
4. Campochiaro PA, Wykoff CC, Singer M, Johnson R, Marcus D, Yau L, et al. Monthly versus as-needed ranibizumab injections in patients with retinal vein occlusion: the SHORE study. Ophthalmology 2014;121:2432–42. [CrossRef]
5. Abraham P, Yue H, Wilson L. Randomized, double-masked, sham-controlled trial of ranibizumab for neovascular age-related macular degeneration: PIER study year 2. Am J Ophthalmol 2010;150:315–24.e1. [CrossRef]
6. Minocha A, Sim SY, Than J, Vakros G. Survey of ophthalmology practitioners in A&E on current COVID-19 guidance at three Major UK Eye Hospitals. Eye (Lond) 2020;34:1243–5. [CrossRef]
7. Corazza P, D'Alterio FM, Younis S. Proposed algorithm during COVID-19 pandemic for patient management in medical retina clinic. Int J Retina Vitreous 2020;6:20. [CrossRef]
8. Antaki F, Dirani A. Treating neovascular age-related macular degeneration in the era of COVID-19. Graefes Arch Clin Exp Ophthalmol 2020;258:1567–9. [CrossRef]
9. Sengupta S, Honavar SG, Sachdev MS, Sharma N, Kumar A, Ram J, et al; Writing Committee on behalf of the All India Ophthalmological Society - Indian Journal of Ophthalmology Expert Group for COVID-19 Practice Guidelines; Composition of the All India Ophthalmological Society - Indian Journal of Ophthalmology Expert Group for COVID-19 Practice Guidelines includes the Writing Committee (as listed) and the following members (in alphabetical order by the first name):. All India Ophthalmological Society - Indian Journal of Ophthalmology consensus statement on preferred practices during the COVID-19 pandemic. Indian J Ophthalmol 2020;68:711–24.
10. Gupta V, Rajendran A, Narayanan R, Chawla S, Kumar A, Palanivelu MS, et al. Evolving consensus on managing vitreo-retina and uvea practice in post-COVID-19 pandemic era. Indian J Ophthalmol 2020;68:962–73. [CrossRef]
11. American Academy of Ophthalmology. Important coronavirus updates for ophthalmologists. Available at: https://www.aao.org/headline/%0Aalert-important-coronavirus-context. Accessed Mar 31, 2020.
12. The Royal College of Ophthalmologists. COVID-19 clinical guidance for ophthalmologists. Available at: https://www.rcophth.ac.uk/2020/%0A03/covid-19-update-and-resources-for-ophthalmologists/. Accessed Apr 15, 2020.
13. Japanese Ophthalmological Society. Guidance for ophthalmology-related healthcare workers regarding COVID-19. Available at: http://www.nichigan.or.jp/news/065.pdf. Accessed Jun 15, 2020.
14. Korobelnik JF, Loewenstein A, Eldem B, Joussen AM, Koh A, Lambrou GN, et al. Guidance for anti-VEGF intravitreal injec-

tions during the COVID-19 pandemic. Graefes Arch Clin Exp Ophthalmol 2020;258:1149–56. [CrossRef]
15. Brown DM, Schmidt-Erfurth U, Do DV, Holz FG, Boyer DS, Midena E, et al. Intravitreal aflibercept for diabetic macular edema: 100-week results from the VISTA and VIVID studies. Ophthalmology 2015;122:2044–52. [CrossRef]
16. Gillies MC, Hunyor AP, Arnold JJ, Guymer RH, Wolf S, Pecheur FL, et al. Macular atrophy in neovascular age-related macular degeneration: a randomized clinical trial comparing ranibizumab and aflibercept (RIVAL Study). Ophthalmology 2020;127:198–210. [CrossRef]
17. Tóth G, Xanthopoulou K, Stachon T, Németh J, Hécz R, Berkó-Göttel B, et al. Impact of COVID-19 pandemic on emergency inpatient volume at a tertiary eye care center in Germany with corneal main specialization. Klin Monbl Augenheilkd 2021;238:715–20. [CrossRef]
18. Yeter DY, Dursun D, Bozali E, Ozec AV, Erdogan H. Effects of the COVID-19 pandemic on neovascular age-related macular degeneration and response to delayed Anti-VEGF treatment. J Fr Ophtalmol 2021;44:299–306. [CrossRef]
19. Elfalah M, Alryalat SA, Toro MD, Rejdak R, Zweifel S, Nazzal R, et al. Delayed intravitreal anti-vegf therapy for patients during the covid-19 lockdown: An ethical endeavor. Clin Ophthalmol 2021;15:661–9. [CrossRef]
20. dell'Omo R, Filippelli M, Semeraro F, Avitabile T, Giansanti F, Parmeggiani F, et al. Effects of the first month of lockdown for COVID-19 in Italy: A preliminary analysis on the eyecare system from six centers. Eur J Ophthalmol 2021;31:2252–8. [CrossRef]
21. Wasser LM, Weill Y, Brosh K, Magal I, Potter M, Strassman I, et al. The Impact of COVID-19 on intravitreal injection compliance. SN Compr Clin Med 2020:1–4. [CrossRef]
22. Campos A, Oliveira N, Martins J, Arruda H, Sousa J. The paradigm shift of ophthalmology in the COVID-19 era. Clin Ophthalmol 2020;14:2625–30. [CrossRef]
23. Shmueli O, Chowers I, Levy J. Current safety preferences for intravitreal injection during COVID-19 pandemic. Eye (Lond) 2020;34:1165–7. [CrossRef]
24. Sindal MD, Chhabra K, Khanna V. Profile of patients receiving intravitreal anti-vascular endothelial growth factor injections during COVID-19-related lockdown. Indian J Ophthalmol 2021;69:730–3. [CrossRef]
25. Hanna TP, Evans GA, Booth CM. Cancer, COVID-19 and the precautionary principle: prioritizing treatment during a global pandemic. Nat Rev Clin Oncol 2020;17:268–70. [CrossRef]