Research Article / Araştırma Makalesi

Changes in the Prevalence of Neovascular Glaucoma in Individuals Over Sixty-Five Years of Age During the Covid-19 Pandemic

COVID-19 Pandemi Döneminde Altmış Beş Yaş Üstü Neovasküler Glokomlu Bireylerin Prevalansındaki Değişiklikler

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Abstract

Background: To examine changes in the number of neovascular glaucoma patients aged over 65 presenting to a tertiary hospital at different stages of the COVID-19 pandemic, as well as changes in their intraocular pressure and vision levels.
Materials and Methods: Patients aged over 65 years who had been diagnosed with neovascular glaucoma were divided into the three following groups: pre-lockdown (March 21–June 10, 2019), lockdown (March 21–June 10, 2020), and post-lockdown (March 21–June 10, 2021). Age, sex, the eye(s) involved, etiology, intraocular pressure, best corrected visual acuity, and the treatments administered were compared among the groups.
Results: Patient numbers decreased by 51.02% in the lockdown group and 14.29% in the post-lockdown group compared with the pre-lockdown group. The number of treatments applied during the lockdown period decreased by 51.85% compared with the pre-lockdown period (p = 0.002). No statistically significant difference in mean best corrected visual acuity levels was observed between the pre-lockdown period and the lockdown and post-lockdown periods (p = 0.078); however, a significant difference was determined in mean intraocular pressure values (p < 0.001).
Conclusions: Hospital presentations among patients with neovascular glaucoma aged over 65 years decreased during and after lockdown. A decrease associated with delayed treatment was observed in vision levels after lockdown, whereas intraocular pressure levels increased. A subsequent increase will inevitably be seen in the number of patients with neovascular glaucoma and in surgeries performed.

Key Words: COVID-19, geriatrics, intraocular pressure, neovascular glaucoma, visual acuity

Öz

Amaç: Pandeminin farklı dönemlerinde 3. basamak bir hastaneye başvuran 65 yaş üstü neovasküler glokomlu olguların sayısında, GİB' ı ve görme düzeylerindeki değişikliği incelemeyi amaçlamaktadır.
Materyal ve metod: Hastalar karantina öncesi (21 mart 2019 -10 haziran 2019), karantina dönemi (21 mart 2020 -10 haziran 2020), karantina sonrası (21 mart 2021 -10 haziran 2021) 65 yaş üstü neovasküler glokom tanılı hastalar olmak üzere 3 gruba ayrıldı. Yaş, cinsiyet, dahil olan göz(ler), etiyoloji, göz içi basıncı (GİB), en iyi düzeltilmiş görme keskinliği (EİDGK), uygulanan tedaviler karşılaştırıldı.
Bulgular: Karantina öncesi gruba göre karantina grubunda % 51.02, karantina sonrası grubunda % 14.29 oranında hasta sayısında azalma tespit ettik. Karantina döneminde uygulanan tedavi sayısı, karantina öncesi döneme göre % 51.85 azaldı (p=0.002). Karantina ve karantina sonrası dönem, karantina öncesi ile karşılaştırıldığında ortalama EİDGK seviyelerinde istatiksel anlamlı fark saptanmadı (p=0.078). Ancak ortalama GİB değerlerinde anlamlı fark tespit edildi (p<0.001)
Sonuç: 65 yaş üstü neovasküler glokomlu hastaların karantina sürecinde ve sonrasında hastaneye başvurularında azalma tespit edildi. Karantina sürecinden sonra tedavinin gecikmesine bağlı olarak görme düzeylerinde azalma, GİB seviyelerinde yükselme mevcut idi. İlerleyen dönemlerde kaçınılmaz olarak neovasküler glokomlu hasta ve cerrahi sayısında artış görülecektir.

Anahtar Kelimeler: COVID-19, geriatri, göz içi basıncı, neovasküler glokom, görme keskinliği

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Introduction

The COVID-19 virus outbreak was declared a pandemic by the World Health Organization on March 11, 2020. The first case in Turkey was reported on the same day. Restrictions and closures were subsequently imposed in Turkey, as they were in the rest of the world. Risk groups were identified, with the main ones being elderly people and individuals with chronic disease. In particular, lockdown measures were introduced to protect individuals aged over 65 years. On March 21, 2020, the Turkish Ministry of Health made it mandatory for citizens aged over 65 to remain indoors, and this was enforced until June 10, 2020 (1). At times when the pandemic was particularly intense, restrictions were also imposed on presentations to hospital, travel, and public transport (2). Except for emergency surgeries, elective cases were not admitted to hospital. An appointment system was adopted in clinics. In this context, several ophthalmological associations published guidelines for the treatment of patients with eye diseases (3,4).

Individuals aged over 65 years in particular were unable to attend routine checkups for a long time because of fear of catching the infection in hospitals, restrictions on travel, and a lack of appointment availability stemming from limited numbers of patients being treated. This especially affected individuals with chronic diseases, such as diabetes and hypertension. Inactivity, diabetes, failure to regulate hypertension, and delayed treatment also exacerbated effects on the eye (5). The patients we follow up because of neovascular glaucoma are generally of advanced age and have chronic diseases. Patients followed up because of neovascular glaucoma should also be monitored in terms of chronic diseases, such as diabetes and hypertension; laser photocoagulation and intravitreal procedures; and intraocular pressure (IOP). Adherence to treatment is of great importance because even slight deviations can lead to severe loss of vision and increased IOP (6). Studies from various countries have shown that the COVID-19 pandemic resulted in delays to intravitreal injection sessions and a decrease in the number of diabetic retinopathy and retinal vascular occlusions, which represent the most common causes of neovascular glaucoma. (2-5,7). Delay of treatments in this way can result in a subsequent increase in the numbers of patients with neovascular glaucoma and in surgical procedures in elderly individuals. The purpose of the present study was to compare changes in numbers and clinical outcomes among individuals over 65 years of age with neovascular glaucoma presenting to a tertiary hospital at different stages of the pandemic.

Materials and Methods

The study involved 115 patients (126 eyes) presenting to the Harran University Medical Faculty Eye Diseases glaucoma clinic in Turkey with a diagnosis of neovascular glaucoma. Approval for the study was granted by the Harran University institutional assessment committee and ethical committee (numbered HRÜ.22/05/25; dated 07/03/2022), and the study was performed under the principles of the Declaration of Helsinki.

Patients aged over 65 years with neovascular glaucoma were assigned to the three following groups: pre-lockdown (March 21–June 10, 2019), lockdown (March 21–June 10, 2020), and post-lockdown (March 21–June 10, 2021). The pre-lockdown group was defined as patients presenting during the period in 2019 that was equivalent to the lockdown period in 2020. The post-lockdown group was defined as patients who presented during the equivalent period in 2021. The pre-lockdown group was also evaluated as the control group. In addition, the etiology of neovascularization was divided into the three following groups: diabetic retinopathy, retinal vein occlusion (RVO), and other (ocular ischemic syndrome, central retinal artery occlusion, uveitis, and trauma).

All cases underwent full ophthalmological examinations, including best corrected visual acuity (BCVA) using a Snellen chart, slit-lamp examination, measurement of IOP with Goldmann applanation, and dilated fundus or orbital ultrasound (USG; Nidek-RS300). BCVA values were converted to a logarithm of minimum resolution angle (LogMAR) system for statistical analysis. Non-Snellen visual acuities were converted to finger counting (2.0), hand gestures (2.3), light perception (2.6), and no light perception (3.0) (8). The numbers of patients presenting before and after lockdown were evaluated in terms of age, gender, the eye(s) involved, etiology, IOP, BCVA, the medical or surgical treatment applied, and lens status. Patients under 65 years of age or without neovascular glaucoma were excluded from the study.

Treatment Protocol

Eyes developing angle and/or iris neovascularization during patient follow-up and with IOP exceeding 21 mmHg were evaluated as having neovascular glaucoma. If neovascularization was detected in the iris or angle, pan-retinal photocoagulation and anti–vascular endothelial growth factor (VEGF) medical therapies were immediately initiated. Medical control of rising IOP was established using topical antiglaucoma drugs. Oral carbonic anhydrase enzyme inhibitors were added to the patient group requiring them. However, medical treatment is insufficient if neovascularization is present in the angle at gonioscopic examination and if closure has occurred because of synechiae, making the control of IOP difficult (9). In that event, surgical options for trabeculectomy with antimetabolite therapy after laser and anti-VEGF treatment, shunt implants, and diode laser cyclophotocoagulation were performed on the cases without light perception.

Statistical Analysis

Statistical analyses were conducted using SPSS for Windows version 25.0 software (IBM SPSS Inc., Chicago, IL, USA). The Shapiro–Wilk test was employed to assess the normality of distribution of data. A comparison of three-sample numerical variables was conducted using the unpaired Kruskal–Wallis test and post hoc Mann–Whitney U test. The Pearson chi-square test was also used to compare categorical variables. In addition, a two-tailed p-value < 0.05 was considered statistically significant.

Results

One hundred and twenty-six eyes from 115 patients met the inclusion criteria. These consisted of 54 eyes of 49 patients in the pre-lockdown group, 26 eyes of 24 patients in the lockdown group, and 46 eyes of 42 patients in the post-lockdown group. Patient numbers decreased by 51.02% in the lockdown period and by 14.29% in the post-lockdown period compared with the pre-lockdown period (p = 0.005 and 0.530, respectively). A comparison of the total numbers of patients with glaucoma in the pre-lockdown, during lockdown, and post-lockdown periods revealed no significant differences in terms of age, sex, laterality, or lens status (Table 1).

The pre-lockdown, lockdown, and post-lockdown BCVA levels were 1.10±0.47, 1.22±0.43, and 1.32±0.49 logMAR, respectively. No statistically significant difference was determined between the groups (p=0.078). IOP values in the pre-lockdown, lockdown, and post-lockdown groups were 45.74±6.17, 47.92±3.76, and 50.76±4.80 mmHg, respectively. Significant variation was observed between the groups (p<0.001; Table 2). Whereas no significant difference in IOP was found between the pre-lockdown and lockdown groups (p = 0.226), significant differences were identified between the pre- and post-lockdown groups (p < 0.001).

Trabeculectomy numbers decreased by 48.15% during lockdown compared to pre-lockdown, EX-PRESS glaucoma shunt numbers by 42.86%, Ahmed valve numbers by 50%, photocoagulation+anti-VEGF-only numbers by 75%, and cyclophotocoagulation numbers by 25%. Decreases of 3.7% in trabeculectomy numbers, 28.57% in EX-PRESS glaucoma shunt numbers, 25% in Ahmed valve numbers, and 33.33% in photocoagulation+anti-VEGF-only numbers were determined in the post-lockdown period. The total number of treatments decreased by 51.85% in the lockdown period compared with pre-lockdown and by 14.81% in the post-lockdown period (Table 3).

Table 1. Pre-lockdown, lockdown, and post-lockdown group data

Variable	Pre-lockdown group (%)	Lockdown group (%)	Post-lockdown group (%)	*p*
Number of eyes	54 (42.9%)	26 (20.6%)	46 (36.5%)	0.099
Age	71.47 ± 10.63	67.25 ± 11.30	71.57 ± 10.20	0.220
Sex (F/M)	26/28	12/14	24/22	0.868
Right/left	28/26	12/14	25/21	0.799
Lens status:				
Phakic	18 (33.3%)	6 (23.1%)	12 (26.1%)	
Pseudophakic	33 (61.1%)	18 (69.2%)	31 (67.4%)	0.883
Aphakic	3 (5.6%)	2 (7.7%)	3 (6.5%)	
Disease diagnosis:				
DR	30 (55.6%)	14 (53.8%)	24 (52.2%)	
CRVO	17 (31.5%)	10 (38.5%)	14 (30.4%)	0.810
Other	7 (13%)	2 (7.7%)	8 (17.4%)	

DR: diabetic retinopathy, CRVO: central retinal vein occlusion
Values are expressed as mean ± standard deviation.

Table 2. Vision (logMAR) and IOP (mmHg) levels in the pre-lockdown, lockdown, and post-lockdown groups

	Pre-lockdown group	Lockdown group	Post-lockdown group	*p*
Vision levels	1.10 ± 0.47	1.22 ± 0.43	1.32 ± 0.49	0.078
IOP	45.74 ± 6.17*	47.92 ± 3.76	50.76 ± 4.80*	<0.001

IOP: intraocular pressure ** Group exhibiting a difference* *Values are expressed as mean ± standard deviation.*

Table 3. Changes in the numbers and percentages of treatments applied pre-, during, and post-lockdown

	Pre-lockdown group (%)	Lockdown group (%)	Post-lockdown group (%)	Percentage change in the pre-lockdown and lockdown groups %	Percentage change in the pre- and post-lockdown groups %
Trabeculectomy	27 (50%)	14 (53.8%)	26 (56.5%)	-48.15	-3.70
EX-PRESS glaucoma shunt	7 (12.96%)	4 (15.3%)	5 (10.8%)	-42.86	-28.57
Ahmed valve	4 (7.4%)	2 (7.6%)	3 (0.6%)	-50.00	-25.00
Photocoagulation+ anti-VEGF only	12 (22.2%)	3 (11.5%)	8 (17.3%)	-75.00	-33.33
Cyclophotocoagulation	4 (7.4%)	3 (11.5%)	4 (0.8%)	-25.00	00.00
Neovascular glaucoma number/total glaucoma number	54/112 (48.2%)	26/53 (49%)	46/98 (46.9%)	-51.85	-14.81
Glaucoma number/total patient number	112/2,423 4.62%	53/986 5.37%	98/1,956 5.01%	-52,68	-12,50

Discussion

Several studies have reported an increase in mortality among people of advanced age because of COVID-19 (2,10). Eighty percent of the COVID-19 deaths in the United States and China are reported to have occurred over the age of 65 years (11). This situation has led to individuals aged over 65 being fearful and anxious about going to the hospital. Partial or complete closures have been imposed in several countries to protect this age group. Consequently, individuals in

this group have presented to hospital less frequently during the lockdowns than they did before (2,5,10). Patients with neovascular glaucoma, the prognosis of which is already poor, were perhaps even more affected by this situation. The purpose of the present study was to examine the incidence and progression of neovascular glaucoma in patients aged over 65 who presented to our hospital during and after the lockdown.

Patients with neovascular glaucoma, recently detected ischemic central retinal vein occlusion (CRVO), and proliferative diabetic retinopathy, were classified into the high-priority group for intravitreal injection during the pandemic (12,13). However, the number of intravitreal injections performed during the pandemic dropped around the world (2,10). A study performed in three hospitals in the United States (in New York, Boston, and Miami) reported a decrease in the number of intravitreal injections compared with the same period in the previous year of 30%–64% (14). Studies have shown that access to medical care during the pandemic was severely affected because of a fear of infection among patients (15). Posarelli et al. reported a 74% decrease in the number of patients attending the ocular emergency department during the 2020 lockdown compared with 2019 (16). Rajendrababu et al. compared the number of patients with neovascular glaucoma who presented to the glaucoma unit during the lockdown from March 23 to June 23, 2020, compared with the equivalent period in 2019; the authors reported that whereas 1,023 patients presented in 2019, only 335 did so in 2020. The decrease in patient numbers was 67.25% (17). In the present study, a 51.02% decrease was detected in the lockdown group compared with the pre-lockdown group.

Maalej et al. determined a 50% decrease in ocular emergencies during the lockdown period (March 17–May 10, 2020) compared with the pre-lockdown period, as well as a 30% decrease in the post-lockdown period (18). A study from France reported an 11.5% decrease in observed intravitreal anti-VEGF injections compared with the expected numbers (estimated from the previous 2 years) in the post-lockdown period (May 11–June 7, 2020), with no recovery occurring in the post-lockdown period (19). Both studies attributed their findings to people still fearing COVID-19 transmission. Despite the fear of infection, Maalej et al. identified a twofold increase in the number of neovascular glaucoma cases in the post-lockdown period compared with during the lockdown in 2020 (18). In the present study, the number of cases of neovascular glaucoma in the over-65 age group decreased

by 14.28% in the post-lockdown group compared with the pre-lockdown group. We ascribe this to anxiety persisting in the older age group. Concerns about viruses in hospitals, public transport, crowded environments, and the continuation of restrictions in hospitals are important factors that continue to reduce hospital admissions (2,5,10). That pre-pandemic numbers have still not been reached, despite a decrease in visual acuity and an increase in IOP, is one indication of this.

Studies have reported a negative correlation between duration of treatment interruption and patients' visual outcomes (2,5,20). Stone et al. reported that vision did not return to baseline values in 30% of patients with RVO and 10% of patients with diabetic macular edema (DME) following an 8- to 16-week delay during closure (21). Within the DME subgroup, patients whose injections were delayed exhibited a statistically significant trend of decline in vision, from logMAR 0.54 in the pre-lockdown period to logMAR 0.72 at follow-up. However, no significant decrease in vision was determined in patients whose injections were not delayed (22). Yang et al. reported a mean length of interruption of treatment of 5.3 ± 0.8 months in patients with DME and RVO, with BCVA decreasing from logMAR 0.57 ± 0.23 before discontinuation to logMAR 0.98 ± 0.41 with the interruption (20). In the present study, vision levels among patients with neovascular glaucoma were logMAR 1.10 ± 0.47 pre-lockdown, decreasing to logMAR 1.22 ± 0.43 during lockdown.

Quaranta et al. reported performing more glaucoma surgeries during lockdown compared with the same period in the previous year, and they attributed this to other hospitals in the region being converted into COVID treatment centers (23). Krishna et al. determined decreases of 59% in laser cyclophotocoagulation, 74% in glaucoma drainage device implantation, 77% in trabeculectomy, and 80% in total glaucoma surgeries from March 23 to August 31, 2020, compared with the same period in 2019 (24). Research conducted in 39 hospitals in Italy determined a 73% decrease in trabeculectomies, a 59% in glaucoma drainage implants, and an 85% decrease in cyclophotocoagulation in the March 10–May 9, 2020, lockdown period compared with the same period in 2019 (25). In the present study, a 48.15% decrease in the number of trabeculectomies, a 42.86% decrease in EXPRESS glaucoma shunt numbers, a 50% decrease in the number of Ahmed valves, a 75% decrease in the number of photocoagulation+anti-VEGF-only treatments, and a 25% decrease in cyclophotocoagulation were determined during the lockdown period compared with the pre-lockdown period. In terms of the total number of treatments, decreases of 53.7% in the lockdown period and 14.81% in the post-lockdown period were observed compared with the pre-lockdown period.

The principal limitations of this study are its retrospective nature and the small size of the patient groups. In addition, different types of closures were applied at different times in different countries; this prevents any definitive conclusion from being reached about the significance of the results and their effects on health.

Patient numbers decreased by 51.02% in the lockdown group and by 14.29% in the post-lockdown group compared with the pre-lockdown group. Vision levels in the pre-lockdown, lockdown, and post-lockdown groups were 1.10 ± 0.47, 1.22 ± 0.43, and 1.32 ± 0.49 logMAR, respectively. The IOP levels in the three groups were 45.7, 47.9, and 50.7

mmHg respectively. The total number of treatments decreased by 53.7% during lockdown and 14.81% post-lockdown compared with the pre-lockdown period.

In conclusion, the number of patients with neovascular glaucoma over the age of 65 decreased significantly during lockdown compared with the pre-lockdown period. An increase occurred in the subsequent period, although the number was still lower than it was in the pre-lockdown period. In particular, mean vision levels decreased in the post-lockdown period compared with the pre-lockdown period, whereas IOP increased. We attribute this to anxiety and to treatments being postponed because of closures; postponed treatments led to irreversible visual damage in patients. The data suggest that our workload may be increased by a backlog of patients requiring glaucoma surgery in the near future. Further studies from different centers and with larger patient numbers are needed to confirm this.

Ethical Approval: *For this study, following the permission of the hospital management on 09.29.2021, numbered E-66063783-622.99-66538, ethics committee approval was gained from Harran University clinical research ethical committee numbered HRÜ.22/05/25; dated 07/03/2022.*

Author Contributions:

Concept: M.T.

Literature Review: M.T.

Design : M.T.

Data acquisition: M.T.

Analysis and interpretation: M.T.

Writing manuscript: M.T.

Critical revision of manuscript: M.T.

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