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Perception of COVID-19 Pandemic in Refractive Laser Surgery Patients: Cross-Sectional Research

Refraktif Lazer Cerrahisi Hastalarında COVID-19 Pandemisi Algısı: Kesitsel Araştırma

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ABSTRACT Objective: To evaluate the impact of the coronavirus disease-2019 (COVID-19) pandemic on patients' refractive surgery preferences and contact lens (CL) or spectacle-wearing behaviors. **Material and Methods:** The survey was conducted at two centers in Türkiye between July 2020 and August 2021. An anonymized paper questionnaire was administered to all participants to collect information about sociodemographic profiles, reasons for choosing refractive surgery, and CL or spectacle-wearing habits during the COVID-19 pandemic. The number of refractive surgeries performed before and after the announcement of the COVID-19 pandemic was obtained from the medical records. **Results:** A total of 661 patients were enrolled in the study. Compared to the previous year, the rate of refractive surgery declined by 83.1% in the first quarter after the declaration of the pandemic, while it increased by 36.3%, 118.1% and 211.7% in the second, third and fourth quarters, respectively. The rate of increase in the number of refractive surgeries between pre-and post-pandemic was 69.8%. The main reasons associated with the COVID-19 pandemic for preferring permanent surgical correction in the CL group were the perceived increased risk of COVID-19 infection and fear of possible CL contamination with severe acute respiratory syndrome-coronavirus-2 (24.3%) and avoiding face touching (14.7%). In the spectacle group, the reasons related to the COVID-19 pandemic for preferring refractive surgery included fogging of glasses due to mask-wearing (11.4%), avoiding face touching (10.1%) and fear of possible mask or spectacle contamination (18.8%). **Conclusion:** The COVID-19 pandemic emerges as a substantial factor to prefer permanent correction of refractive errors with refractive laser surgery among CL or spectacle wearers.

Keywords: COVID-19; mask; contact lens; spectacles; refractive surgery

ÖZET Amaç: Koronavirüs hastalığı-2019 [coronavirus disease-2019 (COVID-19)] pandemisinin hastaların refraktif cerrahi tercihleri ile kontakt lens (KL) ya da gözlük kullanım davranışları üzerindeki etkisini değerlendirmek. **Gereç ve Yöntemler:** Anket, Temmuz 2020-Ağustos 2021 arasında Türkiye'de 2 farklı merkezde gerçekleştirildi. Hastaların sosyodemografik profilleri, COVID-19 pandemisi sırasında refraktif cerrahiyi tercih nedenleri ve KL ya da gözlük kullanma alışkanlıkları hakkında bilgi toplamak için tüm katılımcılara anonimleştirilmiş bir yazılı anket uygulandı. COVID-19 pandemisinin ilanından önce ve ilanından sonra yapılan refraktif cerrahi sayıları tıbbi kayıtlardan elde edildi. **Bulgular:** Çalışmaya toplam 661 hasta kaydedildi. Refraktif cerrahi oranı pandeminin ilanından sonraki ilk çeyrekte bir önceki yıla göre %83,1 azalırken, iki, üç ve dördüncü çeyreklerde sırasıyla %36,3, %118,1 ve %211,7 arttı. Pandemi sonrasında, pandemi öncesi döneme göre refraktif cerrahi sayısındaki artış oranı %69,8 idi. KL grubunda kalıcı cerrahi düzeltmeyi tercih etmek için COVID-19 pandemisi ile ilişkili ana nedenler, artmış COVID-19 enfeksiyonu riski algısı ve şiddetli akut solunum sendromu-koronavirüs-2 ile olası KL kontaminasyonu korkusu (%24,3) ve ek olarak, yüze dokunmaktan kaçınma davranışıydı (%14,7). Gözlük grubunda COVID-19 pandemisi ile ilişkili refraktif cerrahiyi tercih etme nedenleri arasında yüz maskesi kullanımı nedeniyle gözlüğün buğulanması (%11,4), yüze dokunmaktan kaçınma davranışı (%10,1) ve olası maske ya da gözlük kontaminasyonu korkusu (%18,8) yer aldı. **Sonuç:** COVID-19 pandemisi, KL ya da gözlük kullanıcıları arasında kırma kusurlarının refraktif lazer cerrahi ile kalıcı olarak düzeltilmesini tercih etmede önemli bir etken olarak ortaya çıkmaktadır.

Anahtar Kelimeler: COVID-19; maske, kontakt lens; gözlük; refraktif cerrahi

The coronavirus disease-2019 (COVID-19), caused by the severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2), spread rapidly throughout the world and became a major public health concern. The World Health Organization (WHO) declared the COVID-19 outbreak a pandemic on March 11, 2020.[1]

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Droplet transmission has been identified as the primary mode of COVID-19 transmission.[2] Airborne transmission with a high viral load can occur, primarily inside rather than in public places like streets, parks, and transportation hubs.[3,4] Another mode of transmission has been reported to be indirect, as a result of interaction with contaminated surfaces and subsequent touching behaviors of organs such as the eyes, mouth and face.[5] Zhang et al. emphasized that the ocular transmission may also be a potential route for COVID-19 infection.[6] Although it was thought that fomites might be partially responsible for the transmission of the SARS-CoV-2 in the initial phase of the pandemic, current evidence indicates that the primary route is the airborne transmission.[7]

Many governments have implemented different methods to minimize the spread of the virus and reduce hospital overcharging, such as obligatory mask-wearing rules, preserving social distance, and restricting free movement of individuals. Furthermore, according to WHO preventative guidelines, actions like as frequent hand washing and avoiding touching the nose, eyes, and mouth are advised.[8]

The impact of the COVID-19 pandemic on daily life is not independent of personal preferences, such as the use of contact lenses (CL) or spectacles and permanent correction with refractive surgery. In a study evaluating the impact of the COVID-19 pandemic on CL wearers' behaviors toward CL wear in Spain, it was shown that there was a significant association with the perception of infection risk and CL cessation.[9] Following the declaration of the COVID-19 pandemic, we have observed an increase in the demand for permanent correction of refractive errors with surgery among patients who wear CLs or spectacles in our clinical practice. Therefore, this study aims to evaluate the effects of the COVID-19 pandemic on patients' CL or spectacle wear habits and refractive surgery preferences.

MATERIAL AND METHODS

PATIENT SELECTION

The protocol of this two-center study, in which an anonymized paper questionnaire was administered to all participants, was approved by the local ethics committee (Necmettin Erbakan University Faculty of Medicine Ethics Committee; date: June 4, 2021, no: 2021/3269). Participation in the questionnaire was on a voluntary basis, and the purpose and importance of the study were explained to all patients. Each patient provided their written informed permission, and the study was carried out in accordance with the Declaration of Helsinki's guidelines. Patients who underwent permanent correction with laser in situ keratomileusis (LASIK) or photorefractive keratectomy (PRK) among patients who wore CL or glasses due to refractive error were enrolled in the study. Inclusion criteria were being older than 18 years of age, having a stable refractive error and not having any ocular or systemic pathology that would hinder refractive laser surgery. On the other hand, patients who wore both CLs and spectacles were excluded from the study.

THE QUESTIONNAIRE

A written paper questionnaire in Turkish language was prepared for patients who underwent refractive surgery after wearing CLs or spectacles for at least six months. We created the questionnaire and then presented it as a pilot trial to 18 patients who had refractive surgery to guarantee understanding of the questions and to calculate the needed response time. The results of this pilot test were not included in the study, and the questionnaire was further revised according to the feedback received. The survey was conducted at two centers Konyagöz Eye Hospital and Eye Center in Türkiye between July 2020 and August 2021, i.e., over a period of 15 months. The required time to respond to the questions was approximately five minutes. The questionnaire was administered at the last visit before the day of refractive laser surgery. The final version of the questionnaire comprised of sociodemographic information of the patients (i.e., age, sex, education level, and smoking habits), information about CLs or spectacles (such as the type of refractive error, the modes of refractive correction, the duration of spectacle or CL wear, type of CLs, CL or spectacle-wearing time per day and week), the reason for requesting permanent correction of refractive errors with surgery, the perceived risk of COVID-19 infection due to CL or spectacle wear during the pandemic, and the source of participants' information about COVID-19. In terms of CL or

spectacle-wearing time per day, participants were divided into three groups: less than 6 hours, between 6 and 12 hours, and more than 12 hours. Weekly CL or spectacle wearing frequency was defined as regular use (five or more days) or occasional use (less than five days). In addition, all patients were asked whether they believed in a possible protective effect of glasses for transmission of COVID-19. Furthermore, the number of refractive surgeries (LASIK or PRK) performed before and after the announcement of the COVID-19 pandemic was obtained from the medical records.

STATISTICAL ANALYSIS

Using the SPSS program (Version 22.0. IBM Corp., Armonk, NY), all descriptive statistical analyses were carried out (SPSS, Inc., version 22). A p value of 0.05 or less was regarded as statistically significant for continuous variables, which were specified as mean standard deviation.

RESULTS

A total of 661 patients who underwent permanent correction of refractive errors with surgery were enrolled in the study. Of these patients, 262 were males (39.6%) and 399 were females (60.3%). The mean patient age at the time of the survey was 26.9±5.4 years (range, 18-43). The demographical characteristics of the patients are presented in Table 1.

Spectacle and CL wearing profiles of the patients are presented in Table 2. The vast majority (68.3%) of the patients in the spectacle group (n=294) reported at least one year of spectacle wear. In the CL group, 63.0% of the patients reported at least one year of CL wear, and 97.0% of them (n=367) preferred soft CLs. During the COVID-19 pandemic, there was a significant increase in occasional wearing (less than five days) of both spectacles and CLs (from 45.2% to 79.3% and from 42.0% to 62.1%, respectively). Additionally, before the COVID-19 pandemic, 29.6% of the patients in the spectacle group and 17.4% of the patients in the CL group wore spectacle or CLs less than 6 hours per day. Interestingly, this rate increased to 68.3% in the spectacle group and 74.4% in the CL group during the COVID-19 pandemic. To summarize, after the announcement of the COVID-19 pandemic, both daily and weekly CL and spectacle-wearing times decreased significantly in both groups (p<0.001).

TABLE 1: Demographical characteristics of survey participants.

Parameter	n (%)
Age	
18-20	98 (14.8)
21-30	410 (62.0)
31-40	119 (18.0)
>41	34 (5.1)
Sex	
Male	262 (39.6)
Female	399 (60.3)
Education	
Primary/elementary school	10 (1.5)
High school	78 (11.8)
College	519 (78.5)
Postgraduate	54 (8.1)
The modes of refractive correction	
Spectacle	294 (44.4)
Contact lens	367 (55.5)
Smoking	
Yes	185 (27.9)
No	476 (72.0)

TABLE 2: Spectacle and CL wearing profiles of the patients.

Parameter	Spectacle group (n=294, %)	CL group (n=367, %)
The duration of spectacle/CL wear		
6-12 months	53 (18.0)	65 (17.7)
1-2 years	60 (20.4)	82 (22.3)
2-3 years	71 (24.1)	95 (25.8)
More than 3 years	110 (37.4)	125 (34.0)
Spectacle/CL wearing days per week before COVID-19 pandemic		
Regular use	161 (54.8)	213 (58.0)
Occasional wear	133 (45.2)	154 (42.0)
Spectacle/CL wearing time per day before COVID-19 pandemic		
<6 hours	87 (29.6)	64 (17.4)
6-12 hours	173 (58.8)	237 (64.6)
More than 12 hours	34 (11.6)	66 (18.0)
Spectacle/CL wearing days per week after the declaration of COVID-19 pandemic		
Regular use	61 (20.7)	139 (37.9)
Occasional wear	233 (79.3)	228 (62.1)
Spectacle/CL wearing time per day after the declaration of COVID-19 pandemic		
<6 hours	201 (68.3)	273 (74.4)
6-12 hours	64 (21.8)	67 (18.2)
More than 12 hours	29 (9.9)	27 (7.4)

CL: Contact lens.

TABLE 3: The change in the number of refractive surgeries between the pre-and post-pandemic periods.

Period	March-May (first quarter)	June-August (second quarter)	September-November (third quarter)	December-February (fourth quarter)	Total
Pre-pandemic	172	157	193	145	657
Post-pandemic	29	214	421	452	1,116
Percentage of change	-83.1%	36.3%	118.1%	211.7%	69.8%

Compared to the previous year, the rate of refractive surgery declined by 83.1% in the first quarter after the declaration of the pandemic, while it increased by 36.3%, 118.1% and 211.7% in the second, third and fourth quarters, respectively (Table 3). The rate of increase in the number of refractive surgeries between pre-and post-pandemic was 69.8%. The reasons for preferring permanent correction of refractive errors with surgery in the CL group consisted of the perceived increased risk of COVID-19 infection and fear of possible CL contamination with SARS-CoV-2 (24.3%), avoiding face touching (14.7%), non-compliance with CLs such as intolerance, discomfort or dislike for CL (45.8%), difficulty in accessing a healthcare professional (4.1%), allergy (5.1%), and other causes (6%) (Figure 1). In the spectacle group, the reasons for preferring surgery included cosmetic purposes (31.7%), dislike for spectacles (23.6%), fogging of spectacle glasses due to face mask-wearing (11.4%), avoiding face touching (10.1%), fear of possible mask or spectacle contamination (18.8%), and other causes (4.4%) (Figure 2).

Notably, 641 (93.7%) of the patients stated that they did not believe that the spectacles had a protective effect in preventing the transmission of COVID-19. Additionally, the main sources of patients' information about COVID-19 infection were the internet and social media applications (81.7%), TV (10.4%), healthcare professionals (4.6%), and friends and family (3.3%).

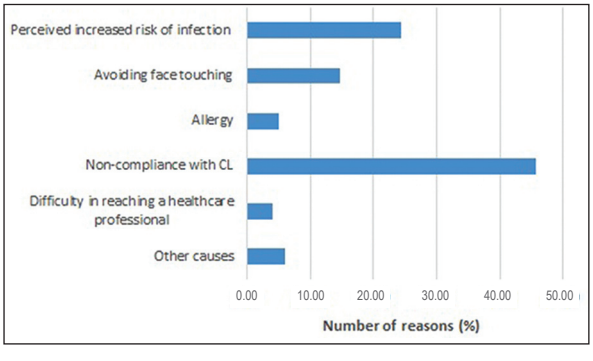

FIGURE 1: The reasons for preferring permanent correction with refractive surgery in the contact lens group.

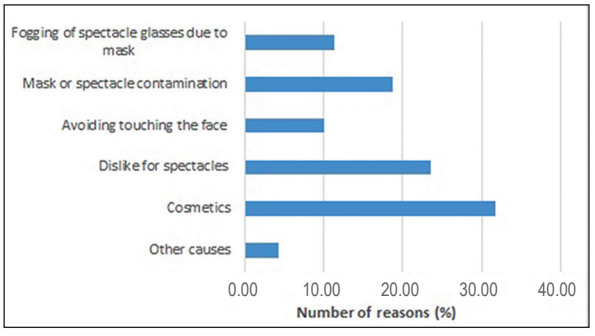

FIGURE 2: The reasons for preferring surgery in the spectacle group.

DISCUSSION

The COVID-19 pandemic has seriously affected patients' behaviors in all health care disciplines and has substantially changed daily life. The reasons for this situation consist of various factors including the limited access of people to health care systems due to lockdown, the need to maintain social distancing, the effects of COVID-19 on global mental health such as stress, anxiety and fear, daily behavior changes and the impact of the pandemic on the economic situation of individuals and governments.[10-13] The results of this study demonstrated that the COVID-19 pandemic significantly contributed to the permanent correction of refractive errors with surgery in patients who wore CLs or spectacles. To our knowledge, this is the first study to evaluate the impact of the COVID-19 pandemic on patients' preference for permanent correction of refractive errors with surgery.

Surprisingly, the rate of refractive surgery declined by 83.1% in the first quarter after the declaration of the pandemic, while it increased by 36.3%, 118.1% and 211.7% in the second, third and fourth quarters, respectively. Similarly, the Refractive Surgery Council reported a 16.3% increase in refractive surgery procedures in the last quarter of 2020 compared to the previous year.[14] Moreover, it was reported that there was a dramatic 200% increase in the monthly rate of refractive surgery after June 2020 compared to the period from December 2019 to February 2020.[15] Although this increase in the demand for refractive surgery was thought to be related to a transient spike caused by the accumulation of patients who were discouraged a visit during the pandemic, our results show that this increasing trend is persistent.[16] On the other hand, even though there are some speculations related to lifestyle, health, and financial factors to explain this increasing trend, to our knowledge, there is no study on this subject in the literature.

According to the results of the present study, 39.1% of the participants in the CL group stated that they preferred refractive surgery for COVID-19-related reasons. Their primary justifications were avoiding face contact, being afraid of probable CL contamination with SARS-CoV-2, and higher perceived infection risk brought on by COVID-19. Similarly, García-Ayuso et al. administered an online survey to 737 CL wearers and reported that during the COVID-19 pandemic, patient concerns about the increased risk of SARS-CoV-2 infection due to CL wear were significantly related to CL discontinuation behaviors (46% of participants).[9] Besides, in that study, 53.52% of CL wearers stated that they would stop wearing CLs if they became infected with COVID-19. Contrarily, the most recent data suggest that wearing CL does not significantly enhance the risk of COVID-19 infection.[17] However, there are several issues that worry CL users, such as the need to touch their faces when applying and removing CLs, and the potential for SARS-CoV-2 transmission through the ocular surface.[6] Another important result of our study was that during the COVID-19 pandemic, there was a tendency to decrease the frequency of wearing CLs, and the occasional CL wear has become widespread among CL wearers. It has been reported that these changes might be related to reducing the risk of exposure to SARS-CoV-2, the decreased need to wear CLs when at home, and some specific activities performed after COVID-19.[9] Likewise, in their online survey study with 196 CL wearers, Bakkar and Alzghoul determined that 38.8% of the study population discontinued CL wear during the COVID-19 pandemic. In that study, the vast majority (70.9%) of the participants reported that they believed that possible ocular surface involvement or contaminated CLs played a role in the transmission of the disease.[18]

According to the current study, some of the possible reasons for preferring refractive surgery in patients wearing spectacles were fogging of the spectacle glasses secondary to face mask-wearing and avoiding face touching. Contact between the warmer breathing air and the cooler spectacle eyeglass causes condensation and the development of microscopic water droplets, which scatter light, reduce visual acuity, and distort vision.[19] Mask-associated dry eye disease has also been described, which can produce dry areas on the ocular surface, ocular irritation, and pain in those who use masks.[20] Although various methods such as creating a barrier between the mask and spectacles, coating the glasses with detergent-based surfactants, using anti-fog lenses or polycarbonate spectacle lenses which defog faster than glass lenses have been reported to prevent this situation, fogging remains a serious problem throughout the pandemic, and this situation leads patients to prefer refractive surgery.[21] Additionally, masks supported by ear straps can become caught on earpieces of spectacle and cause a feeling of crowding around the face.[16] On the other hand, it has been reported that contamination of the face through fingers or objects might be a critical transmission route of SARS-CoV-2 in public places in the general population.[8] Chen et al. reported that after the declaration of the COVID-19 pandemic, mask-wearing was associated with decreased face-touching behavior, especially concerning the eyes, nose and mouth.[12] Therefore, in the general population, it is thought that reducing face contact may be effective in preventing COVID-19 transmission. According to participant re-

sponses, we observed that another reason for spectacle discontinuation was that masks or spectacles themselves might become contaminated. Likewise, the American Academy of Optometry has suggested that SARS-CoV-2 can remain on hard surfaces, where it can be transferred to the spectacle wearer's fingers and face.[18] Moreover, 93.7% of the study population did not believe that the eyeglasses could have any protective effect in preventing the transmission of COVID-19. Nevertheless, we cannot ignore the fact that standard spectacles form a barrier that prevents direct droplet exposure.

CONCLUSION

The COVID-19 pandemic emerges as an important factor for CL or spectacle wearers to prefer refractive surgery. Although refractive surgery is considered to be elective in most countries except for some emergency anterior segment surgeries like globe perforation repair or cataract surgery during the pandemic, reasons such as the perceived increased risk of COVID-19 infection with CLs, contaminated masks or spectacles, fogging of spectacle glasses due to wearing masks and lifestyle changes have been reasonable arguments for permanent correction of refractive errors with surgery.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

This study is entirely author's own work and no other author contribution.

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