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Increased incidence of chalazion associated with face mask wear during the COVID-19 pandemic

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ABSTRACT

Purpose: To determine whether the incidence of chalazion increased significantly in the San Francisco Bay Area and Los Angeles County following the widespread adoption of face mask wear in response to the COVID-19 pandemic.

Methods: This is a retrospective multicenter study of two ophthalmology institutions: a private Oculoplastics practice in San Francisco and the Oculoplastics division of the Stein Eye Institute at the University of California, Los Angeles. All patients seen during the studied time periods with a diagnosis of chalazion or hordeolum were identified through review of electronic medical records and included in the study. Incidence was determined for each month between January and August 2020, and compared to data from prior years via ANOVA to evaluate for changes after the onset of the pandemic.

Results: In San Francisco, the incidence of chalazion rose significantly in June through August of 2020 when compared to the same interval in 2016, 2017, 2018, and 2019. In Los Angeles, the rise in chalazion incidence in 2020 was also statistically significant when compared to data from the years 2018 and 2019.

Conclusion: Importance: Widespread mask wear does appear to correspond to an increased incidence of chalazion. This risk may be minimized, while still maintaining the protective benefits of mask wear, by taking the proactive measures discussed to decrease mask induced eye dryness and changes in the eyelid microbiome.

1. Introduction

Since the novel 2019 coronavirus disease (COVID-19) was declared a pandemic by the World Health Organization (WHO) in March 2020, efforts to minimize its spread have included preventive measures such as social distancing, hand hygiene and face mask wear.[1,2] In the United States, the use of facial coverings made from paper or cloth rose dramatically during the pandemic, driven by recommendations released by the Centers for Disease Control and Prevention (CDC) in April 2020.[2] The increased use of face masks has been linked to unintended consequences in the general population, including an increased incidence of acne driven by localized increases in temperature and humidity.[3] Since wearing a non-respirator face mask generally directs breath upwards to the periorbital area (Fig. 3), it has been hypothesized that wearing such masks may also create a suitable micro-environment for eyelid inflammation and contribute to the development of chalazion.[4]

The aim of this study was to determine whether the incidence of chalazion rose following the widespread implementation of paper or cloth face coverings in response to the COVID-19 pandemic. Through retrospective analysis of medical records from two geographically disparate Oculoplastic practices in California, we explored the incidence of chalazion before and after the CDC's recommendation for face coverings, comparing rates during these time periods to those from prior years to determine whether there is a correlation between widespread mask wear and chalazion incidence.

2. Materials and methods

In this retrospective study, the medical records from two California Oculoplastic practices: a private practice (Silkiss Eye Surgery, San Francisco, USA) and a tertiary referral academic center (Stein Eye, University of California, Los Angeles, USA), separated geographically by 400 miles were reviewed. In the private practice, medical records between the months of January and August, for the years 2016–2020, were

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Table 1
The incidence of chalazion per month in San Francisco between 2016 and 2020. Note April and May are excluded due to practice shutdown during state-mandated stay-at-home orders.

	Jan	Feb	Mar	Jun	Jul	Aug
2016	0.0418	0.0746	0.0875	0.0653	0.0603	0.0417
2017	0.134	0.0459	0.0545	0.0505	0.0339	0.0824
2018	0.0791	0.0916	0.0948	0.0705	0.097	0.0769
2019	0.0512	0.0532	0.0669	0.0821	0.0752	0.0752
2020	0.112	0.0936	0.0912	0.173	0.131	0.131

analyzed for the incidence of chalazion (CPT and ICD10 codes 67800, 67801, H00.1) per all patient visits. The same methods were used to analyze data from the academic center from 2018 to 2020, where the incidence of chalazion was calculated among all visits for ocular symptoms. All statistical analyses were performed with SPSS version 22.0 (SPSS, Inc., Chicago, Illinois, USA). Analysis of variance (ANOVA) was used to determine whether the differences in chalazion incidence at different time points were statistically significant.

The research adhered to the tenets of the Declaration of Helsinki as amended in 2008 as the Health Insurance Portability and Accountability Act (HIPAA) of 1996. It was not appropriate or possible to involve patients in the design, or conduct, or reporting, or dissemination plans of our research.

3. Results

At both institutions, the incidence of chalazion rose significantly in

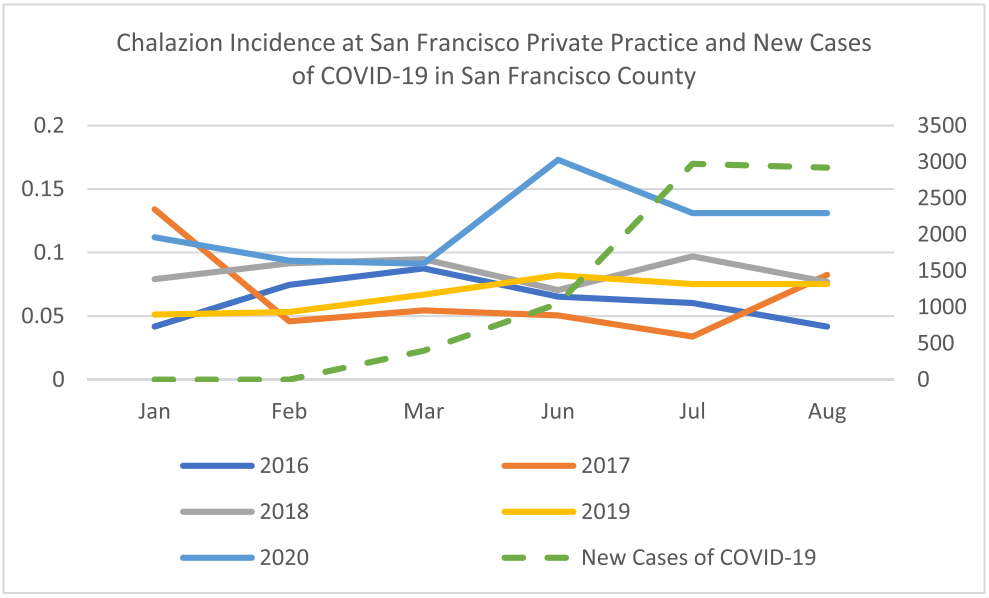

Fig. 1. Chalazion Incidence at San Francisco Private Practice and New Cases of COVID-19 in San Francisco County.
The incidence of chalazion in San Francisco per month between 2016 and 2020, overlaid by incidence of new cases of COVID-19 throughout studied months. Note April and May are excluded due to practice shutdown during state-mandated stay-at-home orders.

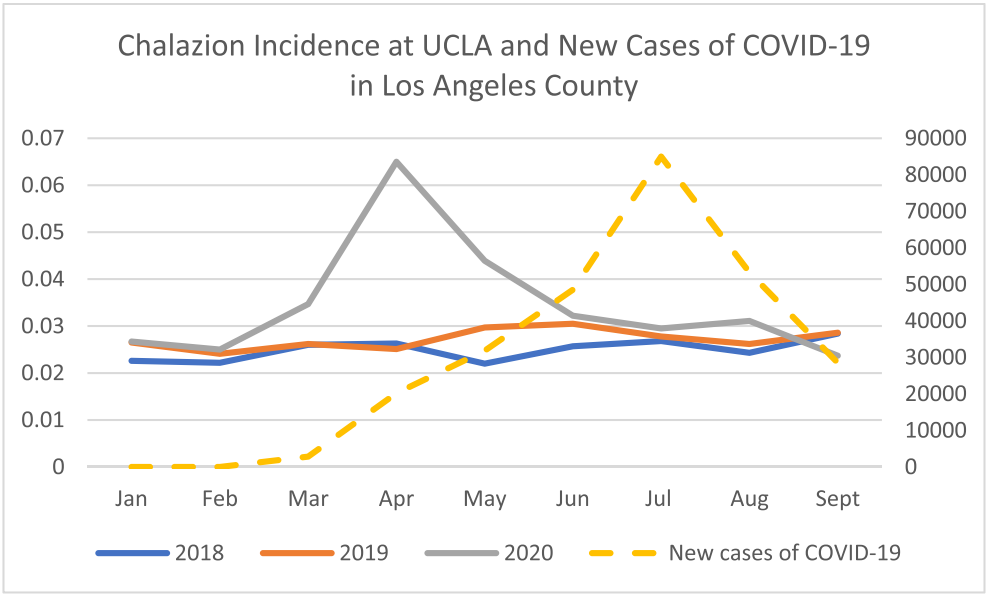

Fig. 2. Chalazion Incidence at UCLA and New Cases of COVID-19 in Los Angeles County. The incidence of chalazion in Los Angeles per month between 2018 and 2020, overlaid by incidence of new cases of COVID-19 throughout 2020.

Fig. 3. Photograph illustrating upwardly displaced air flow in a subject wearing a face mask, as demonstrated by fogging of eye glasse lenses. Note the relatively uniform fogging pattern suggests a reasonably equal distribution of breath throughout the periocular region.

2020 as compared to prior years. In the San Francisco (SF) private practice, partially closed due to local lockdown measures in April and May, between June and August of 2020, 202 of 1338 patients were seen for chalazion, reflecting an incidence of 0.151. For comparison, during the same time interval in 2019, 124 of 1631 (incidence 0.076) patients were seen for chalazion (Table 1 and Fig. 1).

At the Los Angeles (LA) academic center, which did not undergo the same lockdown mandated closures, chalazion incidence began to rise steeply after the pandemic declaration (Fig. 2). Between March and May of 2020, 939 patients were seen for chalazion, reflecting an incidence of 0.044. During the same time interval in 2019, the incidence was 0.027. Between June and August 2020, 1165 patients were seen for chalazion (incidence 0.031). In this interval, numbers from 2019 were similar, with 1165 chalazion patients seen and an incidence of 0.028 (Table 2). The difference in incidence of chalazion between January and September 2018, 2019, and 2020, revealed that the increase in 2020 was significant (f-ratio = 5.27 and $p < 0.01$).

Chalazia were observed in varying severity on both the upper and lower eyelids, in both medial and temporal locations, in some cases all in the same patient (Fig. 4). The authors did not anecdotally observe a predilection for chalazion development in any specific periorbital region following the onset of the pandemic, and anatomic location was not included as a variable in our data analysis.

4. Discussion

This study revealed a significant increase in the incidence of chalazion in two geographically disparate ophthalmology centers in California. The centers were separated by a distance of 400 miles.

The increased incidence of chalazion may be associated with the widespread adoption of facial mask wear. It has been reported that mask wear can accelerate the evaporation of tears and exacerbate the symptoms of dry eye.[5,6] In turn, dry eyes have been linked to blepharitis and the development of chalazion.[7] Further, dehydration has been proposed as a mechanism for meibomian oil hardening and chalazion formation in healthcare workers wearing sealed goggles.[4] Alterations to the normal eyelid flora may also be a factor. Though caused by a noninfectious obstruction of eyelid meibomian glands, chalazion development has been associated with multiple specific bacterial isolates as well as changes to the gut microbiome.[7,8] *Staphylococcus aureus*, for example, is commonly associated with blepharitis[7] and is a frequent component of human oral flora.[9] Bacterial pathogens and normal oral flora are incorporated into expired droplets through activities such as talking, sneezing, and coughing.[10] Therefore, mask wear may provide a funnel for increased bacterial exposure to the eyelids (and fogging eyeglasses), promoting inflammation. Finally, mask use is often accompanied by frequent manual adjustment, increasing the chances of transferring bacteria from the hand to the face.

The observed rise in chalazion incidence was somewhat asynchronous between the two studied institutions, peaking in June in San Francisco and April in Los Angeles. Though the explanation for this discrepancy is likely multifactorial, a significant factor may be the private practice's closure in April and May, which meant any increase in chalazion incidence in the SF patient population would not be reflected in the medical records during that interval. Another notable difference between the two datasets was the overall duration of chalazion increases, with the SF incidence remaining elevated after its initial peak and the LA incidence returning to rates comparable to prior years starting in June. Geographic variation in compliance with mask wear may be implicated in this difference, with an July 2020 observation study showing only 42% of people in a public section of Los Angeles County wearing face masks appropriately.[11] Though analogous data is unavailable for San Francisco, statewide self-reported public mask compliance was 64% in a June 2020 survey[12] and may have remained higher in other parts of California, including the Bay Area.

Additionally, the rapid decline in chalazion incidence observed in Los Angeles may be attributable to "crisis fatigue" and resultant decreased mask wear months after the onset of the pandemic. The ongoing threat of COVID-19 has led to continued, repetitive messages to the public to engage in protective measures such as social distancing and mask wearing, creating mental fatigue and an eventual desensitization to such messaging despite initial anxiety.[13] The LA decrease in chalazion incidence correlates with the low public compliance seen in the July study. A similar phenomenon may be present in the SF data, in which chalazion incidence decreased in July and August despite still being increased relative to prior years. In both locations, peak chalazion incidence corresponded to a period of relatively low incidence of new

Fig. 4. Photograph of severe chalazion formation in a young person involving all four eyelids.

Table 2
The incidence of chalazion per month in Los Angeles Academic Practice between 2018 and 2020.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept
2018	0.0226	0.0222	0.026	0.0263	0.022	0.0257	0.0268	0.0243	0.0284
2019	0.0265	0.0241	0.0262	0.0251	0.0297	0.0305	0.0278	0.0262	0.0286
2020	0.0267	0.025	0.0347	0.065	0.0439	0.0322	0.0295	0.0311	0.0237

cases of COVID-19 (Figs. 1 and 2). According to New York Times data,[14] San Francisco County experienced a decline in infection rate in May and June following an initial rise, corresponding to the peak chalazion incidence we observed in June. In Los Angeles County,[15] infection rates were lowest in April and rose steadily until July, with the low COVID-19 incidence in April corresponding to peak observed chalazion incidence at UCLA. This inverse relationship may suggest that low infection rates in each location correspond with increased mask wear; in turn, the simultaneous rise in chalazion incidence may further support the potential association between mask wear and chalazion development.

5. Conclusions

The increased incidence of chalazion with mask use does not outweigh the significant protective benefits of wearing facial coverings during the pandemic. However, the authors do recommend taking proactive measures to mitigate the risk of chalazion formation. These measures include the use of an antiseptic mouthwash containing hydrogen peroxide, alcohol, or povidone iodine. This has been shown to reduce bacterial load (as well as the viral load of SARS CoV-2 itself)) and may decrease the likelihood of masked breathing patterns altering the normal flora of the eyelids and periorbital region.[16,17] The etiology of chalazion is multifactorial[7] and face masks may only be a contributor to an increased incidence. However, behavioral modifications including frequent hot water washing of cloth face masks, good hand hygiene practices, avoidance of face touching, avoidance of excessive mask adjustment, and use of adhesive tape over one's mask on the bridge of the nose to minimize the upward direction of air towards the eyes may be helpful. The use of a 1% hypochlorous acid solution eyelid scrub (Ocusoft or Avenova) as part of daily eyelid hygiene may act as both an antiviral and antibacterial blepharitis deterrent. We believe routine implementation of these methods may provide an effective strategy for minimizing the risk of chalazion formation while maintaining the efficacy and importance of personal protective mask use.

Although our study was limited to the findings of two institutions in one part of the United States, the significant incidence of chalazion in both populations warrants further study. Since both practices accept all patients, regardless of insurance, these rates are expected to be minimally influenced by demographic bias and reflective of the population of California, where mask adherence has been high relative to the rest of the United States.[12]

Patient consent

Consent to publish this Brief Report was not obtained. This report does not contain any personal information that could lead to the identification of any of the studied patients.

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Authorship

All authors attest that they meet the current ICMJE criteria for authorship. Credit roles are outlined below.

- RZS: Conceptualization; data curation; formal analysis; investigation; methodology; project administration; supervision; validation; writing – review & editing
- MKP: Data curation; formal analysis; investigation; methodology; project administration; visualization; writing – original draft; writing – review and editing
- SU: Conceptualization; data curation; formal analysis; investigation; methodology; software; validation; writing – review and editing

Declaration of competing interest

The authors have no conflicts of interest to disclose.

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