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Open Access Journal of Ophthalmology
ISSN: 2578-465X

Facial Masking and Effects on Ocular Health: A Review

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Mini Review
Volume 6 Issue 1
Received Date: April 02, 2021
Published Date: April 30, 2021
DOI: 10.23880/oajo-16000216

Abstract

It has been over a year since the United States began to feel the effects of the on-going COVID-19 pandemic. In response, many daily practices in the administration of healthcare have changed. Perhaps the most visible of these changes is the widespread use of facial masks to prevent transmission of the SARS-CoV-2 virus. While COVID-19 has documented direct ocular effects, there is increasing interest surrounding the effects of preventative facial masking on ocular health. This review summarizes the major impacts of masking in several domains, in an attempt to better characterize new threats to ocular health.

Keywords: COVID-19; Facial Masking; MADE; Ocular Infection; Orbital Hemorrhage

Mask Associated Dry Eye

Soon after the onset of the pandemic, American ophthalmologist D.E. White coined the acronym "MADE" (mask-associated dry eye) in a blog post [1,2] that contained the results of a survey reporting symptoms of dry eye disease and their relation to duration of facial masking [3]. These initial remarks were followed by further observation of increased dry eye symptoms with associated corneal staining among postoperative cataract patients. Patients reported the sensation of upward airflow from the mask edge towards the eyes as the primary contributing factor [4]. Findings from a much larger survey published in January 2021 confirm that a significant proportion of mask-wearers experience increased ocular discomfort while wearing a face mask [2]. A letter to the editor of the Indian Journal of Ophthalmology offered further analysis in February 2021, postulating that redirection of exhaled air upwards by face masks encourages evaporation of the tear film and promotes ocular dryness and irritation [5].

Ocular Infection Rates

In addition to increased symptoms of dryness and irritation, there have been reports that preventative mask wear may alter post injection and post-operative infection rates. An interventional study in healthy volunteers utilized thermal cameras to detect the extent of upward airflow in different types of surgical and N-95 masks. The authors postulated that the redirection of airflow secondary to masks may lead to increased carriage of oral flora towards the eyes and thus increase the risk of post-injection endophthalmitis [6]. While the scope of the study precluded any clinical monitoring to support that hypothesis, there is at least one case report of oral flora endophthalmitis that occurred after intravitreal injection while the patient was masked in accordance with COVID-19 precautions [7]. It has been reported that mask wear may alter evaporative rates due to upward airflow, however there is additional support that mask wear results in worsening inflammation of secretory glands that contribute to the lipid layer of the tear film. A retrospective study noted incidence of chalazion and meibomian gland dysfunction were significantly increased when compared to pre-pandemic levels. Furthermore, peaks in chalazion incidence were associated with decreased COVID incidence (and therefore presumed increases in mask-wearing) in the preceding month. Although the authors describe a multifactorial etiology for chalazion, they do endorse roles for alterations in eyelid flora and periocular airflow due to mask-wearing [8].

Ophthalmologic Examination

While evidence demonstrates that facial masking can effect ocular irritation and infection rates, masks can provide additional challenges to performing a thorough ophthalmologic exam. Clinicians describe difficulty with fogging during refraction, measurement of visual acuity, slit lamp examination, and optical coherence scanning [9]. These difficulties are reinforced by a case study published in October 2020 describing a patient whose visual field testing revealed a new inferior field defect bilaterally in the setting of a face mask that had ridden up and condensation that had developed on the perimeter lens; the visual field defect vanished upon repeat testing with a properly positioned and secured mask [10]. A 6-patient case series published in December 2020 further supported these findings, describing improved visual field testing reliability after proper mask positioning and taping to prevent fogging in all 6 cases. Furthermore, improvement of visual field defects was documented in 4 of the 6 patients [11]. A prospective interventional study of 127 follow-up glaucoma patients undergoing standard automated perimetry repeated testing after mask repositioning and taping for any patient with low reliability or visual field changes, which led to improvement in reliability and resolution of inferior visual field defects in all repeated tests [12].

While the difficulties posed by mask-induced fogging can largely be remedied by taping the superior edge of the mask to the face, the difficulties masks pose in measuring intraocular pressure are more challenging to mitigate. A case series published in October 2020 documented an inability to accurately measure intraocular pressure while one patient wore a filtering face piece mask. Depending on the mask position, it made contact with either the base of the Goldmann applanation tonometer, the rod of the tonometer, or the patient's inferior eyelid.

Two other patients had elevated pressures while wearing the filtering face piece mask but demonstrated lower pressures with immediate repeat testing while wearing a standard surgical mask [13]. A second case series published in March 2021 demonstrated similar false elevations in intraocular pressure among two patients wearing soft surgical masks, as opposed to the semi-rigid filtering face piece masks previously described [14].

Orbital Hemorrhage

Finally, there has been at least one case of mask-associated orbital haemorrhage. Arranz RC, et al. [15] described a patient who presented with orbital, subconjunctival, and eyelid hemorrhage with associated hematoma that occurred suddenly after the patient adjusted the KN95 mask he was wearing. The hemorrhage and hematoma resulted in binocular double vision without pain or loss of visual acuity, but with limitation of adduction and eyelid occlusion. The patient was treated conservatively with full resolution of symptoms. Given the chronological proximity of mask adjustment to symptom onset, together with the absence of other predisposing factors, the orbital hemorrhage was attributed to the pressure the patient exerted on the bridge of his nose and inner eyelid while adjusting the mask [15]. These case reports continue to be forthcoming and may represent a higher subset of patients than what is reported in the literature.

Conclusion

While COVID-19 vaccination has become increasingly available, facial masking will likely remain a standard in the foreseeable future. Despite the above mentioned effects of facemasks on ocular health, all the cited articles make direct or indirect reference to the necessity of facial mask wear for the control of the SARS-Cov-2 pandemic [1-15]. Given the severity of COVID-19, the reviewed literature supports the continued use of facemasks and promotes education, awareness, and mitigation strategies such as taping to cope with any adverse effects that may arise.

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