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Ocular trauma secondary to exercise resistance bands during the COVID-19 pandemic[☆]

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ABSTRACT

Objective: To characterize injuries caused by exercise resistance bands.

Method: Single-site retrospective case series of patients presenting to the Bascom Palmer Eye Institute emergency room with ocular injuries secondary to exercise resistance bands from March through September 2020.

Results: Eleven patients (9 males, 2 females, 14 eyes) were reviewed. Eight patients had a unilateral injury (3 right eyes, 5 left eyes) while 3 had bilateral injuries. Iritis was the most common presentation, seen in all 11 patients, followed by hyphema (9 patients, 82%), and vitreous hemorrhage (4 patients, 36%). Among affected eyes, the mean presenting visual acuity was approximately 20/100, improving to 20/40 on the last follow up ($p = 0.06$). However, 4 eyes (33%) had vision $\leq 20/60$ at last follow up.

Conclusions: Exercise resistance bands can cause a wide spectrum of ocular injuries, some leading to long-term vision loss. As such, we recommend that patients strongly consider using eye protection goggles or glasses while using resistance bands for exercise.

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1. Introduction

The COVID19 pandemic led to extended lockdowns across the United States, during which Americans were required to stay at home except to perform essential functions [1–3]. Even after lockdown orders were lifted, many businesses, including gyms, remained closed due to social distancing requirements [4,5]. Since the start of the COVID19 pandemic, we noted an increase in resistance exercise band-induced ocular trauma to the Bascom Palmer Eye Institute emergency department.

Resistance exercise bands were originally used for rehabilitation therapy but have grown in popularity in strength training [6,7]. If not secured properly, the elastic bands can recoil and cause ocular trauma. Single reports and small case series of ocular trauma secondary to exercise bands have previously been reported and include lens dislocation, retinal detachment, macular holes, and ruptured globe injuries [8–10].

Herein, we present the largest case series of ocular trauma secondary to exercise resistance bands, all of which presented during the COVID19 pandemic.

2. Methods

The present retrospective consecutive case series received approval from the Institutional Review Board at the University of Miami and adhered to the Health Insurance Portability and Accountability Act and the Declaration of Helsinki. Charts were reviewed for all patients presenting to the Bascom Palmer Eye Institute emergency room with a documented resistance band injury from March 2020, the start of the COVID19 lockdown in Miami-Dade county, through September 2020.

Included in the study were patients who presented with an ocular injury associated with the use of an exercise-specific resistance band. Patients with injuries due to industrial bungee cords or other non-exercise related bands were excluded. Patient information collected included demographics, presenting visual acuity and intraocular pressure (IOP), clinical exam findings, follow up, and treatment information. Statistical analysis was performed using StataC 15.1 (StataCorp, LLC, College Station, TX). A p -value < 0.05 was considered statistically significant.

3. Results

In total, 14 charts of patients with documented resistance band-related injuries were identified. Of these, 3 patients were excluded after chart review revealed non-exercise related resistance band or bungee cord injuries. The remaining 11 patients (14 eyes) consisted of 9 males and 2 females. Eight patients had a unilateral injury (3 right

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Table 1
Presenting demographics, visual acuities, and intraocular pressures of patients with exercise resistance band ocular injuries

Patient	Sex	Age	Affected Eye	Presenting Vision	Presenting IOP	Follow- up Duration
Patient 1	Male	26	Right	20/20	13	None
Patient 2	Male	48	Bilateral	20/100 and 20/25	10 and 12	4 months
Patient 3	Male	50	Left	Counting fingers	12	3 weeks
Patient 4	Male	62	Left	20/25	39	3 months
Patient 5	Female	33	Left	20/25	19	2 weeks
Patient 6	Male	27	Bilateral	20/150 and 20/150	19 and 18	1 week
Patient 7	Male	41	Right	Hand motions	19	2 weeks
Patient 8	Male	49	Left	Hand motions	25	3 months
Patient 9	Female	47	Right	20/25	17	1 week
Patient 10	Male	80	Left	20/50	15	None
Patient 11	Male	37	Bilateral	20/25 and 20/25	10 and 10	3 weeks

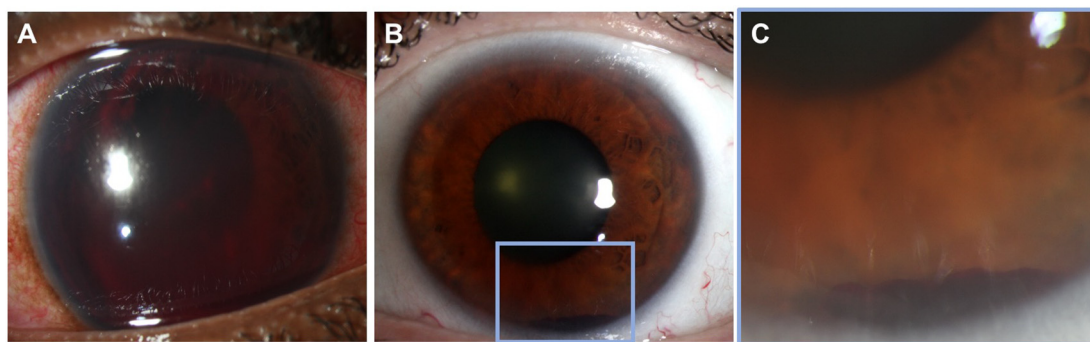


Fig. 1. A–C: Slit lamp photography demonstrates blood diffusely distributed in the anterior chamber causing a red hue (A), which consolidated into a hyphema on follow-up (B, blue box, magnified in C).

eyes, 5 left eyes) while 3 had bilateral injuries. The mean age of patients was 45.5 years (range 26–80 years). Patient demographics, presenting acuities, and IOPs are listed in Table 1.

The most common presenting ocular finding was iritis, which was seen in all 11 patients, followed by hyphema (9 patients, 82%) (Fig. 1), and vitreous hemorrhage (4 patients, 36%) (Fig. 2, Table 2). One patient presented with a macular hole (Fig. 3).

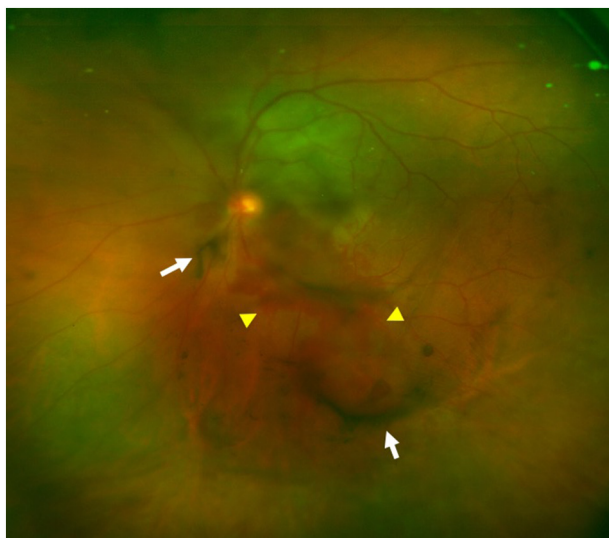


Fig. 2. Fundus photography demonstrates vitreous hemorrhage appearing as opaque media opacities (white arrows) as well as intraretinal hemorrhage (yellow arrowheads).

Among affected eyes, the mean presenting visual acuity was 0.71 logMAR (Snellen equivalent 20/100), which improved to 0.28 logMAR (Snellen equivalent 20/40) on the last follow up ($p = 0.06$). However, among eyes with follow-up beyond the initial emergency room visit (12 of 14 eyes), 4 eyes (33%) had vision $\leq 20/60$.

The mean presenting IOP among affected eyes was 17 mmHg. Two eyes demonstrated elevated intraocular pressures on initial presentation (39 and 25 mmHg). At final follow up, one eye had an IOP above normal (26 mmHg).

Nine patients (82%) presented for at least one scheduled follow-up visit, but ultimately seven patients (64%) were lost to follow-up before completing treatment or observation. The mean follow-up duration for patients presenting for at least one visit after their initial emergency room visit was 4.7 weeks.

All patients required at least topical therapy, which included a combination regimen of cyclopentolate, a cycloplegic, and prednisolone, a topical corticosteroid. Patients with corneal epithelial defects also received topical antibiotic drops. Lastly, one patient who presented with an elevated IOP was placed on topical IOP-lowering therapy. The patient who presented with a traumatic macular hole required surgical repair with a pars plana vitrectomy and membrane peel.

4. Discussion

With the increase of home exercise in the setting of quarantines and social distancing policies during the COVID19 pandemic, we have seen a rise in recreational exercise resistance band-related ocular injuries. The present series of 11 patients, all who presented after the start of the COVID19 pandemic, represents the largest in the literature.

Similar to ocular injuries due to bungee cords, resistance bands can cause a spectrum of ocular injuries involving all ocular structures. Common anterior segment injuries include corneal epithelial defects, iris defects, traumatic iritis, and hyphema. Posterior segment injuries include

Table 2
Types of ocular injuries induced by exercise resistance band ocular injuries. KED: Corneal epithelial defect.

Patient	KED	Iritis	Hyphema	Iris Defect	Angle Recession	Cataract	Vitreous Hemorrhage	Macular Hole	Retinal Tear	Retinal Hemorrhage	Commotio Retinae
Patient 1		X									
Patient 2		X	X		X		X	X	X		
Patient 3		X	X				X			X	X
Patient 4	X	X	X								
Patient 5	X	X	X								
Patient 6		X	X	X		X	X				
Patient 7		X	X				X				
Patient 8		X	X		X						
Patient 9		X	X								X
Patient 10		X	X								
Patient 11		X									
Total Patients (%)	2 (18%)	11 (100%)	9 (82%)	1 (9%)	2 (18%)	1 (9%)	4 (36%)	1 (9%)	1 (9%)	1 (9%)	2 (18%)

vitreous hemorrhage, retinal tear or detachment, macular hole, and commotio retinae (retinal edema). As is seen generally with ocular trauma, most of the patients were male [11–13].

While many of these injuries can be treated with observation or topical therapies, surgical intervention is sometimes required for certain conditions such as macular holes. Additionally, long-term visual deficits may be seen; four eyes maintained vision worse than 20/60 as of their last follow-up visit in the present study.

While the patients in the current study presented to an ocular emergency room, most will present to a general emergency room or urgent care clinic. As such, emergency room physicians should be comfortable triaging such patients. While ophthalmic examinations can be limited in the emergency room, a baseline vision and IOP should be taken. Additionally, fluorescein staining to identify a corneal epithelial defect should be performed. If there is suspicion of a ruptured globe, IOP measurements should be deferred, the globe should not be excessively manipulated, a protective shield should be placed over the eye, and the patient should be seen emergently by the ophthalmology service [14,15].

All patients who present with an ocular injury from an exercise resistance band should receive a baseline examination in the emergency department. Based on the severity of the injury, there should be a low threshold for referring the patient to an ophthalmologist for follow-up care if needed. Some manifestations of traumatic ocular injuries can be chronic. For example, vision-threatening complications such as angle-recession, which can cause elevated IOP and insidious loss of vision, and traumatic cataracts may not be present on initial examination [16–18]. Therefore, follow-up may be needed to determine the risk of

long-term vision loss as well as to perform advanced ophthalmic examinations such as gonioscopy.

Ultimately, exercise resistance bands can cause a wide spectrum of ocular injuries, many leading to long-term vision loss. As such, we recommend that patients strongly consider using eye protection such as goggles or glasses while using resistance bands for exercise. Ocular injuries resulting from exercise resistance bands should receive follow-up care with an ophthalmologist.

Declaration of Conflicting Interest

None of the authors report any financial interests related to the present work.

CRediT authorship contribution statement

Hasenin Al-khersan: Conceptualization, Methodology, Formal analysis, Writing and revision. **Thomas A. Lazzarini:** Conceptualization, Methodology, Writing and revision. **Anne L. Kunkler:** Conceptualization, Methodology, Writing and revision. **Diana M. Laura:** Conceptualization, Methodology, Writing and revision. **Kenneth C. Fan:** Conceptualization, Methodology, Writing and revision. **Lily Zhang:** Conceptualization, Methodology, Writing and revision. **David W. Redick:** Conceptualization, Methodology, Writing and revision. **Humberto Salazar:** Conceptualization, Methodology, Writing and revision. **Charles M. Medert:** Conceptualization, Methodology, Writing and revision. **Nimesh A. Patel:** Conceptualization, Methodology, Writing and revision, Supervision, Project administration.

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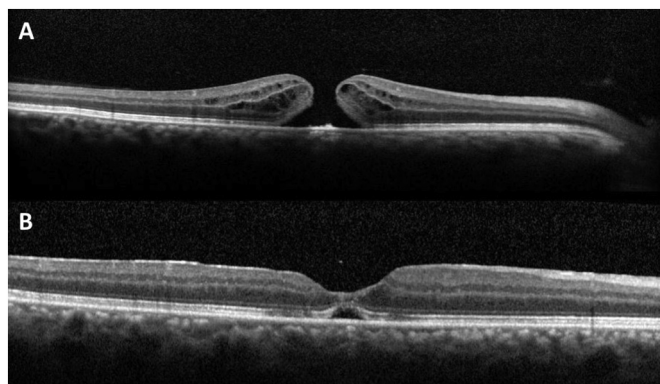


Fig. 3. A,B: Optical coherence tomography demonstrates a full thickness macular hole before (A) and after (B) surgical repair with pars plana vitrectomy and membrane peeling.

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