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Impact of Coronavirus Disease 2019 Restrictions on Retinal Detachment: A Multicenter Experience.

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Reports

Impact of Coronavirus Disease 2019 Restrictions on Retinal Detachment: A Multicenter Experience

The early response to the coronavirus disease 2019 (COVID-19) pandemic included the cessation of all nonessential surgeries as a part of shelter-in-place orders.[1] Although emergent care was permitted for rhegmatogenous retinal detachment (RRD), single-institution–based studies comparing historic experiences with those in the 2020 COVID-19 lockdown period found that patients delayed seeking care, had higher incidences of macula-off detachment and baseline proliferative vitreoretinopathy (PVR), and had worse best-corrected visual acuity (BCVA) at initial presentation.[2–4] However, multicenter studies analyzing the change in practice patterns and longitudinal outcomes during the COVID-19 lockdown period ("during lockdown") and the period immediately after ("post-lockdown") remain lacking.

In this multicenter, retrospective cohort study involving vitreoretinal surgeons from the Young Retina Forum (surgeons with $<$ 10 years of out-of-fellowship training) located across North America, we evaluated the practice pattern alterations with regard to preoperative, intraoperative, and postoperative variables for primary RRD repair and the resulting outcomes (single-surgery anatomic success [SSAS] and BCVA at postoperative month [POM] 3) during and after lockdown. Consecutive patients aged $\geq$ 18 years who underwent repair for treatment-naïve RRD from March 16, 2020, to June 30, 2020, by 36 vitreoretinal surgeons (73% with private practice) with $>$ 90 days of follow-up were identified. Rhegmatogenous retinal detachment repair involved a laser barricade, pneumatic retinopexy (PR), pars plana vitrectomy (PPV) with a gas or silicone oil, a primary scleral buckle, or combined scleral buckle and PPV with a gas or silicone oil. The eyes were divided into 2 groups based on local shelter-in-place mandates,[5] and the end of local shelter-in-place orders were confirmed by all the participating surgeons.

Analyses were performed using Stata 15.0. Potential confounding variables, including preoperative, operative, and treatment outcome variables (Table S1, available at www.opthalmologyretina.org)—with significant association, as determined using univariable regression, with eyes "repaired post-lockdown"—were combined to perform multivariable regressions in which the main predictor variable was "repaired post-lockdown." Statistical significance was set at $P < 0.05$.

Two hundred sixty-one eyes (259 patients) were analyzed, with 169 eyes (169 patients) in the during-lockdown group and 92 eyes (90 patients) in the post-lockdown group. Overall, 69% of the subjects were men, and the subjects were aged 59.4 $\pm$ 14.0 years (mean $\pm$ standard deviation; range, 15–94; similar to previous studies[6]), with a follow-up period of 5.9 $\pm$ 1.6 months. There were more COVID-19–positive diagnoses in the during-lockdown (n = 11) group than in the post-lockdown group (n = 0; $P = 0.012$; Table S1). In the multivariable analysis, eyes repaired post-lockdown had a 22-day–longer duration of symptoms before diagnosis than eyes repaired during lockdown ($P = 0.0080$) after age and COVID-19 positivity were accounted for. After adjusting for the number of days of symptoms and COVID-19 positivity, eyes repaired post-lockdown were 3.7 years younger ($P = 0.047$). After adjusting for age and the number of days of symptoms, eyes repaired post-lockdown were 5.7 percentage points (%p) less likely to be positive for COVID-19 ($P = 0.034$) (Table 1).

In terms of preoperative RRD characteristics, there were no significant differences between the during-lockdown and post-lockdown groups (Table S1). After adjusting for potential confounders, the multivariable analyses comparing operative characteristics during lockdown with those post-lockdown demonstrated that our surgeons tended to use longer-acting tamponade agents during lockdown. With primary PPV, eyes repaired post-lockdown were 15 %p less likely to use perfluoropropane (C_3F_8) than sulfur hexafluoride gas ($P = 0.034$). Surgeons may have used longer-acting tamponade during lockdown to minimize the potential risk of early reoperation even though postoperative visits were still required to monitor for complications. Additionally, COVID-19–positive patients had a 62 %p greater likelihood of undergoing primary in-office PR ($P < 0.0010$) (Table 1) during lockdown, likely because of limited access to ambulatory surgical centers and hospital-based operating rooms. Unfortunately, primary repair with PR was associated with a lower likelihood of SSAS at POM 3 (−26 %p; $P < 0.0010$) and POM 6 (−25 %p; $P = 0.0020$) but, interestingly, required fewer second surgeries for recurrent RRD (−44 %p; $P = 0.0020$). Lastly, for every year of older age, the eyes were 1.2 %p less likely to be repaired under general anesthesia ($P < 0.0010$) (Table 1).

Overall, POM 3 primary SSAS was achieved in 82% of the eyes. Final anatomic success was achieved in 99%. The POM 3 SSAS rate was significantly higher in the during-lockdown group than in the post-lockdown group (85% vs. 75%, respectively; $P = 0.042$; Table S1), but there was no significant difference in the POM 3 final anatomic success. The multivariable analysis showed that eyes repaired post-lockdown were less likely to achieve SSAS at POM 3 (−14 %p; $P = 0.015$) and POM 6 (−13 %p; $P = 0.049$) (Table 1). Eyes in the post-lockdown group had significantly more postoperative PVR (+11 %p; $P = 0.02$) and epiretinal membrane (+12 %p; $P = 0.024$) (Table 1). Each additional day of symptoms before repair was associated with a lower POM 6 SSAS rate (−0.1 %p; $P = 0.020$) and a greater postoperative PVR rate (+0.1 %p; $P = 0.0010$). Each additional year of age was also associated with a greater postoperative PVR rate (+0.4 %p; $P = 0.033$). Additionally, PPV using C_3F_8 gas (vs. sulfur hexafluoride) was associated with a lower likelihood of SSAS at POM 3 (−16 %p; $P = 0.0020$) and POM 6 (−14 %p; $P = 0.023$) and a greater likelihood of postoperative PVR (+13 %p; $P = 0.0030$) and epiretinal membrane (+15 %p; $P = 0.0030$) (Table 1), presumably because of the greater complexity of RRD.

When examining the entire cohort, there were significant improvements in the POM 1, POM 3, and POM 6 mean BCVAs vs. the baseline BCVA (Table S1). The BCVA did not differ between the post-lockdown and during-lockdown groups at any time point (Table S1). Each additional day of symptoms was associated with a worse POM 3 BCVA (+0.0019; $P < 0.0010$), consistent with

Table 1. Multivariable Regression Analysis of the Adjusted Association between the Presence or Absence of Lockdown

	Preoperative Characteristics						Operative Characteristics							
	Age at the Time of Primary Repair		*Days of Symptoms before Diagnosis*		*COVID-19-Positive Status*		*Laser Demarcation as Primary Treatment*		*PR as Primary Treatment*		*PPV with C_3F_8 gas (vs. SF_6 gas) as Primary Treatment*		*General Anesthesia*	
Variable	*Coefficient (95% CI)*	*P Value*	*Coefficient (95% CI)*	*P Value*	*Coefficient (95% CI)*	*P Value*	*Coefficient (95% CI)*	*P Value*	*Coefficient (95% CI)*	*P Value*	*Coefficient (95% CI)*	*P Value*	*Coefficient (95% CI)*	*P Value*
Post-lockdown	−3.70 (−7.34 to −0.055)	**0.047***	21.87 (5.77 to 37.96)	**0.008***	−0.057 (−0.11 to 0.004)	**0.03***	−0.43 (−0.09 to 0.009)	0.11	−0.057 (−0.16 to 0.041)	0.25	−0.15 (−0.30 to −0.01)	**0.03***	0.047 (−0.065 to 0.16)	0.41
Days of symptoms	0.006 (−0.022 to 0.034)	0.68	—	—	−0.00002 (−0.0004 to 0.0004)	0.93	−0.0004 (−0.0004 to 0.0004)	0.86	−0.0001 (−0.0008 to 0.0007)	0.83	0.0005 (−0.0005 to 0.0015)	0.30	0.0008 (−0.0001 to 0.0016)	0.06
Age	—	—	0.11 (−0.44 to 0.67)	0.68	0.002 (0.001 to 0.004)	**0.01***	−0.001 (−0.002 to 0.001)	0.53	0.001 (−0.002 to 0.005)	0.46	0.003 (−0.002 to 0.008)	0.27	−0.012 (−0.015 to −0.008)	**<0.001***
COVID-19 positive	11.23 (2.73 to 19.8)	**0.01***	−1.75 (−40.1 to 36.5)	0.93	—	—	0.04 (−0.08 to 0.17)	0.47	0.62 (0.39 to 0.85)	**<0.001***	−0.44 (−0.78 to −0.11)	**0.01***	−0.03 (−0.30 to 0.23)	0.80
Pneumatic	—	—	—	—	—	—	—	—	—	—	—	—	—	—
PPV with C_3F_8 (vs. SF_6 gas)	—	—	—	—	—	—	—	—	—	—	—	—	—	—
General anesthesia	—	—	—	—	—	—	—	—	—	—	—	—	—	—

	Postoperative Characteristics													
	POM 1 Best Corrected Visual Acuity		*POM 3 Best Corrected Visual Acuity*		*Anatomic Success at POM 3 after Single Surgery*		*Anatomic Success at POM 6 after Single Surgery (n = 226)*		*Additional Surgery(ies) for Recurrent RRD within 6 Mos (e.g., PR, PPV, and/or SB)*		*Postoperative Proliferative Vitreoretinopathy*		*Postoperative Epiretinal Membrane*		*Postoperative Choroidal Detachment*	
Variable	*Coefficient (95% CI)*	*P Value*	*Coefficient (95% CI)*	*P Value*	*Coefficient (95% CI)*	*P Value*	*Coefficient (95% CI)*	*P Value*	*Coefficient (95% CI)*	*P Value*	*Coefficient (95% CI)*	*P Value*	*Coefficient (95% CI)*	*P Value*	*Coefficient (95% CI)*	*P Value*
Post-lockdown	0.15 (−0.096 to 0.39)	0.24	0.13 (−0.030 to 0.28)	0.11	−0.14 (−0.24 to −0.026)	**0.02***	−0.13 (−0.25 to −0.001)	**0.049***	0.22 (−0.03 to 0.46)	0.08	0.11 (0.02 to 0.20)	**0.02***	0.12 (0.02 to 0.22)	**0.02***	−0.04 (−0.08 to 0.0003)	0.05
Days of symptoms	0.0016 (−0.0005 to 0.0033)	0.06	0.0019 (0.0009 to 0.0030)	**<0.001***	−0.0006 (−0.0013 to 0.0002)	0.14	−0.001 (−0.0018 to −0.0002)	**0.02***	−0.00004 (−0.001 to 0.001)	0.94	0.0011 (0.0005 to 0.0017)	**0.001***	−0.0004 (−0.0011 to 0.0003)	0.28	−0.00002 (−0.0003 to 0.0003)	0.89
Age	0.0069 (−0.0023 to 0.016)	0.14	0.0018 (−0.0041 to 0.0078)	0.55	0.004 (−0.0002 to 0.0082)	0.06	0.004 (−0.001 to 0.009)	0.09	−0.003 (−0.013 to 0.007)	0.56	0.0038 (0.0003 to 0.0074)	**0.03***	0.0038 (−0.0002 to 0.0077)	0.06	0.0011 (−0.0005 to 0.0027)	0.16
COVID-19 −positive	−0.15 (−0.75 to 0.45)	0.62	−0.10 (−0.49 to 0.28)	0.60	0.12 (−0.15 to 0.39)	0.37	0.25 (−0.06 to 0.57)	0.11	0.087 (−0.79 to 0.97)	0.84	−0.097 (−0.32 to 0.13)	0.40	−0.045 (−0.30 to 0.21)	0.73	−0.031 (−0.13 to 0.07)	0.56
Pneumatic	−0.030 (−0.33 to 0.27)	0.84	−0.11 (−0.30 to 0.089)	0.29	−0.26 (−0.39 to −0.12)	**<0.001***	−0.25 (−0.41 to −0.09)	**0.002***	−0.44 (−0.17 to 0.71)	**0.002***	0.072 (−0.04 to 0.19)	0.22	−0.056 (−0.18 to 0.07)	0.38	−0.025 (−0.08 to 0.03)	0.34

(*Continued*)

Table 1. (Continued.)

	Postoperative Characteristics															
	POM 1 Best Corrected Visual Acuity		POM 3 Best Corrected Visual Acuity		Anatomic Success at POM 3 after Single Surgery		Anatomic Success at POM 6 after Single Surgery (n = 226)		Additional Surgery(ies) for Recurrent RRD within 6 Mos (e.g., PR, PPV, and/or SB)		Postoperative Proliferative Vitreoretinopathy		Postoperative Epiretinal Membrane		Postoperative Choroidal Detachment	
Variable	*Coefficient (95% CI)*	*P Value*	*Coefficient (95% CI)*	*P Value*	*Coefficient (95% CI)*	*P Value*	*Coefficient (95% CI)*	*P Value*	*Coefficient (95% CI)*	*P Value*	*Coefficient (95% CI)*	*P Value*	*Coefficient (95% CI)*	*P Value*	*Coefficient (95% CI)*	*P Value*
PPV with C_3F_8 (vs. SF_6 gas)	0.50 (0.27 to 0.73)	**<0.001***	0.23 (0.078 to 0.37)	**0.003***	−0.16 (−0.26 to −0.058)	**0.002***	−0.14 (−0.26 to −0.02)	**0.02***	0.20 (−0.05 to 0.45)	0.11	0.13 (0.05 to 0.22)	**0.003***	0.15 (0.05 to 0.25)	**0.003***	−0.04 (−0.08 to 0.002)	0.06
General anesthesia	0.34 (0.055 to 0.63)	**0.02***	0.16 (−0.023 to 0.35)	0.09	0.0003 (−0.13 to 0.13)	1.00	0.002 (−0.15 to 0.15)	0.98	0.37 (0.06 to 0.69)	**0.02***	0.09 (−0.02 to 0.20)	0.11	−0.02 (−0.14 to 0.10)	0.75	0.04 (−0.01 to 0.09)	0.12

C_3F_8 = perfluoropropane; CI = confidence interval; COVID-19 = coronavirus disease 2019; POM = postoperative month; PPV = pars plana vitrectomy; PR = pneumatic retinopexy; RRD = rhegmatogenous retinal detachment; SB = scleral buckle; SF_6 = sulfur hexafluoride.

*A series of multivariable linear regressions was performed, with the dependent outcome variable as the bolded column header and the predictor variables listed as the nonbolded row headers. The main predictor variable was set as repair during the post-lockdown period (vs. repair during lockdown). In constructing our multivariable models, we excluded variables that held the risk of reverse casualty or collinearity and included univariable variables that had P values <0.10. The reported coefficients from our multivariable analyses denote the change in the outcome variable per unit change in predictor variable. Specifically, for binary outcome variables, the coefficient denotes percentage point (%p) difference. The bold font and asterisk denote statistical significance at P <0.05. The coefficient denotes the change in the outcome variable per unit change in predictor variable. For binary outcome variables, the coefficient denotes percentage point (%p) difference. Dash implies variable was omitted due to collinearity.

previous studies.[7] Additionally, primary PPV using C_3F_8 gas was, understandably, associated with a worse logarithm of the minimum angle of resolution BCVA at POM 1 (+0.50; $P < 0.0010$) and POM 3 (+0.23; $P = 0.0030$), given the duration and blurring effect of C_3F_8. Interestingly, general anesthesia was associated with a worse POM 1 BCVA (+0.34; $P = 0.020$) and required more second surgeries for recurrent RRD (0.37 %p; $P = 0.023$), which may imply that more complicated cases required general anesthesia.

The limitations of the current study include inherent variability in surgical repair strategies, specifically in the cohort of younger vitreoretinal surgeons with < 10 years of post-training experience; the complexity of the RRD cases; and the heterogeneity of lockdown strictness. Moreover, our study was not powered to assess individual surgical outcomes for each type of surgical technique. Lastly, as with all retrospective studies, but especially during a pandemic, there was an inherent risk that the cases that were lost to follow-up might have been those with poorer vision or outcomes. However, our patients completed an average of 5.9 months of follow-up.

Despite these limitations, to our knowledge, this is the only multicenter study to assess the effect of COVID-19 lockdown restrictions on the management and outcomes of primary RRD. Patients who underwent RRD repair in the post-lockdown period were typically 3.7 years younger and experienced an additional 22-day delay, leading to significantly more postoperative epiretinal membrane and PVR and lower SSAS rates. During lockdown, office-based PR for COVID-19−positive patients and longer-acting intraoperative C_3F_8 gas tamponade were used. Our findings are of increased relevance, given the persistence of the COVID-19 pandemic with new ongoing variants.

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No animal subjects were included in this study.

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Conception and Design: Jung, Hoang
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Data collection: Jung, Chang, Oellers, Ali, Do, Tseng, Roizenblatt, Muni, Weng, Oakey, Tsao, Rofagha, Chan, The Young Retina Forum, Hoang
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Abbreviations and Acronyms:
%p = percentage points; **BCVA** = best-corrected visual acuity; **C_3F_8** = perfluoropropane; **COVID-19** = coronavirus disease 2019; **POM** = postoperative month; **PPV** = pars plana vitrectomy; **PR** = pneumatic retinopexy; **PVR** = proliferative vitreoretinopathy; **RRD** = rhegmatogenous retinal detachment; **SSAS** = single-surgery anatomic success.

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Readability and Accountability of Online Patient Education Materials for Common Retinal Diseases

Patients increasingly turn to the internet for health-related information.[1] However, online patient education materials may vary in readability and accountability. The American Medical Association recommends that online patient education resources should be readable at no greater than a seventh grade level[2]; accountability is frequently assessed using Journal of the American Medical Association (JAMA) benchmarks.[3] According to JAMA guidelines, a website containing patient education materials should include all authors and their relevant credentials, list references, provide disclosures, and provide publication date of the last update. The readability of patient education materials in pediatric ophthalmology and glaucoma has been previously reported.[4−6]

In this study, we evaluated the readability and accountability of online patient education materials for 10 common retinal diseases and compared metrics on the basis of the source of online information, including informal or layperson medical resources, crowdsourced references, and official patient education materials published by national organizations.

The study was performed in compliance with ethical standards and did not involve human subject research. We conducted an internet search query using Google (Google, Inc) for 10 common retinal diseases. To avoid bias from previous search history and geographically targeted search results, the Google search was performed on an Incognito browser with location filters, advertisements, and sponsored results disabled. The 10 retinal diseases searched were "retinal tear," "retinal detachment," "diabetic retinopathy," "macular hole," "macular degeneration," "epiretinal membrane," "retinitis pigmentosa," "posterior vitreous detachment," "infectious retinitis," and "central retinal vein occlusion." Prior research indicates that patients are unlikely to scroll past the