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ABSTRACT

Background/aims The COVID-19 crisis and the decisions made regarding population lockdown may have changed patient care. We aimed to investigate the incidence rate of rhegmatogenous retinal detachment (RRD) cases during the COVID-19 lockdown period.

Methods In this nationwide database study, we identified hospital and clinic admissions of French residents for a first episode of RRD in France from 2017 to the lockdown period in 2020. The monthly hospital incidence rates of RRD procedures per 100 000 inhabitants before, during and after lockdown were computed for the whole country. Finally, we assessed the influence of viral incidence on the RRD incidence rate, comparing two regions with highly contrasting viral penetration.

Results From January to July, the average monthly national hospital incidence rate of RRD decreased from a mean of 2.59/100 000 inhabitants during 2017–2019 to 1.57/100 000 inhabitants in 2020. Compared with 2019, during the 8-week lockdown period in 2020, a 41.6% decrease in the number of RRD procedures was observed ($p<0.001$) with the weekly incidence of RRD decreasing from 0.63/100 000 inhabitants in 2019 to 0.36/100 000 inhabitants. During the 4-month post-lockdown period, no increased activity related to postponed procedures was observed. No difference was found in the rate of RRD surgery when comparing two regions with highly contrasting viral incidence.

Conclusion Containment may have been responsible for a decrease in the number of surgical procedures for RRD, without any compensating post-lockdown activity in France. These results might help increase awareness of the management of RRD emergencies.

INTRODUCTION

The COVID-19 (SARS-CoV-2-linked disease) pandemic has drastically modified how outpatient care is available in healthcare practices. This disease, beginning in early 2020, has hit most countries, and was declared a pandemic by the WHO on 11 March 2020. During the peak phase of the COVID-19 epidemic, many countries imposed lockdown and activity-restriction measures to reduce the risk of transmission of the virus. The French government placed the entire country under lockdown for 55 days (8 weeks, from 17 March to 11 May 2020)[1] with restrictions on movement except for basic necessities, work and health-related outings. This resulted in patients greatly reducing their healthcare consumption in virtually all medical specialties. Ophthalmology was one of the specialties most impacted, as observed in many countries, with an approximately 80% reduction in activity in the USA.[2] In Europe, ophthalmology lost 81% of patient volume in March and April 2020 versus 2019.[3] At the same time, all ophthalmological societies published recommendations for managing only elective treatments and organising ophthalmological emergency care, such as rhegmatogenous retinal detachment (RRD) management.[4–6] RRD is an acute and severe retinal disease requiring urgent surgical treatment to limit visual loss. Indeed, time to surgery has been identified as one of the risk factors for poor visual outcome.[7–9] We hypothesised that lockdown-related movement restrictions might have influenced emergency care access, notably for symptoms that may be related to RRD. To study the factors influencing the use of healthcare for a rare event such as RRD, a large database like the French health insurance database is valuable, as we have already shown.[10–12] Similar analyses have been conducted through this database to assess the influence of COVID-19 on other types of complications.[13] Herein, we aimed to measure the effect of the lockdown on the number of RRD surgical procedures carried out.

MATERIALS AND METHODS

Study design

We conducted a national retrospective observational study of all surgical procedures performed in France.

Data source

The French acts and diagnoses database (*Programme des Médicalisations des Systèmes d'Information*) collects all procedural and discharge abstracts for public and private care facilities in France, that is, covering more than 66 million inhabitants. Diagnoses are identified according to the International Statistical Classification of Disease, 10th revision (ICD-10), and acts are categorised according to the Common Classification of Medical Acts (*Classification Commune des Actes Médicaux*).

Data extraction

We identified surgical procedures for RRD from 2017 to 2020; from 2017 to 2020 a monthly count

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could be extracted and from 2019 to 2020 a weekly count. Three study periods were defined to compare the period 2017–2020 with the period in 2020 before, during and after lockdown corresponding, respectively, to January–February, March–May, June–July, for the 2017–2020 monthly analysis, with April 2020 considered a full month of containment. Since weekly data were available for 2019 and 2020, three periods were defined: from the 2nd to 11th weeks, 12th to 19th weeks and 20th to 30th weeks, corresponding to before, during and after lockdown in France. RRD procedures were identified based on the association of ICD-10 diagnosis codes (H330, H332 and H335) and related procedure codes, available for each hospital stay in France, and mandatory for all institutions. Reoperations were excluded. In order to relate the number of RRD cases to the number of hospital stays for COVID-19 in 2020, the hospitalisations for COVID-19 were identified with the specific codes created by the Technical Agency for Information on Hospitalisation for the pandemic. We retained the sex and age of the patients as well as the patients' locations through their geographical code of residence.

Statistical analyses

The monthly and weekly RRD incidence rates per 100 000 inhabitants, estimated through RRD incident procedures, were computed at the national level in France. The denominator was the number of inhabitants in France by region, by 5-year age group and by gender obtained from *Institut national de la statistique et des études économiques* census data. All overseas regions of France were excluded, as the lockdown policy was not similar. Finally, we evaluated the impact of viral penetration comparing two areas (Occitanie and Grand Est) that were considered the least and the most affected regions at the time the containment was implemented, with an incidence rate between 1 and 5 per 100 000 inhabitants for Occitanie and more than 10 per 100 000 inhabitants for Grand Est during the first week of containment. Age and sex standardisation was performed using the direct method and the French standard population. The X^2 test, the Cochran-Armitage test for trend and time-series tests were used. The tests were two-tailed and values of $p<0.05$ were considered statistically significant. SAS software was used for data extraction and analysis (SAS V.9.4; SAS Institute).

RESULTS

A total of 11 103, 11 437, 12 345 and 10 791 surgical procedures for RRD were identified in France from January to July in 2017, 2018, 2019 and 2020, respectively. From 2017 to 2019, the monthly average incidence rates per 100 000 inhabitants were found to be 2.31, 2.63 and 2.69 before, during and after the lockdown period, respectively. In 2020, the monthly incidence rates per 100 000 inhabitants were 2.58, 1.97 and 2.77 before, during and after the lockdown period, respectively. For the entire containment month of April, there was a reduction in the number of RRD procedures from 1630, 1550 and 1868 in 2017, 2018 and 2019, respectively, to 1019 cases in 2020 (see table 1). When comparing 2020 with 2019, a 45.5% reduction rate was found for the month of April ($p<0.0001$). A 23.7% and 20.3% reduction (1825 and 1795, respectively, in 2019 and 1393 and 1430 in 2020, $p<0.001$) was also observed during the partly confined months of March and May 2020. There was a 41.6% reduction in the total number of RRD surgical procedures in France during the 8-week COVID-19 lockdown in 2020 compared with the same period in 2019 (from 3311 procedures in 2019 to 1935 in 2020). Similarly, the number of weekly RRDs for the years 2019 and 2020 decreased from 0.63 to 0.36/100 000 inhabitants/week ($p<0.0001$). This decrease of 0.27 RRDs/100 000 inhabitants per week (95% CI (0.21 to 0.33)) was constant throughout the containment period (see figure 1). Furthermore, each year from 2017 to 2019, a steady increase was observed in the number of RRD cases managed from January to May and in July ($p<0.005$). This upward trend was confirmed over January, February and July 2020 ($p<0.001$), but the curve was inverted from March to May 2020. Additionally, no increased activity was observed in 2020 after the containment since the RRD incidence returned to the same levels as in 2019 but did not increase. The monthly average rate of RRD operations during the 2-month post-lockdown period was 2.80/100 000 inhabitants in 2019 and 2.77 in 2020 ($p=0.68$).

Table 1 Number of rhegmatogenous retinal detachment treatments in metropolitan France from January to June in the period 2017–2020

Months	2017	2018	2019	2020	Changes in the number of procedures 2020 vs 2019
January	1525	1531	1774	1815	+2.31%
February	1340	1391	1447	1533	+5.94%
March	1682	1674	1825	1393	**–23.67%**
April	1630	1550	1868	1019	**–45.45%**
May	1617	1708	1795	1430	**–20.33%**
June	1750	1875	1737	1806	+3.97%
July	1489	1708	1899	1795	–5.48%
Total	11 033	11 437	12 345	10 791	–12.59%

Bolded values mean a statistically significant difference between 2020 and 2020.

The mean age of patients with RRD over the period 2017–2020 was 63.0 years (±14.3). In April 2020, the mean age of patients was 62.8 years (±13.5) and was not significantly different from April of previous years ($p=0.15$). Considering the weeks in 2020 before, during and after lockdown, the mean ages were 63.4, 63.0 and 63.0 years, respectively, and were not significantly different ($p=0.08$). Furthermore, when comparing the weeks of lockdown in 2020 with the corresponding weeks in 2019, there was no age difference ($p=0.13$). Finally, concerning the sex ratio of patients with RRD, 62.7% were male in 2020, and this proportion was comparable over April throughout the years ($p=0.35$). Regarding the specific analysis of the two French regions, in 2019, the standardised incidence rate was higher in Occitanie (5.05/100 000 inhabitants from weeks 12 to 19; 95% CI (4.50 to 5.61)) than in the Grand Est (3.80/100 000 inhabitants; 95% CI (3.29 to 4.31); $p<0.05$). In 2020, from weeks 12 to 19, this incidence rate decreased for both regions and was no longer significantly different between the two regions, with 2.95/100 000 inhabitants in Occitanie (95% CI (2.52 to 3.37)) and 2.72/100 000 inhabitants (95% CI (2.29 to 3.14)) in the Grand Est. However, in these two regions, between 2019 and 2020, the same decrease was observed during the lockdown as was observed at the national level. The incidence rate of RRD per week was not impacted in 2020 by local viral penetration studied through interrupted time-series segmented regression analysis (figure 2). After the lockdown period, there was a return to normal numbers of patients with RRD treated in these areas, when comparing 2020 with 2019. Patients presenting for RRD during lockdown tended to be younger in the Grand Est region than in Occitanie, 61.1 years (±13.5) vs 63.5 years (±14.3), respectively, but this difference was not significant ($p=0.06$).

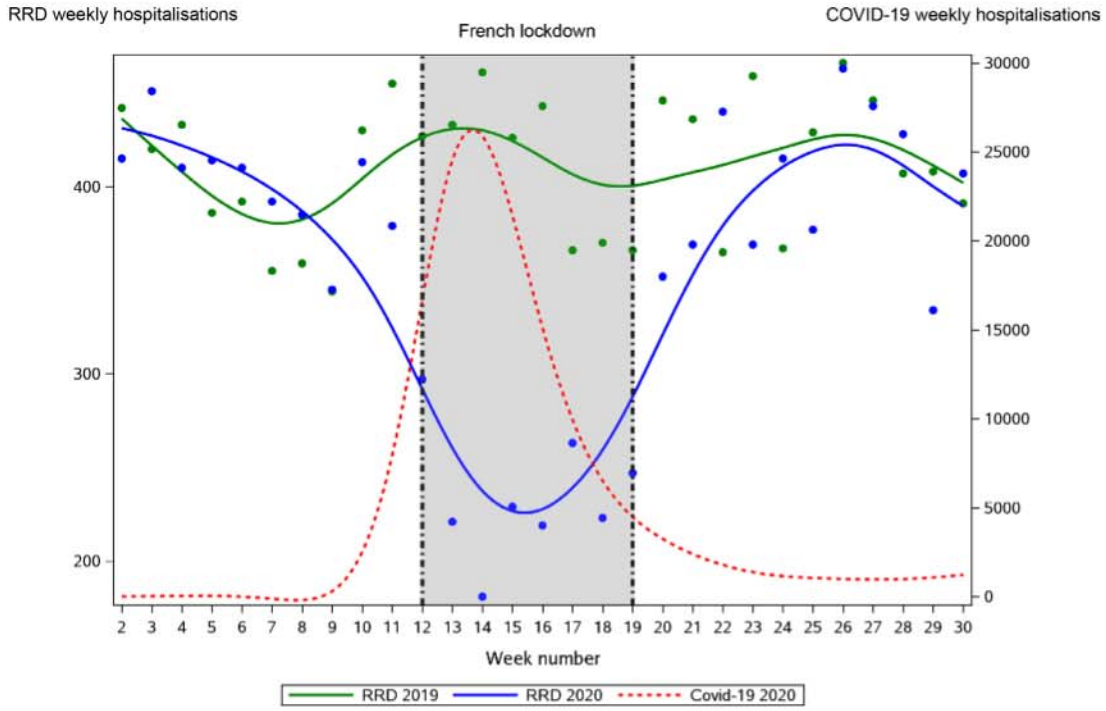

Figure 1 Number of rhegmatogenous retinal detachment (RRD) cases managed per week in 2019 and 2020 in France.

DISCUSSION

Our nationwide medico-administrative database study showed a 41.6% reduction in the total number of RRD surgical procedures in France during the 8-week COVID-19 lockdown, when comparing 2019 with 2020. This observation was not influenced by viral penetration and region specificities. No compensating activity during the post-lockdown period was noted. Among the predisposing factors of RRD, cataract surgery and trauma should have been influenced by cancelled non-urgent surgery and restriction of outdoor activity, with a subsequent reduction in the risk of secondary RRD.[14–16] It is very unlikely that environmental changes can explain the significant interruption of the upward trend observed in RRD incidence since 2017, an increase previously described for the period 2010–2015, and also observed in Denmark, the Netherlands and Scotland. The likely explanation is that patients with RRD simply did not attend a visit despite RRD-related symptoms. Indeed, older age, male sex and diabetes are common risk factors for RRD, as for severe COVID-19 presentation.[17]

Viral penetration did not influence the incidence of RRD surgical procedures.[18] In this regard, the patient's age is probably the most important factor for reluctance to seek emergency care. This most likely explains why the decrease observed in Occitanie was greater than in the Grand Est, although the difference is non-significant. Indeed, the proportion of patients over 65 years of age is higher in Occitanie than in the Grand

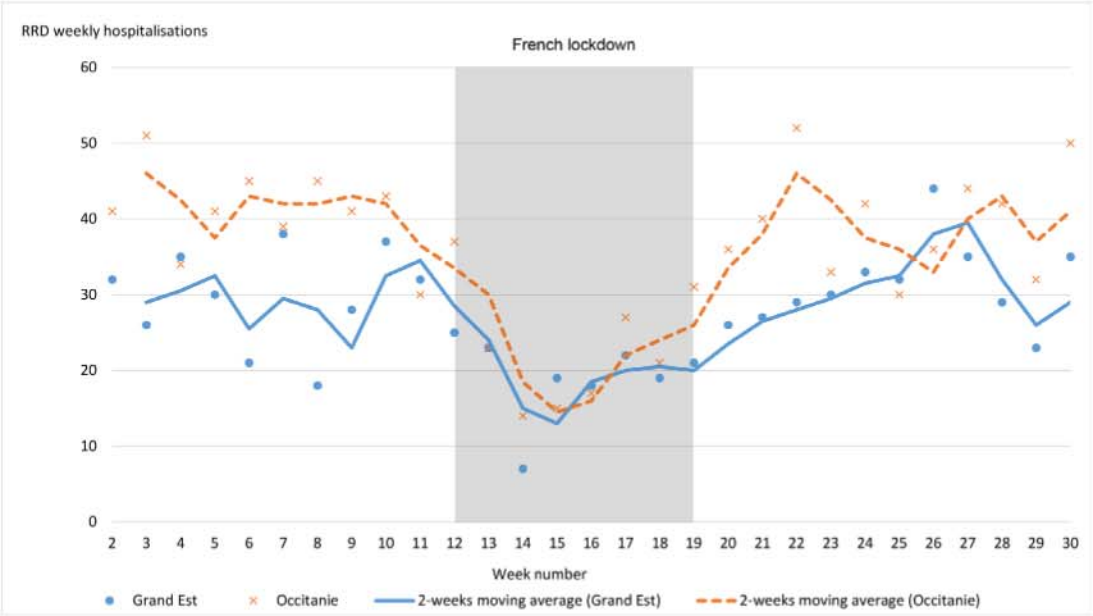

Figure 2 Number of rhegmatogenous retinal detachment (RRD) cases managed per week in 2020 in the Occitanie and Grand Est regions.

Est (23.1% vs 20.9%, respectively).[19] This demographic structure could explain the non-significant differences in the age of patients with RRD, with older patients presenting in Occitanie. The reluctance to visit the emergency department can be due to either fear of contamination in a population that may be at greater risk of a severe form of COVID-19 or a lack of awareness that emergency activities were maintained. Age is one of the main risk factors for severe and life-threatening forms of COVID-19.[17 20] Surprisingly, the mean age of patients presenting during lockdown was similar to previous years and to the weeks preceding and following lockdown. Unfortunately, we cannot assess the influence of other risk factors such as obesity since this information is not available in our database. The same trend towards a decrease in the RRD management rate has been observed in other countries for ophthalmological emergencies.[21] In London, Wickham *et al* also reported a steep 62% decrease in the number of patients presenting with RRD following isolation measures compared with the rates in 2019.[22] In a recent large US nationwide study, Breazzano *et al* reported similar results, with a decrease in the rate of ophthalmological procedures as much as 84.3% for some vitrectomies.[23] These authors found that this trend did not concern vitreoretinal surgery activity only but also intravitreal injection activity, which showed a 38.6% decrease. A recent nationwide study reported a 47.1% decrease during the first 5 weeks of France's lockdown period.[24]

We were surprised not to see an increased number of postponed RRD surgical procedures after the lockdown. Indeed, the rate of RRD procedures recovered to the same level after the lockdown period as observed during previous years without any rebound post-lockdown activity. Recent studies observed an increase in the time to RRD surgery during the COVID-19 period. RRD cases were more severe at presentation due to the COVID-19 lockdown with more macula-off RRDs in two cases series in the USA and Canada, both related to delayed care.[25 26] Indeed, it has been shown that the duration of macula detachment correlates with a poorer visual prognosis,[8 9] and raises fears of significant functional loss in patients who did not consult or who postponed their visit. However, we could not assess the severity and the cause of RRD in our database since detailed clinical information is not available. Moreover, we could not study the number of non-operated RRD because during a visit without procedure performed, and not followed by a hospitalisation, the diagnosis is not recorded in the French medico-administrative database. Nevertheless, the absence of an increased number of surgical procedures observed in the 3 months following the end of the lockdown period suggests that there was a significant proportion of patients with severe visual loss and/or a risk of chronic RRD complications, as found in acute cardiac diseases.[27] We could assume that late presentations for retinal detachment, which were untreated during lockdown, were left untreated or delayed due to complications such as fibrosis and proliferative vitreoretinopathy, secondary cataract and uveitis.[28] Another hypothesis would rely on the patients' personal choice and possibly their retinal surgeon not to perform surgery in light of the poor prognosis of a prolonged and often macula-off RRD. Similarly, we could not investigate the role of risk factors associated with RRD such as myopia or diabetes, but whose frequency of occurrence should be similar between very close periods of comparison. However, we cannot exclude the influence of the decreased rate of cataract surgery and YAG laser capsulotomy due to postponed procedures, although this risk would be delayed. Nevertheless, our study has several strengths. It was a national study over a 4-year period using a comprehensive and validated medico-administrative database.[29 30] This database was previously used to study the impact of COVID-19 on healthcare.[13] In particular, the incidence rate of RRD cases managed was age and sex standardised to account for demographic variations between regions and to allow for comparisons. The lockdown period involved the entire country at the same time with generalised recommendations covering the whole period of time. Moreover, we were able to measure post-lockdown activity with a 3-month follow-up.

Our observations show that it is crucial to prepare healthcare policies in the event of a new health crisis, whether or not related to COVID-19, by informing the population about the availability of care and of its safety, with the objective of prioritising high-acuity conditions such as RRD that require urgent treatment.

Contributors Conception and design—CPC-G, CQ, VD and FB. Data extraction—EB and FB. Analysis and interpretation—A-SM, CQ, FB, P-HG, IBG, CPC-G and VD. Discussion and suggestions on the manuscript—A-SM, CQ, FB, P-HG, IBG, CPC-G and VD. Full access to all the data in the study and responsible for the integrity of the data and the accuracy of the data analysis—CPC-G and CQ.

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Competing interests IBG, EB, A-SM and CQ have nothing to disclose. FB—consultant (Novartis and Théa). P-HG—consultant (Novartis, Bayer, Allergan and Horus). VD—consultant (Bayer, Novartis and Théa). CPC-G—consultant (Allergan, Bayer, Horus Pharma, Novartis, Roche and Théa).

Patient consent for publication Not required.

Ethics approval The use of the PMSI database was approved by the National Commission for Data Protection (*Commission Nationale de l'Informatique et des Libertés* no. 919086), and this study adhered to the tenets of the Declaration of Helsinki.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement All data relevant to the study are included in the article or uploaded as supplemental information. Aggregate data extracted from health insurance databases are only accessible to authorised personnel. The number of retinal detachments per month in France is available in table 1.

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