S Afr J Surg. 2022;60(3):199-203
https://doi.org/10.17159/2078-5151/SAJS3764

S Afr J Surg
ISSN 038-2361

OPHTHALMOLOGY

Impact of COVID-19 on surgical specialist training as quantified by trainee complication rates for cataract surgery

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Background: Reduction in elective surgeries during the COVID-19 pandemic has negatively impacted surgical specialist training. Posterior capsule rupture rate (PCR), a complication of cataract surgery, is an objective measure of the quality of ophthalmic surgery. This study aimed to compare PCR pre- and post-COVID-19 in trainees and consultants.
Methods: A single-centre consecutive cases series of cataract surgeries performed at Groote Schuur Hospital, between 1 February 2017 and 31 May 2021 were analysed. Our main outcome measure was the effect of the volume of cataract surgeries on PCRs between ophthalmology trainees and consultants before and after the COVID-19 reduction in elective surgeries on 23 March 2020.
Results: During the study period, 4 157 cataract surgeries were performed (3 493 in the 38 months pre-COVID-19 and 664 in the 14 months post-COVID-19). Fourteen ophthalmology trainees and six consultants performed 2 919 and 1 238 cataract surgeries, respectively. In the trainees the PCR was 4.4% pre-COVID-19 and 10.0% post-COVID-19 (odds ratio [OR] 2.44; $p < 0.001$; CI 1.71–3.47; relative risk [RR] 2.29). The PCR of consultants remained unchanged with a PCR of 3.4% pre- and post-COVID-19 (OR 1.02; $p = 0.97$; CI 0.42–2.46; RR 1.02).
Conclusion: COVID-19 has caused a marked reduction in the volume of cataract surgery which has resulted in a deterioration in the performance of trainees, but not consultants, and quantifies the negative impact of the pandemic on surgical training in ophthalmology. This highlights the need to develop plans to improve surgical training during the COVID-19 recovery period.
Keywords: surgical training, surgical education, COVID-19, cataract surgical complications, posterior capsule rupture rates

Introduction

The COVID-19 pandemic has placed an unprecedented burden on global health care systems. To ensure adequate hospital resources and improve patient safety, elective surgeries have been reduced or cancelled, and staff have been redeployed to COVID areas.[1] Due to multiple waves of COVID-19 in some areas of the world, this shift in surgical priorities has become prolonged.[2] The detrimental effect of these measures on surgical specialist training has become increasingly clear. A recent meta-analysis containing data from more than 20 countries with 5 260 surgical trainees across all specialties showed that COVID-19 reduced operative experience of surgical trainees in all studies.[3] Between 6% and 57% were redeployed to non-surgical roles and many trainees reported concern about reaching target specialisation surgery numbers.[4] This creates a problem as patient safety and outcomes depend on trainees reaching a high level of competence prior to completion of their training. Surgical competency and safety are difficult to measure objectively across the range of surgical disciplines. Ophthalmology is in a unique position in that it has an objective measure of the quality of the most important surgery that must be mastered by trainees, namely the posterior capsule rupture rate (PCR).

Cataract surgery forms an integral part of ophthalmology specialist training. Rupturing the posterior capsule of the lens during this operation is a feared complication which is directly linked to poor patient visual outcomes.[5] Hence the PCR, namely the percentage of cataract surgeries in which this complication occurs, is a measure of cataract surgery quality and is used to assess the competency and safety of ophthalmology surgical trainees. PCR is dependent on surgeon experience level.[6] Internationally reported PCR amongst consultant ophthalmologists is 0.8–3.5%,[7,8] whilst reported rates amongst trainees are generally higher and vary between 0.8–8.9%.[9,10] At our unit, we consider a PCR of 5% or less as acceptable for our trainees. PCR is also directly related to surgery numbers, with the lowest PCR in surgeons who perform high-volume cataract surgery.[11] Therefore, it is critical to provide adequate numbers of cataract surgery to ophthalmology trainees.

The aim of this study is to investigate the impact of the COVID-19-related reduction in cataract surgery numbers on the PCR of ophthalmology trainees. The results are important as they may provide an objective assessment of the negative impact of the pandemic on the quality of ophthalmology surgical training that could be extrapolated to other surgical disciplines.

Table I: Comparison of cataract surgery numbers and posterior capsule rupture rates pre-COVID-19 and post-COVID-19 amongst ophthalmology trainees and consultants

		Pre-COVID-19	Post-COVID-19	*p*-value
Trainees	Cataracts, *n*	2 429	490	
	Posterior capsule ruptures, *n*	106	49	
	PCR, %	4.4%	10.0%	$p < 0.001$
Consultants	Cataracts, *n*	1 064	174	
	Posterior capsule ruptures, *n*	36	6	
	PCR, %	3.4%	3.4%	$p = 0.97$
Total	Cataracts, *n*	3 493	664	
	Posterior capsule ruptures, *n*	142	55	
	PCR, %	4.1%	8.3%	$p < 0.0001$

PCR – posterior capsule rupture rate

Materials and methods

This was a retrospective single-centre consecutive cases series of cataract surgeries performed at Groote Schuur Hospital, University of Cape Town, South Africa, between 1 February 2017 and 31 May 2021. All phacoemulsification and small-incision extracapsular cataract surgeries recorded on an electronic theatre logbook were included in the study. The exclusion criteria were primary intracapsular cataract extractions, paediatric lens washouts, and cataract surgeries that were combined with another ocular procedure.

PCRs were defined as any inadvertent breach in the posterior capsule of the lens. The number of cataract surgeries and the number of PCRs were recorded. Surgeons were categorised as trainees if they were registrars with an ophthalmology training number through the Colleges of Medicine of South Africa, and as consultants if they were full-time ophthalmologists at the unit. Time periods of cataract surgeries were categorised as pre-COVID-19 (1 Feb 2017 to 22 March 2020) if they occurred prior to the first COVID-19-related reduction in elective surgeries, and post-COVID-19 (23 March 2020 to 31 May 2021) if they occurred after the onset of COVID-19-related reduction in elective surgeries.

At our unit, trainees are expected to perform at least 350 cataract surgeries during their 4-year training period. They are supervised by consultants, who ensure proper case selection of less challenging cases, whilst the consultants perform the cases with a high complication risk. Once trainees advance in skill level, they perform more difficult cases under consultant supervision, and, in the final period of their training, they have unsupervised cataract slates and assist in training of junior surgeons.

Statistical analysis was performed using STATA v16 (StataCorp, Texas, USA). Odds ratios (ORs) with confidence intervals (CIs) were calculated to determine differences between pre-COVID-19 and post-COVID-19 PCR. A *p*-value of less than 0.05 was considered as statistically significant.

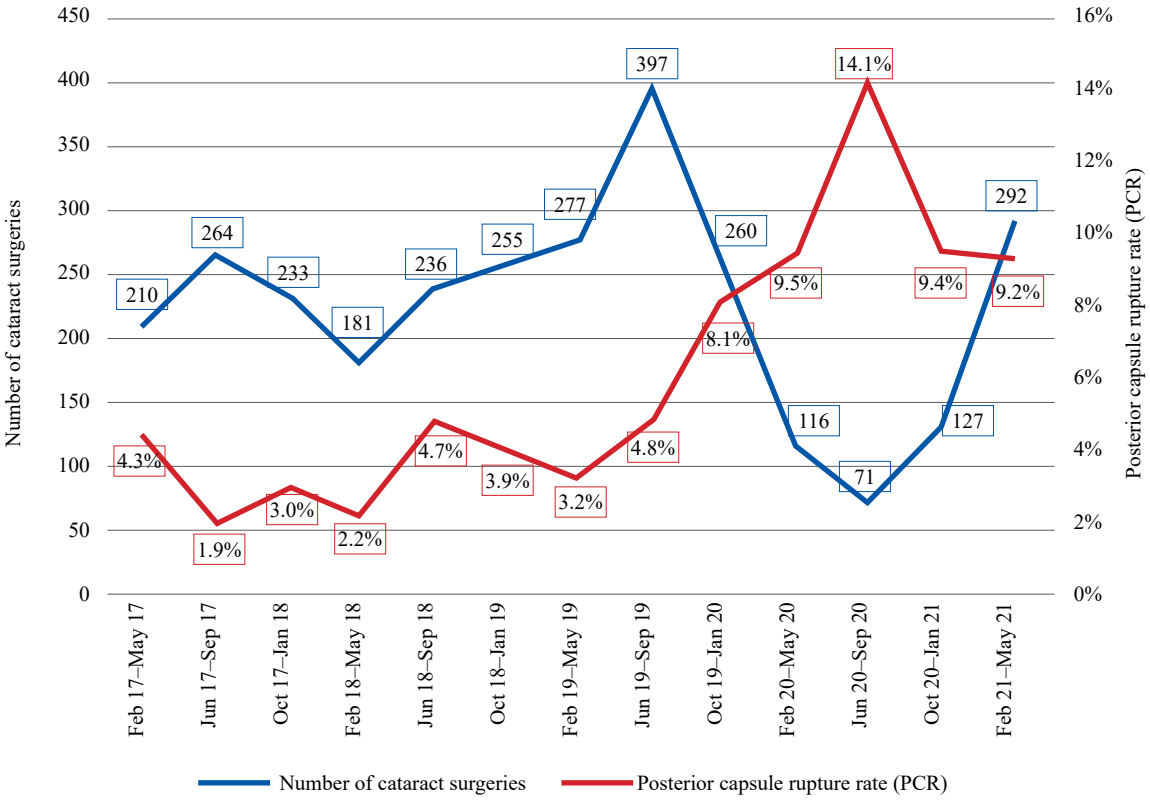

Figure 1: Number of cataract surgeries and posterior capsule rupture rates of ophthalmology trainees over time

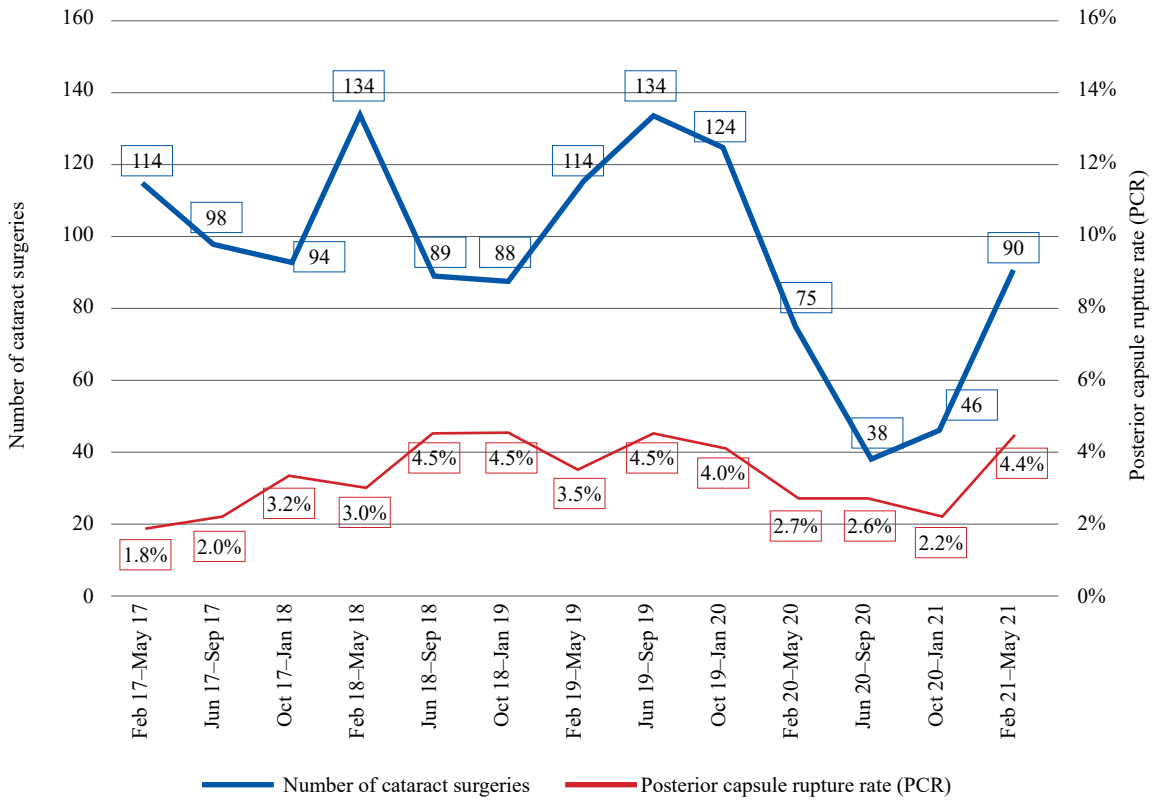

Figure 2: Number of cataract surgeries and posterior capsule rupture rates of ophthalmology consultants over time

Results

A total of 4 157 cataract surgeries were included in the study, of which 3 493 were performed in the 38 months prior to the COVID-19-related reduction in elective surgeries (pre-COVID-19) and 664 were performed in the 14 months after the onset of COVID-19-related surgery reductions (post-COVID-19). This is a 48% reduction in cataract surgery numbers per month post-COVID-19 compared to pre-COVID-19.

Surgeries were performed by 14 ophthalmology trainees and six consultants. Trainees performed 2 919 cataract surgeries (2 429 pre-COVID-19 and 490 post-COVID-19) and consultants performed 1 238 cataract surgeries (1 064 pre-COVID-19 and 174 post-COVID-19). There was a 45% reduction in cataract surgeries performed by registrars per month post-COVID-19 and a 56% reduction in cataract surgeries performed by consultants per month post-COVID-19, compared to pre-COVID-19.

A total of 197 cataract surgery cases were complicated by posterior capsule rupture with a PCR of 4.7% (197/4 157). The PCR was 4.1% (142/3 493) pre-COVID-19 and 8.3% (55/664) post-COVID-19 (OR 2.13; $p < 0.0001$; CI 1.54–2.94; relative risk [RR] 2.04).

The PCR was further analysed according to surgeon grade. Consultants PCR was 3.4% in both periods (36/1 064 pre-COVID-19 and 6/174 post-COVID-19) (OR 1.02; $p = 0.97$; CI 0.42–2.46; RR 1.02). Conversely, there was a significant increase in the PCR amongst trainees in the post-COVID-19 compared to the pre-COVID-19 period with a PCR of 4.4% (106/2 429) pre-COVID-19 and 10.0% (49/490) post-COVID-19 (OR 2.44; $p < 0.001$; CI 1.71–3.47; RR 2.29) (Table I).

Figure 1 and Figure 2 depict the numbers of cataract surgeries and PCR of trainees and consultants over time.

Discussion

The COVID-19-related reduction in elective operative volume has raised concern about the quality of surgical specialist training worldwide.[12] Cataract surgery training of ophthalmologists provides an opportunity to better quantify this impact by measuring the PCR, a complication rate that is an objective marker of cataract surgery quality.

Our analysis found that the reduction in cataract surgery numbers necessitated by the COVID-19 pandemic led to a significant increase in PCR amongst ophthalmology trainees (4.4% pre-COVID-19 vs 10% post-COVID-19). Figure 1 demonstrates the especially high spike in PCR when the trainees first started performing cataract surgery again after the initial total shutdown of elective operating theatres in March 2020. This high PCR post-COVID-19 indicates a lower quality of cataract surgery and potentially poorer visual outcomes in these patients.[5]

In contrast, the PCR of ophthalmology consultants at the same unit remained unchanged at 3.4% during this period despite a similar reduction in cataract surgery volume. This is consistent with the findings of a recent study which reported that the COVID-19 surgical theatre lockdown did not affect the PCR of eight experienced consultant ophthalmologists.[13] This demonstrates the fragility of surgical expertise during specialist training. It is possible that the COVID-19 pandemic has not only caused a stagnation in the surgical training level amongst trainees, but that it may have caused regression.

At the time of writing of this article, South Africa is in its third wave of COVID-19, with only 5.1% of the population fully vaccinated, and elective surgery has once again been cancelled.[14] Not only have current trainees had limited surgical exposure for more than a year of their residency time, but the suboptimal surgical training may persist for

an unknown period into the future. If one extrapolates the findings of this study to other surgical disciplines, then it is concerning that we may soon have a generation of surgical workforce that are sub-optimally trained. This may, in turn, compromise patient surgical safety and outcomes.

It is critical to address this problem with proactive solutions. During periods of theatre shutdown, loss of surgical skills may be mitigated by simulation-based training techniques such as virtual reality, wet-lab and dry-lab training, as well as web-based discussion of edited surgical videos.[15-19]

Several surgical training bodies internationally have introduced a COVID-19 "no fault" extension of training time.[20] Although this is necessary, it is important to note that it will result in a backlog of incoming trainees, thus potentially causing a shortage of qualified specialists in the years to come. Additionally, extended training time concessions may not be sufficient for some to obtain adequate levels of surgical expertise to qualify as a specialist. This may be an opportunity to move towards surgical training curricula that are more competency-based, rather than time-based.

The Joint Committee on Surgical Training in collaboration with other UK surgical associations published a document to help guide the maximisation of surgery training in the COVID-19 recovery period.[21] It highlights the importance of active, goal-directed interventions under the hashtag #NoTrainingTodayNoSurgeonsTomorrow. It advises that trainees perform an honest self-assessment of the current gap in their surgical skills, which should then be discussed with their trainers, so that an individualised training prescription with bespoke targets can be formulated for each trainee.

The document also stresses that training should take place at each possible opportunity. It argues that all consultants can train and that there is no surgical case where trainees should not be able to have a practical involvement in at least part of the procedure. It also provides guidance on how to incorporate the training goals for surgical cases into the WHO surgical checklists. It is acknowledged that service delivery pressure hampers training. Hence, the document stresses the importance of involving employers and urges that all departmental meetings where service delivery is planned need to consider the needs of the trainees.

Finally, it is important to remember that COVID-19-related depression, anxiety and burnout is common amongst surgical trainees, and many may have lost confidence in their surgical abilities.[3,22] Additional support is paramount in these difficult times.

There are some limitations to our study. Despite the sample size of 5 147 cataract surgeries, PCR is low and larger datasets are needed to confirm our results. Another limitation is that our cases were not stratified according to complication risk.[23] It is possible that the increased PCR post-COVID-19 may be partially explained by more complicated cataracts being prioritised for surgery in the period after lockdown of theatres.

Conclusion

Our study showed that COVID-19 has caused a marked increase in PCR during cataract surgery amongst ophthalmology trainees. This increase in complication rate due to reduction in surgery exposure may be transferrable to other surgical disciplines. It is important that the plight of our surgical trainees is not overlooked and that proactive plans are implemented to maintain a well-trained workforce and ensure the safety of patients.

#NoTrainingTodayNoSurgeonsTomorrow

Conflict of interest

The authors declare no conflict of interest.

Funding source

No funding was required.

Ethical approval

Approval for this study was granted by the University of Cape Town Human Research Ethics committee (HREC no 510/2021).

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