The Royal College of Ophthalmologists' National Ophthalmology Database: Catastrophic Vision Loss Post Cataract Surgery Rates in almost 1 Million Eyes

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Background:

Since inception, the RCOphth NOD Cataract Audit has reported the rates of Vision Loss, defined as doubling of the visual angle (loss of 0.3 LogMAR, approximately 2 lines of Snellen). The rates and risk factors for severe or "catastrophic" visual loss have not been reported but are important for informed consent.

Aim:

To investigate rates of catastrophic vision loss (CVL) post cataract surgery.

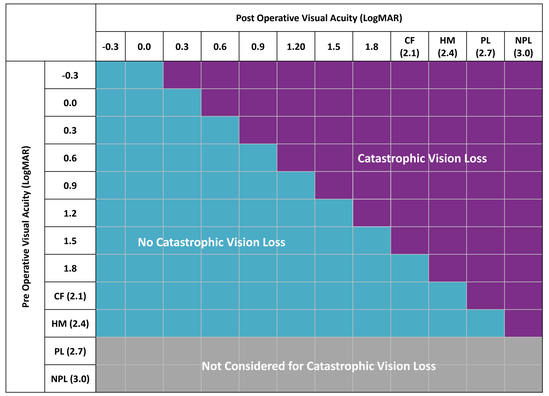
Subjects:

- Eligible cataract operations were performed in eyes between 01/04/2010 and 31/03/2021 in centres supplying data to the national cataract audit with at least 50 eligible operations that had data for both preoperative and postoperative visual acuity measurements
- Only centres with a minimum of 60% of eyes with both preoperative and postoperative visual acuity (VA) were included in analysis

Definitions:

- Post cataract **catastrophic vision loss** was defined as:
  - A reduction in LogMAR of ≥0.60
  - For eyes with a preoperative VA Perception of Light (PL) and No Perception of Light (NPL) no vision loss is considered
- The term 'legally blind' was used for eyes with a corrected visual acuity of 1.3 LogMAR or worse

Figure 1: Examples of the definition of catastrophic vision loss



Statistical Methods:

- Pre-operative VA was defined as the better of corrected distance or uncorrected distance VA that is closest to the date of surgery, and within 6 months prior to surgery
- For calculations, Count Fingers (CF), Hand Movements (HM), PL and NPL are assigned 2.1, 2.4, 2.7 and 3.0
- Posterior Capsular Rupture (PCR) was defined as in the RCOphth NOD and is sub-divided into PCR without vitreous loss (PCR no VL), PCR with vitreous loss (PCR + VL), zonule rupture with vitreous loss (ZR + VL) and PCR and zonule rupture with vitreous loss (PCR + ZR + VL)
- CVL was compared using chi-squared tests between eyes with and without related ocular co-pathology, and the result of blindness
- All analyses were performed using STATA 17

Results:

Within the study period **964,271 eligible operations** were performed on 679,916 patients from 89 centres by 2,729 surgeons. CVL was recorded in 1,995 (0.2%) eyes with 6 cases from 1,797 (0.2%) immediate sequential bilateral cataract surgery (ISBCS) eyes. Patients aged ≥80 years had a higher risk of CVL occurring (p<0.01), Table 1.

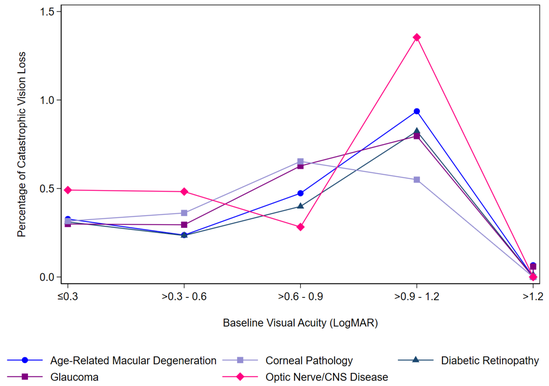
Table 1: Catastrophic vision loss for eyes with and without ocular co-pathology

N (row %)	Catastrophic Vision Loss	No Catastrophic Vision Loss	Overall
Number of operations	**1,995**	**962,276**	**964,271**
Operative Factors			
Grade of operating surgeon			
Consultant	1,347 (0.2)	706,932	708,279
Career grade non-consultant surgeon	147 (0.2)	67,173	67,320
More Experienced Trainee Surgeon	442 (0.3)	157,521	157,963
Less Experienced Trainee Surgeon	59 (0.2)	30,650	30,709
First/ second treated eyes			
First Eye	1,199 (0.2)	584,252	585,451
Second Eye	796 (0.2)	378,024	378,820
Patient Factors			
Patient sex			
Female	1,128 (0.2)	560,275	561,403
Male	867 (0.2)	402,001	402,868
Age at surgery in years			
<70	373 (0.2)	253,525	253,898
70-74	247 (0.1)	171,038	171,285
75-79	369 (0.2)	205,202	205,571
80-84	438 (0.2)	189,604	190,042
85-89	375 (0.3)	108,419	108,794
>=90	193 (0.6)	34,488	34,681
Diabetic status			
Has diabetes mellitus	462 (0.3)	168,623	169,085
Not diabetic	1,533 (0.2)	793,653	795,186

Ocular Co-pathology

The risk of CVL between the main vision related ocular co-pathology varied most for preoperative VA >0.9-1.2 LogMAR, Figure 2.

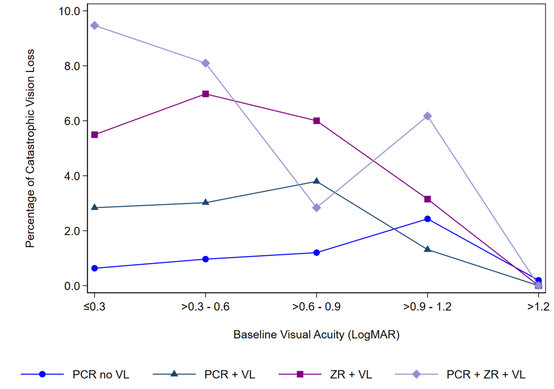
Figure 2: Percentage of catastrophic vision loss by ocular co-pathology



Posterior Capsule Rupture

The differences of risk of CVL between constituent parts of PCR are most evident for eyes with preoperative VA ≤0.6 LogMAR, Figure 3.

Figure 3: Percentage of Catastrophic Vision Loss for PCR by constituent parts



Catastrophic Vision Loss, Ocular Co-pathology and PCR

There was an increased risk of CVL in eyes when PCR occurred or in eyes with certain ocular co-pathology (all; p<0.01) including:

- Age-related Macular Degeneration
- Glaucoma
- Diabetic Retinopathy
- Corneal Pathology
- Optic Nerve / CNS Disease

The highest rates of CVL happened when vitreous loss occurred, Table 2.

Table 2: Catastrophic vision loss for eyes with and without ocular co-pathology and PCR as an operative complication – split by constituent parts

N (row %)	Catastrophic Vision Loss	No Catastrophic Vision Loss	Overall
Ocular Co-pathology			
Age-Related Macular Degeneration	417 (0.4)	106,053	106,470
Glaucoma	324 (0.4)	78,238	78,562
Diabetic Retinopathy	196 (0.4)	54,995	55,191
Corneal Pathology	224 (0.4)	50,503	50,727
Optic Nerve/ CNS Disease	20 (0.6)	3,592	3,612
Operative Complication			
Posterior Capsule Rupture	354 (3.1)	11,071	11,425
PCR no VL	28 (1.2)	2,375	2,403
PCR + VL	232 (3.1)	7,339	7,571
ZR + VL	49 (6.0)	765	814
PCR + ZR + VL	45 (7.1)	592	637

Catastrophic Vision Loss Resulting in Blindness

Of 889,521 (91.8%) eyes who were not preoperatively legally blind, 1,939 (0.2%) were postoperatively legally blind

- Of these, 1,418 (73.1%) eyes experienced CVL

Conclusions:

Catastrophic visual loss is a rare complication of cataract surgery with an overall rate of 0.2%. Notably, patients with comorbidities such as common retinal diseases, glaucoma and corneal pathology had a higher rate of CVL . In cases where posterior capsular rupture occurred, the rate of CVL is 15 times higher.

We expect that these will be useful metrics for surgeons and their patients as they navigate the consent process for cataract surgery.

Acknowledgments:

We remember our friend and colleague Robert Johnston, who sadly died in 2016. His inspirational vision, determination and commitment, underpins all work done within NOD.

We acknowledge the support of centres participating in this NOD Audit study and thank them for the considerable time and effort devoted to data collection.