

Introduction:

This analysis of data submitted to The Royal College of Ophthalmologists' National Ophthalmology Database Audit (RCOphth NOD), aims to assess the relationship between baseline axial length and intraoperative complications of cataract surgery in contributing centres from England, Wales and Guernsey.

Methods:

Eligible operations were those that were performed between 1st April 2010 and 31st August 2019 satisfying the eligibility criteria that apply to the RCOphth NOD Cataract Audit, from any contributing centre with at least 50 eligible operations. Operations were excluded if there was no recorded axial length measurement, if the measurement was <18 mm or >40 mm or if there was no age at surgery recorded.

Axial length was categorised as <21 mm (short eyes), 21 – 28 mm (medium eyes) and >28 mm (long eyes) and also reported in 1 mm increments.

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 dialysis with vitreous loss (ZD + VL) and PCR and zonule dialysis with vitreous loss (PCR + ZD + VL).

Table 1: Recorded intraoperative complications of cataract surgery for short, medium and long eyes

Intraoperative Complications n (column %)	Baseline Axial Length			Total	p-value
	Short (<21mm)	Medium (21-28mm)	Long (>28mm)		
Number of operations/eyes	17,170	1,182,513	11,837	1,211,520	N/A
Number of operations/eyes with					
No Complication	16,400 (95.5)	1,147,866 (97.1)	11,452 (96.7)	1,175,718 (97.0)	<0.001
Any Complication	770 (4.5)	34,647 (2.9)	385 (3.3)	35,802 (3.0)	
Individual Complications					
Overall PCR	263 (1.53)	16,497 (1.40)	191 (1.61)	16,951 (1.40)	0.043
PCR no VL	43 (0.25)	3,669 (0.31)	34 (0.29)	3,746 (0.31)	<0.001
PCR + VL	158 (0.92)	10,801 (0.91)	131 (1.11)	11,090 (0.92)	
ZD + VL	37 (0.22)	1,174 (0.10)	9 (<0.10)	1,220 (0.10)	
PCR + ZD + VL	25 (0.15)	853 (<0.10)	17 (0.14)	895 (<0.10)	
Overall Zonule Dialysis	137 (0.8)	4,996 (0.4)	57 (0.5)	5,190 (0.4)	<0.001
Corneal Epithelial Abrasion	88 (0.5)	3,238 (0.3)	35 (0.3)	3,361 (0.3)	<0.001
Zonule Dialysis no VL	75 (0.4)	2,969 (0.3)	31 (0.3)	3,075 (0.3)	<0.001
Torn Iris / Damage from Phacoemulsification	103 (0.6)	2,849 (0.2)	9 (<0.1)	2,961 (0.2)	<0.001
Endothelial Damage / Descemet's Tear	47 (0.3)	1,299 (0.1)	7 (<0.1)	1,353 (0.1)	<0.001
Lens Exchange Required / Other IOL Problems	38 (0.2)	1,038 (<0.1)	32 (0.3)	1,108 (0.1)	<0.001
Corneal Oedema	34 (0.2)	956 (<0.1)	10 (<0.1)	1,000 (<0.1)	<0.001
Hyphaema	18 (0.1)	599 (<0.1)	6 (<0.1)	623 (<0.1)	0.008
Iris Prolapse / Trauma	27 (0.2)	580 (<0.1)	4 (<0.1)	611 (<0.1)	<0.001
Phacoemulsification Burn / Wound Problems	12 (<0.1)	553 (<0.1)	6 (<0.1)	571 (<0.1)	0.377
Choroidal / Suprachoroidal Haemorrhage	12 (<0.1)	315 (<0.1)	6 (<0.1)	333 (<0.1)	0.001
Anterior Capsular Tear	5 (<0.1)	188 (<0.1)	4 (<0.1)	197 (<0.1)	0.130
Unspecified 'Other'	102 (0.6)	5,301 (0.4)	68 (0.6)	5,471 (0.5)	0.002

Results:

Within the study period, 1,211,520 eligible operations were performed on 820,354 patients from 110 centres by 3,210 surgeons.

There were 17,170 (1.4%), 1,182,513 (97.6%), 11,837 (1.0%) short, medium and long eyes respectively and axial lengths were approximately normally distributed (mean = 23.5 mm, SD = 1.4 mm) Figure 1.

The proportion of eyes experiencing PCR was 1.40% (1.09% with vitreous loss; 0.31% without).

PCR occurred in 1.53%, 1.40% and 1.61% of short, medium and long eyes respectively, Figure 2.

More short eyes experienced the following than medium and long eyes, Figure 3 and Table 1:

- Corneal epithelial abrasion
- Zonule dialysis no VL
- Torn iris / damage from the phaco
- Endothelial damage / Descemet's tear

For these complications and PCR, the proportion of eyes that experienced these were similar or lower for second treated eye surgery than for first treated eye surgery in respect to patient factors, excluding ISBCS patients, Table 2.

Figure 1: Histogram of baseline axial length

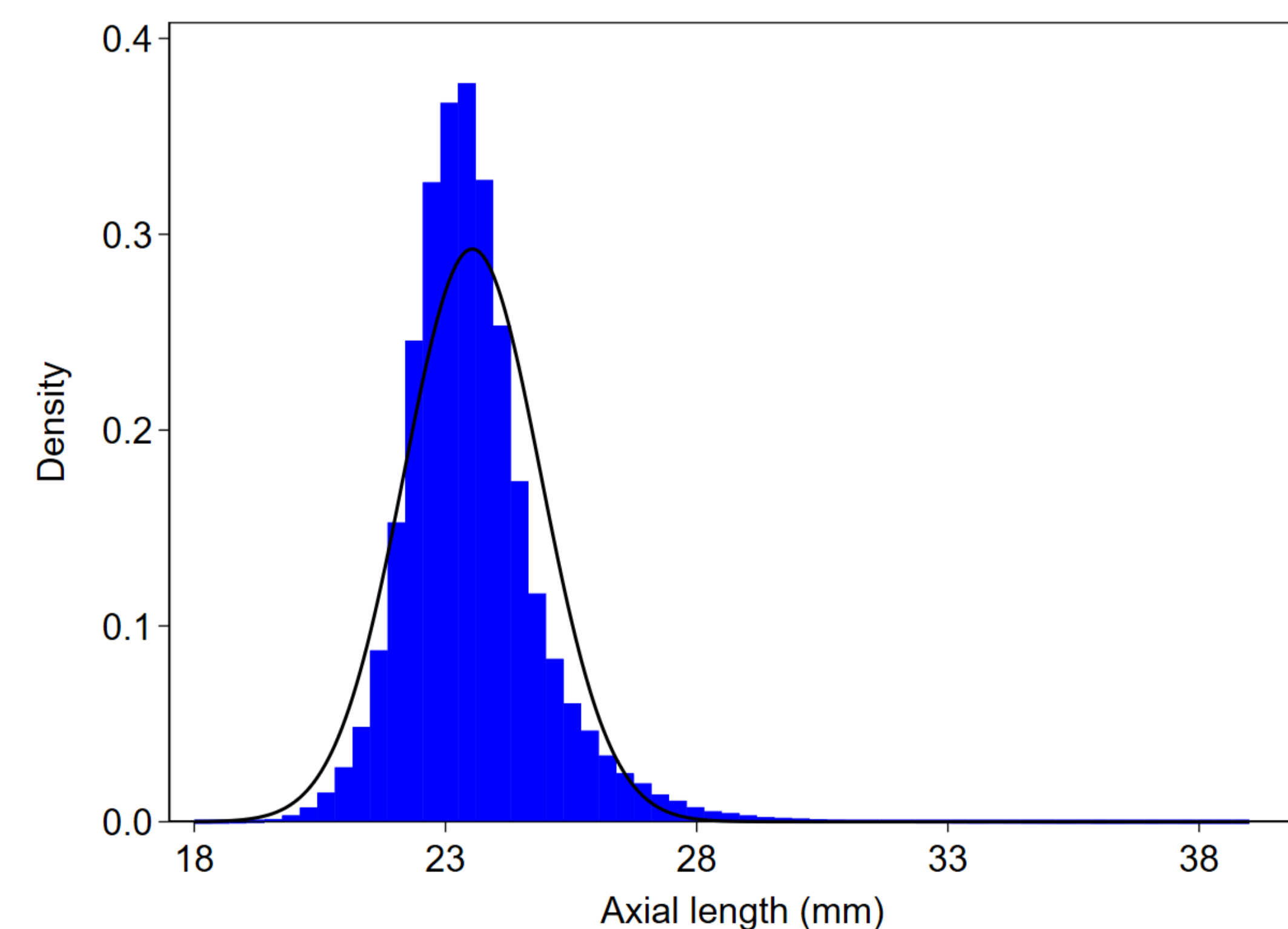


Figure 2: PCR rates for 1 mm increments of axial length

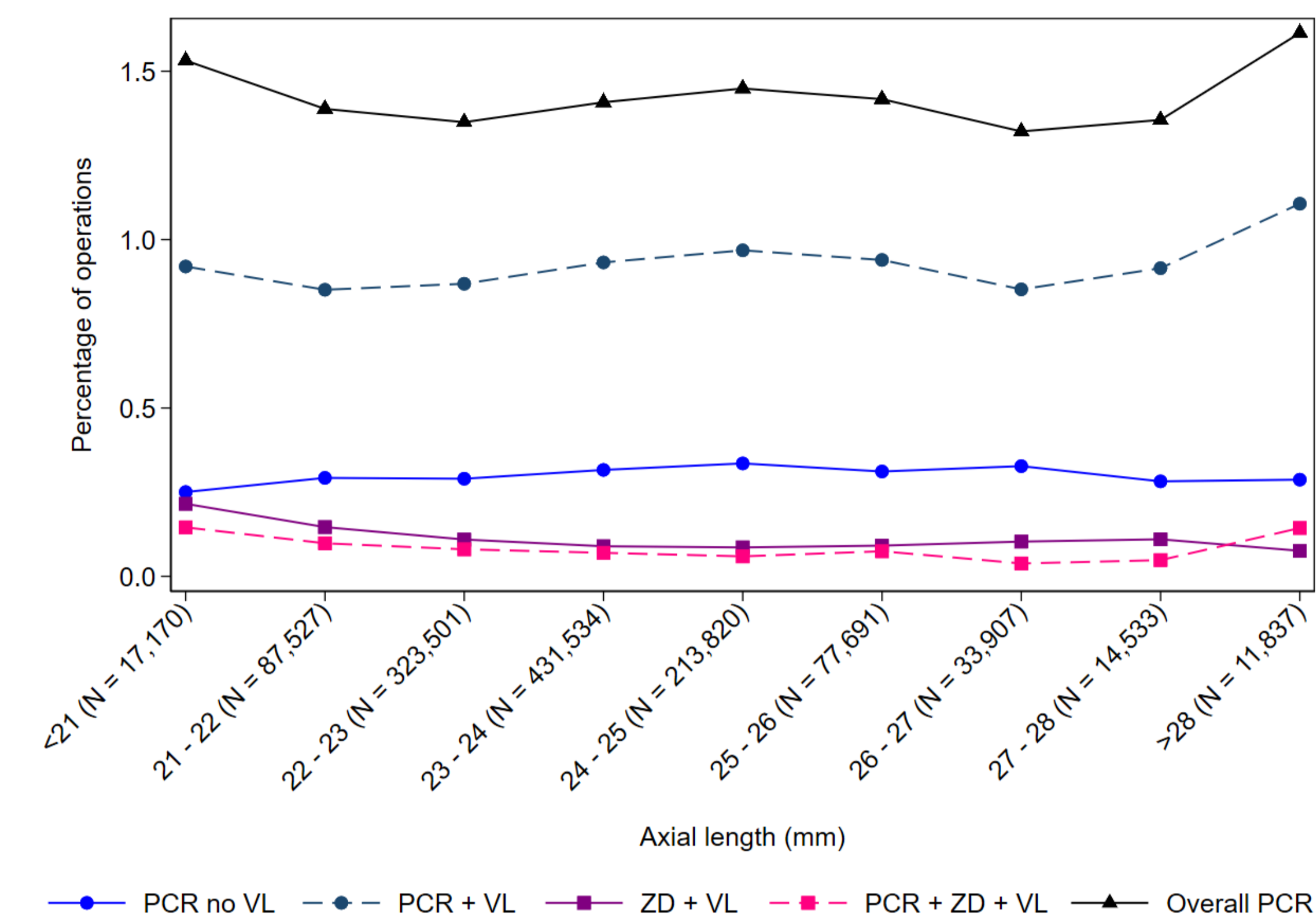
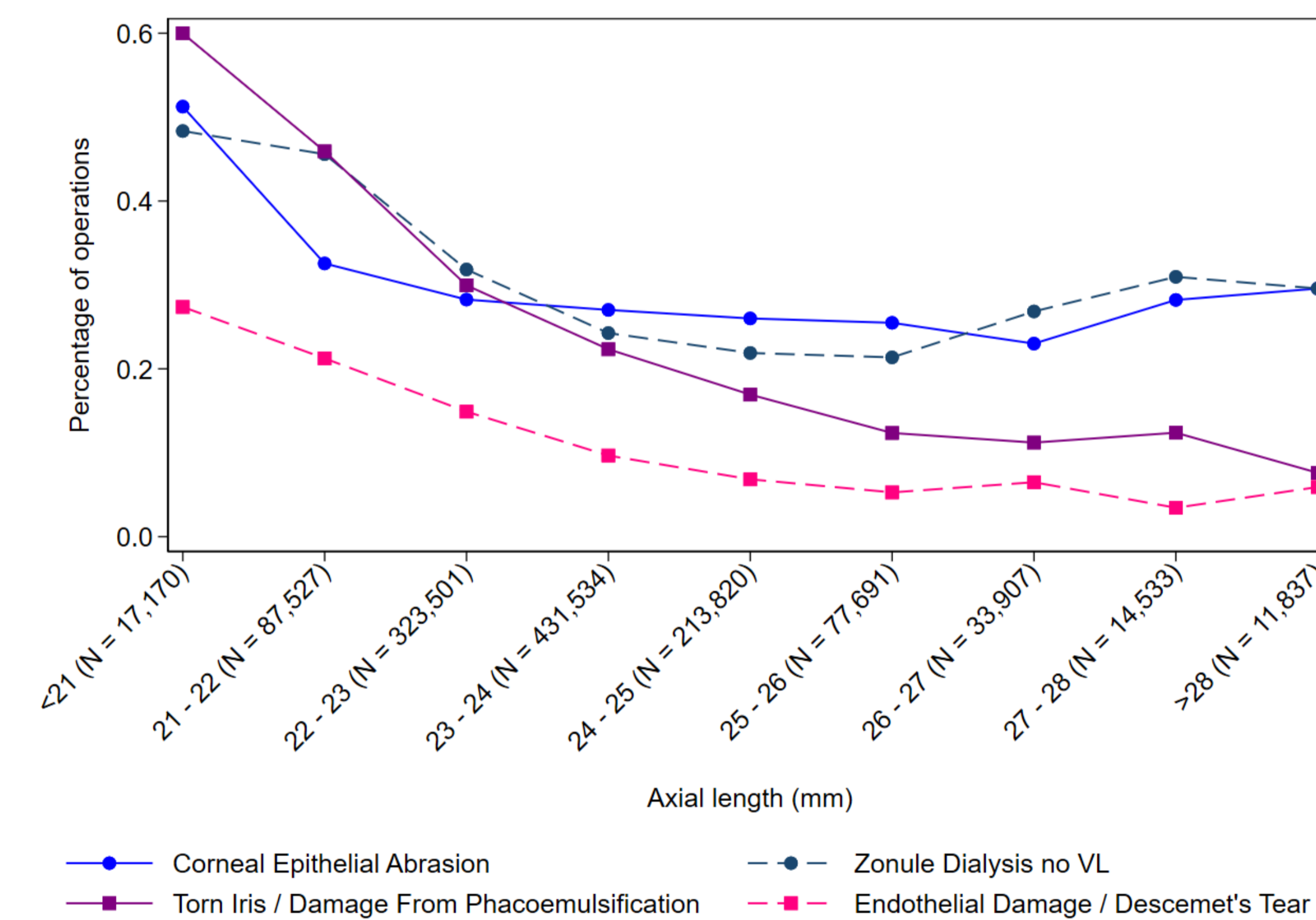


Figure 3: Complication rates for 1 mm increments of axial length



Conclusions:

There is little change in PCR rates by axial length with only slight increases for eyes with extreme axial lengths.

Certain intraoperative complications occurred more often in short eyes and first eye surgery than second eye surgery.

Table 2: Intraoperative complication rates for first and second eye surgery by patient's factors, for the 5 most frequently recorded complications.

Row Percentage	Posterior Capsule Rupture	Corneal Epithelial Abrasion	Zonule Dialysis no VL	Torn Iris / Damage From Phaco	Endothelial Damage / Descemet's Tear
First eye surgery (N= 715,952)	1.5	0.3	0.3	0.3	0.1
Able to lie flat					
Yes (N = 703,549)	1.5	0.3	0.3	0.3	0.1
No (N = 12,403)	2.0	0.3	0.4	0.3	0.1
Able to cooperate					
Yes (N = 696,563)	1.5	0.3	0.3	0.3	0.1
No (N = 19,389)	1.6	0.3	0.3	0.3	0.1
Age at surgery					
<70 (N = 199,130)	1.4	0.3	0.3	0.1	<0.1
70-74 (N = 123,281)	1.4	0.3	0.3	0.2	<0.1
75-79 (N = 147,788)	1.4	0.3	0.3	0.2	0.1
80-84 (N = 138,095)	1.4	0.3	0.3	0.3	0.1
85-89 (N = 80,522)	1.8	0.3	0.3	0.5	0.2
>=90 (N = 27,136)	2.2	0.2	0.4	0.6	0.2
Gender					
Male (N = 304,642)	1.6	0.3	0.3	0.3	0.1
Female (N = 411,310)	1.4	0.3	0.3	0.2	0.1
Second eye surgery (N = 493,018)	1.3	0.3	0.3	0.2	0.1
Able to lie flat					
Yes (N = 485,717)	1.4	0.3	0.2	0.2	0.1
No (N = 7,301)	1.5	0.3	0.3	0.4	0.2
Able to cooperate					
Yes (N = 480,059)	1.3	0.3	0.3	0.2	0.1
No (N = 12,959)	1.5	0.3	0.3	0.3	0.2
Age at surgery					
<70 (N = 117,851)	1.2	0.3	0.2	0.1	<0.1
70-74 (N = 83,457)	1.1	0.3	0.2	0.2	<0.1
75-79 (N = 106,543)	1.2	0.3	0.2	0.2	0.1
80-84 (N = 103,102)	1.4	0.3	0.3	0.3	0.1
85-89 (N = 61,448)	1.5	0.3	0.3	0.4	0.2
>=90 (N = 20,617)	1.9	0.2	0.4	0.5	0.2
Gender					
Male (N = 201,938)	1.3	0.3	0.2	0.3	0.1
Female (N = 291,080)	1.2	0.3	0.3	0.2	0.1

Acknowledgments:

We would like to thank both the hospitals and the staff collecting the data for contributing data to the RCOphth NOD. All participating centers are listed on the RCOphth NOD website (www.nodaudit.org.uk).

It is with deep regret that we note the death of our friend and colleague Robert Johnston, who sadly died in September 2016. Without his inspirational vision, determination and career long commitment to quality improvement in ophthalmology this work would not have been possible.