The Royal College of Ophthalmologists' National Ophthalmology Database: Risk Factors for Suprachoroidal Haemorrhage during Cataract Surgery

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Introduction:

Acute intraoperative suprachoroidal haemorrhage (AISH) is a rare but sight-threatening complication of cataract surgery, Figure 1.

Acute hypotony during surgery can cause a ciliochoroidal effusion and subsequent rupture of stretched posterior ciliary arteries.

Multiple risk factors for AISH have been identified, including older age, cardiovascular disease, glaucoma, increased axial length and posterior capsule rupture.

Aim:

To establish the incidence of acute intraoperative suprachoroidal haemorrhage during cataract surgery and identify the risk factors for this complication.

Subjects:

Eligible cataract operations were performed between 01/04/2010 and 31/03/2020 in centres with at least 50 eligible eyes that supplied data for anaesthesia (type, needle, medication and complication).
Excluded were:

- operations where general anaesthesia was used or without details for anaesthesia
- operations with axial length smaller than 18mm or without details for axial length
- operations without details for pre-operative intraocular pressure (IOP)
- operations without information if an intraocular lens implant (IOL) was inserted
- and data from centres with <2% of patients recorded as taking anticoagulant medication.

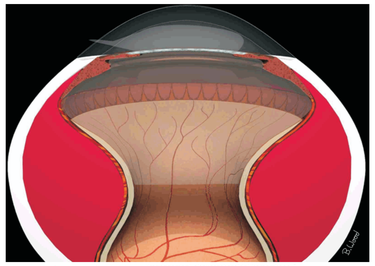


Image source: https://entokey.com/management-of-suprachoroidal-hemorrhage-2

Figure 1: *Schematic drawing of eye with Suprachoroidal Haemorrhage*

Statistical Methods:

- Logistic Regression was used to model the factors influencing the risk of developing AISH
- Robust standard errors were calculated to account for clustering on individual surgeons and surgeon's grade
- Candidate variables were assessed by fitting a univariate model, and only considered in a multivariate model if statistically significant at the 10% level , Table 1
- The final model was fitted using forwards selection with a 5% level of significance
- All analyses were performed using STATA 17

Results:

Within the study period, 709,083 operations performed by 2,680 surgeons on 498,170 patients from 65 centres were eligible for analysis. 564,691 (79.6%) operations were performed in traditional NHS institutions and 144,392 (20.4%) operations in Independent Sector Treatment Centres.

Acute intraoperative suprachoroidal haemorrhage occurred in 204 (0.03%) eyes and the rate of cases ranged between NHS years from 0.02% to 0.06%, Figure 2.

Of the AISH cases, 74 (36.3%) were male and 130 (63.7%) were female.
The median age was 80.6 years (IQR: 75.0 – 86.1 years) and 72 (35.3%) eyes were recorded as being left aphakic.

Posterior capsule rupture (PCR) was the risk factor most strongly associated with AISH (OR: 17.6, 95% CI:12.4– 24.9, p<0.001).

Other ocular risk factors identified were preoperatively raised IOP (OR: 3.7, 95% CI: 2.5 – 5.5, p<0.001), glaucoma (OR: 1.7, 95% CI: 1.2 – 2.4, p=0.004). Risk increased with age and patients aged over 90 years were at greatest risk (OR: 6.7, 95% CI: 3.5 – 12.8, p<0.001).

The addition of intracameral anaesthetic when performing surgery under topical anaesthetic appears to be protective (OR: 0.5, 95% CI: 0.3 – 0.8, p=0.003), compared to topical anaesthetic alone, Figure 3.

Figure 2: *Suprachoroidal Haemorrhage rates per NHS year*

(Operations in 2010 (N=16,519); 2012 (N=31,865); 2012 (N=39,877); 2013 (N=47,950); 2014 (N=54,656); 2015 (N=67,032); 2016 (N=86,094); 2017 (N=95,417); 2018 (N=108,290); 2019 (108,600); 2020 (N=52,783))

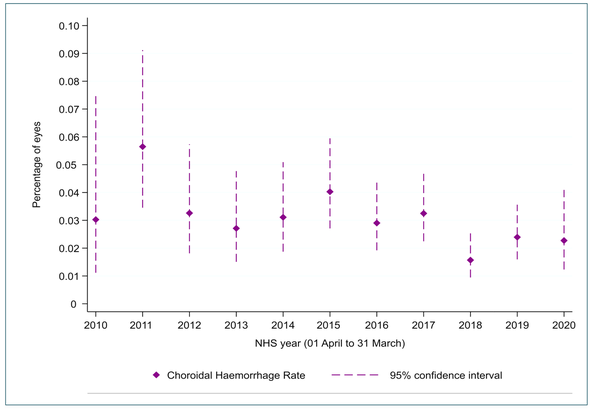
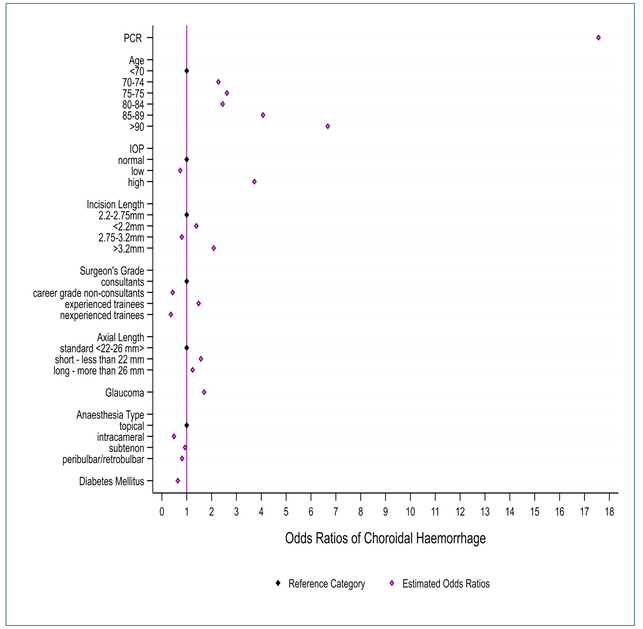


Table 1: *The results of univariate analysis of potential risk factors for suprachoroidal haemorrhage for patient, ocular and surgical covariates*

N (row %)	AISH	No AISH	Overall	p-value
Number of operations	204 (0.03)	708,879	709,083	
Patient Factors				
Gender:				
Male	74 (0.02)	299,023	299,097	0.222
Female	130 (0.03)	409,584	409,714	
Not stated	0 (0.00)	272	272	
Age at surgery in years:				<0.001
<70	20 (0.01)	177,207	177,227	
70-74	31 (0.03)	123,415	123,446	
75-79	44 (0.03)	150,801	150,845	
80-84	41 (0.03)	144,307	144,348	
85-89	43 (0.05)	85,022	85,065	
>=90	25 (0.09)	28,127	28,152	
Diabetic Status:				0.022
Not diabetic	174 (0.03)	558,239	558,413	
Has diabetes mellitus	30 (0.02)	150,640	150,670	
Anticoagulant Use:				0.215
No	131 (0.03)	483,844	483,975	
Yes	73 (0.03)	225,035	225,108	
Eye Factors				
First / Second eye:				0.449
First treated eye	118 (0.03)	391,333	391,451	
Second treated eye	86 (0.03)	317,546	317,632	
Axial Length (mm):				0.021
<21 (short)	28 (0.05)	59,174	59,202	
21-26 (normal)	167 (0.03)	615,001	615,168	
>26 (long)	9 (0.03)	34,704	34,713	
Glaucoma:				0.001
No	157 (0.02)	639,398	639,555	
Yes	47 (0.07)	69,481	69,528	
Bruenescent / white/ mature cataract:				0.001
No	184 (0.03)	674,976	675,160	
Yes	20 (0.06)	33,903	33,923	
IOP:				<0.001
<10 (low)	4 (0.02)	19,462	19,466	
10-21 (standard)	160 (0.02)	653,709	653,869	
>21 (high)	40 (0.11)	35,708	35,748	
Operative Factors				
Surgeon's grade:				<0.001
Consultants	132 (0.03)	503,647	503,779	
Career grade non-consultants	7 (0.01)	52,639	52,646	
Experienced trainees	62 (0.05)	127,567	127,629	
Inexperienced trainees	3 (0.01)	25,026	25,029	
PCR:				<0.001
No	159 (0.02)	699,701	699,860	
Yes	45 (0.49)	9,178	9,223	
Anaesthesia type:				<0.001
Topical	32 (0.04)	88,688	88,720	
Intracameral	58 (0.02)	326,610	326,668	
Subtenon	103 (0.04)	263,104	263,207	
Peribulbar/Retrobulbar	11 (0.04)	30,477	30,488	
Incision size (mm):				<0.001
< 22mm	10 (0.04)	24,374	24,384	
2.2-2.75mm	117 (0.03)	427,918	428,035	
2.75-3.2mm	51 (0.02)	221,537	221,588	
> 3.2 mm	26 (0.07)	35,050	35,076	

Figure 3: *Suprachoroidal haemorrhage risk factor model odds ratios*



Conclusions:

What was known before:

- Acute intraoperative suprachoroidal haemorrhage is a rare but potentially blinding complication of cataract surgery
- Previously identified risk factors for AISH include: increasing age, raised preoperative IOP, glaucoma and PCR

What this study adds:

- **The incidence of AISH during modern cataract surgery in a UK population is approximately 1 in 3,500**
- **There is a 16-fold increase in the risk of vision loss postoperatively if AISH occurs**
- **The addition of intracameral anaesthesia to topical anaesthesia may reduce the likelihood of AISH but the mechanism remains unclear**
- **Posterior capsule rupture represents the greatest risk for development of AISH in our study population**