

Eye Injury Associated Surgery and Anesthesia

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Financial disclosure

I have no commercial or other
conflicts of interest





Objectives

1. To recognize these potentially devastating complications
2. To prevent eye injury during non-ophthalmic surgery
3. To treat complications

A Review of the ASA Closed Claim Study in Eye Injury

Eye Injuries Associated with Anesthesia

A Closed Claims Analysis

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TABLE 1. Mechanism of Eye Injury

Mechanism of Injury	Eye Injury (Total) (n = 71)	Corneal Abrasions (n = 25)
Patient movement	21 (30%)	0 —
Chemical injury	9 (13%)	1 (4%)
Direct trauma	6 (8%)	4 (16%)
Pressure on eye	2 (3%)	0 —
Other	3 (4%)	0 —
Unknown	30 (42%)	20 (80%)

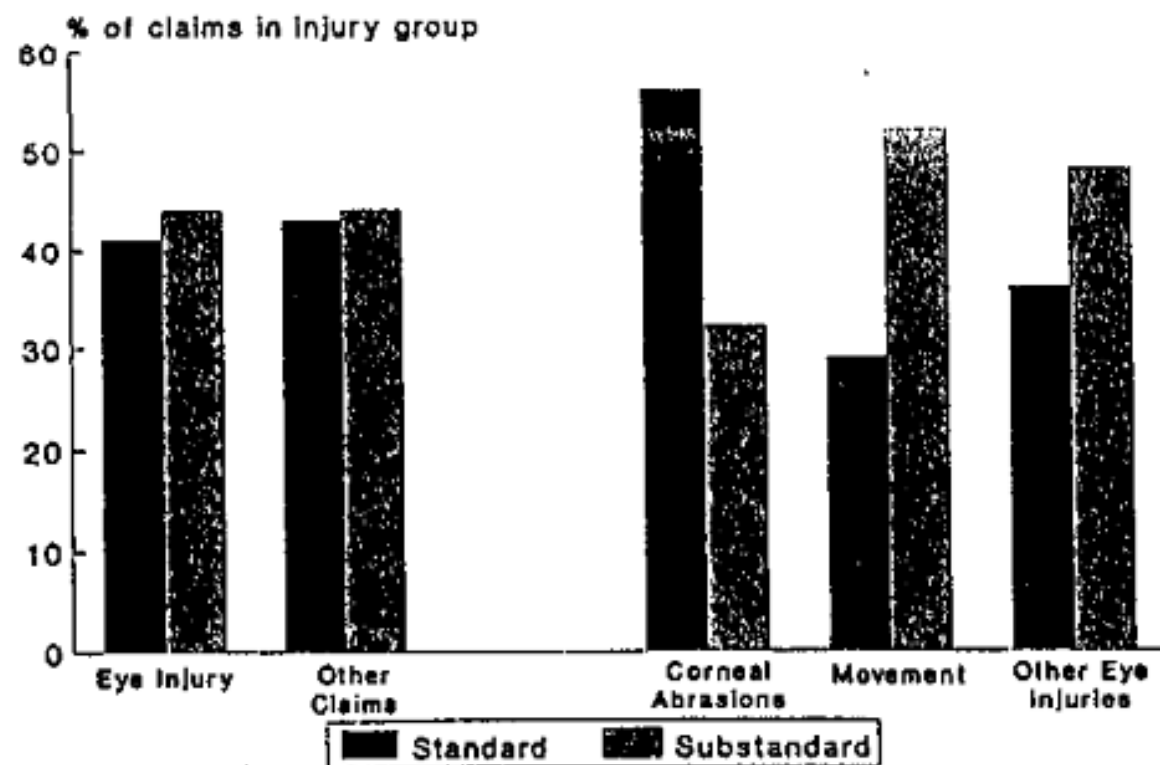


FIG. 2. Standard of anesthesia care. Distribution of standard of care determinations in eye injury claims compared to claims for other injuries. Claims in which a determination could not be made are not shown.

EYE INJURY AND ANESTHESIA

TABLE 2B. Incidence and Amount of Payment Eye Injury

Type of Claim	Number of Claims with Payment	Median Payment (\$ × 1,000)	Range of Payments (\$ × 1,000)
All movement claims (n = 21)	16 (76%)	90*	5-275
During general anesthesia (n = 16)	14 (88%)	108	20-275
During MAC (n = 5)	2 (40%)	35	5-65
Nonmovement (n = 50)	34 (68%)	9	0.025-1,000
All corneal abrasions (n = 25)	16 (64%)	3†	0.025-25
Nonabrasion (n = 46)	34 (74%)	89	1-1,000
All other claims (n = 25)	18 (72%)	75	1-1,000

Note: Claims with no payment (\$0) are excluded from calculation of all statistics.

* $P \leq 0.01$ between median payment for eye injuries caused by

movement *versus* other eye injury claims.

† $P \leq 0.01$ between median payment for corneal abrasions *versus* other eye injuries.

Anesthesia Malpractice Claims Associated with Eye Surgery and Eye Injury: *Highlights From the Anesthesia Closed Claims Project Data Request Service*

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1. 7,351 surgical anesthesia claims.
2. 184 anesthesia claims associated with eye surgery representing 4.5 % of all surgical anesthesia claims.
3. Characteristics: female gender, adults, healthy (ASA 1-II), and older (58 yo)
4. Surgical features: elective and ambulatory surgery.
5. 67% cases were regional (35%) and MAC (32%), vs 78% GA in other surgical anesthesia claims.

Figure 2: Trends in Anesthesia Claims Associated With Eye Injuries

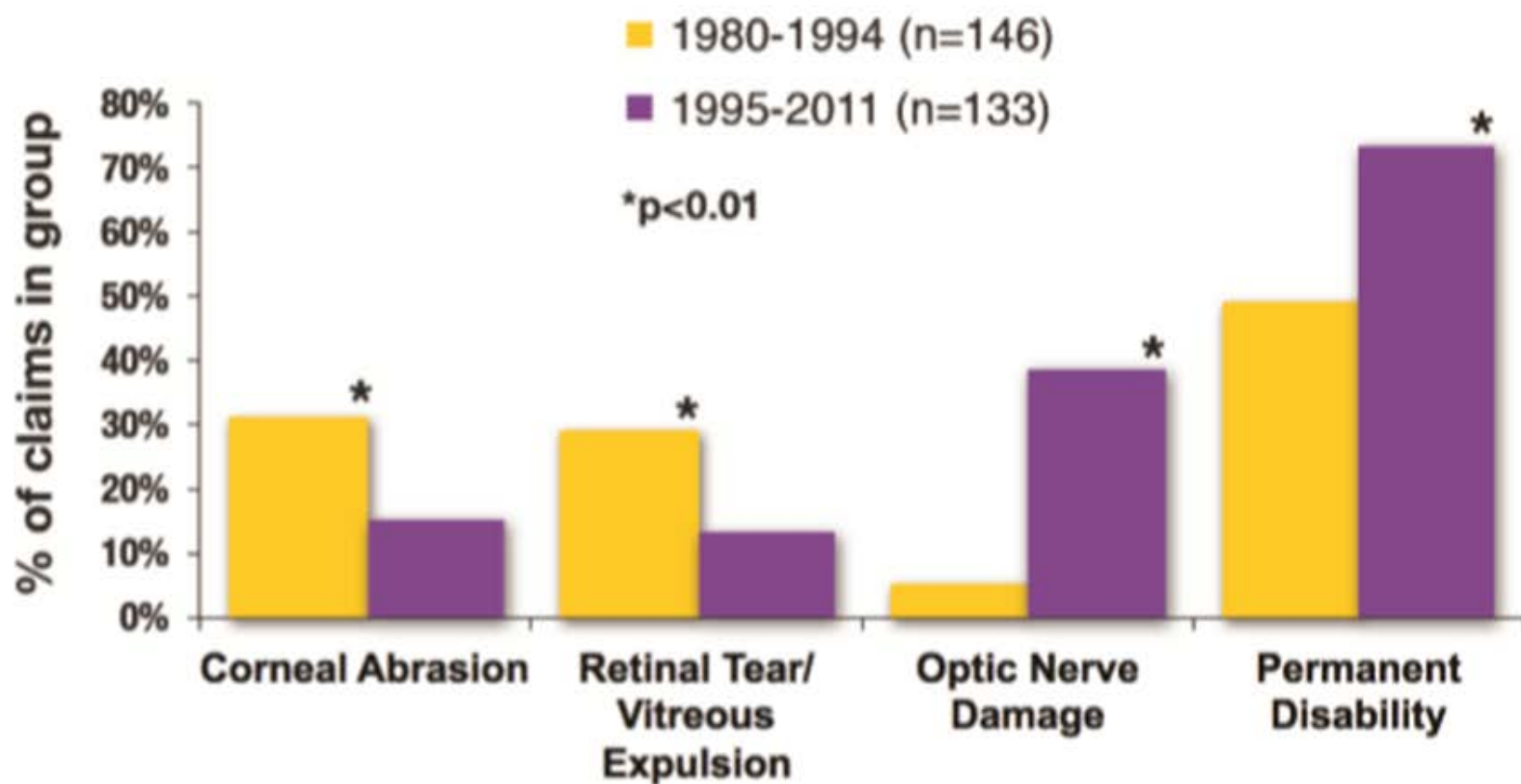
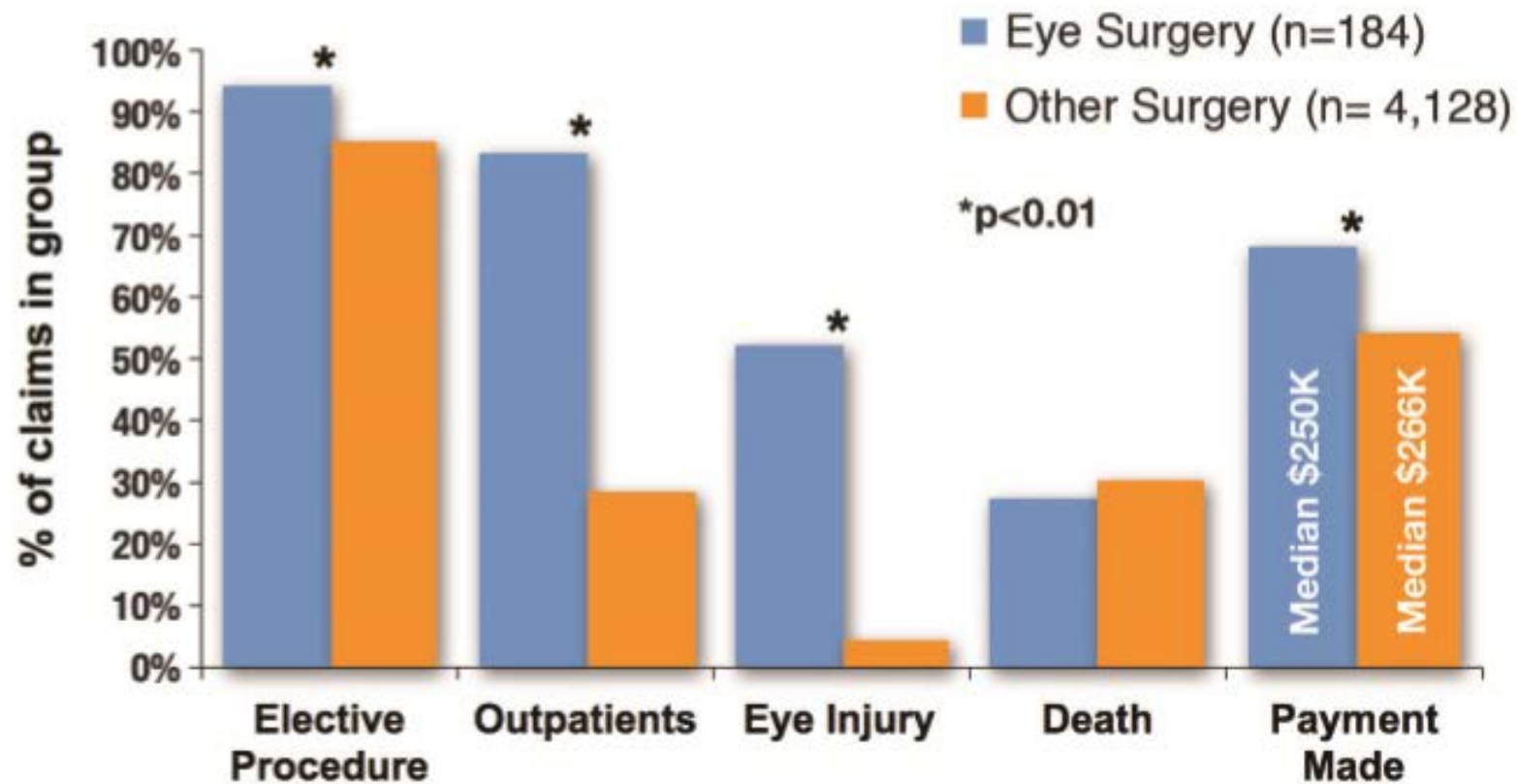


Figure 1: Anesthesia Claims Associated With Eye Surgery 1990-2012



Summary

1. The risk of death from anesthesia either during eye surgery or non-eye surgery was similar.
2. Eye surgery did increase incident of anesthesia associated eye injury either under general anesthesia or Monitored Anesthesia Care (MAC).
3. Patient movement intraoperatively and during eye block was still the major cause of eye injury.
4. Corneal abrasion and retinal injury was decreased comparing to the previous decade.
5. Optic nerve injury was dramatically increased because of the increased numbers of spinal surgery.

Corneal Abrasion

An Analysis of Perioperative Eye Injuries After Nonocular Surgery

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1. The incidence of eye injury was 0.023% (17 cases in total of 75,120 cases)
2. Corneal abrasion was the most common form of eye injury

Table 1 Types, treatments and outcomes of patients with eye injuries

No.	Age (yr)	Sex	Type of eye injury	Injured Side	Treatment	Sequelae
1	64	Female	Corneal abrasion	Right	BSS, sulfisomezole oph soln 4%	No
2	62	Male	Corneal abrasion	Both	FML oph soln 0.02%	No
3	55	Female	Corneal abrasion	Right	BSS	No
4	52	Female	Corneal abrasion	Right	BSS, carbomer oph gel, tobramycin oint	No
5	50	Male	Corneal abrasion	Right	BSS, GM oint, ice pack	No
6	47	Female	Corneal abrasion	Right	BSS, carbomer oph gel	No
7	42	Female	Corneal abrasion	Right	Sulfisomezole oph soln 4%	No
8	39	Male	Corneal abrasion	Both	BSS, carbomer gel, FML oph soln 0.02%, tetracycline oint	No
9	36	Male	Corneal abrasion	Right	Sulfisomezole oph soln 4%	No
10	23	Male	Corneal abrasion	Both	Artificial tears, FML oph soln 0.1%, sustain-tears, tobramycin oint	No
11	74	Male	Conjunctivitis	Both	Observation	No
12	69	Female	Conjunctivitis	Left	Observation	No
13	61	Female	Conjunctivitis	Both	BSS, sulfisomezole oph soln 4%, sustain-tears	No
14	53	Male	Conjunctivitis	Both	Sulfisomezole oph soln 4%	No
15	16	Male	Conjunctivitis	Both	Observation	No
16	53	Male	Prolonged blurred vision	Right	Observation	No
17	68	Male	Blindness	Right	Acetazolamide, carteolol eye drops, mannitol	Permanent blindness

BSS – balanced salt solution; oph – ophthalmic; soln – solution; FML – fluorometholone; oint – ointment; GM – gentamicin.

Table 4 Results of regression analysis*

	OR	95% CI	<i>p</i>
Anemia	5.3	1.8–15.4	0.002
Head and neck surgery	9.3	2.3–38.0	0.002
Surgical position			
Supine			Reference
Lateral	7.1	1.2–43.2	0.034
Prone	10.8	2.4–48.8	0.002
Fiberoptic intubation	2.9	0.6–12.6	0.167
Deliberate hypotension	8.7	2.4–31.8	0.001
Duration of anesthesia [†]	0.9	0.8–1.7	0.674

*Area under the receiver operating characteristic curve is 0.770; [†]OR per hour. OR=odds ratio; CI=confidence interval.

Corneal Protection during General Anesthesia for Nonocular Surgery

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Pathogenesis of Corneal Abrasions

- **A. Risk Factors**
 - Long surgical procedures
 - Operations on the head and neck
 - Lateral or prone positioning
 - Lower ASA physical status
 - Others (SRNA, Monday, deliberate hypotension and anemia, etc)
- **B. Mechanical Injury**
 - watch, ID badge, stethoscope, anesthetic mask, surgical drape, surgical instruments)
- **C. Chemical Injury** (antimicrobial solution, halothane)
- **D. Exposure Keratopathy**
 - incomplete eyelid closure, corneal exposure & dryness
- **E. Reduced Tear Production**
 - GA suppresses the autonomic nerve supply to the lacrimal gland

Methods of Ocular Surface Protection

- A. Passive Eyelid Closure (27% corneal epithelial defect)
- B. Eyelid Taping (2%, but needs to be placed properly!)
- C. Ocular Lubricants (1%)
- D. Tarsorrhaphy (eyelid injury)
- E. Protective Goggles and Bandage Contact Lenses (place properly)
- F. Geliperm (mechanical barrier)
- G. Bio-occlusive Dressings (Tegaderm)

Research Article

Evaluation and Treatment of Perioperative Corneal Abrasions

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Received 20 October 2013; Revised 9 December 2013; Accepted 25 December 2013; Published 4 February 2014

TABLE 4: Treatment for corneal abrasion.

Treatment	%
AT only	40%
Antibiotic only	10.6%
Bacitracin	2.4%
Erythromycin	7%
Polytrim ophthalmic	1.2%
Antibiotic and AT	35.3%
Bacitracin	18.8%
Erythromycin	12.9%
Polytrim ophthalmic	2.4%
Moxifloxacin	1.2%
Two antibiotics and AT	9.4%
Moxifloxacin + erythromycin	2.4%
Erythromycin + polytrim	3.5%
Bacitracin + polytrim	2.4%
Bacitracin + moxifloxacin	1.2%
Two antibiotics (erythromycin + polytrim)	1.2%
Lubricant	1.2%
One antibiotic and cycloplegic	1.2%
Two antibiotics and cycloplegic (bacitracin + moxifloxacin)	1.2%

Intraocular Pressure and Vision Changes in Robotic-Assistant Laparoscopic Surgery



OPEN ACCESS

The effect of steep Trendelenburg positioning on intraocular pressure and visual function during robotic-assisted radical prostatectomy

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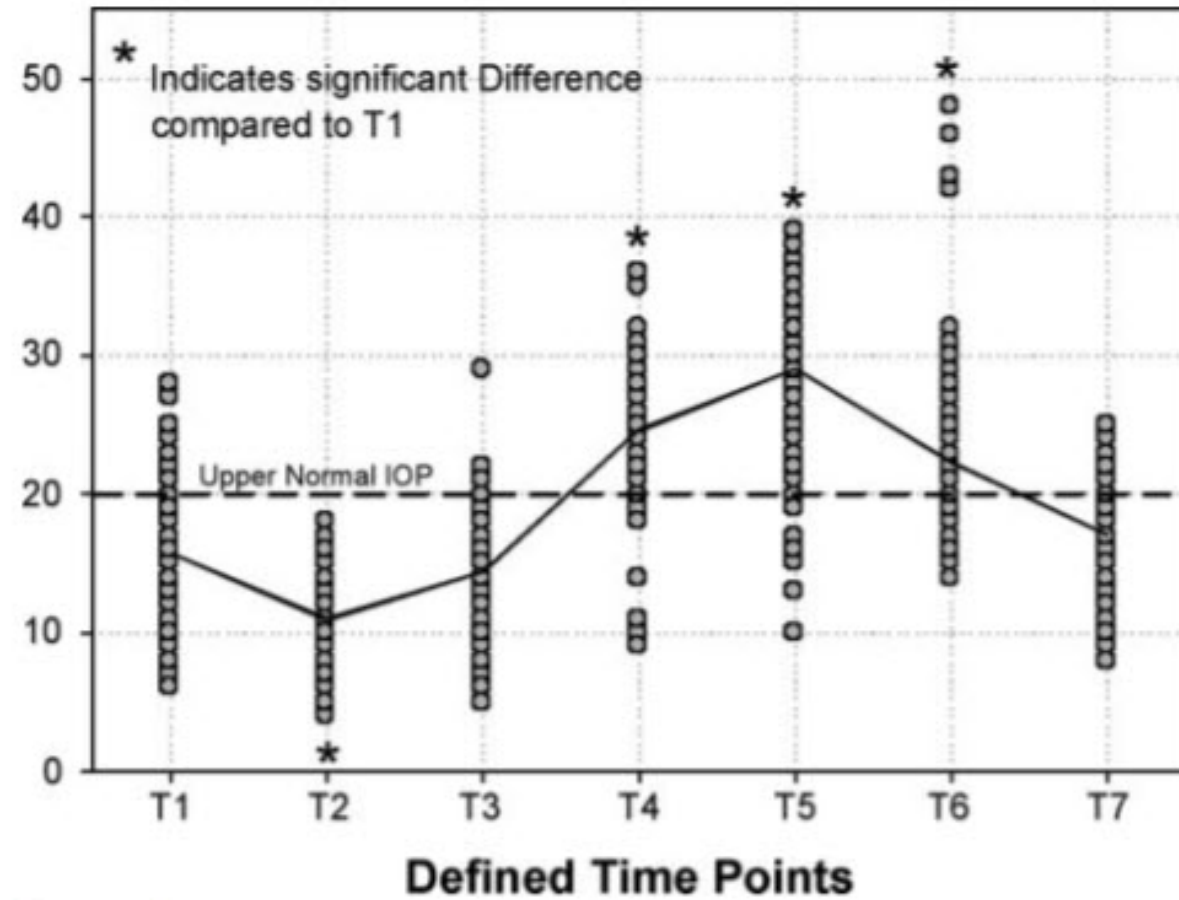


Figure 1. Scatter plot of the IOP with the overlaid line connecting the IOP least square estimates at each time point. The dotted line represents the upper normal IOP in adult patients. IOP = intraocular pressure.

IOP changes in steep Trendelenburg position

Table 2. Means & Standard deviations via repeated measure anova of Intraocular pressure over time. ST n=37 Supinen=29

IOP/Time/Position	ST Group			Supin Group		
	M	SD	Range	M	SD	Range
IOP – Initial (Flat)	13.4	4.73	9-26	13.2	4.15	8-24
IOP – 30 (trendelenburg)	25.1	7.76	11-33	21.2	5.43	8-35
IOP – 60 (trendelenburg)	32.3	10.06	23-57	24.5	7.58	11-40
IOP – 90 (trendelenburg)	33.8	8.23	25-51	20.5	7.08	6-43
IOP – 120 (trendelenburg)	35.7	10.56	25-61	18.7	5.22	10-33
IOP – final (flat)	20.6	4.58	10-42	14.0	4.69	7-24
% Return to Baseline IOP	11%			73%		

** Supine intervention takes place just prior to /or following 60 - 90 minutes of ST position dependant on IOP measure and allowed time by surgeon during procedure.

RESEARCH ARTICLE

Transient but Significant Visual Field Defects after Robot-Assisted Laparoscopic Radical Prostatectomy in Deep Trendelenburg Position

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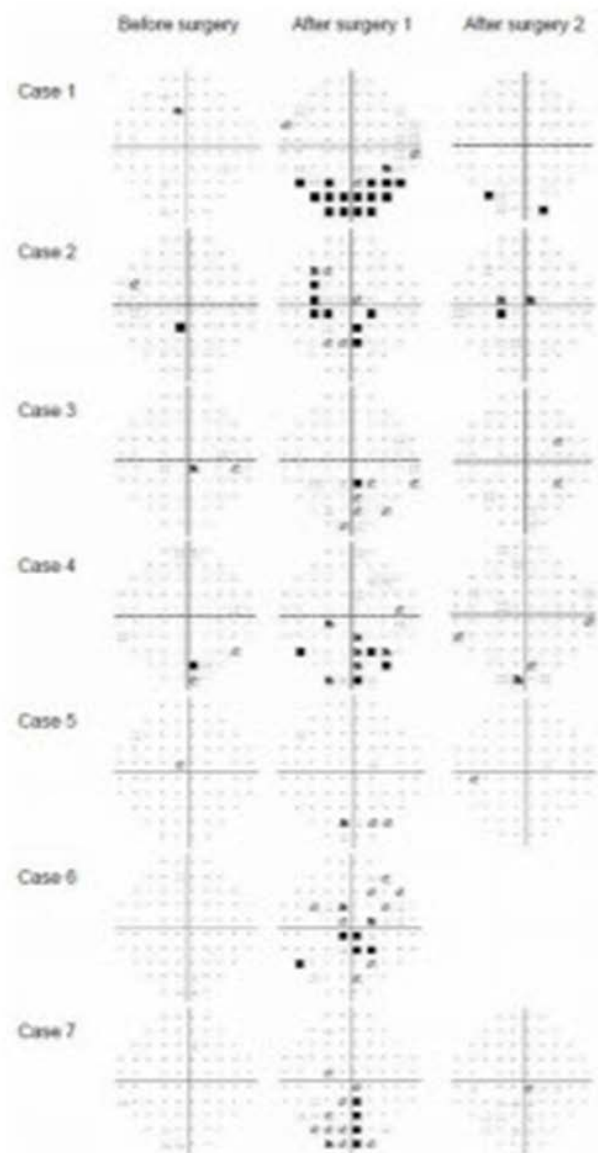


Fig 1. Visual fields of seven eyes of seven cases with unilateral postoperative visual field defects. Before surgery: 0-2 months before surgery. After surgery 1: mean of 7.0 days after surgery. After surgery 2: mean of 77 days after surgery.

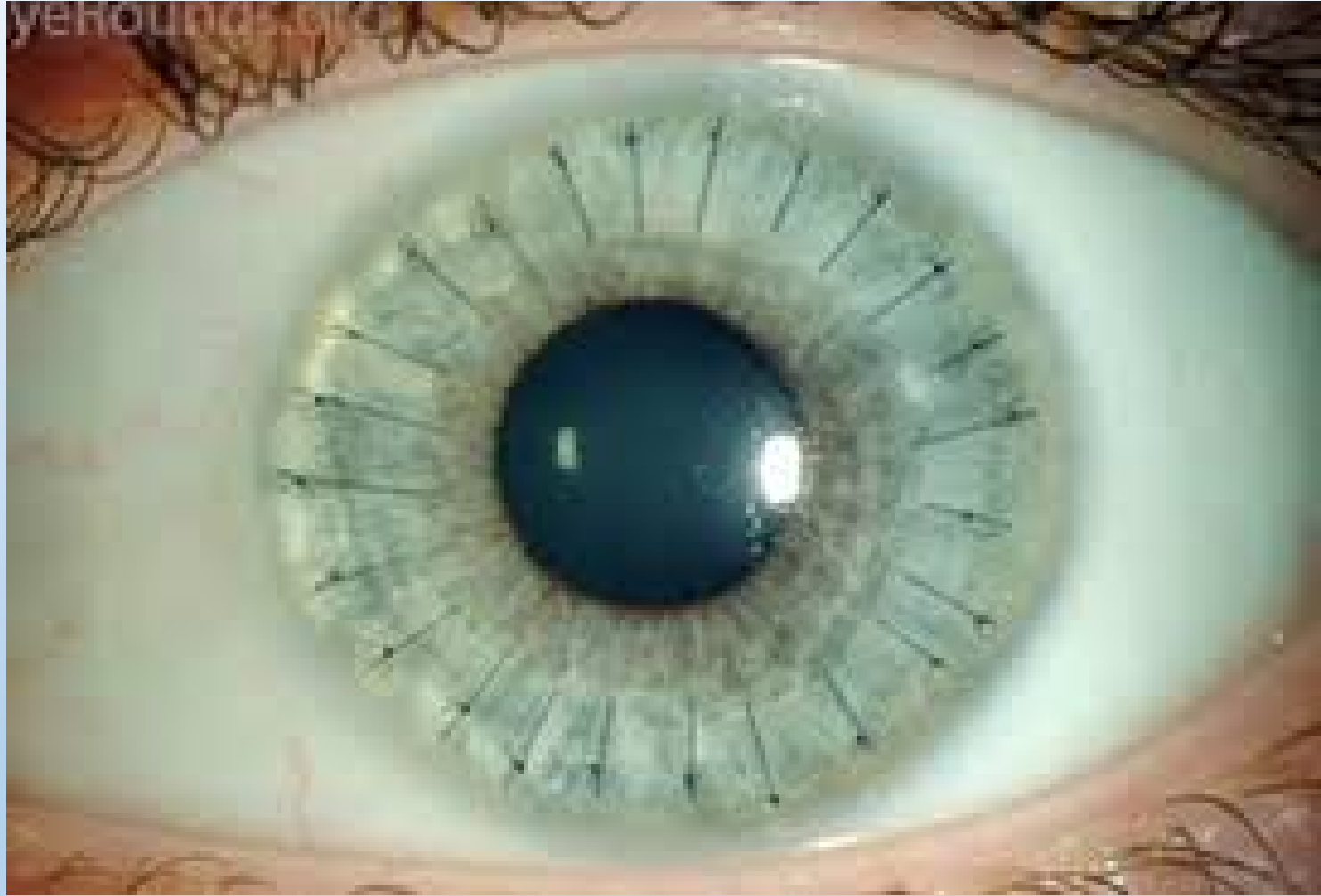
Summary

- Intraocular pressure (IOP) increase related to the degree of the Trendelenberg position and the length on the position
- The elevation of the IOP can reach 3 to 5 folds
- Potential vision change is a real threat to our patients
- The significance of IOP elevation in glaucoma patients is unknown
- Keep the Trendelenberg position at 25 degree and less than 3 hours may help in the decrease the eye injury

Special Concerns







Prevention of eye injury for non-ophthalmic surgery

- Prevention of coughing and vomiting (increase IOP)
- Protect eyes (artificial tear ointment and tegaderm taping)
- Avoid pressure on the eyes (shell)
- Specially attention to positioning
 - Prone (spine surgery, craniotomy)
 - Beach-chair
 - Steep Trendelenburg position (robotic prostatectomy, hysterectomy)