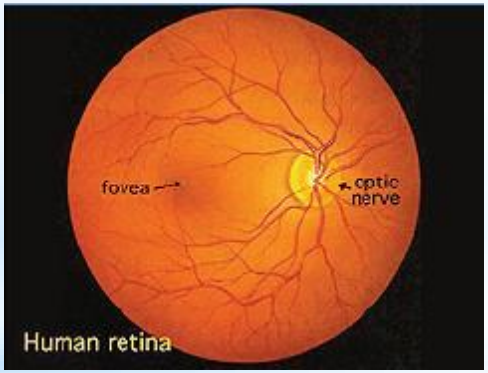
Perioperative Cosopt for Rising Intraocular Pressure During Steep Trendelenburg Position Surgery



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Research Purpose

- After observing this case of postoperative visual loss (POVL) following a lengthy surgery (7.5 hours) in the steep Trendelenburg (ST) position, we investigated effects and causal relationship between duration of time in the ST position on intraocular pressure (IOP) resulting in a decreased ophthalmic perfusion pressure (OPP)
  - MAP – IOP = OPP
- We observed gross orbital and facial edema

- A review of 17 POVL patients showed findings of eyelid edema, conjunctival edema and ecchymosis.
  Delattre 2007

- Measuring IOP intraoperatively requires costly tonometers and credentialed personnel

Hypothesis & Goals

❖The eyelid edema, conjunctival edema (chemosis) and, ecchymosis that we observed would correlate to significant increases in IOP and could assist us as a measure of when (> 40 mmHg) critical threshold IOP levels were reached

Pillunat 1997 / Harris 1998

❖The aim of our series of studies was to link gold standard IOP tonometry measurements to an observation scale enabling caregivers to determine when to institute preventive and interventive measures to optimize ocular perfusion.

Initial Study Results

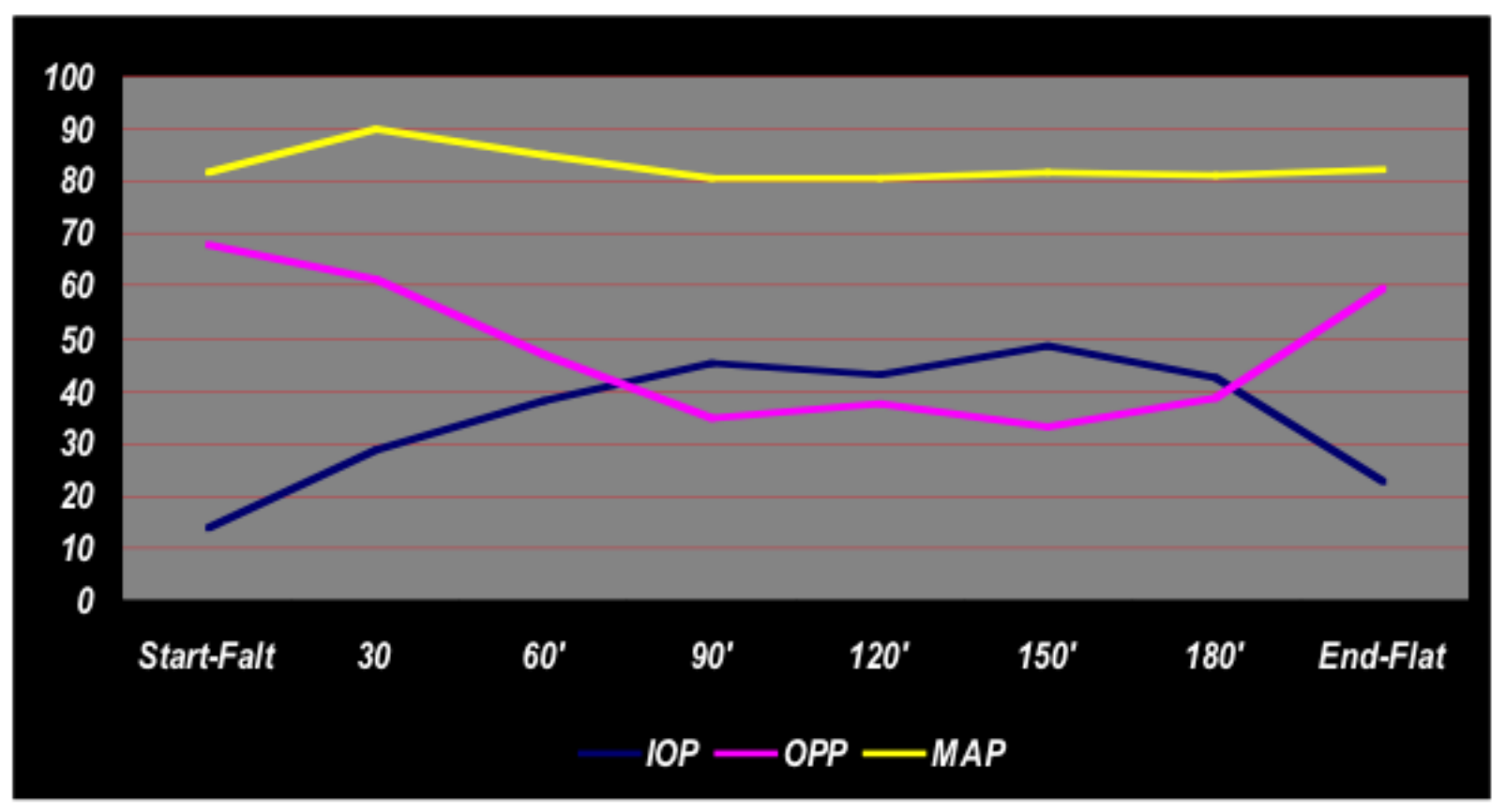
- **N = 37 patients**
- Measurement of IOP over a 3-hour duration in laparoscopic procedures (prostatectomy, bowel and hysterectomy) while mean MAP was maintained optimally at greater than 60 mmHg

	Starting	120 min	Ending
IOP	13 mmHg (9-20)	32 mmHg (25-54)	20 mmHg (10-42)
OPP	65 mmHg (50-82)	45 mmHg (21-75)	56 mmHg (29-75)

What happened to the autoregulation system?

Results

- 26% of subjects' IOPs *tripled* within two hours after institution of ST position, OPP dropped below IOP in this subset, thus recognizing a potential low perfusion state



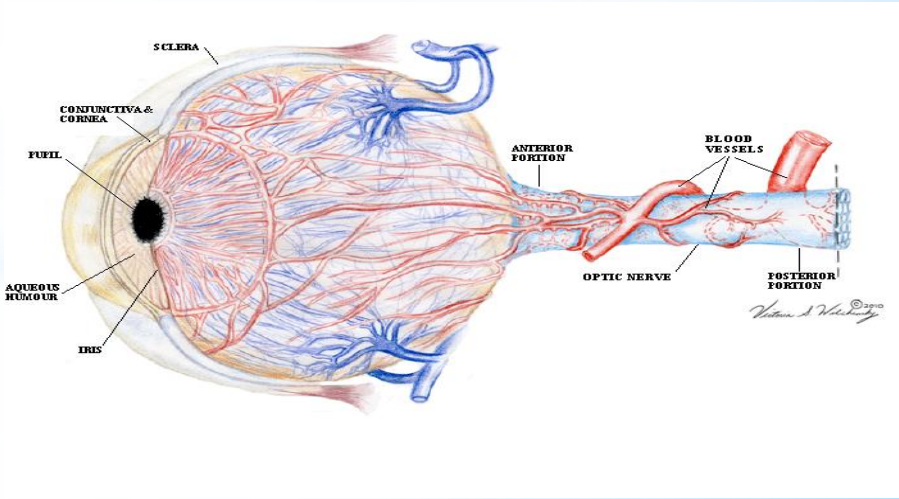
Types of Perioperative Vision Loss

Anterior Ischemic Optic Neuropathy (AION) : flow related - damage to the anterior optic nerve secondary to a decreased blood supply

Posterior Ischemic Optic Neuropathy (PION): also proposed flow related - ischemic event secondary to damage to the retrobulbar portion of the optic nerve

Central Retinal Artery and Vein Occlusion:
(CRAO & CRVO)

Ischemic & non-ischemic can be a result of globe compression as well as increased IOP



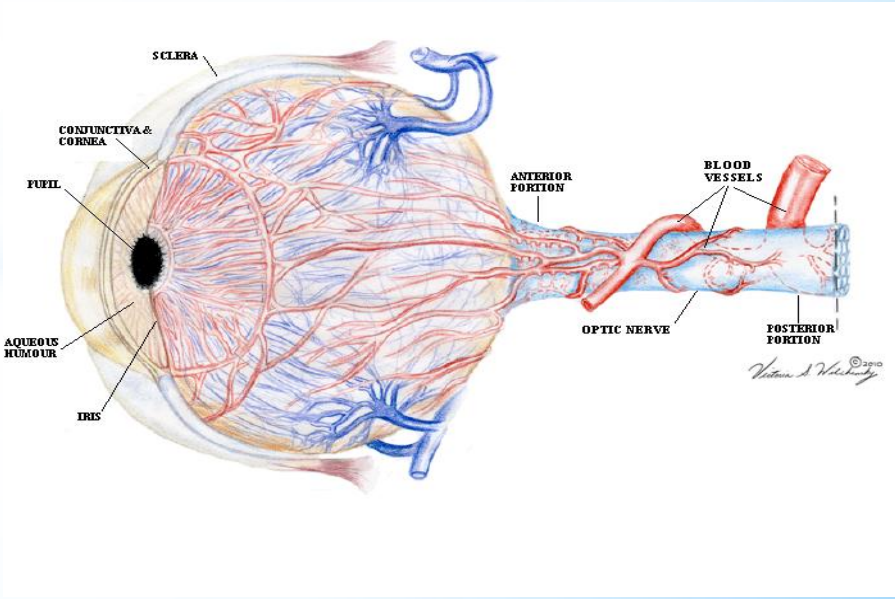
Neuro-ophthalmology Literature

- Gilbert - any interference with a patient's ophthalmic blood flow autoregulation system can lead to a POVL event.
- Savitsky - irreversible optic and retinal nerve damage may occur within 90 minutes of ↓ OPP
- Baig - secondary to a compartment syndrome mechanism: the posterior optic nerve susceptible to ↓ perfusion.

  Blood supply via arterial vessels - only small terminal pial vessels penetrating to the central core of posterior optic nerve .

- Optic nerve passes through bony tunnel leading to the brain (optic canal)
- Swelling in this inelastic space may cause compression on the nerve.

*** Individual watershed zones & Marked individual variation of outflow



Pertinent Current Literature

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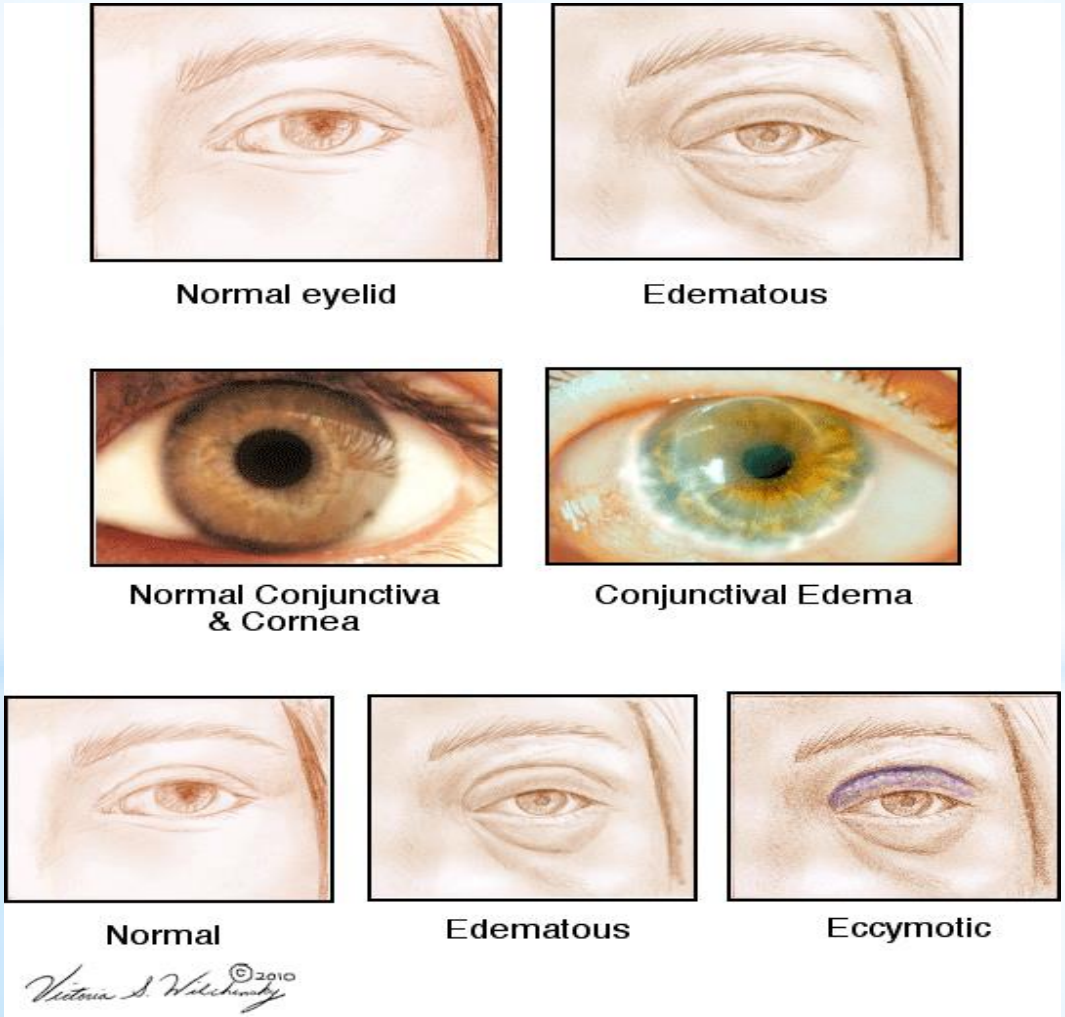
Zheng, Biu, et. al.- Rodent models - confirming that even brief acute rises in IOP can "lead to cumulative dysfunction in the inner retina"
Doppler flow -Ischemia causing retinal structural damage.
(30-45 minutes)

Dysregulation of trabecular meshwork drainage secondary to high IOP & orthostatic pressure changes there is dysregulated pressure dependent outflow. (Rhee)

The Schlemm's canal that lies below the trabecular meshwork can collapse during prolonged ST position secondary to high IOP and the orthostatic changes: causing occlusion of the lumen and obstruction to outflow
1) increasing potentials for compression of these vessels in the posterior chamber and 2) directly prevents reflux of blood into the anterior chamber**
(Johnstone & Grant)

A Preventive Intervention For Rising Intraocular Pressure
Development of the Molloy/ BAA Observation Scale
"The MBOS"
VISUALS OF EYELID EDEMA, CORNEAL EDEMA / CHEMOSIS AND ECCHYMOSIS



Eyelid Edema

2.5 times >baseline IOP incidence

Chemosis
3.4 times
IOP

Ecchymosis

4.6 times
IOP


APPLANATION TONOMETER

Suggested Treatment Interventions For Elevated IOP

Baig et al. suggest that a treatment measure would be to place the orbit above the level of the heart. They have advised the need to prevent venous pooling in the orbit and recommend rest stops to elevate the head.
Porciatti studied Reverse Trendelenburg positioning and saw an improvement in RCG function.

Grover et al. reviewed the use of beta adrenergic blocker eye drops in general anesthesia and concluded that Timolol acts by decreasing the production of aqueous humour and demonstrated a decrease in IOP .

Cosopt™ Trials: A Beta-Adrenergic Blocker/ Carbonic Anhydrase Inhibitor Combination (Dorzolamide and Timolol)

Perioperative Cosopt Intervention

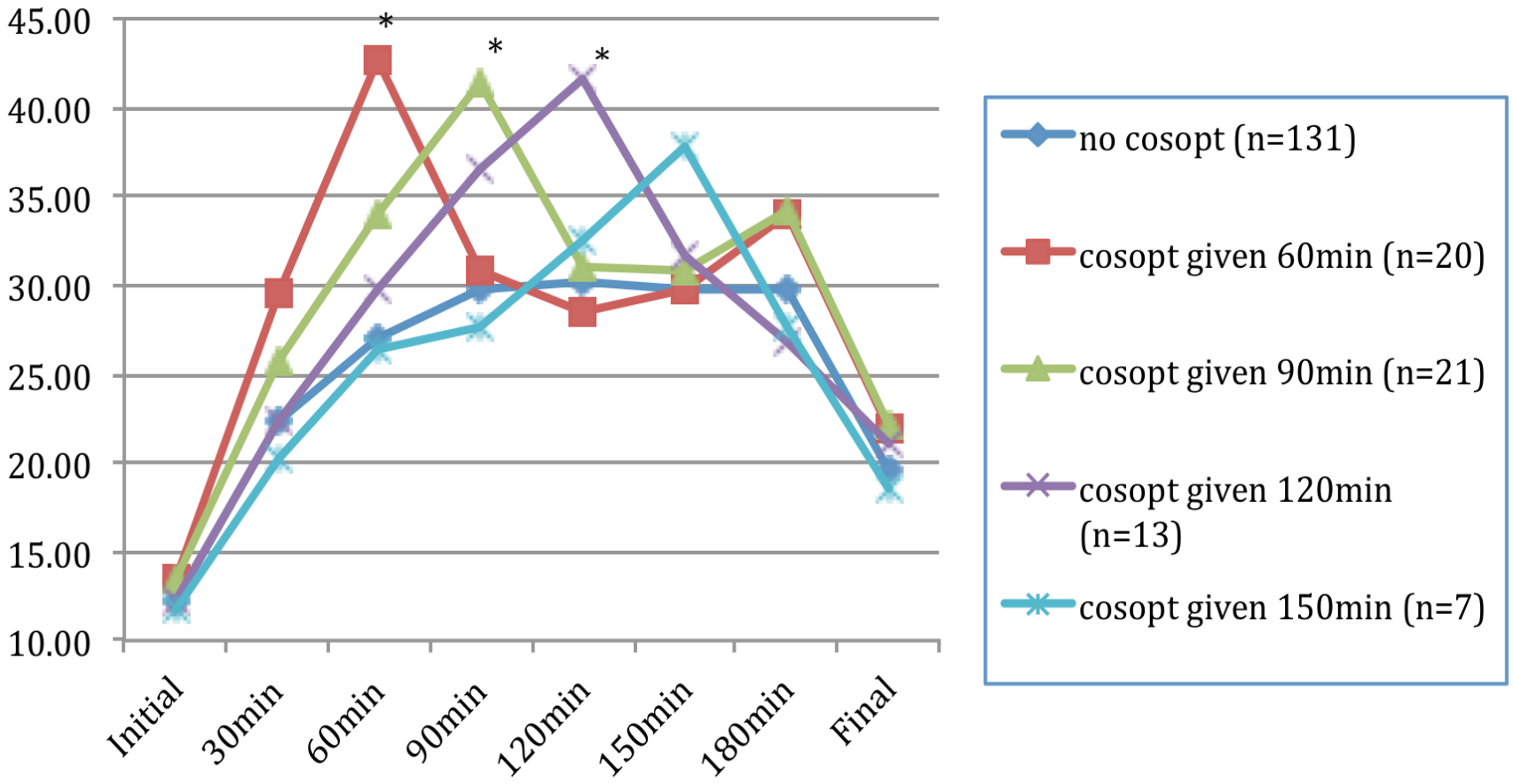


Figure 1. Patients' IOP levels in the standard group (no cosopt given) and cosopt given groups at 60, 90, 120, and 150 minutes. Repeated measures analysis of covariance (RM-ANCOVA) using time as repeated factor and BMI as covariate: Significant results: * $p < 0.001$.

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*Preventive Cosopt™ Study

partially funded by the AANA Foundation Research Fellowship Grant

* 90 patients were enrolled
* Double-blinded, randomized study where vial A or vial B* was administered following baseline IOP measurement.

***Balanced Salt Solution vs. Cosopt™**

* Research assistant is blinded as to which is being administered.
* Procedures are the same thereafter.

*Indications

*Beneficial in high risk population where history of glaucoma, diabetes or vascular disease is noted

*Prolonged case duration in ST position or prone

Results of subjects:

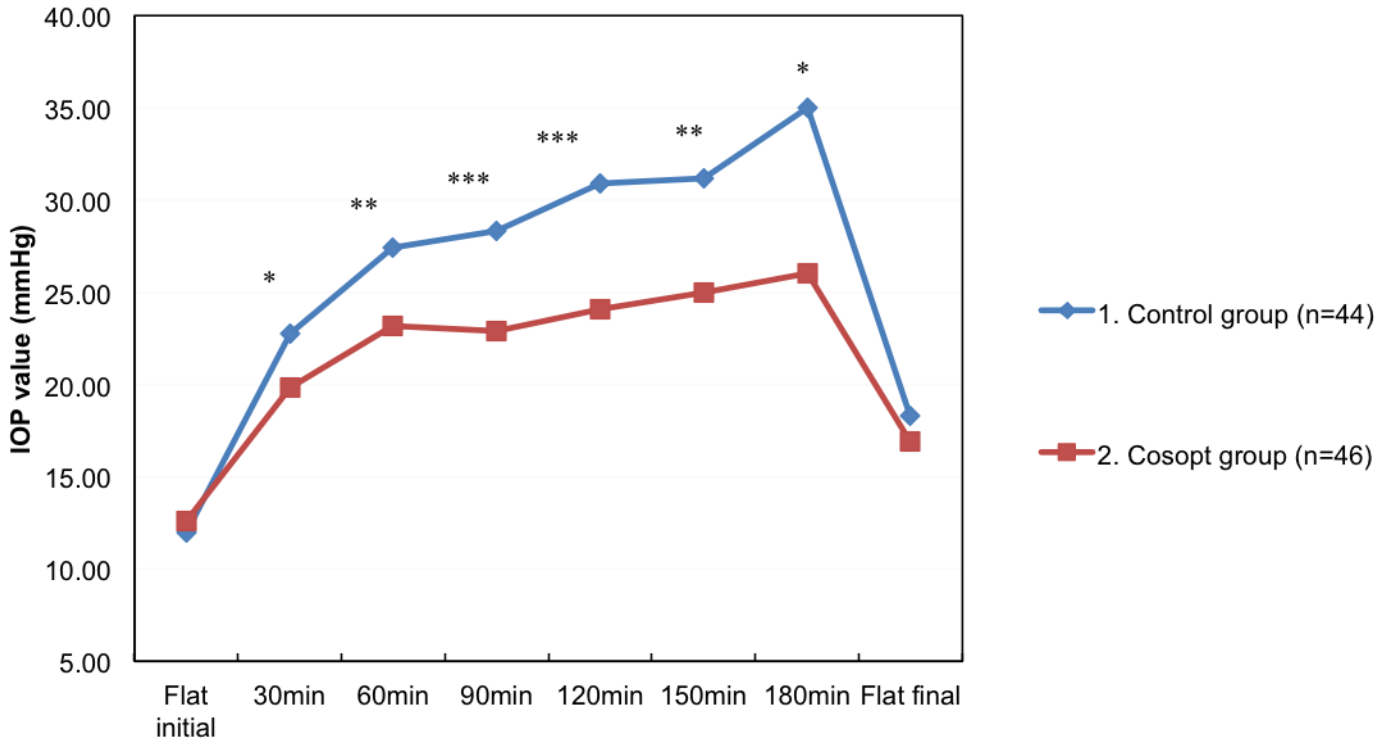
- 42 (47%) males and 48 females (53%) were recruited in the study. 46 patients received Cosopt™ treatment and 44 patients were in the control group. There were no statistical differences in baseline IOP levels between the Cosopt™ and control groups.

*Results

Throughout the surgery, patients' IOP levels were significantly lower in the Cosopt™ group than the control group

Time	Cosopt (mmHg)	Control (mmHg)	p value
IOP initial	12.61 ± 5.32	12.00 ± 4.05	< 0.05
30 min	19.83 ± 5.50	22.80 ± 5.51	< 0.05
60 min	23.15 ± 5.48	27.41 ± 6.47	< 0.01
90 min	22.89 ± 5.14	28.30 ± 6.08	< 0.001
120 min	24.11 ± 6.53	30.88 ± 7.48	< 0.001
150 min	25.00 ± 7.50	31.21 ± 7.76	< 0.01
180 min	26.06 ± 8.06	35.00 ± 8.80	< 0.05

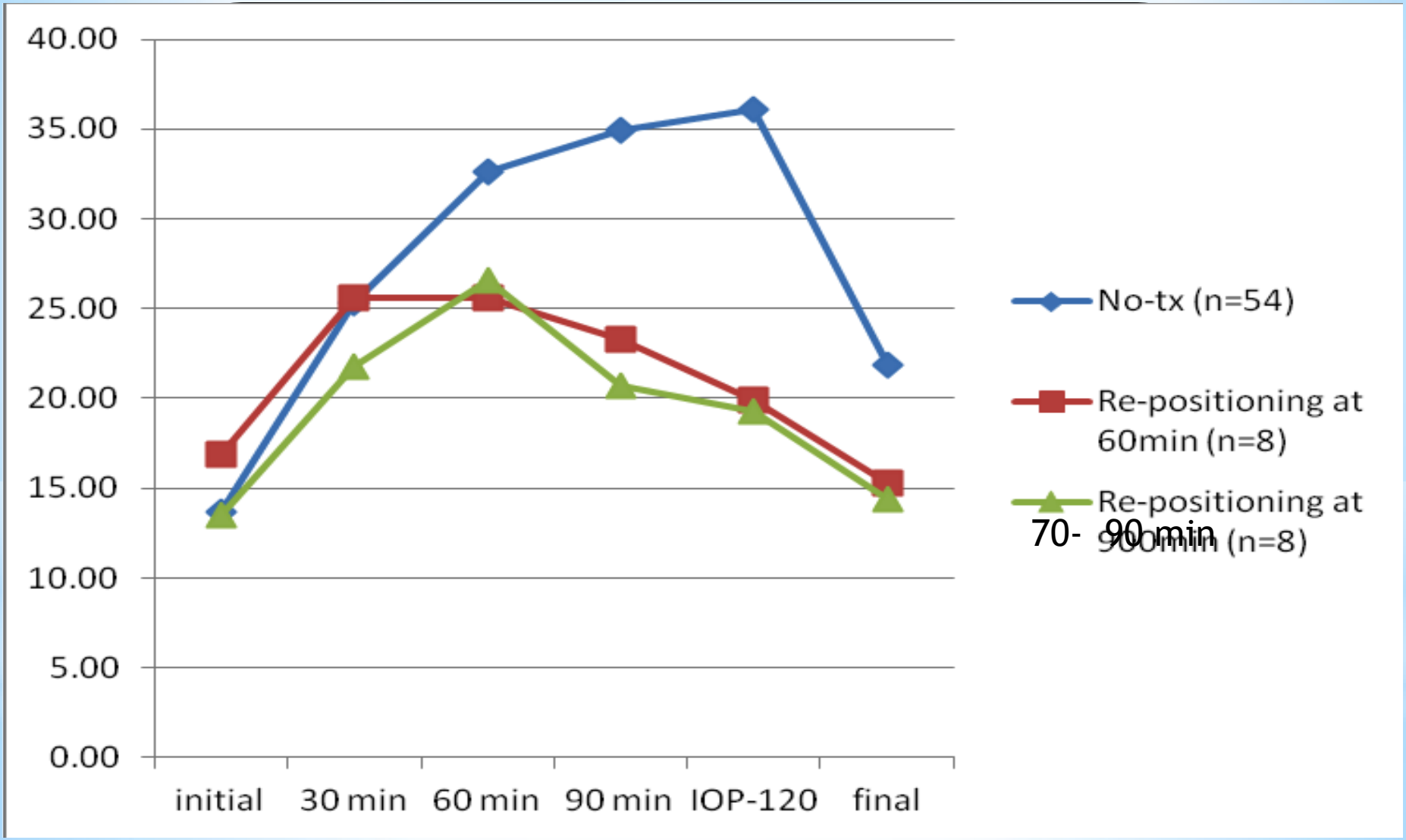
Preventive Cosopt Profile Plot



Conclusion: *Cosopt™ drops significantly reduce IOP of patients who undergo lengthy laparoscopic surgery in the ST position when given preventively before the surgery for a two-hour duration of time.*

* Cosopt Group: Visuals Eyelid Edema & absence of chemosis 2.5hrs

A Comparative Assessment of IOP during Prolonged Laparoscopy in ST Position vs. Supine Position Intervention Group



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*Bridgeport Hospital Recommended Protocol

- *Preventive Cosopt™ for high risk population & Intervention at time point when IOP reaches 40 mmHg (or Billowing chemosis is present)
- *Four hour “Time Out” where Anesthesia discusses intended completion of procedure.
- * Cosopt™ may be repeated one additional time during procedure if chemosis effect is strong.
- *If extended surgery time needed a supine rest stop for 10 minutes is introduced. Undocking of robot and redocking occurs at 4 hour time frame

QUESTIONS ??