

# Prevalence of Steroid Induced Ocular Hypertension Following Refractive Vision Correction for Myopic Astigmatism

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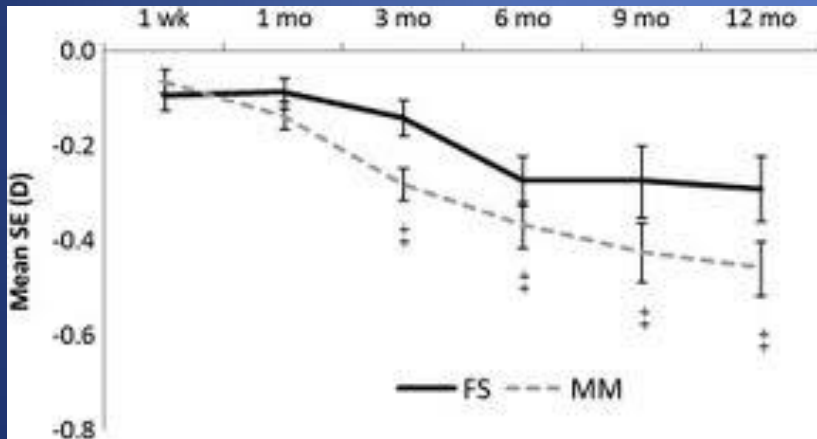
Rapidly Resolved with Topical Steroids

Inhibition of Myopic Regression

Tengroth et al. Excimer laser PRK for myopia; clinical results in sighted eyes. *Ophthalmology* 1993;100:739-45.

Nagy et al. Treatment of Intraocular Pressure Elevation after PRK. *2001;27:1018-24. J cataract Refract Surg*

## Corneal Haze



## Myopic Regression



American Academy of Ophthalmology. Excimer Laser PRK for myopia and astigmatism. *Ophthalmology* 1999;106:422-37

- **Elevated IOP Persists as long as Steroids are Continued**
- **Autosomal Dominant Trait found in Approx 33% of the Population**
- **Approx 98% Return to Baseline Levels after Withdrawal within 10 – 21 Days**
- **Risks Include**
  - POAG
  - Type 1 Diabetes Mellitus
  - Severe Myopia

Vertrugno et al. A randomized, comparative open label study on the efficacy of latanoprost and timolol in steroid induced ocular hypertension after PRK. Eur J Ophthalmol 2000;10:205-11

Munja et al. Steroid Induced Glaucoma. Indian J Ophthalmol 1982;30:379-82

Havener et al. Corticosteroid Therapy in ocular pharmacology 4 th Ed. USA: Mosby;1978:347-4.5.

# METHODS

**-Retrospective Chart Review** From the Practice of **Eyereum** EyeClinic

**-July, 2011 - Feb, 2013** (19 Months)

Vision Correction was Performed on **12,164 eyes / 6087 Patients 2 Surgeons**

**-Femto LASIK** : IntraLase, AMO, USA (Ifs, Plus)

**-PRK** : Allegretto Eye Q 400, Wavelight, Alcon, USA  
Amaris 750 S, Schwind, Germany

**-Phakic IOL** Implantations : ICL, Starr Surgical,Switzerland  
Veriflex, AMO,USA.  
Artiflex, Ophtec, Netherlands.  
Toric Artiflex, Ophtec, Netherlands.  
Artisan, Ophtec, Netherlands.

were Performed

# IOP And CCT Measurements

## Pre-operative Assessments

Goldman Applanation Tonometry,  
Heidelberg, Germany.

VISANTE OCT, CARL ZEISS, USA  
A Scan Pachymetry, NIDEK, JAPAN

## Post-operative Assessments

Non Contact Tonometry, NIDEK, Japan



Suspicion of IOP Rise



### Corrected IOP

0.5 mmHg Decrease for every 10 Micron  
CCT Change

**Ocular Hypertension** was Defined  
as Rise in Corrected IOP > **20%** Baseline

### Post OP CCT

VISANTE OCT, CARL ZEISS, USA on all Eyes

A Scan Pachymetry, NIDEK, JAPAN  
on suspicious eyes

Ehlers et al Applanation Tonometry and Central corneal thickness Acta Ophthalmol 1975;53:34-43.

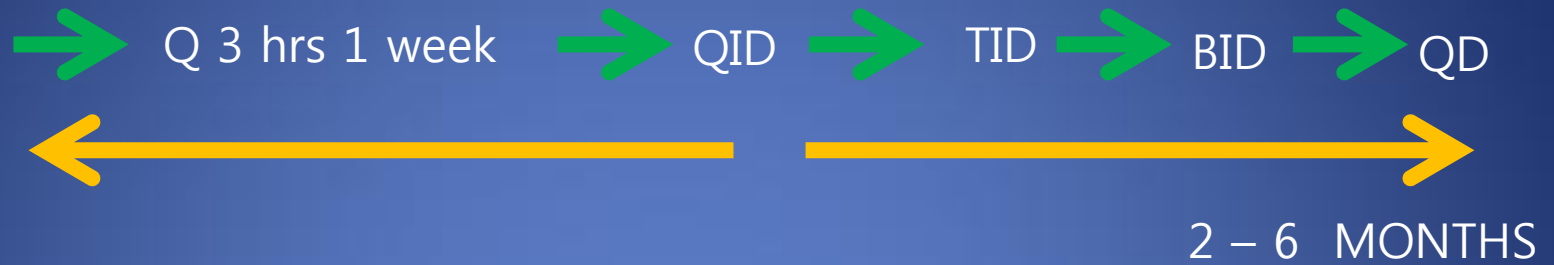
Johnson et al Increased corneal thickness simulating elevated intraocular pressure. Arch Ophthalmol 1978;96:664-5.

Shimzu et al Photorefractive keratectomy for myopia: one year follow up in 97 eyes. Rfract Corneal Surg 1994;10(Suppl):S178-87.

# PRK

T Lens Removal on 4th Day

Fluorometholone 0.1%, Q 2HRS 1 week



# Femto LASIK

Fluorometholone 0.1%, Q 2HRS 2 Days



# Phakic IOL

Vexol, Alcon, USA Q 2Hrs 2 Days



# Baseline Demographics

	Non Responder	Responder	P Value
No. of Eyes (n=12,164)	11,485	679	<b>&lt;0.01</b>
Age	26.43 ± 4.79	27.88 ± 4.91	.71
Range	18 - 45	18 - 44	
Sex (%)	54	46	.64
Sphere	-4.98 ± 2.40	-9.12 ± 2.12	<b>&lt;0.05</b>
Range	-1.25 - -13.75	-0.75 - -19.2	
Cylinder	-1.03 ± 0.65	-1.66 ± 0.78	.73
Sim K1	43.01 ± 1.74	42.87 ± 1.80	.82
Sim K2	44.21 ± 1.50	44.19 ± 1.76	.86
CCT	542.67 ± 29	541.76 ± 32	.74

Means ± SD

CCT = Central Corneal Thickness, Sim k1/2 = Simulated Keratometry ½,

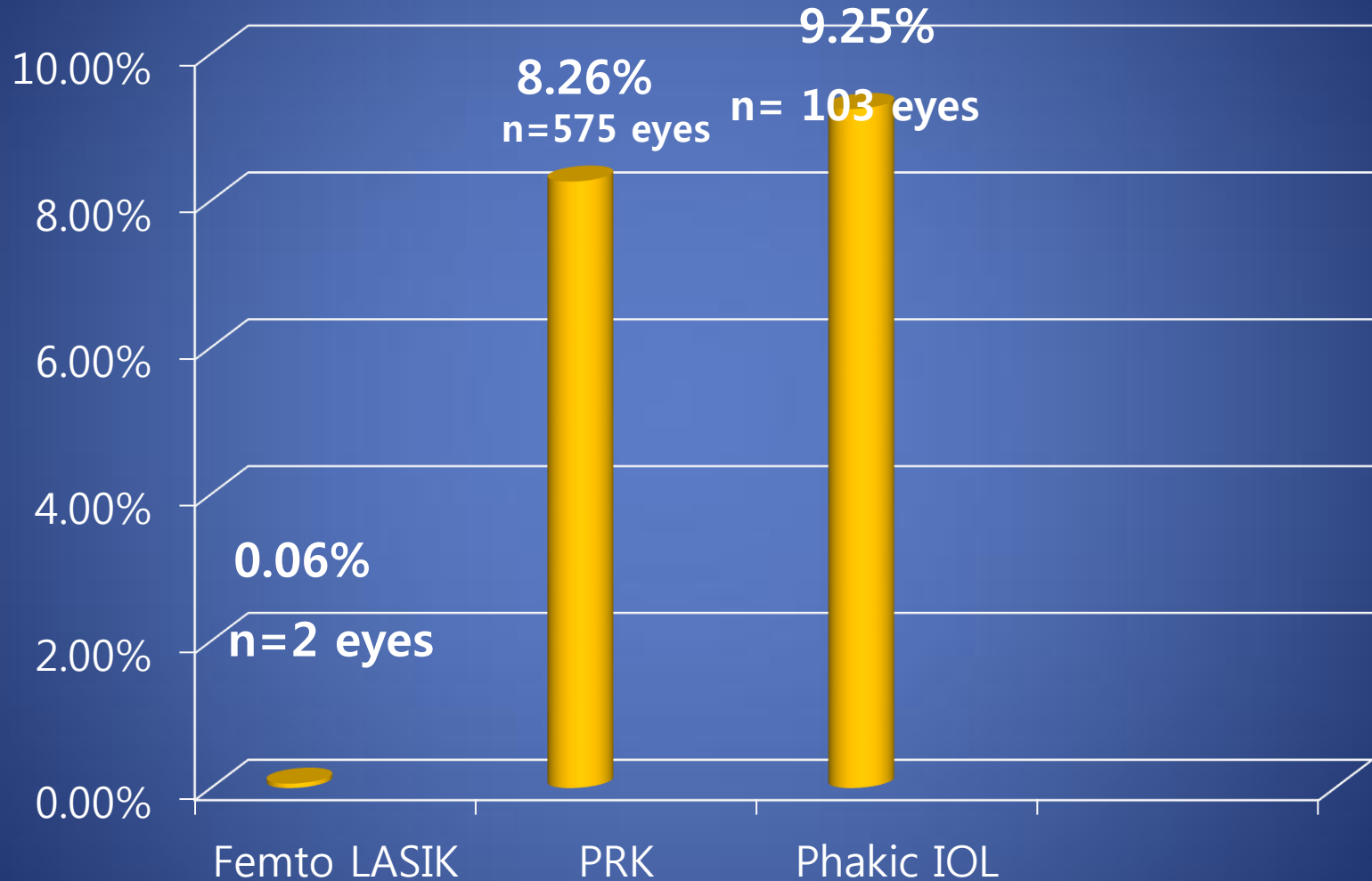
	Non Responder	Responder	P Value
<b>PRK</b>			
<b>No. of Eyes (n=7533)</b>	6958	575 (8.26%)	<b>&lt;0.01</b>
<b>Age</b>	26.25 ± 4.73	26.87 ± 4.97	.83
<b>Range</b>	18 - 40	18 - 44	
<b>Sex (%) (M:F)</b>	55.9 : 44.1	55:45	
<b>Sphere</b>	-4.40 ± 3.40	-4.88 ± 2.12	.62
<b>Range</b>	-1.25 - -9.75	-0.75 - -9.42	
<b>Cylinder</b>	-1.05 ± 0.44	-1.09 ± 0.48	.73
<b>CCT</b>	545.67 ± 29	537.76 ± 32	.74
<b>Phakic IOL</b>			
<b>No. of Eyes (n=1117)</b>	1010	103 (9.2%)	<b>&lt;0.01</b>
<b>Age</b>	27.72 ± 5.11	27.88 ± 5.69	.74
<b>Range</b>	18 - 38	18 - 44	
<b>Sex (%) (M:F)</b>	<b>24.5 : 75.5*</b>	44.2 : 55.8	<b>*&lt;0.01</b>
<b>Sphere</b>	8.06 ± 4.12	9.12 ± 5.40	<b>&lt;0.05</b>
<b>Range</b>	-1.50 - -13.75	-1.50 - -19.2	
<b>Cylinder</b>	1.33 ± 0.73	1.66 ± 1.03	.72
<b>CCT</b>	521.30 ± 39	522.44 ± 36	.98

Means ± SD

CCT = Central Corneal Thickness, Sim k1/2 = Simulated Keratometry ½,

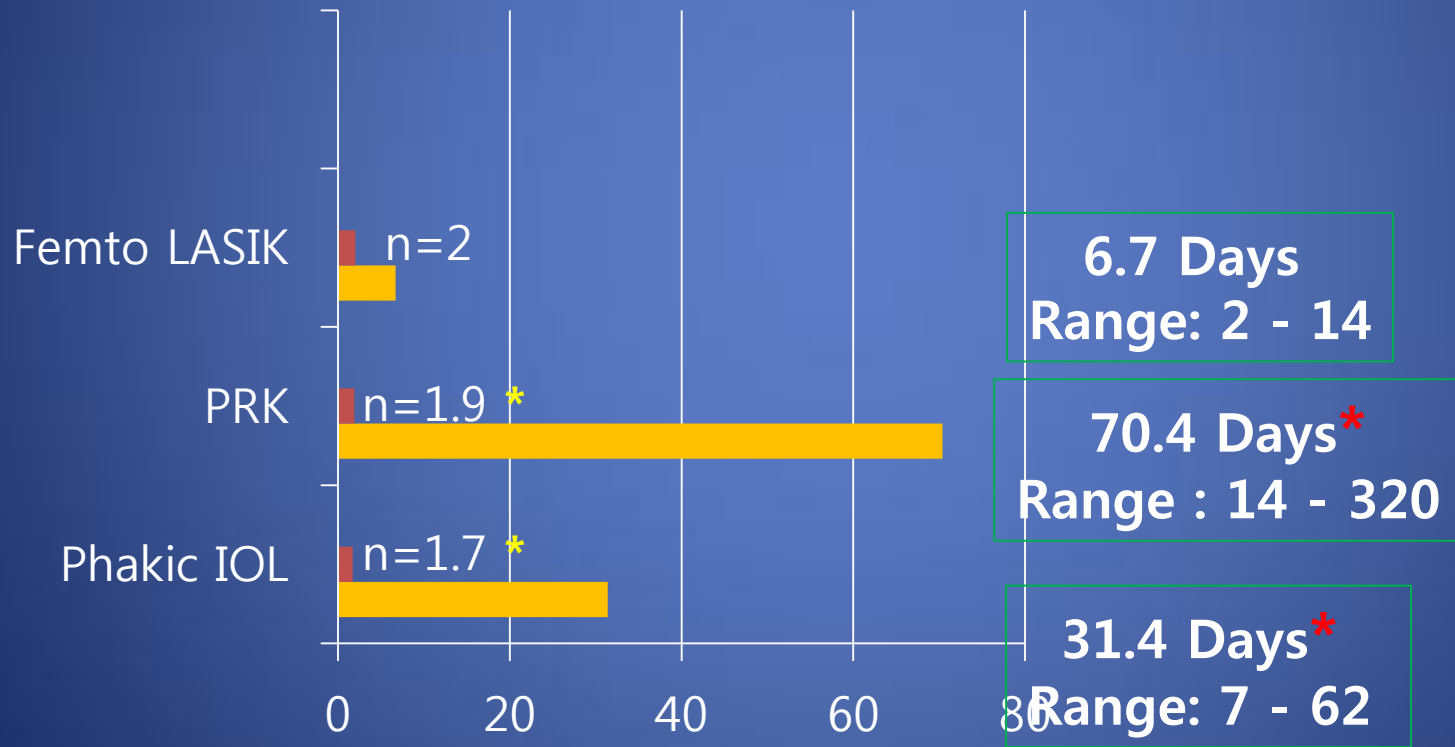


# RESULTS



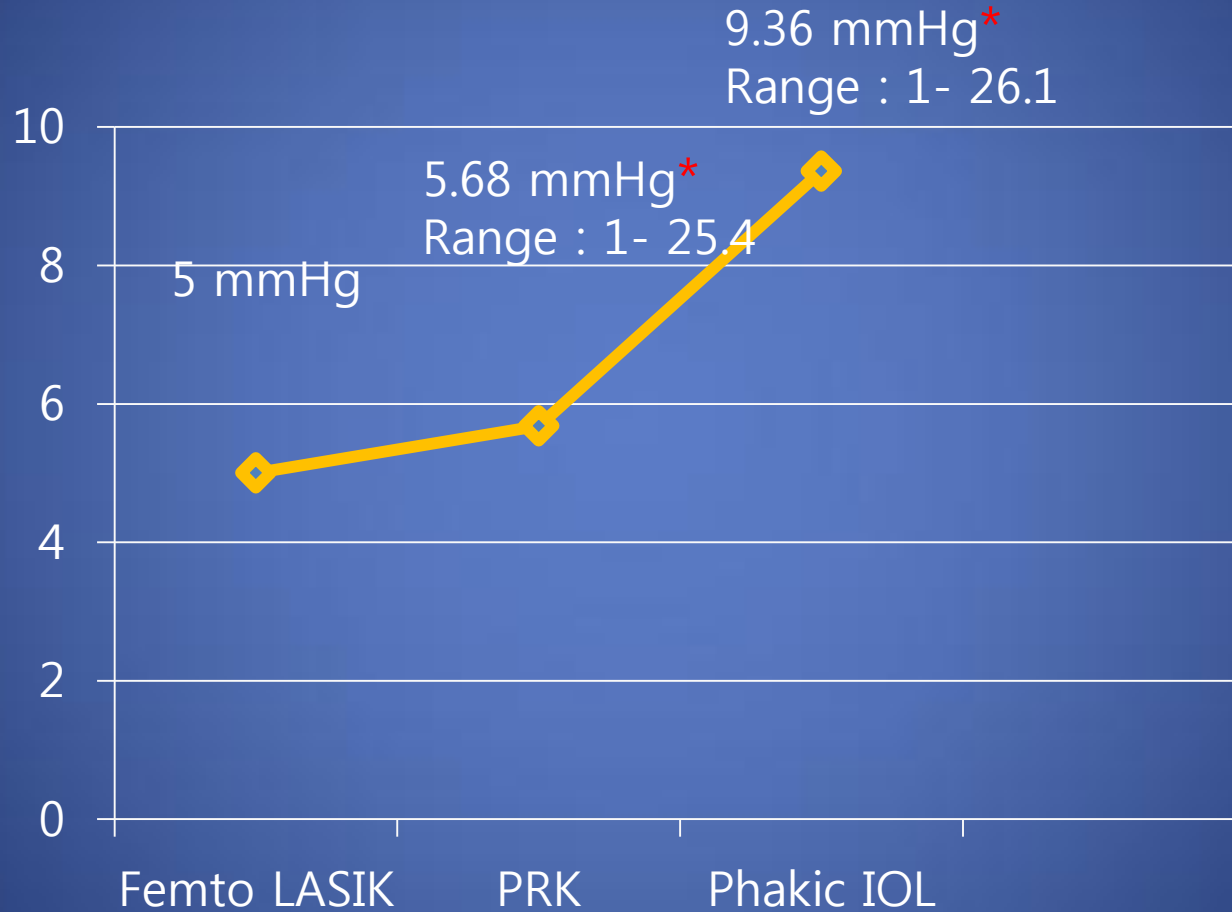
Number of Steroid Responders for Each Surgical Group

# Duration and Number of Medications Required for IOP Control



\* P < 0.05

# RESULTS



**Average IOP Rise in steroid Responders for each Surgical Group**

\* P < 0.05

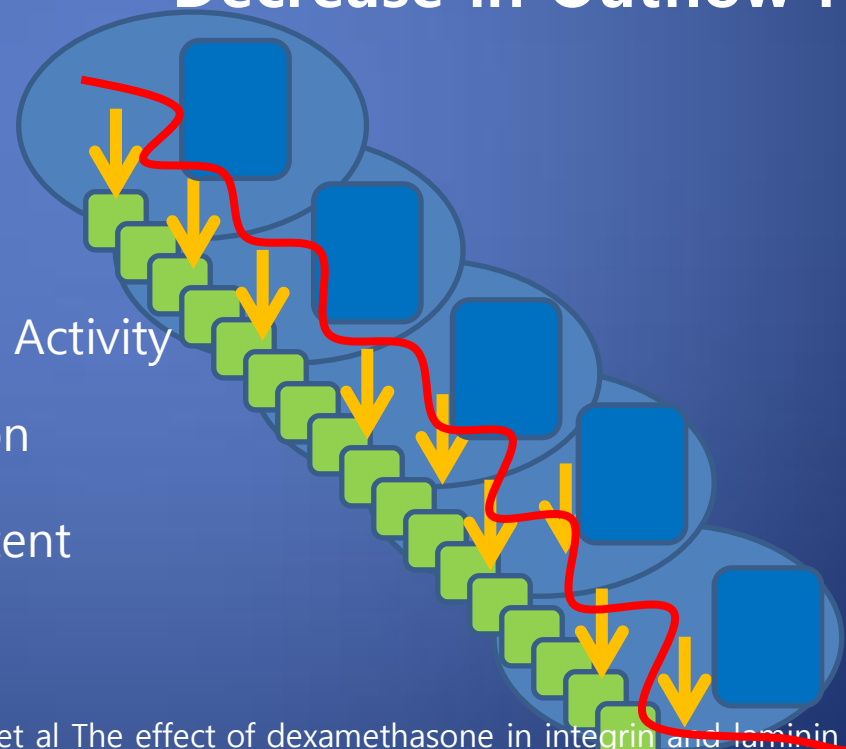
# Discussion

Histologic Studies of Human TM Cells from eyes with Steroid Induced Glaucoma

Experimental Studies on Organ Cultured TM Cells

Ishibashi et al c DNA Microarray analysis of gene expression changes induced by dexamethasone in cultured Trabecular meshwork cells. *Inves Ophthalmol* 2002;43:3691-7.

## Decrease in Outflow Facility



Accumulation of ECM material

Decrease in Protease and Stromelysin Activity

Reorganization of the TM Cytoskeleton

Increased Nuclear size and DNA Content

Decreased Phagocytic Activity

Increased Myocillin Protein

Dickerson et al The effect of dexamethasone in integrin and laminin expression in cultured human trabecular meshwork cells *Eye Res* 1998;66:731-8

# Discussion

## PRK

Long Term Use of Weak Steroid

Fluorometholone Known for Potent

Anti inflammatory Action but

Weaker Intraocular Delivery

Least Amount of IOP Rise

But Longest Tx Duration

## Phakic IOL

Stronger Affinity Steroid

Higher Myopia

Thinner CCT

Highest Number of Responders

Highest Average IOP Rise

## FEMTO LASIK

Shortest Duration of Steroid Use

Initial IOP Rise During Flap Creation; 12 Seconds

Safest from Increased IOP ?

# Take Home Message

1. Steroid Induced Ocular Hypertension is prevalent after myopic vision correction
2. IOP measurements should be initiated no later than 1 week after surgery
3. Although, most cases of steroid induced ocular hypertension can be controlled with careful follow up and administration of anti hypertensive medications , there are a few minority that eventually require surgical intervention
4. Pre-operative Gonioscopic studies should be performed on all refractive candidates