

# Steroid-induced Ocular HyperTension: Higher Risk in Keratoconus Eyes

## A study of IntraOcular Pressure Changes following Lengthy Topical Corticosteroid Use in Normal vs. Keratoconic non-Glaucoma Patients

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### PURPOSE

To investigate steroid-related IntraOcular Pressure (IOP) sudden increase (spike) as a result of long-term postoperative topical corticosteroid use.

### METHODS

Five hundred sixteen (516) eyes of normal and keratoconic eyes were treated with topical dexamethasone 0.1%, following corneal laser photorefractive keratectomy (PRK) (group A), or Collagen Cross Linking (CXL) treatments (group B),

- Group-A (control): 120 eyes
- Group-B: 396 keratoconic eyes.

Exclusion criteria: IOP > 21 mmHg and family history of systemic or ophthalmic diseases

#### Data collected in the study

Pre-operative, 1 month, up to 12 months

- Age & Gender
- IOP (Applanation)
- Central Corneal Thickness (CCT), via Scheimpflug imaging

### What was Known

- A decreased tissue thickness such as in those with keratoconus and post refractive surgery patients is associated with a low intraocular pressure (IOP) due to decrease in corneal resistance.
- This poses a major concern for early glaucoma detection because the true pressure inside the eye is grossly underestimated especially as IOP has been identified as a strong predictor of glaucoma severity and progression.
- Thus, vital recognition of a true increase in IOP is imperative for early glaucoma detection and vision stabilization

### What this Work Adds

- Thin cornea and Male gender are the highest risk factors for IOP Spike

### RESULTS

After 3-4 week of topical corticosteroid treatment, a statistically significant incidence difference ( $p < 0.001$ ) of steroid induced ocular hypertension occurred in both groups.

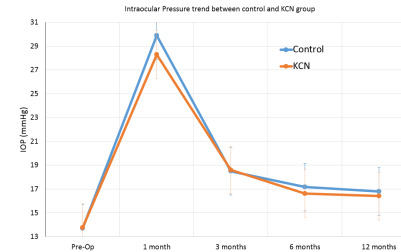
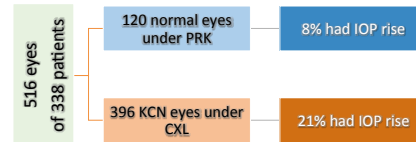
IOP rise over 25 mmHg at 4 weeks of topical dexamethasone treatment:

- Control group: **8% (9 out of 120)** of eyes had in comparison to the
- KCN group: **21% (84 out of 396)** of eyes [statistically significant difference,  $p < 0.001$ ]

None of the patients developed late onset IOP spike beyond 1 month in both groups. All cases returned to 'normal' IOP within 3 months (follow-up 1-5 years).

Risk factors identified were

- Male gender ( $p < 0.001$ ) and
- Post operative central corneal thickness < 400  $\mu\text{m}$  ( $p < 0.03$ ).



### DISCUSSION

Topical corticosteroid routinely prescribed after any corneal procedure such as collagen cross linking (CXL) for keratoconus and laser refractive surgery such as PRK may increase IOP in steroid responders or among patients already diagnosed with glaucoma.

Studies have shown that corticosteroid induces the production of the molecular myocillin gene which causes morphological changes in the trabecular meshwork impeding aqueous flow.

On the other hand, it has been postulated that high IOP after CXL may be due to an increase in corneal resistance from all the collagen linkage made after the procedure. However, it is still unclear if this increased merely makes the eye more susceptible to a corticosteroid induced high IOP, and not cause the increased IOP itself.

Preoperative Baseline Characteristics by Treatment Group			
Parameters	KCN group	Control group	P value
Number of operated eyes (n)	396	120	
Age (Years)	31.30 ± 11.09	34.78 ± 11.79	0.04
Gender (Female : Male)	103 : 167	37 : 28	
Intraocular pressure (mmHg)	13.94 ± 2.77	13.79 ± 2.39	0.58

Incidence of Ocular Hypertension by treatment group					
	IOP Spike	Incidence	Risk Ratio	Odds Ratio	P value
KCN group	84 out of 312	21%			
			2.82	3.32	<0.00
Control group	9 out of 111	8%			

Association of 1 month IOP spike with Age, Gender, and CCT			
Parameters	Odds Ratio	95% Confidence Interval	P value
Male	22.33	7.91-89.78	0.00
Female	3.51	0.73-16.7	0.16
Age below 50	2.95	0.69-14.69	0.30
Age above 50	0.71	0.06-8.70	0.99
CCT below 400 $\mu\text{m}$	0.49	0.27-0.91	0.03
CCT above 400 $\mu\text{m}$	0	0.0-1.11	0.12

### CONCLUSIONS

- This study demonstrates a potentially significant pre-disposition for KCN eyes to develop steroid-induced glaucoma after cross linking procedure.
- Male gender and CCT less than 400  $\mu\text{m}$  were risk factors observed.
- The IOP lowered or returned to normal after discontinuing topical dexamethasone treatment.



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