POST-TRAUMATIC GLAUCOMA

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Conflict of Interest Disclosure

I have no potential conflict of interest to disclose

31 year old Male

- **Right Eye**
  - Reduced vision
  - Occasional discomfort/dull ache
- **Examination:**
  - Vision : 6/24
  - Van Herick 2 corneal thickness
  - Angle recession 280deg
  - Normal lens
  - IOP 38mmHg
- Does not recall any trauma, but mother confirms injury while playing sports at 10 years of age. Treated with eye drops.

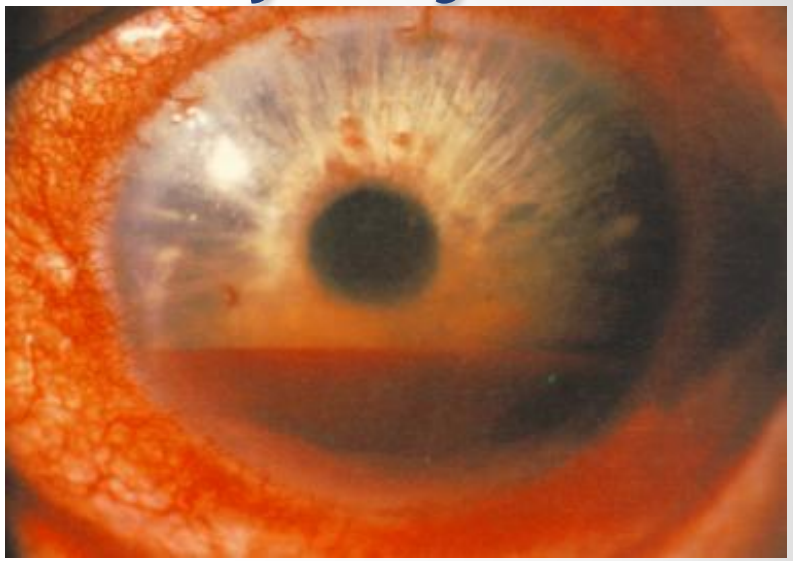
Glaucoma after closed globe injury

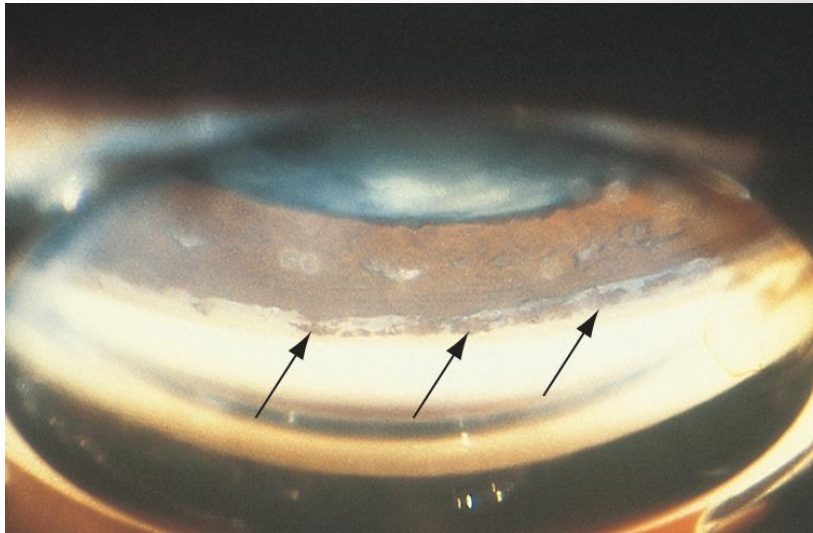
- May go unnoticed and are diagnosed many years later as having irreversible glaucomatous optic nerve damage.
- Two peak incidences of glaucoma after trauma have been reported, less then 1 year and at least 10 years after trauma.[1]
- A 3.4% incidence of glaucoma after ocular contusion has been reported during a 6-month follow-up[2] and up to 10% during the 10 years after trauma.[3]
- Glaucoma has a reported incidence of 2.7% after penetrating ocular trauma

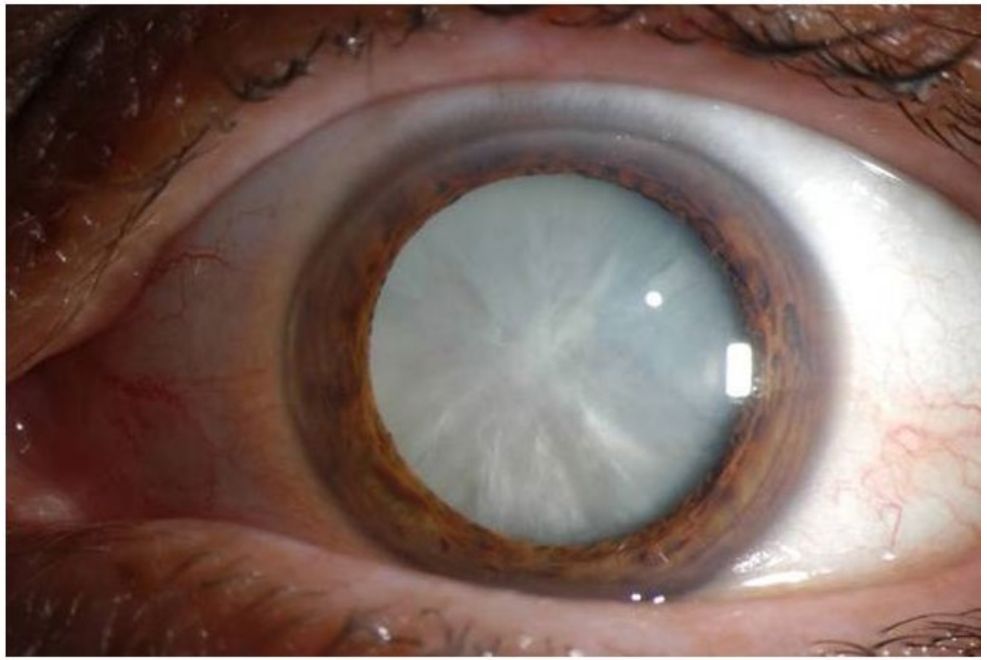
- 1.Blanton FM Anterior angle recession and secondary glaucoma: a study of the aftereffects of traumatic hyphemas. *Arch Ophthalmol* 1964;7239-44ArticlePubMedGoogle ScholarCrossref
- **2.**Girkin CA McGwin G JrLong CMorris RKuhn F Glaucoma after ocular contusion: a cohort study of the United States eye injury registry. *J Glaucoma* 2005;14 (6) 470-473PubMedGoogle ScholarCrossref
- **3.**Kaufman JHTolpin DW Glaucoma after traumatic angle recession: a ten-year prospective study. *Am J Ophthalmol* 1974;78 (4) 648- 654PubMedGoogle Scholar
- 4. Girkin CA, McGwin G Jr, Morris R, Kuhn F. Glaucoma following penetrating ocular trauma: a cohort study of the United States Eye Injury Registry. *Am J Ophthalmol*. 2005;139(1):100-105.

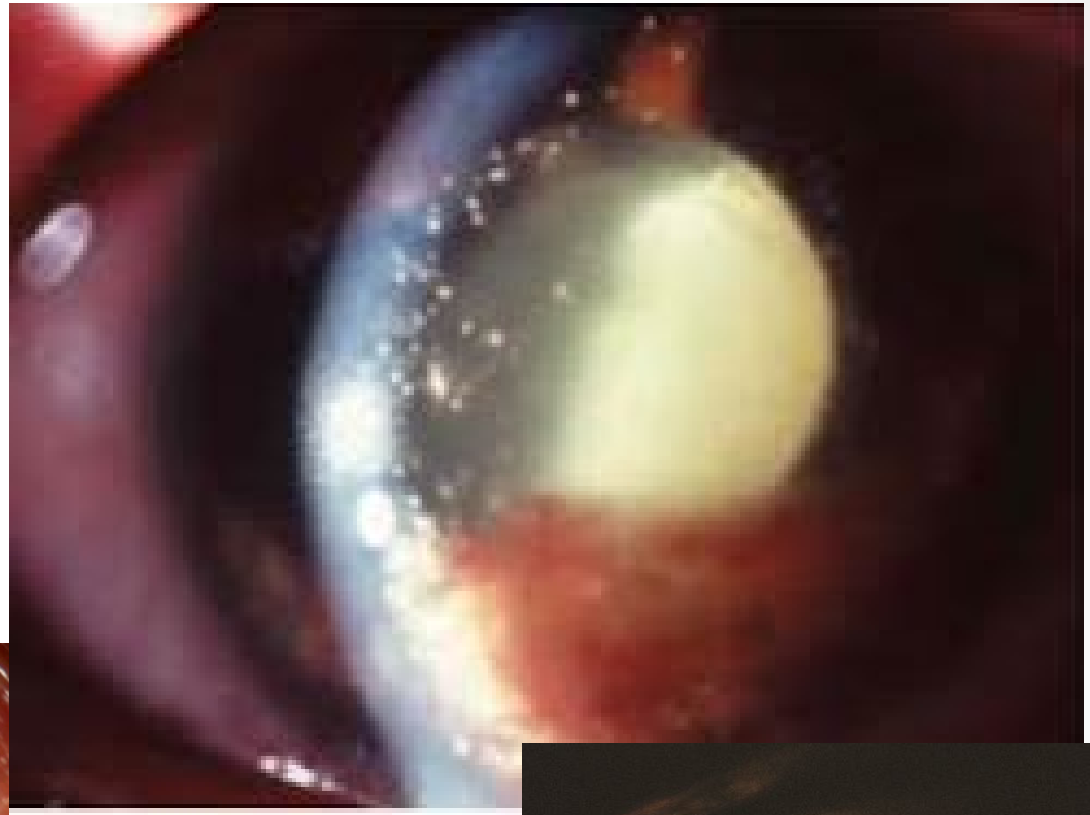
Glaucoma: Closed globe injury

- Red cell Glaucoma (hyphaema)
- Angle Recession Glaucoma
- *Lens related glaucoma*
- *Ghost cell glaucoma*
- *Schwartz-Matsou syndrome*







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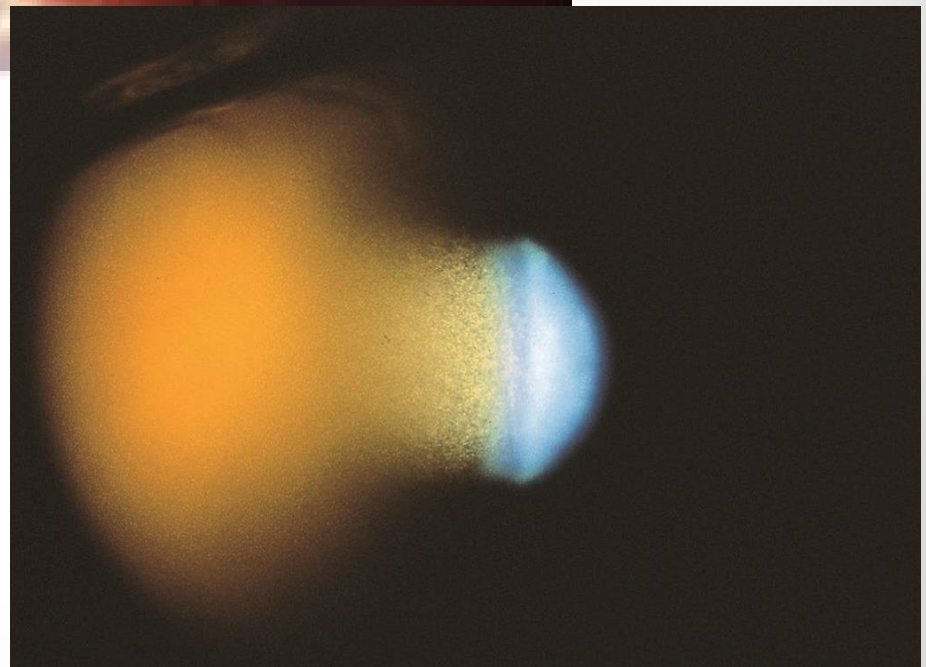


From: **Early Predictors of Traumatic Glaucoma After Closed Globe Injury: Trabecular Pigmentation, Widened Angle Recess, and Higher Baseline Intraocular Pressure**

Ramanjit Sihota, MD, FRCS; Sunil Kumar, MD; Viney Gupta, MD; et al

Arch Ophthalmol. 2008;126(7):921-926

Table 1. Demographic Data of 92 Patients With Closed Globe Injury

Characteristic	Closed Globe Injury Without Glaucoma (n = 52)	Traumatic Glaucoma (n = 40)	*P* Value
Age, mean (SD), y	22.4 (11.0)	19.4 (9.5)	.74
Sex, No. M:F	49:3	37:3	.90
Trauma to presentation interval, mean (SD), d	10.8 (15.1)	9.5 (5.9)	.59
Type of trauma, No. (%)			
Cricket ball	23 (44)	17 (43)	.77
Firecracker	9 (17)	8 (20)	.90
Wooden stick	10 (19)	7 (18)	.85
Other	10 (19)	8 (20)	.88

Table 2. Anterior and Posterior Segment Findings in Eyes With Closed Globe Injury With and Without Chronic Glaucoma

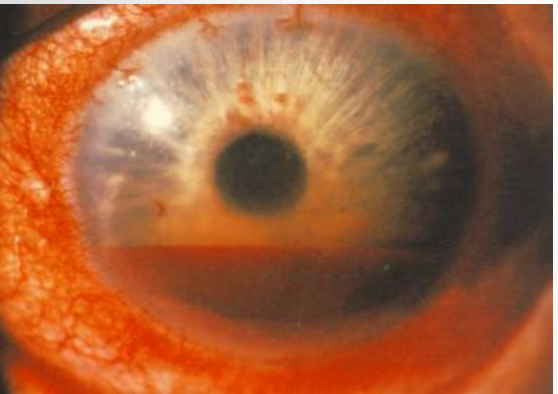
	Closed Globe Injury (n=52)	Traumatic Glaucoma (n=40)	*P* Value
Visual acuity <6/60 at initial examination, No (%)	12 (23)	25 (63)	.001
Mean (SD) baseline IOP, mm Hg	17.3 (5.0)	35.2 (12.8)	.001
Anterior segment features			
Hyphema	22 (42)	37 (93)	.001
Sphincteric tears	18 (35)	17 (43)	.44
Iridodialysis	4 (8)	6 (15)	.43
Trabecular pigmentation grade ≥3	7 (13)	36 (90)	<.001
Angle recession >180°	6 (12)	14 (35)	.005
Angle recession of 360°	1 (2)	9 (23)	.03
Cyclodialysis on UBM	18 (35)	7 (18)	.001
Lenticular features			
Cataract	7 (13)	10 (25)	.15
Phacodonesis	8 (15)	14 (35)	.03
Posterior segment features			
Macular edema	11 (21)	12 (30)	.33
Choroidal rupture	4 (8)	5 (13)	.67
Retinal dialysis	6 (12)	8 (20)	.26
Vitreous hemorrhage	5 (10)	7 (18)	.49
Macular hole	1 (2)	2 (5)	.41

Abbreviations: IOP, intraocular pressure; UBM, ultrasonographic biomicroscopy.

[a] Unless otherwise indicated, data are expressed as number (percentage) of eyes.

Hyphaema

- Grade 1 - Layered blood occupying less than one third of the anterior chamber (58%)
- Grade 2 - Layered blood filling one third to one half of the anterior chamber (20%)
- Grade 3 - Layered blood filling one half to less than the total of the anterior chamber (14%)
- Grade 4 - Total clotted blood, often referred to as blackball or 8-ball hyphema (8%) .



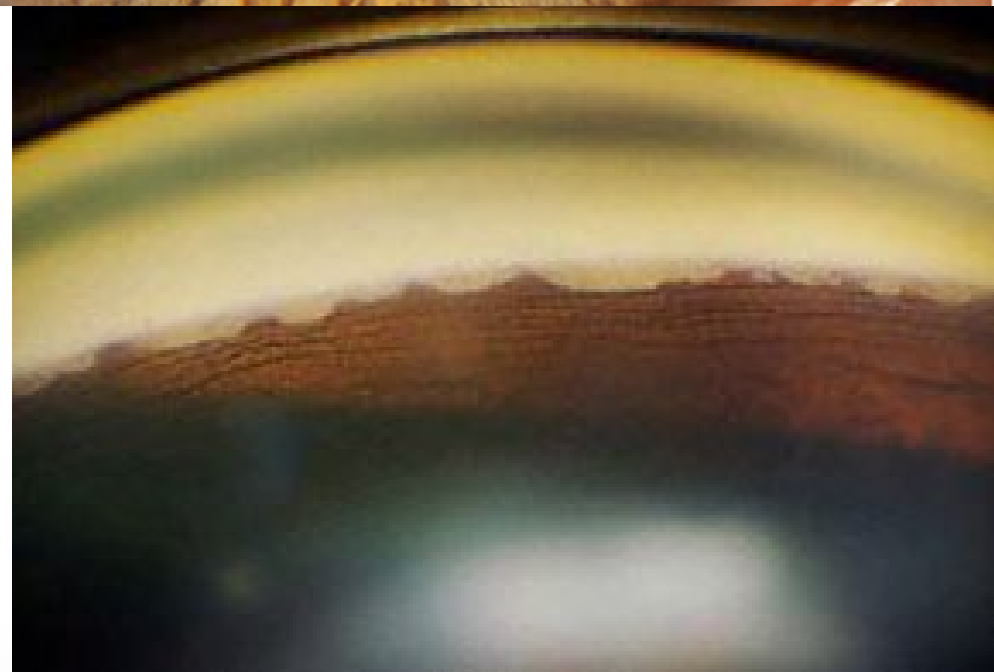
Hyphaema

- The early period of elevated IOP is due to trabecular plugging by erythrocytes and fibrin.
- Elevated IOPs (>22 mm Hg) in approximately 32% of all patients with hyphemas
- Secondary hemorrhage (day3-4) occurs in approximately 25% (range, 7-38%) .
- The secondary bleeding may result in increased intraocular pressure and corneal staining and is associated with a poorer visual prognosis.

Complications of hyphaema

- **Posterior synechiae**: Secondary to iritis or iridocyclitis

- **Peripheral anterior synechiae**: Hyphema in the A/C for a prolonged period, typically 9 or more days.

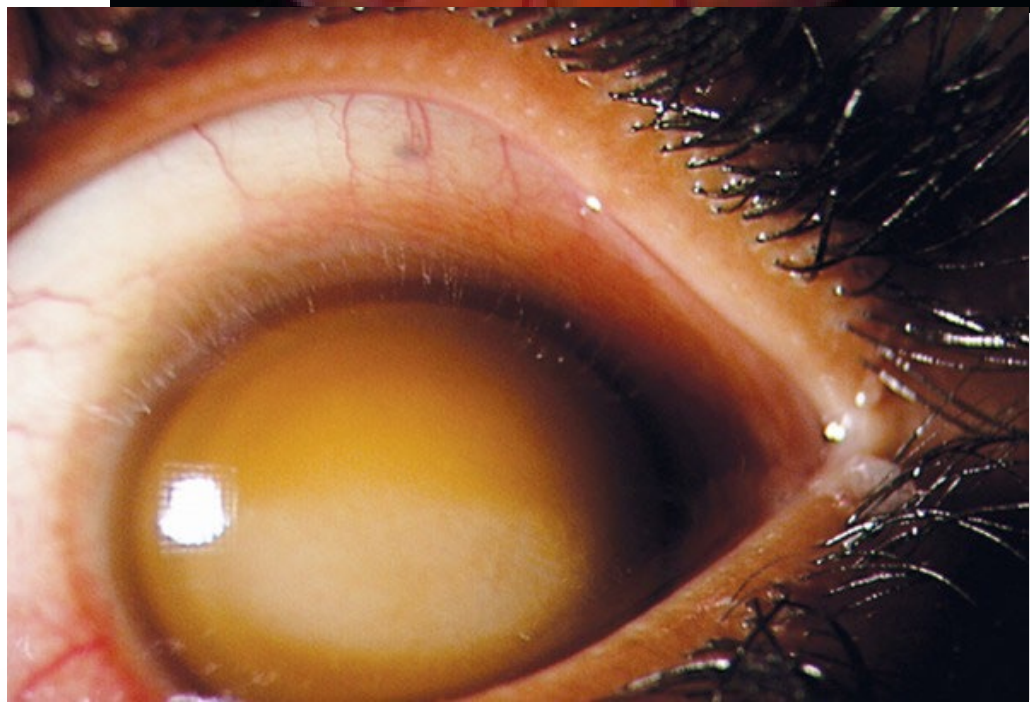


Both cases leading to increased IOPs

Complications of hyphaema

- **Diffuse optic pallor (non-glaucomatous):**
- Transient periods of markedly elevated intraocular pressure.
  - o Constant pressure of 50 mm Hg or higher for 5 days or 35 mm Hg or higher for 7 days.

- **Corneal bloodstaining :**
  - o Total hyphema for 6 days with continuous IOPs of greater than 25 mm Hg.



Treatment-Hyphaema

- Pain**: Paracetatmol** Avoid aspirin and NSAIDS
- **Patch or shield** to protect the eye.
- **Elevating the head** of the bed 30-45° when sleeping or resting
- Topical medications (cycloplegics, corticosteroids)
- **Antiglaucoma** medication
- **Antifibronolytics** (**aminocaproic acid**[5] given systemically/topically, **Tranexamic acid**) for < Grade 3 decrease the incidence of secondary hemorrhage
- **Intracameral topical tissue plasminogen activator (t-PA):** Associated risk of rebleeding of the initial wound.

5. Kutner B, Fourman S, Brein K, et al. Aminocaproic acid reduces the risk of secondary hemorrhage in patients with traumatic hyphema. *Arch Ophthalmol*. 1987 Feb. 105(2):206-8.

Surgery

- **4 days** since onset of total hyphema and the hyphema has not cleared
- Microscopic **corneal bloodstaining** (at any time)
- **Total hyphema** with intraocular pressures of **50 mm Hg or more for 4 days** (to prevent optic atrophy)
- Total hyphemas or hyphemas filling greater than 75% of the anterior chamber present for **6 days with pressures of 25 mm Hg or more**
- Hyphemas filling **greater than 50%** of the anterior chamber retained longer than 8-9 days
- In patients with **sickle cell trait or sickle cell disease** who have hyphemas of any size that are associated with intraocular pressures of greater than 35 mm Hg for more than 24 hours

ANGLE RECESSION GLAUCOMA (ARG)

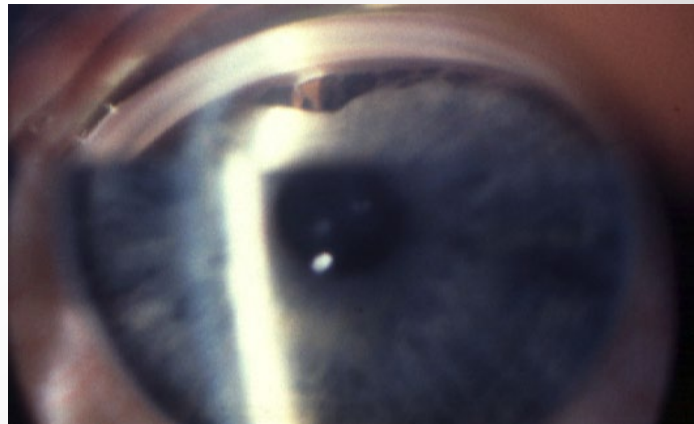
- Can develop within months or even years later (>50 years)

o Up to **60% of eyes** with non-penetrating or concussive trauma will develop some degree of angle recession

o Angle recession is also strongly associated with traumatic hyphema with studies reporting a **60-100%** incidence

o **3.39%** of people go on to develop ARG at 6 months following blunt ocular trauma[6]

o A 10 year prospective study of 31 eyes by Kaufmin and Tolpin reported that 6% with angle recession will go on to develop glaucoma.



6. Girkin CA, McGwin G Jr, Long C, Morris R, Kuhn F. Glaucoma after ocular contusion: a cohort study of the United States Eye Injury Registry. J Glaucoma. 2005 Dec. 14(6):470-3.

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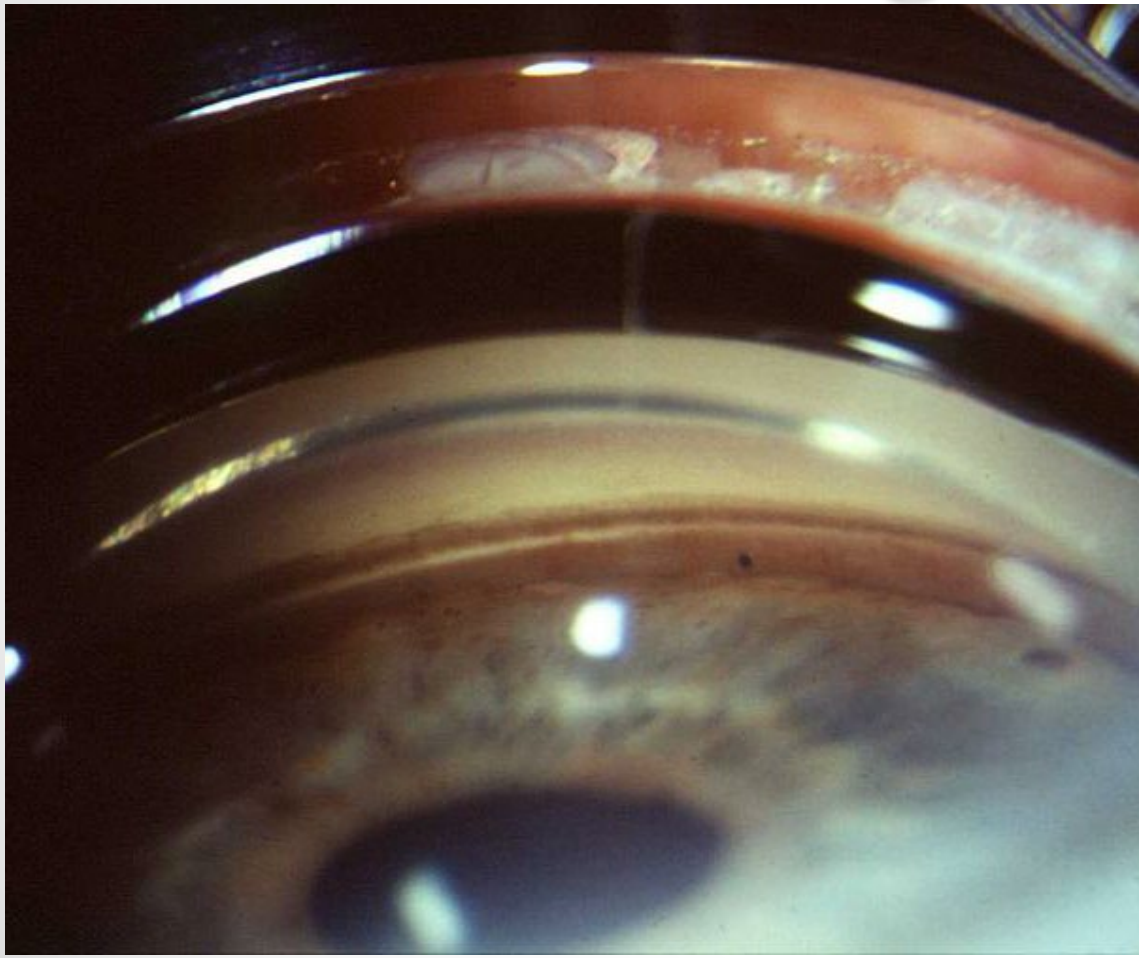
Authors have reported varying amounts ranging from **180 to 240 degrees** as "at high risk," but most studies confirm that **greater than 180 degrees** of recession makes glaucoma more likely

Angle recession



- Blunt trauma forces cause a tear between the longitudinal and circular muscles of the ciliary body with damage to the the ciliary arteries leading to a hyphema.

- Damage to TM and Schlemm's canal leading to an early IOP spike. Long term scarring and fibrosis of the TM/Schlemm's canal can lead to elevated pressure

Treatment – Angle recession glaucoma

- **Medical therapy**
- Topical aqueous suppressants
- Avoid prostaglandin analogues in the acute phase of trauma because of their potential to be pro-inflammatory.
- Pilocarpine should be avoided as it has been reported to exacerbate angle recession
- **Surgical Therapy**
- Laser trabeculoplasty is ineffective
- Trab MMC successful in lowwering IOP, though high risk failure
- Glaucoma drainage devices
- Cyclodestructive procedures in poor visual potential

31 year old Male

- **Right Eye**
  - Reduced vision
  - Occasional discomfort/dull ache
- **Examination:**
  - Vision : 6/24
  - Van Herick 2 corneal thickness
  - Angle recession 280deg
  - Normal lens
  - IOP 38mmHg
- Does not recall any trauma, but mother confirms injury while playing sports at 10 years of age. Treated with eye drops.

SUMMARY

- Glaucoma after closed globe injury is a major concern as it may go undiagnosed for many years and eventually present as advanced glaucomatous neuropathy
- Early predictors of post-traumatic glaucoma include: Reduced VA, high IOPs, increased trabecular pigmentation, widened angle and phacodinesis
- Aggressive treatment of hypaema can reduce risk of post traumatic glaucoma
- Surgical management of Angle Recession can help to control IOPs if MT fails

THANK YOU!