LENS INDUCED GLAUCOMA

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DEPT OF OPHTHALMOLOGY
LENS INDUCED GLAUCOMA

• It is a form of secondary glaucoma where intraocular pressure is raised due to disorder in crystalline lens
• Most important cause of irreversible loss of vision, especially in the rural population
• More common in older age (>50yrs)
• More predominant in females
• Seen more in developing countries
Lens-Induced Glaucoma

SUBTYPES:
1) Phacomorphic glaucoma
2) Phacolytic glaucoma
3) Lens particle glaucoma
4) Phacotopic glaucoma
5) phacoanaphylaxis glaucoma
Lens induced secondary glaucoma

**Open angle**

* a) **Phacolytic Glaucoma**  
  Condition related to soluble lens proteins

* b) **Lens Particle Glaucoma**:  
  Condition related to lens particles

* c) **Phacoanaphylactic Glaucoma**  
  Antigen-lens protein and Antibody reaction

**Closed angle**

* a) **Phacomorphic Glaucoma**:  
  Conditions related to the size of the lens
  1) Intumescent cataract
  2) Traumatic cataract

* b) **Phacotopic Glaucoma**:  
  Condition related to the site of the lens
  1) Subluxated
  2) Dislocated
PHACOLYTIC GLAUCOMA

• Secondary open-angle glaucoma associated with a hypermature cataract
Phacolytic glaucoma

**Mechanism:**

Heavy Molecular Weight lens protein (HMW) released-microscopic defects in the capsule of immature/hypermature lens

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Cause direct obstruction of outflow pathways

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**Macrophages** attempt to remove this material

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Macrophages laden with phagocytosed HMW lens material- cause blockage at the angle of the anterior chamber (major culprit)

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Increase in IOP
Phacolytic glaucoma

(A) Lens protein-containing macrophages in the angle

(B) Lens protein-containing macrophages on the corneal endothelium
Phacolytic glaucoma

Clinical Picture:

Symptoms

• Acute ocular Pain
• History of slow vision loss for months or years prior to the acute onset of pain
• Inaccurate light perception due to the density of the cataract
Phacolytic glaucoma

Signs

- Lid edema
- Conjunctival hyperemia
- Corneal edema
- Anterior chamber contains:
  - Flare
  - Aqueous cells
- Lens particles may precipitate on the
  - corneal endothelium
- Pupil sluggishly reacting
- Mature, hypermature /even morgagnian
  - cataract
Phacolytic glaucoma

1. Hypermature cataract
2. Lens protein floating in the aqueous and endothelium
Phacolytic glaucoma

Soft white patches on the Capsule-aggregates of macrophages trying to seal the site of leakage
Phacolytic glaucoma

Differential Diagnosis:

- Acute Angle closure glaucoma
- Phacoanaphylactic glaucoma
- Lens particle glaucoma
Phacolytic glaucoma

On Investigation:

• Tonometry - IOP is raised (30-50 mmHg)
• Gonioscopy reveals open angles
Phacolytic glaucoma Management:

- **Principles of management**
  - Reduce IOP
  - Remove the cause: cataract extraction

- Phacolytic glaucoma should be handled as an emergency

- **Initial treatment** - acute lowering of IOP
  - Combination of topical and systemic IOP lowering agents
  - Hyperosmotic agents –
    - i.v. **mannitol** 20% 1 to 2g/ kg in 30 to 40 mins
  - Systemic Carbonic anhydrate inhibitors –
    - **Acetazolamide** 250-500mg  bd
Phacolytic glaucoma

• Topical beta-blockers -
  **Timolol maleate** 0.5% BD

Topical steroids –
• Eye drops prednisolone acetate 1%
  - reducing inflammation

• Cycloplegic drugs - eye drops homatropine 2% bd
Phacolytic glaucoma

• **Definitive treatment** - Cataract extraction

• **Combined surgery** (Trabeculectomy with cataract surgery)

**Indication**

• Duration of presentation is prolonged (more than 72 hours)
• Intraocular pressure not by controlled with medical therapy for more than 07 days
Phacomorphic Glaucoma [PMG]

- Acute secondary angle-closure glaucoma precipitated by an intumescent cataractous lens
- More common in smaller eyes (hyperopic)
- Predisposing factor- rapidly developing intumescent cataract and traumatic cataract
  - More often seen as compared to other lens induced glaucomas.
Phacomorphic glaucoma

Precipitating factors

- Intumescent cataractous lens

  antero-posterior thickness increased

  increased iridolenticular contact

- Ageing lens-zonules gets weakened

  Allows lens to move anterior

  increased iridolenticular contact
Phacomorphic glaucoma

Mechanism:

Swollen lens → Pupillary block

↓

Angle closure ← Iris bombê

↓

Outflow obstruction

↓

Raised IOP
Phacomorphic glaucoma

SYMPTOMS

• Acute ocular pain
• Blurred vision
• Colored halos around light
• Decreased vision before the acute episode because of cataract.
Phacomorphic glaucoma

**SIGNS:**

- Inaccurate light perception
- Reduced visual acuity
- Lid edema
- Chemosis
- Circumcorneal congestion
- Corneal edema
- Anterior chamber appears shallow both centrally and peripherally
- Presence of flare
Phacomorphic glaucoma

- Mid-dilated, sluggish, irregular pupil
- An intumescent cataractous lens
Phacomorphic glaucoma

**Investigation**

- On tonometry - Raised intraocular pressure (30-50 mmHg)
- On Gonioscopy – closed angles
- On ultrasonographic biomicroscopy - iris bombe and angle closure
Phacomorphic glaucoma

Management:

- **Principles of management**
  - Reduce IOP
  - Remove the cause: cataract extraction
  - **Medical treatment to lower IOP:**
  - Combination of topical and systemic IOP lowering agents
  - Hyperosmotic agents –
    - i.v. **mannitol** 20% 1 to 2g/ kg in 30 to 40 mins
  - Systemic Carbonic anhydrate inhibitors –
    - **Acetazolamide** 250-500mg bd
  - Topical beta-blockers –
    - **Timolol maleate** 0.5% bd
Phacomorphic glaucoma

SURGICAL:
• **Definitive treatment** - Cataract extraction
• **Combined surgery** (*Trabeculectomy with cataract surgery*)

**Indication**
• Duration of presentation is prolonged (more than 72 hours)
• Intraocular pressure not by controlled with medical therapy for more than 07 days
Lens Particle Glaucoma

- Secondary open angle glaucoma due to presence of fragments of lens material in the anterior chamber
  - Usually follows after:
    - Cataract extraction
    - Penetrating lens injury
    - Nd: YAG laser capsulotomy
**Lens Particle Glaucoma**

The mechanism involves:
- Breach in the lens capsule
- Dislocation of lens fragments
- Obstruction of trabecular meshwork
- Reduction of the outflow

- Patient often gives recent history of trauma or intraocular surgery, particularly cataract extraction
- Can also occur many years after cataract surgery
Lens Particle Glaucoma

**Clinical features**

- Present with monocular eye pain
- Redness
- Blurring of vision

Variable degree of inflammation:
  - Corneal edema
  - Keratic precipitates
  - Hypopyon
  - Often associated with posterior and anterior synechiae and inflammatory pupillary membranes
Lens Particle Glaucoma

Differential diagnosis

• Phacoanaphylaxis,
• Phacolytic glaucoma
• Uveitic conditions with associated open-angle glaucoma
Lens Particle Glaucoma

Management:

- **Principles of management**
  - Reduce IOP
  - Remove the cause-irrigation and aspiration of lens particles

- **Medical Therapy:**
  - Anti-glaucoma therapy
  - Topical steroid

- **Surgical:**
  - Anterior chamber wash-out: irrigation and aspiration of lens particles
Lens Particle Glaucoma

- IOP can elevate after Nd: YAG laser Posterior Capsulotomy
  - Acute “within hours”

Risk is greater in:

- Glaucoma patients
- Eyes without IOL
- More energy used
  - Measure IOP 1h post laser capsulotomy
  - Prophylactic anti-glaucoma therapy
Lens Particle Glaucoma Management:

- Medical Therapy
  - Anti-glaucoma therapy (avoid miotics)
  - Hyperosmotic agents
  - Topical steroids
  - Cycloplegics

- Surgical
  - Anterior chamber wash-out
Phacoanaphylaxis Glaucoma

• Fulminating acute inflammatory reaction
  (Antigen-lens protein and Antibody reaction)
• Rare entity
• Inflammatory reaction directed against own lenticular antigens
Phacoanaphylaxis Glaucoma

• Such cases are allergic in nature - the allergen being their own lens protein.
• Positive skin test - tested intradermally to lenticular protein
• Also called Endophthalmitis phacoanaphylactica
• Preceding disruption of the lens capsule similar to the lens particle glaucoma
• But there is usually a latent period of 24 hours to 14 days between the trauma and the onset of inflammation
Phacoanaphylaxis Glaucoma

**Mechanism:**

- The patient is sensitized to his own lens antigens
- These proteins are kept in an immunologically privileged site within the lens capsule
Phacoanaphylaxis Glaucoma

- After an eye surgery or other trauma to the lens capsule, lens antigens are exposed to the circulation.

  Recognized - ‘foreign’ by immune system

  Inflammatory response

  Arthus-type immune complex reaction mediated by IgG and the complement system

  Inflammation trabecular meshwork

  Obstruction to aqueous outflow
Phacoanaphylaxis Glaucoma

**Clinical Features**

- Lid edema
- Chemosis
- Conjunctival injection
- Corneal edema
- Mutton fat keratic precipitates
- Heavy anterior chamber reaction
- Posterior synechiae
Phacoanaphylaxis Glaucoma

• Development of phacoanaphylaxis – nucleus is retained in the vitreous.

• *Typical finding*
  
• chronic

• Granulomatous-type inflammation - center of lens material in the primarily involved eye or in the fellow eye
Phacoanaphylaxis Glaucoma
Differential diagnosis

• Phacolytic glaucoma
• Lens particle glaucoma
• Chronic forms of uveitis
Phacoanaphylaxis Glaucoma Treatment

Principle-
• Reduce IOP
• Treat the cause

➢ Initial measure –

Control the inflammation-

○ Inflammation is intense (cells > +3) -
  ✓ Oral steroids (prednisolone 1mg/kg once daily)

○ Inflammation is mild -
  ✓ Topical steroids (prednisolone acetate 1% hourly)
Raised IOP if present

• Requires antiglaucoma drugs
  ○ Cycloplegics

➤ Surgical- irrigation and aspiration of lens particles
PHACOTOPIC GLAUCOMA

- Secondary angle closure glaucoma occur due to the site of the lens
  1) Subluxated
  2) Dislocated
PHACOTOPIC GLAUCOMA

*Mechanism*

Dislocation/subluxation

↓

cause pupillary block

↓

result in angle-closure glaucoma

• Dislocated lens may directly encroach upon the angle
PHACOTOPIC GLAUCOMA

Clinical features

Symptoms

• Redness
• Painful eye
• Decreased visual acuity
PHACOTOPIC GLAUCOMA

(A) Lens dislocation into the anterior chamber

(B) Lens incarceration in the pupil
PHACOTOPIC GLAUCOMA

Signs

• Shallowing of the anterior chamber either symmetrically or asymmetrically

• Iridodonesis

• Phacodonesis

• Subluxation/Dislocation

• Difference in the depth of the anterior chamber between the two eyes
Inferior subluxation
MANAGEMENT
Therapeutic approach - degree of dislocation and the symptoms.

- If no pupillary block glaucoma -
  - conservative nonintervention strategy

- Accompanied by pupillary block-
  - laser peripheral iridectomy
PHACOTOPIC GLAUCOMA
Management:

- Principle of management
  - Reduce IOP
  - Remove the cause-cataract extraction
  - For acute attack-Initial treatment - acute lowering of IOP
  - Combination of topical and systemic IOP lowering agents
  - Total anterior dislocation requires removal of the lens.
Main clinical presentations of LIG
• Triad of acute eye pain, reduced vision and redness
• The common cause of LIG is phacomorphic glaucoma
• Late intervention cause poor visual outcome
• Public awareness and early detection is important for an early intervention of cataract
• Early cataract surgery aids in visual recovery and IOP control
Thank you