جامعة المستقبل
كلية التقنيات الصحية والطبية
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REFRACTIVE ERRORS 3

Lecture Title

Aphakia & Pseudophakia

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Aphakia & Pseudophakia

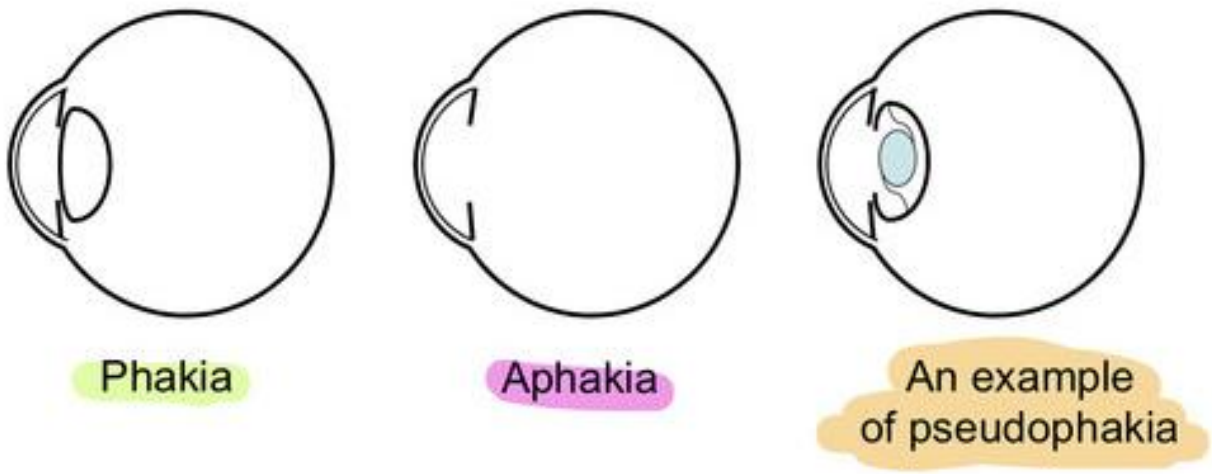
1. Introduction

The crystalline lens contributes approximately +19 diopters (D) to the eye's optical power. When the lens is absent (Aphakia) or replaced by an artificial intraocular lens (Pseudophakia), the optical properties of the eye change dramatically. Understanding these states is essential for optometry and ophthalmology students.

2. Definition

Aphakia: The complete absence of the crystalline lens from the eye. May occur in one (unilateral) or both eyes (bilateral). The lens may be absent congenitally, surgically removed (after cataract extraction), or lost due to trauma. Effect: Marked loss of optical power (+15 to +20 D) leading to high hypermetropia and loss of accommodation.

Pseudophakia: The presence of an intraocular lens implant (IOL) that substitutes for the natural crystalline lens, usually placed during cataract surgery. The IOL restores optical power but not accommodation.



3. Optical and Anatomical Changes in Aphakia

- Loss of +15–20 D refractive power → high hypermetropia.
- Deep anterior chamber and iris tremor (iridodonesis).
- Jet-black pupil with a bright blue fundus reflex.
- Complete loss of accommodation.

Purkinje Images: The third Purkinje image (from the posterior lens surface) disappears.

4. Etiology

Aphakia: congenital (rare, developmental defect) or acquired (after cataract surgery, trauma, lens dislocation, spontaneous absorption).

Pseudophakia: always acquired, following cataract surgery with lens implantation.

5. Clinical Features

Aphakia

Symptoms: blurred vision, photophobia, poor depth perception, monocular diplopia, and glare.

Signs: deep anterior chamber, absent lens, iridodonesis, hyperopia on refraction, blue reflex, and sometimes vitreous prolapse.

Pseudophakia: Clear visual axis, emmetropic or near-emmetropic vision, stable IOL, absent accommodation.

6. Complications

Aphakia: retinal detachment, cystoid macular edema, secondary glaucoma, corneal edema, amblyopia (in children), and aniseikonia (if unilateral).

Pseudophakia: early (corneal edema, inflammation, IOP rise); late (posterior capsule opacification, IOL decentration, glare, halos, or residual refractive error).

7. Optical Correction of Aphakia

1) Spectacles: High-plus convex lenses (+10 to +12 D). Advantages: simple and cheap. Disadvantages: large image magnification (~25–30%), ring scotoma, restricted field, poor cosmesis. Not tolerated in unilateral aphakia.

2) Contact Lenses: Rigid or soft lenses. Advantages: minimal magnification (6–8%), good field and cosmesis. Disadvantages: handling difficulty, hygiene, risk of infection.

3) Intraocular Lens (IOL): Preferred correction. IOL restores optical power internally. Power calculated via biometry (e.g., SRK/T formula).

8. Types of Intraocular Lenses

Posterior Chamber IOL: placed behind the iris in the capsular bag (common, stable).

Anterior Chamber IOL: placed in front of the iris when the capsule is absent.

Iris-Claw IOL: fixed to the iris.

Scleral-Fixated IOL: sutured to the sclera for cases without support.

9. Refractive States in Pseudophakia

- Emmetropic: Clear distance vision.
- Myopic: Improved near vision (monovision setup).
- Hypermetropic: Underpowered IOL outcome.
- Astigmatic: Corrected with toric IOL or corneal laser.

10. IOL Optical Designs

- Monofocal: Single focus (usually distance); reading glasses needed.
- Multifocal: Multiple foci (distance and near) but may cause halos.
- Toric: Corrects astigmatism.
- Aspheric: Reduces spherical aberrations, improving contrast.
- Accommodative: Provides limited near focus by shifting the IOL position

11. Comparison: Aphakia vs Pseudophakia

Feature	Aphakia	Pseudophakia
Lens status	Absent	Replaced by IOL
Refractive effect	High hypermetropia	Normal or slightly hyperopic/myopic
Accommodation	Completely lost	Absent (unless accommodative IOL)
Magnification	High (25–30% with spectacles)	Normal (~1–2%)
Preferred correction	CLs or IOL	Built-in IOL correction
Cosmesis	Poor with thick lenses	Normal appearance
Optical aberrations	Significant	Minimal (modern aspheric IOLs)
Binocular tolerance	Poor if unilateral	Excellent
Visual stability	Depends on external correction	Stable once healed
Surgery needed	May remain unoperated	Surgical implantation mandatory

12. Corneal Refractive Procedures in Pseudophakia

Residual refractive errors after IOL surgery can be corrected with:

- Excimer Laser (LASIK/PRK).
- Piggyback IOL (secondary lens implant).
- IOL exchange in major power miscalculations.

13. Pediatric Considerations

Congenital aphakia causes severe amblyopia if not corrected early. Treatment: contact lenses (unilateral) or spectacles (bilateral). Secondary IOLs may be implanted later when ocular growth stabilizes. Early correction and amblyopia therapy are critical.

14. Clinical Pearls

- Avoid high-plus spectacles in unilateral aphakia.
- IOL implantation is the gold standard for visual rehabilitation.
- Educate pseudophakic patients on reading adds and posterior capsule opacification (YAG laser).
- Always record IOL details (type, power, and position).
- Check centration and retinal status at follow-up.

HOME WORK

Questions

1. Define aphakia and pseudophakia.

Explain how each condition alters the optical state of the eye.

2. Describe the main optical consequences of aphakia. Why does an aphakic eye become highly hypermetropic?
3. List three major clinical signs that help identify an aphakic eye during examination.
4. Compare the image magnification effects produced by aphakic spectacles and contact lenses. Why are contact lenses preferred in unilateral aphakia?
5. Explain why aphakic patients lose accommodation, while pseudophakic patients still cannot accommodate despite having a lens implant.
6. Discuss the differences between anterior chamber, posterior chamber, iris-claw, and scleral-fixated IOLs. Indicate one clinical situation where each might be preferred.
7. What are the common early and late complications of pseudophakia? Include at least one management option for posterior capsule opacification.
8. A patient underwent cataract surgery and received an IOL implant but still reports blurred vision. What possible optical or surgical causes could explain this complaint?
9. Explain how aniseikonia can occur in unilateral aphakia and how it affects binocular vision.
10. In pediatric patients, why is early correction of congenital aphakia essential? Mention the preferred correction methods and the risk of delayed intervention.