جامعة المستقبل

كلية التقنيات الصحية والطبية

قسم تقنيات البصريات

Second Stage 2024-2025

REFRACTIVE ERRORS

Lecture Title

Refractive Error

Lecture Number: 4 / course 1

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OPTOMETRIST

Refractive Error

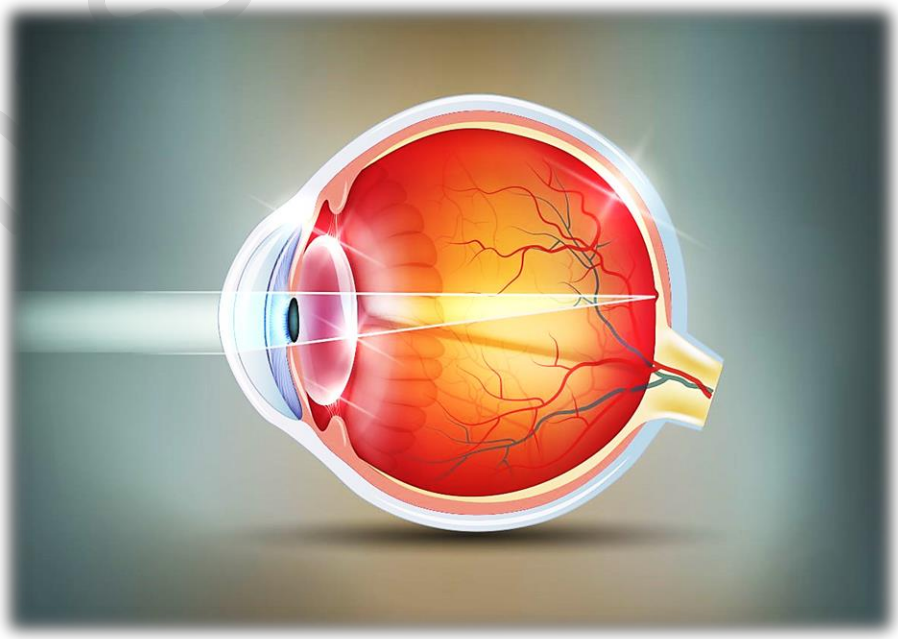
- A person who has a refractive error will need to wear spectacles (glasses) or contact lenses so that they can see clearly and comfortably.
- This is because their eye is not the correct size and shape and light does not focus correctly on their retina.
- If light from a distant or a near object does not focus properly on the retina, the person will have a problem seeing because they have a *refractive error.*
- There are four main types of refractive error: *myopia*, *hyperopia*, *astigmatism* and *presbyopia*.

The amount of refractive error that an eye has depends on:

- ✓ the steepness/flatness of the cornea
- ✓ the thickness/thinness of the crystalline lens
- ✓ the length of the eyeball

The Normal Eye (Emmetropia)

Emmetropia refers to the state of the human eye when it is perfectly shaped to focus light directly on the retina, resulting in clear vision without the need for corrective lenses. It is the ideal refractive condition of the eye.



Key Characteristics of Emmetropia:

1. Normal Eye Shape:

- In an emmetropic eye, the shape of the eyeball, the curvature of the cornea, and the lens work together harmoniously to focus light precisely on the retina.
- The axial length (distance from the front of the eye to the retina) is within the normal range, typically around 23.0 mm to 24.5 mm.

2. Perfect Focus:

- Light rays entering the eye are bent (refracted) by the cornea and lens so that they converge exactly on the retina.
- The retina, located at the back of the eye, acts like a screen that captures the focused image and sends it to the brain via the optic nerve for interpretation.

3. Clear Vision at All Distances:

- In an emmetropic eye, both near and distant objects can be seen clearly without any blurriness or distortion.
- The eye does not require additional focusing effort (accommodation) to see clearly, which is why people with emmetropia do not need glasses or contact lenses for clear vision.

4. How Emmetropia is Determined:

- Eye Exams: During a routine eye examination, if no refractive errors are found, the person is determined to have emmetropia.
- Visual Acuity Test: An emmetropic eye typically achieves 20/20 (6/6) vision, which means that the person can see clearly at 20 feet (6 meter) what should normally be seen at that distance.
- No Need for Correction: Individuals with emmetropia do not require corrective lenses for either distance or near vision.

5. Importance of Emmetropia:

- **Optimal Vision: Emmetropia represents the optimal condition of the eye, where the natural focusing ability provides clear vision without strain.**
- **Baseline for Eye Health: It serves as a baseline or reference point when assessing and diagnosing refractive errors in others. Any deviation from emmetropia indicates a refractive error that might require correction.**

6. Emmetropia in Different Life Stages:

- **Young Age: Most children are born slightly hyperopic (farsighted), and their eyes gradually grow into emmetropia as they age.**
- **Adulthood: Emmetropia is more common in young adults. As people age, changes in the eye's lens and other structures might lead to presbyopia, a condition where near vision becomes difficult.**

- **Compare emmetropia with myopia, hyperopia, and astigmatism in terms of:**
  - **Eye shape**
  - **Light focusing on the retina**
  - **Vision clarity at different distances**

- **A 20-year-old student complains of difficulty seeing the board in class but has no issues reading a book up close.**

Question: Based on this description, which refractive error is most likely? Explain your reasoning.

- **If a patient achieves 20/20 vision during an eye exam, what does this indicate about their eye condition? Explain how this relates to emmetropia.**