

Introduction to Contact Lenses

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Key concepts, types, fitting process, care, and safety considerations

1. What Are Contact Lenses?

Aspect	Description
Definition	Thin, curved optical devices placed directly on the tear film surface of the eye to correct refractive errors or provide therapeutic benefits.
Purpose	• Vision correction (myopia, hyperopia, astigmatism, presbyopia) • Cosmetic enhancement (colored lenses) • Therapeutic use (drug delivery, bandage lenses for corneal healing). • Wider field of view
Advantages vs. Glasses	• No fogging or smudging • No weight on the nose/ears • Suitable for active sports and certain occupations. • Requires diligent hygiene
Limitations	• May cause dryness or irritation • Not suitable for all ocular conditions.

2. Basic Optics Review (Why Lenses Work)

1. **Refractive error** occurs when the eye’s optical power does not focus light on the retina.
2. **Contact lenses** sit on the cornea, eliminating the “air/cornea” interface that glasses must compensate for, thus providing a more natural refractive surface.
3. **Power formula** (simplified):

[$P_{\text{lens}} = \frac{1}{f_{\text{lens}}}$ quad (text{diopters, D})]

where (f_{lens}) is the focal length in meters.

4. **Vertex distance** (distance from lens to eye) is essentially zero for contacts, so the prescribed power is usually the same as the spectacle prescription for low to moderate errors, but may differ for high prescriptions.

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3. Types of Contact Lenses

Category	Sub?type	Material	Wearing Schedule	Typical Use
Soft Lenses	- Hydrogel	Water?based polymer (hydrogel) or silicone?	Daily	Most common for routine correction
	- Silicone?hydrogel	hydrogel (higher oxygen permeability)	disposable, weekly, bi? weekly, monthly	
Rigid Gas? Permeable (RGP) / Hard Lenses	- Conventional RGP	Rigid, oxygen? permeable polymer	Extended wear (up to 30 days)	High astigmatism, keratoconus, specialty optics
	- Hybrid (RGP center + soft skirt)			
	- Toric (for astigmatism)			
	- Multifocal (presbyopia)			
Specialty Lenses	- Orthokeratology (overnight reshaping)	Varies (soft, silicone? hydrogel, RGP)	Varies	Specific visual or medical needs
	- Therapeutic / Bandage lenses			
Cosmetic Lenses	- Colored (enhancement or opaque)	Usually soft hydrogel or silicone?hydrogel	Daily or extended wear	Aesthetic purposes (must still meet vision correction standards)

Key Material Property: Oxygen Permeability (Dk)

- Higher Dk ? more oxygen reaches the cornea ? longer safe wearing times.
- Silicone?hydrogel lenses typically have Dk values $> 100 (\times 10^{-11} \text{ (cm}^2 \cdot \text{s} \cdot \text{mL}^{-1} \cdot \text{mmHg}^{-1}))$, whereas conventional hydrogel lenses range 10–30.

4. Fitting Process

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1. Pre-Fit Evaluation

- Complete ocular history (dry eye,