

Pterygium and pinguecula

Conjunctival actinic lesions

Pinguecula: conjunctival | Pterygium: corneal extension

Dr Abu Suraih Sakhri

MBBS, MD (Pathology)

www.abusuraihsakhri.com

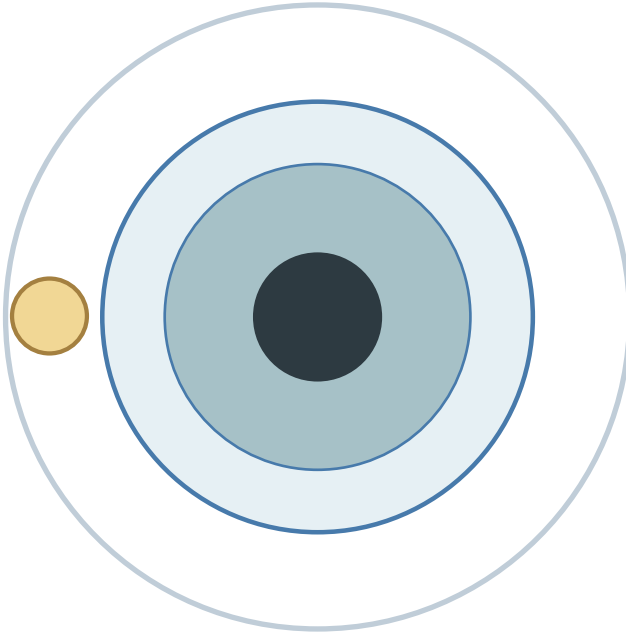
Learning outcomes

- Locate the lesions in conjunctival anatomy and identify their UV-exposed distribution.
- Distinguish a non-corneal pinguecula from a fibrovascular pterygium.
- Explain stromal change, Bowman layer layer involvement, and refractive consequences.
- Recognize red flags for ocular surface neoplasia and interpret excision specimens.

A shared exposure; Two distinct growth patterns

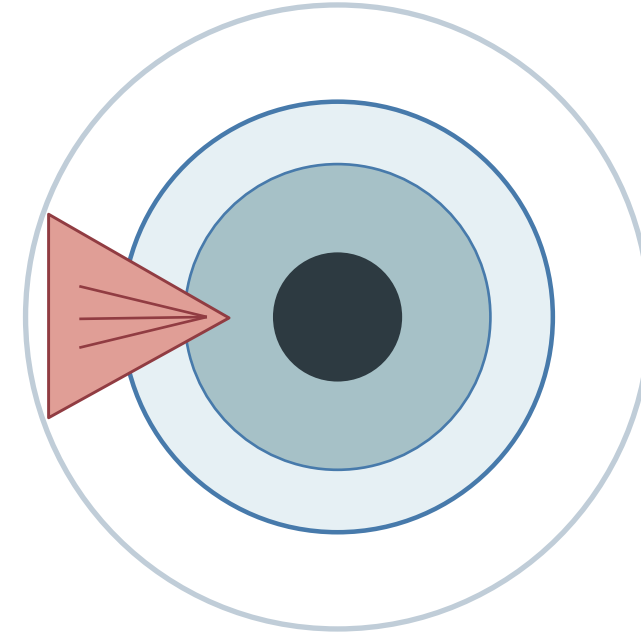
Schematic: Shared actinic exposure, different corneal relationships

Pinguecula



No corneal extension

Pterygium



Corneal fibrovascular advance

Conjunctival zones determine lesion location

Ocular surface zones (schematic cross-section)

Palpebral conjunctiva

Fornix

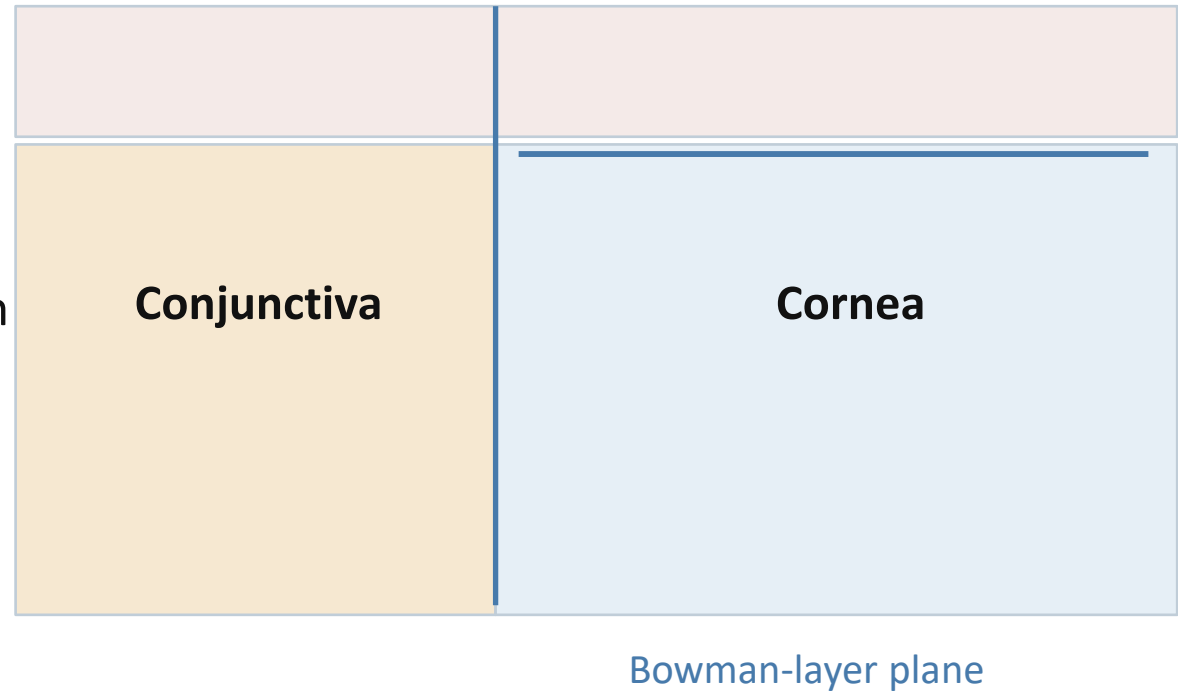
Bulbar conjunctiva

Limbus: Transition between bulbar conjunctiva and corneal epithelium. Pterygium is defined by advance beyond this boundary.

The limbus is an anatomical and epithelial transition

- The limbus joins bulbar conjunctiva to the cornea.
- Conjunctival and corneal epithelia differ in their normal architecture.
- Limbal stem-cell function helps maintain the corneal epithelial phenotype.

Conjunctival-to-corneal interface (schematic)

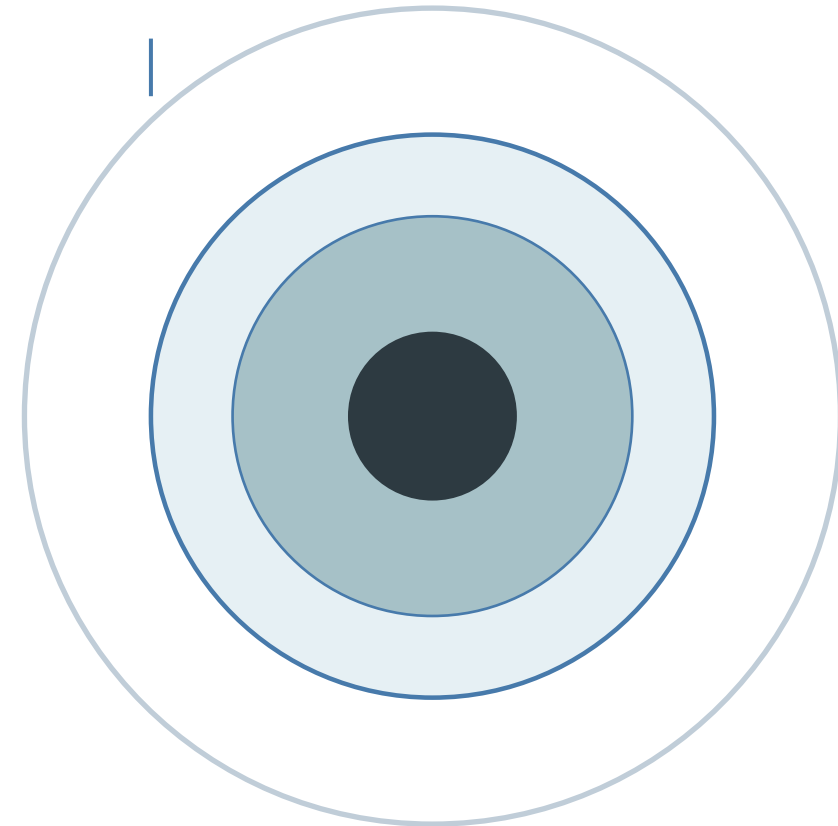


Limbus separates conjunctival from corneal epithelium

The interpalpebral fissure defines UV-exposed conjunctiva

- Surface exposed between the upper and lower lids is the main site of these lesions.
- Subepithelial elevations appear within this exposed band.
- A lesion outside this expected distribution deserves careful reassessment.

Anterior ocular surface — schematic

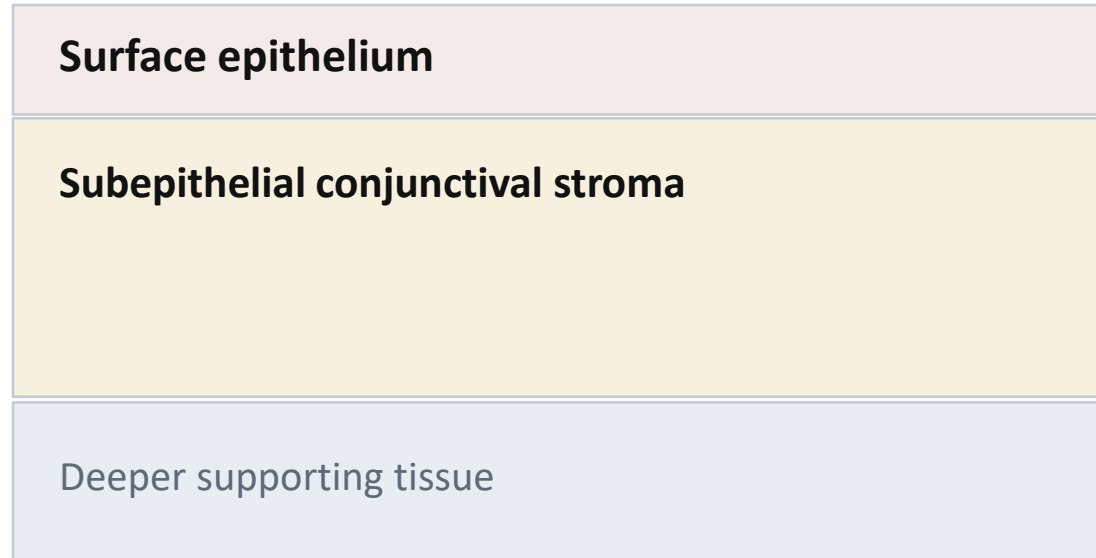


Interpalpebral surface and corneal limbus

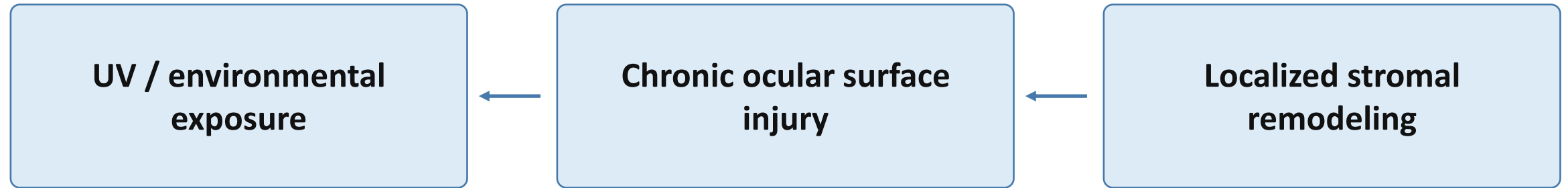
Bulbar conjunctiva has a squamous epithelial covering

- Normal bulbar conjunctiva is covered by nonkeratinizing stratified squamous epithelium.
- The epithelium overlies a supportive subepithelial connective-tissue compartment.
- Both lesions primarily remodel the subepithelial tissue, with variable epithelial response.

Simplified tissue section



Actinic injury is the common etiologic theme

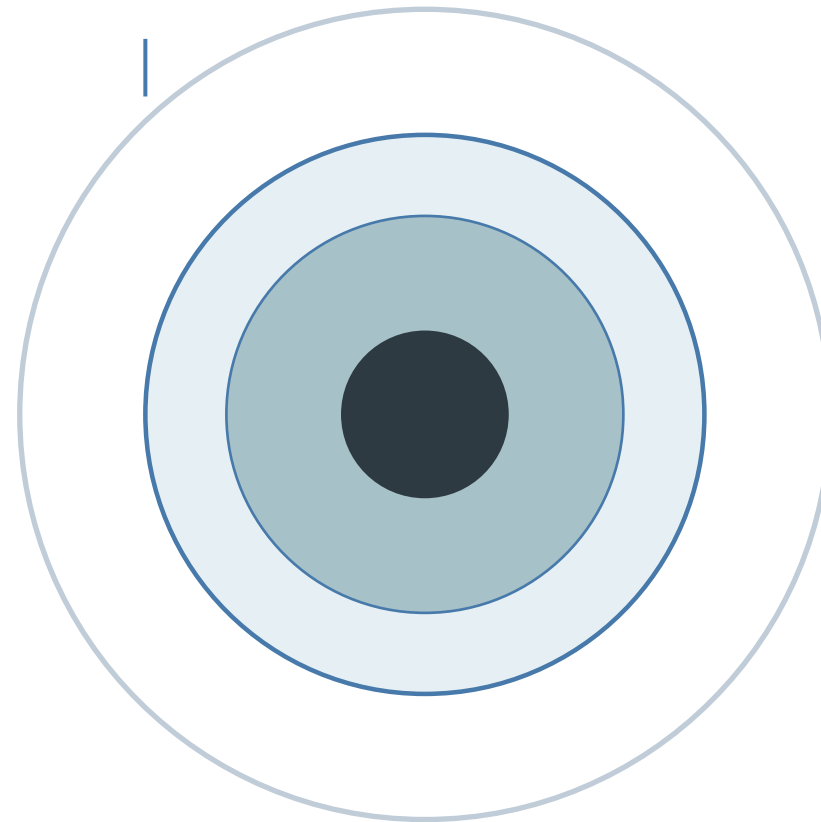


Proposed etiologic sequence; Individual causal contributions vary

Why the nasal limbus is commonly involved

- Both disorders frequently involve the nasal interpalpebral conjunctiva.
- Peripheral light focusing toward the nasal limbus is a proposed explanation.
- Anatomical distribution supports — but does not independently prove — a single causal model.

Anterior ocular surface — schematic



Interpalpebral surface and corneal limbus

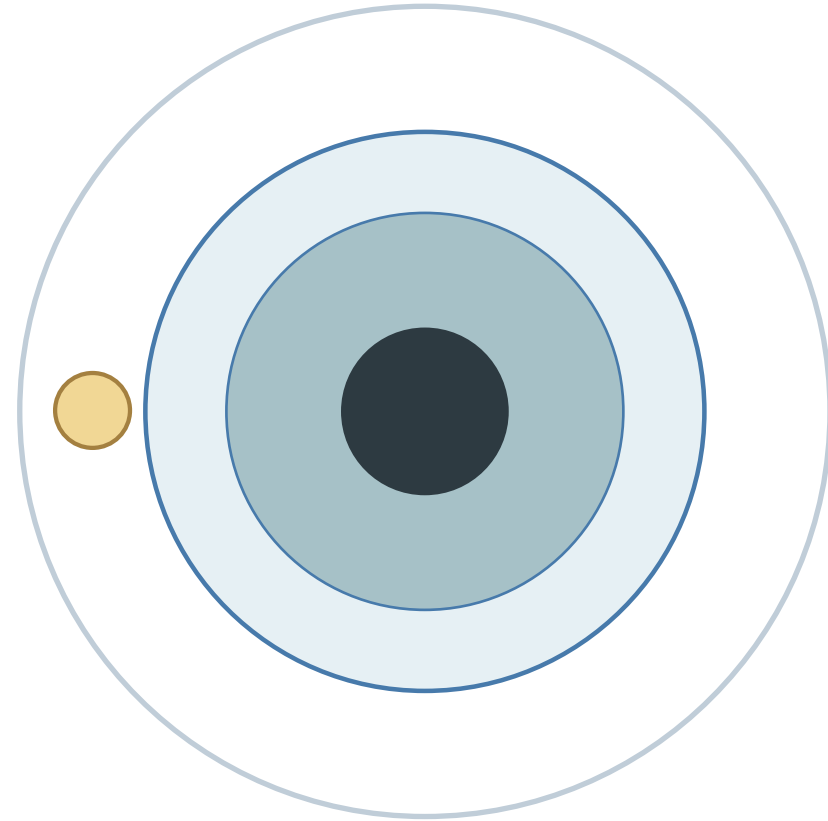
Environmental association is not a quantitative risk model

- Both lesions to actinic damage without specifying attributable fractions.
- Evidence for the UV association is stronger for pterygium than some pinguecula associations.
- Do not infer individual progression, recurrence, or cancer risk from appearance alone.

Pinguecula: A limbal-adjacent conjunctival elevation

- Typically a small, yellow-white, slightly raised lesion.
- Located on interpalpebral bulbar conjunctiva close to the limbus.
- Its defining feature is absence of corneal extension.

Anterior ocular surface — schematic

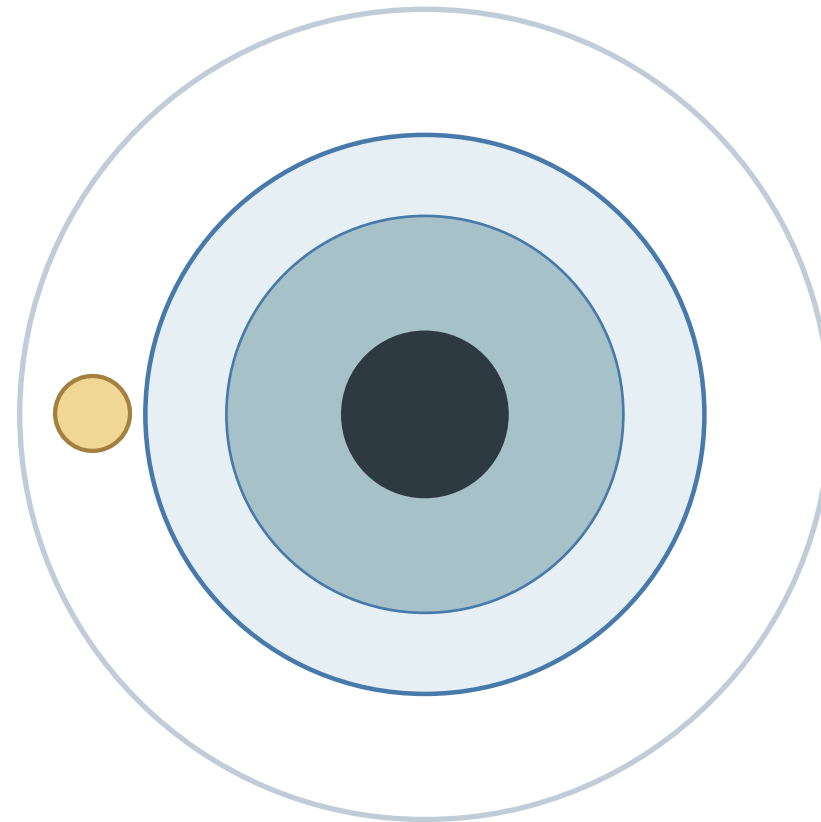


Conjunctival elevation; No corneal extension

Pinguecula has a discrete, non-wedge geometry

- The elevation is localized rather than a triangular advance across the cornea.
- The conjunctiva remains the tissue of origin and the site of visible growth.
- Color and elevation are descriptive — not histologic evidence by themselves.

Anterior ocular surface — schematic

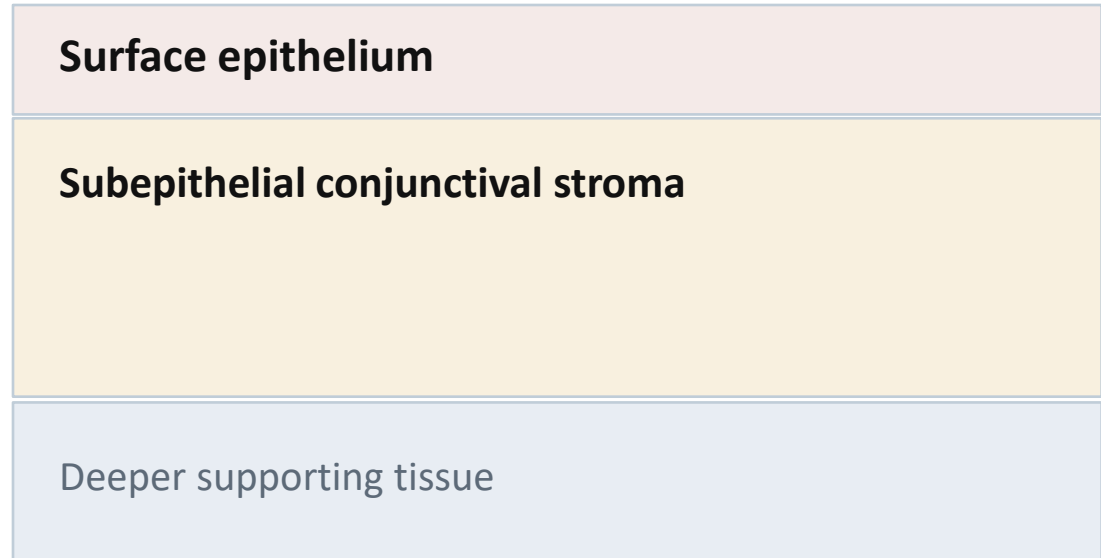


Conjunctival elevation; No corneal extension

The yellow-white appearance reflects stromal change

- Subepithelial collagen shows degenerative, elastotic alteration.
- Hyalinization may contribute to the gross appearance.
- Do not assume that a yellow lesion is necessarily a primary lipid deposit.

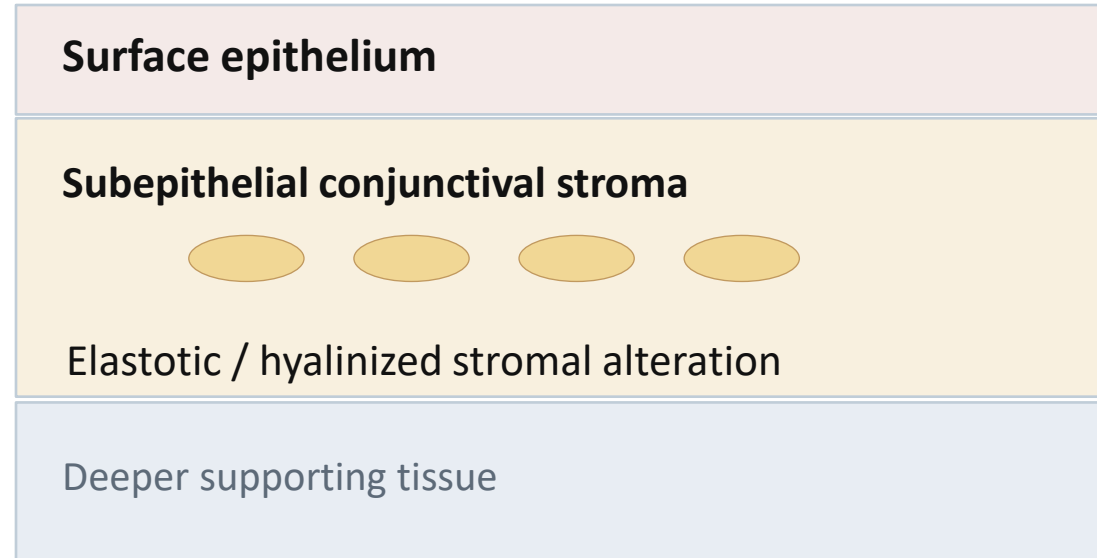
Simplified tissue section



Pinguecula: Stromal change beneath surface epithelium

- Actinic-related stromal alteration lies below the epithelial surface.
- Surface epithelium may be attenuated or reactive.
- A conceptual cross-section explains localization; Diagnosis still depends on the real specimen.

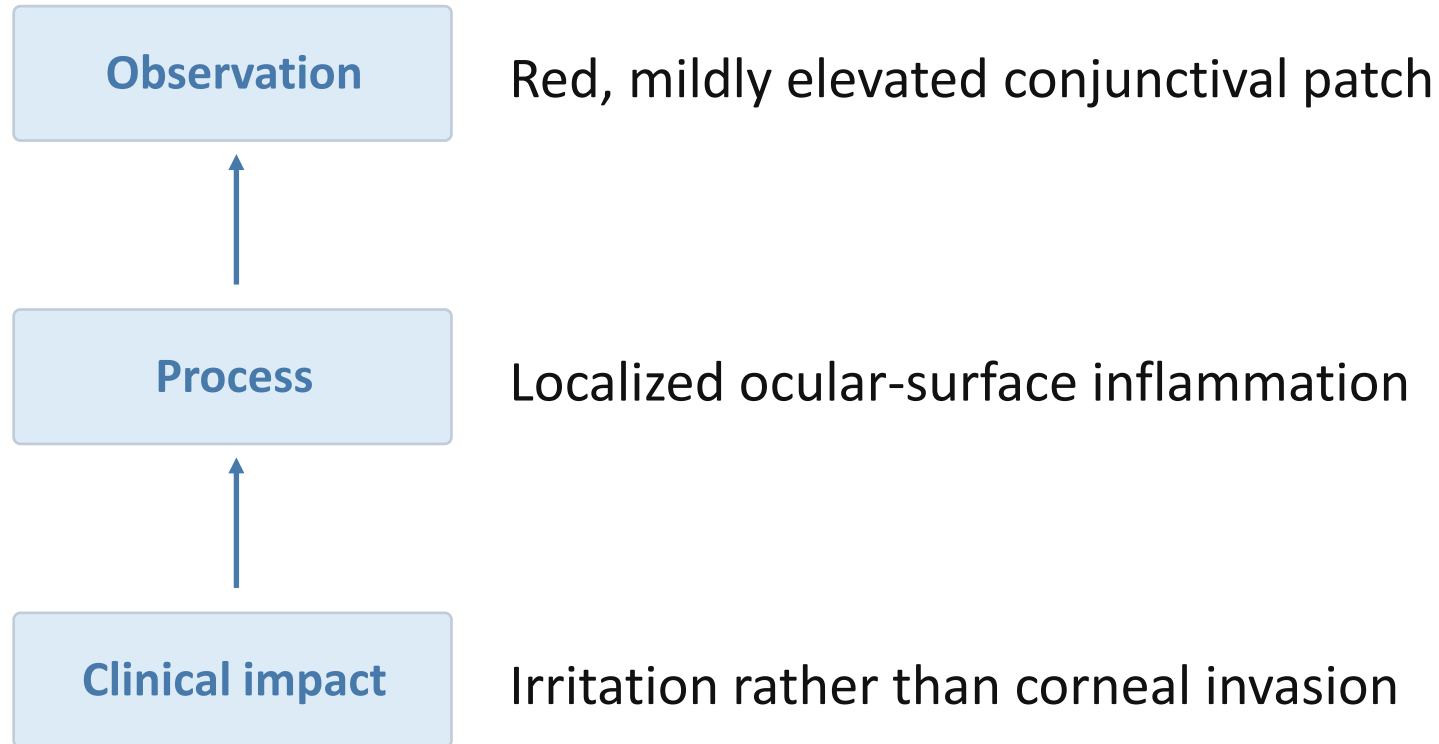
Simplified tissue section



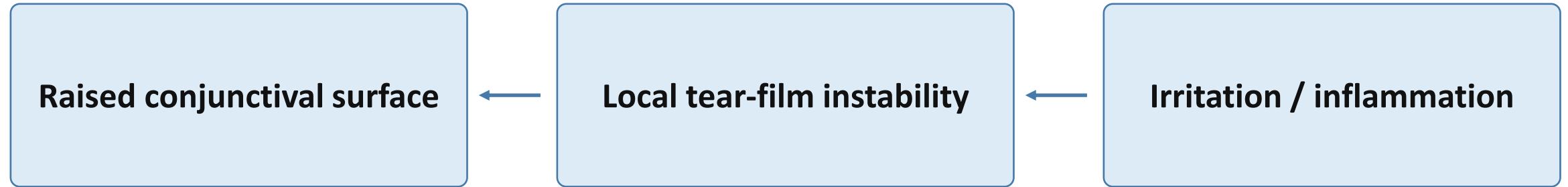
Pinguecula is generally a benign surface finding

- Most lesions are small and asymptomatic.
- They are commonly encountered during routine ocular examination.
- Presence alone does not establish visual dysfunction.

Pingueculitis: Inflammation changes the presentation



Surface elevation can disturb the tear film

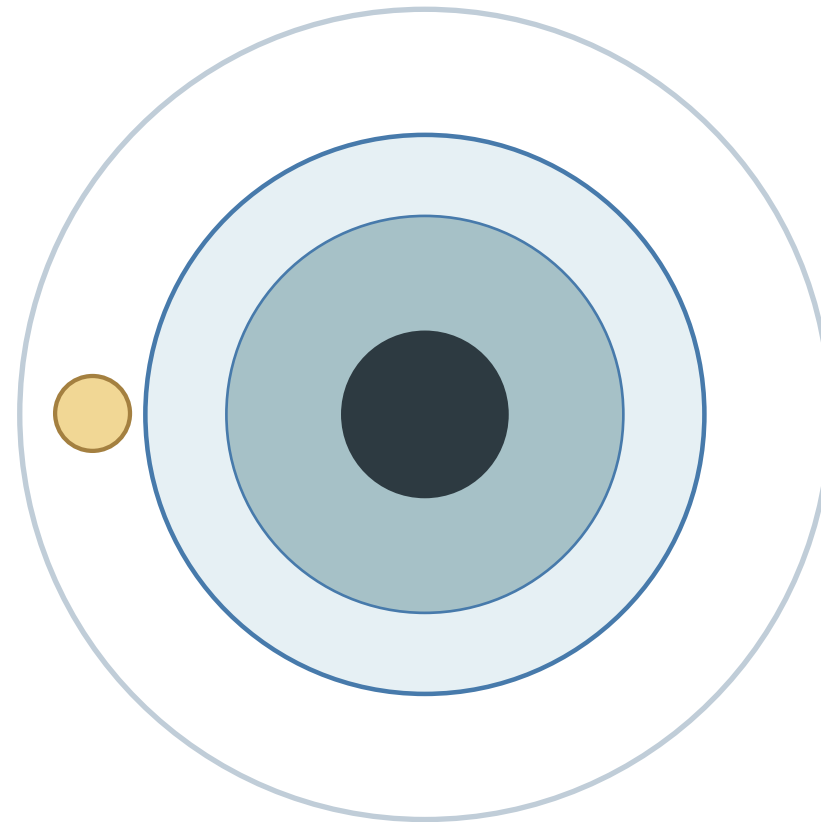


Local tear-film disturbance can explain irritation

The cornea remains clear of pinguecular tissue

- The lesion stops at or beside the limbus.
- It does not form a fibrovascular head on the cornea.
- Documenting this boundary is often sufficient for the primary clinical distinction.

Anterior ocular surface — schematic

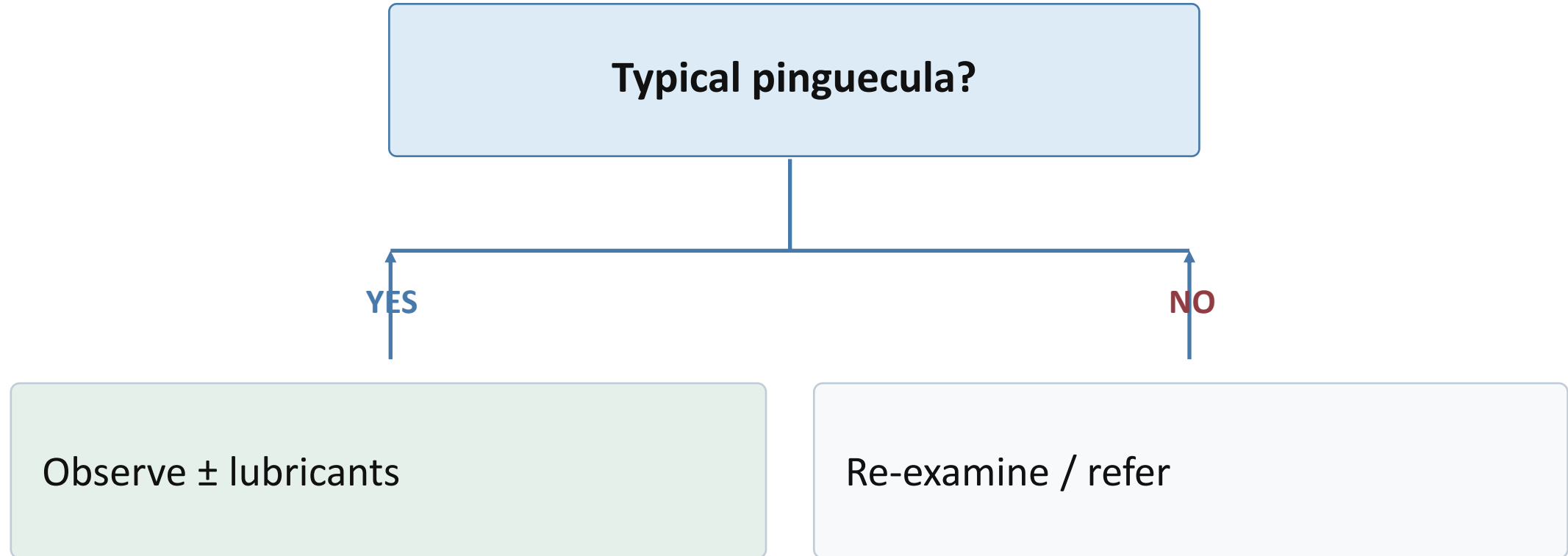


Conjunctival elevation; No corneal extension

Typical pinguecula is primarily a clinical diagnosis

- 1 Slit-lamp examination establishes color, contour, location, and corneal noninvolvement.
- 2 Clinical photographs may document size or change when useful.
- 3 Atypical pigmentation, growth, or epithelial features require a broader differential.

Pinguecula: Management is usually conservative



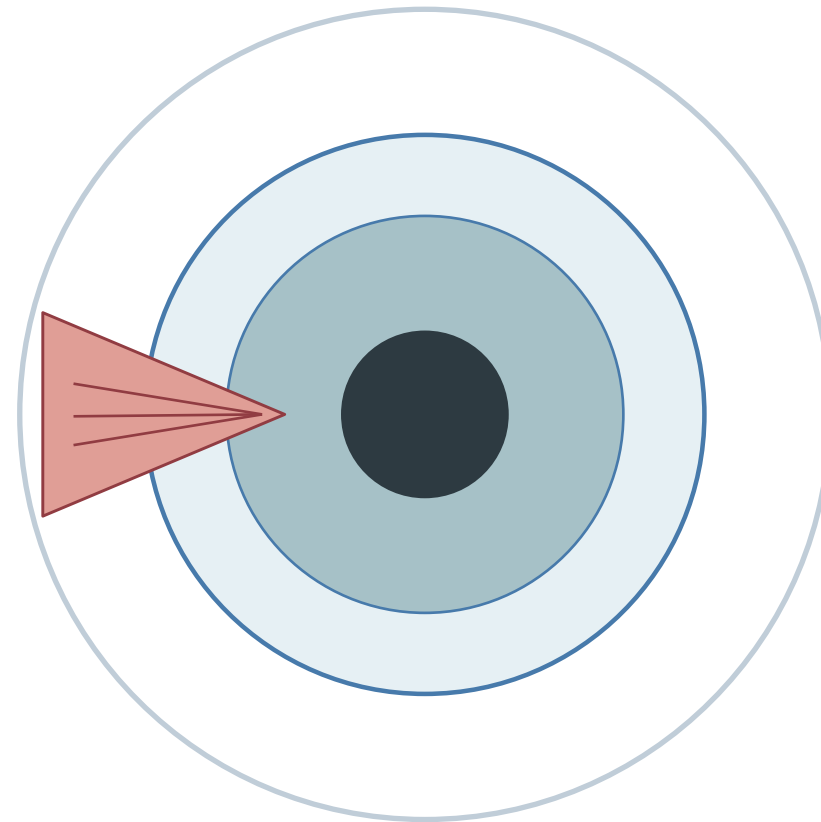
Excision of pinguecula is selective, not routine

- Symptoms, contact-lens interference, or substantial cosmetic concerns may prompt discussion.
- Surgery itself can cause ocular surface disturbance and scarring.
- When tissue is removed, examine it if diagnostic uncertainty exists.

Pterygium: Fibrovascular growth onto the cornea

- A wedge-shaped conjunctival growth crosses the limbus.
- The advancing tissue carries stromal collagen and blood vessels.
- The corneal extension — not merely conjunctival redness — defines the lesion.

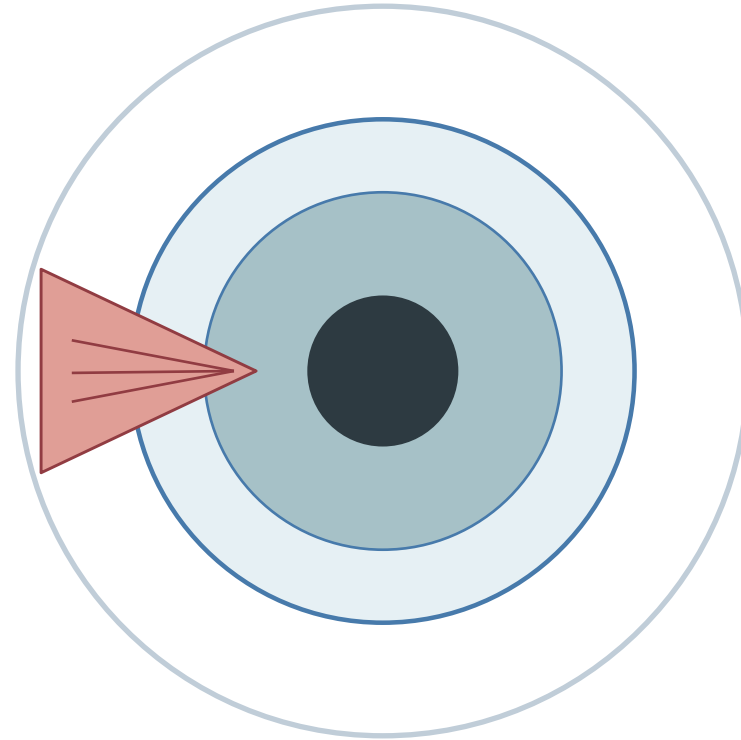
Anterior ocular surface — schematic



Fibrovascular tissue advances onto the cornea

A pterygium has a base, body, and advancing head

- The body remains continuous with bulbar conjunctiva.
- The head is the forward margin on the corneal surface.
- The advanced edge can show a thin cap; These are clinical descriptors, not histologic tumor staging.

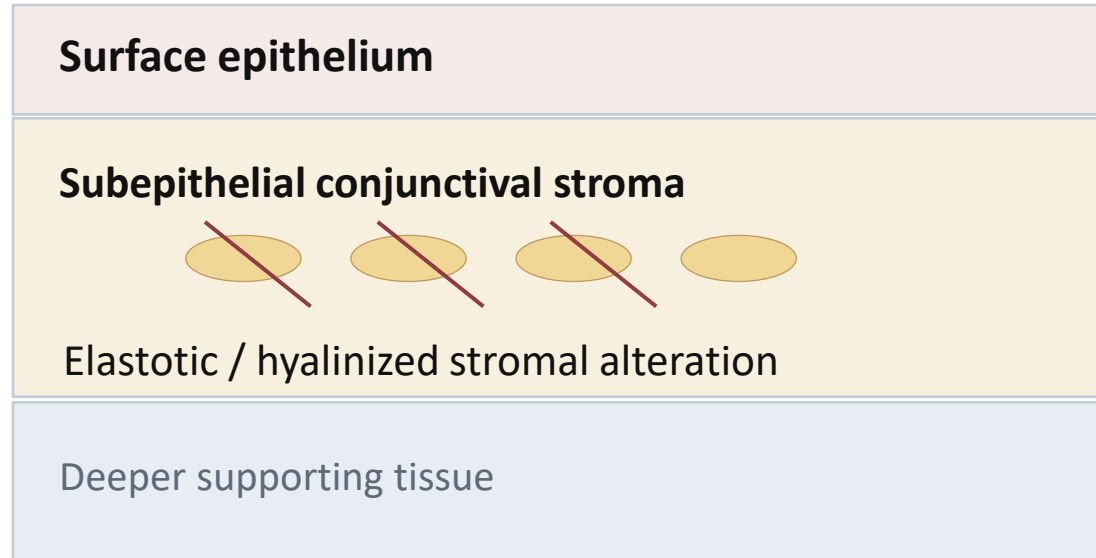


Base → body → advancing corneal head

Pterygium tissue has a fibrovascular composition

- Connective tissue matrix forms the bulk of the wedge.
- Accompanying blood vessels account for its fleshy, vascular appearance.
- The epithelium may show secondary reactive changes.

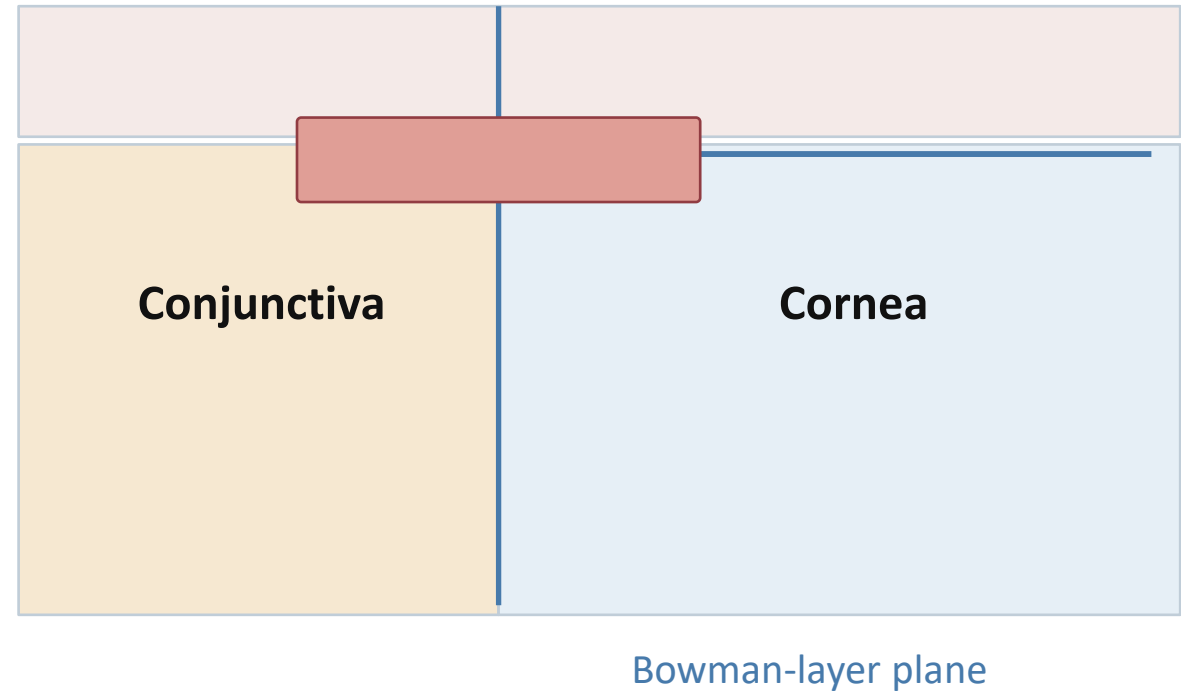
Simplified tissue section



Pterygium remodels the Bowman-layer plane

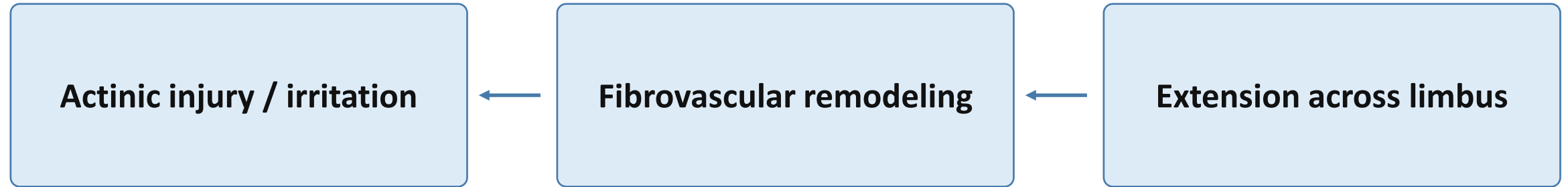
- Tissue dissecting into the plane normally occupied by Bowman layer.
- Loss or disruption of Bowman layer may accompany fibrovascular ingrowth.
- This corneal interface distinguishes pterygium from a purely conjunctival pinguecula.

Conjunctival-to-corneal interface (schematic)



Fibrovascular tissue traverses the limbus

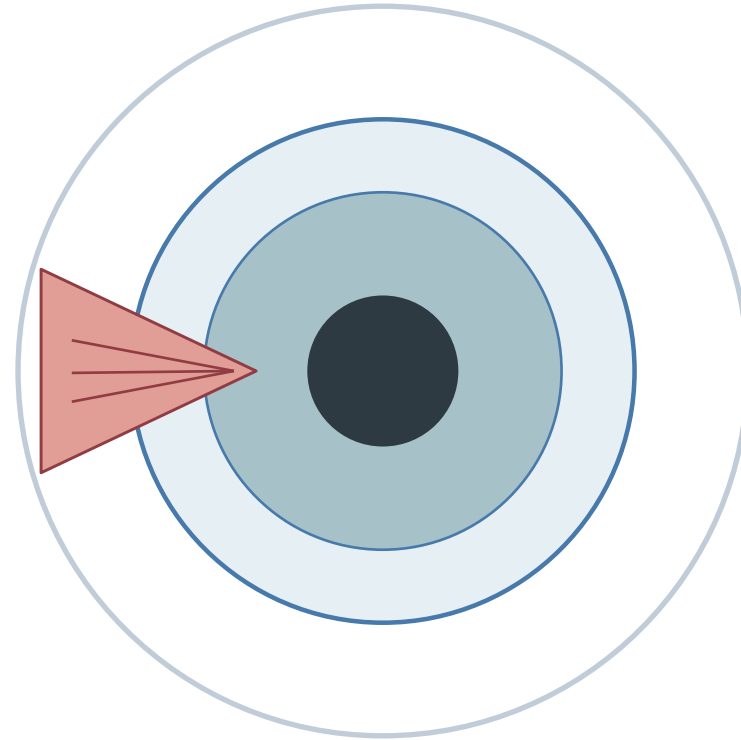
Corneal extension requires tissue remodeling



Remodeling is mechanistically plausible, not a molecular criterion

Fibrovascularity explains the clinical appearance

- Vessels track within the connective-tissue wedge.
- A thicker, more vascular lesion may appear red and fleshy.
- Color alone cannot reliably quantify its rate of progression.

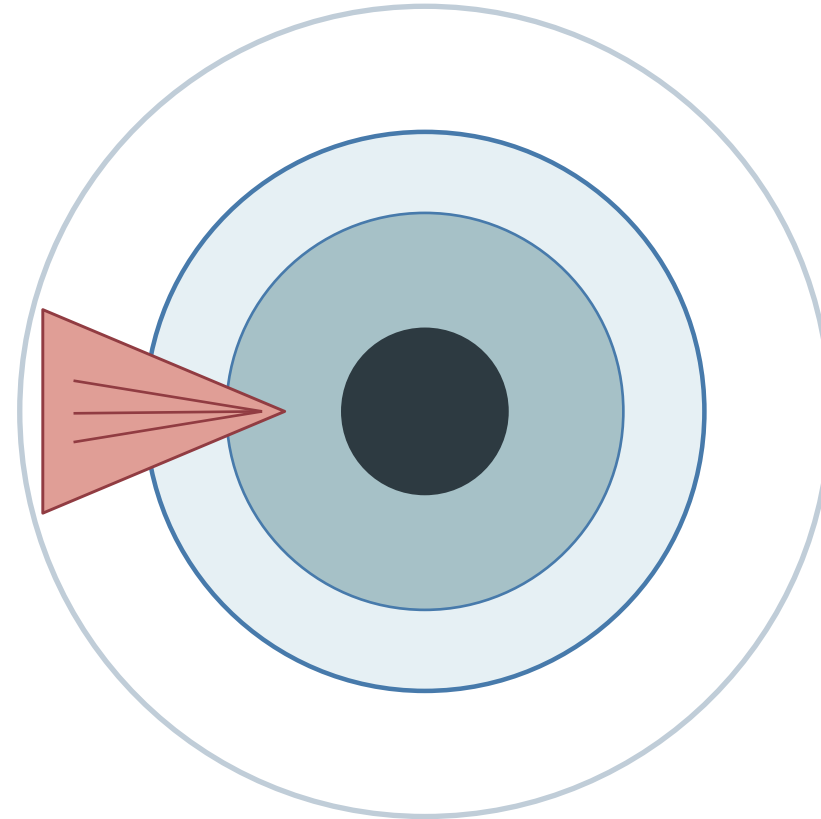


Base → body → advancing corneal head

A triangular lesion follows a corneal trajectory

- The base is peripheral, typically on the nasal conjunctiva.
- The apex advances toward the corneal center.
- Progression should be documented by location and corneal extent, not assumed from one examination.

Anterior ocular surface — schematic



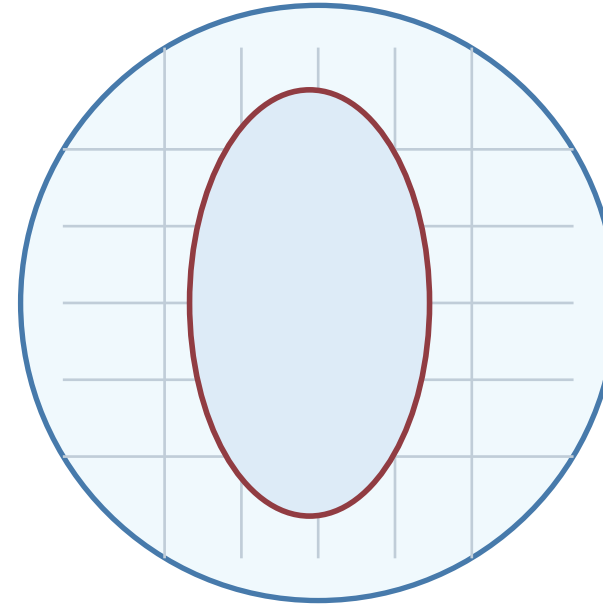
Fibrovascular tissue advances onto the cornea

Pterygium may be quiet or inflamed

Dimension	Quiescent lesion	Inflamed lesion
Appearance	Thin or pale	Injected or fleshy
Discomfort	Often minimal	Burning / tearing
Next step	Document extent	Treat surface symptoms; Reassess

Induced astigmatism is the principal refractive effect

- Peripheral tissue can deform local corneal contour.
- Progressive distortion may cause astigmatism and reduced visual quality.
- Refractive impact may precede actual obscuration of the pupil.

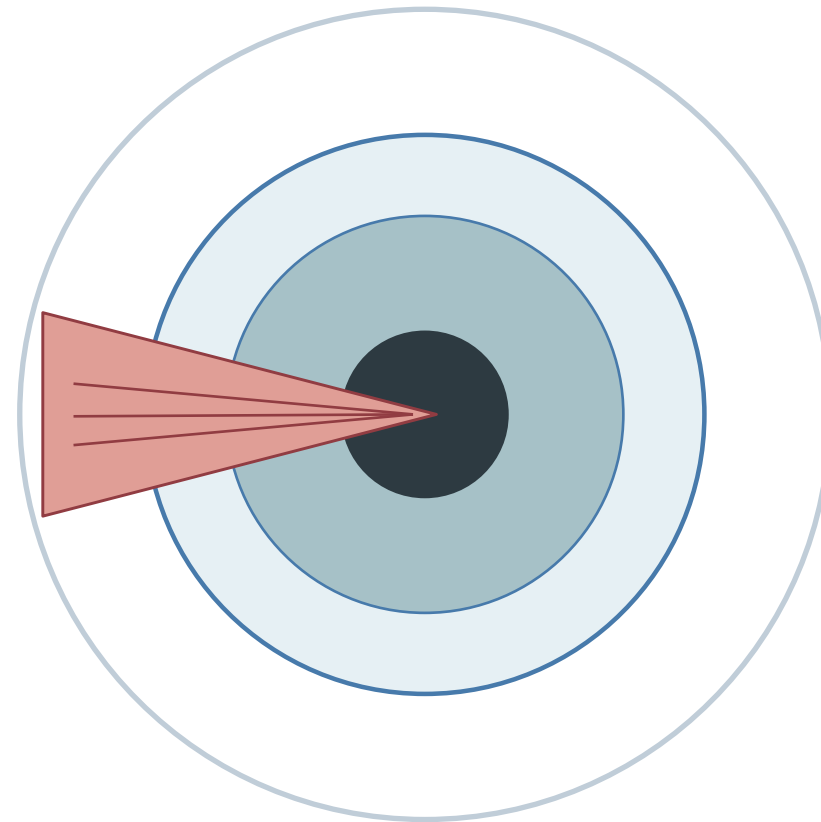


Schematic curvature distortion $\neq$ measured topography

Advanced lesions can impair the visual axis

- Small lesions ordinarily spare the central optical axis.
- Large or progressive lesions can approach or cover the visual axis.
- This extends beyond Robbins' brief description of typical limited visual threat.

Anterior ocular surface — schematic



Advanced growth may reach the central cornea

Corneal distortion and central obstruction are different

Dimension	Astigmatism	Visual-axis involvement
Mechanism	Corneal shape alteration	Physical central encroachment
Early detection	Refraction / topography	Slit-lamp view / photograph
Consequence	Blur / irregular optics	Direct central vision compromise

Primary and recurrent pterygia are distinct contexts

Dimension	Primary	Recurrent
History	No prior excision	Previous removal
Tissue planes	Often less scarred	Can be scarred or adherent
Planning	Initial risk assessment	Recurrence and surface reconstruction

Clinical assessment begins with visual function

1

Measure visual acuity with appropriate correction.

2

Check refraction if vision complaints or suspected induced astigmatism exist.

3

Inspect corneal clarity and whether the lesion approaches the central optical zone.

Describe the lesion reproducibly at the slit lamp

1

Record nasal or temporal location and extent onto the cornea.

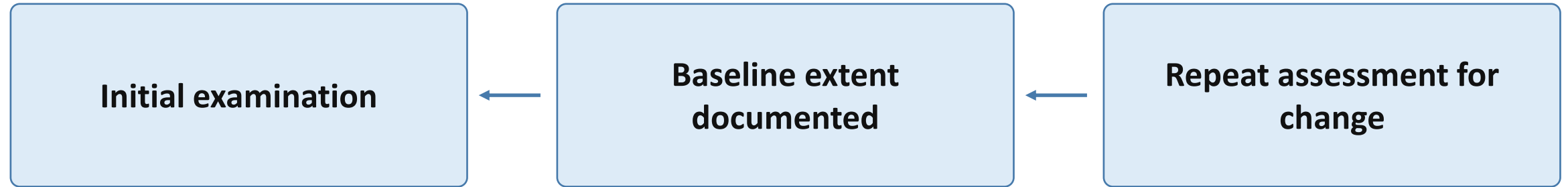
2

Describe thickness, vascularity, inflammation, and mobility.

3

Look for focal leukoplakia, pigmentation, atypical vessels, or unusually rapid enlargement.

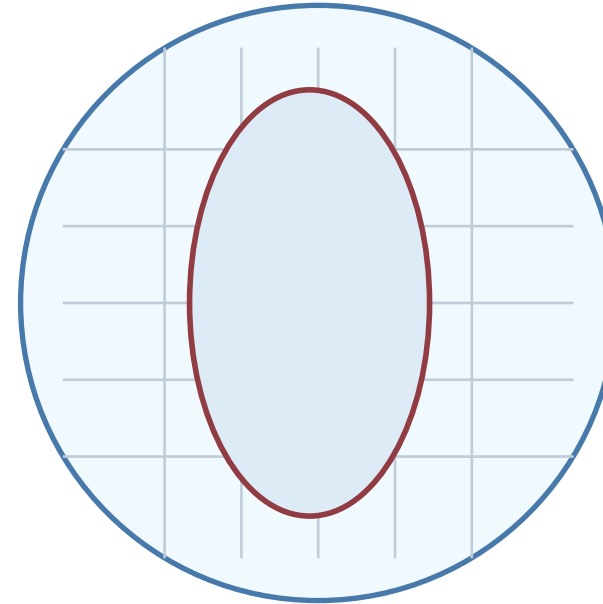
Serial documentation identifies growth



Use comparable documentation at each visit

Corneal topography assesses refractive distortion

- Topography can reveal localized or irregular corneal curvature change.
- Use it when visual symptoms and lesion size appear discordant.
- This is a functional evaluation; It is not a tissue diagnosis.



Schematic curvature distortion $\neq$ measured topography

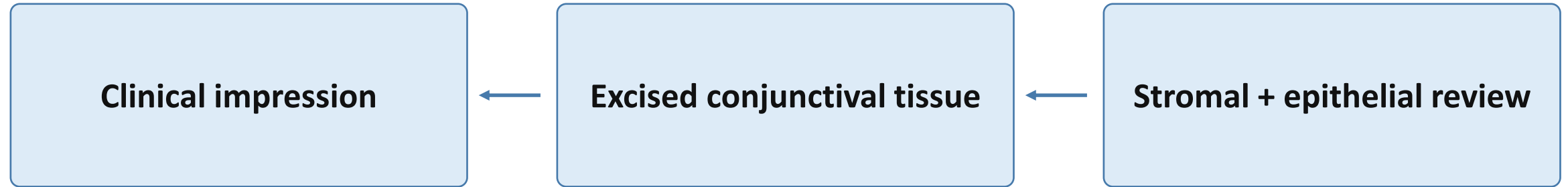
Anterior-segment OCT can aid selected differentials

- Cross-sectional imaging can depict epithelial thickness and subepithelial tissue.
- An unusually thick, hyperreflective epithelium raises concern for epithelial neoplasia.
- OCT assists characterization but does not replace histopathology when indicated.



Layer mapping ≠ histologic diagnosis

Pathology begins with a clinical question

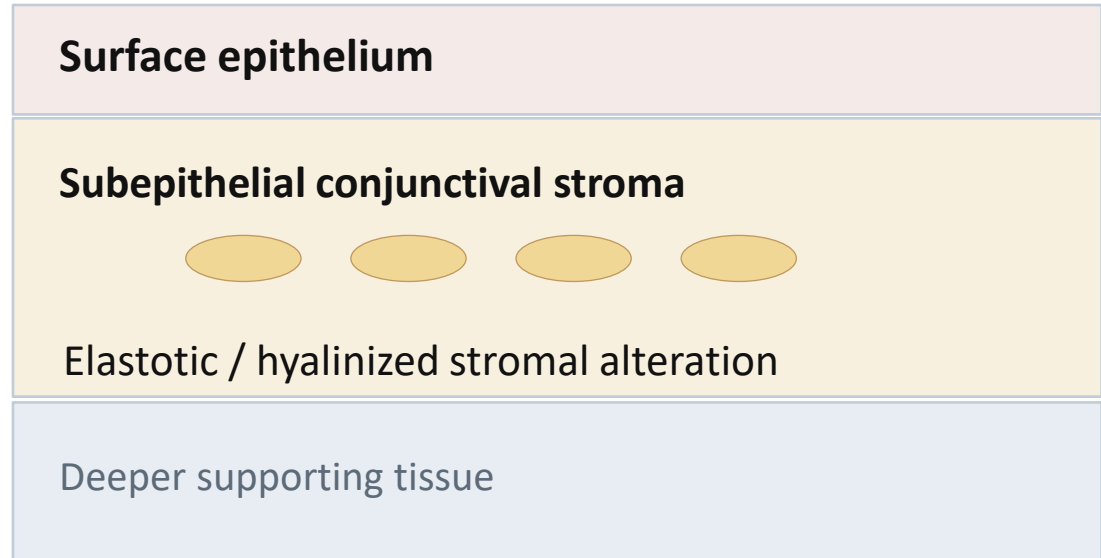


Evaluate surface epithelium as well as stroma

Histology: Actinic or elastotic stromal alteration

- Degenerated, altered stromal collagen is a characteristic lesion substrate.
- The finding is subepithelial and can accompany variable fibrosis and vascularity.
- Histologic appearance should be interpreted in its anatomical context.

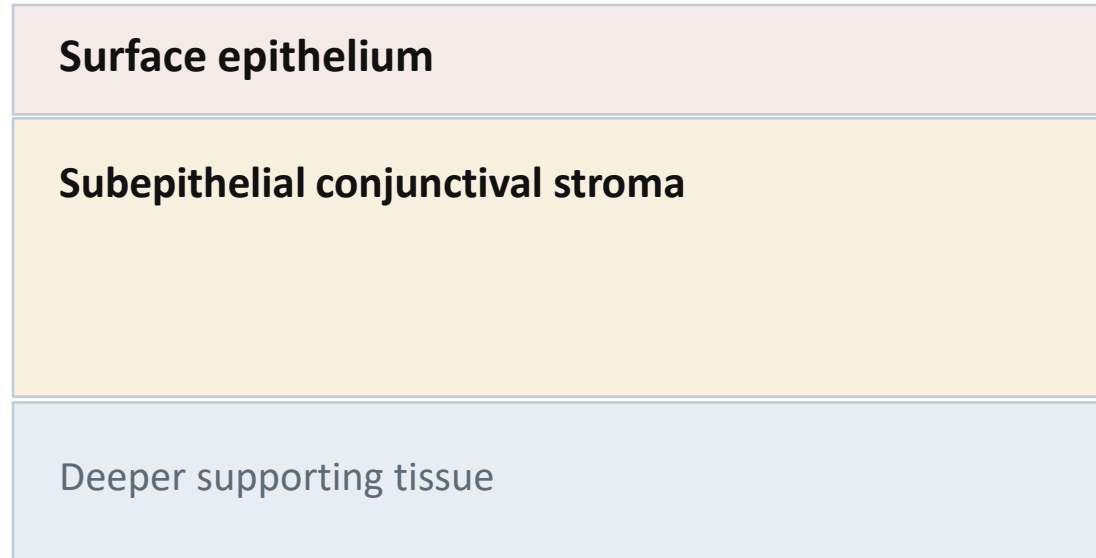
Simplified tissue section



Histology: The pterygium epithelial compartment

- Overlying conjunctival-type epithelium is often reactive.
- Hyperplasia, keratinization, or dysplastic epithelial changes may be present.
- Atypia should not be dismissed as part of ordinary actinic degeneration.

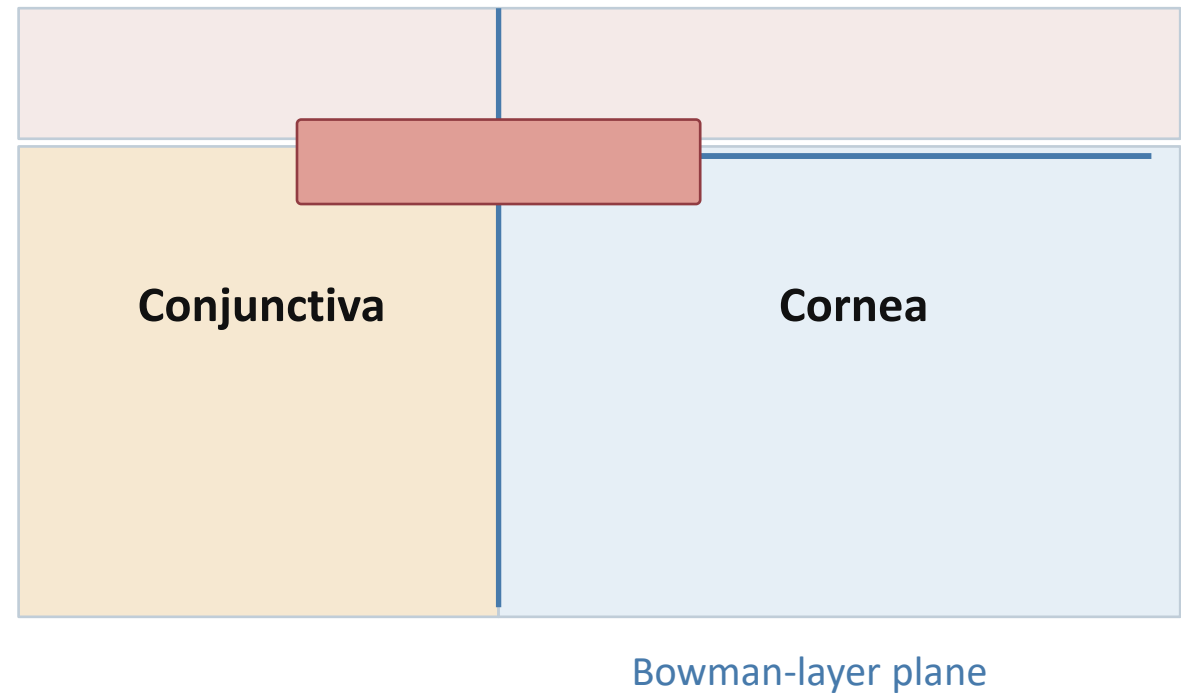
Simplified tissue section



Histology: The advancing corneal interface

- Fibrovascular tissue extends across the limbal boundary.
- Disruption of Bowman layer supports the advancing corneal growth pattern.
- Do not describe this benign stromal advance as malignant invasion.

Conjunctival-to-corneal interface (schematic)



Fibrovascular tissue traverses the limbus

Comparative pathology: One shared substrate, two locations

Dimension	Pinguecula	Pterygium
Gross contour	Focal yellow elevation	Wing-shaped fibrovascular wedge
Corneal involvement	Absent	Present
Stroma	Elastotic / hyalinized	Elastotic + fibrovascular
Bowman layer	No advancing interface	May be disrupted

Benign pterygium and epithelial neoplasia may coexist

- An actinic field can contain more than one pathologic process.
- Some excised pterygia harbor dysplastic epithelial changes.
- Therefore grossly innocuous appearance is not a guarantee of normal epithelium.

Ocular surface squamous neoplasia is a crucial mimic

Dimension	Pterygium	Suspicious for OSSN
Surface	Usually smooth fibrovascular	May show leukoplakia / irregular plaque
Trajectory	Characteristic wing-shaped	Can be atypical / nodular
Diagnosis	Usually clinical	Targeted assessment ± tissue sampling

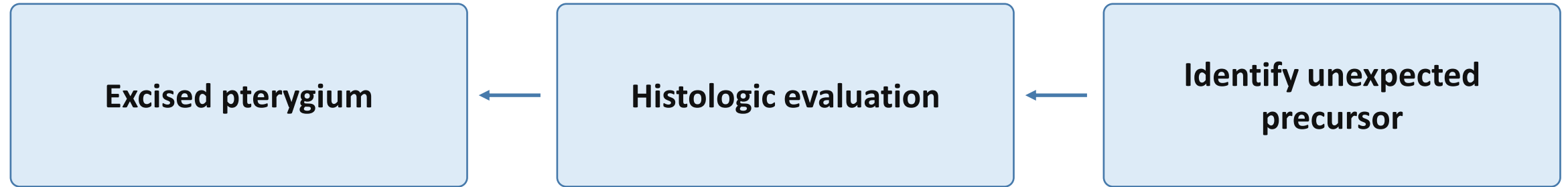
Warning signs must override a reassuring label

- Rapid change, irregular feeder vessels, pronounced leukoplakia, and atypical location warrant attention.
- Unexpected pigmentation demands evaluation for melanocytic lesions.
- A presumed pterygium should not conceal a limbal neoplasm.

Melanocytic lesions belong in the limbal differential

- Conjunctival nevus, melanocytic intraepithelial lesions, and melanoma can affect the ocular surface.
- Pigmentation, unusual elevation, and acquired change alter the differential.
- The distinction requires clinical examination; Some lesions require histopathology.

Why pathology submission is worth considering



Incidental precursor lesions may alter interpretation

Pseudopterygium may follow corneal surface injury

Dimension	True pterygium	Pseudopterygium
Setting	Actinic interpalpebral lesion	Prior injury / inflammation
Distribution	Usually nasal / temporal	May occur at atypical sites
Clinical action	Assess size and progression	Evaluate underlying corneal pathology

Differential diagnosis uses site and tissue behavior

Dimension	Usual finding	Discriminating feature
Pinguecula	Raised yellow-white lesion	No corneal extension
Pterygium	Fibrovascular wedge	Extension across limbus
OSSN	Irregular epithelial plaque	Leukoplakia or atypical growth
Pseudopterygium	Adhesion after surface injury	Scarring or unusual location

Case 1: Incidental yellow-white limbal elevation

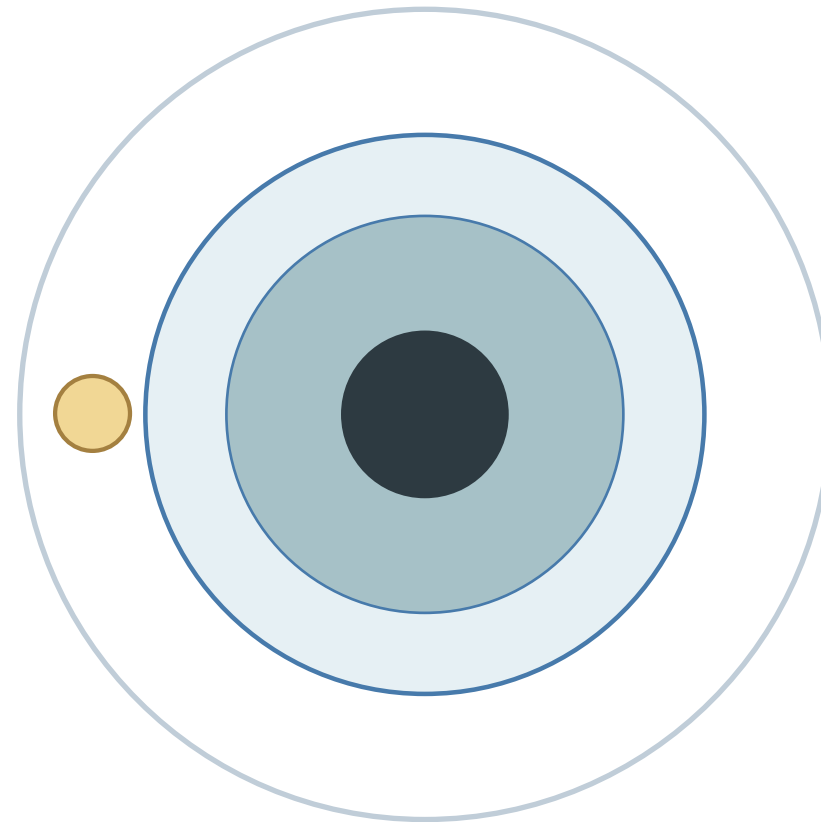
Clinical vignette

- A patient has a small nasal bulbar conjunctival elevation.
- The corneal surface remains uninvolved; Vision is unaffected.
- What single anatomical observation best supports pinguecula?

Case 1: Anatomical boundary resolves the question

- The defining observation is preserved corneal noninvolvement.
- A focal raised yellow-white lesion next to the limbus supports pinguecula.
- In an otherwise typical asymptomatic lesion, observation is appropriate.

Anterior ocular surface — schematic



Conjunctival elevation; No corneal extension

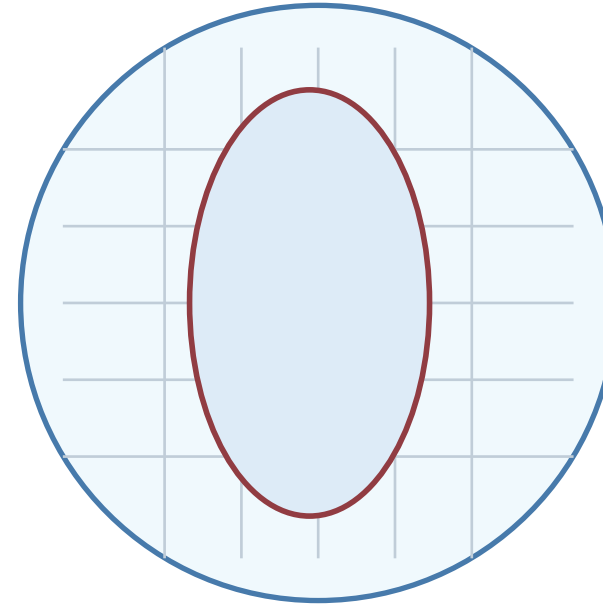
Case 2: Blur with a nasal corneal wedge

Clinical vignette

- A fibrovascular wedge extends from conjunctiva onto the nasal cornea.
- The patient reports progressive blur despite a peripheral-looking lesion.
- Which functional consequence should be assessed before any visual-axis obstruction?

Case 2: Corneal shape explains the blurred vision

- The lesion can distort corneal curvature before reaching the pupil.
- Refraction and corneal topography help characterize the refractive effect.
- Document progression and discuss referral if clinically significant.



Schematic curvature distortion $\neq$ measured topography

Case 3: A presumed pterygium grows atypically

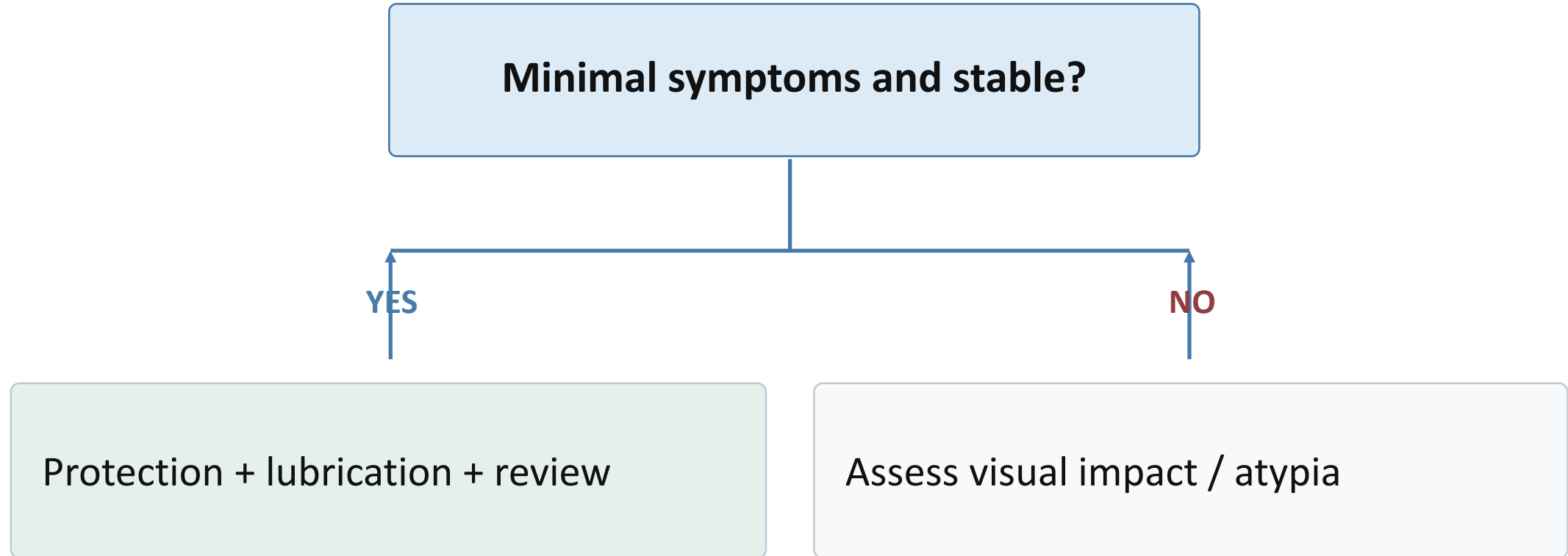
Clinical vignette

- An irregular elevated limbal lesion develops leukoplakia and prominent vessels.
- The change is faster than expected from earlier photographs.
- Which diagnostic alternative must be considered?

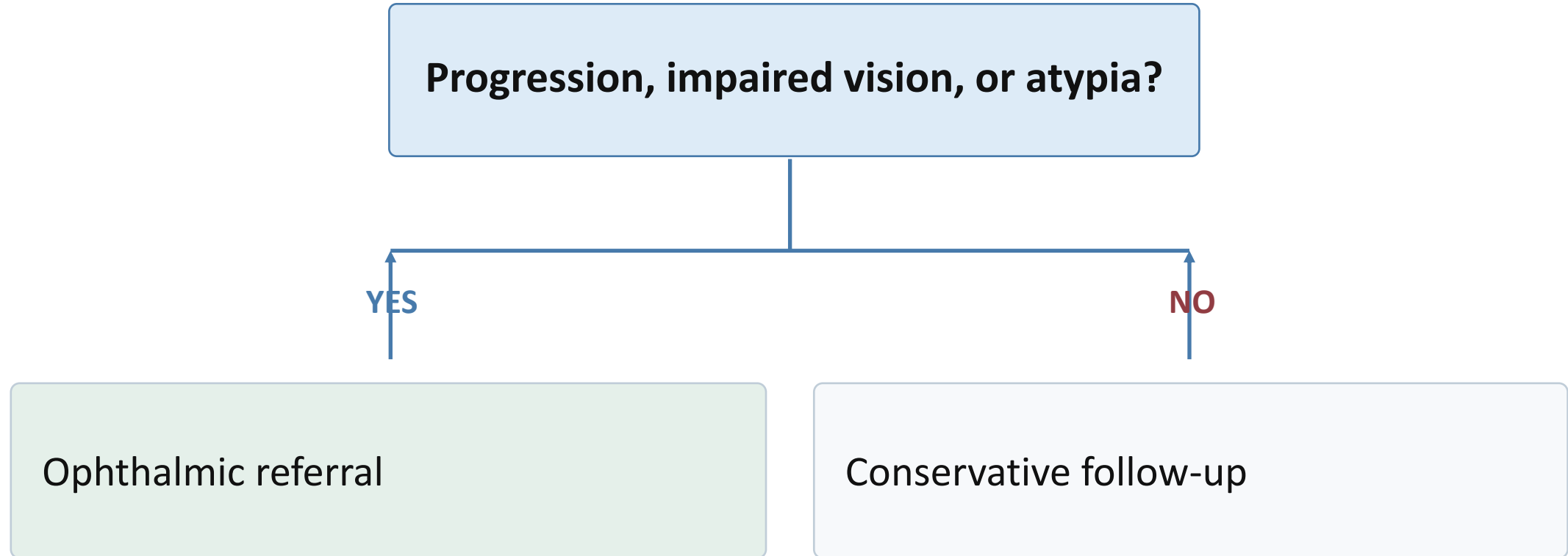
Case 3: Histology must exclude neoplasia

- The lesion requires reassessment rather than labeling it uncomplicated pterygium.
- OSSN is a high-priority epithelial differential.
- If excised or biopsied, submit material for histopathology.

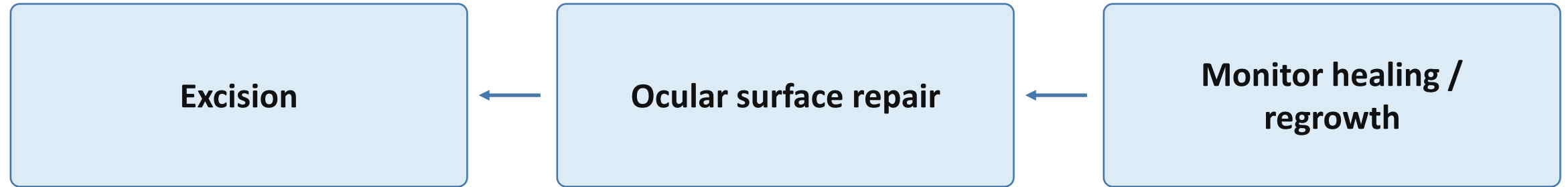
Conservative care targets symptoms, not lesion removal



Surgical referral depends on functional and diagnostic risk



Pterygium excision is not biologically trivial



Recurrence is a recognized wound-healing complication

Follow-up must assess recurrence and ocular surface health

1

Examine the surgical site for recurrent fibrovascular extension.

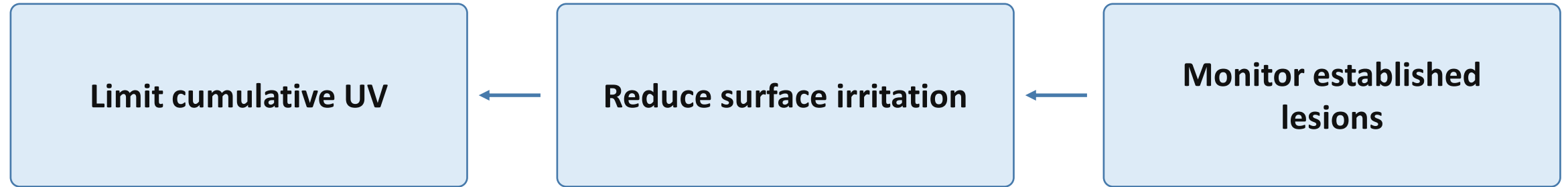
2

Assess corneal surface, scar, inflammation, and refractive change.

3

Maintain UV protection; Do not infer a zero-recurrence guarantee.

Prevention emphasizes ocular UV protection



Protection limits exposure but does not remove an existing lesion

Diagnostic comparison: Three questions decide much

1

Does the lesion enter the cornea?

2

Is its architecture a characteristic fibrovascular wedge?

3

Are there atypical epithelial or melanocytic features?

Clinicopathologic synthesis

- Shared exposure: Chronic actinic ocular surface injury.
- Pinguecula: Conjunctival, yellow-white, non-corneal stromal degeneration.
- Pterygium: Fibrovascular growth onto cornea, with Bowman-layer involvement.
- Atypical lesions and removed tissue deserve assessment for neoplastic precursors.

References and source scope

- Robbins, Cotran & Kumar: Pathologic Basis of Disease, 11th edition, Chapter 29.
- National Eye Institute: ultraviolet exposure and ocular surface lesions.
- NCBI Bookshelf/StatPearls: pterygium clinical assessment and management.
- Austin and colleagues: elastotic changes in pterygium and pinguecula (Ophthalmology, 1983).