

Epithelial or Follicular Inclusion Cyst

A clinicopathologic approach to epidermoid inclusion cysts

Origin and keratinization

Morphologic recognition

Rupture and foreign-body reaction

Differential diagnosis and clinical correlation

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Learning objectives

- Trace epithelial invagination or follicular origin to a keratin-filled cavity.
- Recognize the lining, granular layer, and lamellated keratin on H&E.
- Explain why rupture produces a painful granulomatous response.
- Separate epidermoid cysts from pilar cysts and important mimics.
- Apply histologic findings to clinical management and recurrence.

Placement within benign epithelial lesions

Epithelial lesions

- Derived from epidermal or follicular keratinizing epithelium
- Cystic expansion without neoplastic cytologic features

Boundary of this lecture

- Focus: Epidermoid / follicular inclusion cyst
- Pilar and other cutaneous cysts used as diagnostic comparators
- Appendage tumors are a separate neighboring topic

Terminology: Epidermoid, epidermal, inclusion

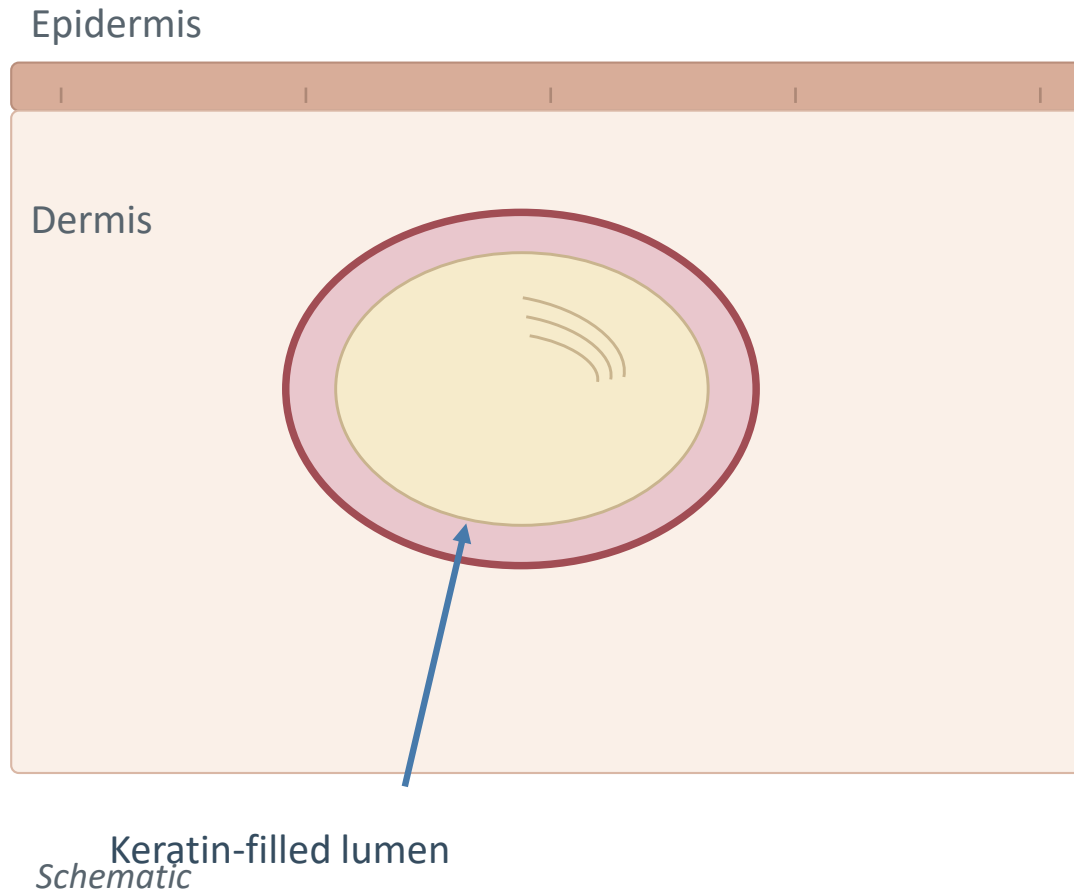
Common terms

- Epidermoid cyst
- Epidermal inclusion cyst
- Infundibular or follicular inclusion cyst

Terminologic caution

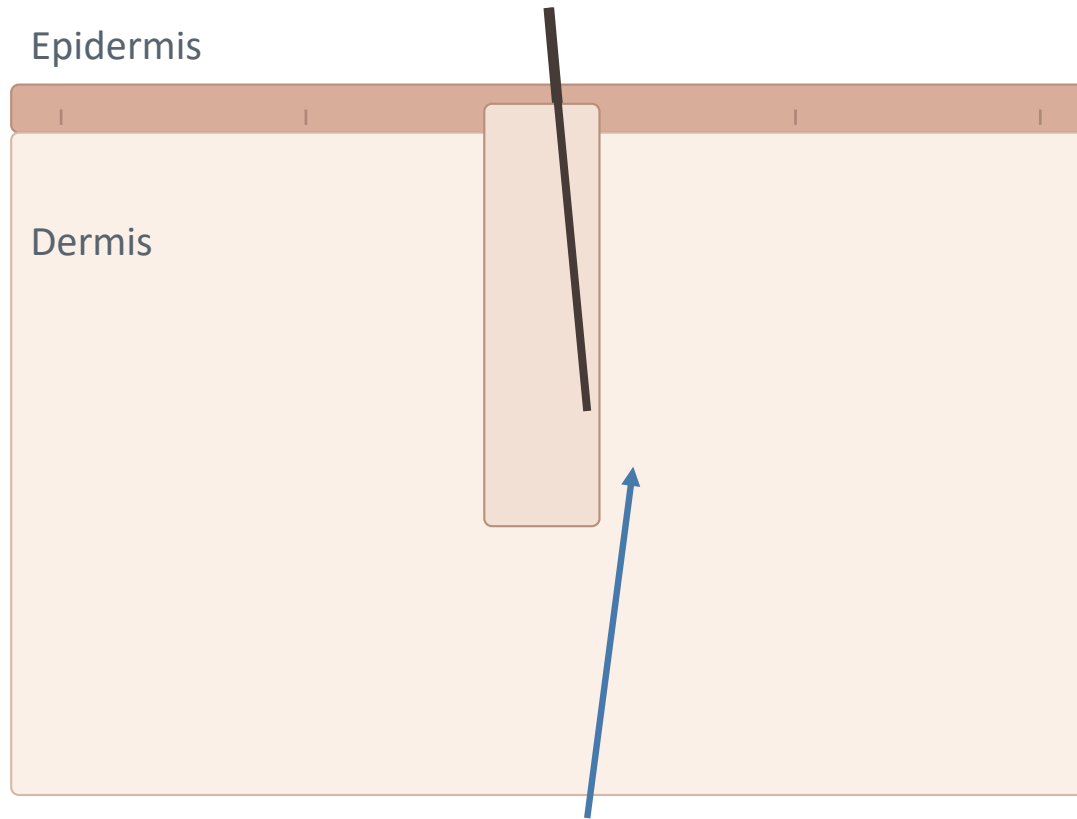
- “Sebaceous cyst” is imprecise for most keratin-filled cysts.
- An epidermoid cyst is not defined by a sebaceous gland lumen.
- Pilar (trichilemmal) cyst is histologically distinct.

Core lesion: An epithelial sac containing keratin



- Benign cystic structure within dermis or subcutis.
- Epithelial lining makes keratin continuously.
- Retained keratin expands the lumen rather than escaping to the surface.

Skin and follicle: Relevant normal architecture

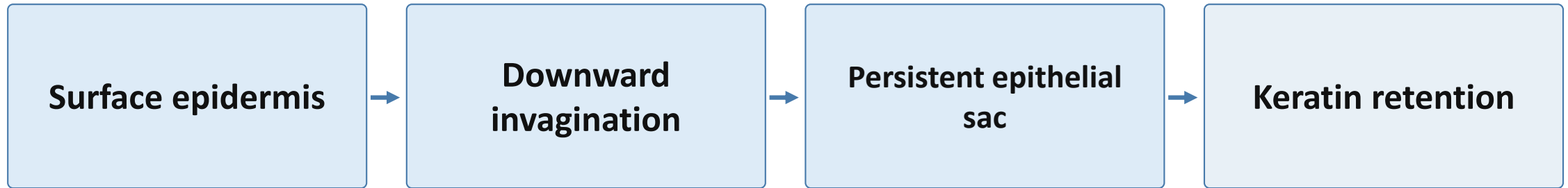


- Surface epidermis undergoes squamous keratinization.
- Follicular infundibulum connects the hair follicle to the epidermal surface.
- Both structures can provide keratinizing epithelial cells.

Schematic

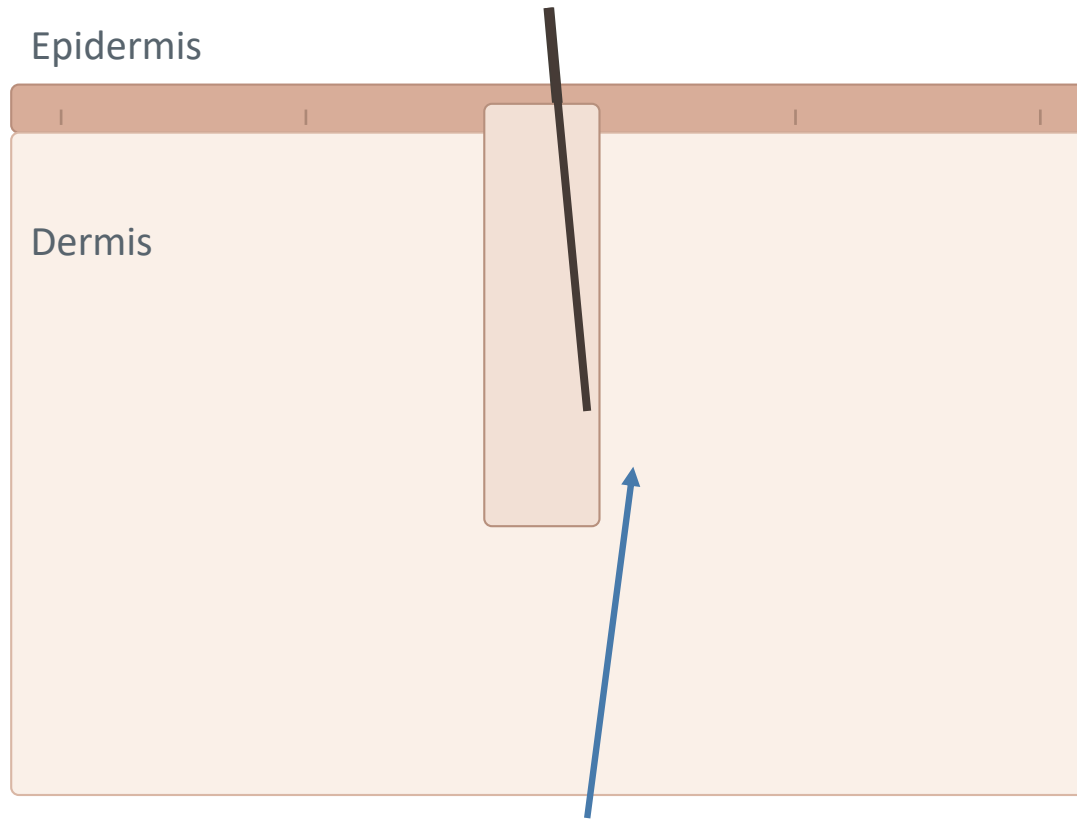
Follicular infundibulum

Pathway 1: Epidermal invagination



An inclusion can be formed when epidermis invaginates and cystically expands.

Pathway 2: Follicular infundibular origin

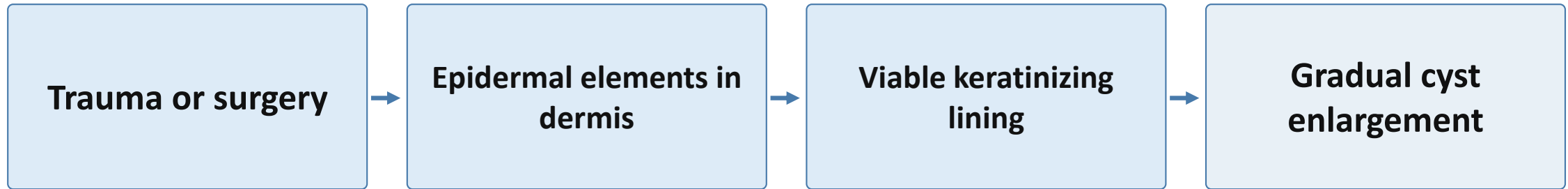


Schematic

Follicular infundibulum

- Follicular epithelium can form the cyst wall.
- Keratin produced by the lining becomes trapped in a closed space.
- The lesion may retain communication with the surface as a punctum.

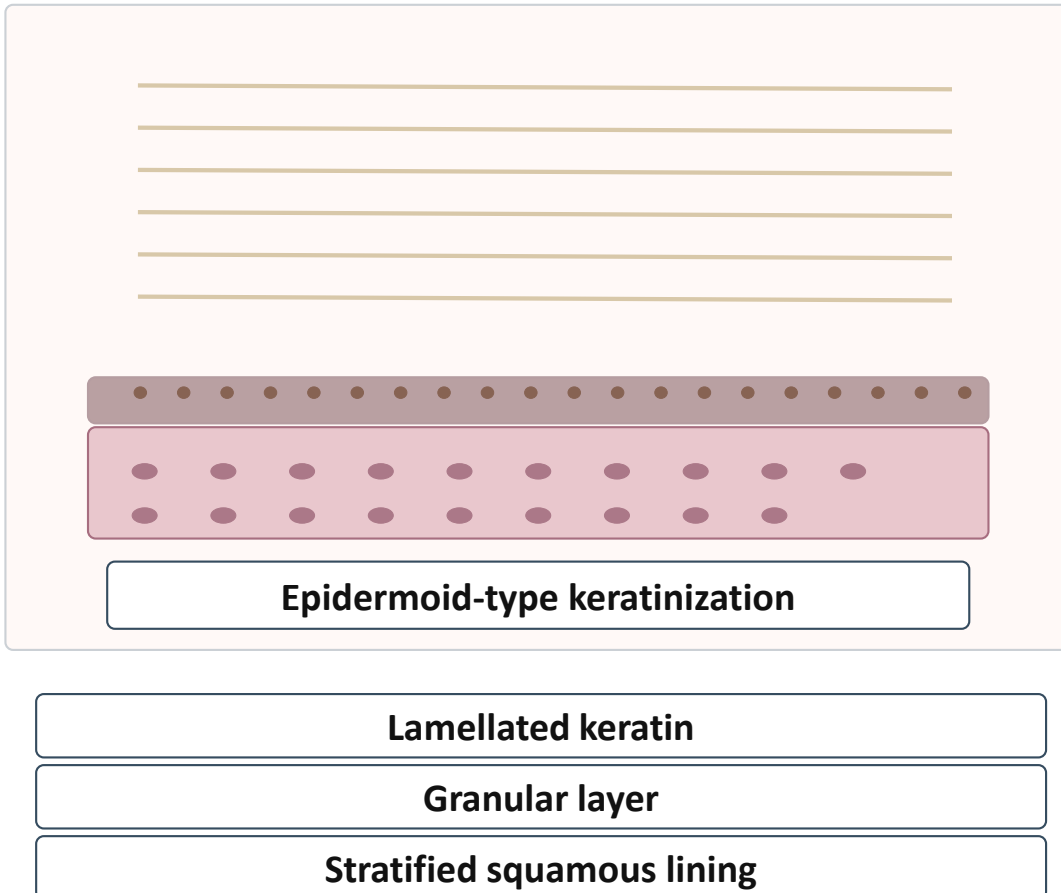
Pathway 3: Implanted epidermis after injury



Acquired inclusion is an additional clinical mechanism, not described in the brief Robbins excerpt.

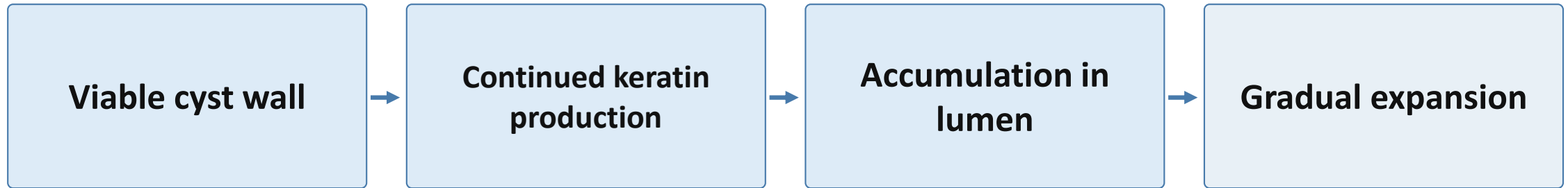
Keratinization is the engine of cyst growth

Schematic



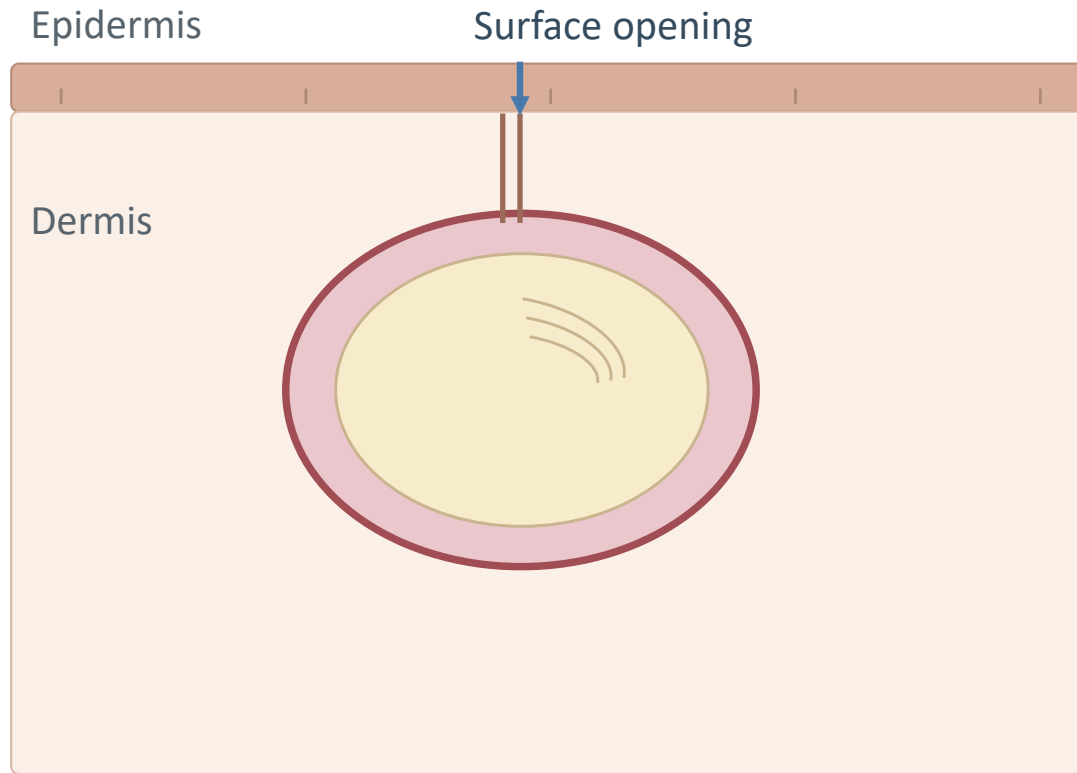
- The cyst lining resembles epidermal keratinizing squamous epithelium.
- Cells mature toward a granular layer and form orthokeratin.
- Keratin accumulates as laminated, largely acellular material.

Why the lesion enlarges slowly



Slow expansion reflects retained epithelial keratin, not evidence of malignancy.

The punctum: Residual surface connection



Schematic

- A central punctum may mark the follicular opening.
- A punctum supports an epidermoid cyst but is not universally present.
- Examination must still consider site, mobility, depth, and inflammation.

Clinical distribution and superficial anatomy

Typical sites

- Face and neck
- Trunk
- Other hair-bearing skin

Clinical assessment

- Determine dermal versus subcutaneous location.
- Look for a central punctum.
- Document growth pattern, tenderness, drainage and recurrence.

Intact lesions: Expected examination

- Usually a slow-growing, well-demarcated dermal or subcutaneous nodule.
- Often mobile relative to deeper structures.
- Skin-colored surface with or without a visible punctum.
- Typically painless until inflammation, irritation or rupture develops.

Symptoms arise from consequences, not atypia

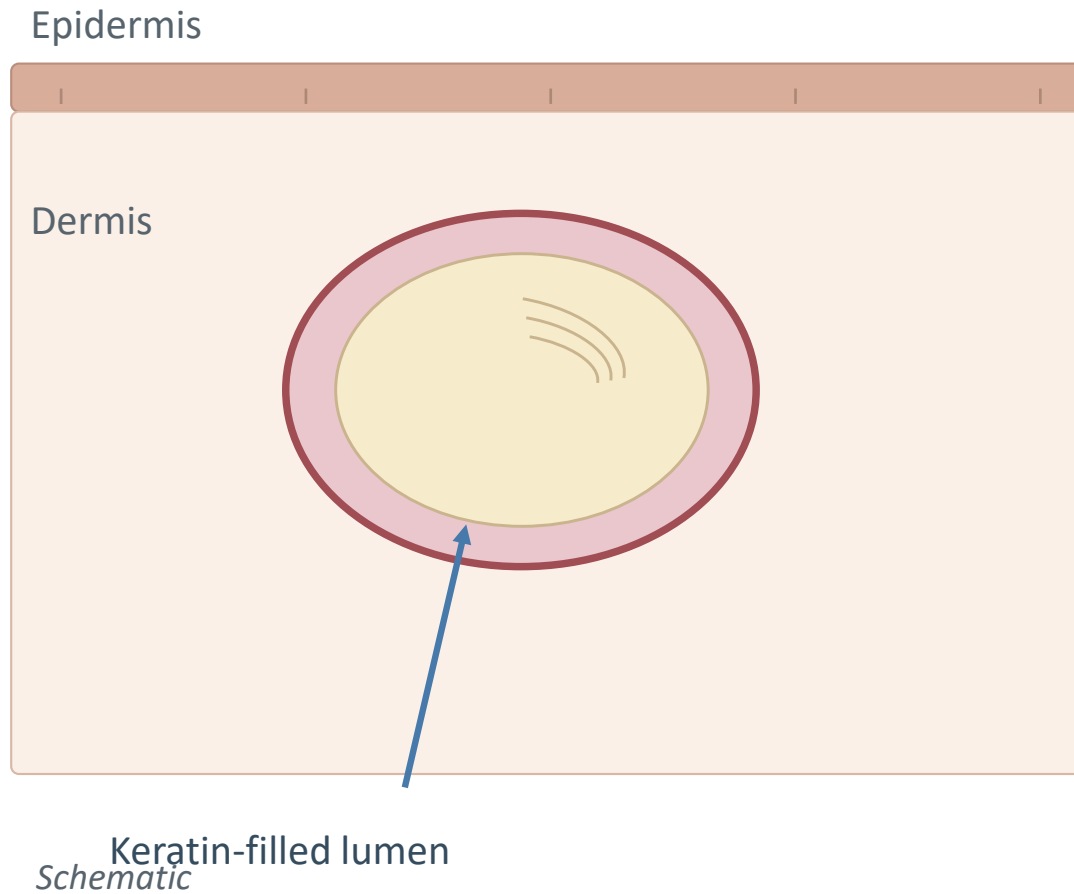
Uncomplicated cyst

- Gradual size increase
- Cosmetic concern or friction
- Occasional spontaneous drainage

Complicated cyst

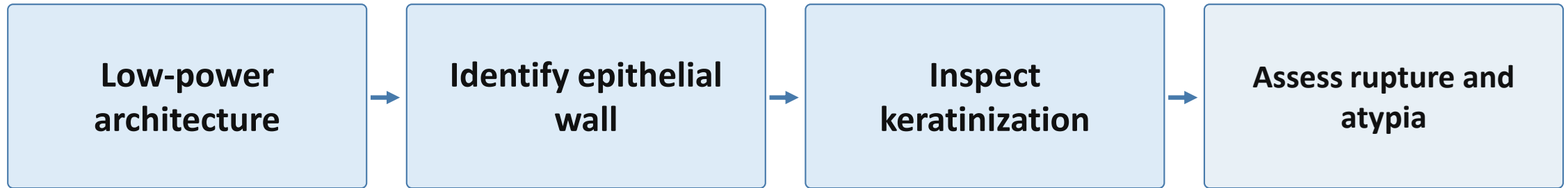
- Tender swelling
- Erythema and warmth
- Sudden change after rupture
- Possible secondary bacterial infection

Gross concept: A cavity filled with keratin



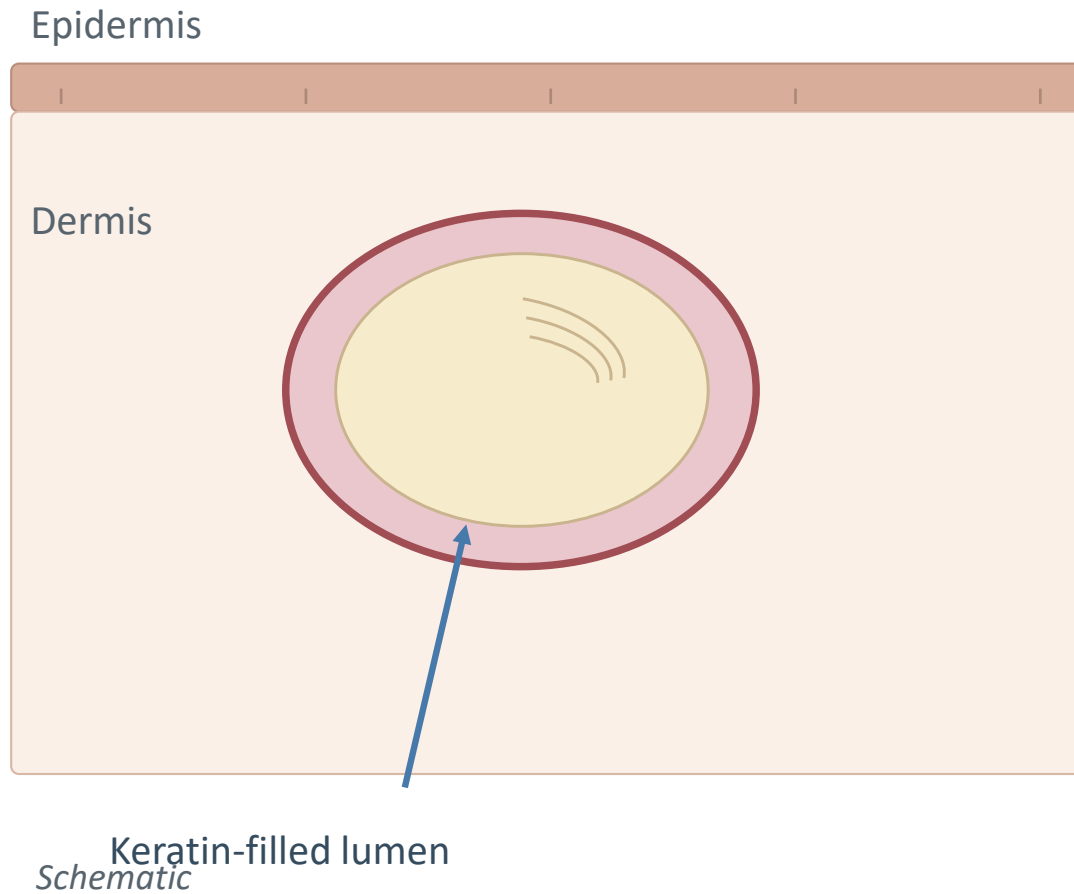
- A cyst wall encloses whitish, pasty or keratinaceous debris.
- The gross cut surface does not alone determine the precise cyst type.
- Definitive classification depends on epithelial lining and contents.

A pathology-oriented reading sequence



Use the same sequence on excision and biopsy material.

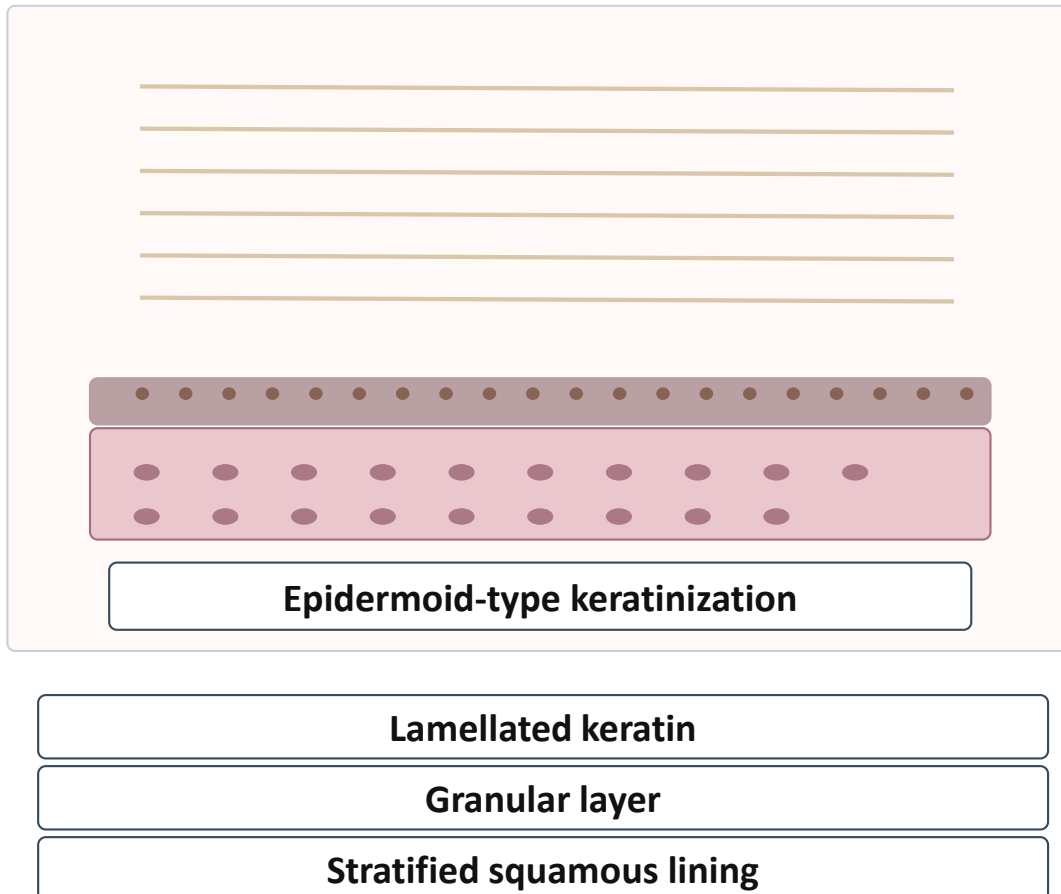
Low-power signature of an intact epidermoid cyst



- Well-circumscribed cystic cavity embedded in dermis.
- Epithelial lining surrounds the keratinous center.
- Architecture is usually unilocular; Adjacent dermis may be unremarkable.

Cyst wall: Stratified squamous epithelium

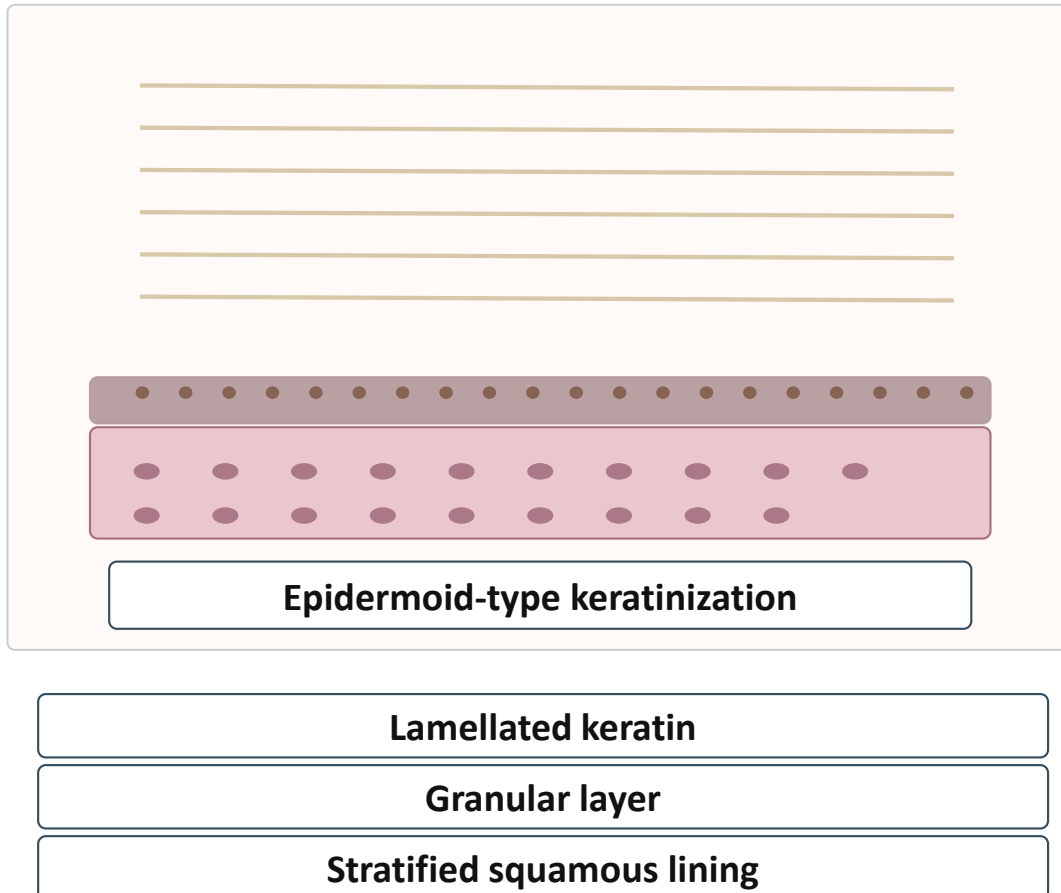
Schematic



- Basal and suprabasal squamous layers line the lumen.
- The lining resembles epidermis but does not form ordinary rete ridges.
- Preserved maturation favors a conventional benign inclusion cyst.

Granular layer is a key discriminator

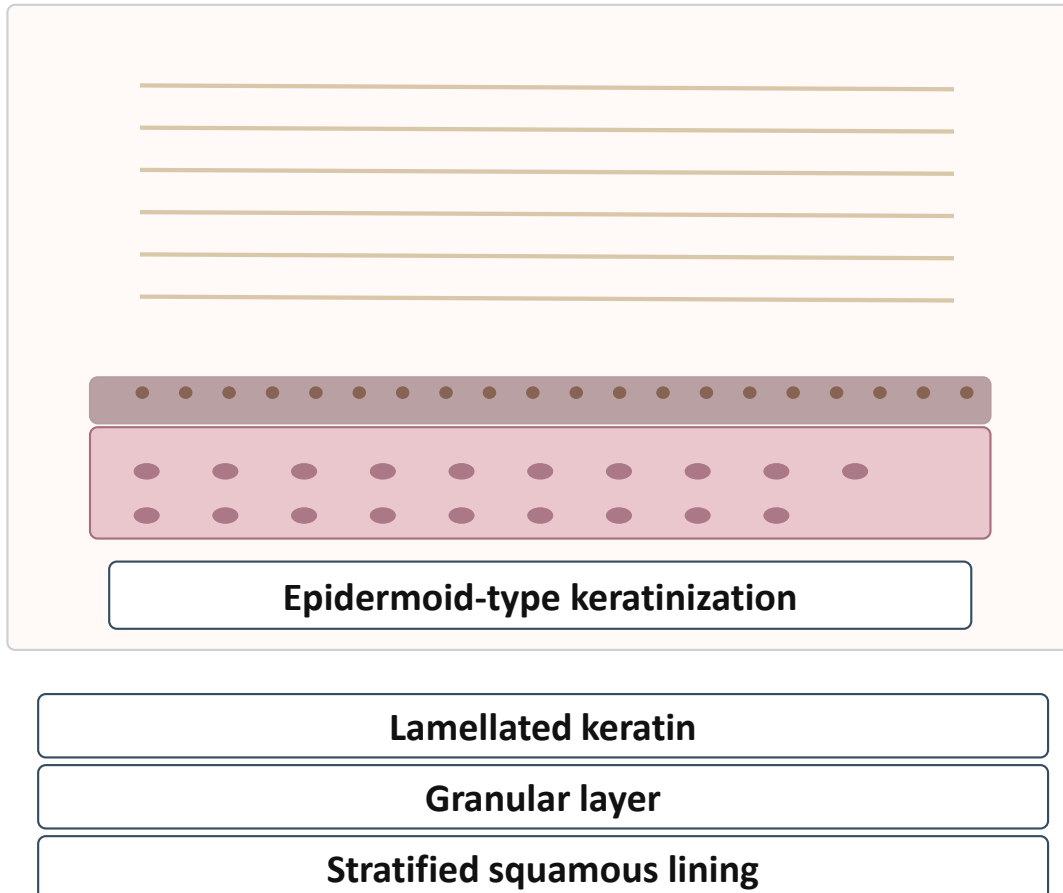
Schematic



- Keratohyalin granules are visible beneath the keratin layer.
- Their presence supports epidermoid-type keratinization.
- Absence of a granular layer redirects the differential toward a pilar cyst.

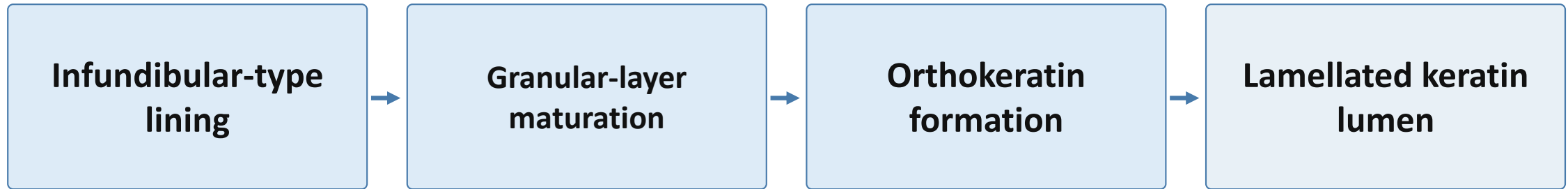
Lamellated orthokeratin in the lumen

Schematic



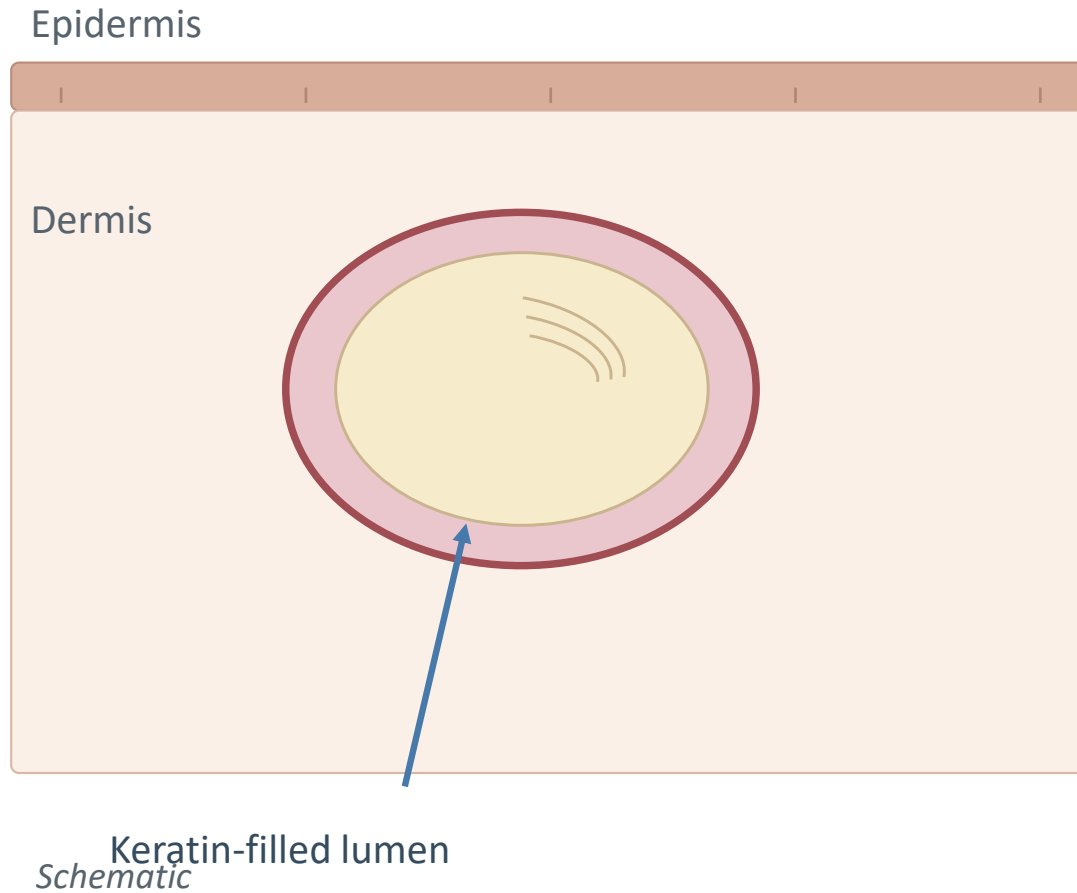
- Keratin forms successive layered flakes in the central cavity.
- The material is predominantly acellular in an intact lesion.
- Lamellation and the granular layer are a paired diagnostic clue.

Anatomy explains the microscopic pattern



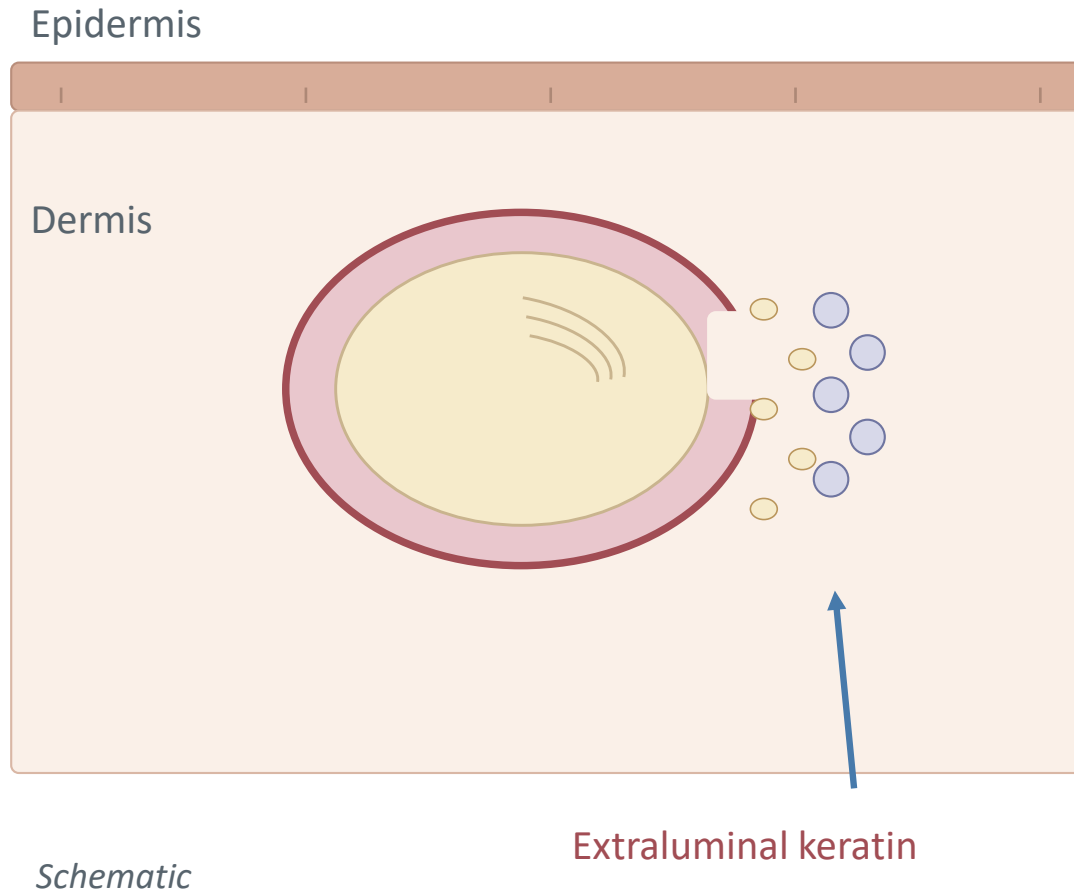
The central morphology follows directly from epithelial differentiation.

Large cysts are especially vulnerable to rupture



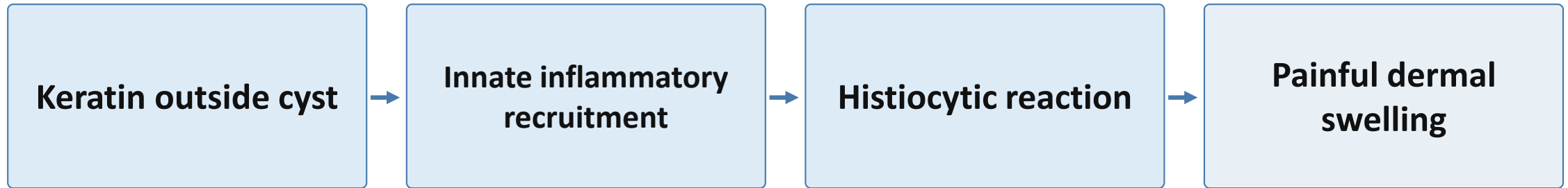
- Progressive expansion can thin or stretch the cyst wall.
- Mechanical trauma may break the lining.
- Loss of cyst-wall integrity exposes retained keratin to the dermis.

Rupture: Keratin moves outside the lumen



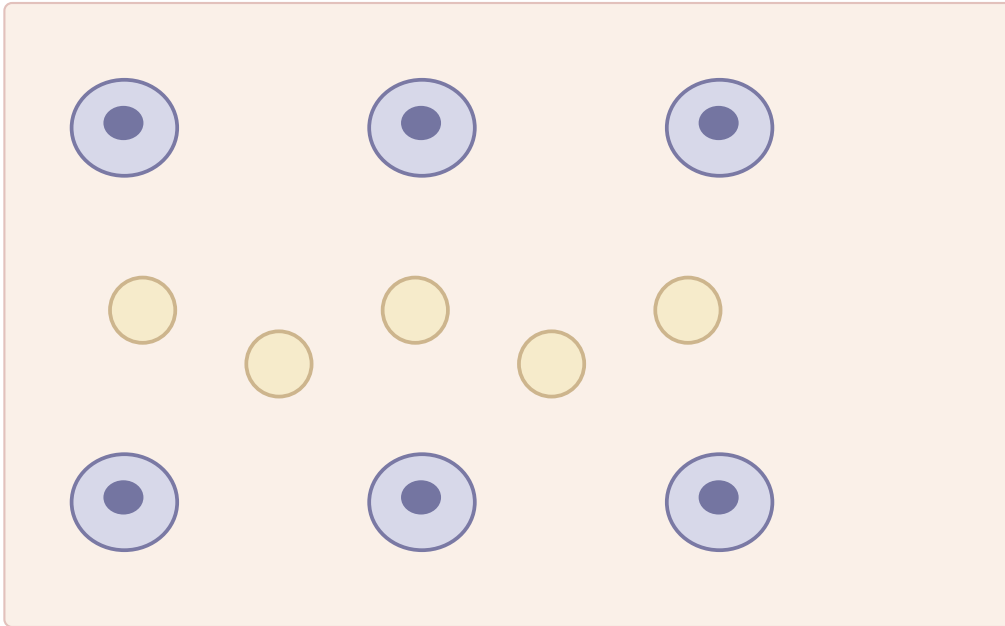
- A breach in the epithelial lining releases keratin fragments.
- Extraluminal keratin contacts dermal connective tissue.
- The material provokes a host inflammatory reaction.

Why keratin can provoke severe inflammation



Sterile keratin spillage alone can produce marked inflammation.

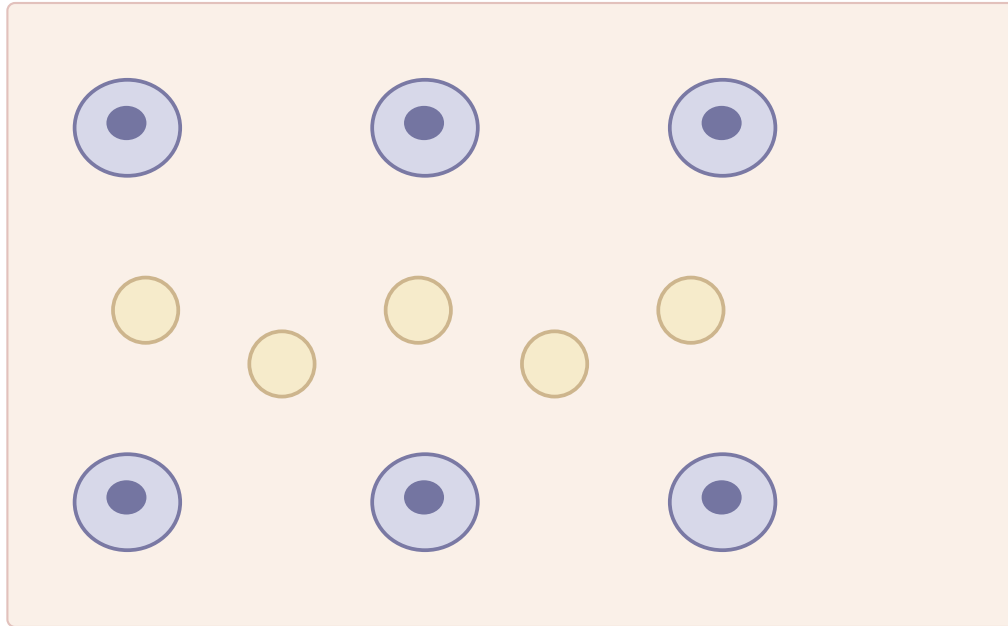
Early rupture can be neutrophil-rich



Schematic

- Neutrophils may collect around newly extruded keratin.
- Clinically, the lesion can resemble an acute abscess.
- Histology must be interpreted alongside evidence of bacterial infection.

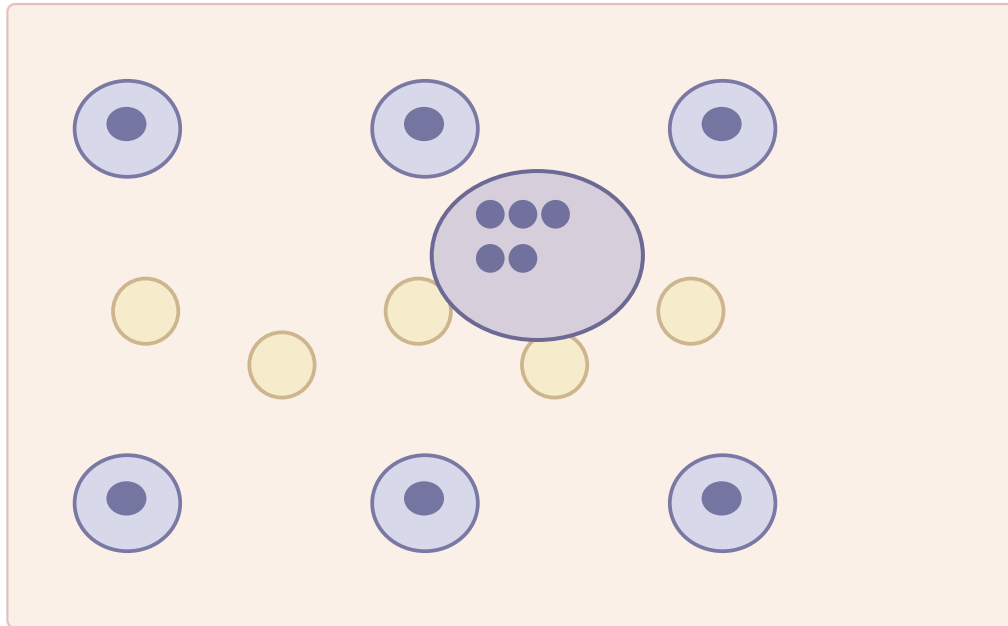
Persistent keratin elicits foreign-body inflammation



Schematic

- Macrophages accumulate around extracellular keratin fragments.
- Multinucleated foreign-body giant cells may form.
- The response can outlast the acute neutrophilic component.

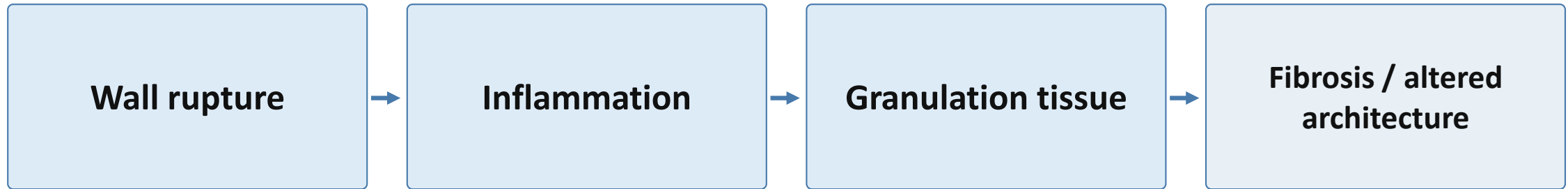
Giant cells encircle difficult-to-clear debris



Schematic

- Foreign-body giant cells are fused macrophage-lineage cells.
- They frequently appear adjacent to irregular keratin fragments.
- They indicate a reaction to extravasated contents, not a cyst-specific tumor marker.

Subsequent healing may produce fibrosis



The epithelial lining can be partly or entirely obscured in an old rupture.

Ruptured cysts may lose their diagnostic lining

Intact lesion

- Continuous squamous lining
- Visible granular layer
- Central laminated keratin

Ruptured lesion

- Lining partly destroyed
- Extraluminal keratin shards
- Neutrophils, histiocytes and giant cells
- Granulation tissue and fibrosis

Clinical inflammation is not synonymous with infection

Sterile rupture

- Keratin induces foreign-body inflammation.
- Redness, swelling and pain can occur without bacteria.
- Antibiotics are not automatically indicated.

Secondary infection

- Consider purulence, progressive cellulitis or systemic symptoms.
- Assess and treat as an infection when clinically established.
- The two processes can coexist.

Diagnostic trap: Keratin granuloma without intact wall

Available clues

- Laminated keratin fragments in dermis
- Foreign-body-type giant cells
- Residual squamous wall, if present

What not to assume

- Do not require an intact wall in every ruptured case.
- Do not diagnose a specific cyst subtype from inflammation alone.
- Maintain the malignant differential if atypical epithelium is present.

Clinical differential: A subcutaneous nodule

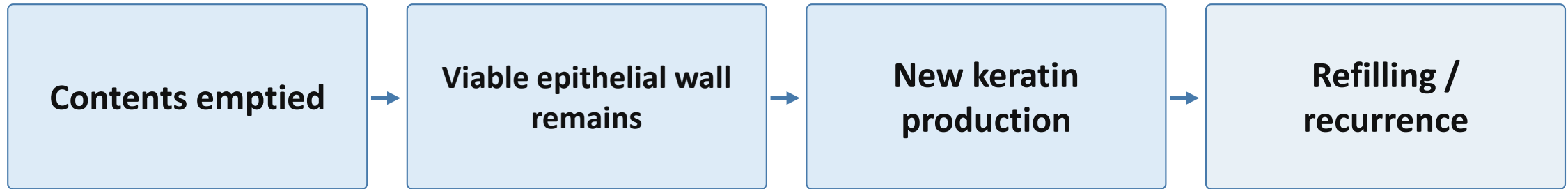
Cystic or inflammatory

- Epidermoid inclusion cyst
- Trichilemmal cyst
- Dermoid cyst
- Inflamed follicular lesion or abscess

Other masses

- Lipoma
- Pilomatricoma
- Steatocystoma
- Rare cystic neoplasm or carcinoma

The retained wall explains recurrence



Drainage of contents is not equivalent to removal of the cyst-generating lining.

Pilar cyst: An important clinical comparator

Clinical setting

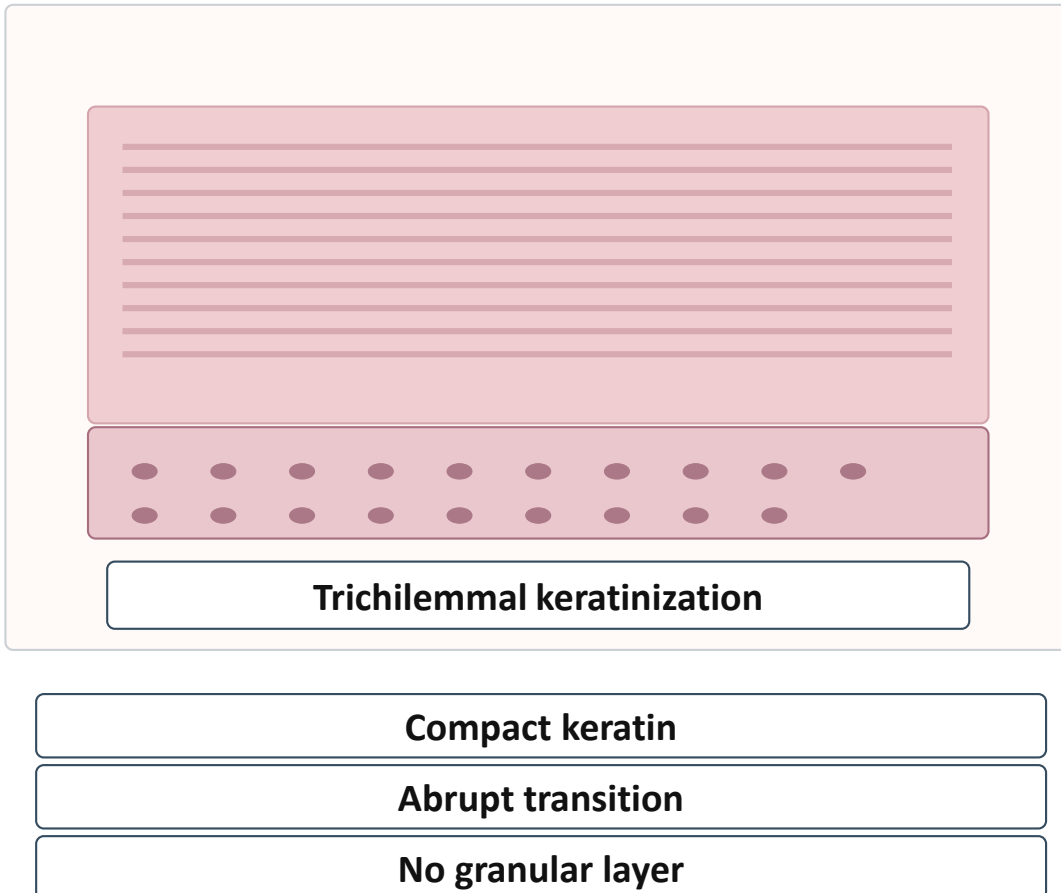
- Commonly occurs on the scalp
- May present as multiple firm nodules
- Usually lacks a central punctum

Conceptual contrast

- Differentiates toward outer root sheath
- Matures via trichilemmal keratinization
- A separate benign follicular cyst type

Pilar cyst: Abrupt keratinization

Schematic



- Squamous lining transitions abruptly into dense compact keratin.
- A conventional granular layer is absent.
- Central keratin is more homogeneous and eosinophilic than lamellar epidermoid keratin.

Epidermoid versus pilar cyst

Feature	Epidermoid cyst	Pilar cyst
Typical location	Face, neck, trunk	Scalp predominant
Surface punctum	Often identifiable	Usually absent
Granular layer	Present	Absent
Keratin	Loose, laminated	Dense, compact
Wall response	Rupture can occur	Wall often thicker

Milia: Miniature epidermoid cysts

Clinical distinction

- Tiny superficial whitish papules
- Often appear in clusters
- Substantially smaller than a typical nodule

Microscopic relationship

- Keratin-filled epithelial cyst
- Epidermoid-type keratinization
- Size and location guide clinical nomenclature

Dermoid cyst: Adnexal elements in the wall

Epidermoid cyst

- Squamous lining and keratin contents
- No requirement for cutaneous appendages in wall

Dermoid cyst

- May contain hair follicles and sebaceous glands in wall
- Often associated with developmental location
- Depth and anatomy can affect surgical evaluation

Steatocystoma: Sebaceous wall differentiation

Steatocystoma

- Folded epithelial wall
- Sebaceous glands attached to cyst wall
- Distinct from a simple epidermoid cyst

Interpretation

- Examine entire lining where possible.
- Recognize mature sebaceous lobules if present.
- Do not infer sebaceous origin from the colloquial term “sebaceous cyst”.

Pilomatricoma: Another follicular mass

Clinical clue

- Often firm or rock-hard
- Calcification may be prominent
- Can be mistaken clinically for a cyst

Histologic clue

- Basaloid hair-matrix cells
- Anucleate shadow (“ghost”) cells
- Not a simple epidermoid lining with layered orthokeratin

Lipoma and abscess: Practical clinical mimics

Feature	Lipoma	Abscess / inflamed cyst
Typical consistency	Soft and fatty	Tender or fluctuant
Punctum	Not characteristic	May be seen in ruptured cyst
Key diagnostic issue	Adipose mass versus cyst	Sterile keratin versus true infection
Histology	Mature adipocytes	Inflammation ± residual keratin sac

A structured cutaneous cyst differential

Keratin-filled dermal cyst?

- Granular layer present
- Lamellated keratin
- Favor epidermoid cyst

- Granular layer absent
- Compact keratin
- Consider pilar cyst

Routine diagnosis is predominantly morphologic

- Clinical appearance may identify an uncomplicated lesion.
- For submitted tissue, H&E morphology usually establishes the cyst type.
- Special studies are generally unnecessary for typical epidermoid cysts.
- Use ancillary testing only for a specific unresolved differential.

Atypia and infiltration require a separate assessment

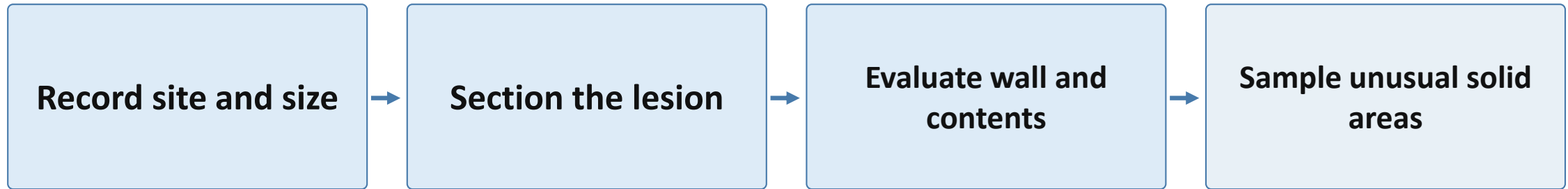
Reactive possibilities

- Ulceration or prior rupture
- Repair-associated epithelial changes
- Inflammatory distortion

Features needing scrutiny

- Unequivocal cytologic atypia
- Infiltrative epithelial nests
- Destructive stromal invasion
- Discordant clinical behavior

Gross examination: Protect diagnostic architecture



Pathology processing should preserve the wall and any abnormal interface.

Useful elements of a pathology report

Positive findings

- Epidermoid (epidermal inclusion) cyst
- Location or site
- Intact or ruptured status
- Associated inflammation

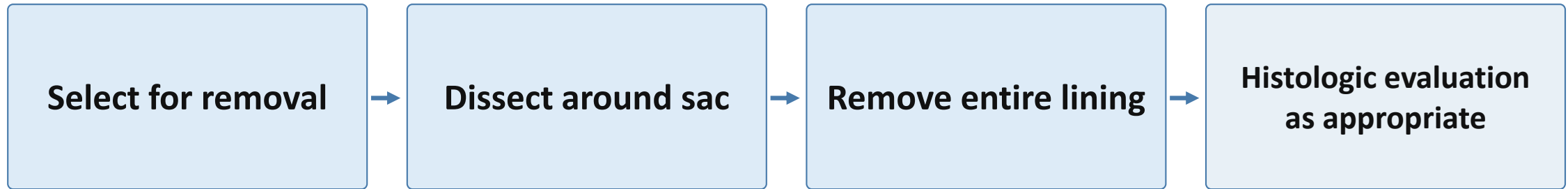
As indicated

- Margin or completeness where relevant
- Unexpected solid epithelial proliferation
- Cytologic atypia and invasion if present
- Clinicopathologic discordance

Observation is reasonable for an uncomplicated cyst

- A small, asymptomatic, clinically typical cyst may not require immediate removal.
- Discuss growth, irritation, cosmetic concerns and diagnostic uncertainty.
- Escalate evaluation for atypical or changing lesions.

Complete excision addresses the cyst-generating wall



Removing the epithelium reduces the chance of keratin reaccumulation.

Inflamed cyst: Recognize the state before intervention

Acute inflammation

- Rupture may create marked tenderness.
- Dissection may be difficult while inflamed.
- Definitive removal may be deferred until settled.

Evidence of infection

- Look for spreading erythema or systemic symptoms.
- Treat bacterial infection when clinically supported.
- Incision and drainage alone may leave the cyst wall.

Management logic: Presentation determines the next step

Typical epidermoid cyst?

- Asymptomatic
- Observe or elective removal
- Review if new changes occur

- Inflamed / atypical
- Assess infection and red flags
- Plan appropriate intervention

Case 1: Mobile nodule with a punctum

Clinical vignette

An adult has a gradually enlarging, mobile skin-colored nodule on the upper back. A small central opening is visible. It is not painful.

Which mechanism and histologic signature best fit this presentation?

Gradual growth

Hair-bearing site

Punctum without inflammation

Case 1: Anatomy predicts the slide findings

Likely diagnosis

- Epidermoid inclusion cyst
- Follicular infundibular origin is plausible
- No clinical evidence of rupture

Expected H&E pattern

- Stratified squamous cyst lining
- Granular layer retained
- Lamellated keratin in lumen

Case 2: Sudden painful enlargement

Clinical vignette

A long-standing small neck nodule becomes acutely tender and red after friction. Excision shows keratin fragments among histiocytes and multinucleated giant cells.

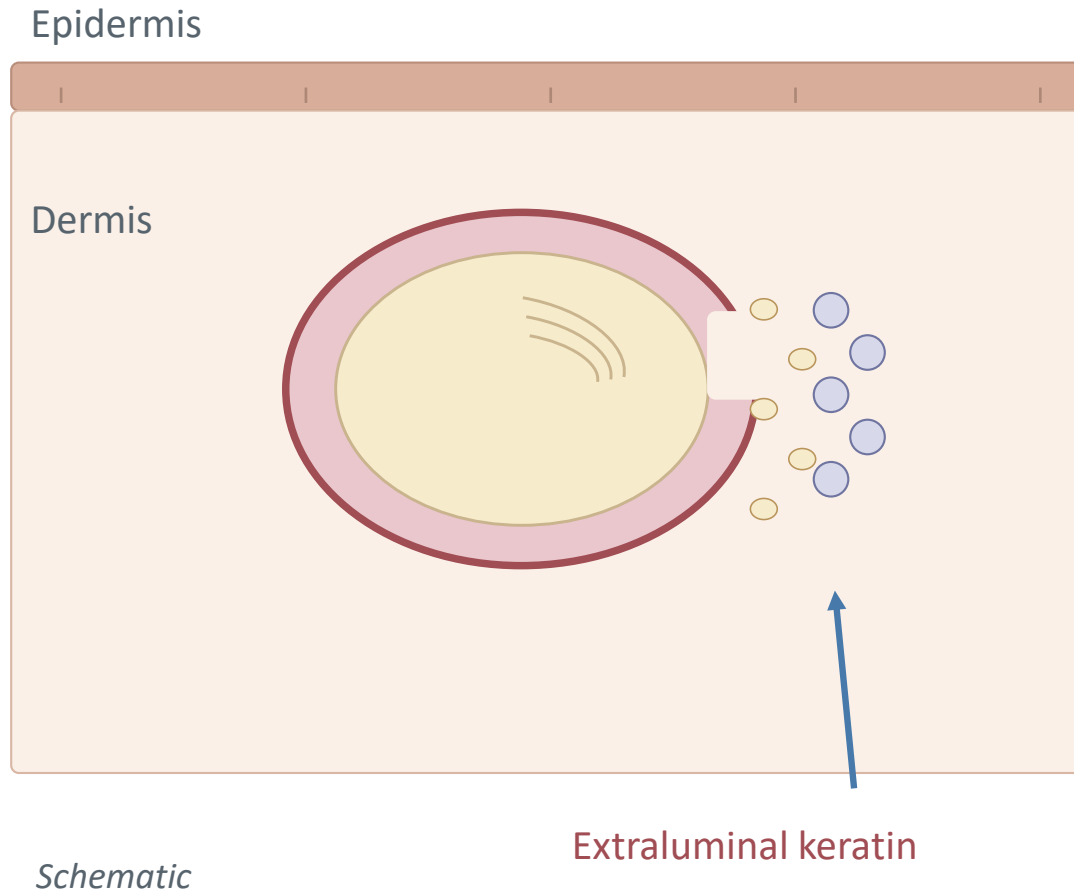
What pathophysiologic event unifies the clinical and microscopic changes?

Trauma preceded symptoms

Extraluminal keratin

Granulomatous foreign-body
reaction

Case 2: Pain follows keratin spillage



- The pre-existing cyst wall ruptured.
- Keratin entered the dermis and initiated inflammation.
- Symptoms do not by themselves establish bacterial infection.

Case 3: Firm scalp nodules without puncta

Clinical vignette

Several firm, mobile scalp nodules lack visible puncta. Histology shows a stratified squamous wall that keratinizes abruptly without a granular layer.

Which follicular cyst subtype is favored?

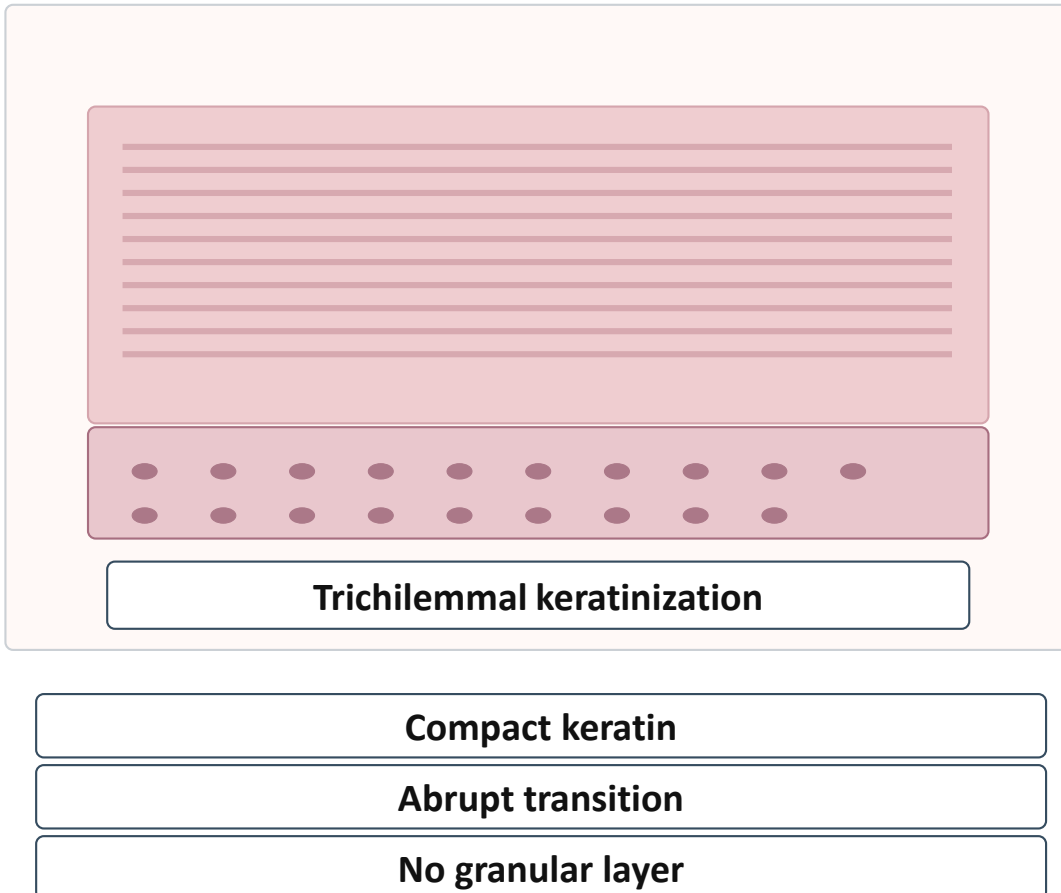
Scalp predilection

No punctum

Absent granular layer

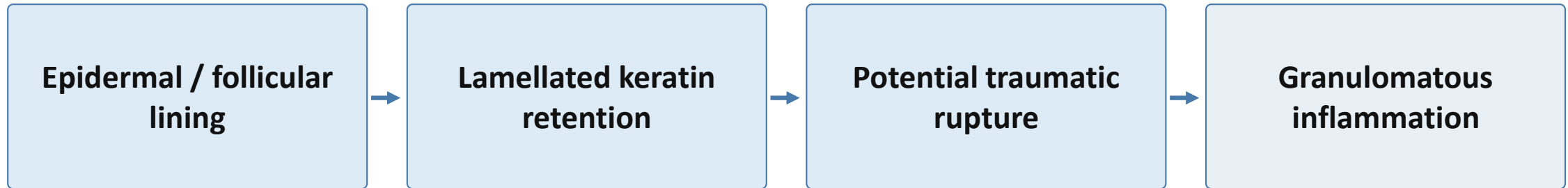
Case 3: The granular layer separates cyst types

Schematic



- Diagnosis: Trichilemmal (pilar) cyst.
- Outer-root-sheath-type keratinization lacks a granular cell layer.
- Dense, compact luminal keratin contrasts with epidermoid lamellae.

Synthesis: Wall → keratin → rupture → reaction



The important diagnostic distinction is keratinization; The important complication is rupture.

Selected references

Robbins, Cotran & Kumar. Pathologic Basis of Disease. 11th ed. (2026), Ch. 25, p. 1038.

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