

Miscellaneous Tumors of the Lung

Pulmonary hamartoma • Lymphangioleiomyomatosis • Inflammatory myofibroblastic tumor

Mediastinal masses and patterns of pulmonary metastasis

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Learning objectives

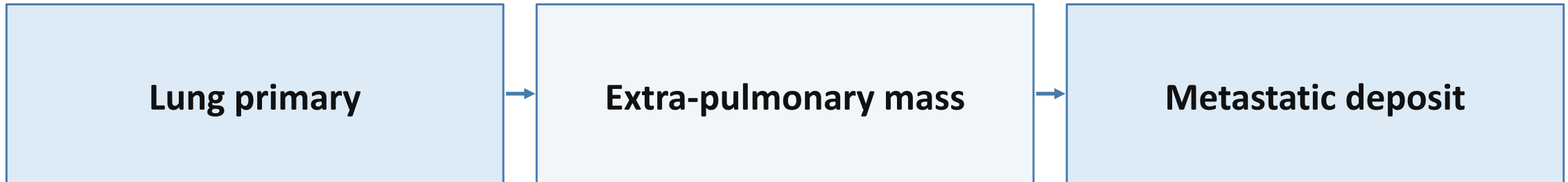
- Classify less-common primary pulmonary lesions and recognize pulmonary metastases.
- Relate hamartoma, lymphangioleiomyomatosis, and inflammatory myofibroblastic tumor morphology to pathogenesis.
- Distinguish principal patterns of mediastinal masses and secondary pulmonary spread.
- Apply morphology, clinical context, and molecular findings without overinterpreting a single clue.

A heterogeneous group—not one tumor family



- The heading gathers tumors with different tissues of origin and behavior.
- Hamartoma, lymphangioleiomyomatosis, and inflammatory myofibroblastic tumor receive focused coverage.
- The associated unit also includes hematolymphoid lesions and metastatic spread.

The first distinction is anatomic origin



- An intrapulmonary lesion is not necessarily a primary epithelial lung cancer.
- Mediastinal lesions may compress or invade lung without originating within parenchyma.
- A deposit from another organ can appear as a solitary pulmonary nodule.

Mesenchymal tumors occur in the lung

- The lung can harbor rare benign and malignant mesenchymal tumors.
- Named examples include fibrous, smooth-muscle, adipocytic, vascular, and cartilaginous neoplasms.
- This diverse group should not be conflated with common primary pulmonary carcinomas.

Fibrous or smooth muscle

Fat or cartilage

Vascular tissue

Schematic — not a histologic specimen

Examples of benign pulmonary mesenchymal tumors

Type	Examples / tissue association
Fibrous	Fibroma
Smooth muscle	Leiomyoma
Adipocytic	Lipoma
Vascular	Hemangioma
Cartilaginous	Chondroma

These are examples listed, not a comprehensive classification.

Examples of malignant pulmonary mesenchymal tumors

Tumor	Named lineage
Fibrosarcoma	Fibrous differentiation
Leiomyosarcoma	Smooth-muscle differentiation

Uncommon entities are named in the source; No grading system is supplied in this section.

Hematolymphoid tumors may involve the lung

- Pulmonary hematolymphoid tumors resemble counterpart lesions in other organs.
- Lung involvement may be isolated, but often occurs with generalized disease.
- Thus, the pulmonary mass or infiltrate may represent part of a systemic process.

Pulmonary isolated

Lung in systemic disease

Classify tissue lineage

Schematic — not a histologic specimen

Named hematolymphoid and histiocytic lesions

Group	Robbins examples
Histiocytic	Langerhans cell histiocytosis
Lymphoid	Hodgkin lymphoma
EBV-associated lymphoid	Lymphomatoid granulomatosis: EBV-positive B-cell lymphoma
B-cell lymphoma	Low-grade extranodal marginal zone B-cell lymphoma

Robbins refers to Chapter 13 for further characterization.

Isolated versus generalized lung involvement

- An isolated pulmonary presentation and pulmonary involvement in generalized disease are both possible.
- Recognizing a lymphoid lineage does not establish the anatomical extent of disease.
- The textbook section does not provide detailed immunophenotypic algorithms for these lesions.

Primary lung

Mediastinal origin

Metastatic lesion

Schematic — not a histologic specimen

Putting rare pulmonary lesions into context

- A rounded nodule may be a hamartoma or inflammatory myofibroblastic tumor.
- Diffuse cystic remodeling suggests a different mechanism, exemplified by lymphangioleiomyomatosis.
- Multiple peripheral nodules often reflect secondary spread rather than a rare primary sarcoma.

Solitary nodule / mass

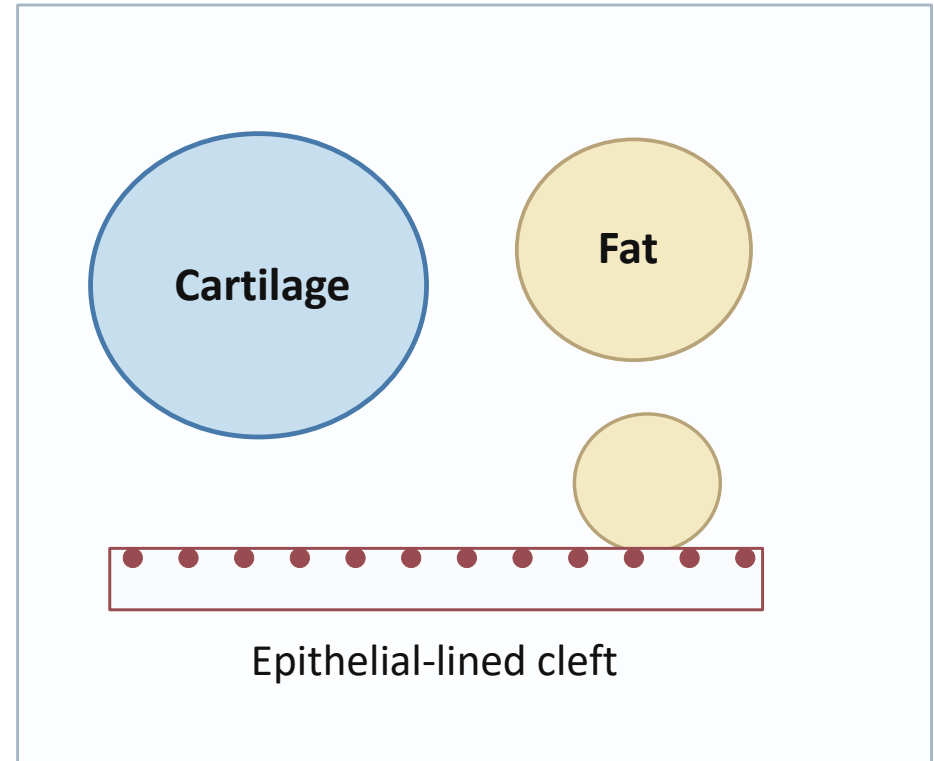
Diffuse cystic process

Secondary lung deposits

Schematic — not a histologic specimen

Pulmonary hamartoma: Benign clonal lesion

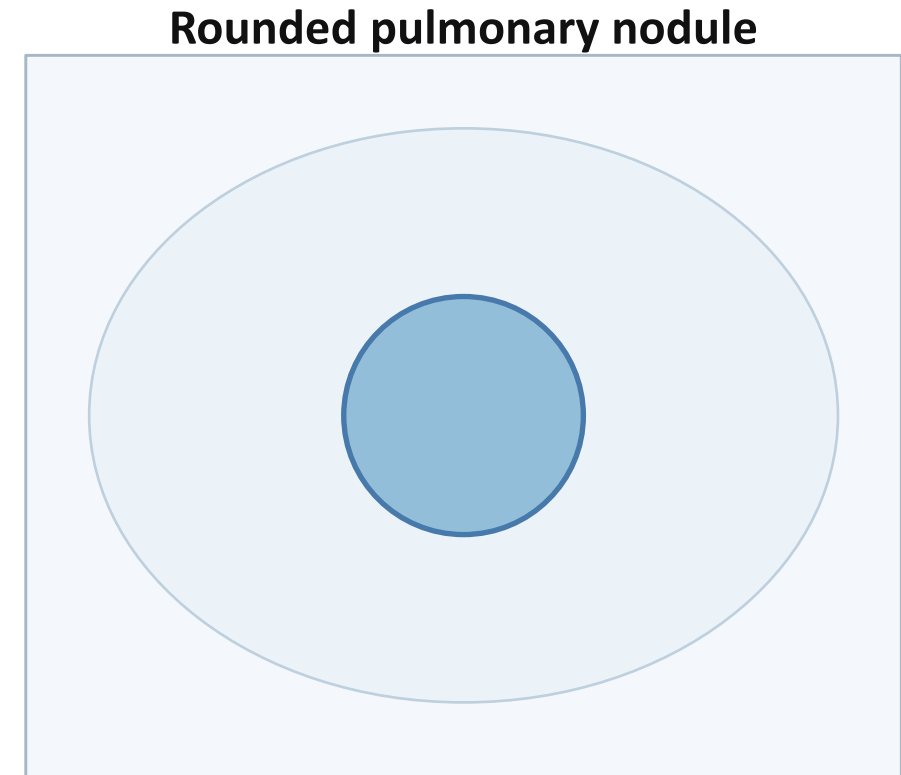
- Pulmonary hamartoma is a relatively common benign pulmonary lesion.
- Despite its traditional name, the lesion is a clonal neoplasm.
- Neoplastic mesenchyme and entrapped respiratory epithelium form its characteristic architecture.



Schematic — not a histologic specimen

Why hamartoma is frequently incidental

- It is often detected on routine chest radiography rather than because of tumor-related symptoms.
- The usual radiographic appearance is a rounded opacity: A “coin lesion.”
- A coin lesion is a radiographic pattern, not a definitive histologic diagnosis.

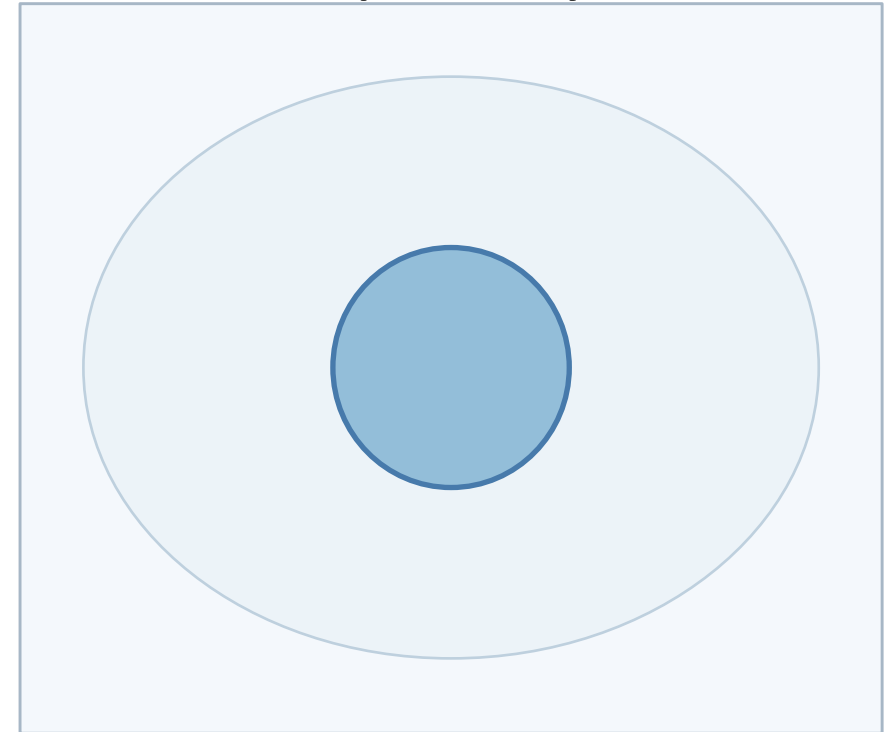


Schematic — not a histologic specimen

Hamartoma: Gross configuration

- Most lesions are solitary and well circumscribed.
- Most measure less than 3–4 cm in diameter.
- The rounded outline correlates with the classic incidental imaging appearance.

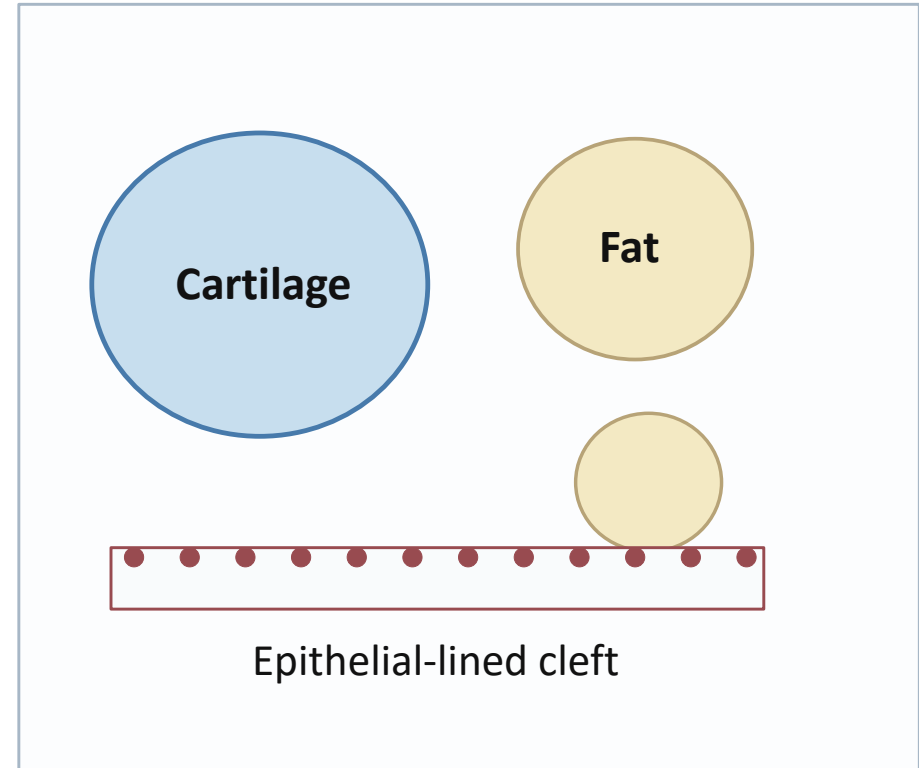
Rounded pulmonary nodule



Schematic — not a histologic specimen

Hamartoma: Defining microscopic architecture

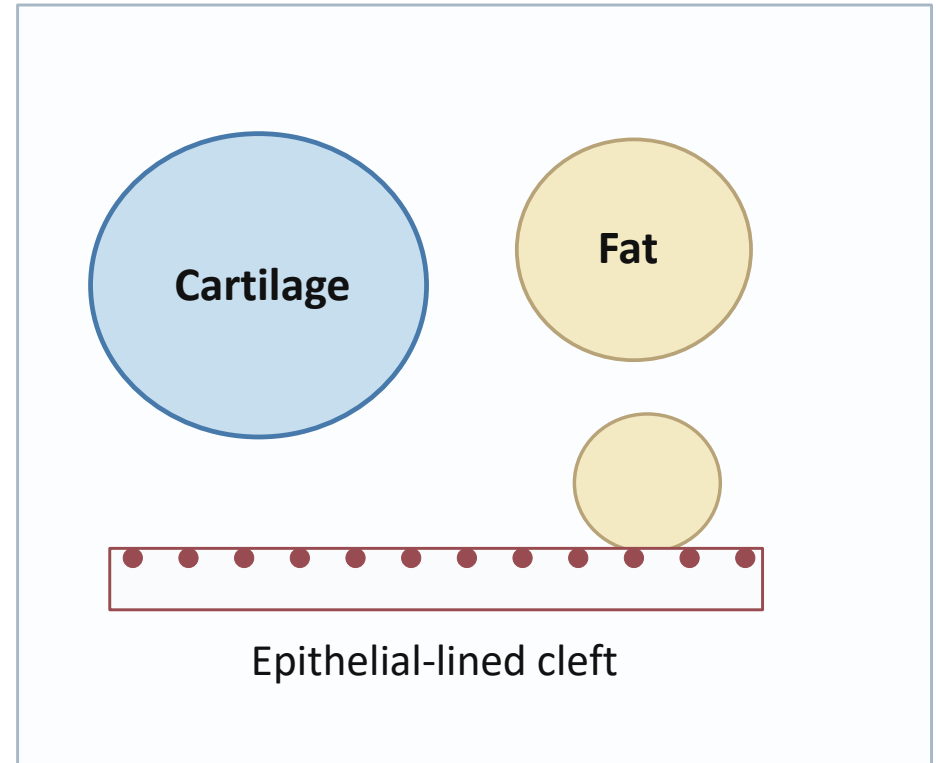
- Nodules of connective tissue intersect with epithelial clefts.
- The connective-tissue and epithelial compartments have different biological origins.
- Cleft lining represents entrapped respiratory epithelium.



Schematic — not a histologic specimen

Connective-tissue elements in hamartoma

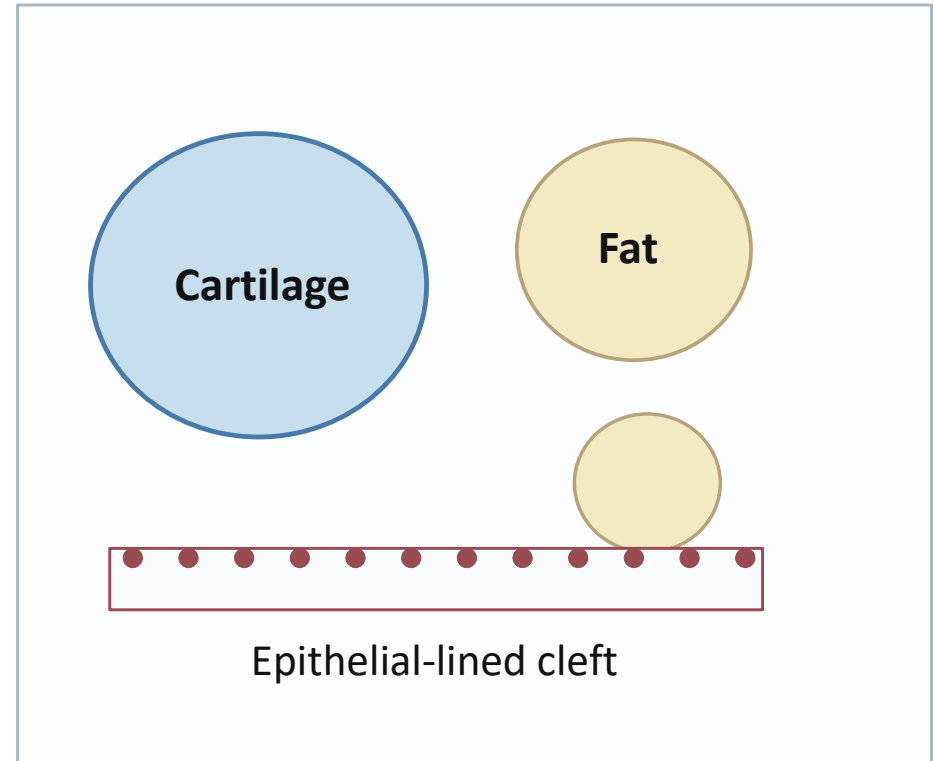
- Cartilage is the most common connective-tissue constituent.
- Fibrous tissue and fat may also be present.
- The coexistence of different mature mesenchymal tissues is a characteristic clue.



Schematic — not a histologic specimen

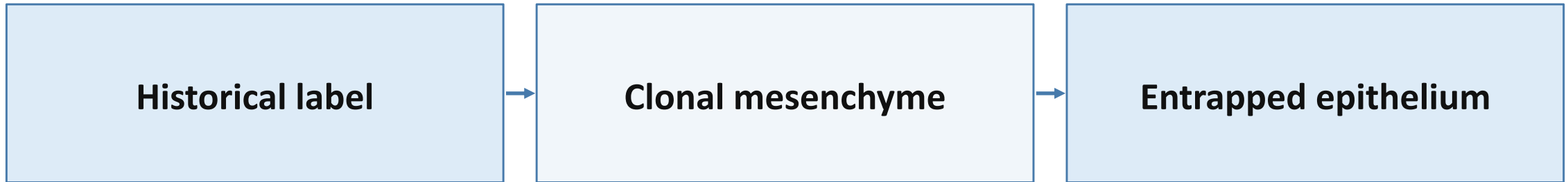
Epithelial clefts in hamartoma

- The clefts are lined by ciliated or nonciliated respiratory epithelium.
- The epithelium is interpreted as entrapped native tissue rather than the clonal tumor component.
- The clefts are therefore central to architectural recognition and the chondroma differential.



Schematic — not a histologic specimen

The paradox of the name “hamartoma”



- The conventional name is retained in clinical-pathology usage.
- Chromosomal abnormalities support neoplastic rather than purely malformative origin.
- The epithelial element does not share the mesenchymal clonal interpretation in the source.

Chromosomal alterations in hamartoma

- Aberrations involving 6p21 or 12q14–q15 are described.
- The alterations are found in the mesenchymal component.
- These findings explain why the lesion is considered a genuine clonal neoplasm.

Genetic / molecular clue

Changes growth signaling

Explains biological subset

Schematic — not a histologic specimen

Hamartoma is a two-compartment lesion

Compartment	Composition	Interpretation
Mesenchymal	Cartilage $\pm$ fibrous tissue $\pm$ fat	Clonal neoplastic component
Epithelial	Ciliated/nonciliated lined clefts	Entrapped respiratory epithelium

Do not infer clonality of the epithelial lining from the mesenchymal rearrangement.

Pulmonary hamartoma versus chondroma

Feature	Hamartoma	Chondroma
Cartilage	Often prominent	Cartilaginous tumor
Entrapped epithelium	Present as lined clefts	Absent as defining feature
Diagnostic logic	Mixed tissue + clefts	Cartilage without entrapped epithelium

This comparison addresses the specific distinction stated.

Case: A solitary incidental “coin lesion”

Clinical-pathology vignette

A rounded, well-circumscribed pulmonary opacity is discovered on a routine chest radiograph. A resected nodule contains cartilage, fat, and epithelial-lined clefts.

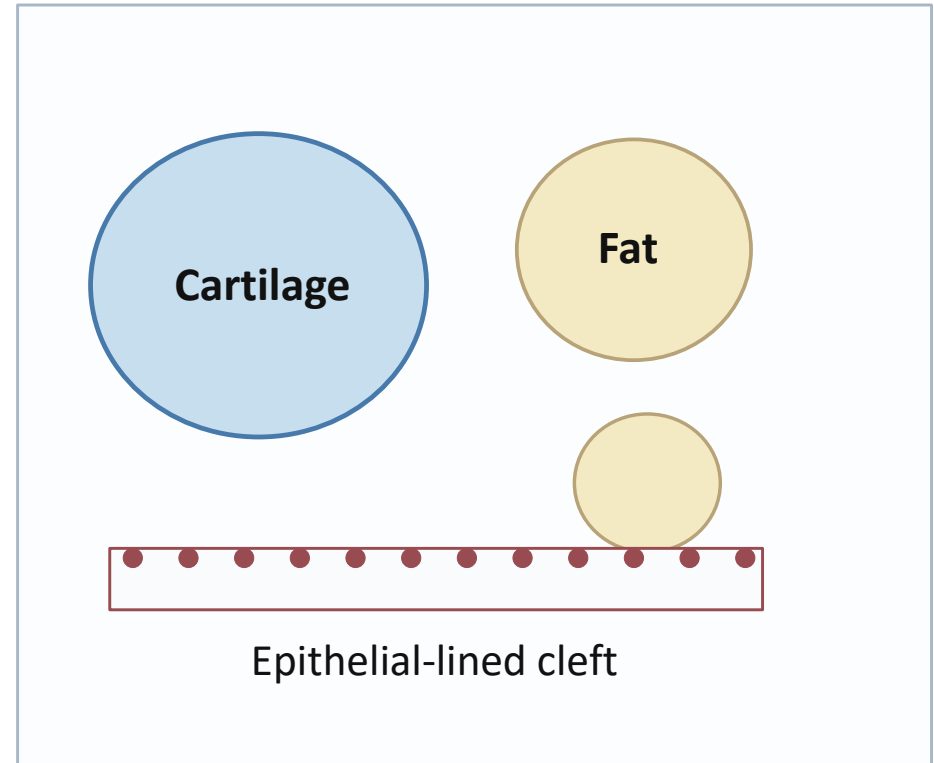
Pulmonary hamartoma

Reasoning

The mixed mesenchymal tissue and entrapped respiratory epithelium are more specific than imaging alone.

Hamartoma: Four diagnostic anchors

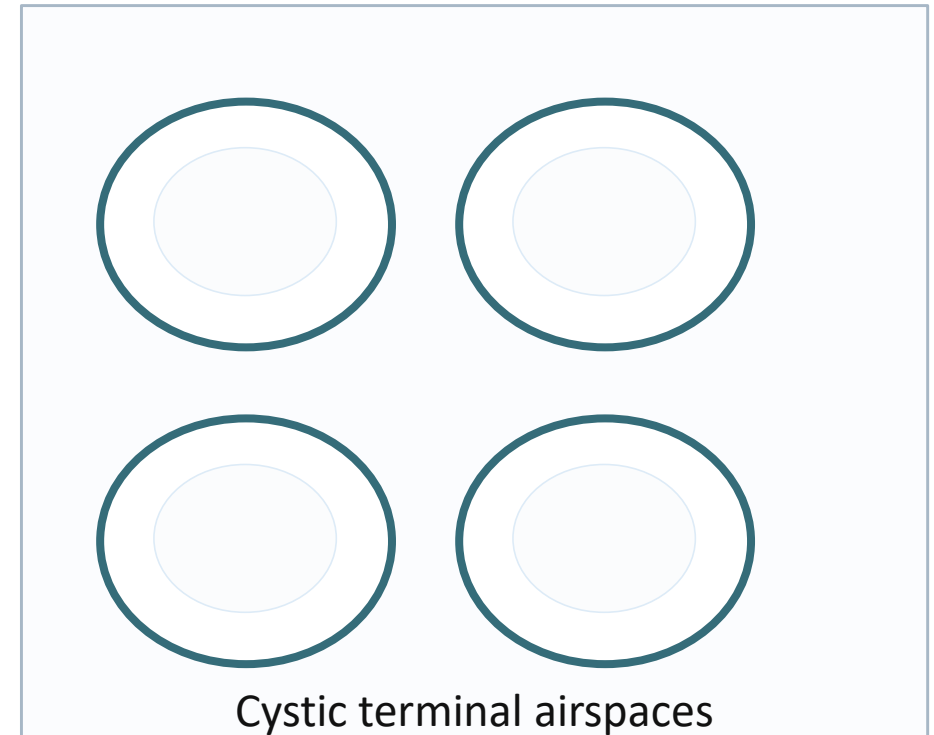
- Incidental, solitary, well-circumscribed pulmonary nodule.
- Cartilage-dominant connective tissue with possible fat and fibrosis.
- Respiratory-epithelium-lined clefts distinguish it from chondroma.
- Chromosomal changes in mesenchyme establish its clonal neoplastic nature.



Schematic — not a histologic specimen

Lymphangiomyomatosis: Clinical profile

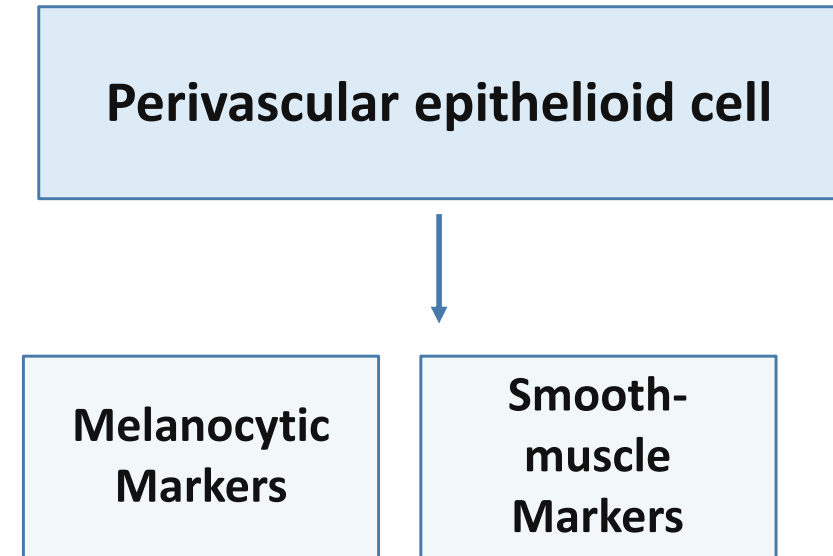
- LAM is a pulmonary disorder affecting primarily young women of childbearing age.
- It is characterized by proliferation of perivascular epithelioid cells.
- The key consequence is progressive structural distortion of lung tissue.



Schematic — not a histologic specimen

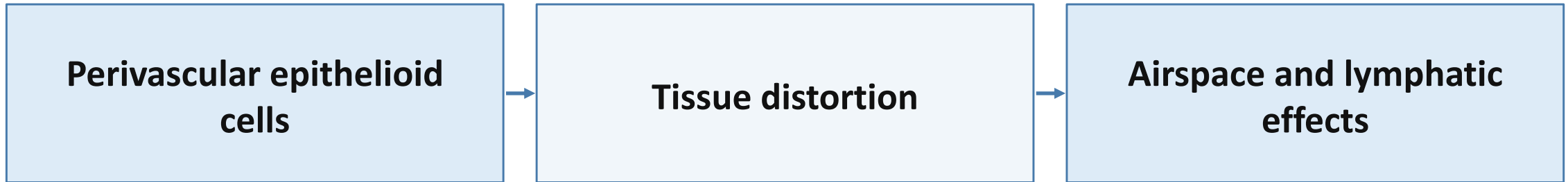
LAM cells have dual differentiation

- Lesional cells express markers of melanocytes and smooth muscle cells.
- This dual identity characterizes the perivascular epithelioid cell phenotype.
- The textbook does not require an individual named immunostain in this short section.



Schematic — not a histologic specimen

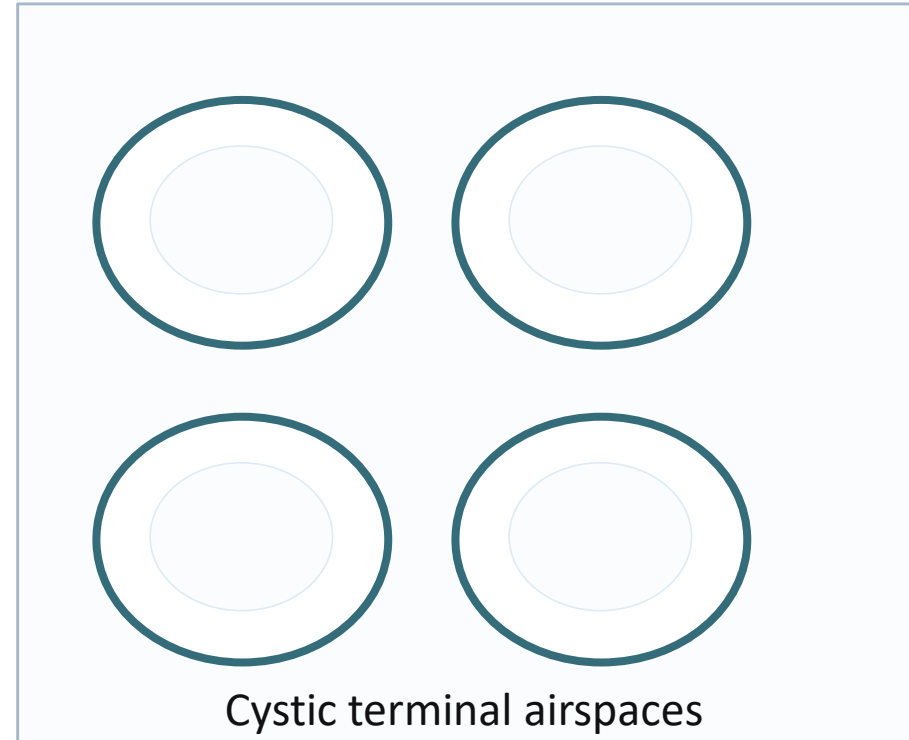
LAM: Proliferation to lung damage



- The cell population expands within affected lung tissue.
- Structural remodeling involves airspaces, interstitium, and lymphatic vessels.
- Clinical symptoms arise from the resulting architectural damage.

Cystic airspace change is central in LAM

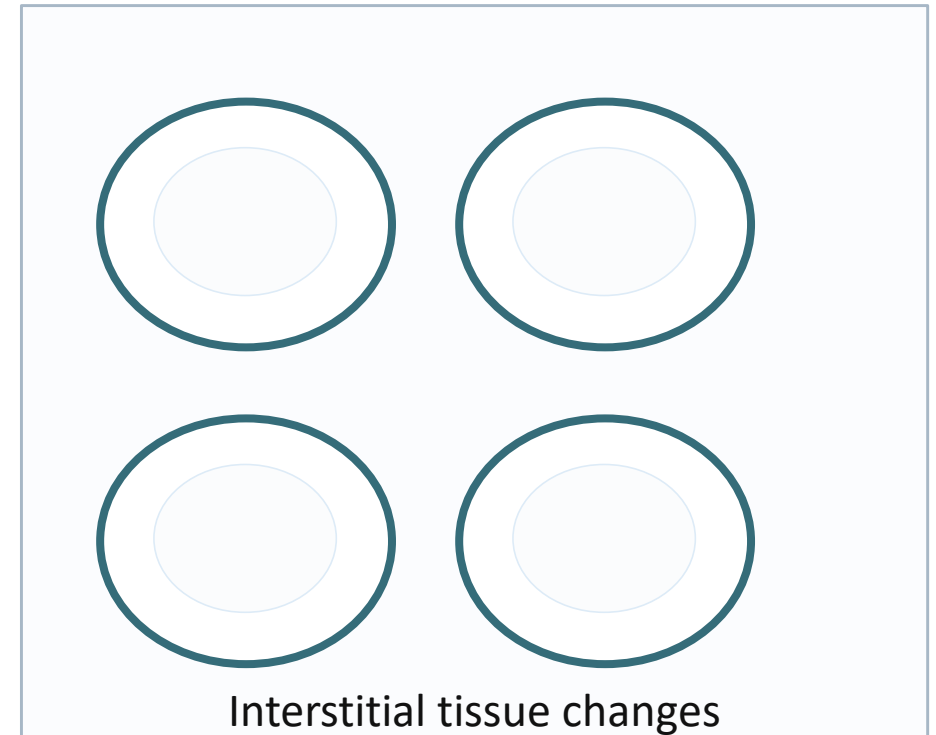
- Terminal airspaces undergo cystic, emphysema-like dilation.
- Abnormal dilation disrupts the normal alveolar architecture.
- This change underlies the textbook association with spontaneous pneumothorax.



Schematic — not a histologic specimen

LAM: Interstitial thickening

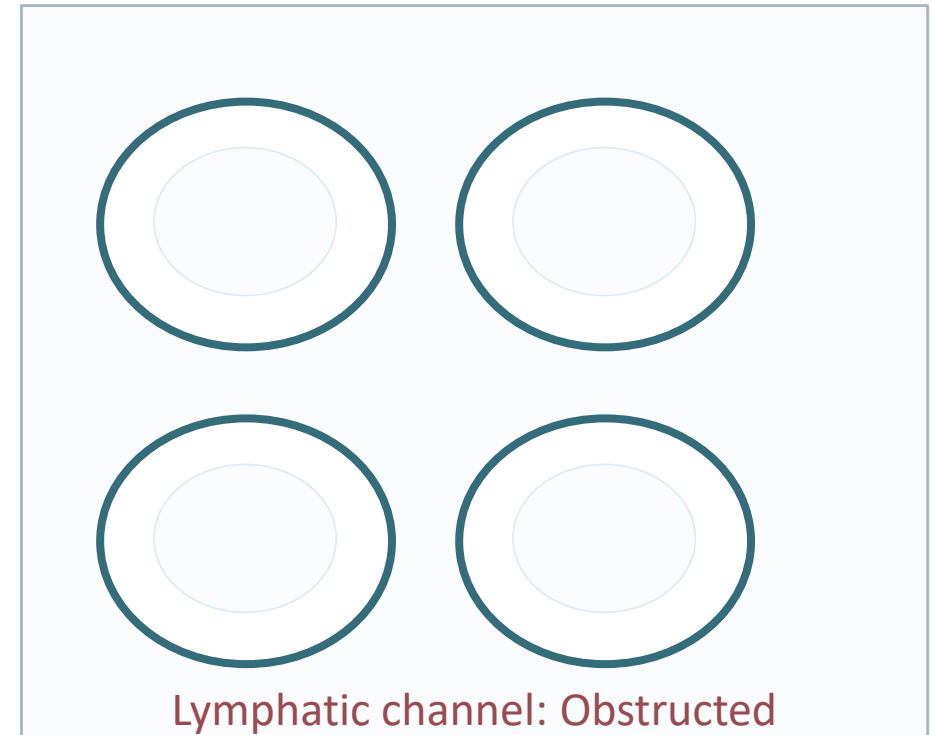
- Proliferating lesional cells contribute to interstitial thickening.
- Thickening accompanies rather than replaces the cystic airspace changes.
- Both findings are part of the same tissue-remodeling process.



Schematic — not a histologic specimen

LAM: Lymphatic obstruction

- Expansion of the lesional population can obstruct lymphatic vessels.
- Lymphatic obstruction is one of the three explicit structural consequences described.
- It is important to distinguish this mechanism from cystic airspace dilation.



Schematic — not a histologic specimen

The three structural effects of LAM

Affected structure	Reported change	Pathology concept
Terminal airspaces	Cystic, emphysema-like dilation	Altered airspace architecture
Interstitium	Thickening	Remodeling between airspaces
Lymphatic vessels	Obstruction	Impaired lymphatic channels

Anatomic effects derive from the same proliferating cell population.

TSC2 loss of function in LAM

- Lesional cells frequently harbor loss-of-function mutations of TSC2.
- TSC2 is a tumor suppressor locus also linked to tuberous sclerosis.
- This molecular clue supports dysregulated growth signaling in LAM.

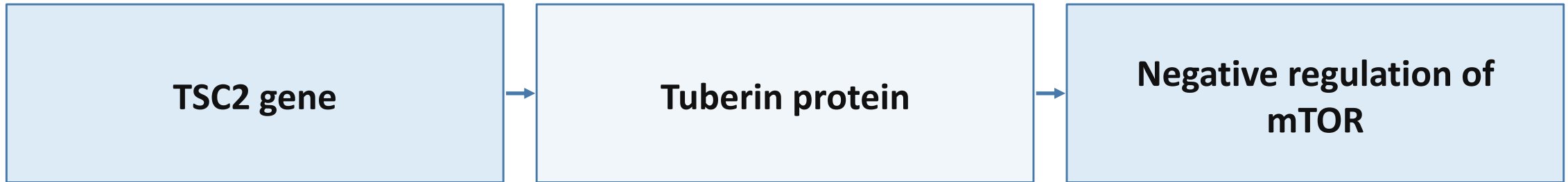
Genetic / molecular clue

Changes growth signaling

Explains biological subset

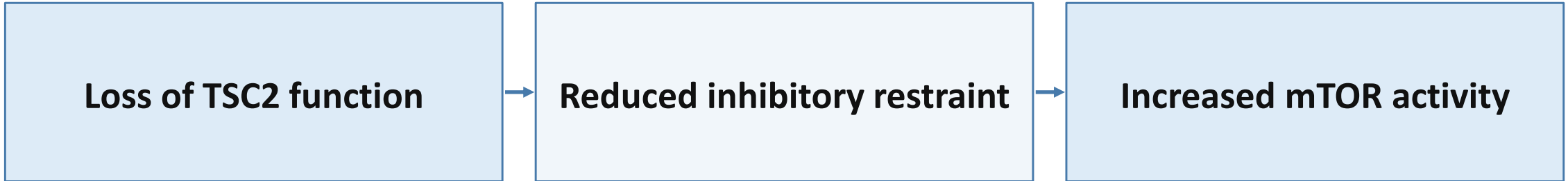
Schematic — not a histologic specimen

Tuberlin normally restrains mTOR



- TSC2 encodes tuberlin.
- Tuberlin is a negative regulator of mechanistic target of rapamycin (mTOR).
- MTOR is a central regulator of cellular metabolism.

TSC2 loss provides a growth-signaling rationale



- The source links TSC2 loss of function to increased mTOR signaling.
- Increased mTOR activity is implicated in pathogenesis.
- The full mechanism of the disorder is not completely understood.

LAM and tuberous sclerosis

- The TSC2 locus is linked to tuberous sclerosis.
- The genetic relationship helps contextualize LAM beyond the respiratory tract.
- The text does not imply that every person with LAM has tuberous sclerosis.

Pulmonary isolated

Lung in systemic disease

Classify tissue lineage

Schematic — not a histologic specimen

Estrogen: A plausible contributor, not a complete model

- LAM has a strong predilection for young women.
- Lesional cells often express estrogen receptors.
- These observations suggest estrogen contributes to proliferation; The full pathogenesis remains incompletely understood.

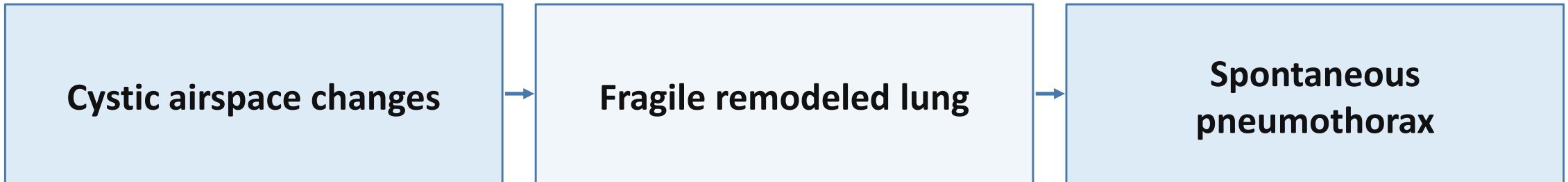
Female predominance

Estrogen receptor expression

Suggested estrogen contribution

Schematic — not a histologic specimen

LAM: Structural cause of pneumothorax



- The source specifically relates spontaneous pneumothorax to emphysema-like changes.
- Dyspnea is another common presenting symptom.
- The presentation follows logically from architectural injury.

LAM: Chronic clinical course

- The disorder tends to progress slowly over several decades.
- Prolonged progression does not mean the changes are clinically insignificant.
- The source emphasizes ongoing deterioration of lung function as the therapeutic target.

Slow progression

Several decades

Ongoing function decline

Schematic — not a histologic specimen

LAM: Treatment and disease control

Strategy	Textbook-supported effect
mTOR inhibition	Slows or prevents lung-function deterioration
Continuity of medication	Treatment must be continued indefinitely for sustained control
Lung transplantation	Identified in the textbook as the only curative option

These are source-specific statements, not a complete contemporary treatment guideline.

Case: Progressive dyspnea and pneumothorax

Clinical-pathology vignette

A young woman has progressive dyspnea and a spontaneous pneumothorax. The lung shows cystic terminal-airspace dilation and perivascular epithelioid cell proliferation.

Lymphangioleiomyomatosis

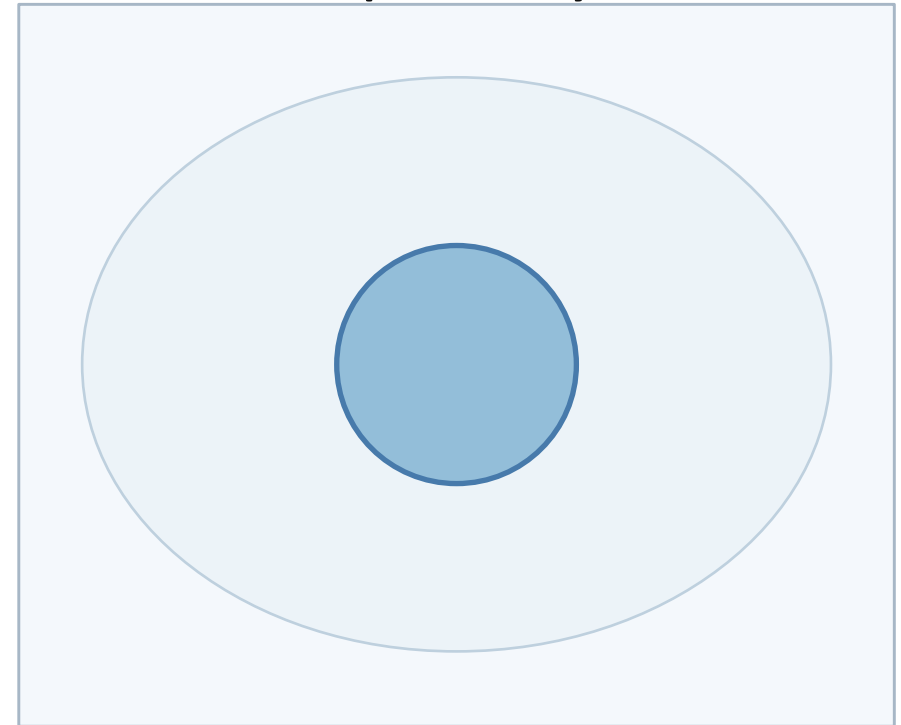
Reasoning

The demographic association, cystic remodeling, and lesional cell phenotype form the discriminating pattern.

Inflammatory myofibroblastic tumor: Who is affected?

- IMT is rare and occurs more frequently in children.
- The source reports an approximately equal male-to-female ratio.
- A pediatric lung mass may therefore be mesenchymal rather than epithelial in lineage.

Rounded pulmonary nodule



Schematic — not a histologic specimen

IMT: Symptomatic and asymptomatic presentations

- Reported symptoms include fever, cough, chest pain, and hemoptysis.
- Some lesions produce no symptoms.
- The symptom profile is nonspecific; Morphology and tumor biology provide more specific information.

Clinical presentation

Symptoms or none

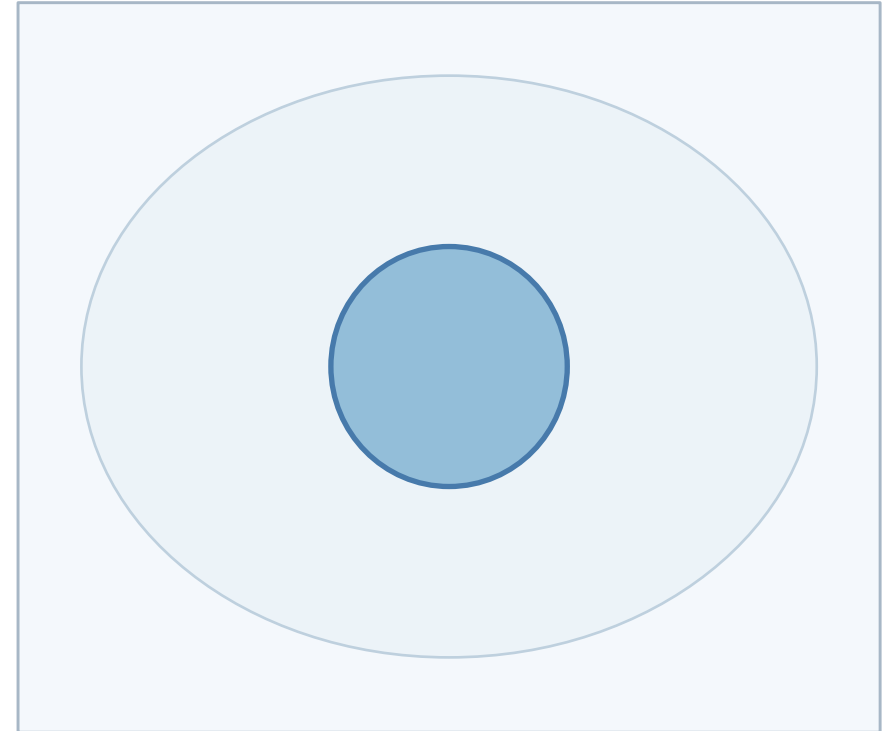
Morphology resolves lineage

Schematic — not a histologic specimen

IMT: Radiographic appearance

- Imaging typically shows a round, well-defined peripheral mass.
- The radiographic form is compatible with multiple distinct tumor entities.
- Imaging appearance alone cannot establish the myofibroblastic nature of the lesion.

Rounded pulmonary nodule

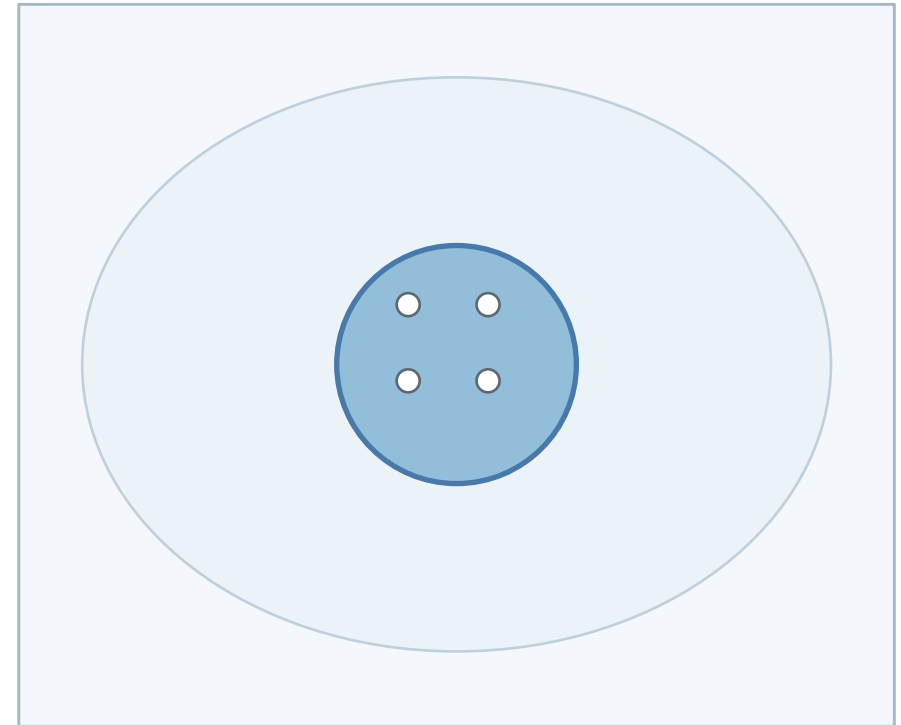


Schematic — not a histologic specimen

IMT: Calcification is a described feature

- Calcification is reported in approximately one quarter of cases.
- Its presence may be a clue but is not specific for this diagnosis.
- Absence of calcification does not exclude IMT.

Variable calcification

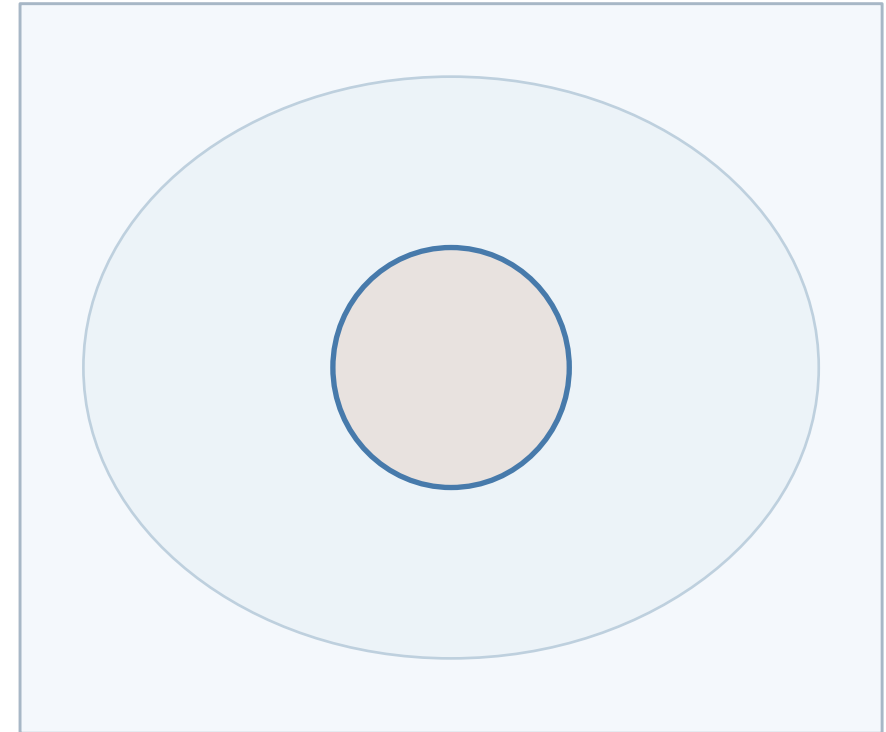


Schematic — not a histologic specimen

IMT: Gross pathology

- A typical lesion is firm and gray-white.
- The cited size range is approximately 3–10 cm.
- The gross mass is often well defined on imaging despite its complex cellular composition.

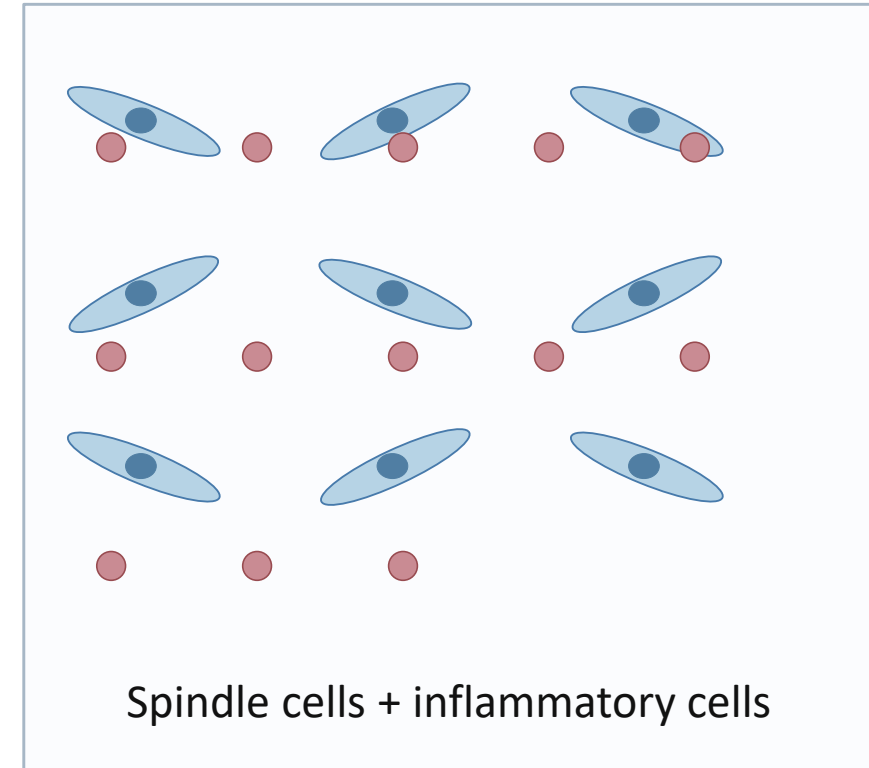
Well-defined solid mass



Schematic — not a histologic specimen

IMT: Spindle-cell population

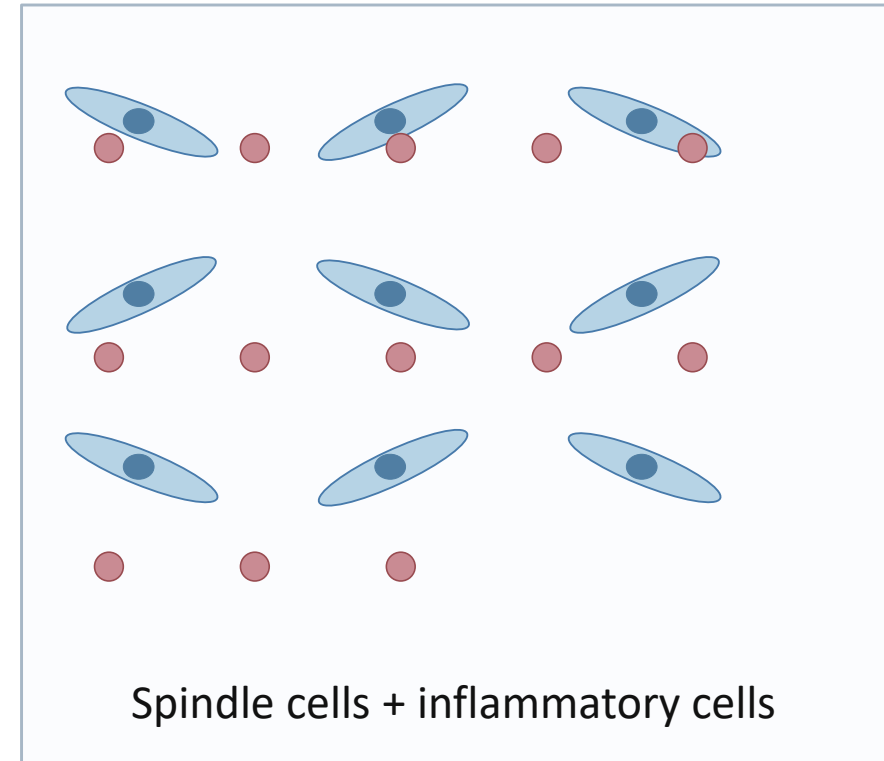
- The tumor contains proliferating spindle-shaped fibroblasts and myofibroblasts.
- The spindle-cell component constitutes the core mesenchymal tumor population.
- Lymphocytes and plasma cells intermingle with the spindle cells.



Schematic — not a histologic specimen

IMT: Inflammatory cell admixture

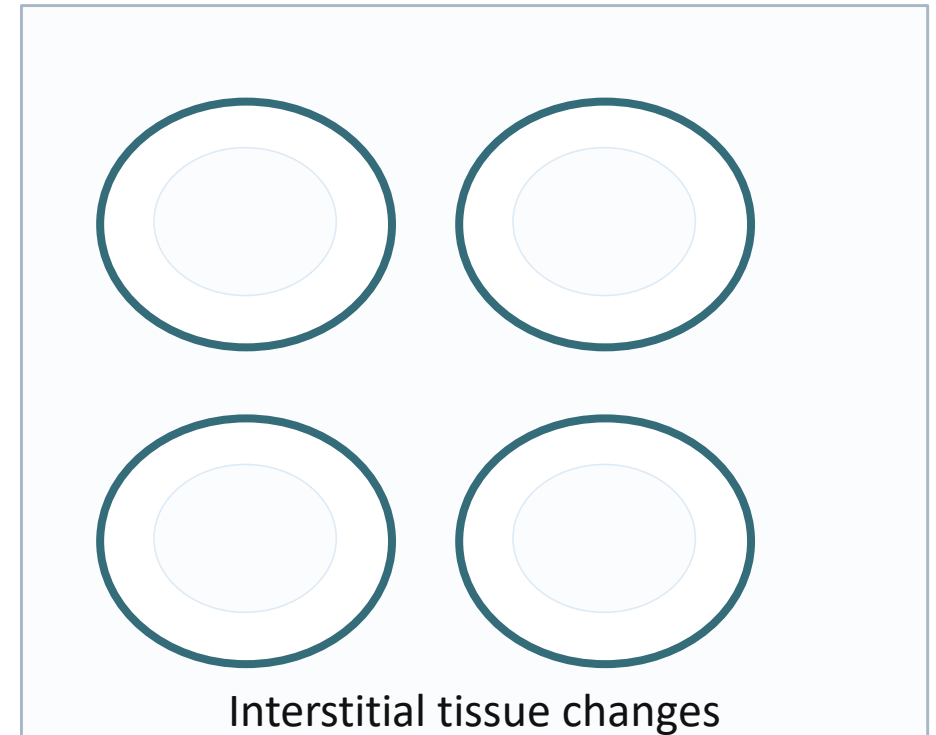
- Lymphocytes and plasma cells are admixed with the spindle-cell tumor.
- The inflammatory component explains the descriptive adjective “inflammatory.”
- These cells coexist with rather than replace the fibroblastic/myofibroblastic component.



Schematic — not a histologic specimen

Peripheral fibrosis in IMT

- The described microscopic composition includes peripheral fibrosis.
- Fibrosis forms part of the lesion architecture alongside spindle cells and inflammatory cells.
- A single component in isolation is not the complete morphologic description.



Schematic — not a histologic specimen

ALK rearrangements define a molecular subset

- Some IMTs have activating rearrangements of the ALK receptor tyrosine kinase gene.
- ALK at chromosome 2p23.
- This is a subset finding: Absence of rearrangement does not contradict the source-level diagnosis.

Genetic / molecular clue

Changes growth signaling

Explains biological subset

Schematic — not a histologic specimen

ALK status links pathology to therapy



- The ALK alteration is actionable in some IMTs.
- Sustained responses to ALK inhibitors in rearrangement-positive cases.
- A therapeutic association does not imply all IMTs harbor ALK rearrangements.

Distinguishing three featured lung lesions

Feature	Hamartoma	LAM	IMT
Usual pattern	Solitary nodule	Diffuse cystic remodeling	Peripheral mass
Defining element	Mesenchyme + epithelial clefts	Perivascular epithelioid cells	Spindle myofibroblasts + inflammation
Molecular clue	6p21 or 12q14–q15	TSC2 loss / mTOR	ALK rearrangement in subset

Columns summarize Robbins descriptions rather than a validated diagnostic rule.

Case: A peripheral mass in a child

Clinical-pathology vignette

A child has a peripheral well-defined pulmonary mass with fever and cough. Histology shows spindle-shaped fibroblasts, plasma cells, lymphocytes, and peripheral fibrosis.

Inflammatory myofibroblastic tumor

Reasoning

The admixture of spindle cells and inflammatory cells, rather than symptoms alone, points to IMT.

Mediastinal tumors can affect the lung secondarily

- A tumor may arise within a mediastinal structure or represent metastasis from lung or another organ.
- Such lesions may invade or compress adjacent pulmonary tissue.
- An anatomic mass in the thorax is not synonymous with a primary lung tumor.

Primary lung

Mediastinal origin

Metastatic lesion

Schematic — not a histologic specimen

Anterior mediastinal masses

Robbins-listed categories	Examples
Thymic	Thymoma
Germ cell	Teratoma
Lymphoid	Lymphoma
Endocrine	Thyroid lesions; parathyroid tumors
Secondary	Metastatic carcinoma

Compartmental lists reproduce the textbook grouping without frequency estimates.

Middle mediastinal masses

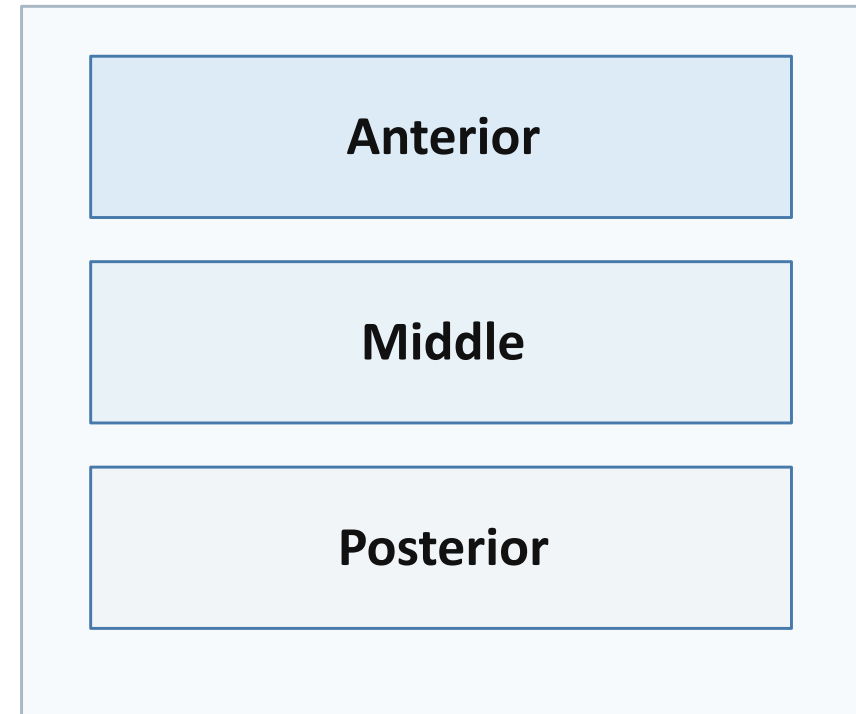
Robbins examples	General type
Bronchogenic cyst	Developmental cyst
Pericardial cyst	Cystic lesion
Lymphoma	Lymphoid neoplasm

Posterior mediastinal masses

Robbins examples	General type
Schwannoma; neurofibroma	Neurogenic tumors
Lymphoma	Lymphoid neoplasm
Metastatic tumor	Most from lung, per Robbins
Bronchogenic cyst	Cystic lesion
Gastroenteric hernia	Non-neoplastic mass mimic

A compartment-based way to read mediastinal masses

- Anterior, middle, and posterior distributions have different typical lists.
- The compartment suggests a differential; It does not establish a diagnosis.
- Compression and invasion can generate pulmonary effects without pulmonary origin.



Schematic — not a histologic specimen

Case: A posterior mediastinal mass

Clinical-pathology vignette

A posterior mediastinal mass abuts the lung. The radiology report describes lung compression, but the lesion is centered outside the pulmonary parenchyma.

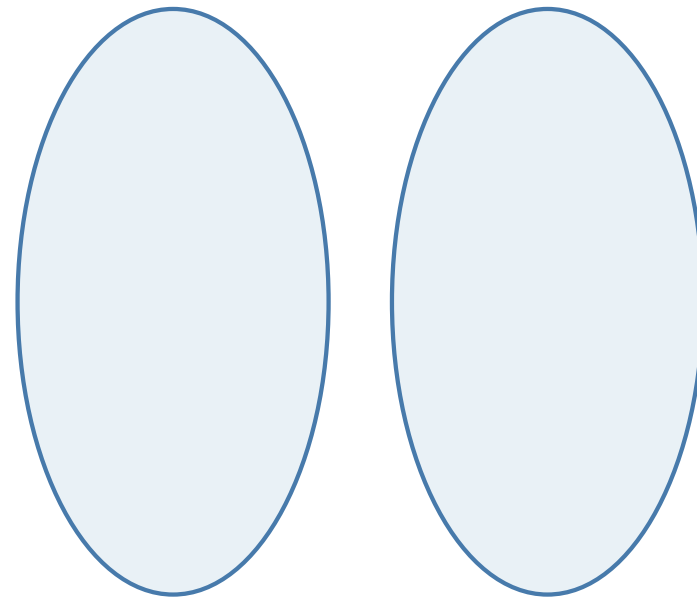
Start with a mediastinal differential

Reasoning

Neurogenic tumors, lymphoma, metastases, bronchogenic cyst, and gastroenteric hernia for this compartment.

The lung is a common destination for metastasis

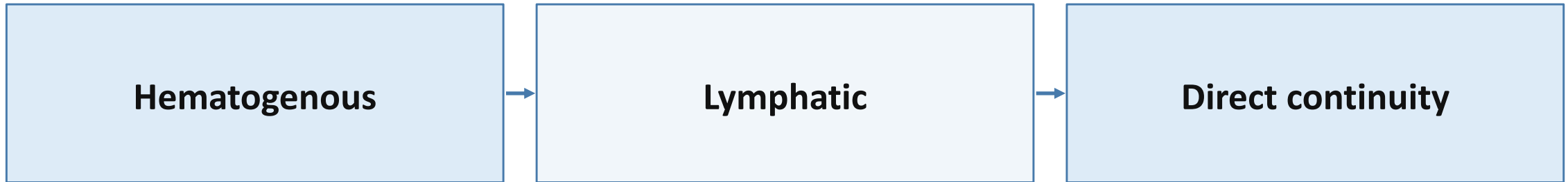
- The lung as the most common site of metastatic neoplasms.
- Both carcinomas and sarcomas from sites throughout the body may spread to lung.
- The pulmonary lesion may therefore be secondary despite its intraparenchymal position.



Lung site

Schematic — not a histologic specimen

Routes by which tumors reach the lung



- Bloodborne and lymphatic dissemination account for many distant pulmonary deposits.
- Direct continuity is also possible from structures adjacent to lung.
- Routes of spread help explain why the appearance of secondary tumors varies.

Direct extension into lung

- Esophageal carcinoma is a named example of direct pulmonary invasion.
- Mediastinal lymphoma may also extend directly into the lung.
- Direct extension differs anatomically from a separated intrapulmonary metastatic nodule.

Primary lung

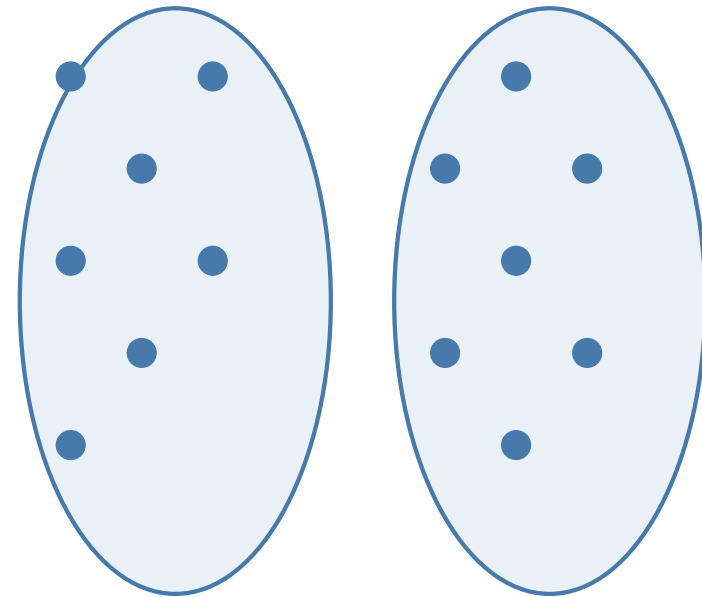
Mediastinal origin

Metastatic lesion

Schematic — not a histologic specimen

Multiple cannonball nodules: A classic pattern

- The usual described pattern consists of multiple discrete nodules in all lobes.
- Nodules particularly favor the lung periphery.
- “Cannonball” is a morphologic descriptor, not a designation of a specific primary tumor.



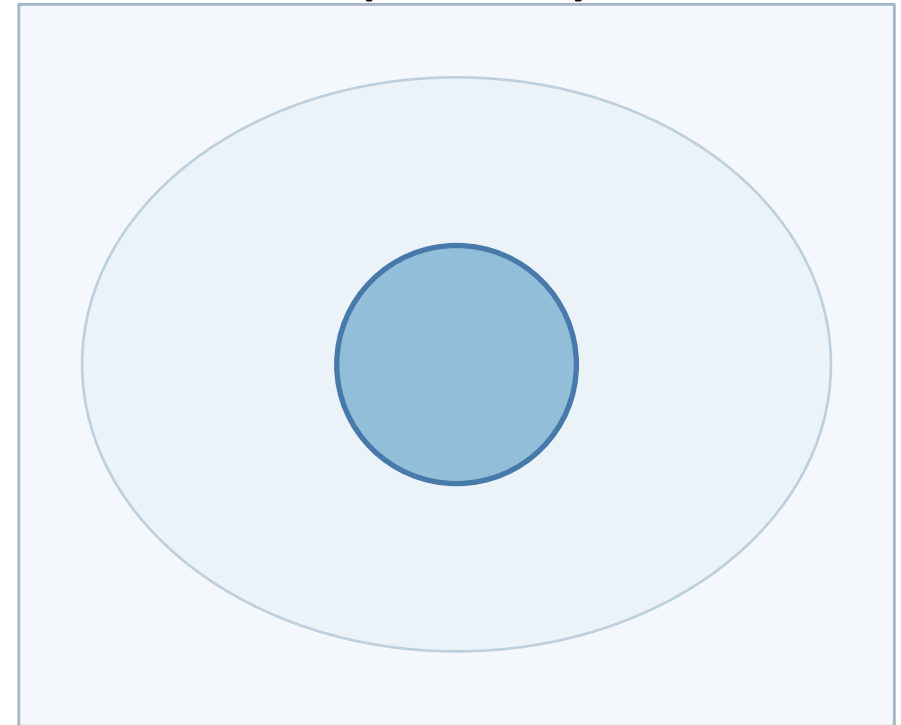
Multiple discrete deposits

Schematic — not a histologic specimen

Pulmonary metastases may be solitary

- A solitary lung nodule is among the metastatic patterns explicitly described.
- Consequently, solitary morphology cannot by itself establish primary pulmonary origin.
- The pattern must be considered alongside clinical and pathologic context.

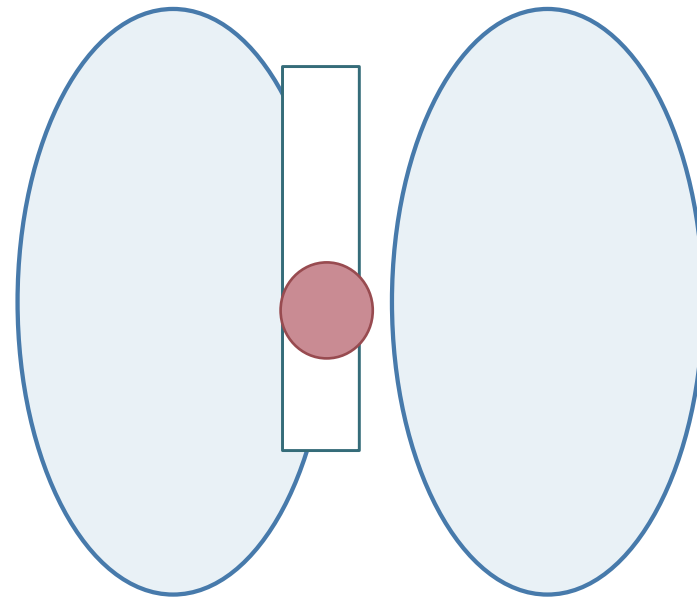
Rounded pulmonary nodule



Schematic — not a histologic specimen

Endobronchial and pleural metastases

- Secondary tumors may involve endobronchial surfaces.
- Pleural involvement is another recognized pattern.
- These locations differ from multiple round parenchymal nodules and may coexist with them.

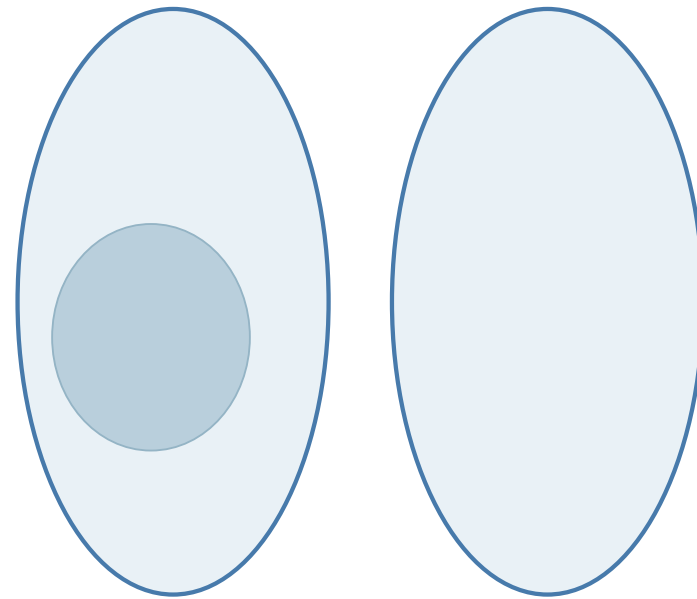


Endobronchial involvement

Schematic — not a histologic specimen

Pneumonic consolidation as metastatic pattern

- Metastatic tumors can sometimes produce a consolidation-like lung appearance.
- The text identifies this as an alternative to nodular patterns.
- A pneumonia-like pattern therefore is not restricted to non-neoplastic processes.



Consolidation pattern

Schematic — not a histologic specimen

Lepidic growth is not uniquely primary

- Occasional metastases show lepidic growth resembling pulmonary adenocarcinoma in situ.
- This growth pattern may occur alongside several metastatic distributions.
- Architectural resemblance should not be treated as proof of primary lung origin.

Schematic — not a histologic specimen

Metastatic patterns listed by Robbins

Distribution pattern	Textbook description
Multiple peripheral nodules	Typical cannonball pattern across lobes
Solitary nodule	One discrete secondary deposit
Endobronchial	Tumor involving bronchial lumen or wall
Pleural	Secondary pleural involvement
Pneumonic	Consolidation pattern
Lepidic	Occasional surface-spreading growth resembling adenocarcinoma in situ

Patterns are alternatives and may occur in combination.

Case: Multiple peripheral rounded nodules

Clinical-pathology vignette

An adult with a known malignancy has numerous well-circumscribed nodules scattered through both lungs, especially peripherally.

Metastatic disease is a central consideration

Reasoning

The distribution matches the “cannonball” pattern; Morphology does not identify the original cancer.

Case: A deceptively solitary pulmonary deposit

Clinical-pathology vignette

A lung biopsy from a solitary nodule shows malignant cells, and the clinical history includes a previous extrathoracic neoplasm.

Primary versus metastatic origin remains a key question

Reasoning

A solitary nodule is explicitly included among metastatic distributions and cannot settle origin alone.

Integrative comparison of pulmonary tumor patterns

Pattern	Featured association	What it does NOT establish
Rounded, well-circumscribed nodule	Hamartoma or IMT	Specific lineage without histology
Cystic diffuse remodeling	LAM	A solitary solid tumor
Multiple peripheral nodules	Metastatic deposits	Identity of the primary cancer
Mediastinal-centered mass	Compartment-specific masses	Primary intrapulmonary origin

This is a teaching synthesis of source statements, not an independent diagnostic algorithm.

Principal clinicopathologic lessons

- Pulmonary hamartoma: Clonal mesenchymal neoplasm with entrapped epithelial clefts.
- LAM: Perivascular epithelioid proliferation, TSC2–mTOR dysregulation, and cystic remodeling.
- IMT: Spindle myofibroblasts with inflammatory cells; ALK rearrangement in a subset.
- Secondary pulmonary lesions may appear nodular, endobronchial, pleural, pneumonic, or lepidic.

Solitary nodule / mass

Diffuse cystic process

Secondary lung deposits

Schematic — not a histologic specimen

Reference and source boundaries

- Primary content: Robbins, Cotran & Kumar, Pathologic Basis of Disease, 11th ed. (2026), Chapter 15, pp. 659–660.
- Metastatic Tumors is included because it is grouped with this teaching unit in the supplied topic register.
- Source was provided as a Markdown extraction; the original chapter PDF and source figures were not available for direct verification.
- All displayed conceptual illustrations are native, editable PowerPoint schematics; they are not pathology specimens.