
Benign Tumors and Tumor-Like Conditions

Vascular ectasias · Hemangiomas · Lymphangiomas

Dr Abu Suraih Sakhri

MBBS, MD (Pathology)

www.abusuraihsakhri.com

Learning outcomes

- Differentiate vascular ectasias from benign vascular neoplasms.
- Recognize the defining morphology and natural history of hemangioma variants.
- Explain clinically important syndromic associations and bleeding risks.
- Distinguish blood-vessel from lymphatic proliferations.

The benign vascular lesion family

- Vascular ectasias: Dilation of preexisting vessels.
- Hemangiomas: Blood-vessel tumors with capillary or cavernous patterns.
- Lymphangiomas: Benign lymphatic vascular lesions.
- Reactive proliferations may resemble neoplasms.

Structural categories

Vascular ectasias

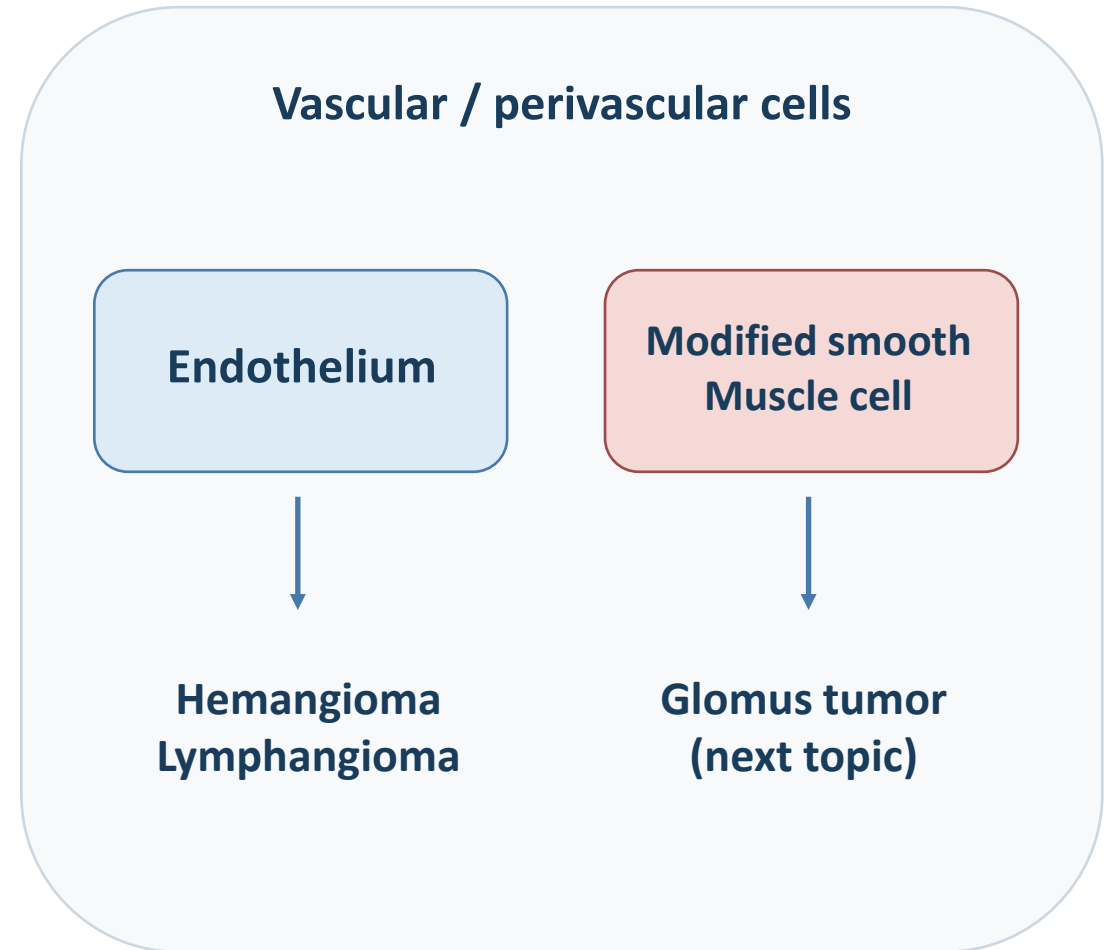
Hemangiomas

Lymphangiomas

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Cell of origin determines the lesion

- Endothelial lesions include hemangiomas and lymphangiomas.
- Support-cell tumors are distinct: Glomus tumor arises from modified smooth muscle cells.
- Morphologic overlap does not imply identical lineage.

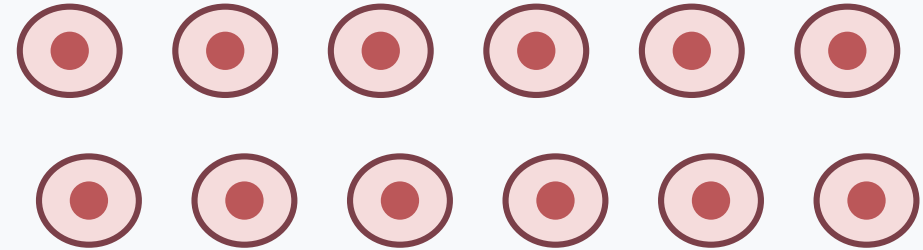


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Benign vascular architecture

- Recognizable lumina are lined by a single layer of bland endothelial cells.
- Blood-filled channels and lymph-filled spaces need different interpretation.
- The arrangement of channels is central to histologic classification.

Endothelial-lined vascular lumina



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Why the malignant boundary matters

- Benign: Organized vascular channels lined by relatively normal endothelial cells.
- Malignant: More solid proliferation, atypical endothelial cells, poorly organized vessels.
- Endothelial immunostains (e.g., CD31 or von Willebrand factor) may be needed in difficult tumors.

Benign pattern	Malignant pattern
Well-formed vascular lumina	Often poorly formed lumina
Bland endothelial lining	Cytologic atypia
Architectural organization	More solid cellular growth

Ectasia, telangiectasia, neoplasm

- An ectasia is localized dilation; Telangiectasia specifically affects small preexisting vessels.
- Telangiectasias form visible red lesions of skin or mucous membranes.
- Vascular ectasias are congenital or acquired, but not true neoplasms.

Dilation

Preexisting vessels enlarge

No neoplastic designation

May be congenital or acquired

Proliferation

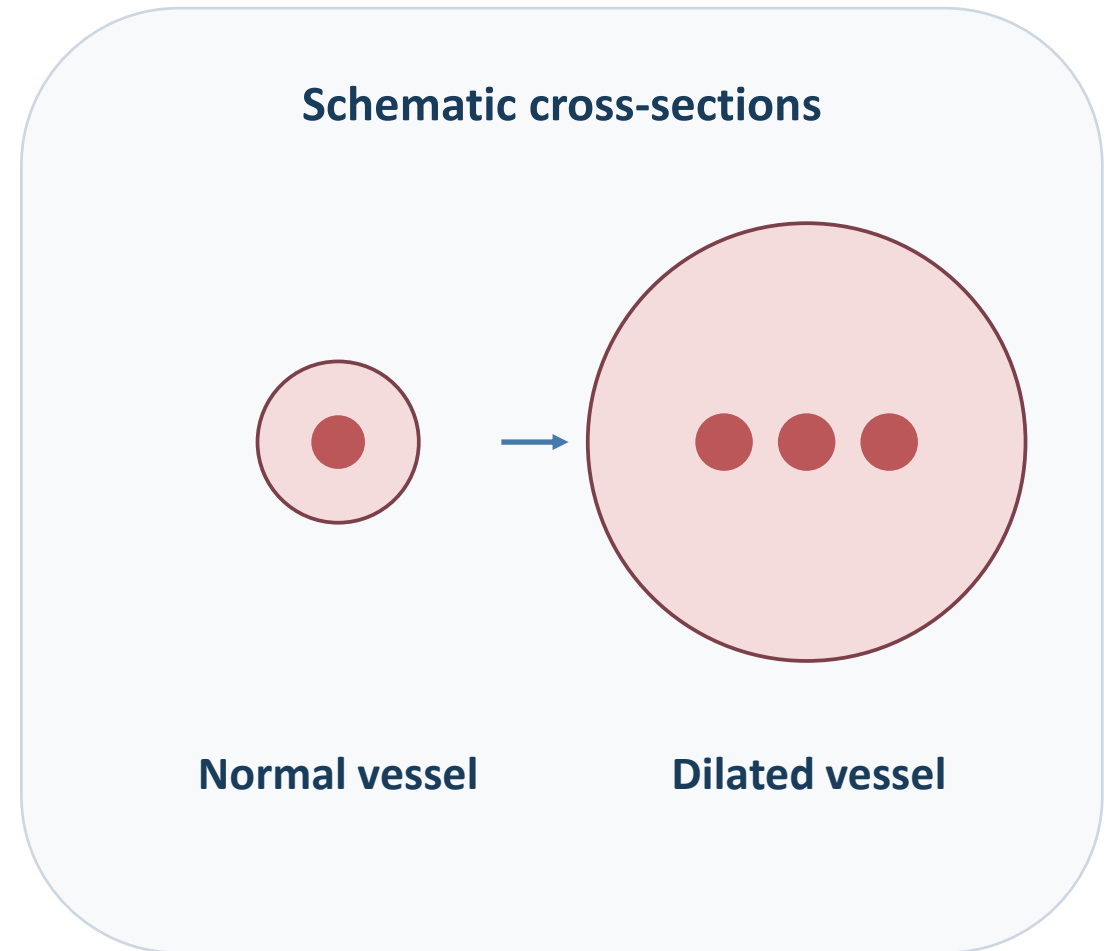
Vascular channels constitute a tumor

Hemangioma/lymphangioma category

Growth pattern depends on subtype

Vascular dilation: The organizing concept

- Capillaries, venules, or arterioles become permanently widened.
- Visible lesion formation reflects enlarged superficial vascular spaces.
- Small-vessel involvement explains the characteristic red surface appearance.

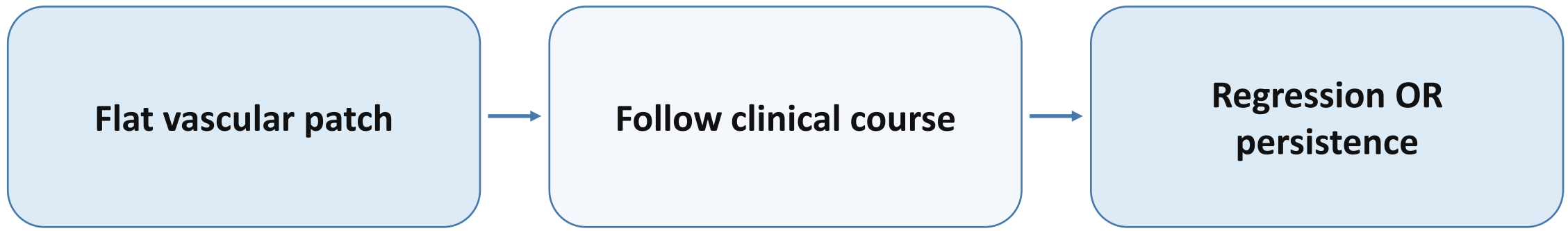


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Nevus flammeus: Identifying features

- A flat, light-pink to deep-purple vascular birthmark.
- Typically affects head or neck.
- It is the commonest form of vascular ectasia in the Robbins description.
- The lesion represents dilated vessels rather than a true neoplasm.

Nevus flammeus: Natural history



- Many ordinary nevi flammei ultimately regress spontaneously.
- A persistent port-wine subtype must be distinguished from lesions that fade.
- Observed course is therefore an important clinical discriminator.

Port-wine stain is a persistent subtype

- Port-wine stain is a form of nevus flammeus.
- Unlike many other nevi flammei, it tends to enlarge during childhood.
- Overlying skin may thicken and the lesion can persist over time.

Patch that persists and thickens



Dermal vascular dilation

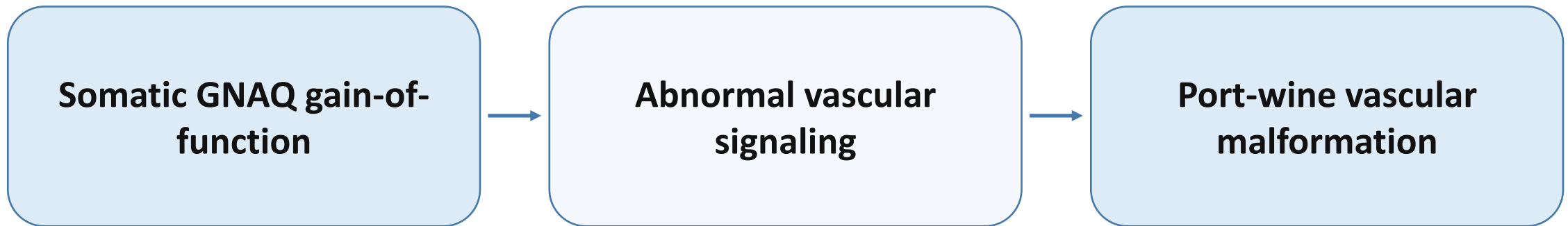
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Port-wine progression is not tumor invasion



- The surface may change from a flat stain to thickened skin.
- This progression is described for the persistent vascular malformation.
- Increasing thickness does not, by itself, make the lesion a malignant neoplasm.

Port-wine stains and GNAQ

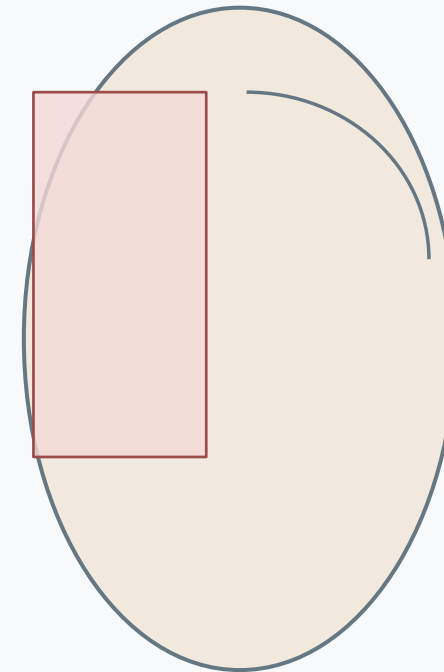


- Most port-wine stains, including Sturge–Weber-associated lesions, have somatic gain-of-function GNAQ mutations.
- GNAQ encodes an α subunit of a heterotrimeric transmembrane signaling molecule.
- The change is acquired in somatic tissue, not described as the inherited mechanism of HHT.

Recognizing Sturge–Weber association

- A port-wine nevus in trigeminal-nerve distribution can signal Sturge–Weber syndrome.
- The syndrome is also termed encephalotrigeminal angiomatosis.
- The facial lesion is a clue to possible associated leptomeningeal vascular abnormalities.

Anatomic association — schematic



Facial port-wine region

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Sturge–Weber: Extracutaneous disease

- Ipsilateral venous angiomas may occur in the cortical leptomeninges.
- Reported consequences include seizures, hemiplegia and intellectual disability.
- Skull radiopacities are part of the textbook-described picture.

Clinicopathologic connection

Facial vascular malformation

Leptomeningeal venous angiomas

Neurologic manifestations

Case: Child with facial vascular lesion

Hypothetical teaching case

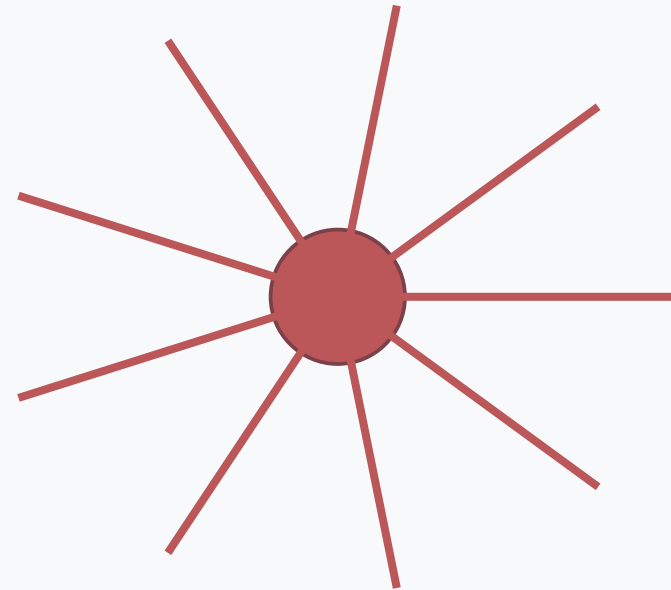
- A child has a large persistent facial port-wine stain in trigeminal distribution and recurrent seizures.
- Question: What associated congenital vascular disorder should be considered?
- Reasoning: A cutaneous distribution may point to an ipsilateral intracranial vascular abnormality.

Discussion prompt: Identify the lesion and the decisive clues.

Spider telangiectasia: Vessel arrangement

- A central vascular core is surrounded by radial dilated arteriolar branches.
- The pattern resembles a spider body with radiating legs.
- These are nonneoplastic vascular malformations.

Central core with radial vessels



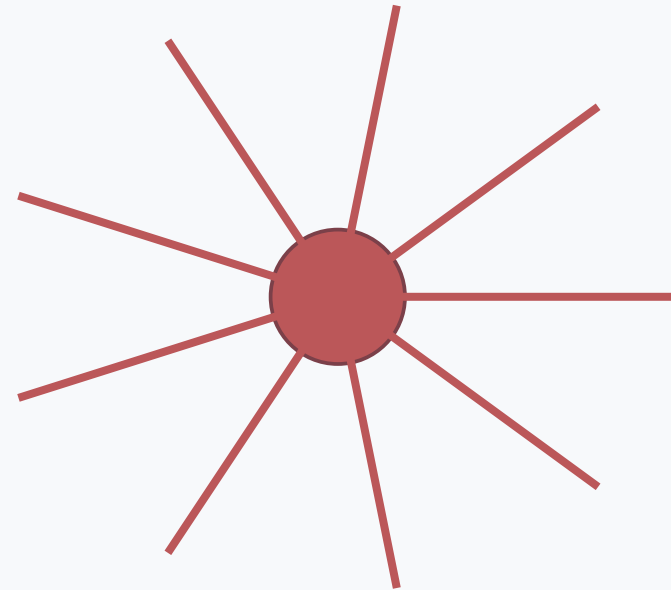
Radial arteriolar pattern

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Spider telangiectasia: Bedside clue

- Radial arteriolar lesions are often pulsatile.
- They blanch under pressure.
- The blanching response and characteristic radial pattern help clinical recognition.

Blanching with pressure



Pressure causes blanching

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Spider telangiectasia: Where and when

- Typical regions: Face, neck and upper chest.
- Common association: Hyperestrogenic states.
- Examples: Pregnancy and cirrhosis.
- The association should not be mistaken for proof of either condition.

Case: Radial red lesion of the upper chest

Hypothetical teaching case

- A pregnant patient develops a red blanchable lesion with a central focus and radiating vascular branches.
- Question: Which benign tumor-like lesion is most consistent?
- Reasoning: The radial arteriolar arrangement is more informative than size alone.

Discussion prompt: Identify the lesion and the decisive clues.

Hereditary hemorrhagic telangiectasia

- Also called Rendu–Osler–Weber disease.
- An autosomal dominant vascular malformation disorder.
- The abnormal vessels include dilated capillaries and veins.
- Mucosal and visceral distribution explains the clinical prominence of bleeding.

HHT: Endothelial signaling defect



- Loss-of-function mutations affect components of endothelial TGF-β signaling.
- The resulting disorder is associated with widespread malformed vascular channels.
- Unlike port-wine stains, the defining Robbins pattern is autosomal dominant inheritance.

HHT: Distribution is multisystem

- Malformations involve skin and oral mucous membranes.
- Visceral sites include respiratory, gastrointestinal and urinary tracts.
- Multiple locations create multiple potential sites for hemorrhage.

Anatomic checklist

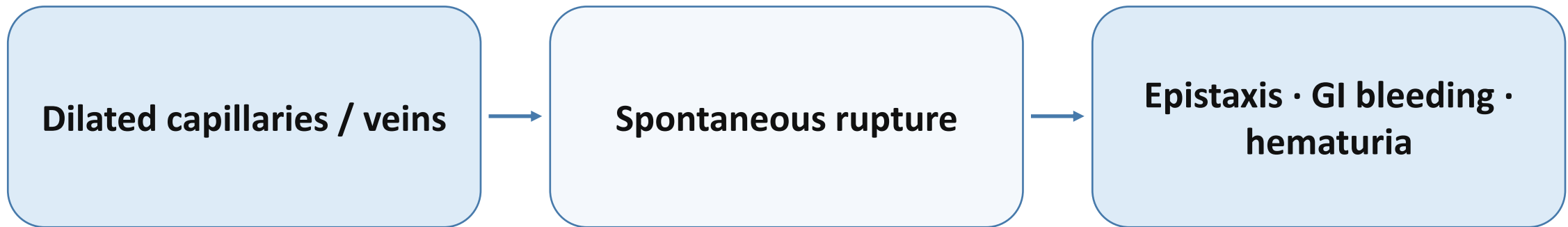
Skin / mouth

Respiratory tract

Gastrointestinal tract

Urinary tract

HHT: Rupture explains morbidity



- Fragile dilated vessels may rupture spontaneously.
- Clinically serious epistaxis is possible.
- Gastrointestinal bleeding and hematuria are other consequences.

Case: Recurrent nosebleeds and red lesions

Hypothetical teaching case

- A patient with affected relatives has telangiectasias of the oral mucosa and recurrent spontaneous epistaxis.
- Question: Which inherited vascular disorder unifies the findings?
- Reasoning: Inheritance, multi-site ectasias and bleeding distinguish the syndrome.

Discussion prompt: Identify the lesion and the decisive clues.

Three ectasias: A diagnostic comparison

Feature	Nevus flammeus / port-wine	Spider telangiectasia	HHT
Pattern	Flat red-purple patch	Central core + radial branches	Widespread telangiectasias
Course / setting	Regression or persistent thickening	Hyperestrogenic states	Autosomal dominant
Complication / link	Sturge–Weber subset	Blanches with pressure	Spontaneous hemorrhage

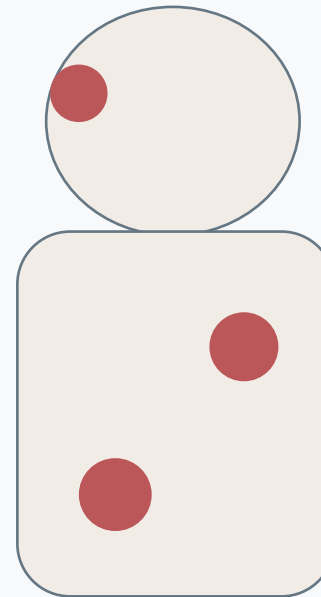
Hemangiomas: Defining concept

- Very common tumors made of blood-filled vascular channels.
- Them as the most common tumor of infancy and childhood.
- Many begin early, enlarge initially and later regress.
- Malignant transformation is rare.

Hemangioma: Favored sites and extent

- Frequently occur in head, neck and thoracic skin.
- Can also arise in internal organs.
- More extensive disease is termed angiomatosis in the source.

Site distribution (schematic)



Head / neck / thoracic skin; Internal sites

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Internal hemangiomas: The liver

- Nearly one-third of internal lesions occur in the liver.
- Internal location can change how a lesion is detected or investigated.
- The benign nature of the entity should be separated from complications of site and extent.

Major hemangioma forms

- Capillary hemangioma: Small, thin-walled capillary-size channels.
- Cavernous hemangioma: Large, dilated blood-filled spaces.
- Pyogenic granuloma: Rapidly growing capillary hemangioma variant.
- Juvenile hemangioma: Distinctive early childhood clinical course.

Clinical / morphologic patterns

Capillary

Juvenile

Cavernous

Pyogenic granuloma

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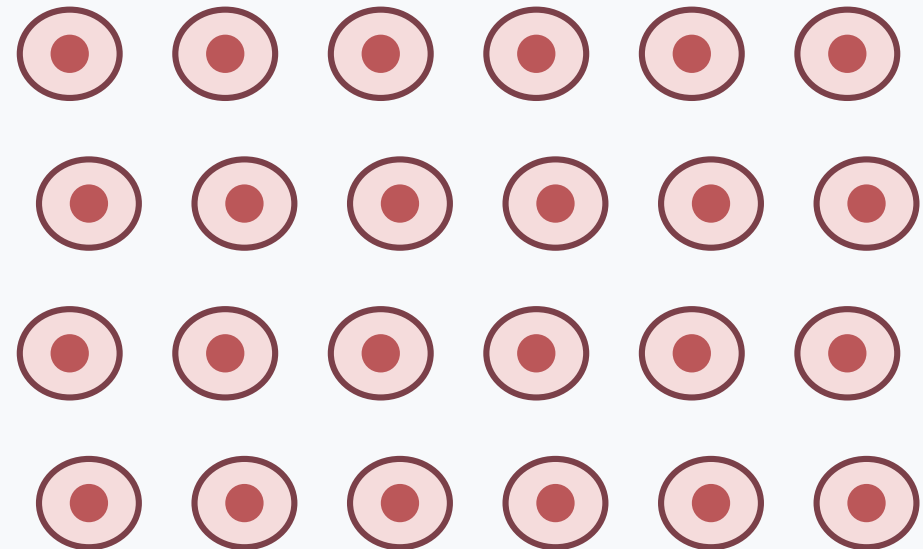
Capillary hemangioma: Typical sites

- Skin and subcutaneous tissue are frequent sites.
- Also present in lips and oral mucosal surfaces.
- Visceral examples include liver, spleen and kidney.
- Microscopic architecture is a proliferation of thin-walled capillaries.

Capillary hemangioma: Microscopy

- Numerous delicate thin-walled capillary channels form the lesion.
- The intervening stroma is scant.
- This is the smaller-channel end of the hemangioma morphologic spectrum.

Small vascular channels



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Juvenile hemangioma: Initial phase

- Juvenile “strawberry-type” lesions occur in newborn skin.
- They may be multiple.
- They typically grow rapidly for several months.

Course

Present very early in life

Early rapid growth

Later fading and involution

Juvenile hemangioma: Regression



- Red lesions typically fade during early childhood.
- Fading by 1–3 years.
- Most completely regress by age 7 years.

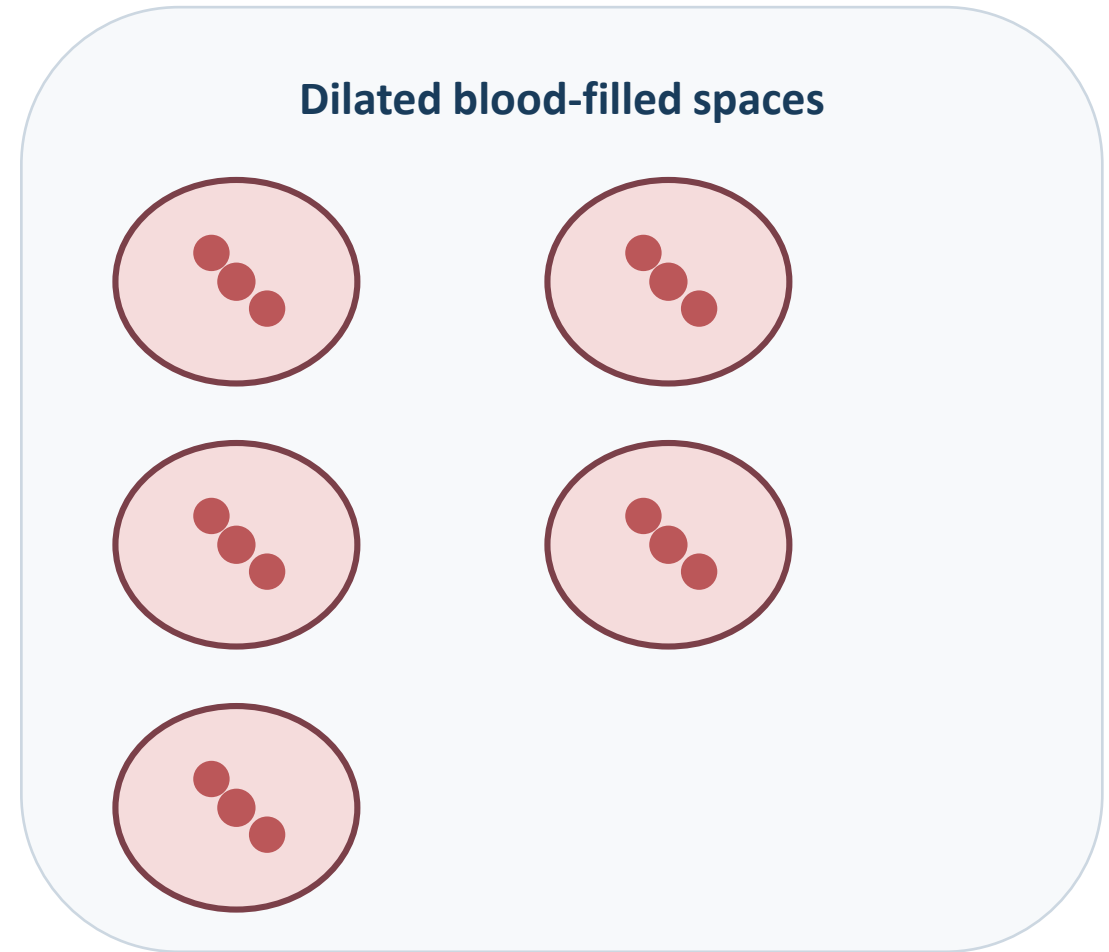
Juvenile vs cavernous: Course differs

- Juvenile hemangiomas commonly undergo spontaneous regression.
- Cavernous hemangiomas, in contrast, generally do not.
- The distinction changes expectations when counseling about natural history.

Juvenile	Cavernous
Rapid early growth	Often deep or infiltrative
Fades in early childhood	Spontaneous regression absent
Most regress by age 7	May persist and cause local effects

Cavernous hemangioma: Architecture

- Large, dilated blood-filled vascular spaces are characteristic.
- Spaces are separated by connective tissue stroma.
- At low magnification the lesion is often sharply demarcated but lacks a capsule.

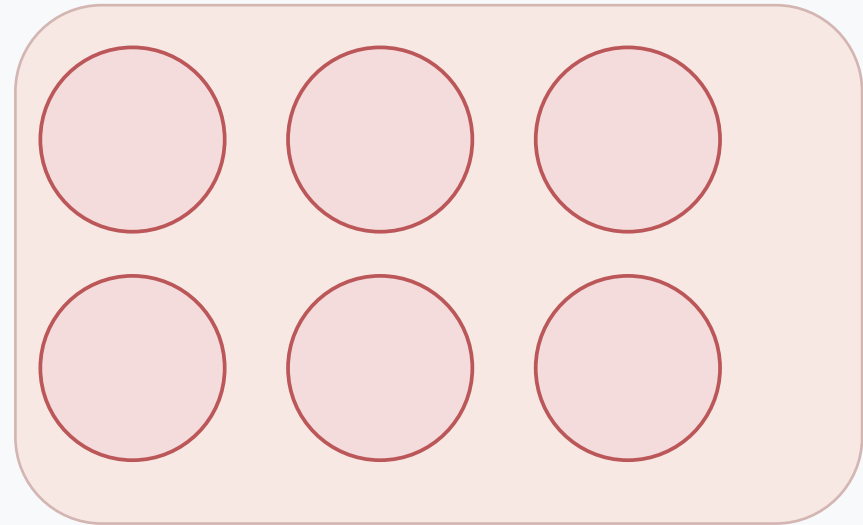


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Cavernous hemangioma: Growth pattern

- Compared with capillary variants, cavernous hemangiomas are more infiltrative.
- They frequently involve deep structures.
- A well-defined gross border does not guarantee an encapsulated tumor.

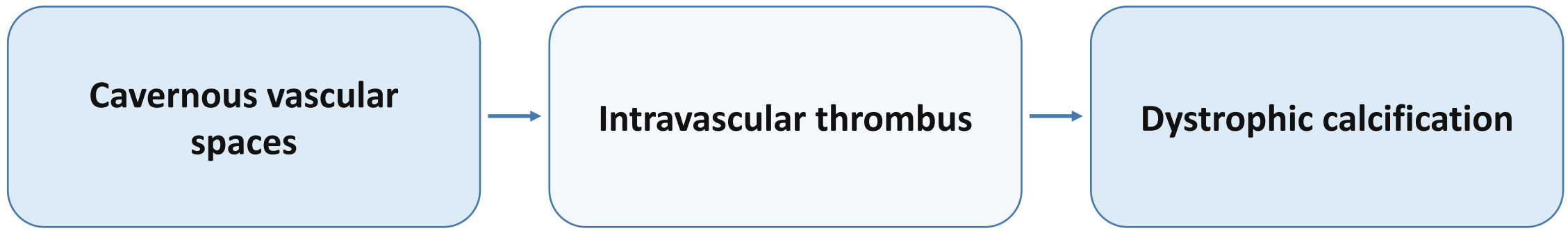
Unencapsulated interface with tissue



Tumor spaces reach surrounding tissue

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Thrombosis and dystrophic calcification



- Blood can thrombose within the cavernous vascular spaces.
- Dystrophic calcification may follow intravascular thrombosis.
- These findings help explain structural heterogeneity within one benign lesion.

Cavernous lesions: Local consequences

- Usually limited clinical significance in many superficial locations.
- Possible cosmetic disfigurement.
- Susceptible to trauma-related ulceration and bleeding.
- Some lesions are locally destructive because of size and location.

Intracranial cavernous hemangiomas



- A cerebral vascular lesion can compress adjacent tissue.
- Rupture is another potential source of symptoms.
- Anatomical location therefore influences clinical severity independently of benign histology.

Cavernous hemangioma and von Hippel–Lindau

- Cavernous hemangiomas are described as a component of von Hippel–Lindau disease.
- Vascular lesions may occur in cerebellum, brain stem, retina, pancreas and liver.
- Syndromic context should be considered with appropriately distributed lesions.

Sites highlighted

Cerebellum / brain stem

Retina

Pancreas / liver

Capillary versus cavernous morphology

- The key distinction is vascular channel caliber and architecture.
- Capillary lesions have closely spaced thin-walled channels and scant stroma.
- Cavernous lesions feature large spaces with connective tissue septa.

Capillary	Cavernous
Small thin-walled capillaries	Large dilated vascular spaces
Scant supporting stroma	Intervening connective tissue
Often superficial	Frequently deeper / infiltrative

Hemangioma versus angiosarcoma: Caution

- Benign hemangioma usually forms recognizable blood-filled channels.
- Malignant endothelial tumors may be solid, atypical and poorly vascularized architecturally.
- Radiologically detected cavernous lesions can be difficult to distinguish from malignant counterparts.

Usually benign

Organized endothelial-lined spaces

Bland endothelial lining

Clinical context often reassuring

Concerning malignant pattern

Disorganized solid growth

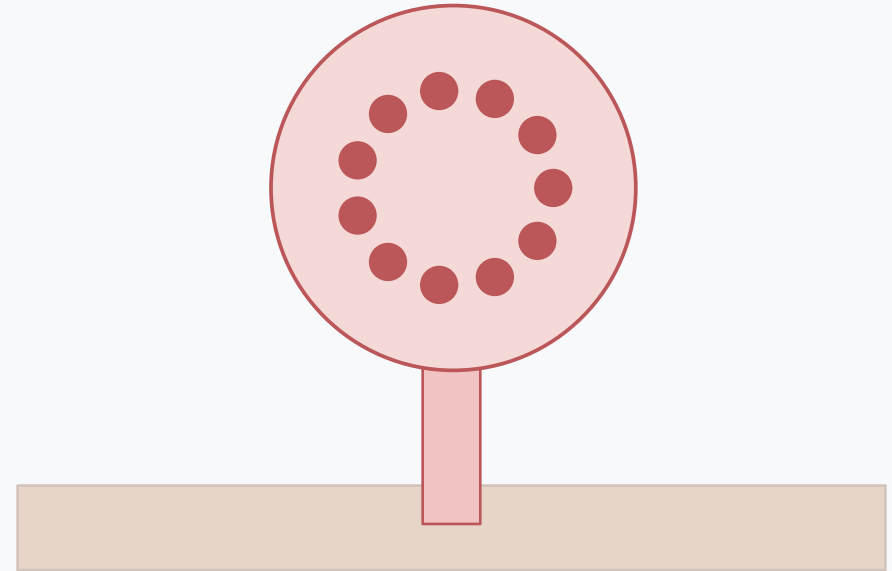
Cellular atypia

Tissue evaluation may be required

Pyogenic granuloma: Clinical appearance

- A rapidly growing, red, often pedunculated vascular mass.
- Typical locations: Skin, gingiva and oral mucosa.
- This as a capillary hemangioma variant.

Surface capillary lesion — schematic



Red pedunculated capillary-rich mass

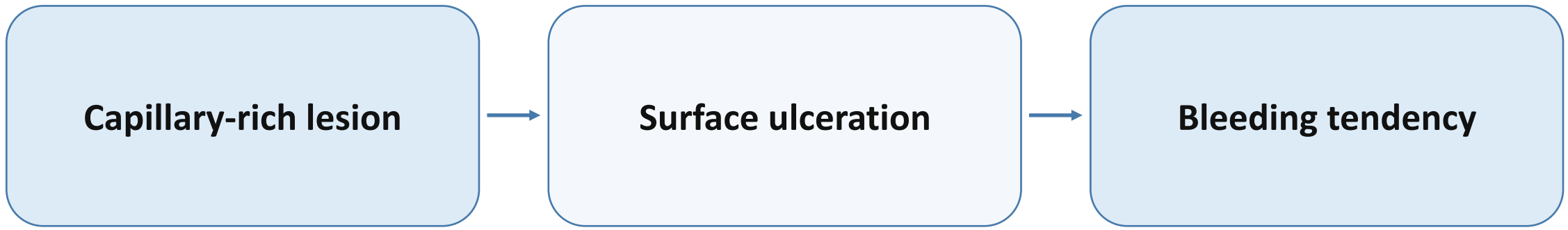
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Pyogenic granuloma: Temporal clues



- Approximately one-quarter arise after trauma description.
- The lesion may reach 1–2 cm over only a few weeks.
- Rapid enlargement alone does not establish malignancy.

Why pyogenic granulomas bleed



- The lesion is richly vascular and often ulcerated.
- It may bleed easily after minor irritation.
- Vascularity and surface ulceration jointly account for the clinical appearance.

Pyogenic granuloma: Local treatment

- Curettage followed by cautery is usually curative.
- Treatment addresses a localized vascular proliferation.
- Site and bleeding tendency are relevant to clinical management.

Pregnancy tumor: A gingival variant

- Granuloma gravidarum is a pyogenic granuloma involving gingiva during pregnancy.
- Occurrence in approximately 1% of pregnant patients.
- It shares the rapidly growing vascular nature of pyogenic granuloma.

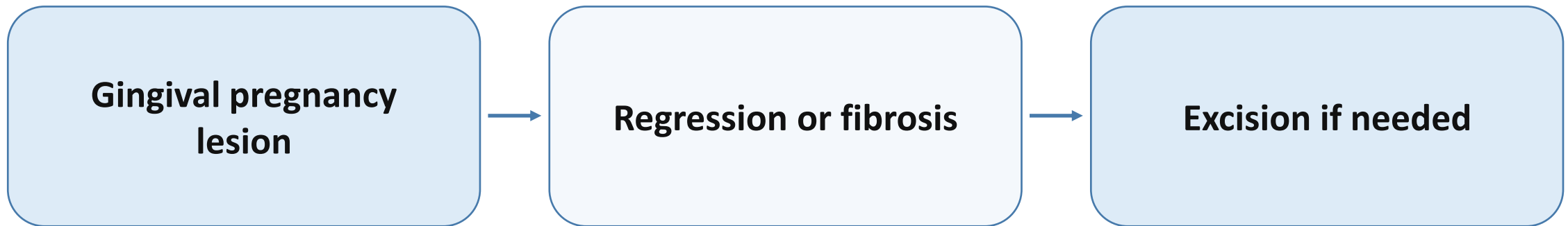
Recognition

Pregnancy

Gingival mass

Capillary-rich / bleeding lesion

Pregnancy tumor: Possible outcomes



- Some lesions regress spontaneously, particularly after pregnancy.
- Others undergo fibrosis.
- Occasional lesions require surgical excision.

Case: Rapidly growing gingival lesion

Hypothetical teaching case

- A patient develops a friable red gingival mass that bleeds with minor contact during pregnancy.
- Question: Which hemangioma variant fits the site and setting?
- Reasoning: The pregnancy association is specific; Malignancy cannot be inferred from rapid growth alone.

Discussion prompt: Identify the lesion and the decisive clues.

Hemangioma variants: Integrate the clues

Variant	Hallmark	Clinical course / issue
Capillary	Small thin-walled channels	Common in skin / mucosa
Juvenile	Newborn skin; strawberry-type	Rapid growth then regression
Cavernous	Large dilated channels	Deeper; no spontaneous regression
Pyogenic granuloma	Red pedunculated mass	Rapid onset; bleeding / ulceration

Lymphangioma: The lymphatic counterpart

- Lymphangiomas are benign lesions of lymphatic vessels.
- They have endothelium-lined spaces, as blood-vessel tumors do.
- Luminal contents and lymphatic endothelial markers help distinguish the systems.

Vessel content distinguishes lineages



Blood

Lymph

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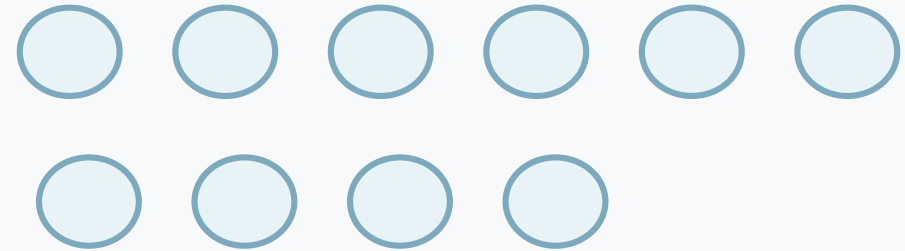
Simple lymphangioma: Clinical pattern

- Usually slightly elevated or pedunculated.
- May reach approximately 1–2 cm.
- Predominantly affects head, neck and axillary subcutaneous tissues.
- This is the small-channel counterpart of cavernous lymphangioma.

Simple lymphangioma: Tissue pattern

- Interconnected endothelium-lined lymphatic spaces form the lesion.
- Unlike blood-filled capillary lesions, spaces may lack red cells.
- The architecture must be interpreted alongside the site and markers.

Endothelial-lined lymphatic channels



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Blood vessels versus lymphatic spaces

- Blood-containing vascular channels often contain visible erythrocytes.
- Lymphatic channels may be relatively empty of erythrocytes.
- The absence of red cells is supportive, not the only diagnostic criterion described.

Blood-vessel lesion	Lymphatic lesion
Channels contain erythrocytes	Lymphatic spaces may lack red cells
Hemangioma variants	Lymphangioma variants
Vascular architecture	Lymphatic endothelial phenotype

Lymphatic lineage: Marker support

- VEGFR-3 and LYVE-1 as lymphatic endothelial markers.
- These markers can help distinguish lymphangioma from capillary channels.
- Marker interpretation should accompany morphology rather than substitute for it.

Support lymphatic identity

VEGFR-3

LYVE-1

Interpret with channel morphology

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Cavernous lymphangioma: Characteristic sites

- Also known as cystic hygroma.
- Usually encountered in neck or axilla in children.
- Less often affects retroperitoneum.

Typical distribution

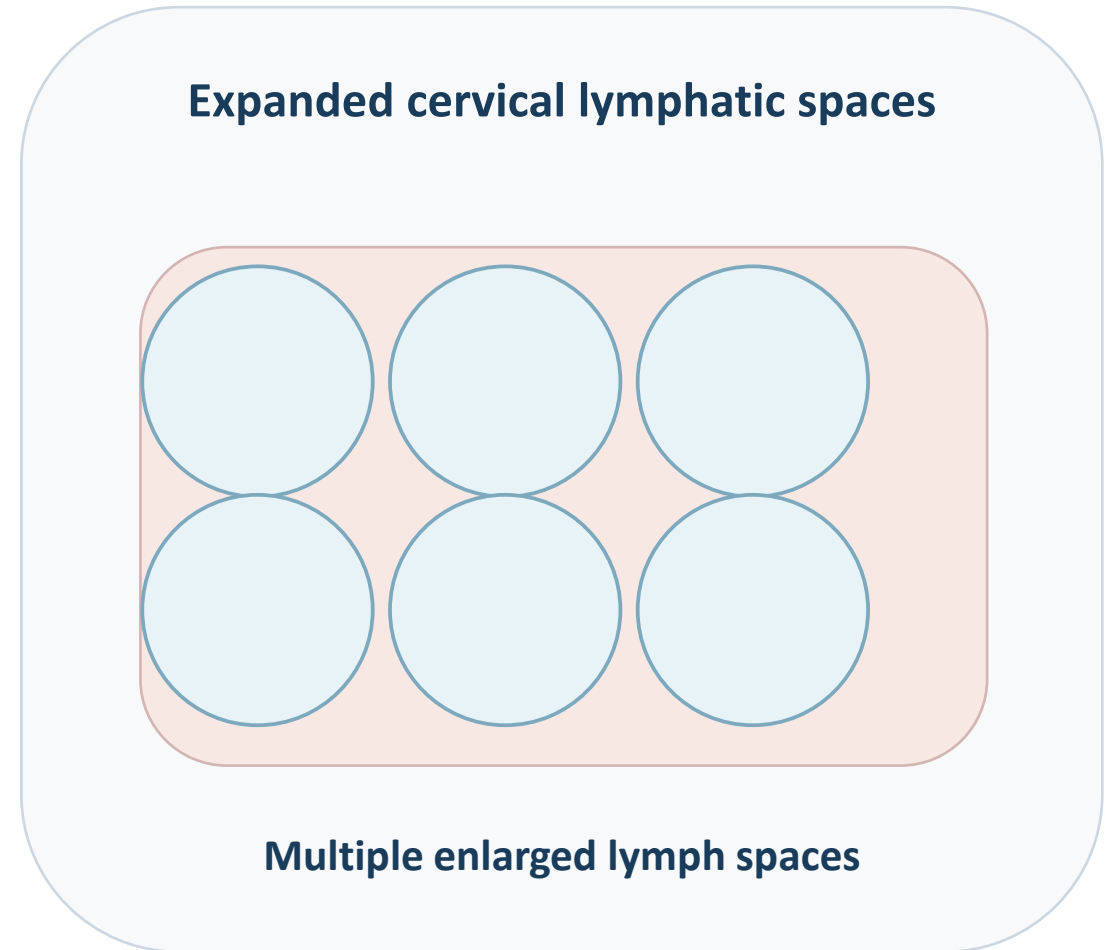
Pediatric neck

Axilla

Occasional retroperitoneum

Cystic hygroma: Potentially large lesion

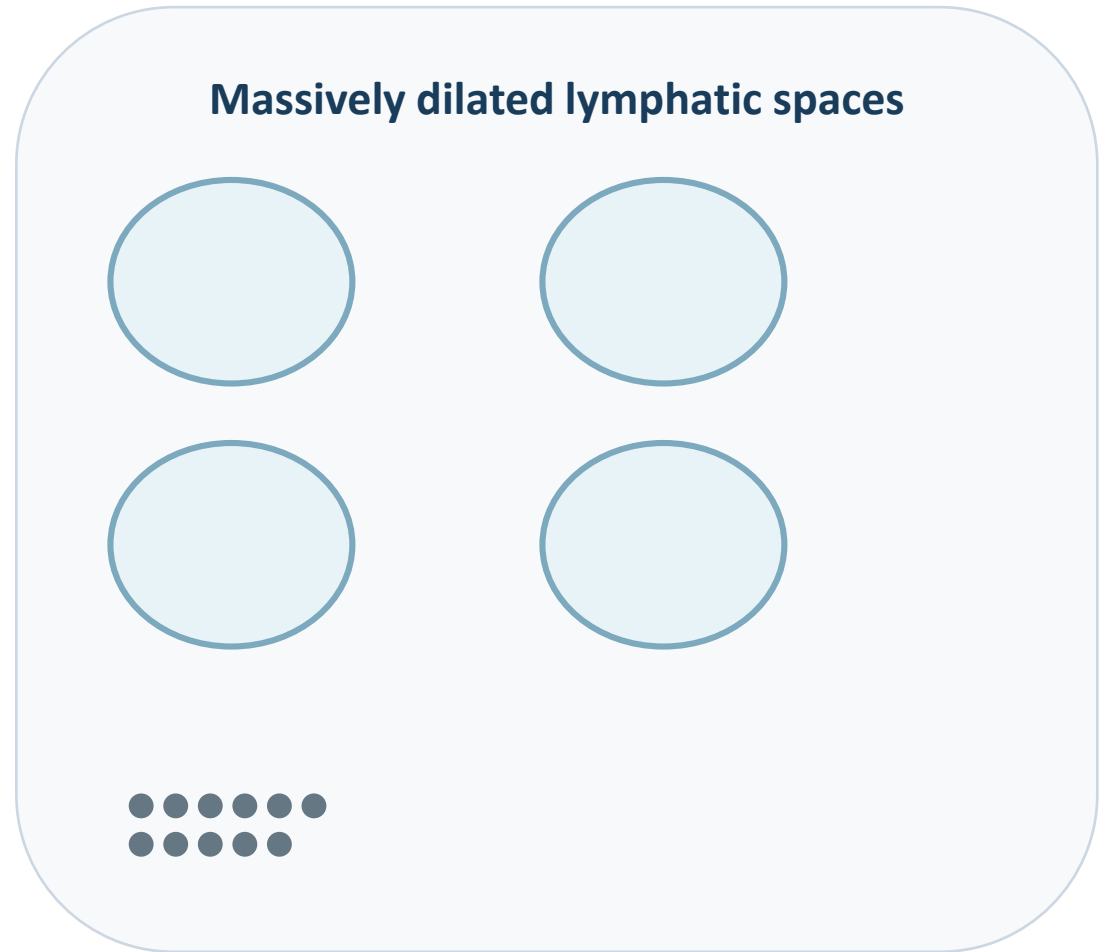
- Cavernous lymphangiomas may become enormous (up to 15 cm).
- Large lesions may fill the axilla or distort the neck.
- Dimensions and infiltrative boundaries help explain the clinical presentation.



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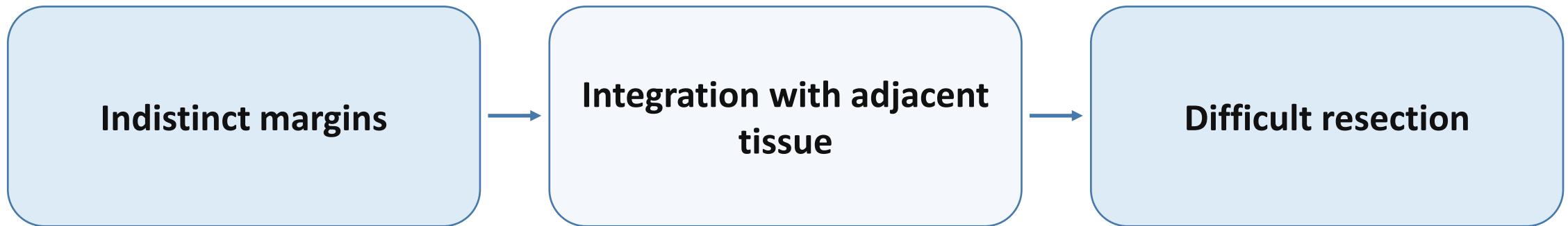
Cavernous lymphangioma: Histology

- Massively dilated lymphatic spaces are endothelial-lined.
- Connective tissue stroma separates the spaces.
- Lymphoid aggregates are present within intervening stroma.



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Unencapsulated margins complicate surgery



- Cavernous lymphangiomas have indistinct, unencapsulated margins.
- They blend with adjacent tissue rather than shelling out as a discrete capsule.
- This helps explain why complete resection may be difficult.

Cystic hygroma and Turner syndrome

- Cervical cavernous lymphangiomas as common in Turner syndrome.
- The association is relevant when a child has a large neck lesion.
- Association is a clue, not a substitute for examining an individual lesion.

Simple versus cavernous lymphangioma

- Both represent lymphatic endothelial-lined spaces.
- Size, location, lumen dilation and tissue boundaries differ.
- The cavernous variant is especially notable for large size and poorly defined margins.

Simple lymphangioma	Cavernous lymphangioma
Slightly raised; Often 1–2 cm	May become very large
Subcutaneous head/neck/axilla	Neck, axilla; Sometimes retroperitoneum
Smaller lymphatic channels	Massively dilated lymphatic spaces

Case: A large vascular neck mass in childhood

Hypothetical teaching case

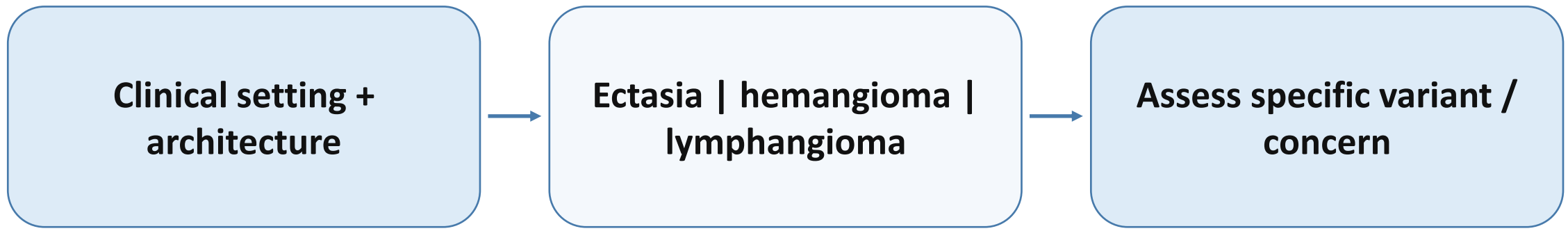
- A child has a large nonencapsulated multilocular-appearing neck lesion; Tissue shows lymphatic spaces with lymphoid aggregates.
- Question: Which lesion best accounts for the morphology?
- Reasoning: Lymphatic contents, deep size and margins matter more than the generic word “vascular.”

Discussion prompt: Identify the lesion and the decisive clues.

Vascular tumor-like lesions: Final comparison

Lesion	Structural substrate	Key recognition clue
Telangiectasia	Dilated preexisting small vessels	Surface lesion; specific distribution
Capillary hemangioma	Small blood-filled capillaries	Thin walls; scant stroma
Cavernous hemangioma	Large blood-filled spaces	Deep, persistent; thrombosis possible
Lymphangioma	Lymphatic endothelium-lined spaces	Absent RBCs / lymphatic markers

An initial diagnostic reasoning pathway



- First determine whether the lesion is a dilation, a vascular proliferation or a lymphatic proliferation.
- Then use architecture, blood content, depth, age and clinical course.
- Escalate concern when atypia or poor vascular organization challenges a benign diagnosis.

Three high-yield distinctions

- A persistent port-wine stain is not the same clinical course as a regressing nevus flammeus.
- A juvenile hemangioma commonly involutes; A cavernous hemangioma does not.
- A large poorly circumscribed cervical lymphatic lesion points toward cystic hygroma.

Morphology → consequence

Dilated vessel → visible ectasia

Blood-filled tumor → hemangioma

Lymphatic spaces → lymphangioma

Further reading

- Robbins, Cotran & Kumar: Pathologic Basis of Disease.
- Review the section on vascular tumors, including vascular ectasias, hemangiomas and lymphangiomas.
- Use authentic microscopy and gross pathology images alongside these conceptual schematics when teaching diagnostic morphology.