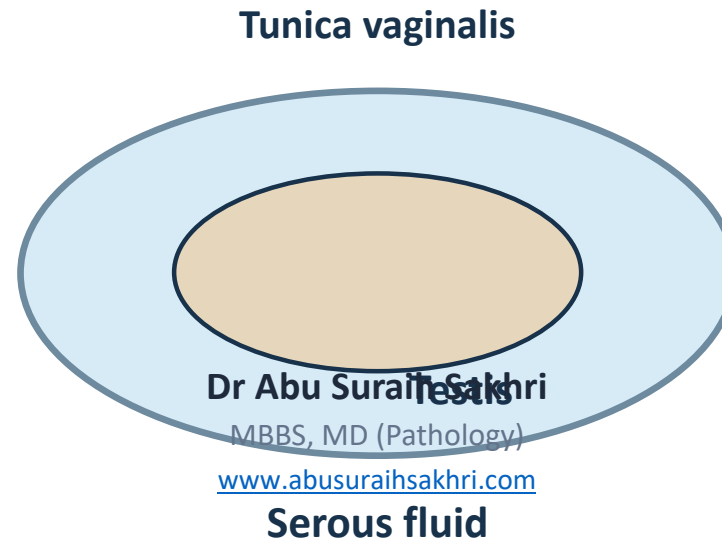


Lesions of Tunica Vaginalis

Fluid collections, ductal and venous mimics, and rare tunical neoplasms



Tunica vaginalis lesions: Learning objectives

- Locate the mesothelial sac relative to the testis, epididymis, and spermatic cord.
- Classify scrotal findings by fluid content, anatomic compartment, and clinical urgency.
- Explain the specific mechanisms and distinguishing features of hydrocele, hematocele, and chylocele.
- Recognize adjacent spermatocele, varicocele, and rare tunical neoplasms.

Tunical sac
Serous / blood / lymph

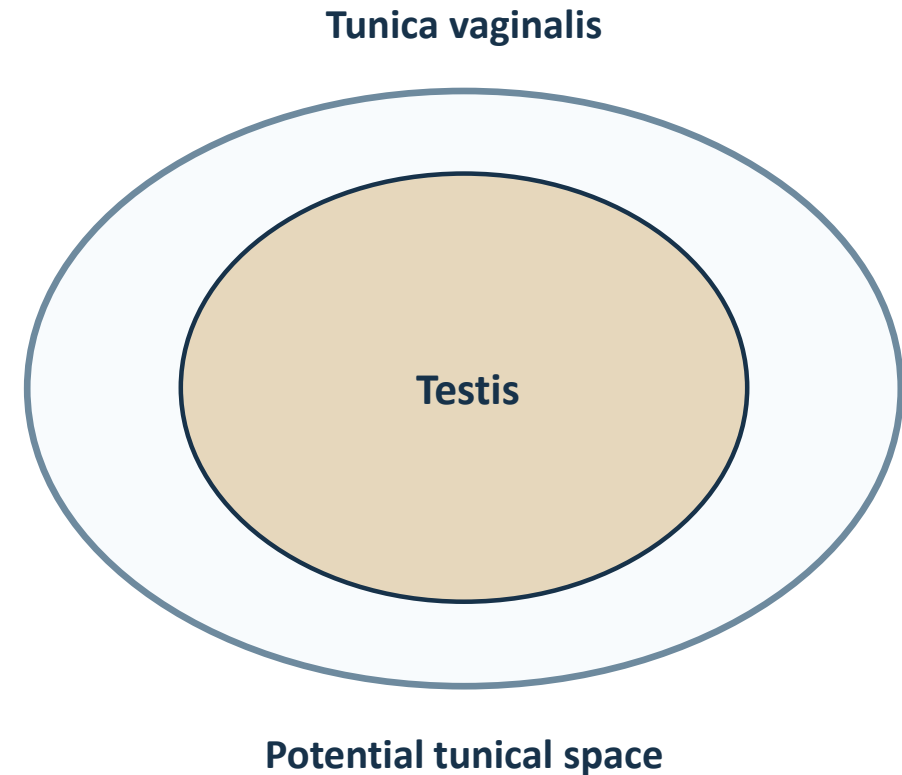
Ductal system
Spermatocele

Spermatic cord
Varicocele

Tunical surface
Rare solid tumors

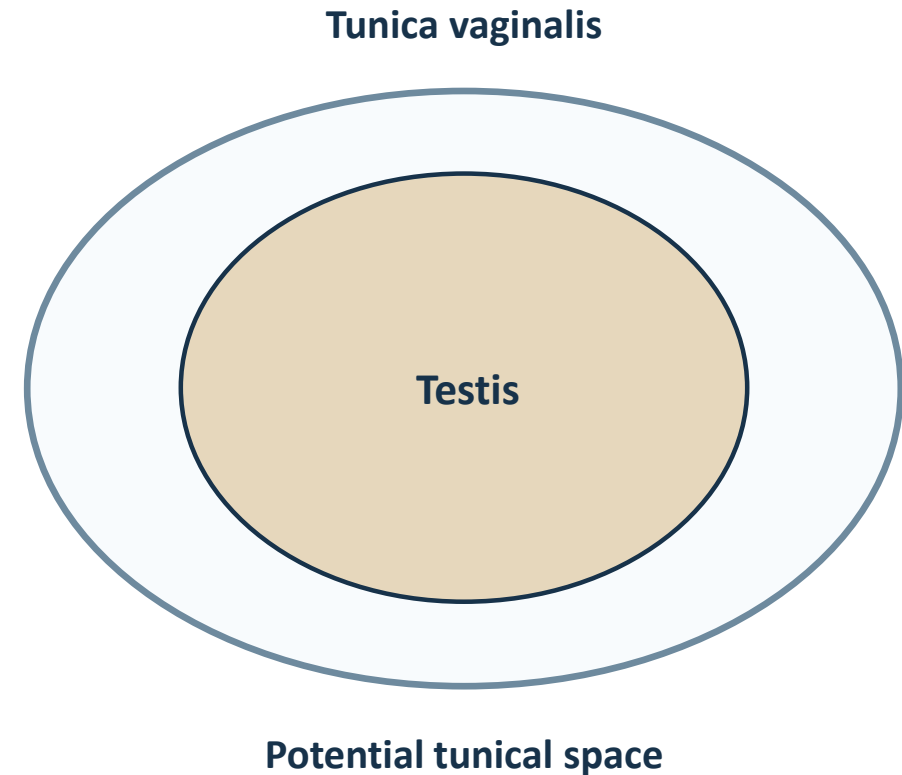
The tunica vaginalis is a mesothelial-lined sac

- The tunica vaginalis lies external to the testis and defines a potential fluid-containing space.
- Its serosal/mesothelial lining provides the relevant tissue origin for some rare neoplasms.
- Understanding this space prevents confusion with intratesticular lesions.



Tunica vaginalis is not the tunica albuginea

- Tunica albuginea forms the dense capsule of the testicular parenchyma.
- Tunica vaginalis is a separate mesothelial covering around the testis.
- A collection between vaginalis layers is extratesticular, not a lesion within the testis.



Localization drives the differential diagnosis

- Tunica vaginalis: Fluid collection or tunical surface lesion.
- Efferent ducts/rete testis: Spermatocoele in the adjacent duct system.
- Spermatic cord veins: Varicocele rather than a cavity containing free fluid.

**Tunical cavity
Fluid**

**Ductal cyst
Semen**

**Cord veins
Venous blood**

Initial classification: Fluid, vascular, or solid

- A fluid-filled tunical sac suggests hydrocele, hematocele, or chylocele.
- Dilated venous channels suggest varicocele; A discrete ductal cyst suggests spermatocele.
- A solid tunical nodule or plaque requires consideration of rare neoplasia.

Tunical sac
Serous / blood / lymph

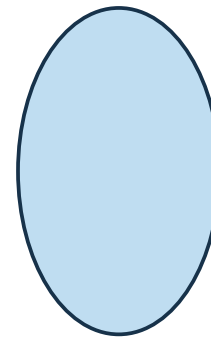
Ductal system
Spermatocele

Spermatic cord
Varicocele

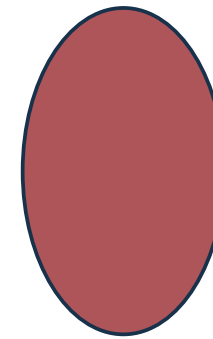
Tunical surface
Rare solid tumors

Fluid composition defines three tunical collections

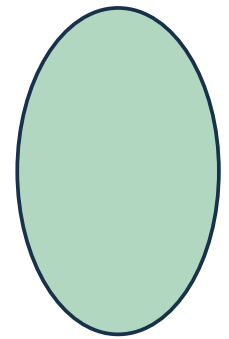
- Hydrocele: Accumulation of serous fluid.
- Hematocele: Blood in the tunica vaginalis cavity.
- Chylocele: Lymphatic fluid in the tunical space.
- Terminology reflects contents; These labels do not by themselves establish the cause.



Serous fluid



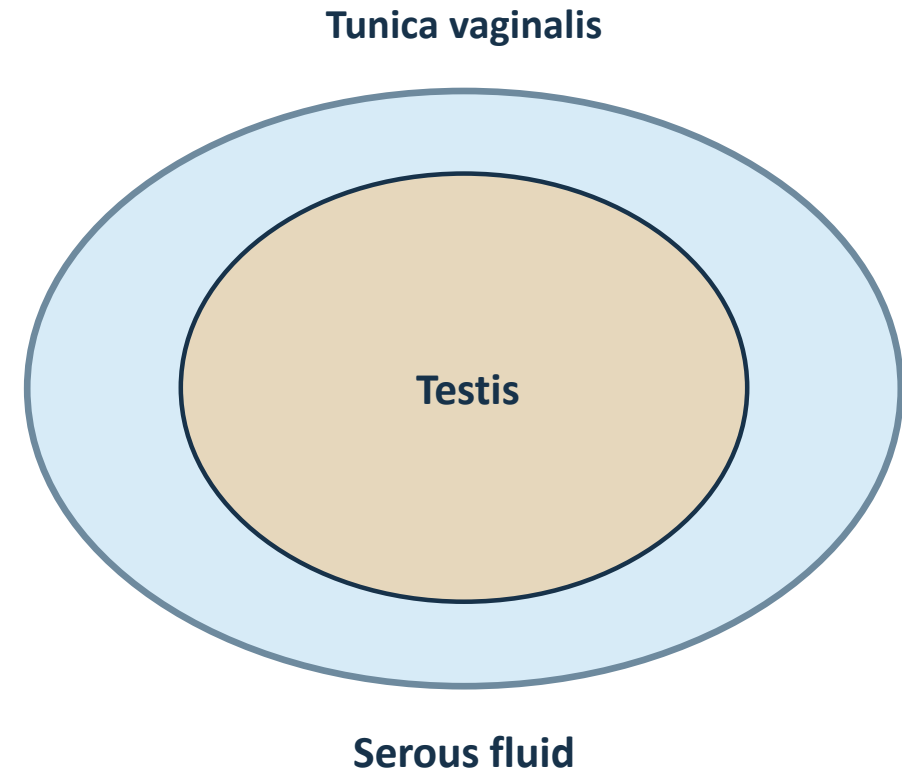
Blood



Lymph

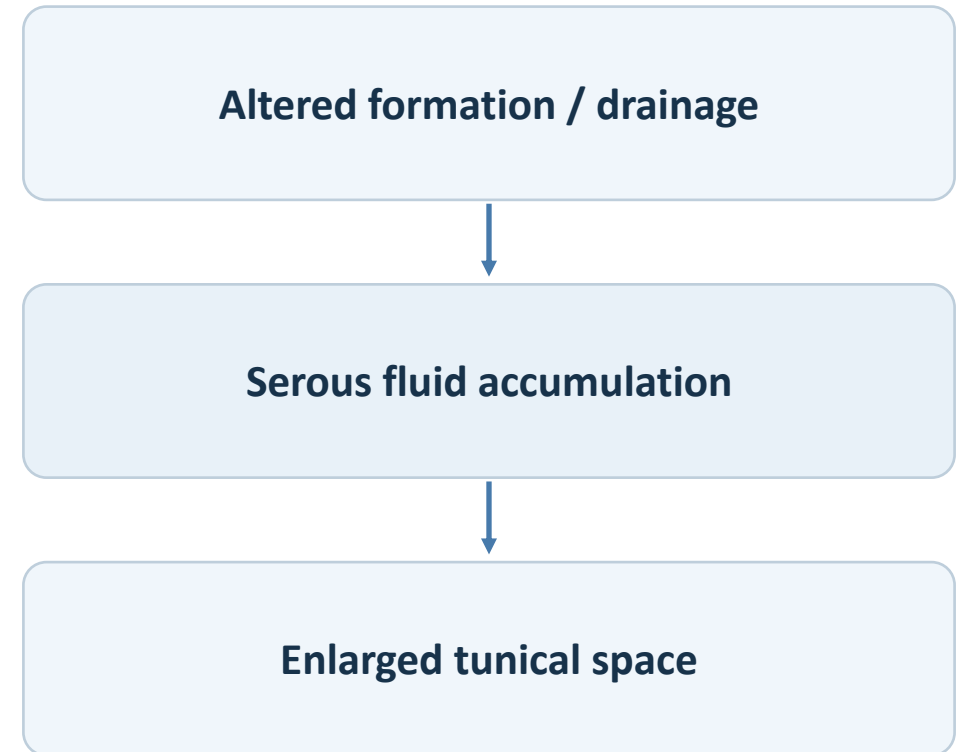
Hydrocele: Serous fluid enlarges the sac

- Serous fluid accumulates around the testis within the tunica vaginalis.
- Enough fluid may produce considerable enlargement of the scrotal sac.
- The testis is displaced or surrounded, rather than being the fluid itself.



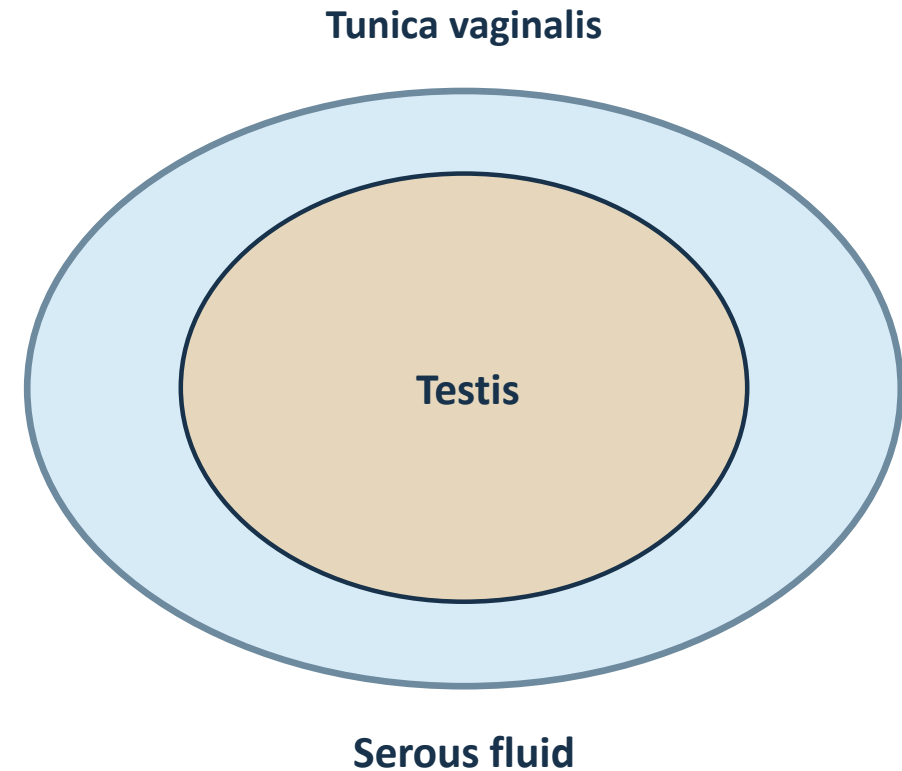
Hydrocele arises when fluid balance is altered

- In acquired hydrocele, excessive formation or impaired clearance permits fluid accumulation.
- A persistent peritoneal communication is an important alternative mechanism in younger patients.
- These mechanistic categories supplement Robbins' concise description of serous fluid.



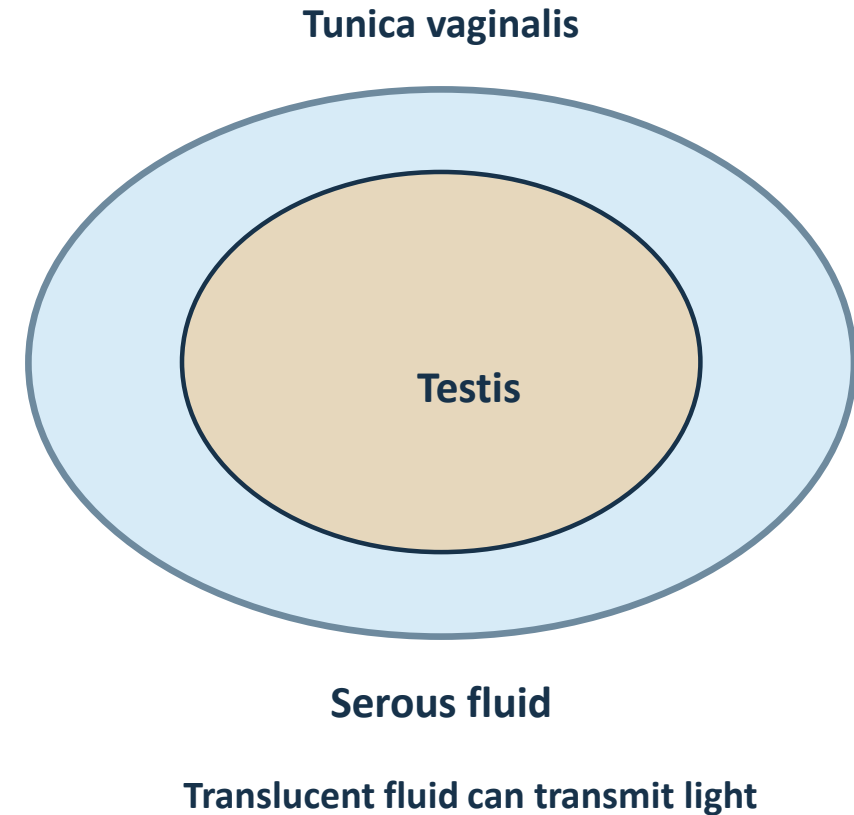
Hydrocele swelling is usually extratesticular

- A scrotal enlargement may be dominated by fluid rather than a palpable solid mass.
- Large collections may make direct examination of the testis difficult.
- The lesion's apparent size does not establish that the testicular parenchyma is enlarged.



Transillumination tests translucency of the contents

- Transmission of light through the typically clear hydrocele fluid.
- A translucent swelling supports—but does not prove—a simple fluid collection.
- Clinical context and examination of the testis remain essential.



Transillumination has important limitations

- It is a bedside observation, not a tissue diagnosis.
- Blood, septations, thickened walls, and solid components can reduce or alter light transmission.
- Ultrasound is appropriate when the swelling is new, unexplained, or the testis cannot be assessed.

History and physical examination



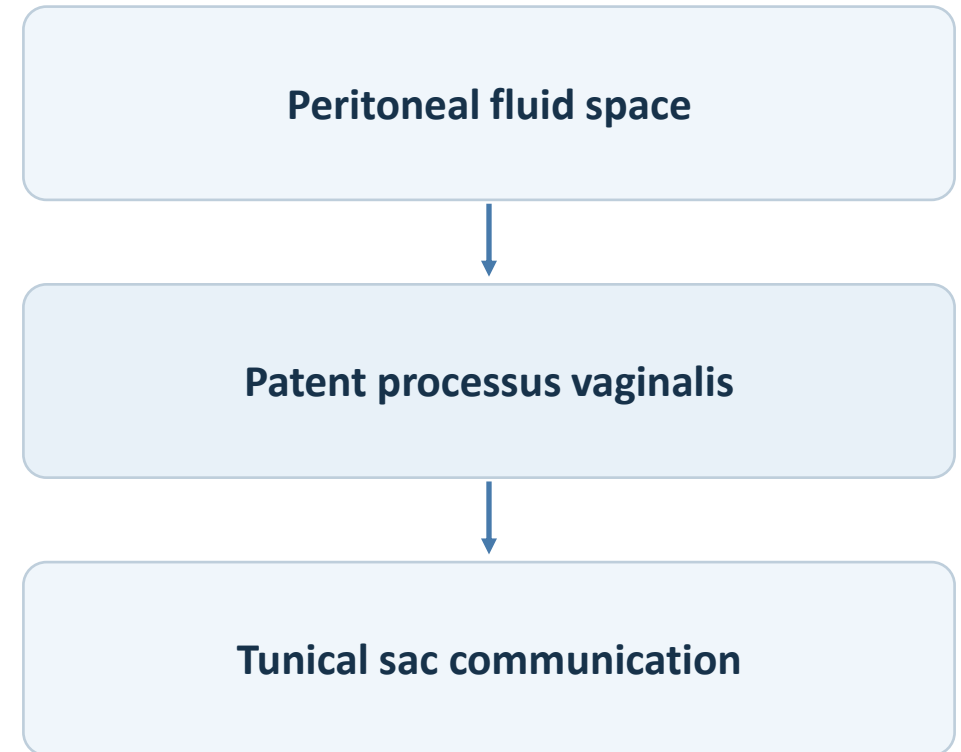
Localize lesion / contents



Targeted scrotal ultrasound

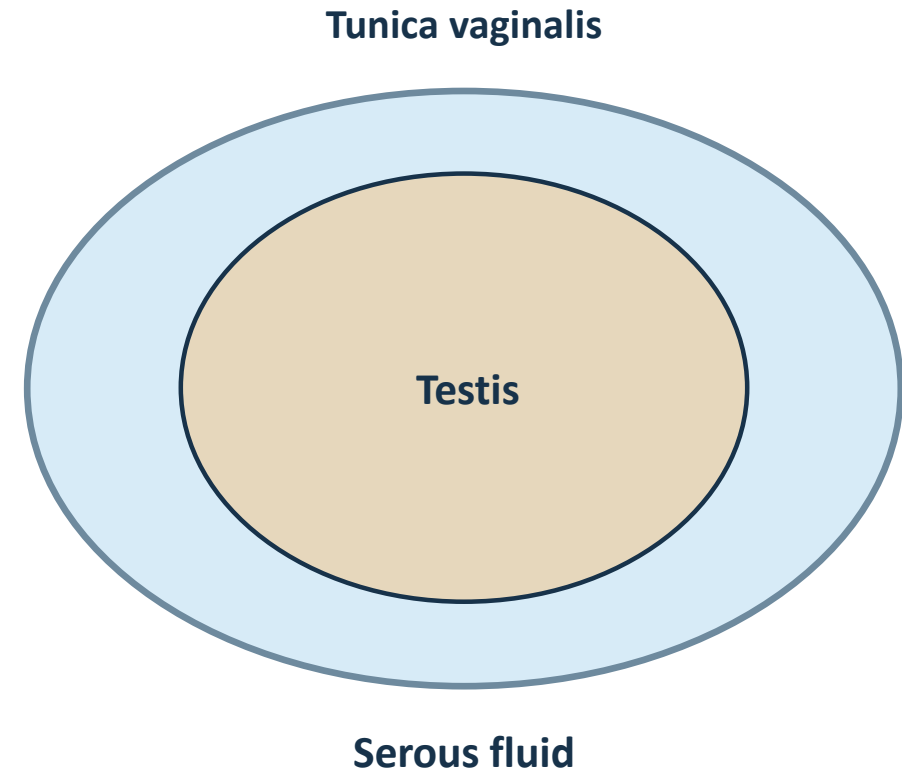
Communicating hydrocele: Persistent peritoneal route

- Persistence of the processus vaginalis permits continuity with the peritoneal cavity.
- Fluid may travel through the patent channel toward the tunical sac.
- The communication is mechanistically distinct from a confined adult hydrocele.



Noncommunicating hydrocele: A closed fluid space

- The fluid remains in the tunica vaginalis without an open peritoneal communication.
- Primary or secondary fluid accumulation can enlarge the closed space.
- The anatomical distinction matters when evaluating a child versus an adult.



Secondary hydrocele prompts a search for another process

- Fluid may accompany inflammatory, traumatic, or other intrascrotal pathology.
- The finding of a hydrocele must not obscure an underlying testicular abnormality.
- A clinical history and scrotal ultrasound help define the cause when indicated.

History and physical examination



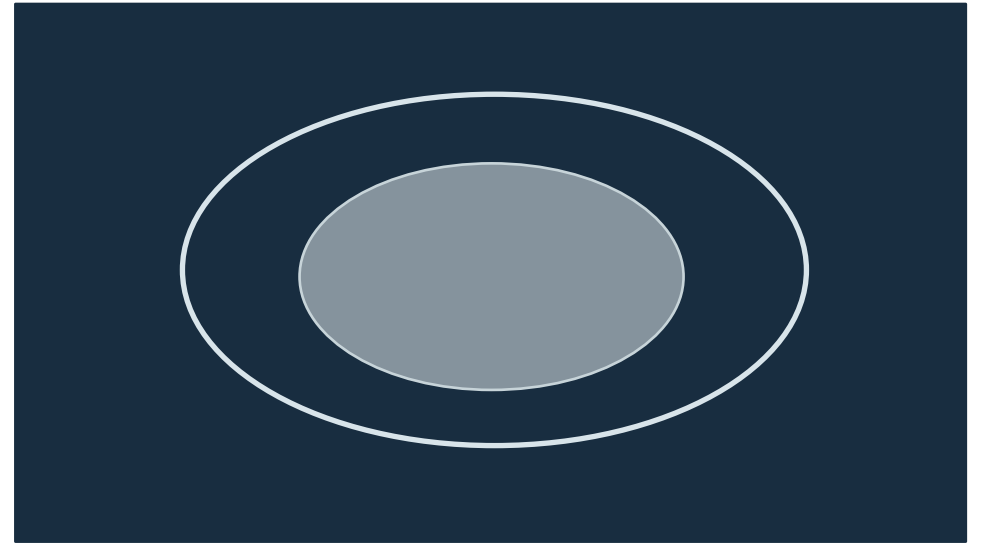
Localize lesion / contents



Targeted scrotal ultrasound

Sonography separates simple fluid from complex contents

- Simple hydrocele is usually a predominantly anechoic extratesticular collection.
- Internal echoes, septa, or nodules should prompt a more careful differential diagnosis.
- Imaging characterizes the collection; Clinical and pathologic correlation determines the diagnosis.



Schematic ultrasound appearance — not a clinical image

Why the location of a hydrocele matters

- The testicular parenchyma should be examined independently of the surrounding fluid.
- A fluid sac and a coexisting focal testicular mass are not mutually exclusive.
- Doppler ultrasound is usually appropriate for a new palpable scrotal abnormality.

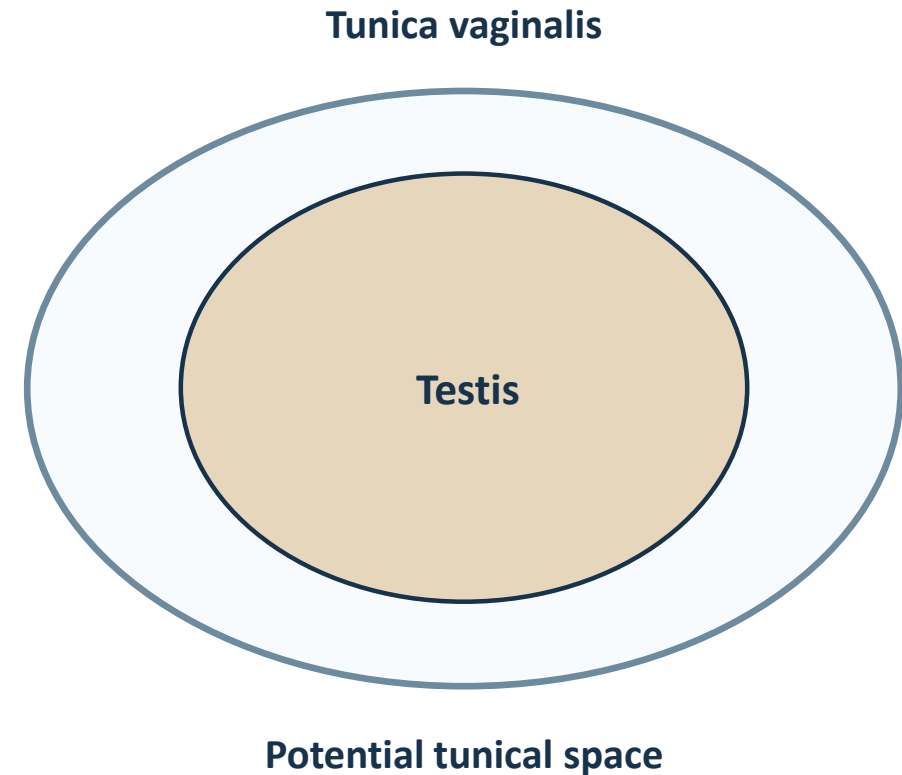
**Tunical cavity
Fluid**

**Ductal cyst
Semen**

**Cord veins
Venous blood**

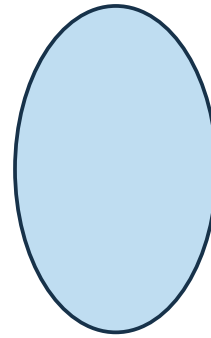
Hydrocele: Pathology of the sac versus the fluid

- The cavity is mesothelial lined; Hydrocele denotes its accumulated serous contents.
- Most uncomplicated presentations do not imply a specific malignant histologic lesion.
- Unexpected wall thickening or nodularity requires separate assessment.

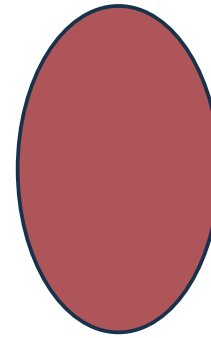


Hydrocele and hematocele are not synonyms

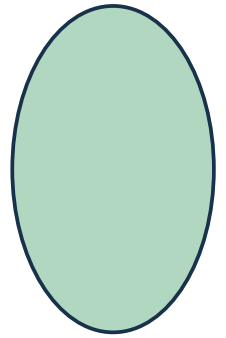
- Hydrocele describes serous fluid, whereas hematocele specifies blood.
- Hemorrhage can make a collection complex and clinically less translucent.
- A change in contents may follow trauma or another acute intrascrotal event.



Serous fluid



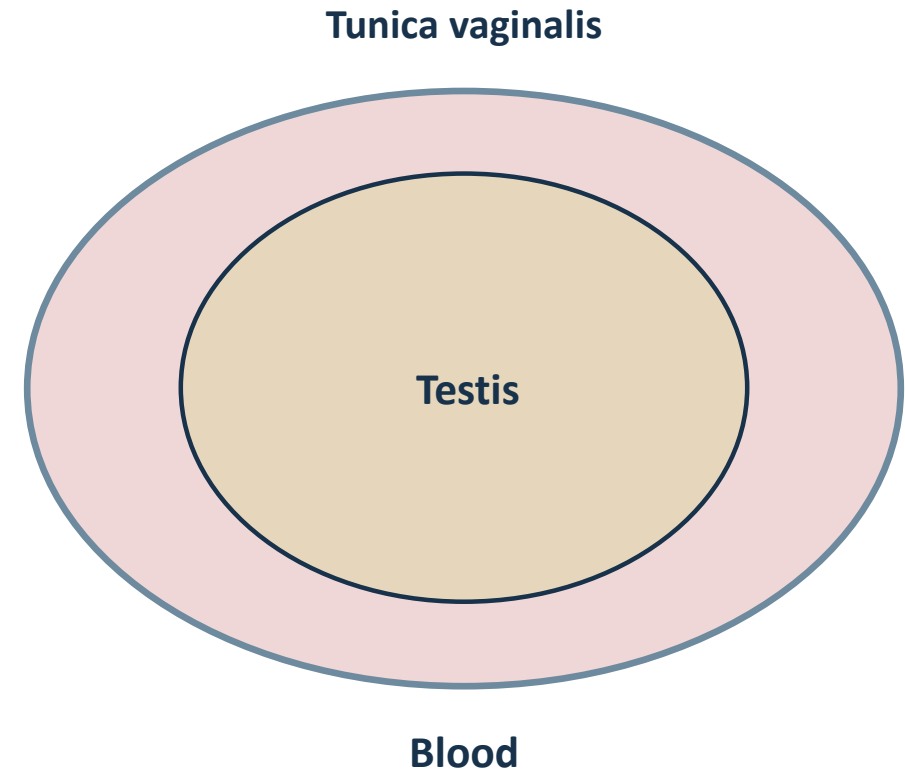
Blood



Lymph

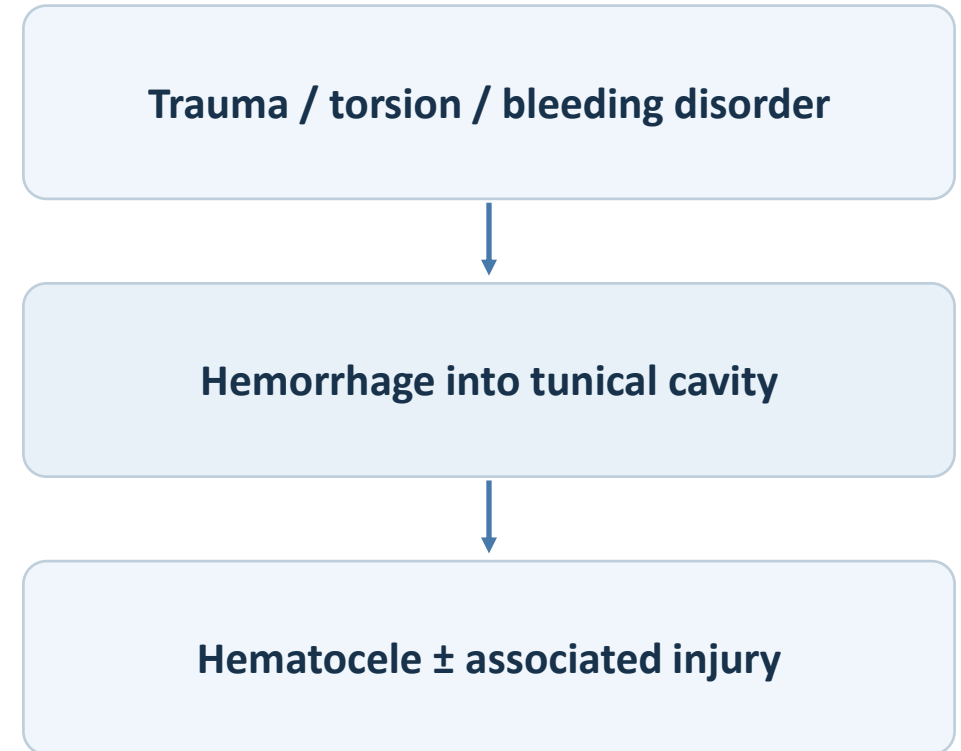
Hematocele: Blood within the tunica vaginalis

- The hemorrhage is located in the serosal space surrounding the testis.
- Hematocele as uncommon.
- History and associated testicular findings are more informative than size alone.



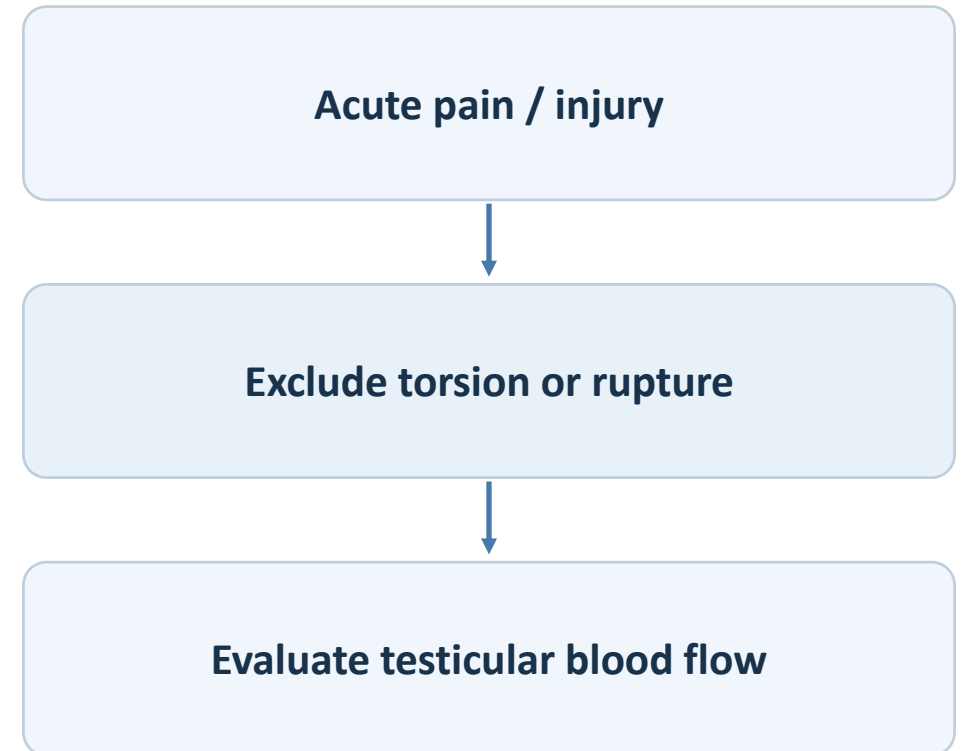
Trauma is a characteristic cause of hematocele

- Blunt or penetrating injury may produce bleeding into the tunical cavity.
- A hematocele may coexist with direct testicular injury.
- The testicular contour and vascular perfusion must be assessed independently.



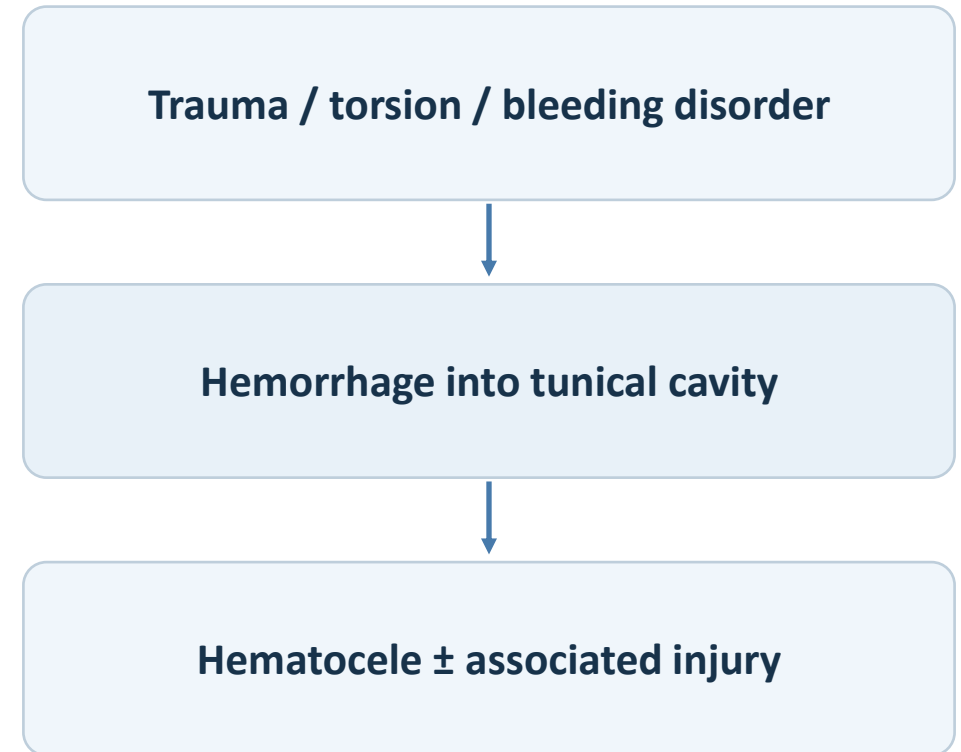
Torsion is another clinical context for hematocele

- Testicular torsion among settings associated with hematocele.
- Acute scrotal pain raises a time-sensitive differential that fluid characterization alone cannot settle.
- Urgent assessment of testicular viability takes precedence over labeling the collection.



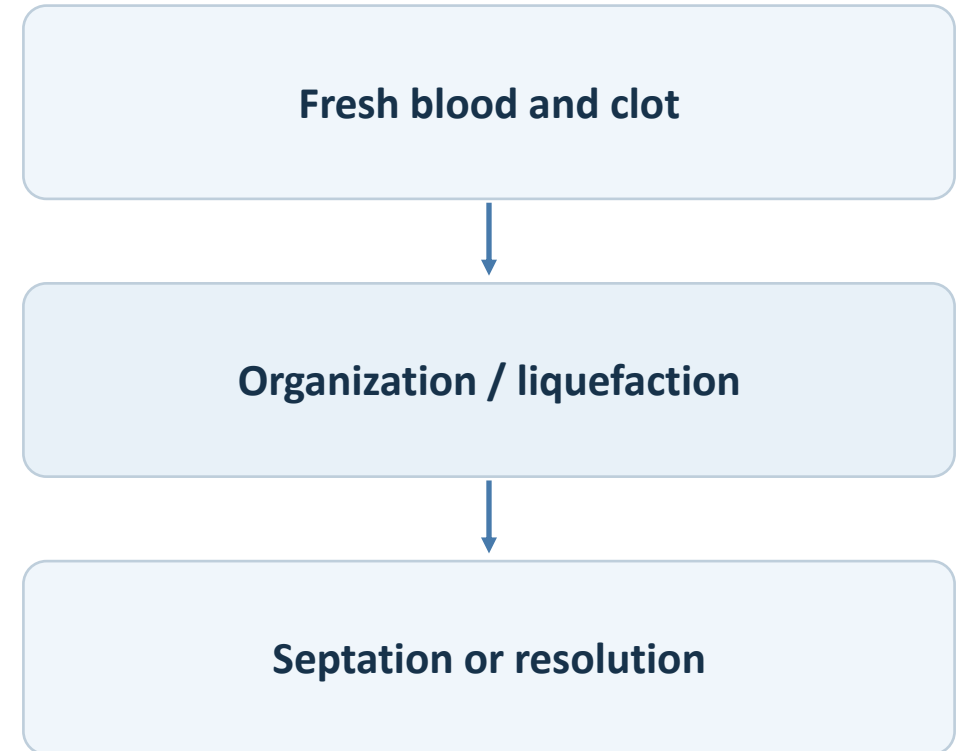
Systemic bleeding disorders predispose to hematocele

- A bleeding diathesis can cause hemorrhagic accumulation without a major injury history.
- Medication and systemic bleeding history are relevant clinical context.
- The pathologic term remains hematocele when blood accumulates in the tunical cavity.



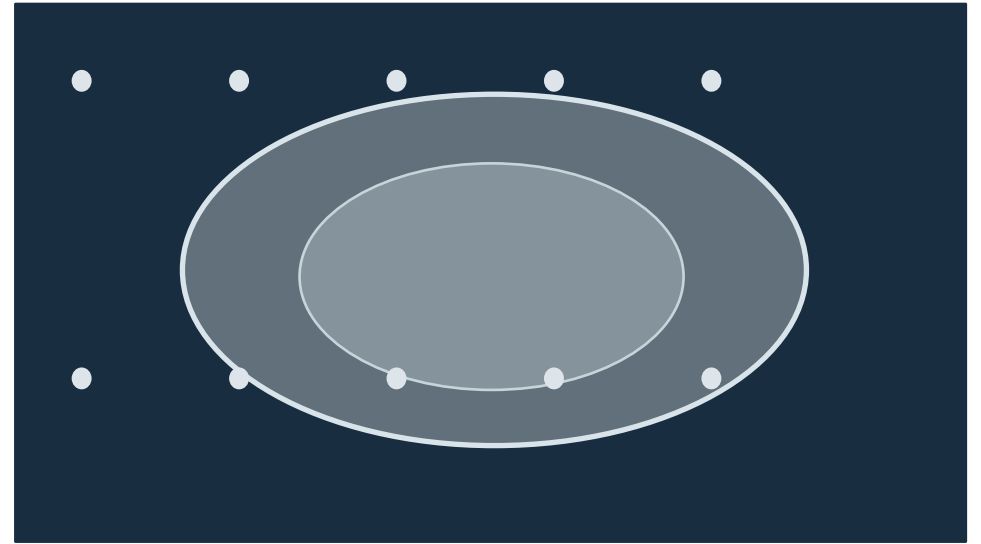
Hematocoele changes appearance as blood organizes

- Fresh blood may contain liquid and clot; Organization and liquefaction alter internal structure.
- Clot and debris may produce internal echoes and later septations.
- The apparent imaging pattern depends on when the collection is examined.



Acute hematocele can appear echogenic

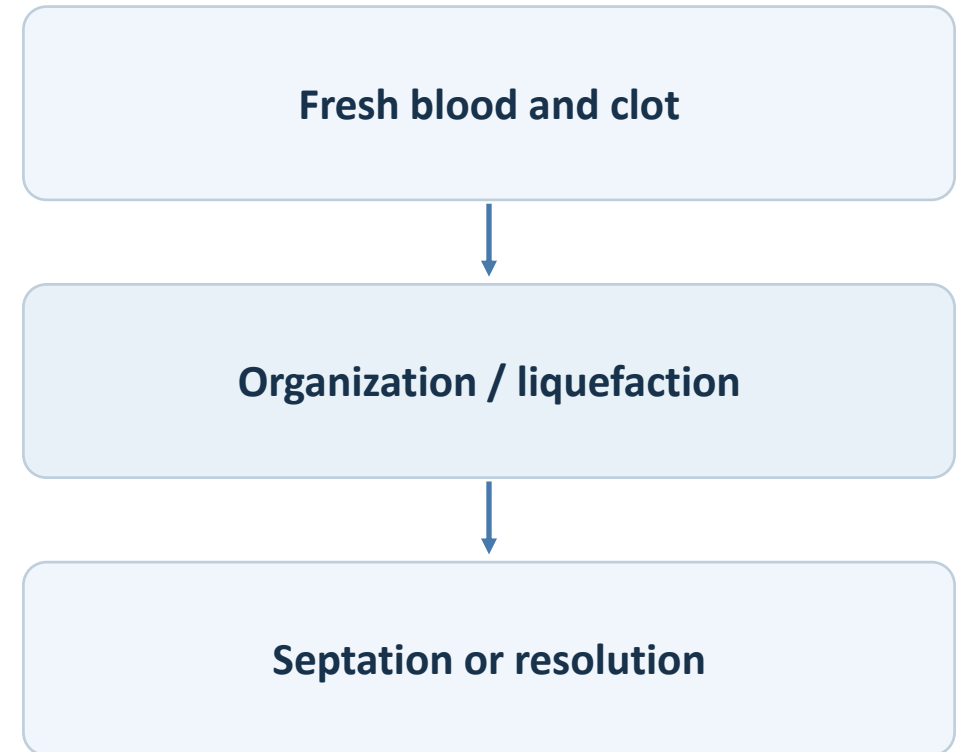
- Blood clot within the tunical sac may yield echogenic internal material on ultrasonography.
- The collection remains extratesticular even if it obscures testicular margins.
- A normal-looking collection should never substitute for assessment of the injured testis.



Schematic ultrasound appearance — not a clinical image

Chronic hematocele may mimic a solid lesion

- Septation, clot organization, and heterogeneous contents can resemble a mass.
- Lack of internal vascularity favors clot, but imaging must evaluate any suspicious solid component.
- Clinical evolution and appropriate follow-up help resolve uncertainty.



Hematocele differs from intratesticular hematoma

- Hematocele occupies the tunica vaginalis cavity outside the testis.
- An intratesticular hematoma lies within the parenchyma.
- The distinction changes the anatomical interpretation of ultrasonography and gross findings.

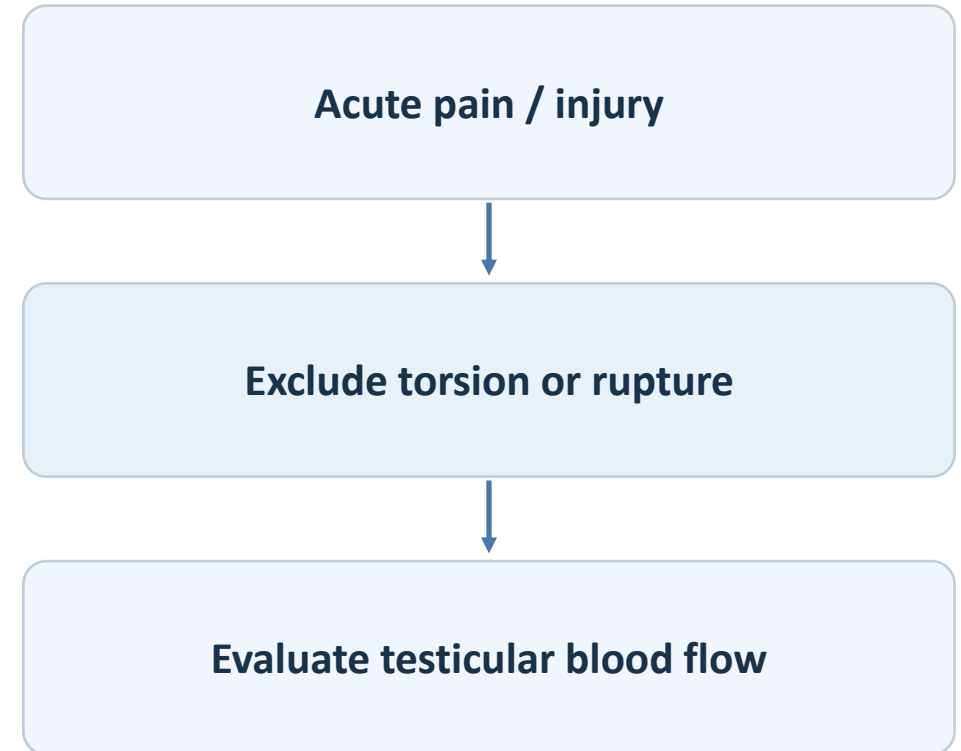
Tunica cavity
Fluid

Ductal cyst
Semen

Cord veins
Venous blood

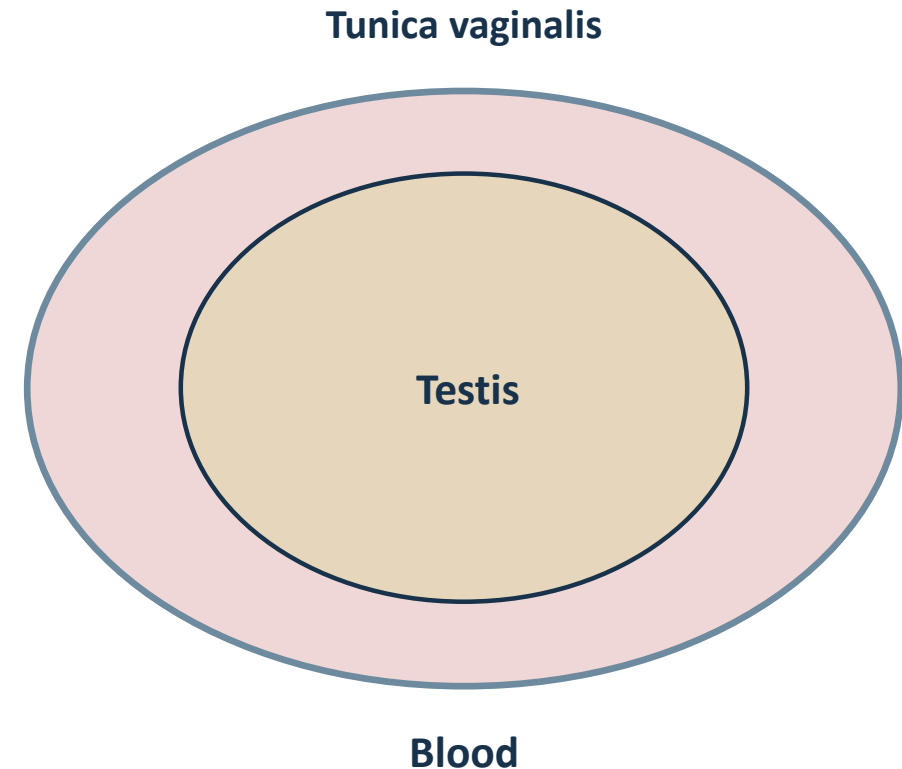
A large hematocele can affect perfusion

- A tense collection may exert pressure on surrounding testicular structures.
- Severe trauma may additionally compromise tissue via rupture or torsion.
- Doppler evaluation of viable testicular tissue is clinically important.



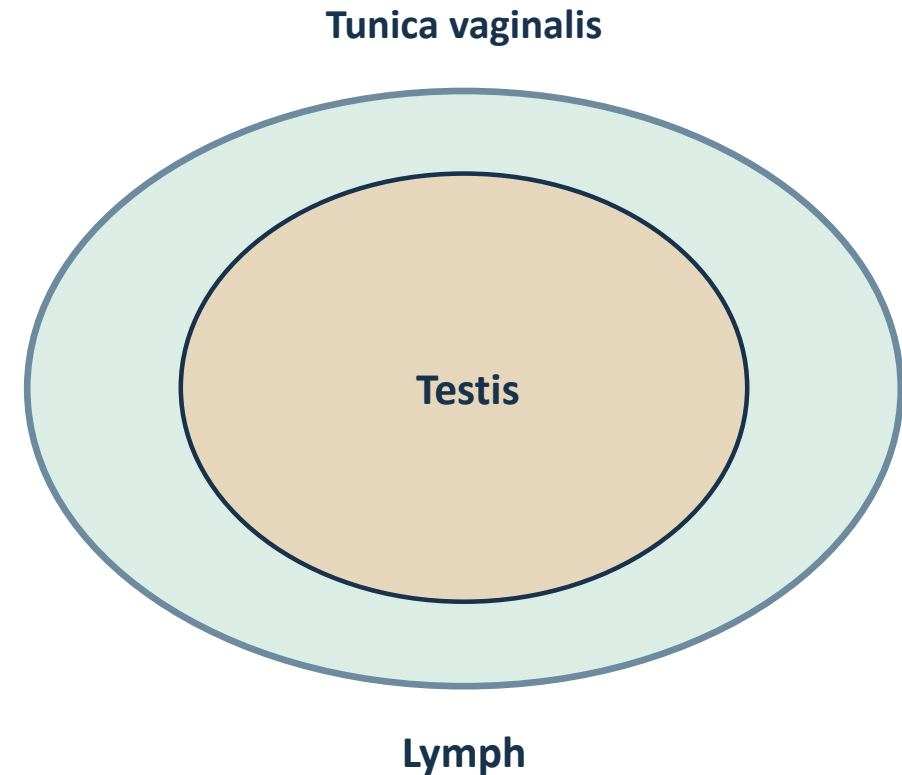
Hematocele pathology: Identify blood and the source

- Describe the collection as tunical rather than intraparenchymal.
- Inspect for associated injury, bleeding source, or unexpected wall lesion.
- Avoid assuming that hemorrhage rules out a coexisting neoplasm.



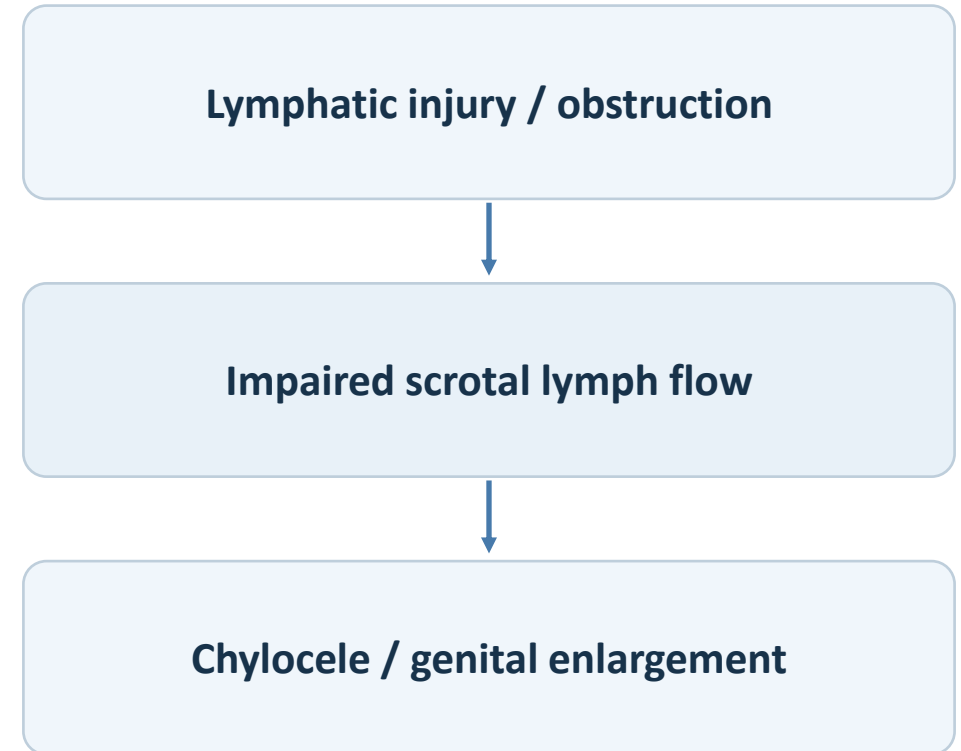
Chylocele: Lymph accumulates in the tunical space

- Chylocele as an accumulation of lymph in the tunica vaginalis.
- Unlike hydrocele, the defining feature is lymphatic fluid rather than simple serous fluid.
- Lymphatic drainage pathology is central to the causal explanation.



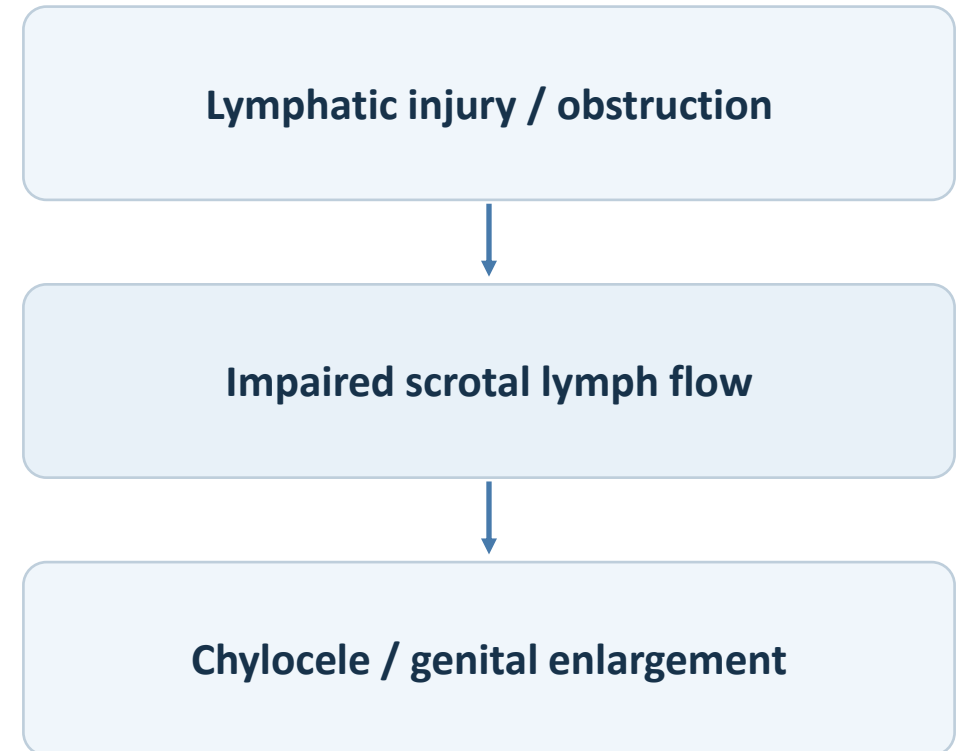
Chylocele points toward severe lymphatic obstruction

- Chylocele strongly with elephantiasis and widespread lymphatic blockage.
- Obstruction impairs the normal clearance of lymph from the affected territory.
- The scrotum is part of a broader lymphatic disease process.



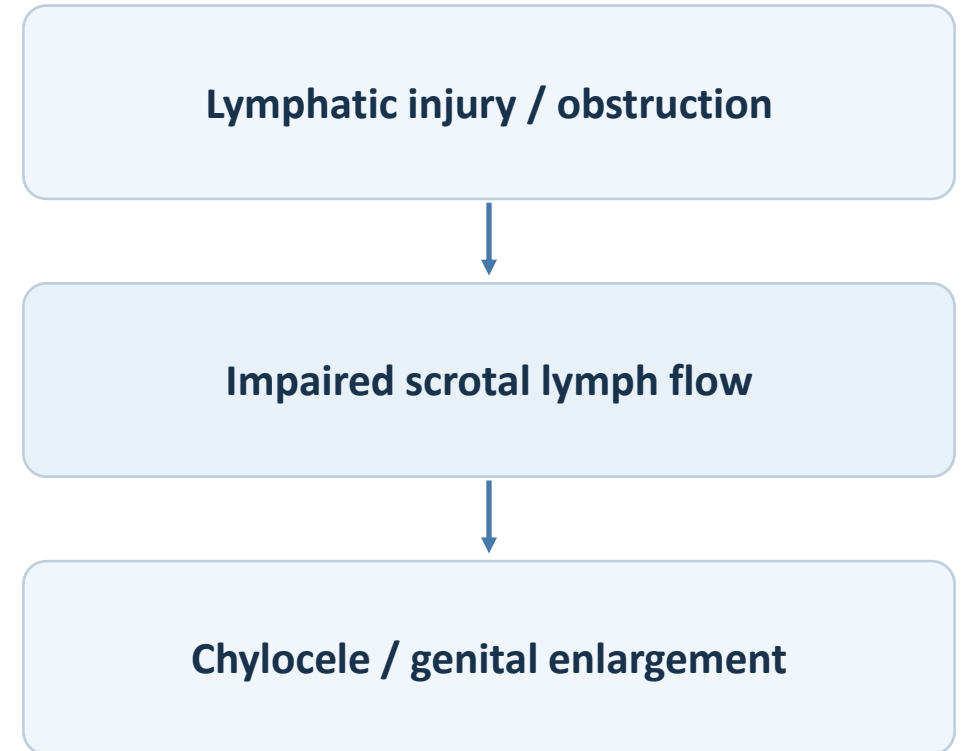
Lymphatic filariasis is an illustrative cause

- Filarial infection can damage or obstruct lymphatic vessels.
- Chronic disease produces lymphedema and may involve the genital lymphatic circulation.
- The mechanism links parasitic lymphatic injury to genital swelling.



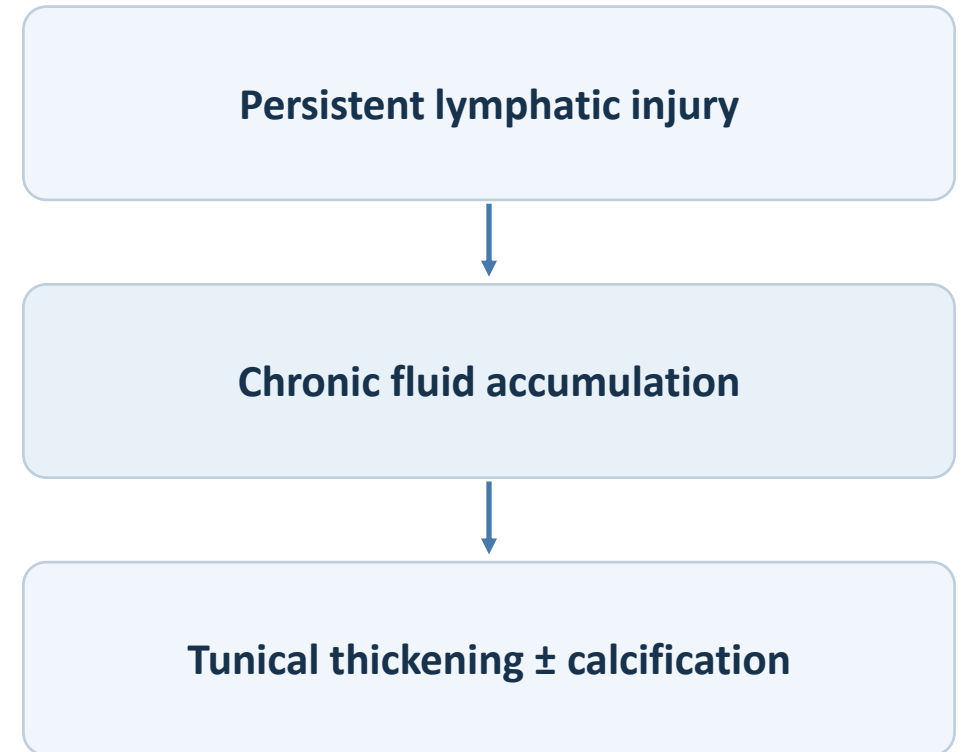
Elephantiasis is a chronic tissue response

- Persistent lymphatic dysfunction results in long-standing edema.
- The skin and soft tissues may develop thickening and fibrosis in severe chronic disease.
- Chylocele must be interpreted within this broader obstructive phenotype.



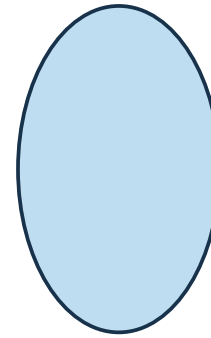
Robbins also describes tunical change in filariasis

- Chapter 8 notes that filarial hydrocele fluid may contain cholesterol crystals, red cells, and hemosiderin.
- Long-standing hydrocele fluid may be associated with thickening and calcification of the tunica vaginalis.
- These observations describe a chronic inflammatory/lymphatic setting, not a universal hydrocele phenotype.

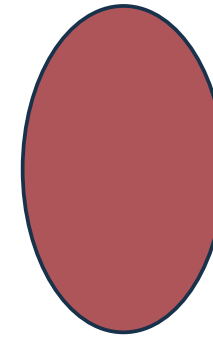


Chylocele and hydrocele may coexist clinically

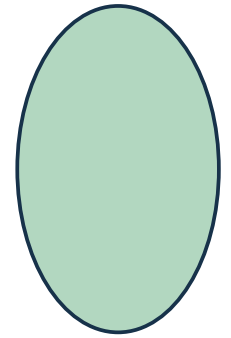
- Filariasis can produce genital lymphatic dysfunction and hydrocele.
- The clinical appearance of scrotal enlargement does not precisely identify the fluid's composition.
- Etiologic context matters more than assuming every enlarged tunical sac is identical.



Serous fluid



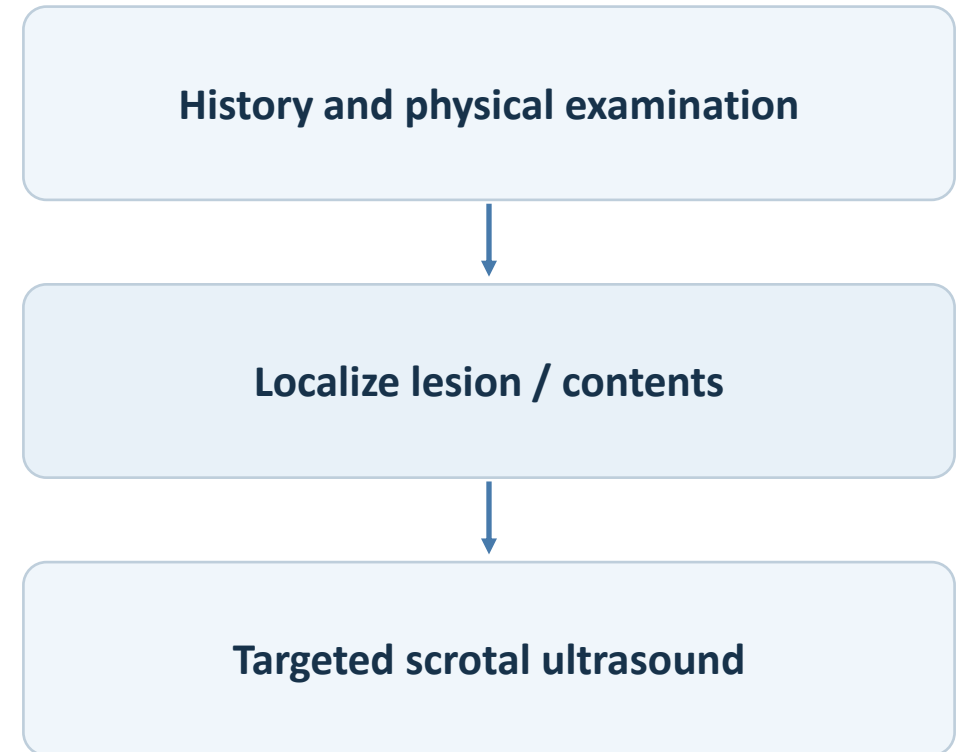
Blood



Lymph

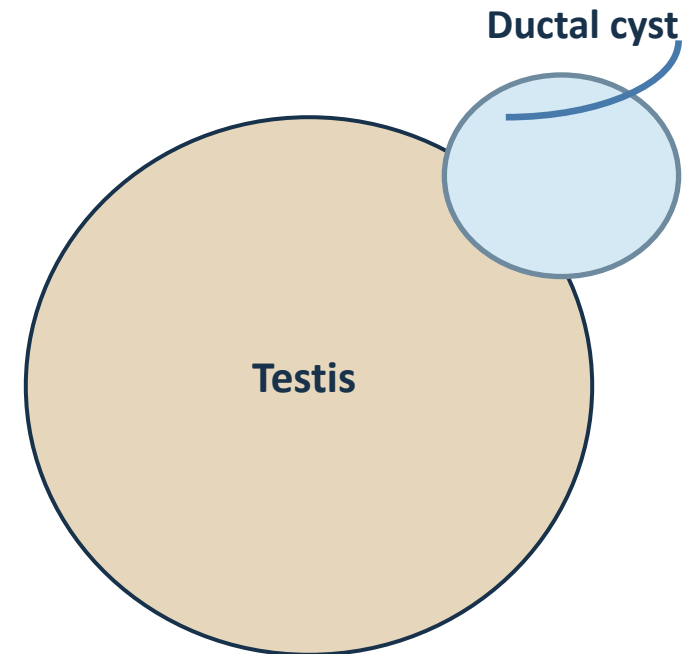
Chylocele is a localization and causal diagnosis

- First identify the extratesticular tunical collection.
- Then identify evidence for severe lymphatic obstruction or an applicable exposure history.
- Do not diagnose filariasis solely from scrotal fluid appearance.



Spermatocele is a ductal cyst, not free tunical fluid

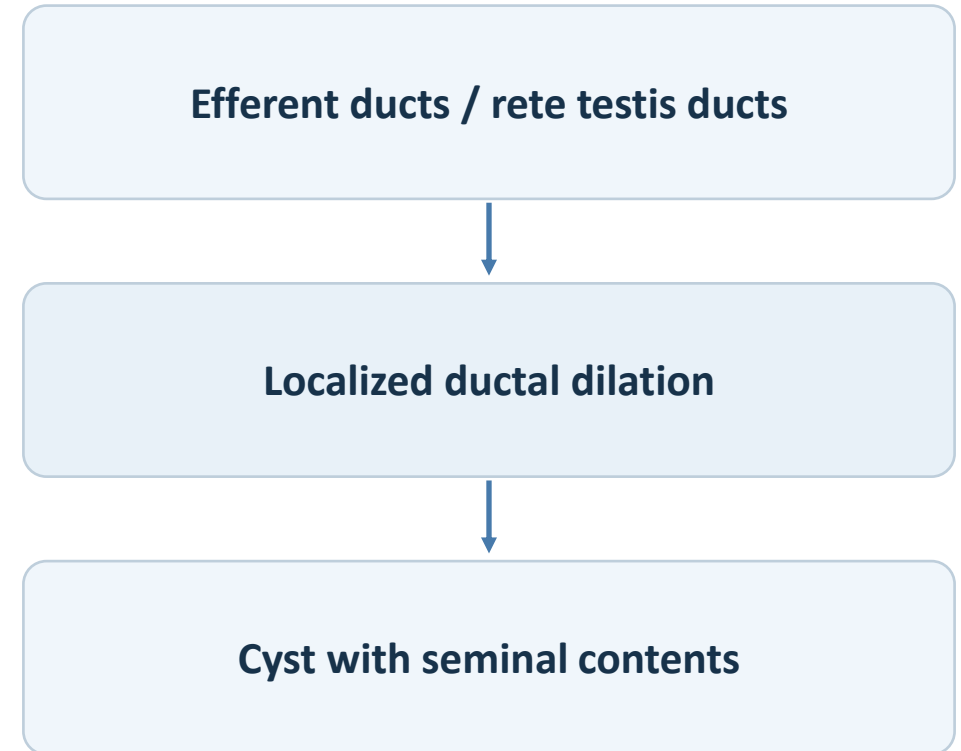
- A small cystic accumulation of semen.
- It occurs in dilated efferent ducts or ducts of the rete testis.
- Its compartment differs from hydrocele despite both being cystic and extratesticular-region findings.



Dilated ducts: Seminal content

Spermatocele traces to the sperm outflow pathway

- Sperm enters the efferent ducts and rete testis-associated ductal system.
- Dilation forms a discrete cystic structure containing seminal material.
- A focal ductal cyst differs fundamentally from a generalized tunica vaginalis fluid sac.



Spermatocele: Localization distinguishes it from hydrocele

- Spermatocele is a localized cystic dilation of ducts.
- Hydrocele is a collection occupying the potential space around the testis.
- Imaging can help when physical examination cannot localize a cystic scrotal lesion.

Tunica cavity
Fluid

Ductal cyst
Semen

Cord veins
Venous blood

Scrotal cysts require precise anatomic terminology

- A cyst within the parenchyma, a spermatocele, and a hydrocele are different diagnoses.

Tunical cavity
Fluid

Ductal cyst
Semen

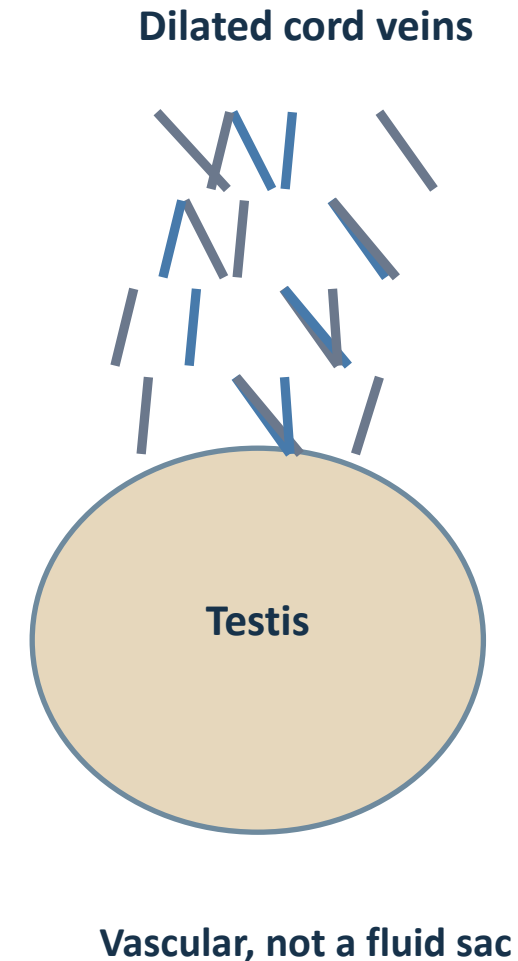
- The lesion's relationship to the testis and ductal structures determines the label.

Cord veins
Venous blood

- An imaging report should describe location before inferring histology.

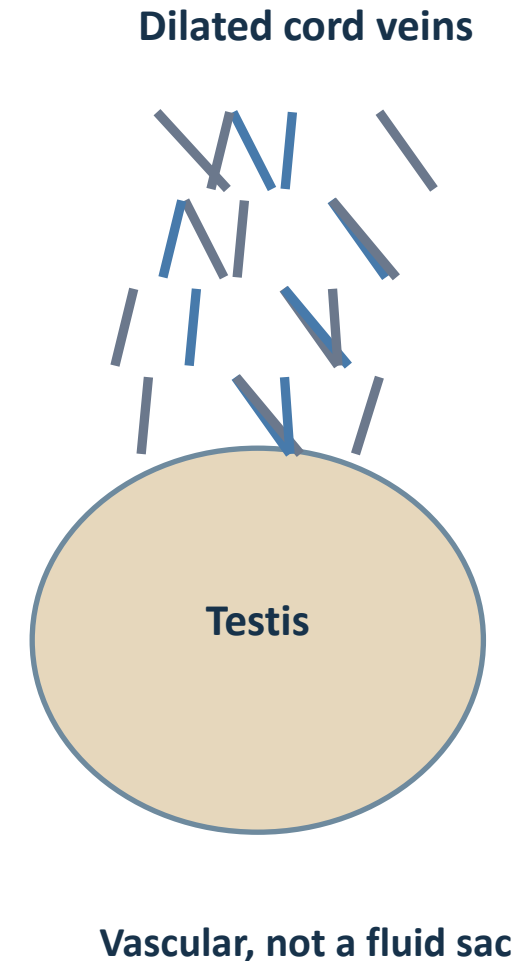
Varicocele is venous dilation—not a fluid sac

- Varicocele as dilated veins in the spermatic cord.
- The lesion involves vascular channels rather than tunical cavity fluid.
- This distinction is basic to both clinical examination and sonographic interpretation.



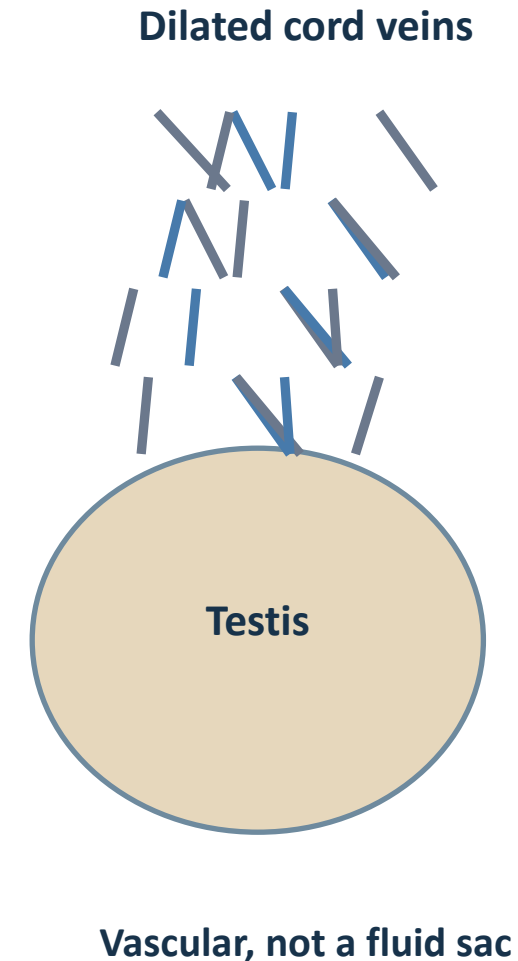
Venous dilation is the anatomic substrate of varicocele

- The pampiniform venous plexus comprises vessels of the spermatic cord.
- Venous reflux and congestion provide a mechanistic framework for dilated channels.
- This is a vascular circulation problem, not a mesothelial sac disorder.



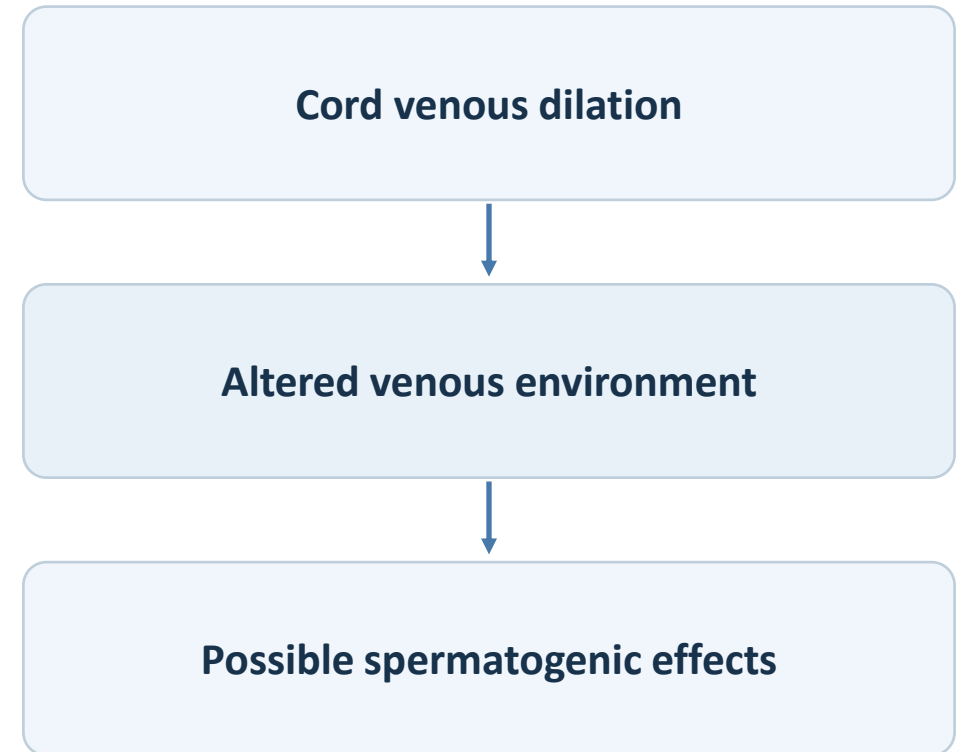
Varicocele can be asymptomatic

- Varicoceles need not produce symptoms.
- When evaluated clinically, the relevant structure is the dilated cord venous network.
- Clinical importance depends on context—not sonographic visibility alone.



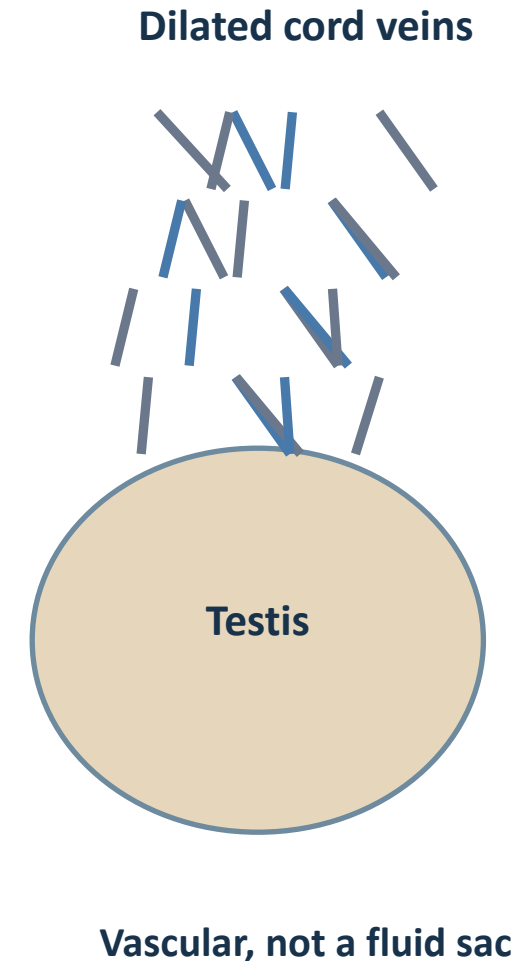
Examination can establish a clinical varicocele

- Assessment typically includes examination standing and with Valsalva maneuver.
- A palpable varicocele differs from a subclinical lesion detected only on ultrasound.
- The distinction matters for evidence-based fertility management.



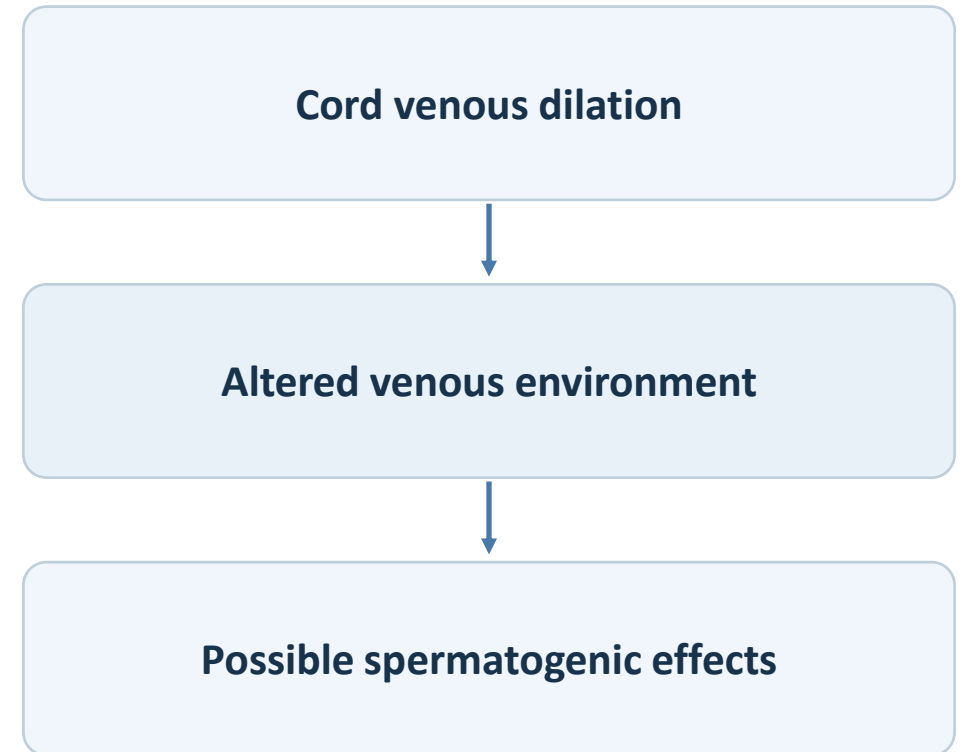
Doppler ultrasound evaluates varicocele physiology

- Sonography identifies dilated venous channels in the cord region.
- Color and spectral Doppler can assess venous flow or reflux where needed.
- Ultrasonography is complementary to—not a replacement for—clinical categorization.



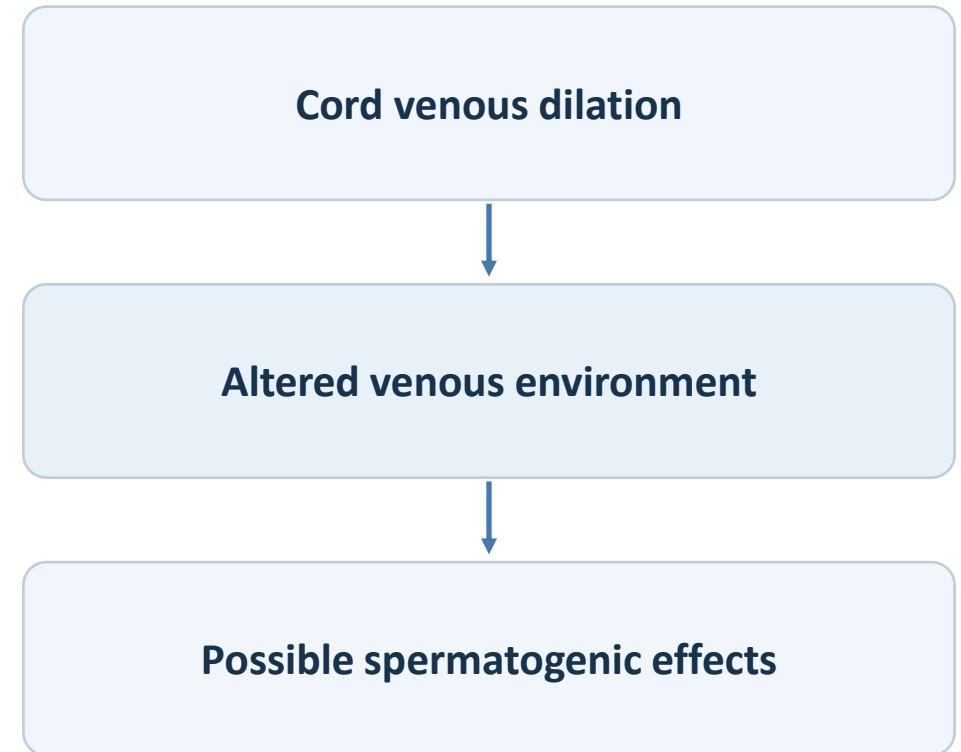
Varicocele may contribute to reduced fertility

- Some varicoceles to male infertility.
- The association is not equivalent to infertility in every affected person.
- Evaluation considers semen parameters, reproductive history, and other factors.



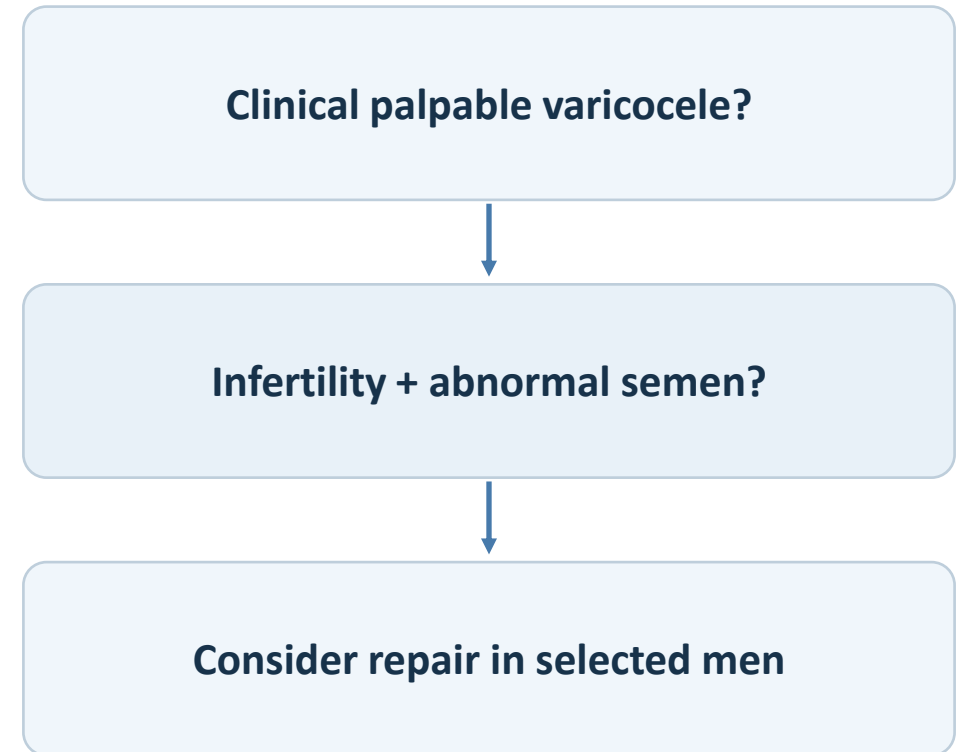
Hypothesized mechanisms of testicular dysfunction

- Increased temperature, hypoxia, and reflux-associated exposures have been proposed.
- Oxidative stress and altered spermatogenic function are discussed in contemporary literature.
- The precise causal contribution varies, and no single mechanism explains all cases.



Varicocele repair is selective, not universal

- Varicoceles can be surgically repaired.
- EAU guidance emphasizes a clinical varicocele plus appropriate infertility context and abnormal semen parameters.
- Subclinical imaging-only varicocele does not alone justify repair for infertility.



Fluid collections versus varicocele: Imaging logic

- Hydrocele, hematocele, and chylocele occupy a sac around the testis.
- Spermatocele forms a localized cyst in the ductal system.
- Varicocele comprises vessel-like structures and can show venous Doppler flow.

Tunical sac
Serous / blood / lymph

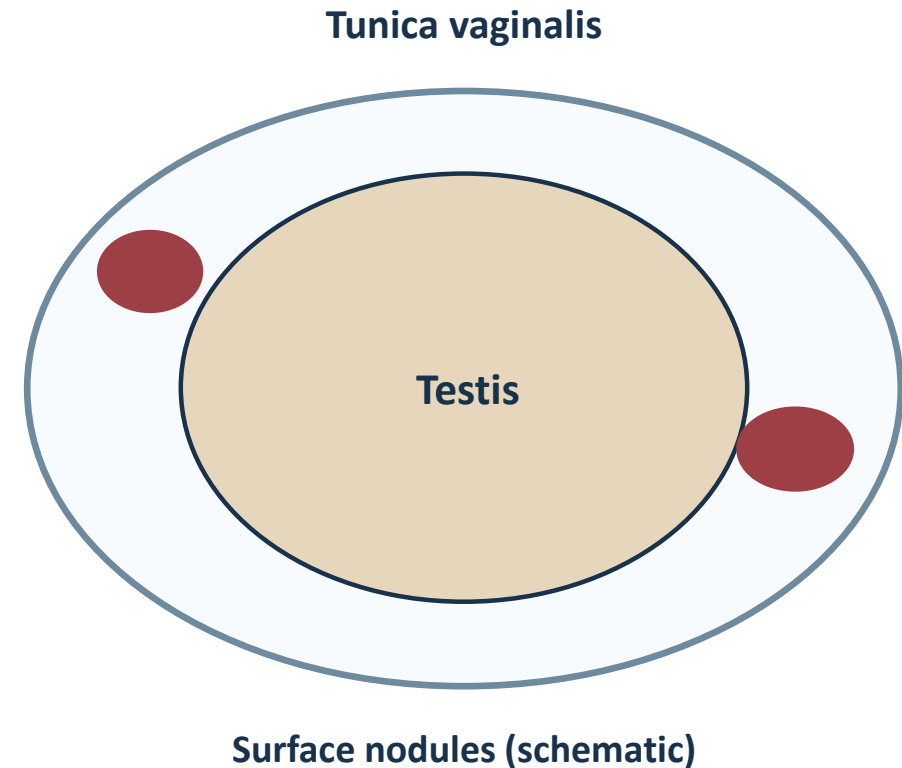
Ductal system
Spermatocele

Spermatic cord
Varicocele

Tunical surface
Rare solid tumors

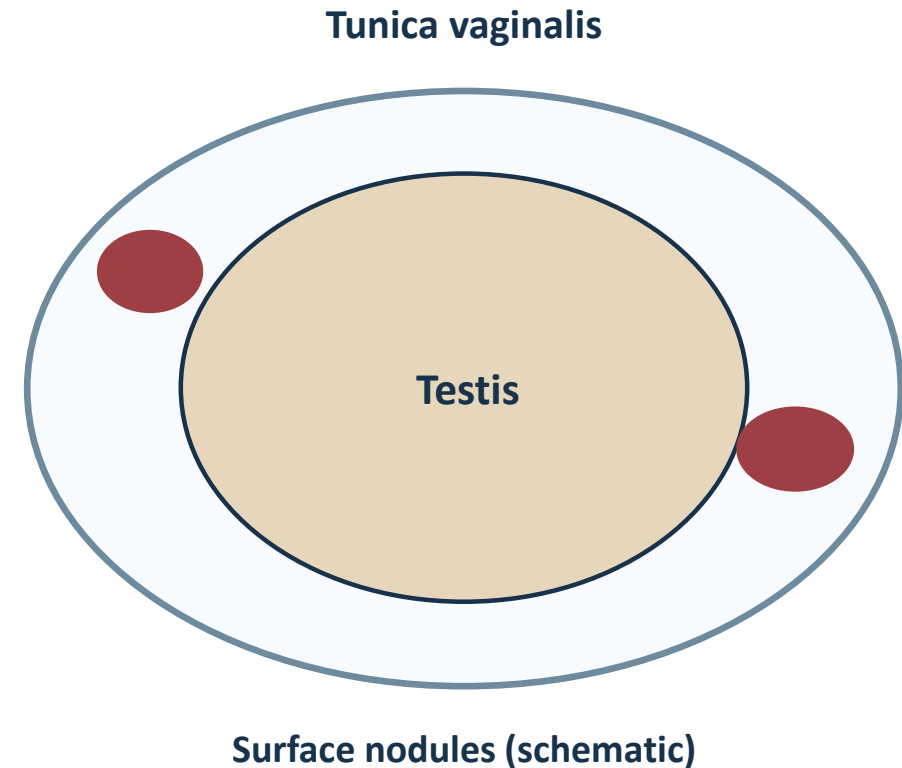
Neoplasms of tunica vaginalis are exceptional

- Malignant mesothelioma may arise from the tunica vaginalis.
- It also mentions rare ovarian epithelial-type tumors in this site.
- Rarity does not eliminate the need to evaluate focal solid abnormalities of a tunical surface.



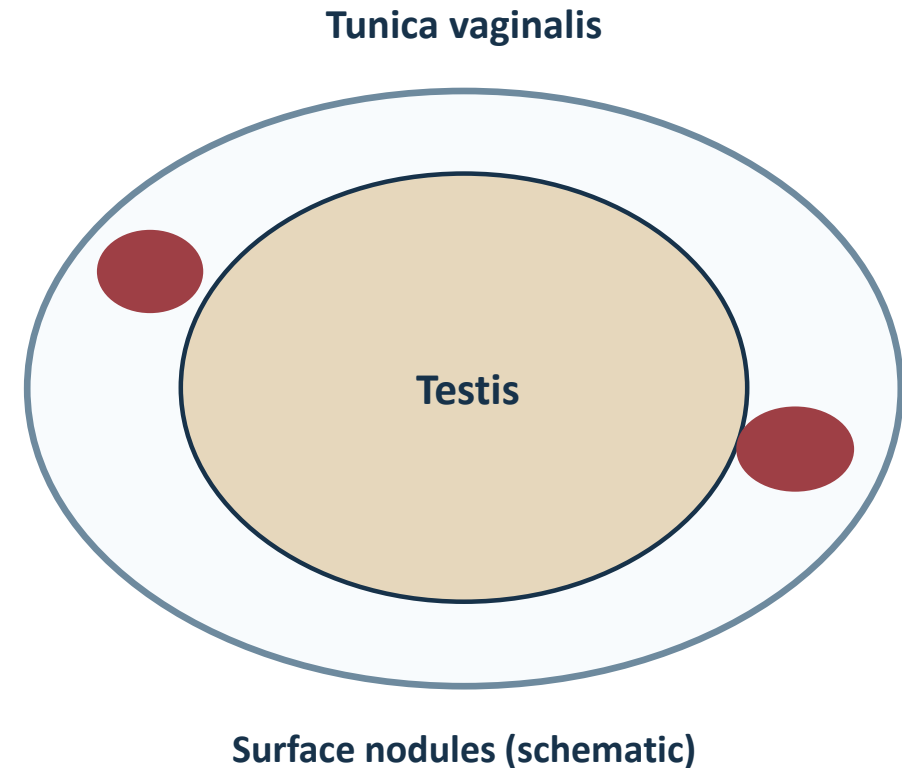
Mesothelioma is biologically linked to the lining

- Tunica vaginalis is mesothelial lined, providing the cell-type context for mesothelioma.
- A neoplasm of this membrane is distinct from a primary testicular germ-cell tumor.
- Anatomic site and histology must both be established.



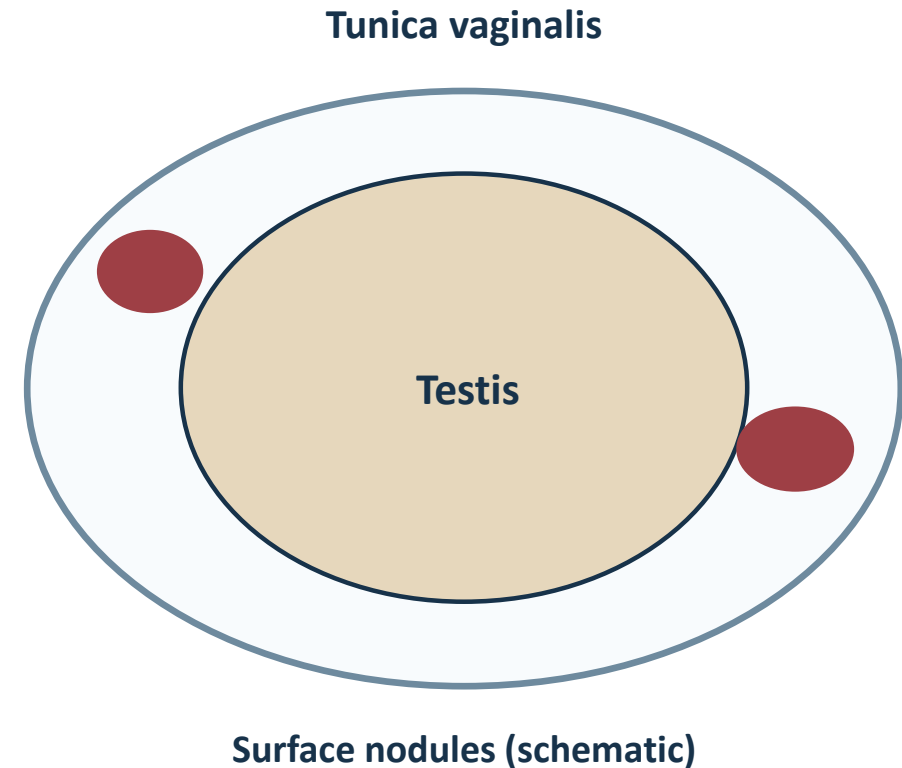
Tunical mesothelioma may masquerade as hydrocele

- Reported cases may initially present as chronic or recurrent scrotal fluid accumulation.
- Wall nodules or plaques, irregular thickening, or an atypical course raise concern.
- A presumed benign fluid collection can therefore conceal a rare solid neoplasm.



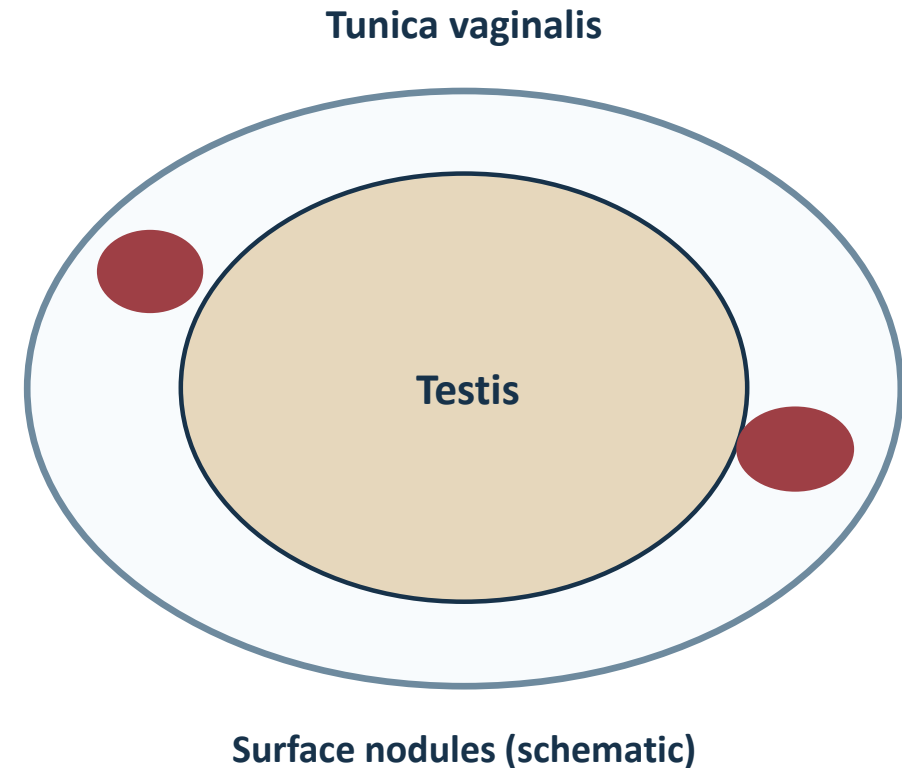
Nodularity changes the diagnostic question

- Simple fluid accumulation and a focal vascularized tunical nodule are different findings.
- Imaging should characterize wall irregularity and any solid component.
- Definitive classification requires appropriate pathologic assessment.



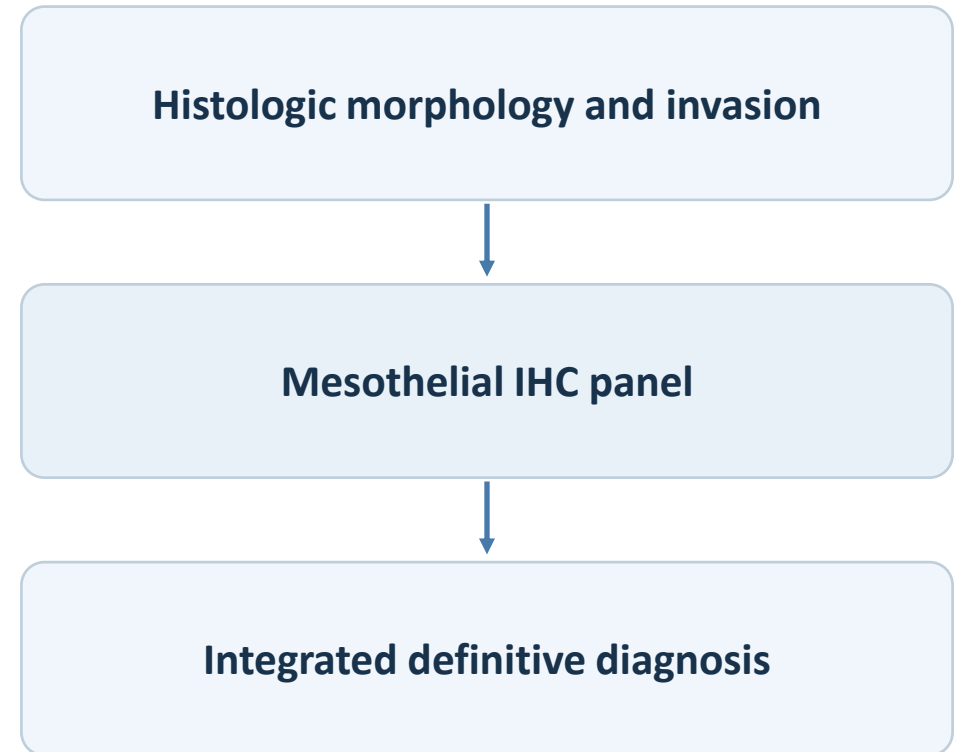
Mesothelioma: Diagnosis relies on tissue architecture

- A malignant mesothelial diagnosis must establish neoplastic morphology and invasive behavior.
- A solitary immunostain cannot establish the presence of malignancy.
- Site, cytology, architecture, and an appropriate immunohistochemical panel are integrated.



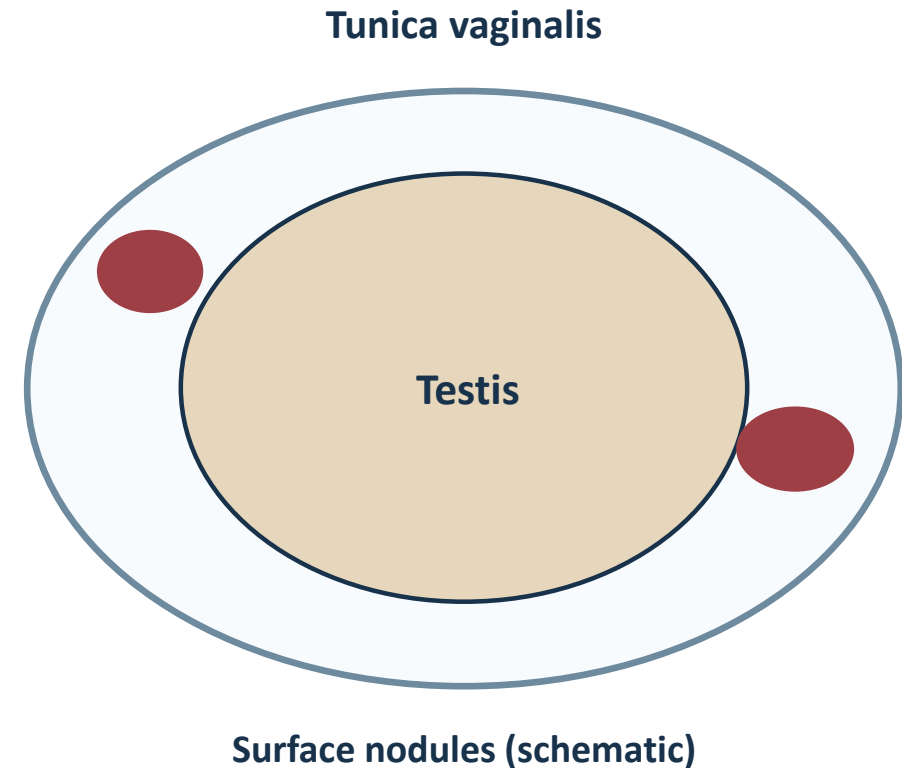
IHC identifies lineage, not malignancy by itself

- Reported mesotheliomas of tunica vaginalis commonly express calretinin, WT1, and D2-40.
- Epithelial-marker negativity such as claudin-4 supports mesothelial origin in the proper setting.
- Neither a positive mesothelial marker nor an imaging finding alone proves malignancy.



Rare ovarian epithelial-type tumors also occur

- Robbins specifically lists ovarian epithelial-type tumors among the rare tunical neoplasms.
- The descriptive category refers to epithelial morphology at an unusual anatomic site.
- Subtype and biologic behavior require specimen-based classification; Do not infer them from site alone.



Solid paratesticular lesions deserve a wider differential

- Surface mesothelial tumors, other paratesticular neoplasms, and chronic organized collections may overlap clinically.
- A thickened sac is not specific for malignant mesothelioma.
- Cross-sectional localization, gross inspection, and microscopy answer different parts of the question.

Tunica sac
Serous / blood / lymph

Ductal system
Spermatocele

Spermatic cord
Varicocele

Tunica surface
Rare solid tumors

Clinical algorithm for a new scrotal abnormality

- Begin with urgency: Severe acute pain or recent trauma changes the differential.
- History and examination assess swelling, reducibility, translucency, and a separate testicular mass.
- Scrotal ultrasonography with Doppler is usually appropriate when an abnormality is newly palpable.

Acute pain or trauma? Assess urgency



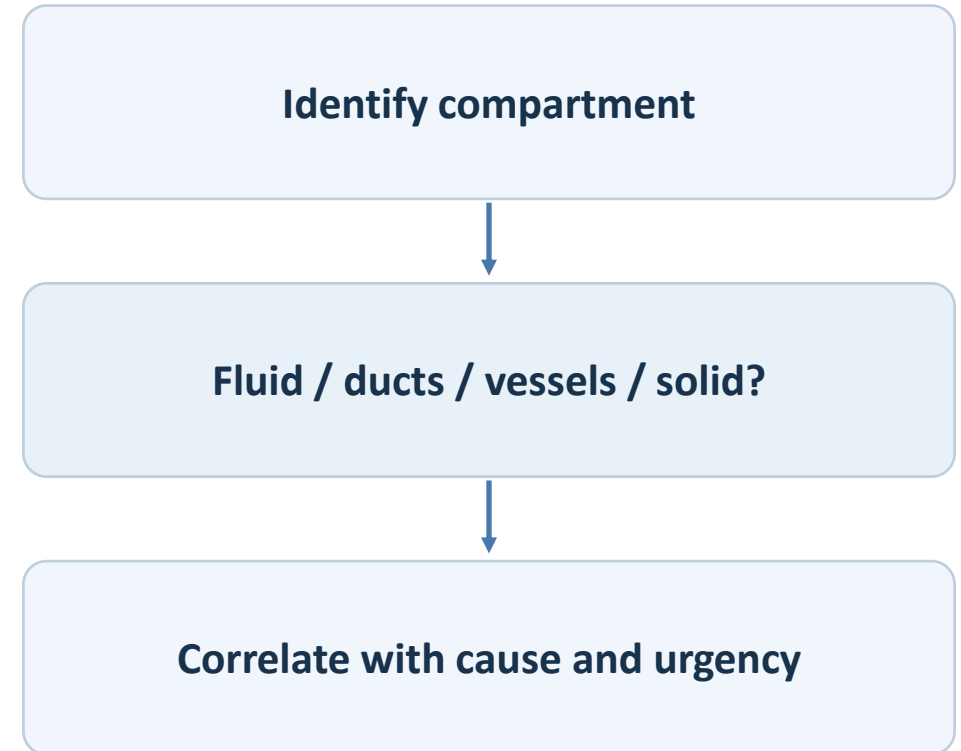
History + examination / localization



Scrotal US / Doppler as indicated

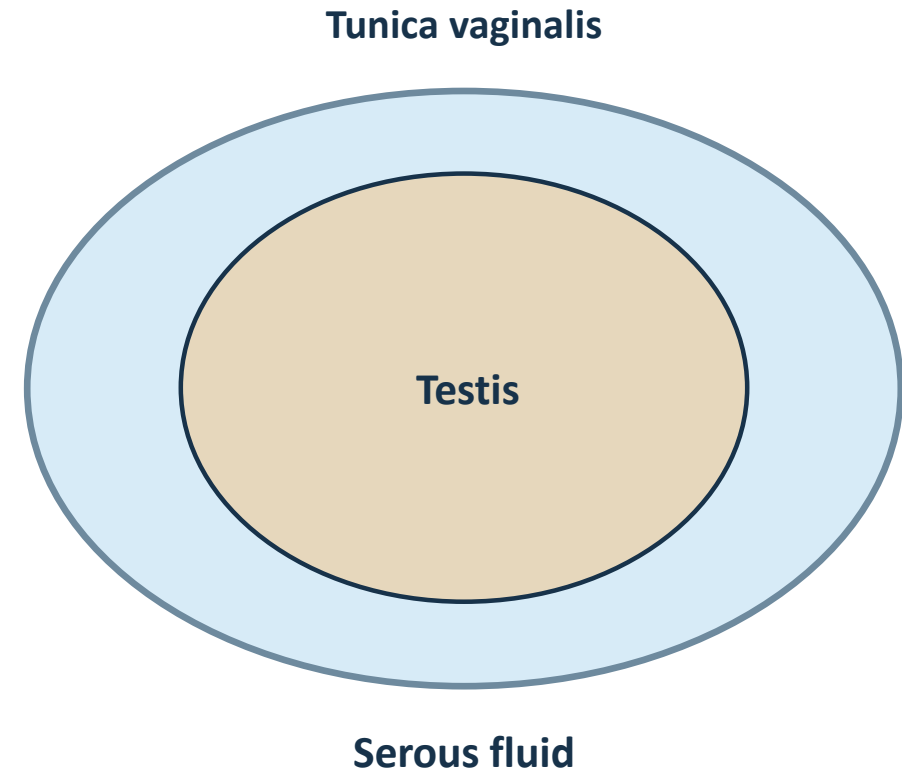
Diagnostic reasoning begins with compartment

- Is the abnormality intratesticular, tunical, ductal, or venous?
- If tunical, characterize the contents: Serous, hemorrhagic, lymphatic, or complex.
- If a solid wall nodule exists, a simple-fluid diagnosis is insufficient.



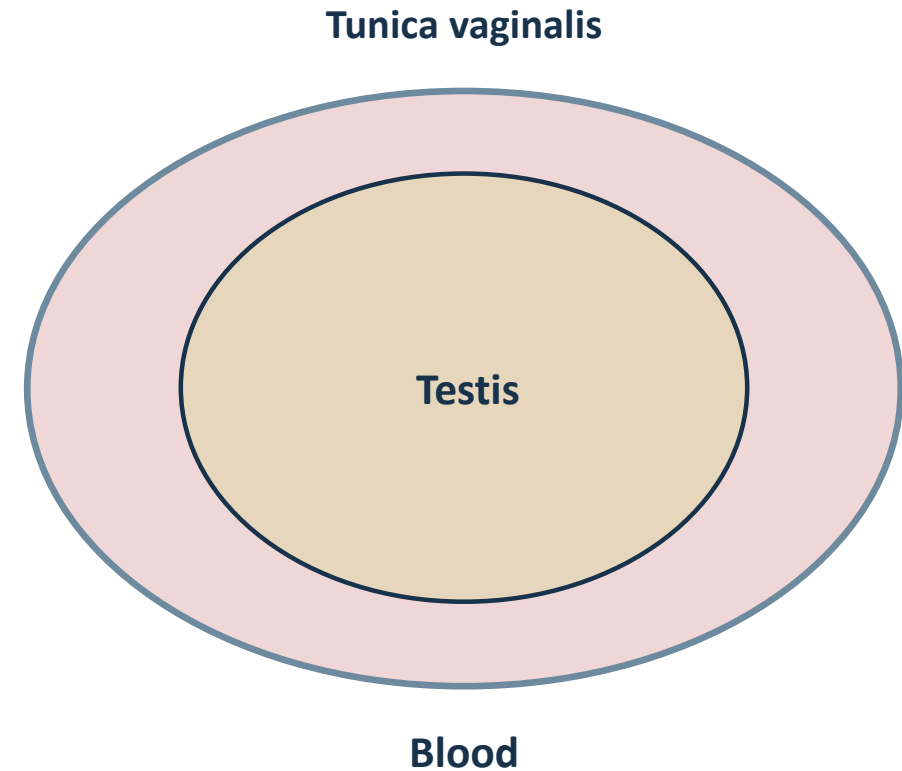
Case: Painless translucent enlargement

- An adult develops gradually progressive scrotal enlargement without acute pain.
- Transillumination suggests a translucent collection around a separately evaluated testis.
- Most likely pattern: Hydrocele; Imaging is appropriate if the diagnosis or testis is uncertain.



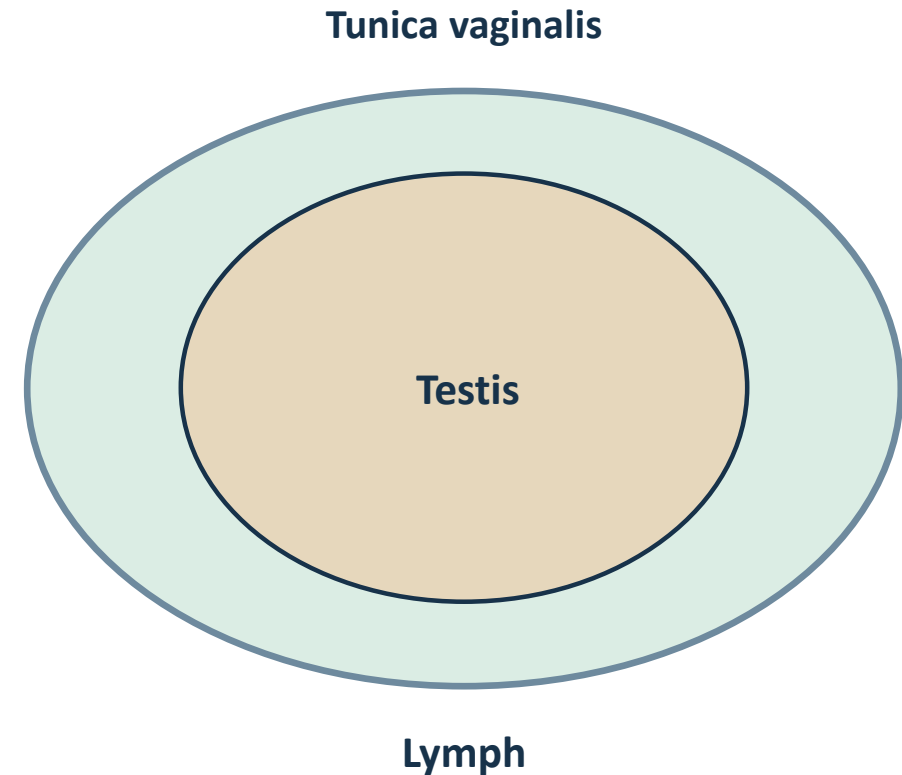
Case: Swelling immediately after trauma

- A patient develops painful scrotal enlargement after an impact.
- The tunical cavity contains heterogeneous echogenic material.
- Consider hematocele and urgently assess associated testicular injury and perfusion.



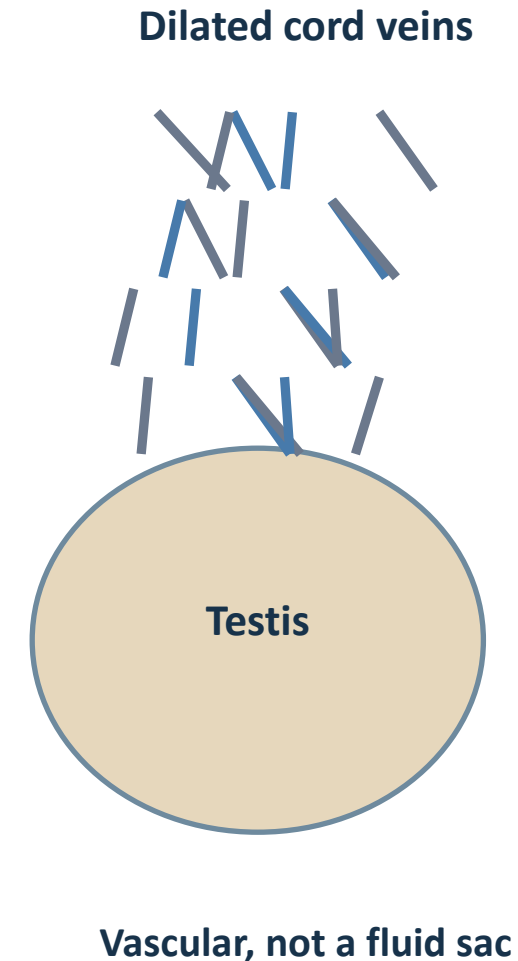
Case: Chronic swelling with elephantiasis

- Severe chronic lymphatic disease is accompanied by genital enlargement.
- Lymph accumulation in the tunical cavity supports chylocele.
- A filarial exposure history may provide an etiologic explanation; It is not established by swelling alone.



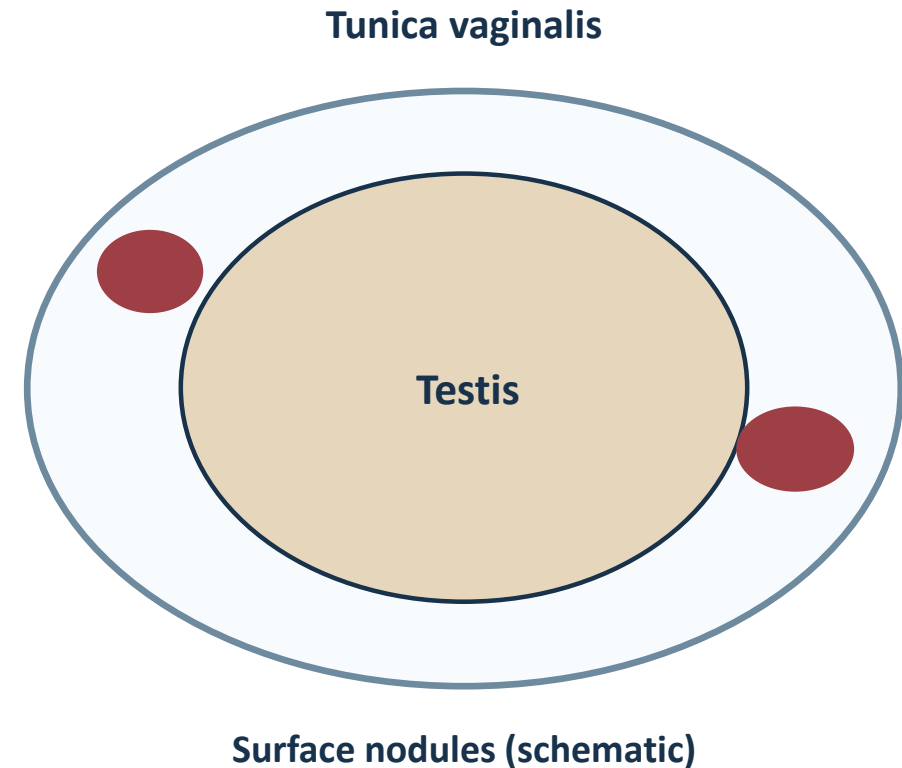
Case: Infertility evaluation and cord veins

- A palpable cord venous abnormality is found during fertility workup.
- The candidate diagnosis is clinical varicocele rather than hydrocele.
- Interpretation of possible treatment requires semen parameters and the couple's broader infertility evaluation.



Case: Recurrent hydrocele with a wall nodule

- A recurrent fluid collection contains a focal solid tunical abnormality.
- The question is no longer only whether the cavity contains serous fluid.
- Assess the solid lesion; Malignant mesothelioma is rare but a relevant consideration.



Five entities: The discriminating feature

- Hydrocele—serous fluid; Hematocele—blood; Chylocele—lymph.
- Spermatocele—semen within dilated ducts; Varicocele—dilated spermatic cord veins.
- The fluid/duct/vascular distinction is more reliable than appearance alone.

Tunical sac
Serous / blood / lymph

Ductal system
Spermatocele

Spermatic cord
Varicocele

Tunical surface
Rare solid tumors

The clinically dangerous shortcuts

- Do not equate transillumination with a definitive benign diagnosis.
- Do not dismiss acute painful swelling as merely a collection.
- Do not assume that a thickened or nodular tunical sac is an uncomplicated hydrocele.
- Do not interpret an incidental subclinical varicocele as a stand-alone cause of infertility.

Acute pain or trauma

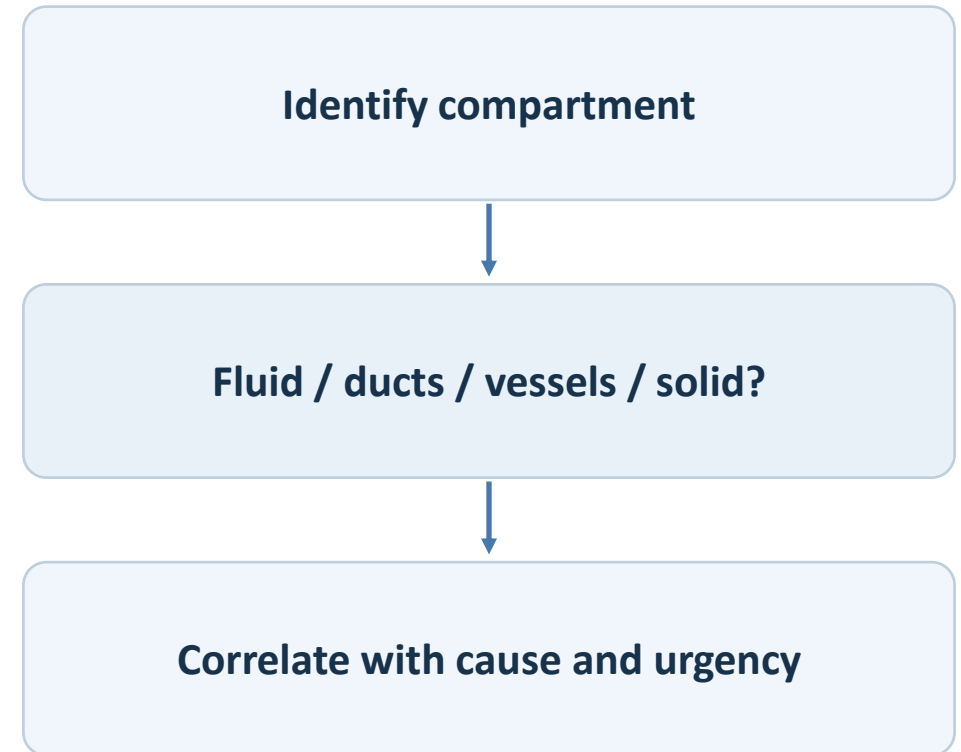
A solid nodule

Hidden testicular mass

Unexplained recurrence

Integrated summary: Anatomy → content → cause

- Localize the lesion to a precise compartment.
- Identify whether its contents are serous fluid, blood, lymph, seminal material, veins, or solid tissue.
- Correlate with trauma, bleeding risk, lymphatic obstruction, infertility, or suspicious tunical morphology.
- Use ultrasound when clinically indicated and reserve histologic labels for tissue evidence.



Comparison of the major lesions

Lesion	Location	Defining contents / structure
Hydrocele	Tunica vaginalis cavity	Serous fluid
Hematocele	Tunica vaginalis cavity	Blood
Chylocele	Tunica vaginalis cavity	Lymph
Spermatocele	Efferent / rete testis ducts	Cystic seminal material
Varicocele	Spermatic cord veins	Dilated venous channels
Tunical neoplasm	Mesothelial surface	Solid neoplastic tissue

References and source boundaries

Robbins, Cotran & Kumar. Pathologic Basis of Disease. 11th ed. 2026. Ch. 21, pp. 886–887; Ch. 8 (filariasis).

ACR Appropriateness Criteria. Newly Diagnosed Palpable Scrotal Abnormality. JACR, 2022.

EAU Guidelines. Sexual and Reproductive Health — Male Infertility (online).

CDC. Lymphatic Filariasis: clinical overview and DPDx.

Patil et al. Common and Uncommon Presentation of Fluid within Scrotal Spaces. 2016.

Tiro et al. Mesothelioma of tunica vaginalis: literature review. Urol Case Rep. 2026.