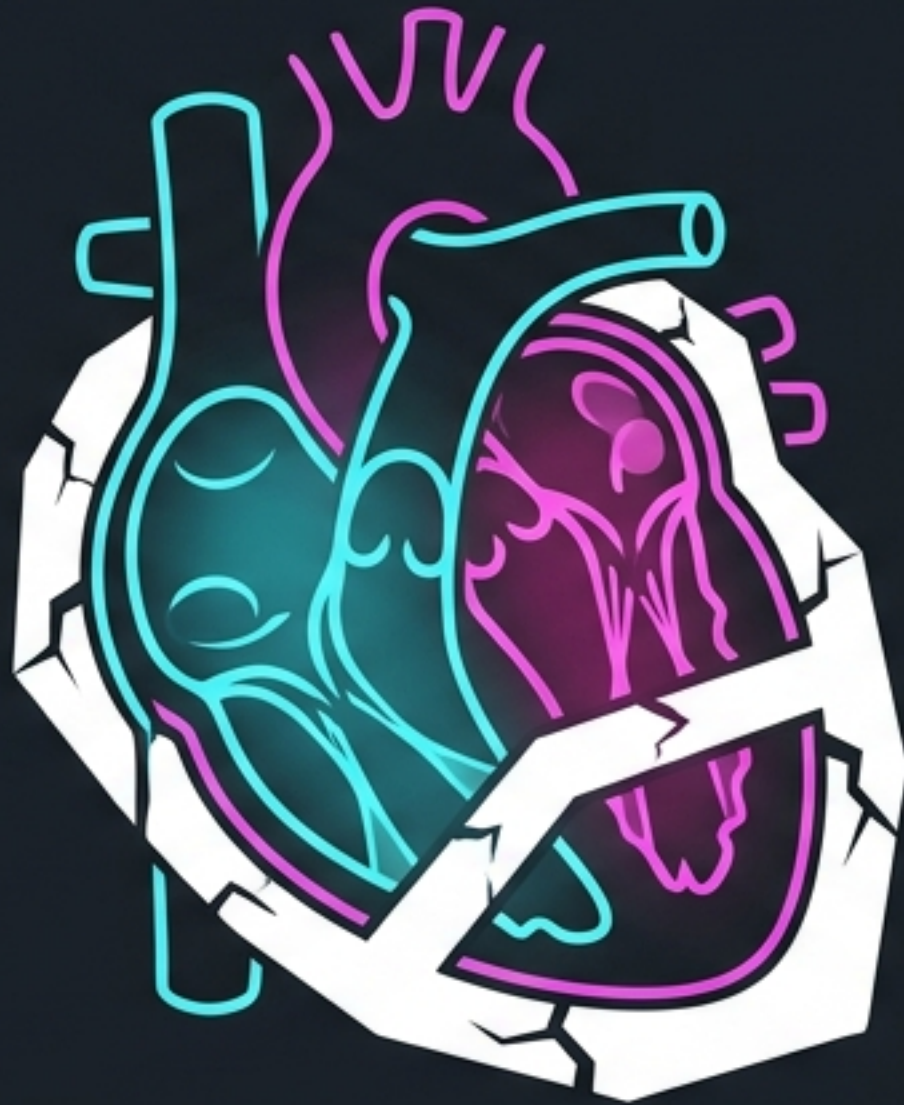


Constrictive Pericarditis

Unmasking the Rigid Shell: Diagnosis, Differentiation, and Management



The Clinical Illusion of Right-Heart Failure

Constrictive pericarditis (CP) occurs when a fibrotic, calcified pericardium restricts diastolic filling, equalizing pressures across all chambers.
Epidemiology: 0.2–0.4 per 1,000 hospital admissions globally. In Australia, idiopathic/viral and post-cardiac surgery are the dominant etiologies.
Diagnostic Pitfall: Frequently misdiagnosed as hepatic cirrhosis or restrictive cardiomyopathy (RCM).
Always consider CP in unexplained right-heart failure with preserved LV ejection fraction.

The Presentation

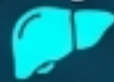
Peripheral edema



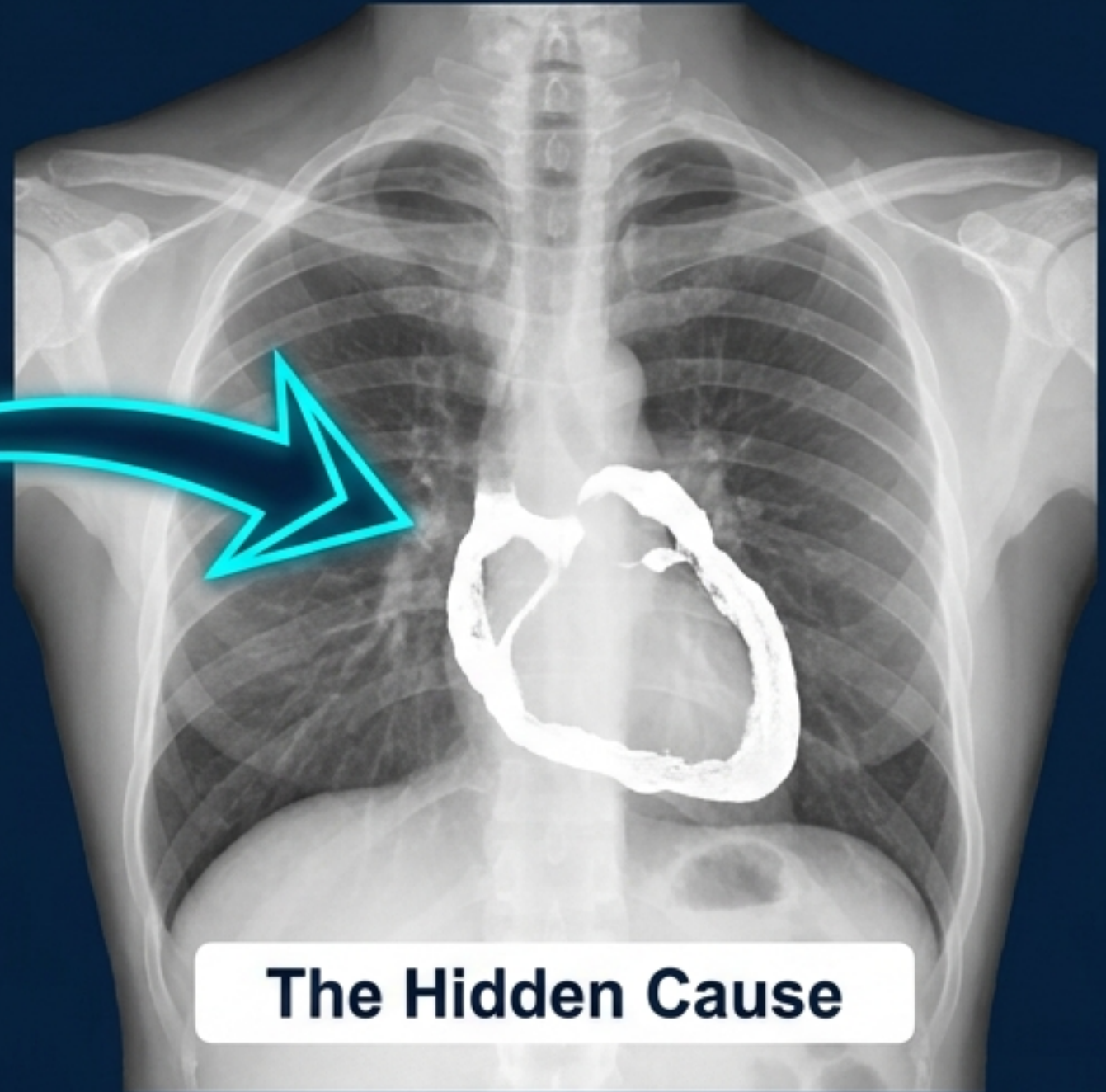
Ascites



Hepatomegaly



Elevated JVP



The Hidden Cause

The Pathophysiology of the Rigid Shell

The normal pericardium is a flexible sac. In CP, it becomes a rigid, fixed-volume shell. Because the total cardiac volume cannot increase, the chambers must compete for space.

Loss of Pericardial Compliance

Diastolic filling is abruptly halted.



Thoracic Isolation

The rigid shell isolates the heart from respiratory changes in intrathoracic pressure.



Pressure Equalization

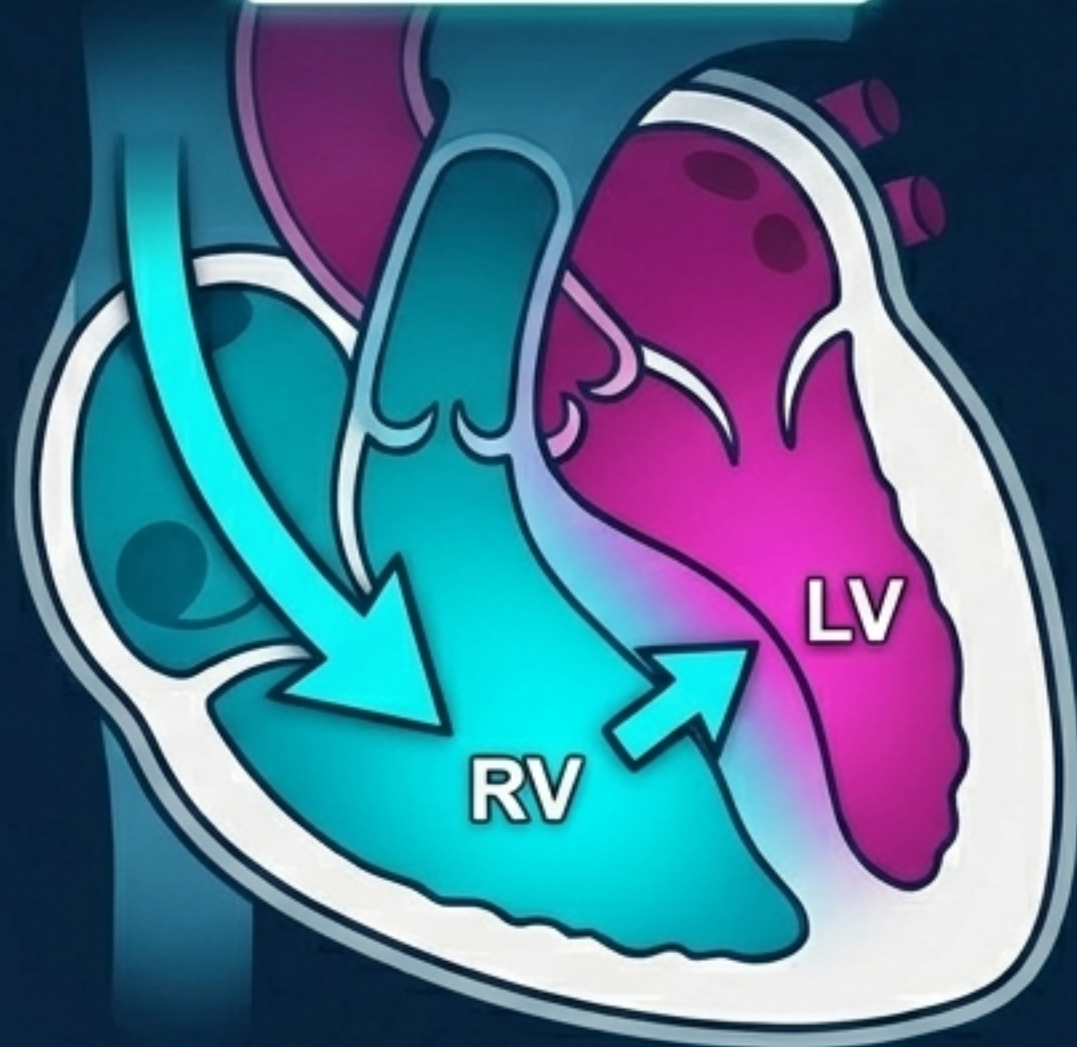
Diastolic pressures in all four chambers rise and equalize within 5 mmHg.



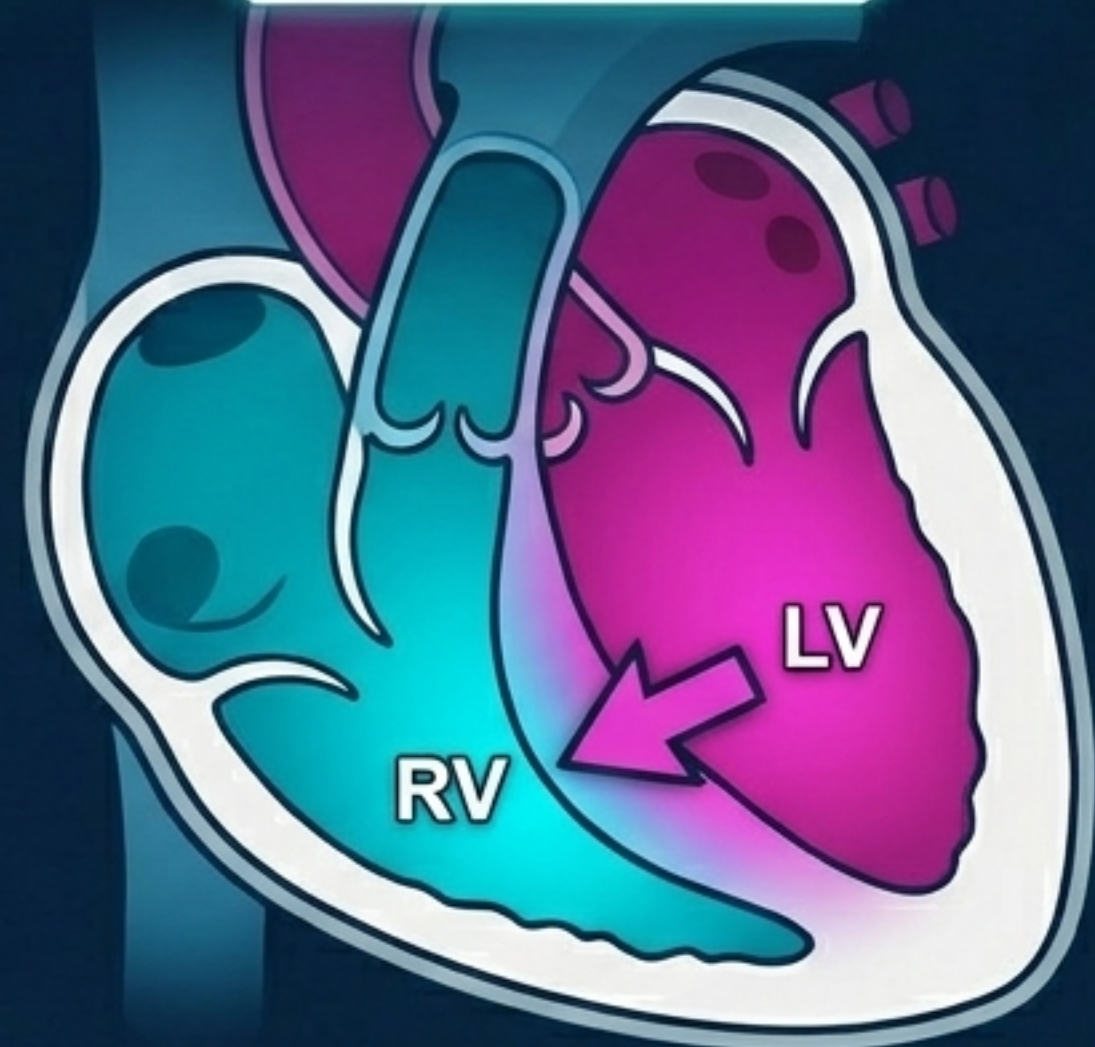
Ventricular Interdependence: Competing for Fixed Space

Venous return shifts with breathing, but total cardiac volume cannot change. The septum becomes the only flexible boundary.

Inspiration



Expiration



This continuous left-right shifting produces the hallmark echocardiographic **Septal Bounce**.

Bedside Clues: Recognizing the Hemodynamic Bottleneck

Symptoms are dominated by severe, relentless systemic venous congestion with preserved systolic function.

Neck: Elevated JVP with prominent x and y descents; **Kussmaul sign** (paradoxical JVP rise with inspiration); **Friedreich sign** (rapid y descent).

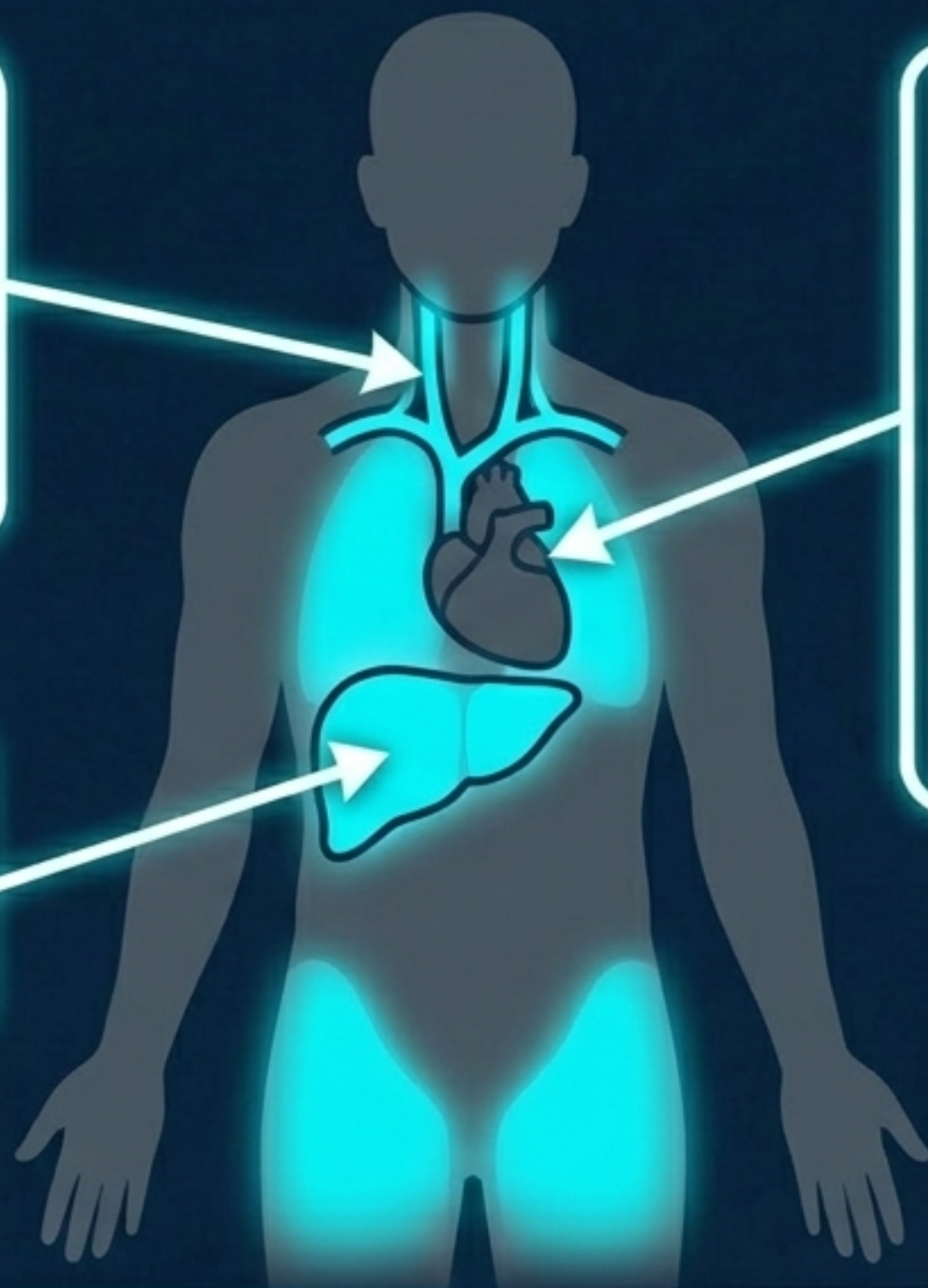
Chest: Pericardial Knock (high-pitched early diastolic sound at apex/LLSB);

Pleural effusions (often bilateral, right > left);

Atrial Fibrillation (20-30% of cases due to atrial dilation).

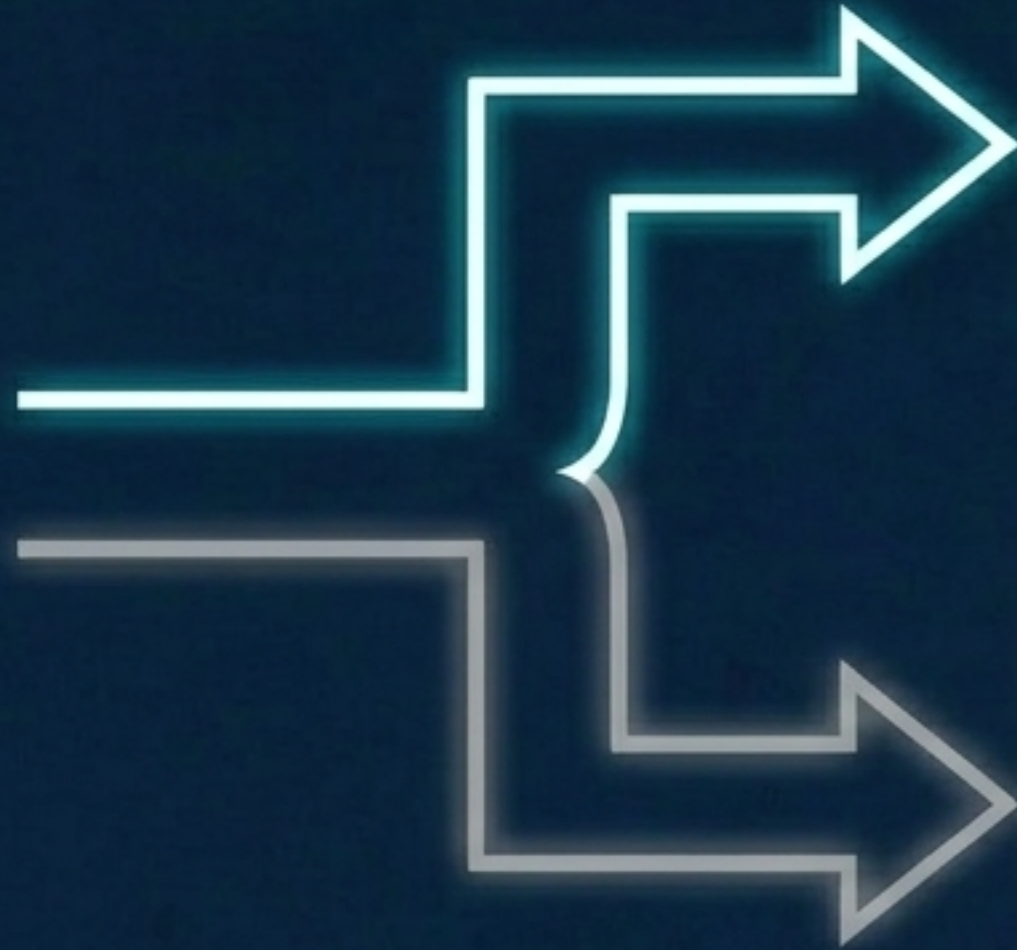
Abdomen/Limbs:

Hepatojugular reflux, ascites, peripheral edema.



The Ultimate Diagnostic Challenge: CP vs. RCM

Differentiating CP from Restrictive Cardiomyopathy (RCM) is critical. The management pathways diverge sharply: CP is a surgical disease (potentially curable), while RCM is a medical/transplant disease.



**Constrictive
Pericarditis**

Surgical Cure



**Restrictive
Cardiomyopathy**

Medical Management





Critical Pitfall: Mixed constrictive-restrictive disease requires multi-modality imaging and right-heart catheterization to untangle.

Hemodynamic Signatures: Catheterization Criteria

	<u>Constrictive Pericarditis</u>	<u>Restrictive Cardiomyopathy</u>
LV/RV End-Diastolic Pressures	= Equalized (within 5 mmHg)	> LV > RV by >5 mmHg
Ventricular Interdependence	✓ Present (discordant systolic pressures)	✗ Absent
RVEDP / RVSP Ratio	$\geq 1/3$	$< 1/3$
Dip-and-plateau (Square Root Sign)	Present in both	LV predominant
PCWP vs LVEDP	PCWP \approx LVEDP	PCWP > LVEDP (prominent V wave)

Echo Discriminators: The Non-Invasive Toolkit

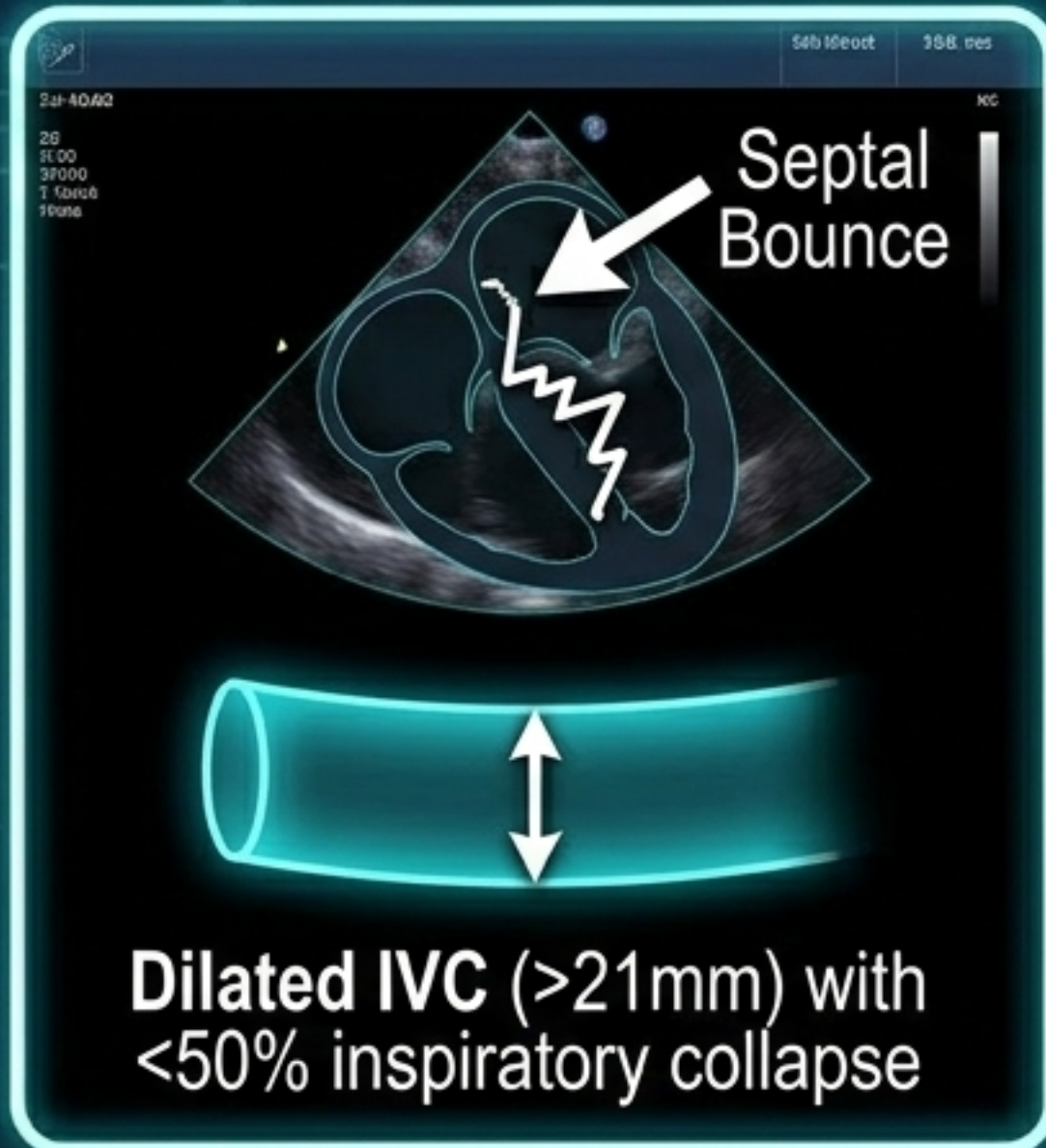
	<u>Constrictive Pericarditis</u>	<u>Restrictive Cardiomyopathy</u>
Mitral Annular e' (Tissue Doppler)	≥ 8 cm/s (preserved relaxation)	< 8 cm/s
Annulus Reversus	 Present (medial e' > lateral e')	 Absent
E/e' Ratio	Usually normal (< 15)	Elevated (> 15)
Respiratory Mitral Inflow Variation	$\geq 25\%$ decrease on inspiration	$< 10\%$
Hepatic Vein Doppler	Prominent diastolic flow reversal during expiration	Blunted

Combined Accuracy: Septal bounce + Mitral variation $\geq 25\%$ + Lateral e' ≥ 8 cm/s yields $> 90\%$ sensitivity and specificity.

Step 1: Transthoracic Echocardiography (The First Pass)

The essential first-line investigation for all suspected cases.
M-mode, 2D, spectral, and tissue Doppler are all required.

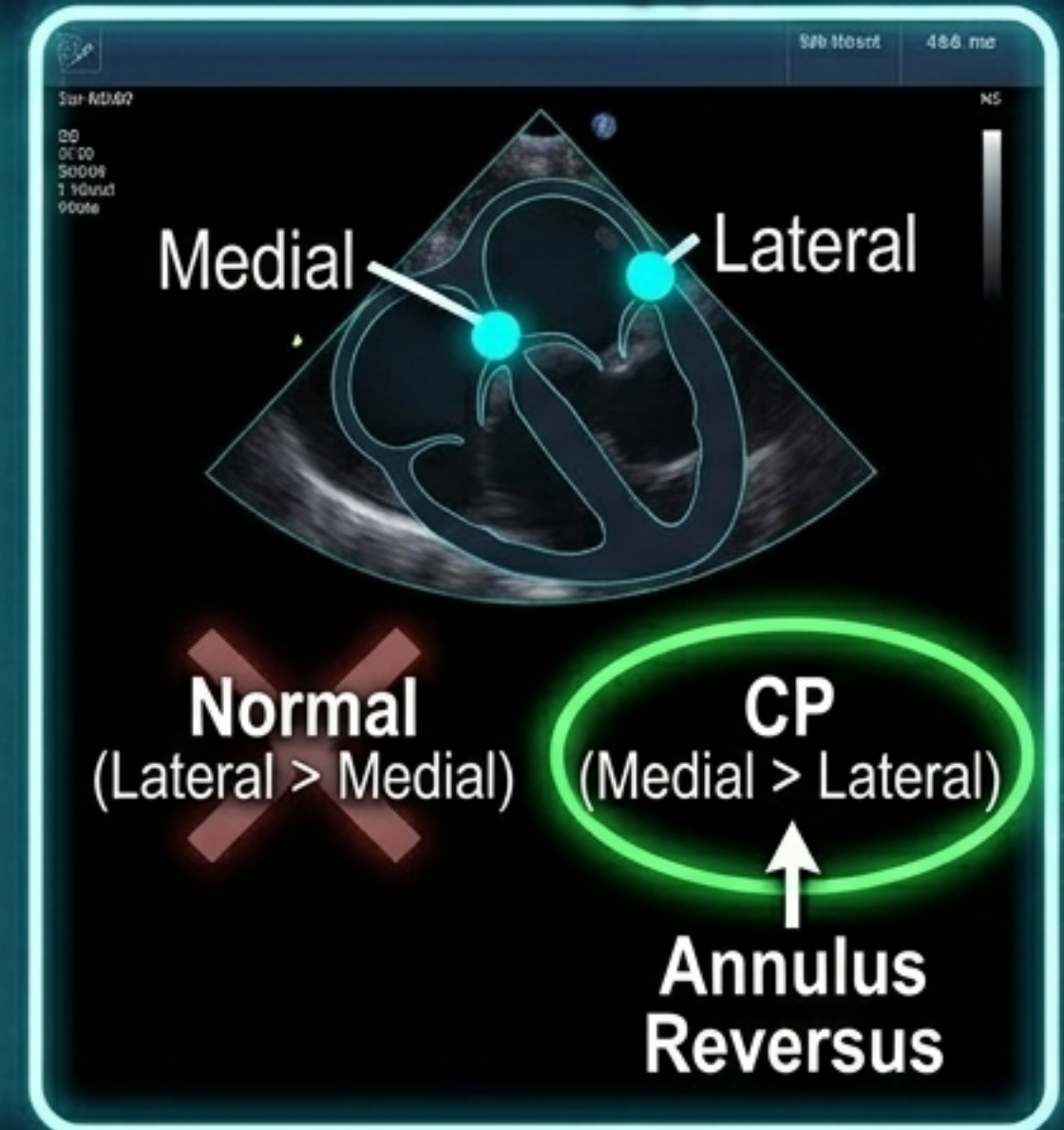
2D & M-Mode



Spectral Doppler



Tissue Doppler



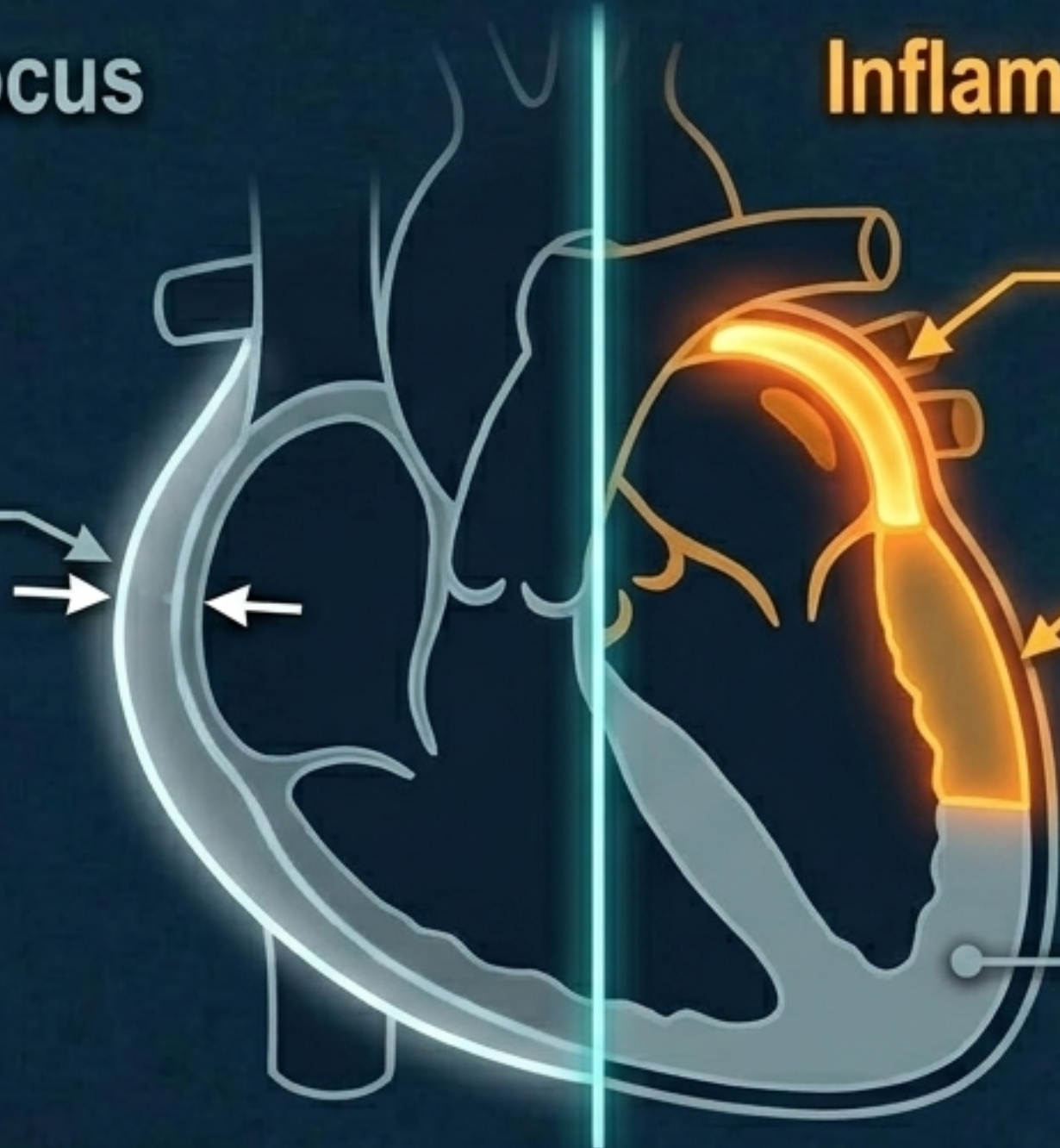
Step 2: Cardiac Magnetic Resonance (The Tissue Interrogator)

Confirms diagnosis, measures thickness, and critically assesses for active inflammation to guide therapy.

Structural Focus



Abnormal $>4\text{mm}$
(CP typically 4-20mm).



Inflammation/Fibrosis Focus

T2-Weighted (Edema):
Indicates active inflammation.
Favors medical therapy.

Late Gadolinium Enhancement (LGE):
Shows accumulation in
inflamed/fibrotic tissue.

Absence of LGE:
Suggests established,
irreversible fibrosis.

Step 3: Cardiac CT & Cath (The Surgical Planners)

Cardiac CT (Gold Standard for Calcification)

When to use: CMR contraindicated (pacemakers) or for precise surgical mapping.

Key Finding: Non-contrast calcium scoring quantifies calcification burden—a direct predictor of surgical difficulty.

Bonus: Concurrent CT Coronary Angiogram excludes epicardial CAD pre-surgery.

Cardiac Catheterization (The Hemodynamic Tiebreaker)

When to use: Non-invasive tests equivocal, or mixed CP-RCM physiology suspected.

Key Finding: Simultaneous RV/LV pressure recording demonstrating equalized diastolic pressures and discordant systolic respiratory changes.

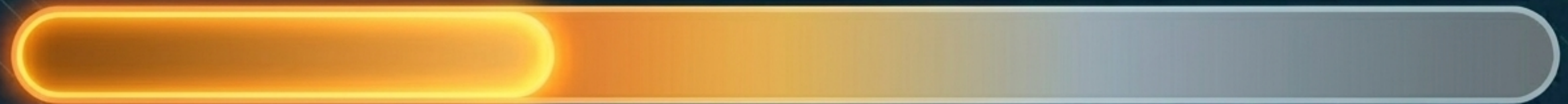
Etiology: Predicting the Shell's Permanence

The underlying cause dictates the likelihood of transient constriction and the role of anti-inflammatory therapy. 30–50% of Western cases remain idiopathic.

Transient / Inflammatory (High Reversibility)

Variable

Permanent / Fibrotic (Low Reversibility)



🦠 Idiopathic/Viral (30-50%)

🫀 Uremia/Dialysis (2-5%)

🛡️ Autoimmune (5-8%)

• Post-Cardiac Surgery (20-30%)

• Post-infectious bacterial (2-5%)

• Post-Radiotherapy (10-15%, 10-20 yr latency)

• Tuberculosis (5-10%, leading global cause)

The Reversibility Window: Transient Constriction

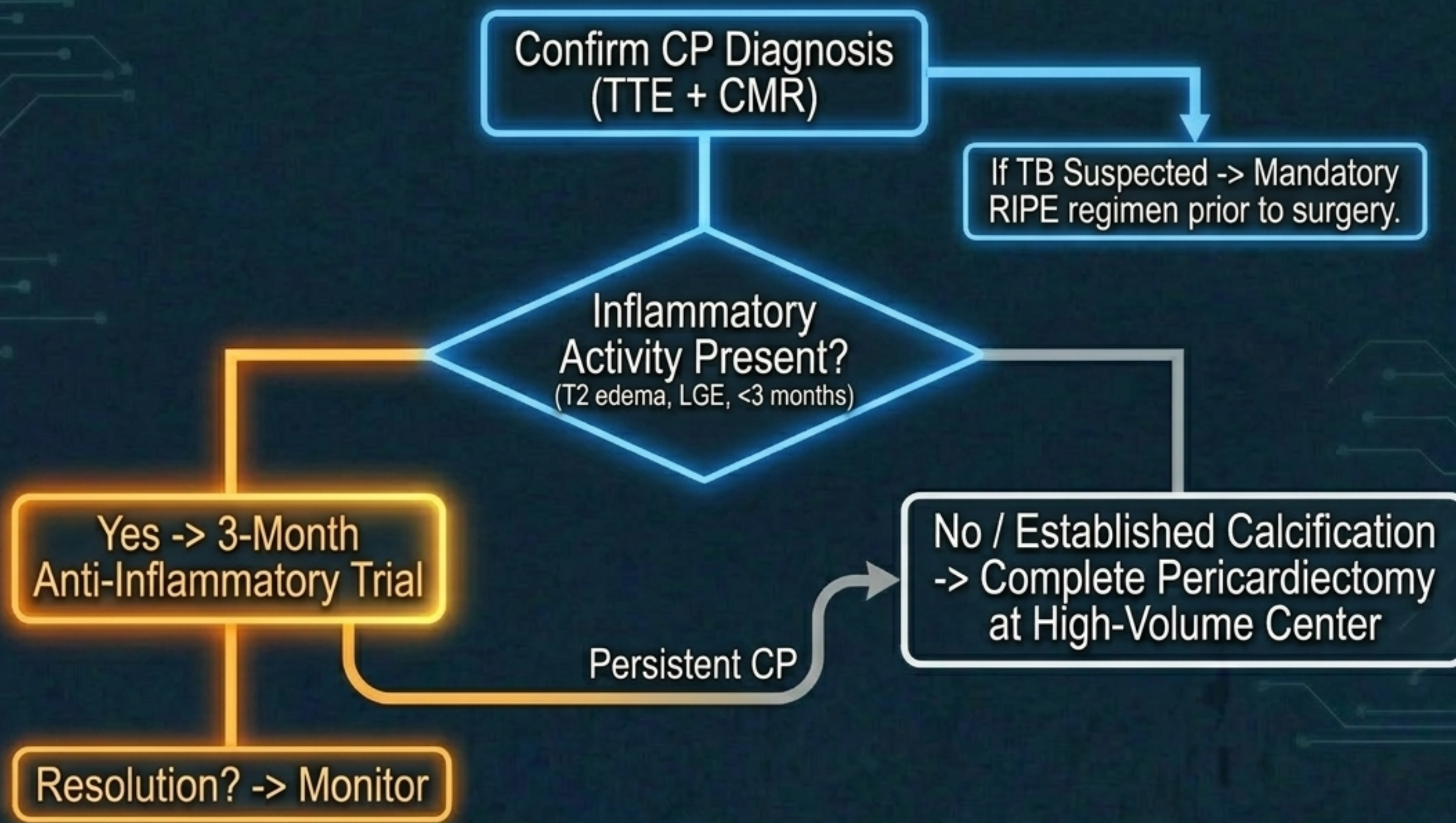
A subset of subacute CP (idiopathic, post-surgical) features reversible pericardial edema. Identifying this window can save the patient from major surgery.

Predictors of Medical Response (The Amber Path)

- ✓ Symptom onset < 3 months
- ✓ CMR shows T2 hyperintensity (Edema)
- ✓ Pericardial LGE present
- ✓ Idiopathic or Post-Surgical etiology
- ✗ Absence of pericardial calcification (CT)

Action: Mandates a 2–3 month trial of anti-inflammatory therapy before declaring the shell permanent.

Treatment Decision Algorithm




The Medical Trial: Dissolving the Inflammation

A dedicated 2–3 month trial. Requires clinical review every 2–4 weeks and repeat TTE/CMR at 3 months.

NSAID Core

Ibuprofen


600 mg PO TDS for 2–4 weeks, then taper over 2–4 weeks.

 **Caution:** Avoid if eGFR <30.

The Anchor

Colchicine


0.5 mg PO BD for 3 months.

 **Caution:** Halve dose if eGFR 10–30; avoid in severe hepatic impairment.

Second-Line

Prednisolone

0.5 mg/kg PO daily for 2–4 weeks, slow taper over 2–3 months.

 Use if NSAID failure, autoimmune, or severe renal impairment.

Definitive Cure: Complete Pericardiectomy

Radical excision of the pericardium to relieve the rigid shell.

Approach: Median Sternotomy
(Preferred for bilateral access).

Complication Warning: 10-20% risk of post-op Low Cardiac Output Syndrome due to chronic myocardial atrophy beneath the rigid shell.

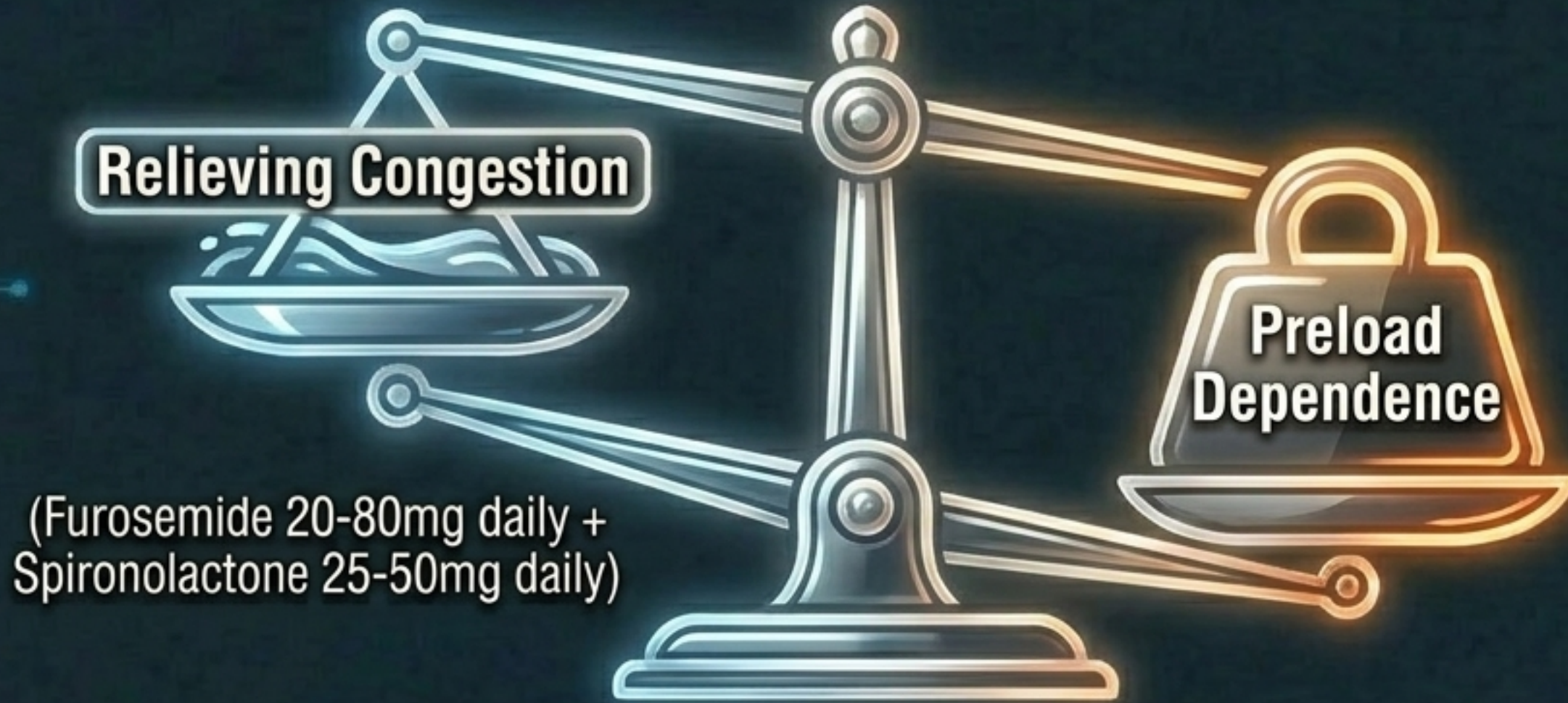


Scope: Must be complete—Phrenic nerve to Phrenic nerve.
(Subtotal pericardiectomy has 2-3x higher rate of persistent symptoms).

Outcomes Data: Idiopathic survival 85-95%; Radiation survival drops to 40-60%.

Bridging the Gap: Symptomatic Management

Diuretics relieve congestion, but the stiff ventricles are highly preload-dependent.



Volume Depletion Warning: Aggressive diuresis of constrained ventricles will cause underfilling, leading to severe low cardiac output, hypotension, and prerenal failure.

Clinical Modifiers: Adapting to Special Populations



Pregnancy

NSAIDs contraindicated in 3rd trimester. Colchicine B3 (use caution).

Defer surgery post-partum.

Monitor carefully due to 30-50% physiological cardiac output increase.



Paediatrics

Common causes: Post-op congenital repair, post-infectious, TB.

Adjust echo e' values via z-scores.



Elderly

High risk GI bleed with NSAIDs. Perioperative mortality jumps to 8-15% in >70 years.

Start diuretics low and slow.



Renal Impairment

Uremic CP may reverse with intensified dialysis ($Kt/V \geq 1.4$).

NSAIDs contraindicated if eGFR <30.



Hepatic Impairment

Distinguish congestive hepatopathy from cirrhosis.

Avoid Colchicine in Child-Pugh C.



Immunocompromised

Steroids risk opportunistic infections. Aggressively exclude TB (GeneXpert) before starting steroids.

The Australian Context: First Nations Health Priorities

CP in Aboriginal and Torres Strait Islander Australians is disproportionately linked to two massive systemic health burdens: Rheumatic Heart Disease (RHD) and Tuberculosis (TB).

Rheumatic Heart Disease (RHD)

Acute Rheumatic Fever rates are 56x higher in Indigenous vs. non-Indigenous Australians.

RHD inflammation can progress to constriction.

The High Suspicion Zone.

Any Indigenous patient with unexplained right-heart failure must be screened for TB and RHD.

Tuberculosis (TB)

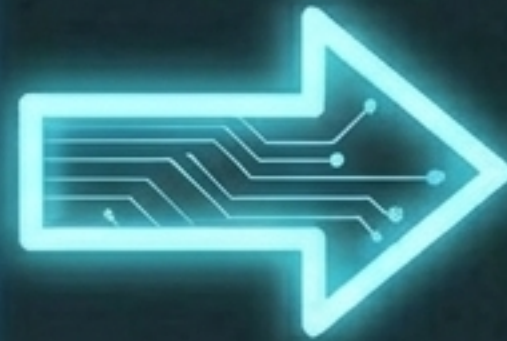
TB notification rates in the Northern Territory are 6–10x the national average.

Causes chronic, dense calcification requiring 6-9 months of mandatory RIPE therapy before surgery.

Bridging the Gap: Care Pathways in Remote Contexts

Diagnostic Access

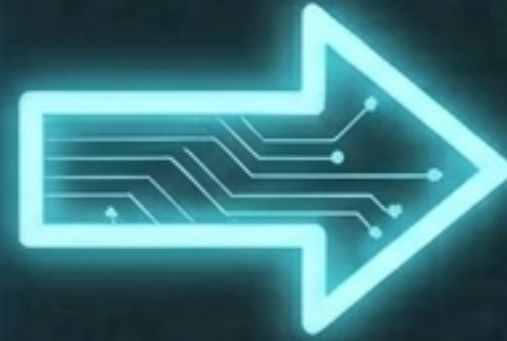
Barrier: CMR/Cath only in major centers.



Solution: Tele-echocardiography outreach; RFDS transfer protocols.

Treatment Adherence

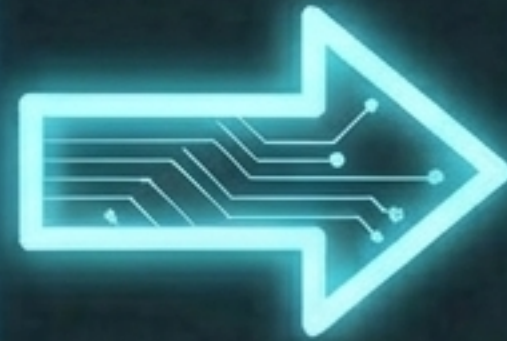
Barrier: Remote geography, refrigeration issues for meds.



Solution: Directly Observed Therapy (DOT) for TB; BPG secondary prophylaxis via RHD Registers.

Surgical Access

Barrier: Interstate transfer required (e.g., NT to Melbourne/Sydney).



Solution: Accommodation support, engaging Aboriginal Health Liaison Officers (AHLWOs), culturally safe yarning-based education.

Quick Reference: The Constriction Toolkit

The Echo Discriminator (CP vs RCM)

Lateral e'

≥ 8 cm/s (CP) | < 8 cm/s (RCM)

Mitral Inflow Variation

$\geq 25\%$ (CP) | $< 10\%$ (RCM)

The Treatment Split

Inflammatory/Transient: Ibuprofen (600mg TDS) + Colchicine (0.5mg BD) for 3 months.

Established/Calcified: Complete Pericardiectomy (Phrenic to Phrenic, median sternotomy).

TB-Related: 6-9 months RIPE regimen prior to surgical intervention.