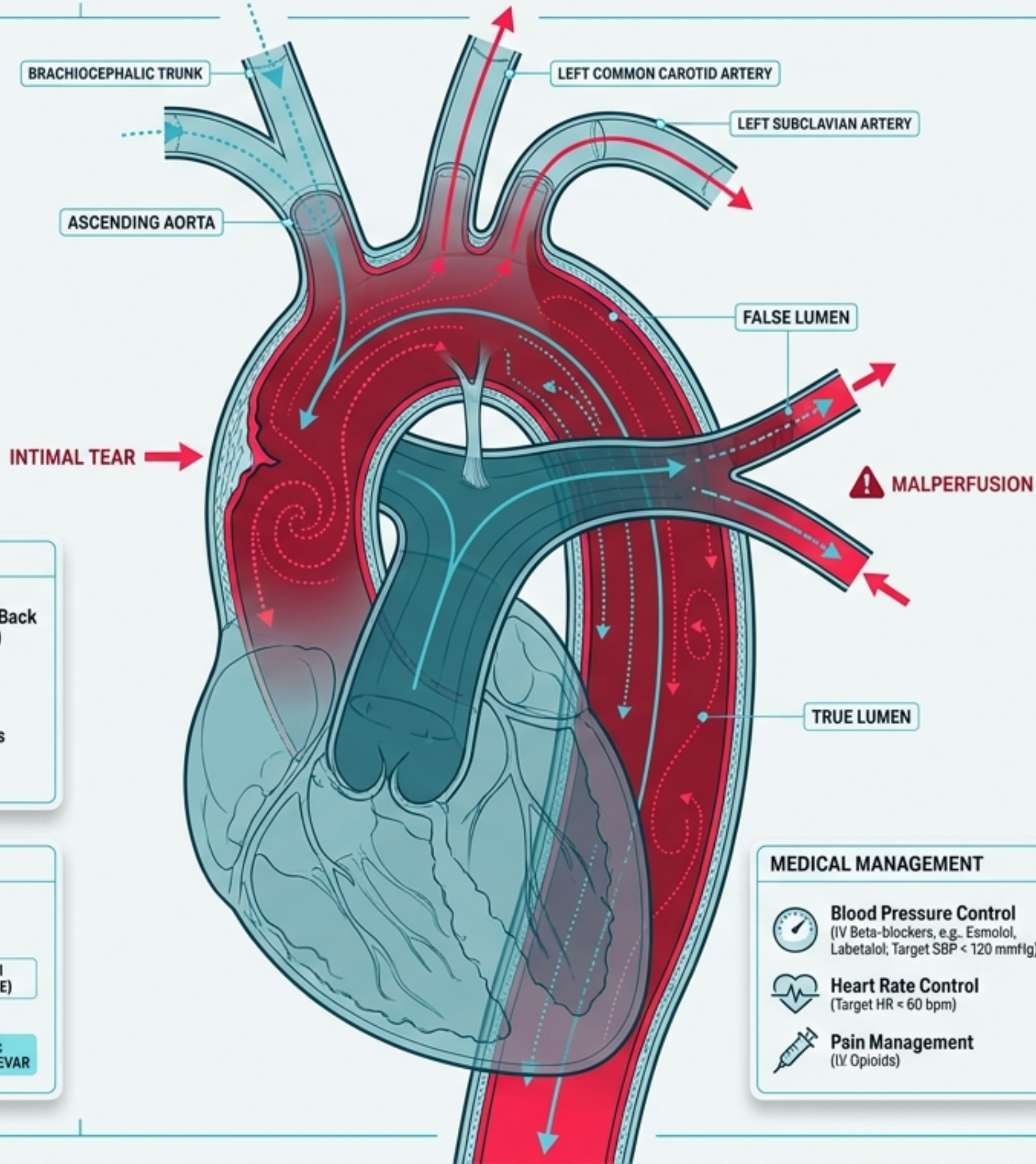


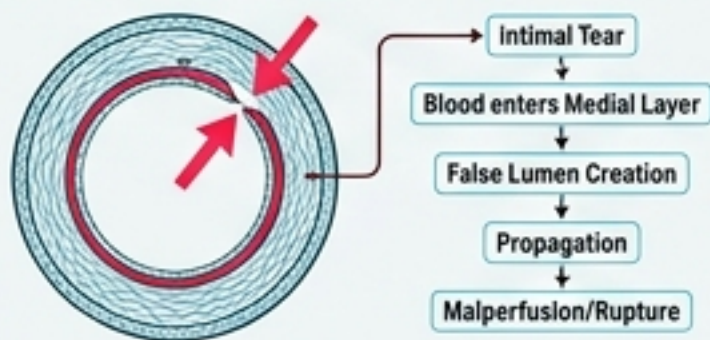
# Aortic Dissection

## The Clinical Blueprint for Rapid Diagnosis & Management

Synthesized from Med2Date Clinical Guidelines



### PATHOPHYSIOLOGY



### CLINICAL PRESENTATION



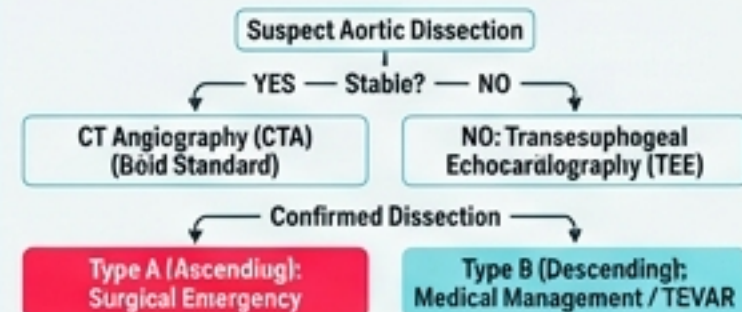
- Sudden, Severe Chest/Back Pain ('Tearing', 'Ripping')
- Hypertension (or Hypotension/Shock)
- Pulse Deficits
- Neurological Symptoms
- Syncope

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- Sudden, Severe Chest/Back Pain ('Tearing', 'Ripping')
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### DIAGNOSTIC ALGORITHM



### MEDICAL MANAGEMENT

- Blood Pressure Control**  
(IV Beta-blockers, e.g., Esmolol, Labetalol, Target SBP < 120 mmHg)
- Heart Rate Control**  
(Target HR < 60 bpm)
- Pain Management**  
(IV Opioids)

# A Race Against Time: The Threat of Acute Aortic Syndrome



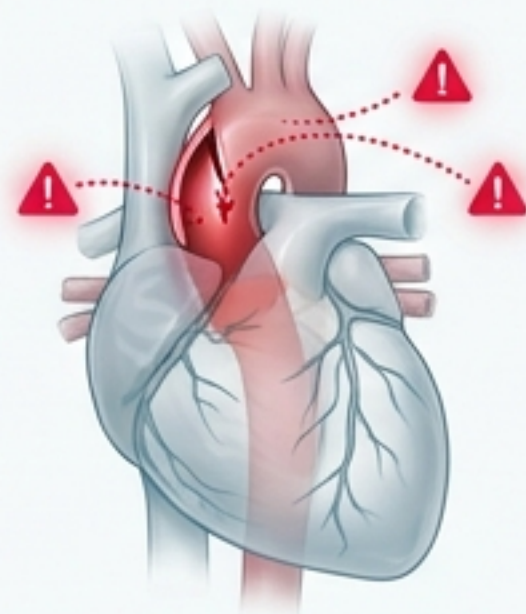
## INCIDENCE



**3-4**  
per 100,000  
person-years  
in Australia.



## MORTALITY



**+1-2%**  
per hour increase in  
mortality if untreated  
in Type A during the  
first 48 hours.



## MEDICAL MANAGEMENT ALONE IN TYPE A



**>50%**  
mortality at 48 hours

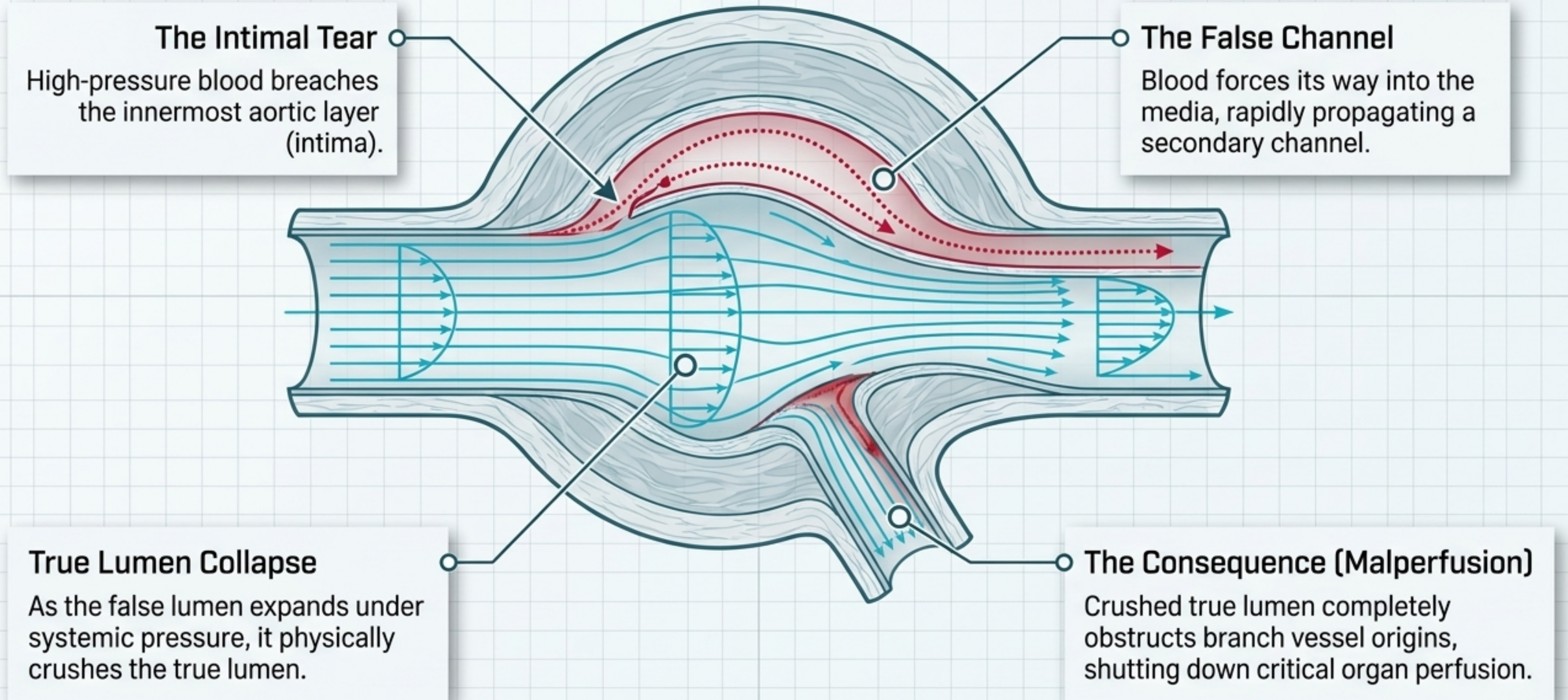


**>90%**  
mortality at 30 days.





**Aortic dissection is the most common acute aortic syndrome. Early suspicion and immediate intervention define the line between survival and death.**

# The Physics of Structural Failure

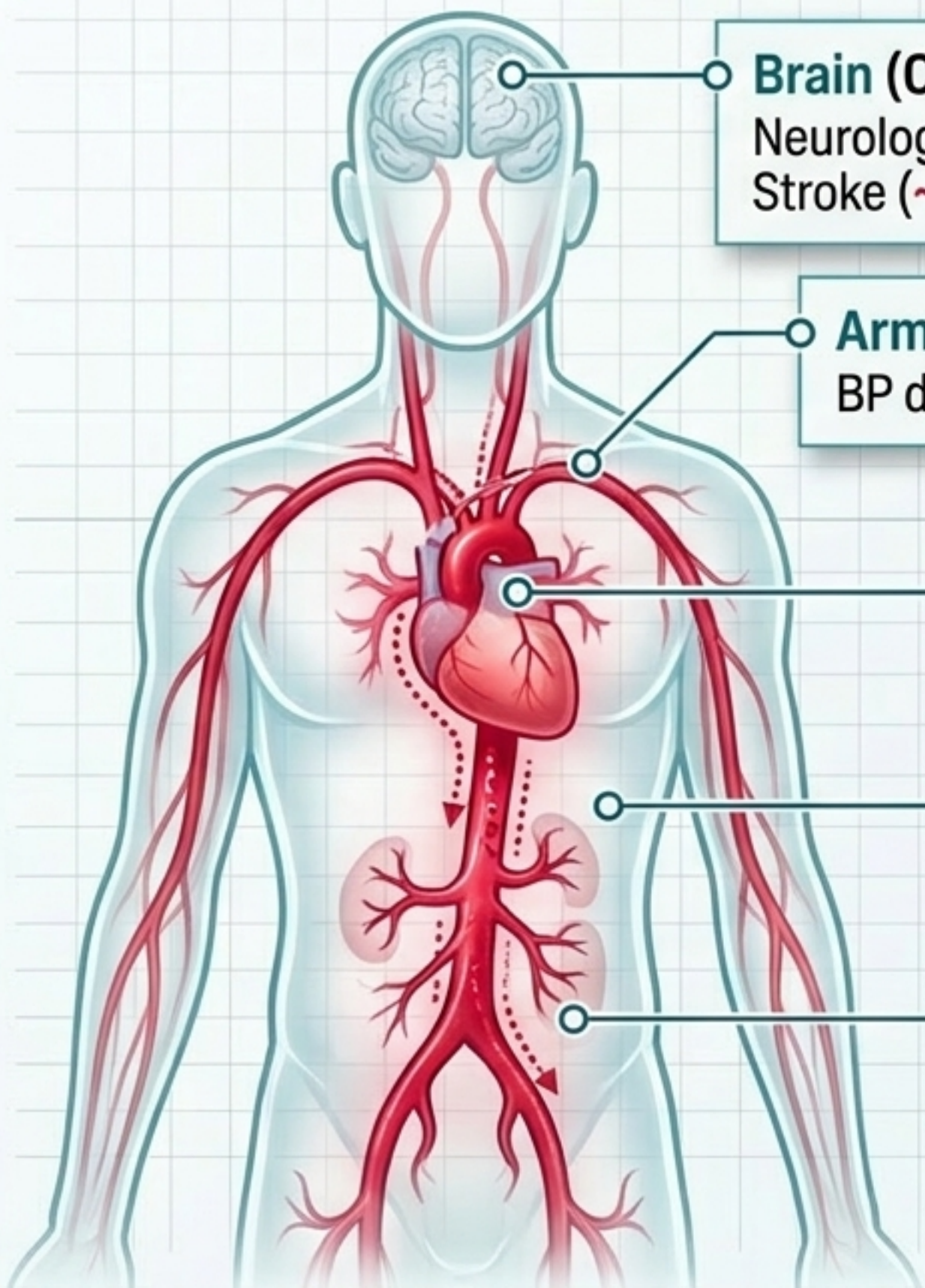


# The Divergence: Anatomical Classification

**Any dissection involving the ascending aorta mandates urgent surgical consultation. Ascending involvement = Surgical Emergency.**

Classification	Involvement	Frequency	DeBakey Equivalent	Core Management
Stanford Type A	Ascending aorta involved	~60–65% of cases	DeBakey I & II	<b>Surgical Emergency</b> 
Stanford Type B	Descending only (distal to L. subclavian)	~35–40% of cases	DeBakey III (a & b)	<b>Medical Management ± TEVAR</b> 

# The Great Masquerader: Correlating Clinical Clues



## Brain (Carotid)

Neurological deficits /  
Stroke (~**5-10%** in **Type A**).

## Arms (Subclavian/Brachiocephalic)

BP differential **>20 mmHg** between arms.

## Aortic Root

New diastolic murmur (Aortic Regurgitation) in **30-50%** of Type A.  
Cardiac tamponade (leading cause of early death).

## Abdomen (Mesenteric)

Ischemia, severe pain, lactic acidosis.

## Spine / Legs

Paraplegia (~**2-5%** in Type B) /  
Pulse deficits (**15-30%** of Type A).

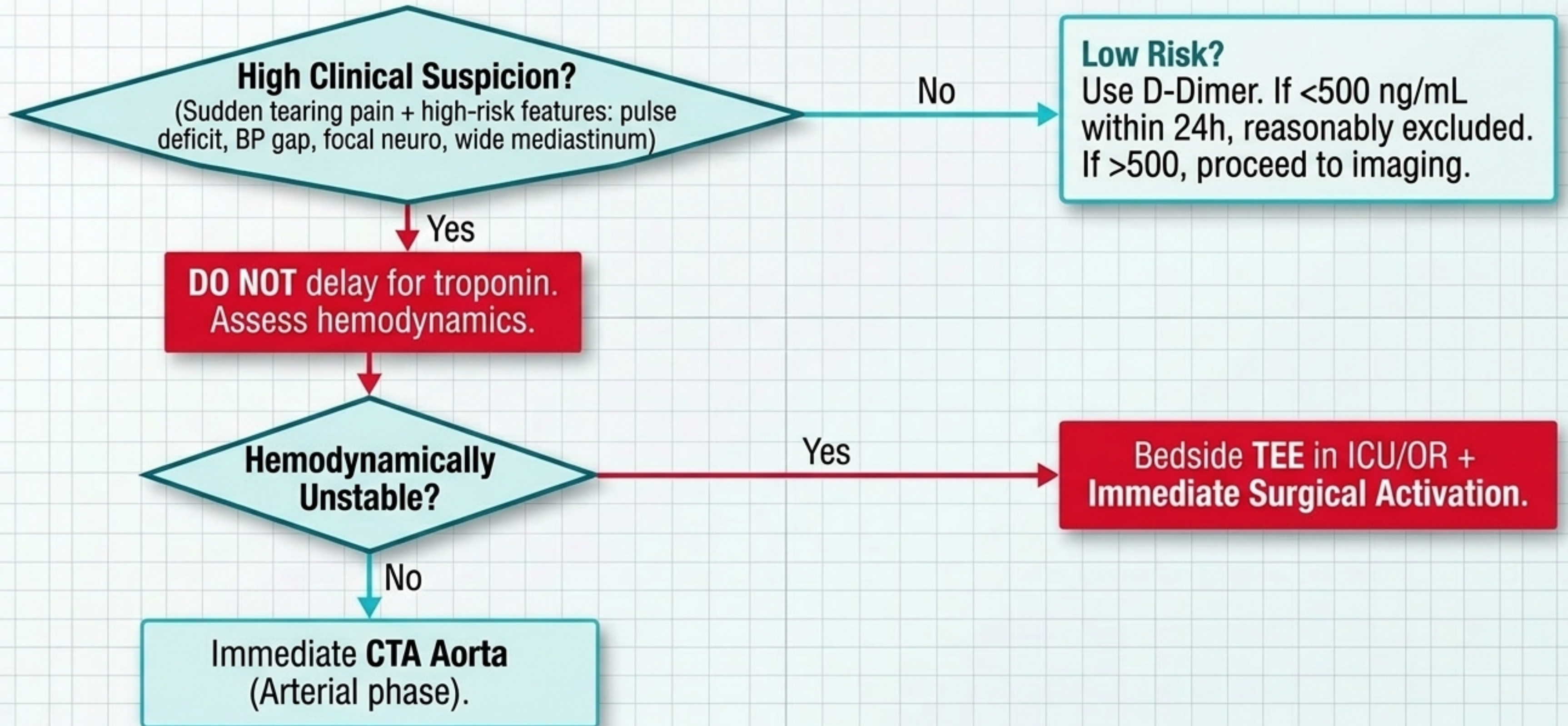
**Pain Profile:** Sudden-onset,  
maximal intensity ('thunderclap').

**Type A:** Anterior chest.

**Type B:** Interscapular back/abdomen.

Migrating pain in **15-20%**.

# The Verdict: Diagnostic Algorithm



# Imaging Modalities Matrix



## CT Angiography (CTA)

- **Sens/Spec:** 95-100%
- **Role:** First-line standard. Fast, 24/7 availability.
- **Pros/Cons:** Maps entire aorta. **Requires IV contrast (renal risk)** and patient stability.



## Transoesophageal Echo (TEE)

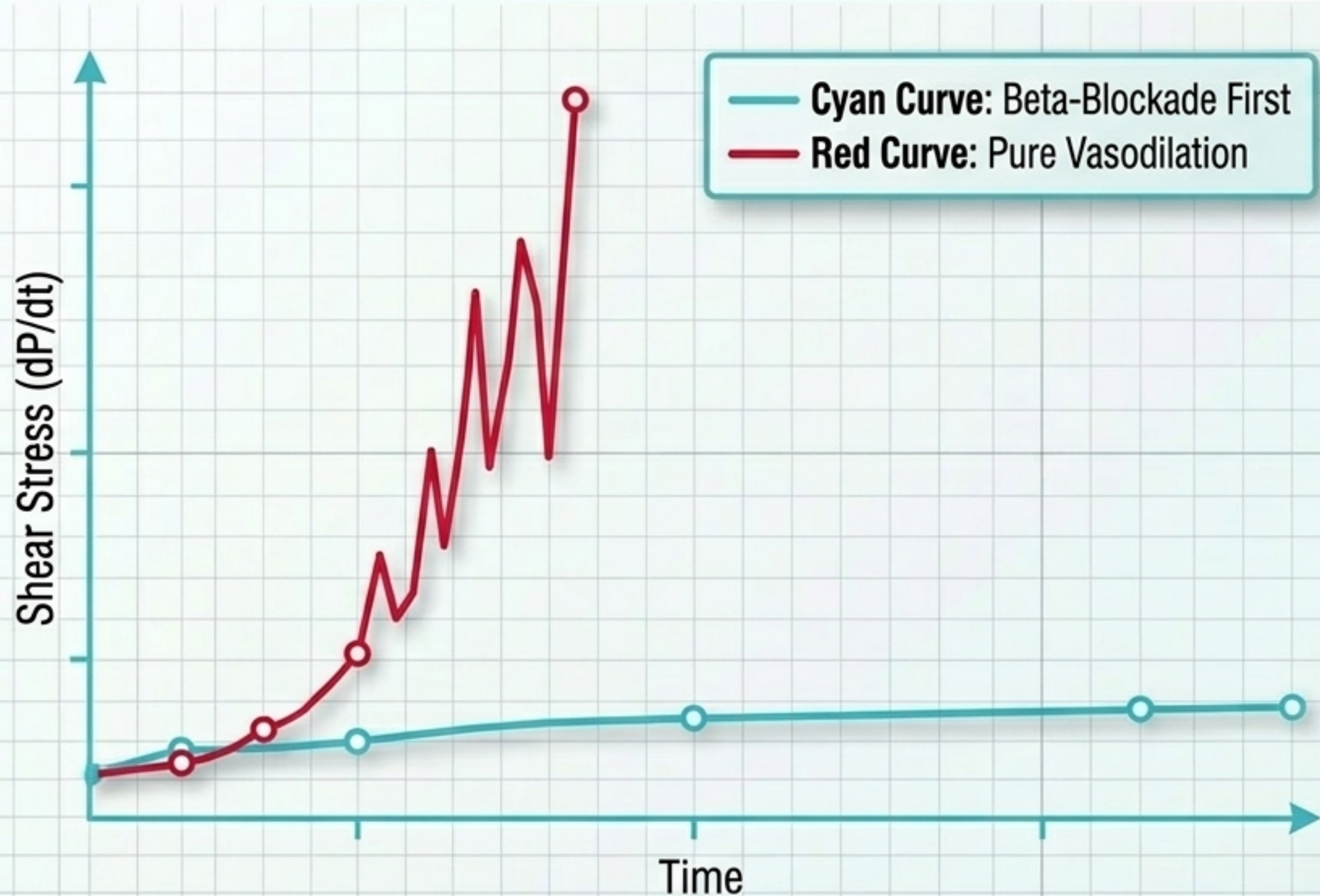
- **Sens/Spec:** 98-99% (Type A)
- **Role:** Unstable / Bedside assessment.
- **Pros/Cons:** Ideal for identifying tamponade/AR. **Blind spot at distal ascending aorta.** Requires sedation.



## Magnetic Resonance Angiography (MRA)

- **Sens/Spec:** 98-100%
- **Role:** Chronic surveillance.
- **Pros/Cons:** No radiation. **NOT for acute phase** (30-60 min min scan). Requires implant screening.

# The Hemodynamic Trap: dP/dt and Shear Stress



## The Concept:

dP/dt represents the rate of change in pressure over time (aortic wall shear stress).

## Red Curve (Pure Vasodilation):

Using pure vasodilators (nitroprusside) alone causes reflex tachycardia.

Heart rate spikes → dP/dt spikes → forces the intimal tear further open.

## Cyan Curve (Beta-Blockade First):

Beta-blockers blunt the reflex tachycardia.

Heart rate drops → shear stress drops → dissection stabilized.

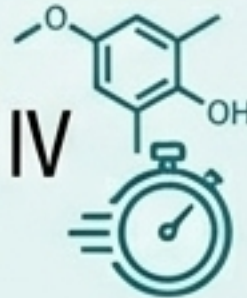
**⚠ NEVER use pure vasodilators without prior adequate beta-blockade. Target HR <60 bpm, then SBP 100-120 mmHg. ⚠**

# Acute Medical Stabilization Dashboard

## Esmolol (First-Line Beta-Blocker)

### Action:

Ultra-short-acting IV beta-1 selective.



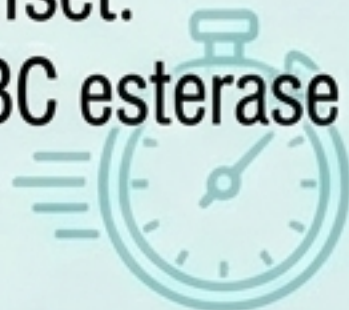
### Dosing:

500 µg/kg bolus, then 50–200 µg/kg/min.

### Perks:

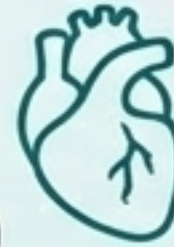
Rapid onset/offset.

Renal-safe (RBC esterase metabolism).



## Labetalol (Alternative Blockade)

**Action:** Combined alpha/beta blocker (lowers HR and BP).



### Dosing:

20 mg bolus, titrate to max 300 mg (or infusion).



## Sodium Nitroprusside (Adjunct Vasodilator)

### Action:

Pure vasodilator.



### Dosing:

0.25–0.5 µg/kg/min IV.

### WARNING:

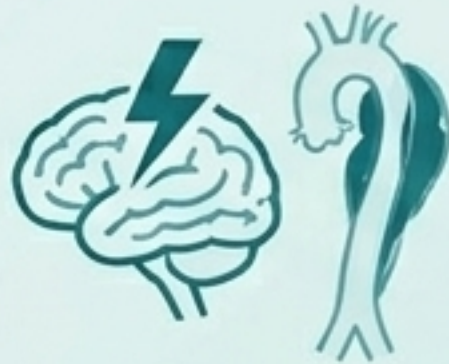
**ONLY** after beta-blockade. Risk of cyanide toxicity >72h.



# Pathway A: The Surgical Emergency

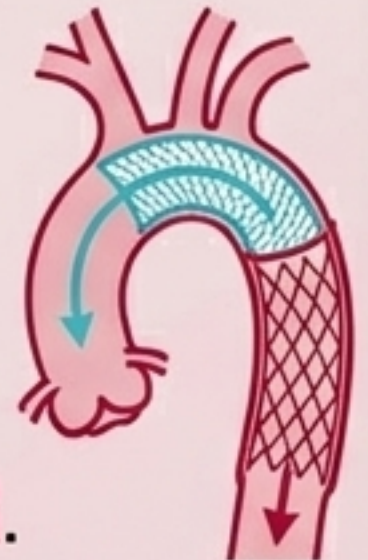
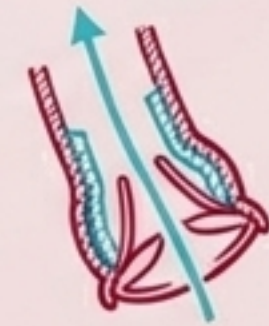
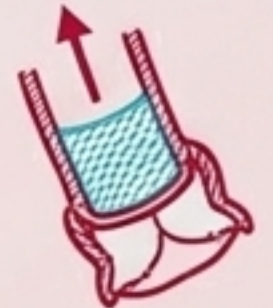
## Logistics & Caveats

- Emergent transfer to cardiothoracic center is mandatory. Operative mortality 15-25% at 30 days.
- **Pre-operative Stroke:** Usually proceed to surgery; stroke worsened by untreated dissection.
- **Tamponade Warning:** Pericardiocentesis is generally **CONTRAINDICATED** (decompression worsens bleeding).



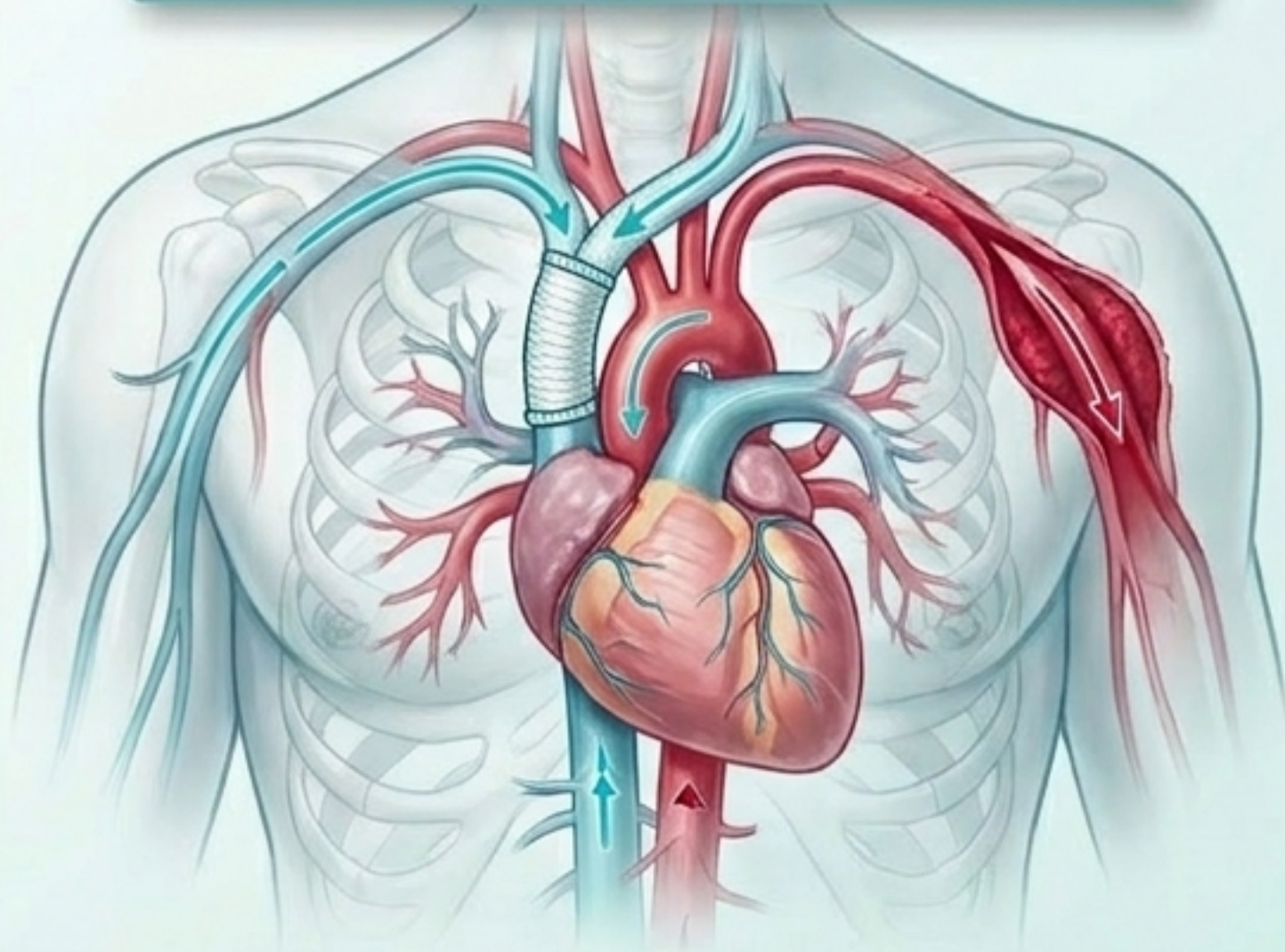
## The Surgical Arsenal

- **Ascending Replacement (Hemiarch):** Dacron graft under deep hypothermic circulatory arrest.
- **Bentall Procedure:** Composite valve-graft root replacement.
- **David Procedure:** Valve-sparing root replacement.
- **Total Arch + Frozen Elephant Trunk:** Arch graft with a stent landing zone for **future TEVAR**.



# Intervention Mechanics: Open vs. Endovascular

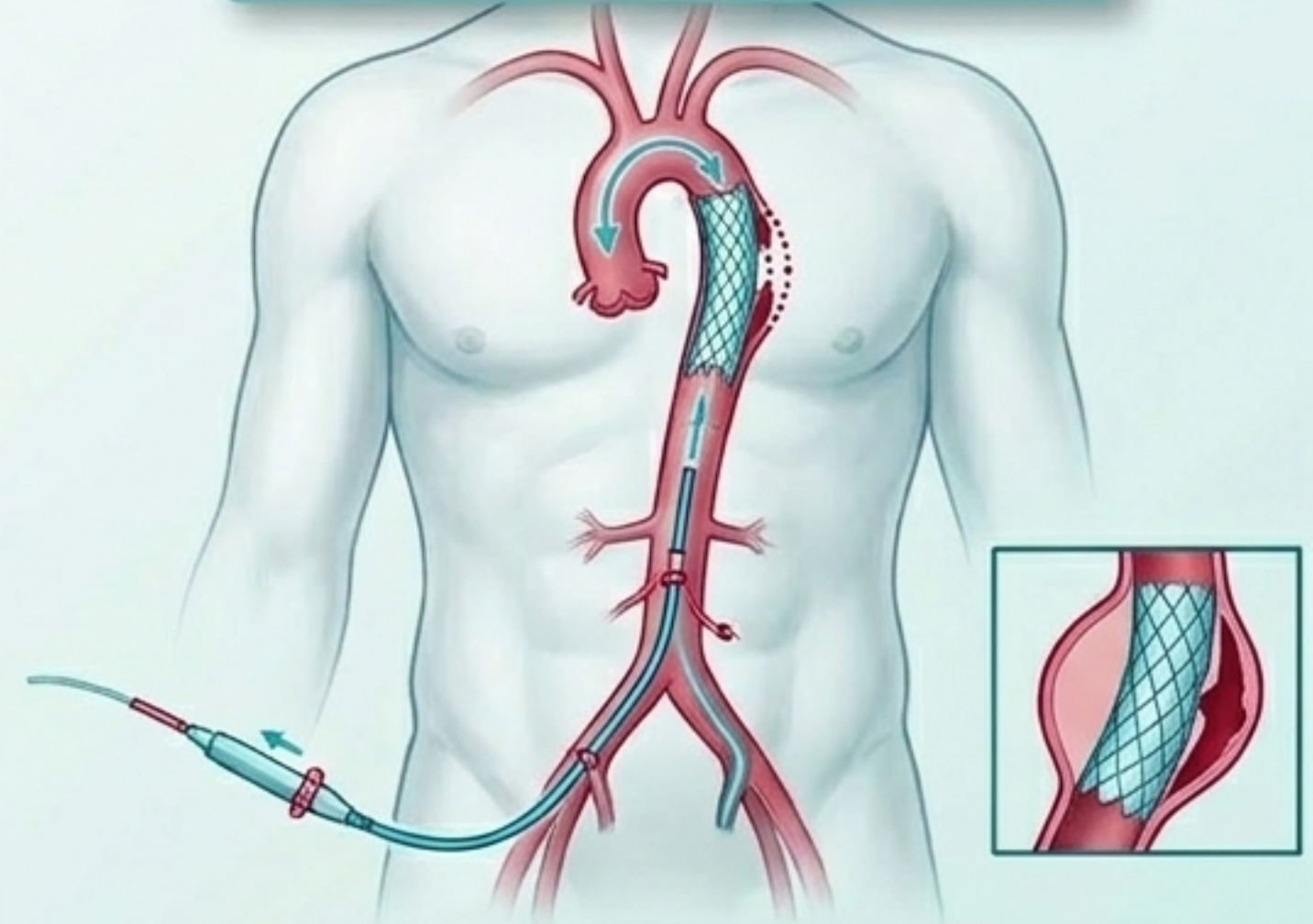
## Open Repair (Type A Focus)



**Mechanism:** Median sternotomy, cardiopulmonary bypass. The diseased aorta is physically resected and replaced with a synthetic Dacron graft.

**Impact:** Highly invasive, definitive repair of ascending anatomy.

## TEVAR (Type B Focus)



**Mechanism:** Thoracic Endovascular Aortic Repair. Accessed via femoral artery. A covered stent-graft is deployed across the entry tear from the inside.

**Impact:** Redirects flow back to true lumen, promoting false lumen thrombosis without opening the chest. 30-day mortality 10-15%.

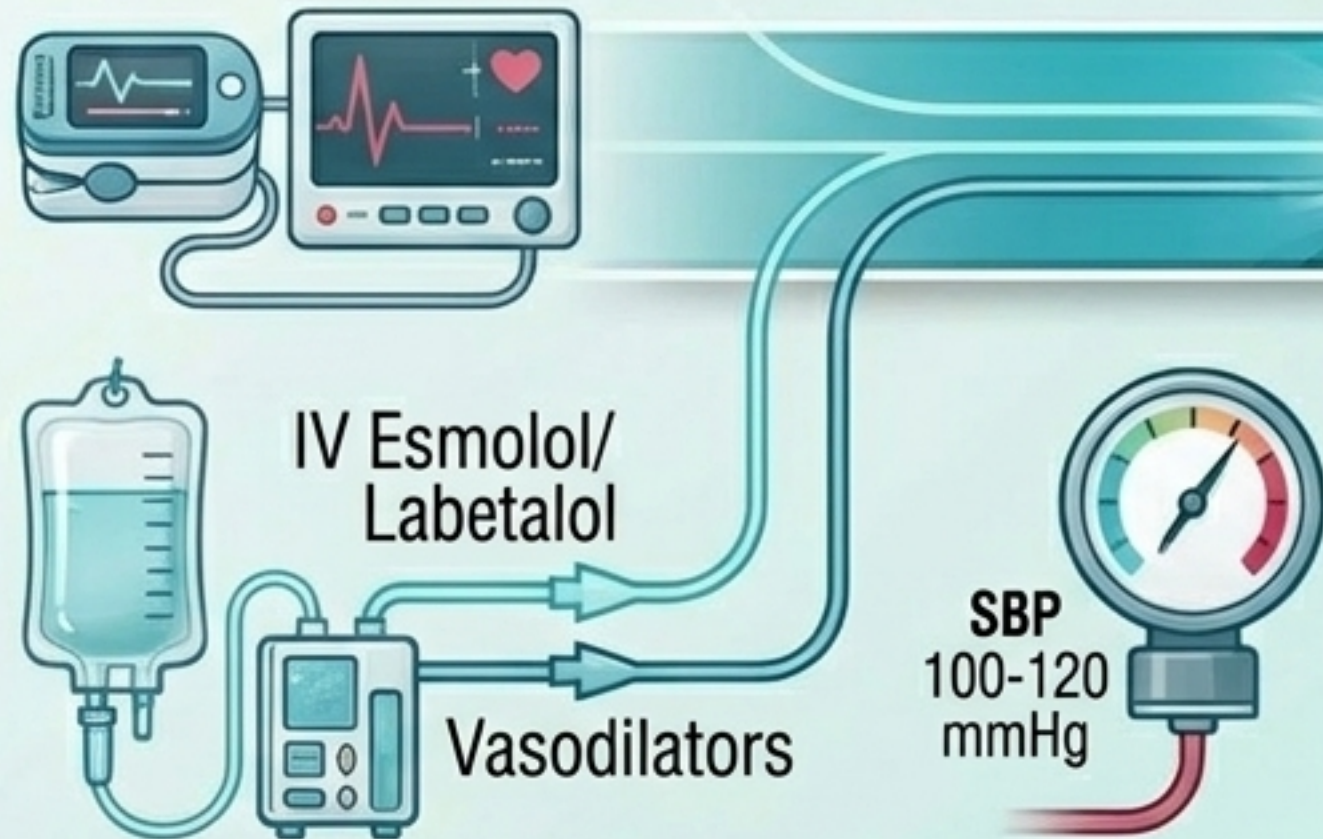
# Pathway B: Uncomplicated Medical Management

## Acute IV Phase

### Phase 1: Immediate Stabilisation

**Goal:** Prevent propagation.

**Action:** IV Esmolol/Labetalol to HR <60, then vasodilators for SBP 100-120.



## Chronic Oral Phase

### Phase 2: The Oral Transition (24-48 Hours)

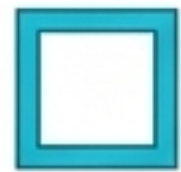
**Goal:** Lifelong mechanical stress reduction.



- ✓ **Bisoprolol:** Selective beta-1 blocker (2.5-10 mg daily).
- ✓ **Perindopril:** ACE inhibitor add-on (2.5-10 mg daily).
- ✓ **Amlodipine:** Calcium channel blocker add-on.

# Complicated Type B Checklist

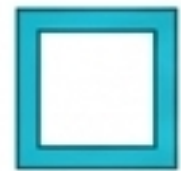
Medical management is the baseline. Any single complication below triggers TEVAR.



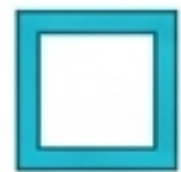
Malperfusion syndrome  
(mesenteric, renal, spinal cord, or  
lower limb ischemia).



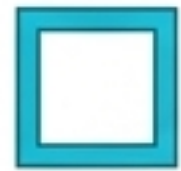
Aortic rupture (contained or free).



Refractory pain despite optimal  
medical therapy.



Rapid aortic expansion ( $\geq 5$  mm  
increase during index admission).



Periaortic hematoma.

If Any  
Checked

Proceed to  
TEVAR

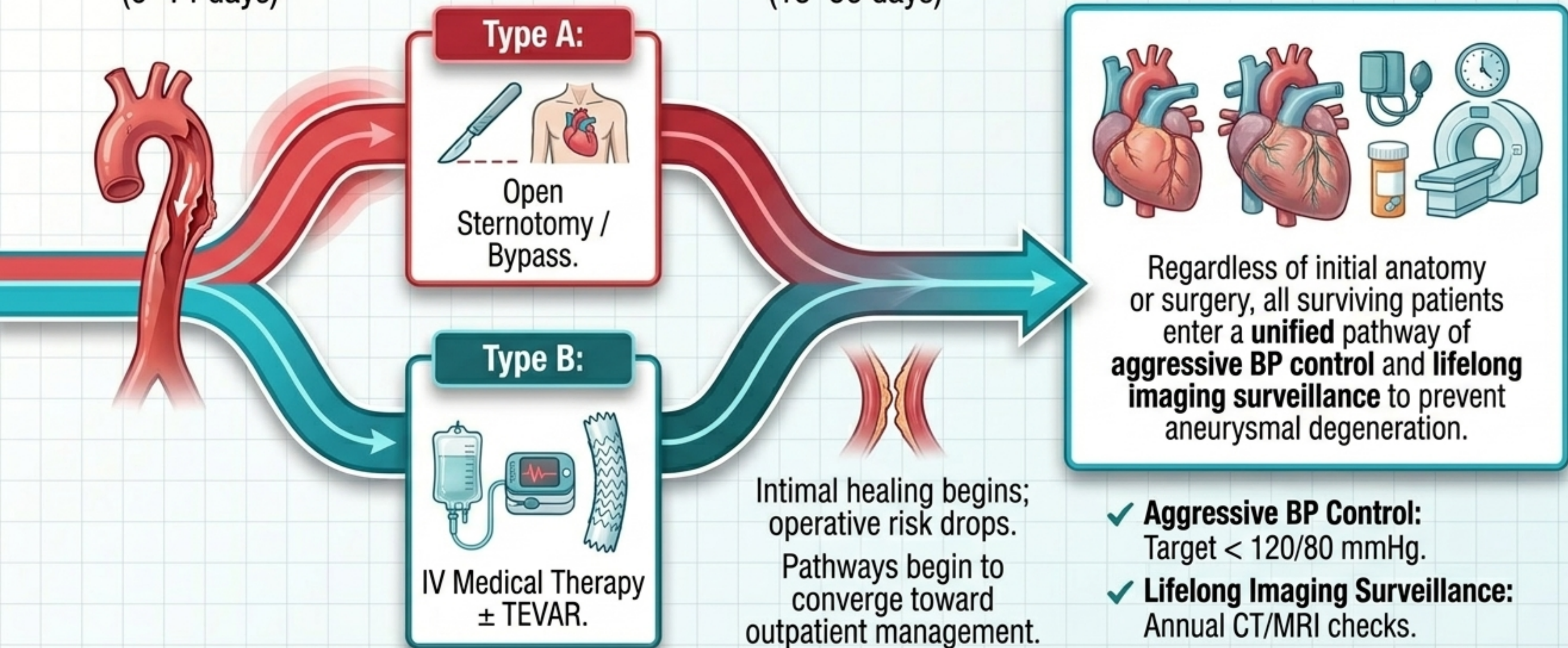
(Deploy covered stent-graft  
across entry tear)

# The Aortic Dissection Lifespan

**Hyperacute / Acute**  
(0–14 days)

**Subacute**  
(15–90 days)

**Chronic (>90 days) - The Convergence**



# The Long Game: Surveillance Cadence

Calendar

**Baseline**  
(Index Admission)

- **CTA Aorta.**
- Document max diameter, true/false lumen, branch patency.



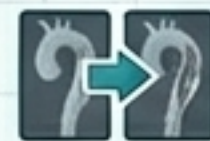
**1 Month & 3 Months**

- **CTA or MRA.**
- Assess early remodeling and false lumen thrombosis.



**6 Months**

- **CTA or MRA.**
- Assess interval change.



**12 Months & Annually**

- Annual **MRA** (preferred to minimize lifetime radiation) or **CTA**.



## Clinical Pearl:

MRA is the gold standard for long-term follow-up to avoid radiation toxicity, but device MRI & ainability fut device **MRI compatibility** must be vust be **verified** if TEVAR was performed.



# Adapting the Playbook: Physiological Extremes



## Pregnancy

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- Highest risk in 3rd trimester/postpartum.
- Type A requires **emergency surgery** regardless of term (C-section if viable  $\geq 28w$ ).
- Labetalol is preferred.
- **Avoid** ACE/ARBs.



## Pediatrics

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- Exceedingly rare; almost exclusively associated with Connective Tissue Disorders (Marfan, Turner, Ehlers-Danlos).
- Requires weight-adjusted IV beta-blockade.



## Elderly (>70 yrs)

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- Operative mortality for Type A jumps to 30-50%, but still vastly outperforms conservative management.
- TEVAR often preferred for complicated Type B to lower morbidity.

# Adapting the Playbook: Organ Dysfunction & Genetics



## Renal Impairment

**CTA contrast risk** requires pre-hydration. **Avoid** Nitroprusside (thiocyanate accumulation). **MRA preferred** for follow-up.



## Hepatic Impairment

**Caution** with Labetalol (reduced first-pass metabolism) and **Nitroprusside** (impaired cyanide metabolism). **Esmolol preferred**.



## Connective Tissue Disorders

- Marfan: Prophylactic root replacement at  $\geq 45-50$  mm.
- Loeys-Dietz: **Highly aggressive**; prophylactic surgery at  $\geq 40-42$  mm.
- Vascular Ehlers-Danlos: Extreme tissue fragility; **high surgical morbidity**.

# Overcoming Geography: Indigenous Health & Remote Access

## The Burden



- **1.5–2x higher rate** of CVD in Aboriginal and Torres Strait Islander populations, compounded by remote distances and higher baseline rates of hypertension/RHD.

## Logistical Imperative (“Scoop and Run”)



- Major cardiothoracic surgery is capital-city only.
- Rely on early **RFDS/ Retrieval** activation.
- Utilize point-of-care TTE and telehealth while awaiting transport.



## Culturally Safe Care & Follow-up



- Involve Aboriginal Health Workers early.
- Respect “sorry business” and family structures in consent.
- Utilize PBS **Close the Gap** co-payments for lifelong oral medical adherence.

