

# Medical Treatment of Type A Aortic Dissection:

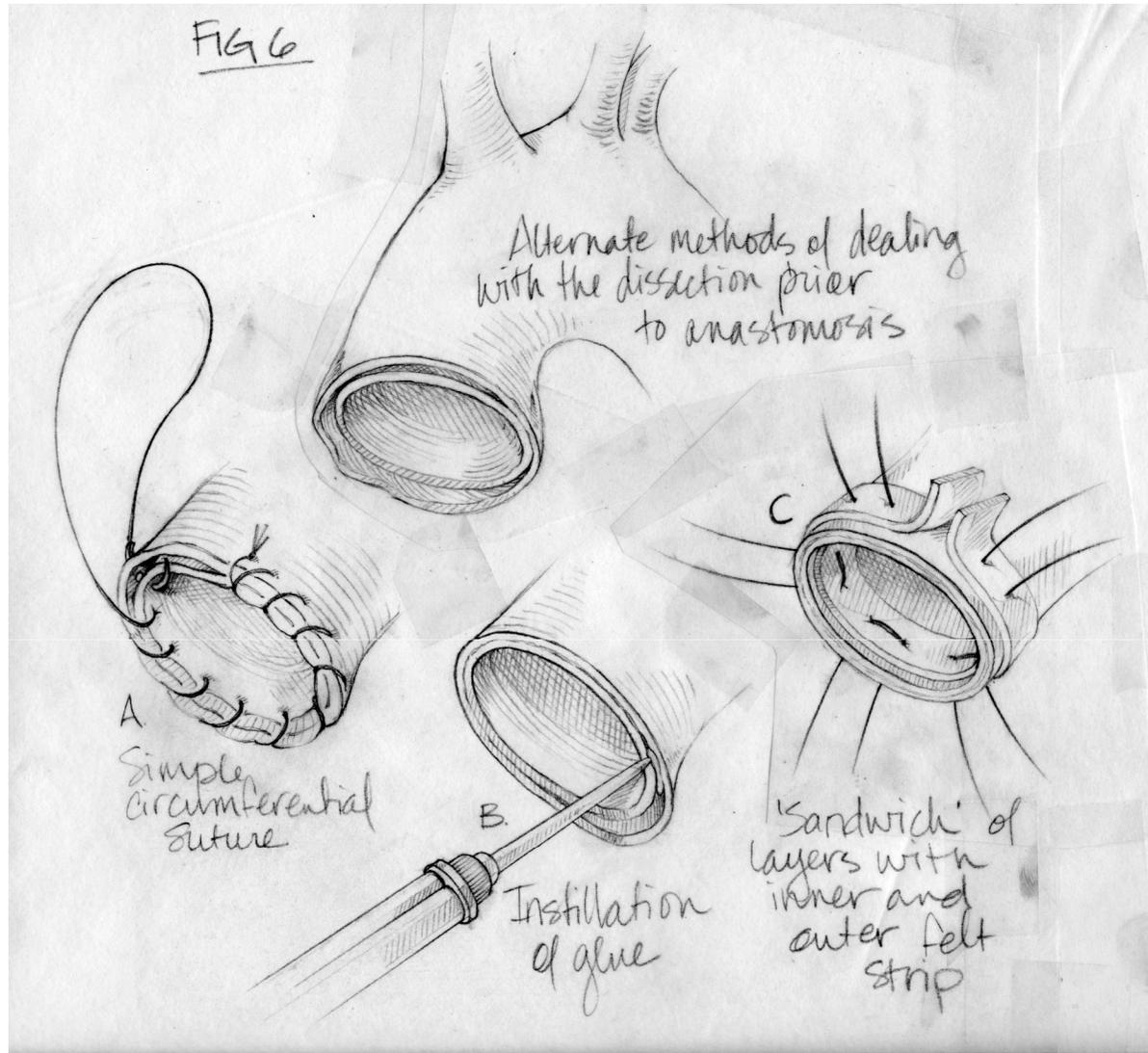
## *Tales of Turkeys, Tygon Tubing, and Evolving Paradigms*

The Houston Aortic Symposium  
April 4-6, 2008

John A. Elefteriades, MD  
William W.L. Glenn Professor of  
Cardiothoracic Surgery  
Yale University School of Medicine



- A very short lecture.



- A very short lecture

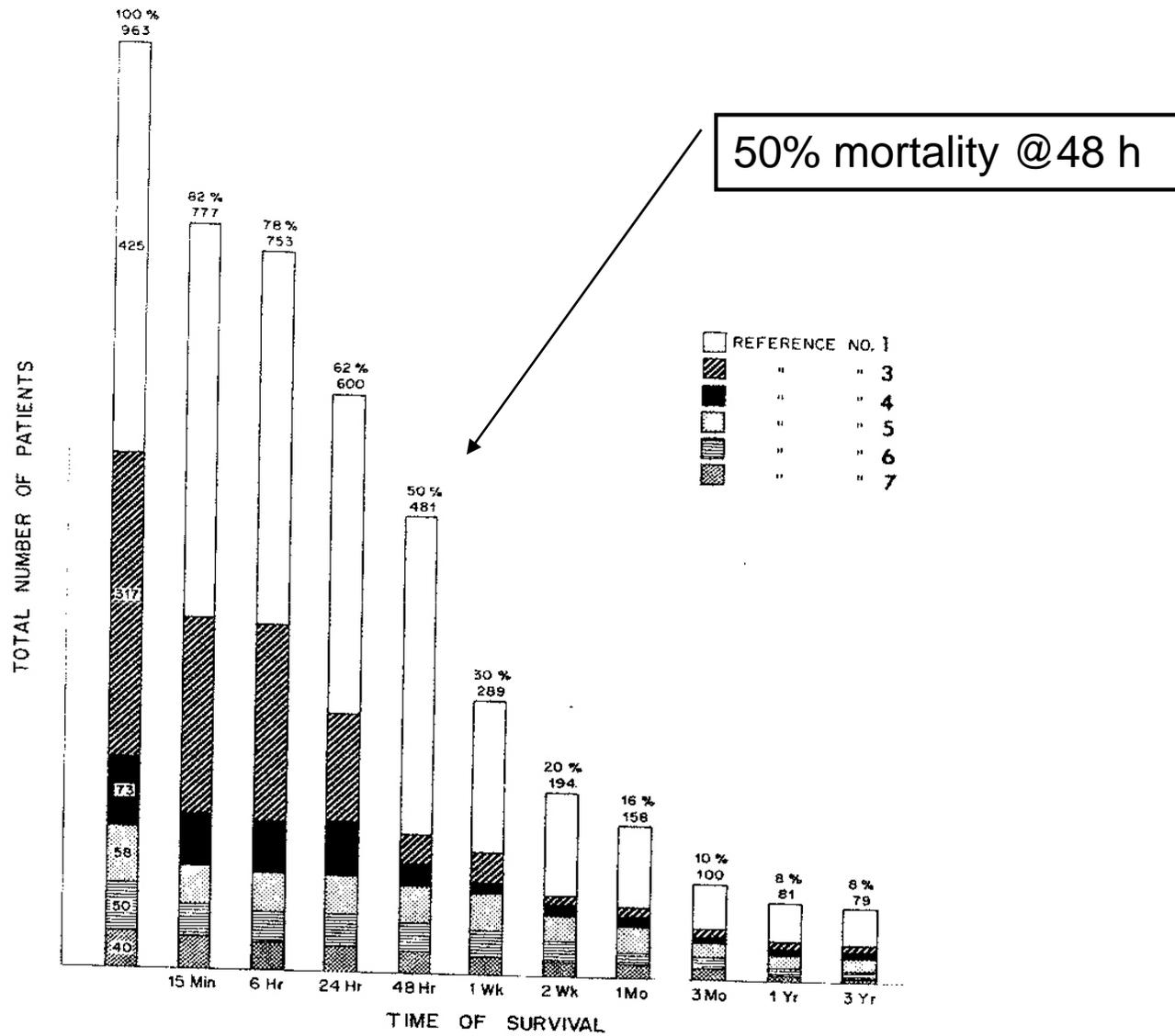


FIGURE 1. Untreated acute aortic dissections: patient survival. (By permission of the Editor, American Journal of Cardiology.)

# “Anti-impulse Rx” dates to work of Myron Wheat in 1960’s



[Dr. Wheat- University of Florida](#)

Treatment of dissecting aneurysms of the aorta without surgery

*Myron W. Wheat, Jr., M.D., Roger F. Palmer, M.D. \* (by invitation)*

TREATMENT OF DISSECTING ANEURYSMS OF THE AORTA WITHOUT SURGERY

MYRON W. WHEAT, JR., M.D.  
ROGER F. PALMER, M.D.  
(by invitation)

THOMAS D. BARTLEY, M.D.  
(by invitation)  
and  
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(by invitation)  
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(Printed in the U. S. A.)

To John,  
Sorry about the delay  
in finding this reference.  
Finally coaxed Bill into  
finding this.  
For your interest  
I appreciate seeing  
my report as a reference  
in your paper.

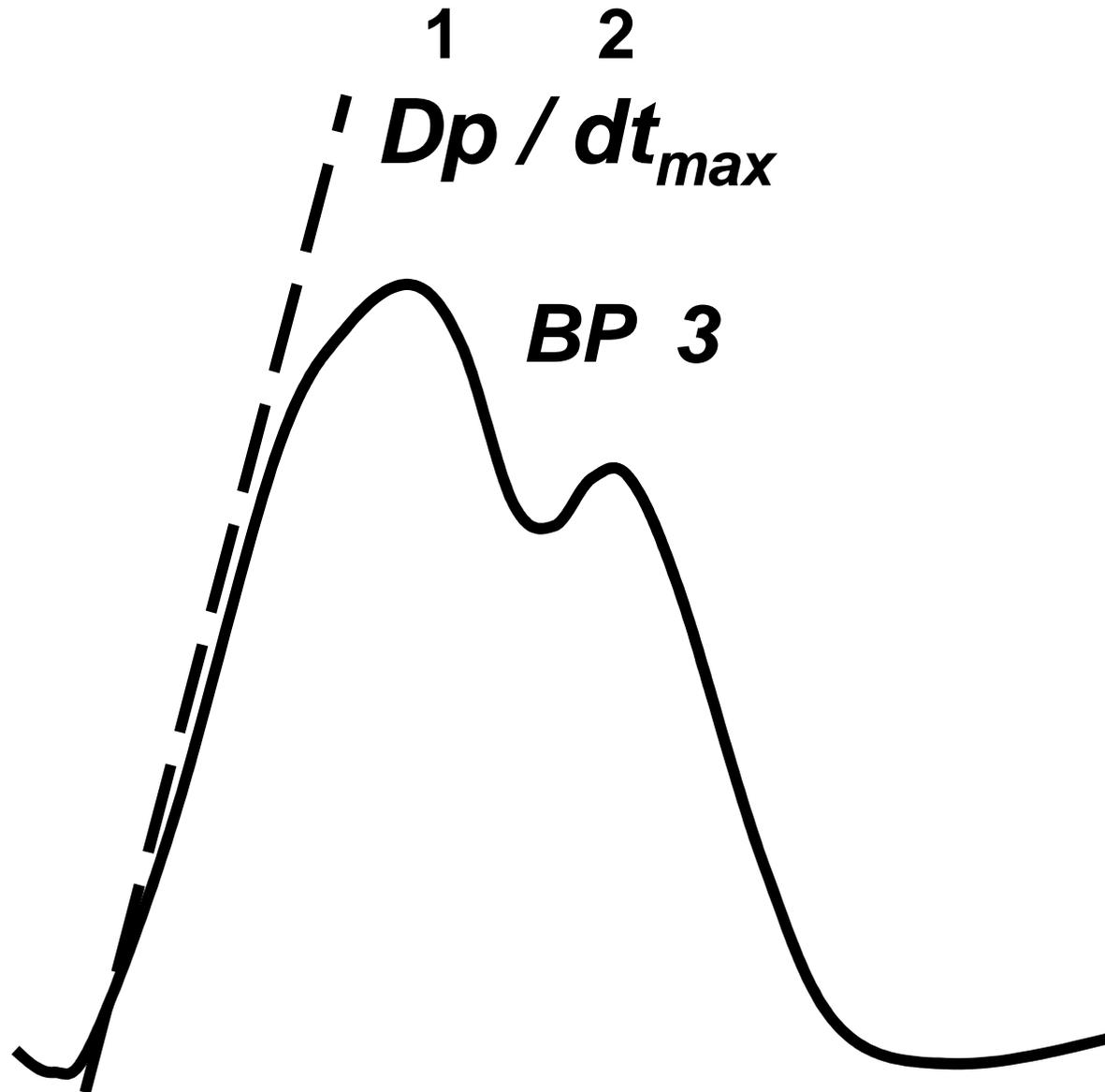
May 7, 1991

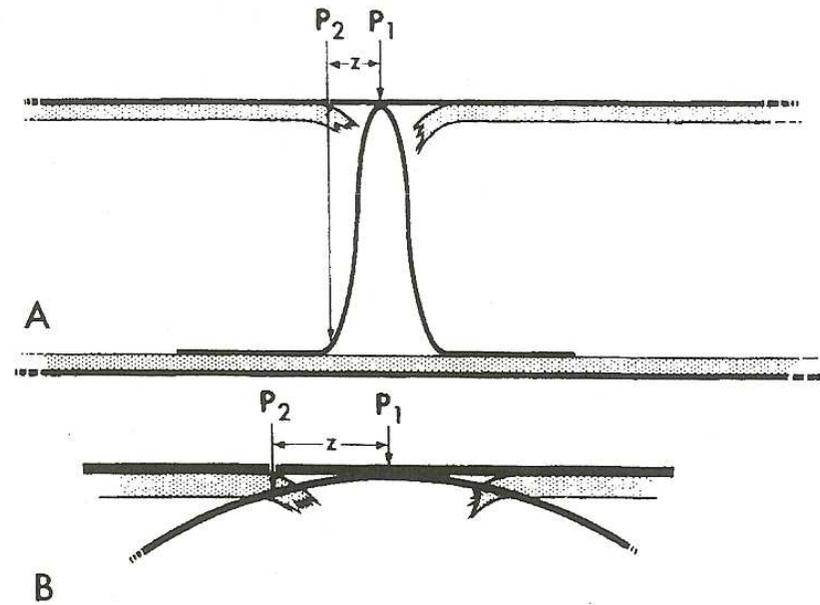
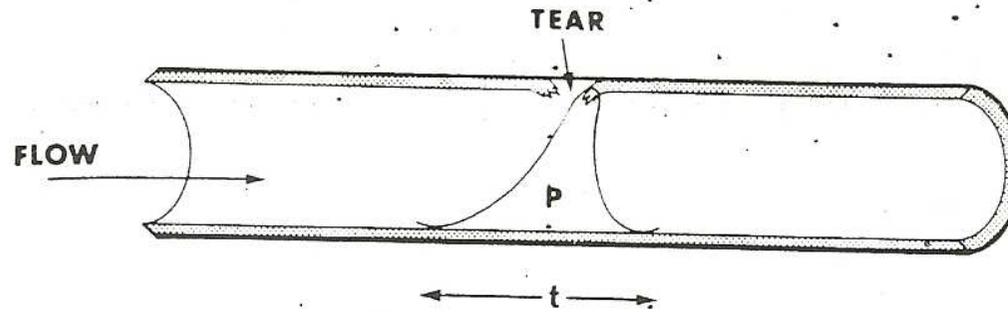
To Hal Stone  
Esteemed colleague  
and my best friend.  
Bill Wheat

Hal  
2

# HEMODYNAMIC FACTORS

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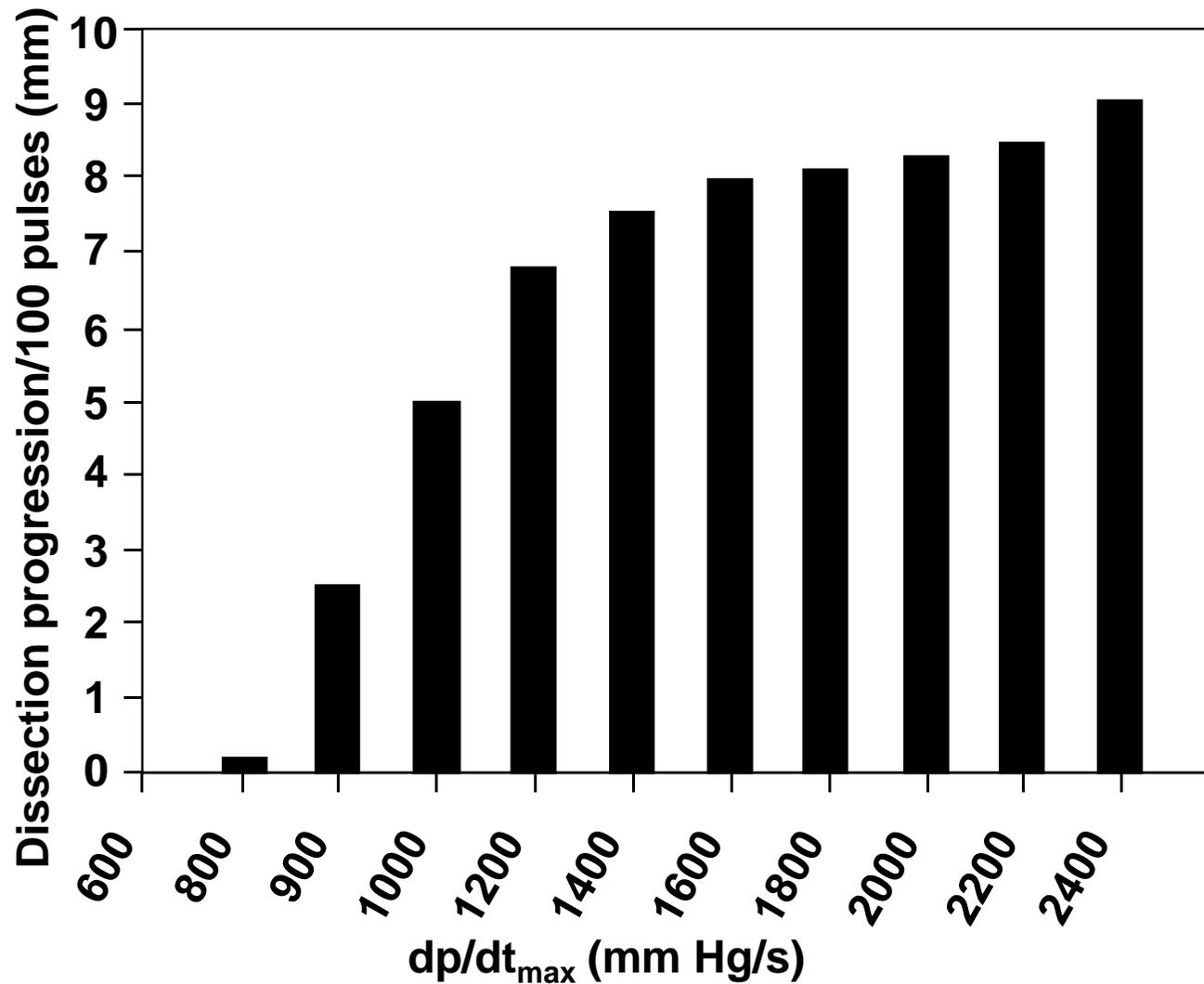




***Experiments carried out on Tygon tubing lined with rubber cement***

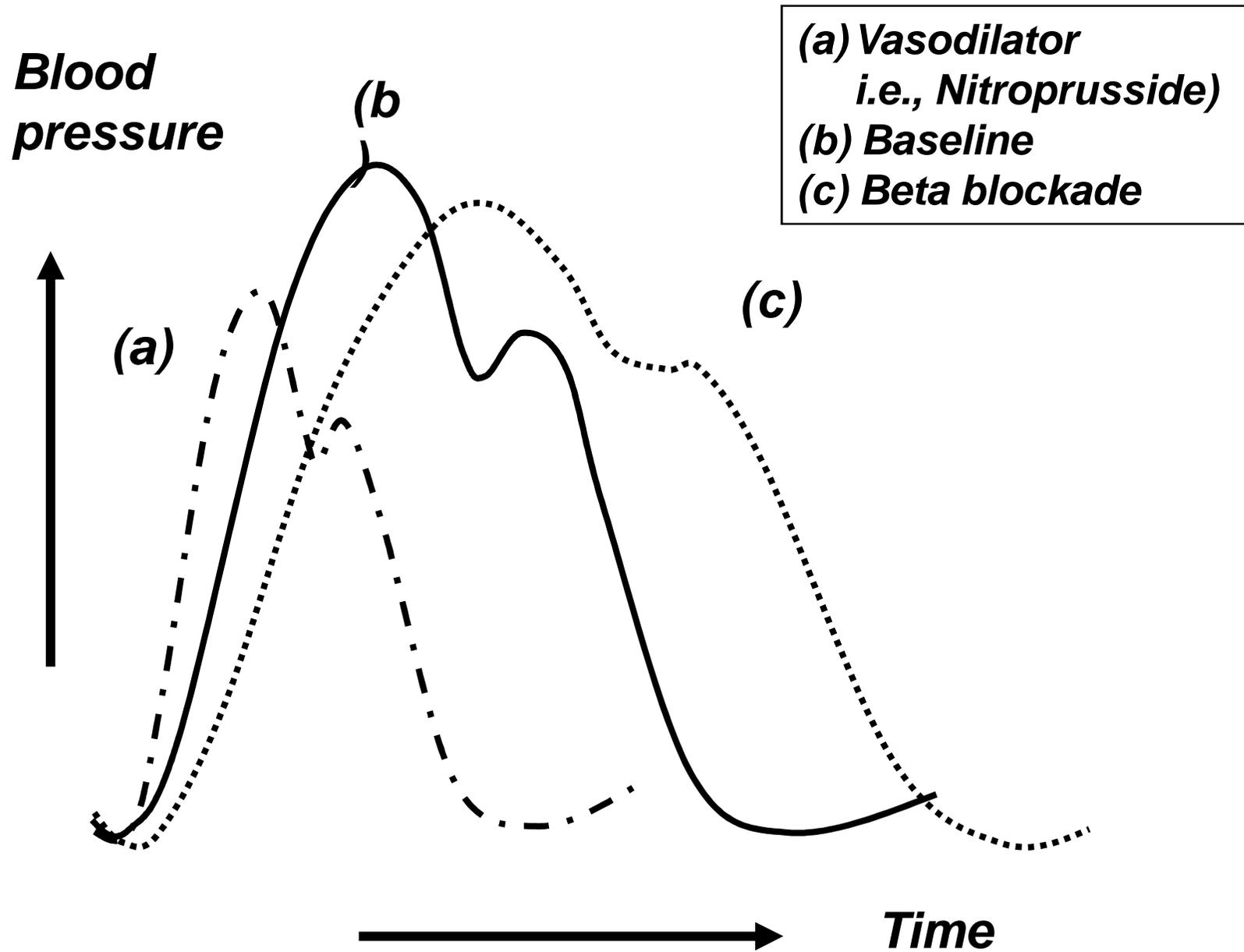
# ***ENHANCED PROGRESSION OF AORTIC DISSECTION IN RELATION TO INCREASING LEVELS OF $dp/dt_{max}$***

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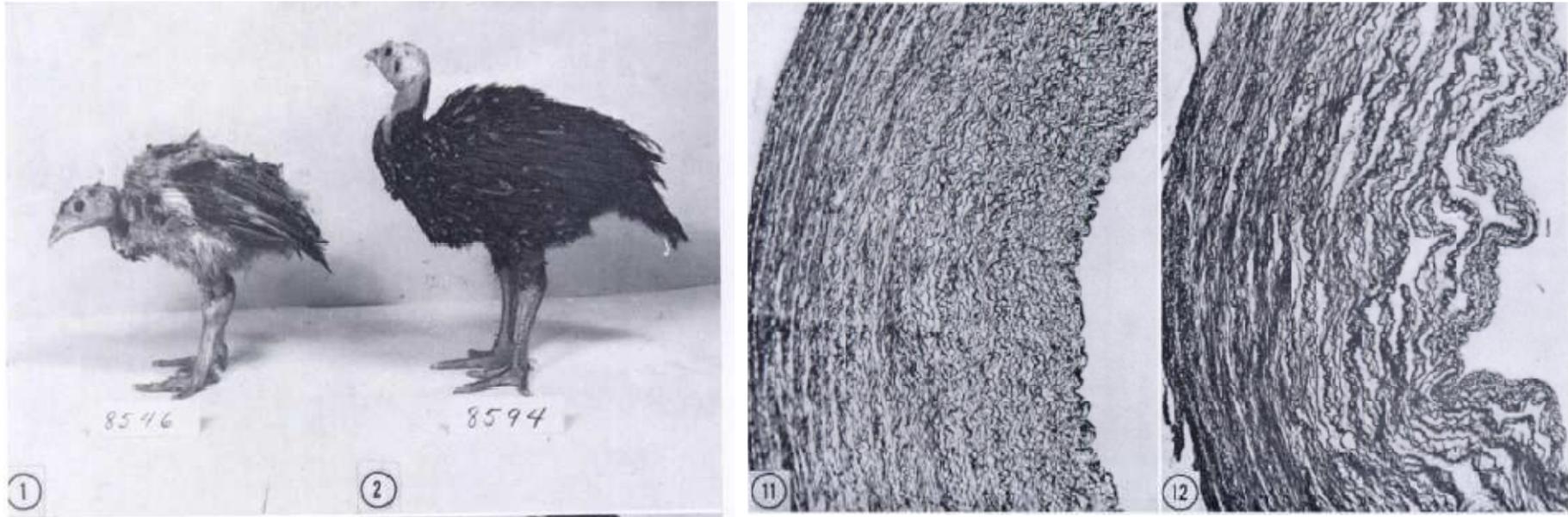


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**EK Prokop, RF Palmer, MW Wheat. Circ Res 1970; 27:121**



Turkey quite prone to aortic dissection, especially with iatrogenic induction of lathyrism (excess peas in diet).



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Savage et al. Comparison of Copper Deficiency and Lathyrism in Turkey Poults.  
*J Nutrition*, 88(1): 15, 1966.

Name	Category	Loading Dose	Maintenance Dose	Adverse Effects	Caution
Sodium Nitroprusside	Vasodialator	.3 mcg/kg/min to 3mcg/kg/min, max limit for adult is 10mcg/kg/min for 10 minutes	1-3 mcg/kg/min	Nausea, Vomitting, agitation, muscle twitching, sweating, cutis anserina, thyrocytannate & cyanide toxicity, tachycardia	In patients with hepatic or renal dysfunction
Propranolol	Beta-Blocker	1-3 mg (given at 1mg intervals over 1 minute). Can be repeated in not less than every 4 hours.	1-3mg every 4 hours	Hypotension, nausea, dizziness, cold extremities, reversible hair loss, bradycardia,	In patients with bradycardia or history of CHF and bronchospasm. Max initial dose should not exceed 0.15mg/hr(Approx 10mg)
Esmolol	Beta-Blocker	500 mcg/kg bolus	Continuous 50 mcg/kg/min up to 200 microgm/kg/min	Hypotension, nausea, dizziness, bronchospasm, dyspepsia, constipation, increases digoxin level,	In patients with CHF, asthma, on concomitant CCB therapy
Labetalol	Alpha & Beta Blocker	20 mg over 2 mins then 40-80mg every 10-15 mins(max 300)	continuous IV at 2 mg/min & titrate upto 5-10mg/min	Vomiting, nausea, scalp tingling, burning in throat, dizziness, heart block, orthostatic hypotension	In patients with lung disease, concomitant CCB therapy,
Diltiazem	CCB	0.25 mg/kg IV bolus (upto 25 mg)	5-10 mg/hour by continuous infusion	Peripheral edema, nausea, vomiting	In patients on concomitant beta blockers
Enalapril	Vasodialator ACE Inhibiter	0.625-1.25 mg Bolus	0.625-5 mg every 6 hours	Precipitates fall in BP in high renin states, variable response, renal failure	In patients with high possibility of MI, renal dysfunction
Fenoldopam	Dopamine D1 receptor agonist	.03-0.1 mcg/kg/min initially	0.1-0.3 mcg/kg/min max. 1.6mcg/kg/min	Tachycardia, hypotension, headache, nausea, flushing, hypokalemia, elevation of IOP	In patients with Glaucoma

# Observations on Anti-impulse Rx

- Based on these historical studies, aggressive reduction in dp/dt, as well as blood pressure, have come to constitute the basis for medical therapy of acute aortic syndromes. These treatments, developed many decades ago, have continued to represent the standard of care—even in modern times.
- Propranolol confers the utmost protection from aortic rupture, based on both its blood pressure and dp/dt effects.
- Hydralazine, a direct vasodilator, as sole therapy, actually increased the risk of aortic rupture, by virtue of a reflex increase in dp/dt.
- The initial therapeutic goal of anti-impulse therapy is elimination of pain and reduction of systolic blood pressure to 100 to 120 mmHg—or the lowest level compatible with adequate vital organ perfusion (brain, kidneys, heart).
- No direct data exists supporting the use of calcium channel antagonists for the management of acute aortic dissection. They are used when  $\beta$ -blockers are contraindicated.

<b>Situations in which medical therapy may be appropriate for acute Type A aortic dissection</b>
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1. During work-up and pre-OR care of patients with suspected Type A dissection
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2. Presentation beyond 48-72 hours after onset of dissection pain (operation may be performed urgently rather than emergently—next daytime slot)
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3. General comorbidities (age, malignancy, etc.) that render cardiac surgery inappropriate
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4. Realized (completed) acute stroke on the basis of the Type A dissection
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5. Prior aortic valve replacement (in past, before acute Type A dissection) (perhaps also CABG)
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6. Permanent medical rx as alternative to surgery in selected patients (controversial)
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**Situations in which medical therapy may be appropriate for acute Type A aortic dissection**

- 1. During work-up and pre-OR care of patients with suspected Type A dissection.**

	This phase of intensive medical management is essential to prevent exacerbation or rupture of the dissection before the patient is placed on CPB for aortic replacement.	

<b>Situations in which medical therapy may be appropriate for acute Type A aortic dissection</b>
<b>2. Presentation beyond 48-72 hours after onset of dissection pain (operation may be performed urgently rather than emergently—next daytime slot)</b>

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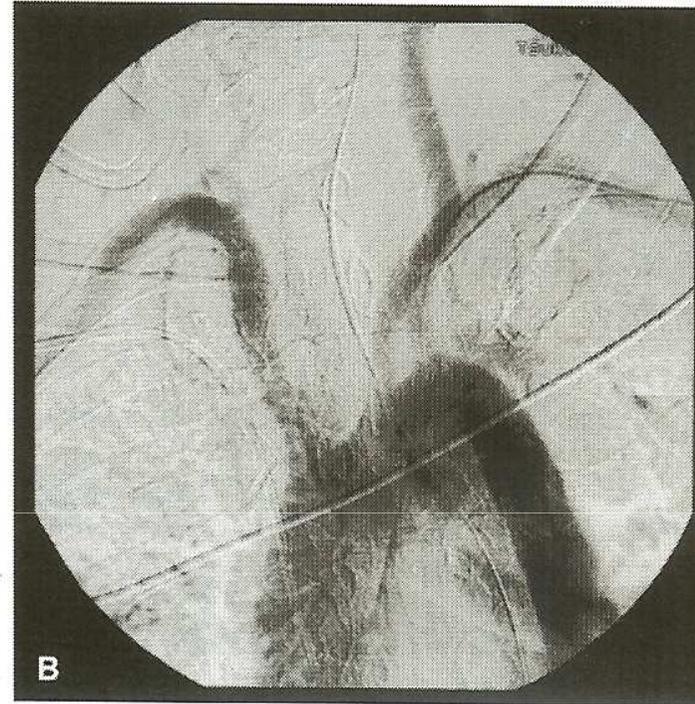
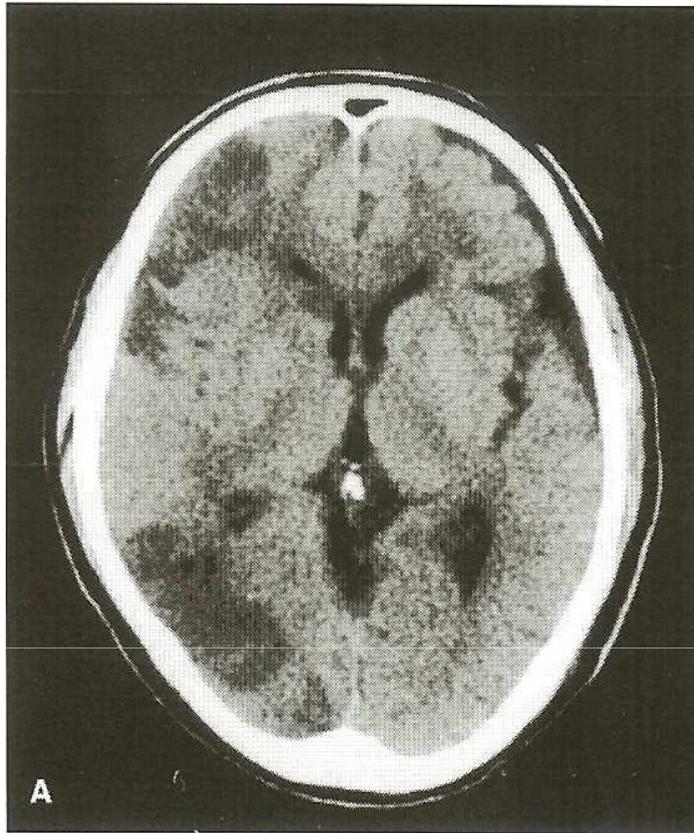
- Patients presenting more than 48-72 hours after onset of dissection pain can be operated at the next semi-elective opportunity.

<b>Situations in which medical therapy may be appropriate for acute Type A aortic dissection</b>
<b>3. General comorbidities (age, malignancy, etc.) that render cardiac surgery inappropriate</b>

## Impact of age on outcome of acute Type A dissection repair

- Mortality in pts 80 to 84 yo: 45%
- Mortality in pts > 85 yo: 50%

<b>Situations in which medical therapy may be appropriate for acute Type A aortic dissection</b>
<b>4. Realized (completed) acute stroke on the basis of the Type A dissection</b>



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Crawford ES et al. Ann Surg 1988;208:254.

Piccione W Jr et al. J Thorac Cardiovasc Surg 1995;109:807-8.

Deeb GM et al. Ann Thorac Surg 1997;64:1669-75.

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Estrera AL et al. J Thorac Cardiovasc Surg 2006;132:1404-8.

**Situations in which medical therapy may be appropriate for acute Type A aortic dissection**

<b>5. Prior aortic valve replacement (in past, before acute Type A dissection)(perhaps also CABG)</b>

After prior AVR, Type A behaves more like Type B

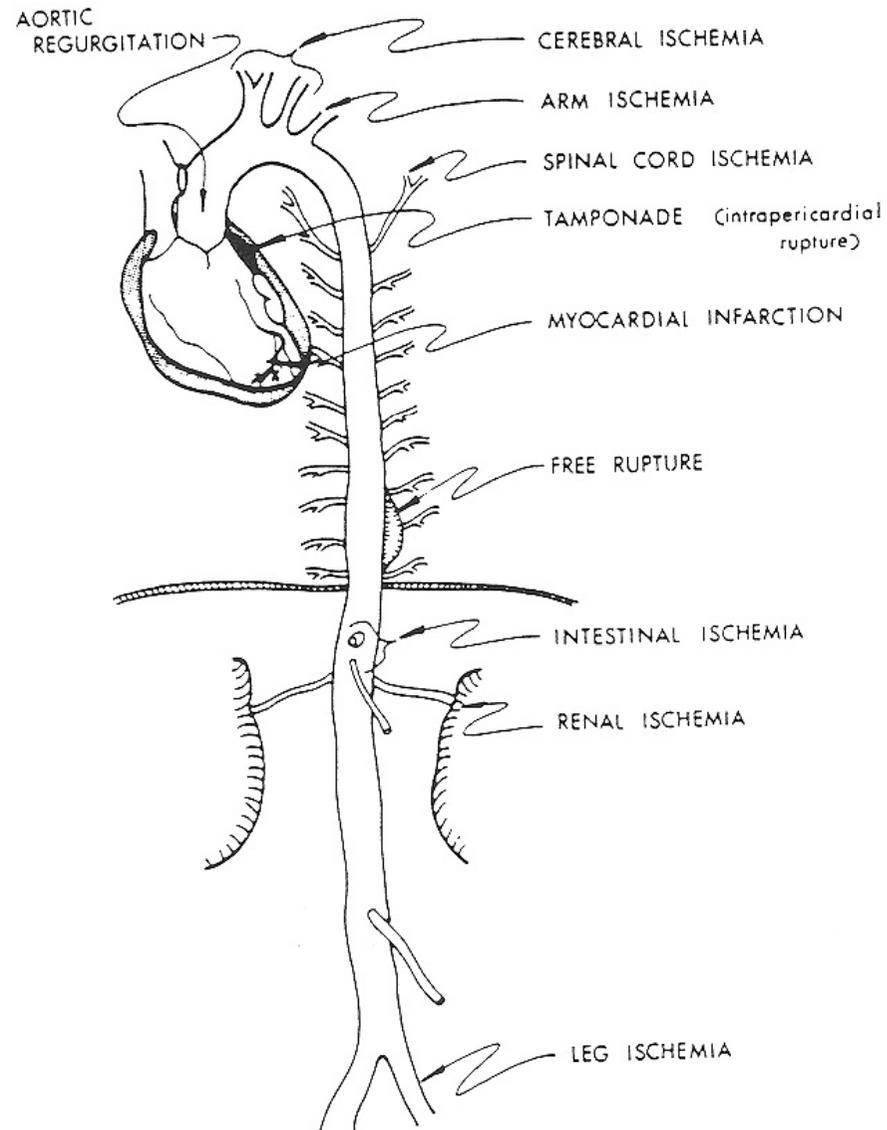


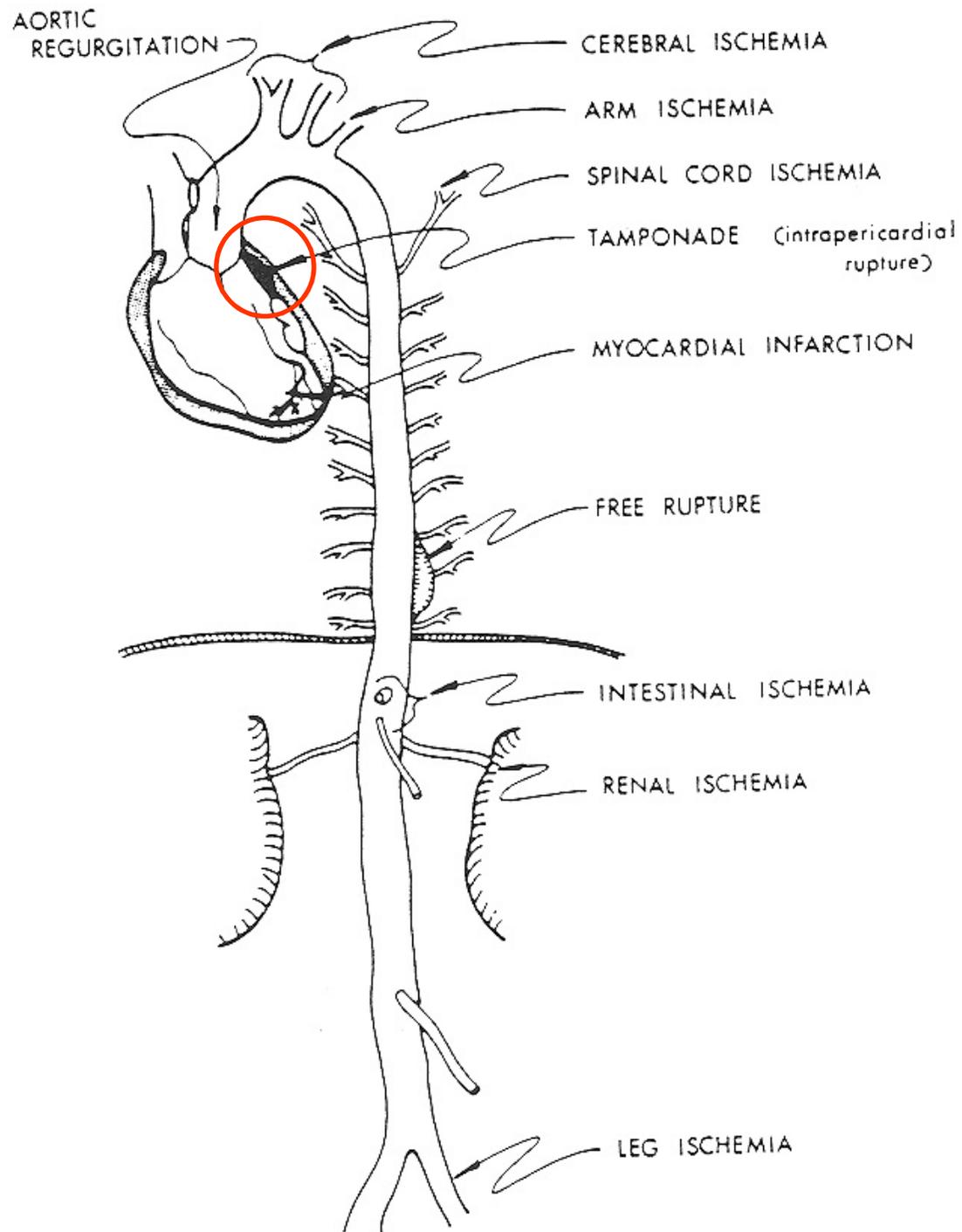
Type A

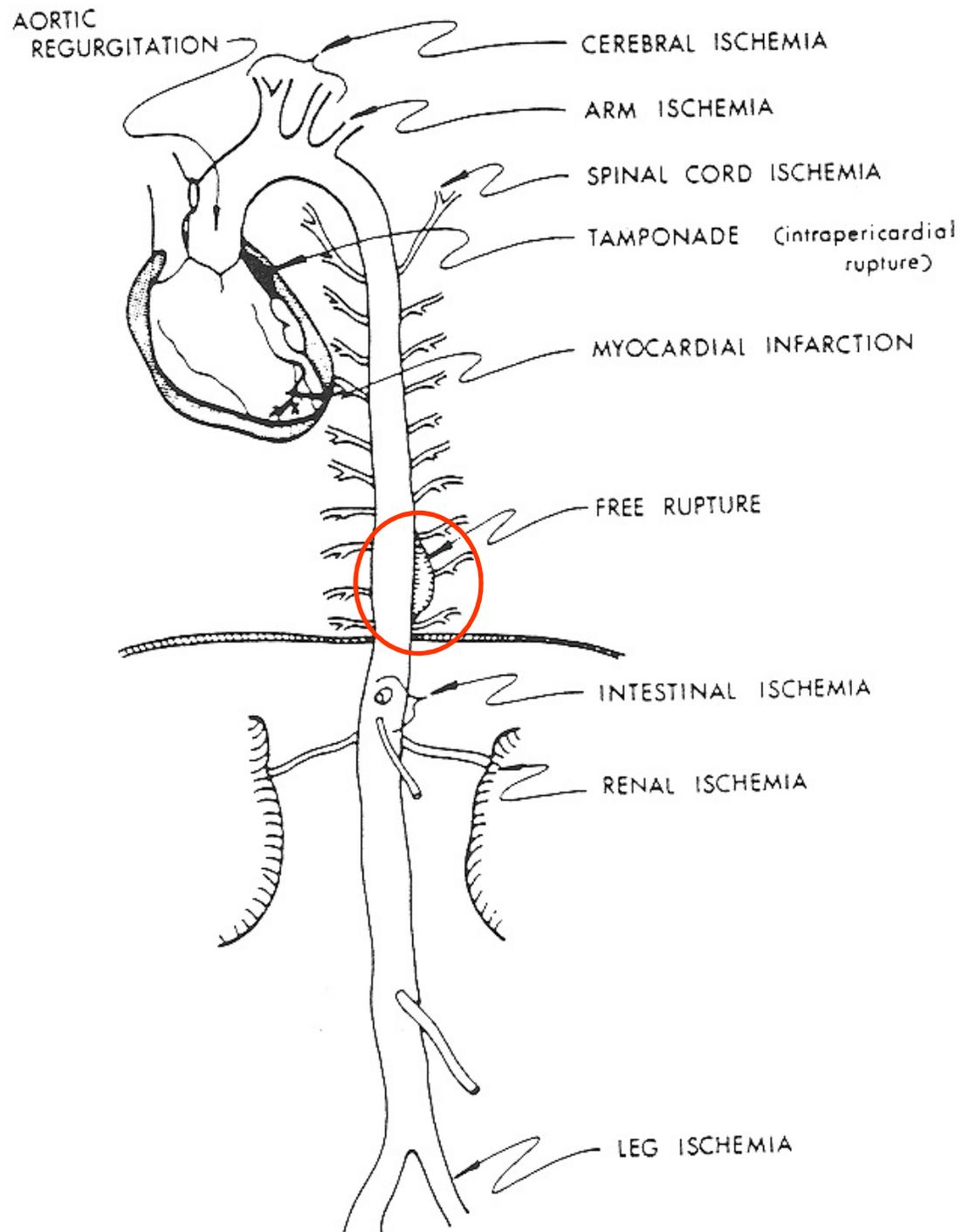


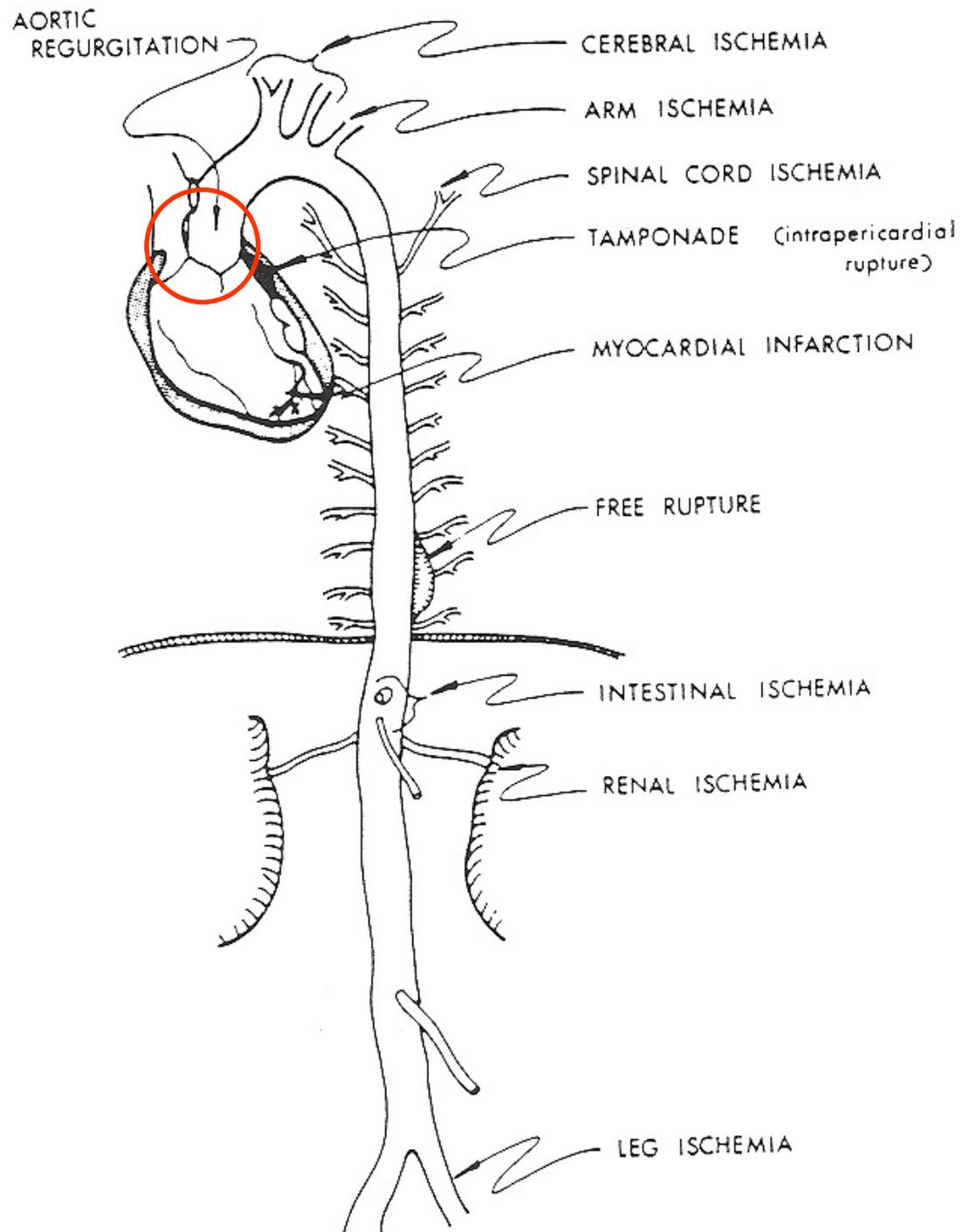
Type B

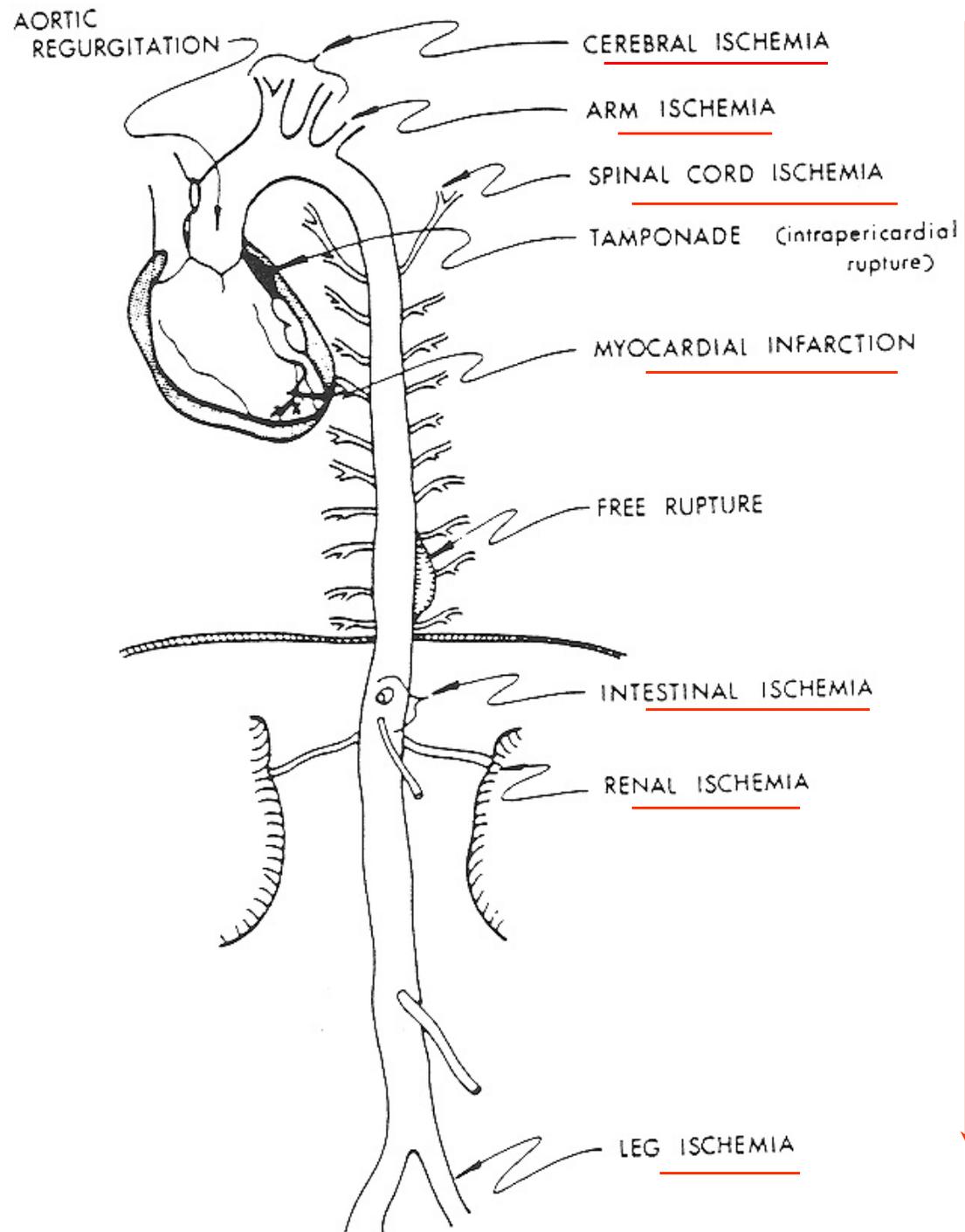
*Aortic dissection is most common lethal condition affecting the human aorta.*



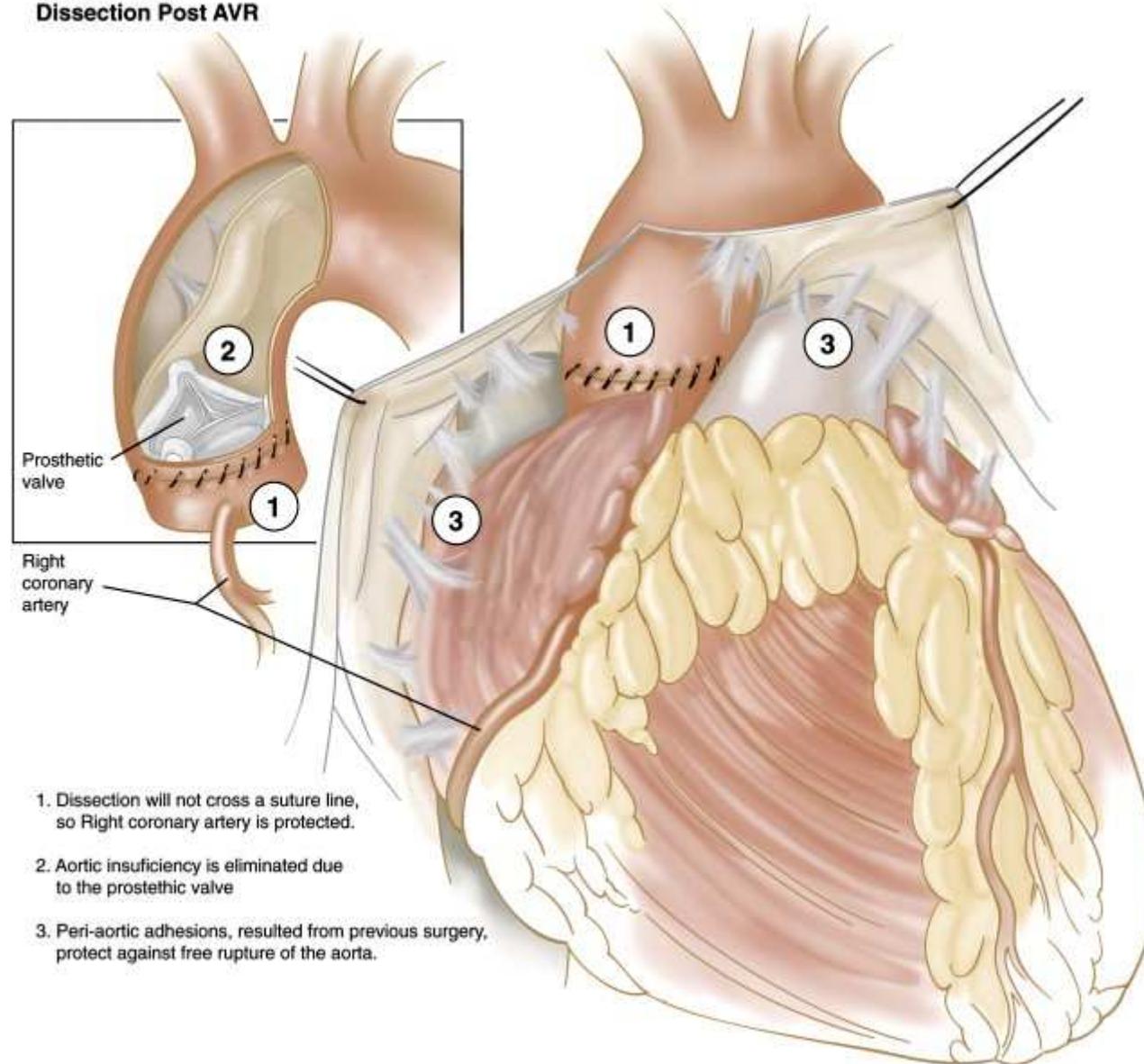








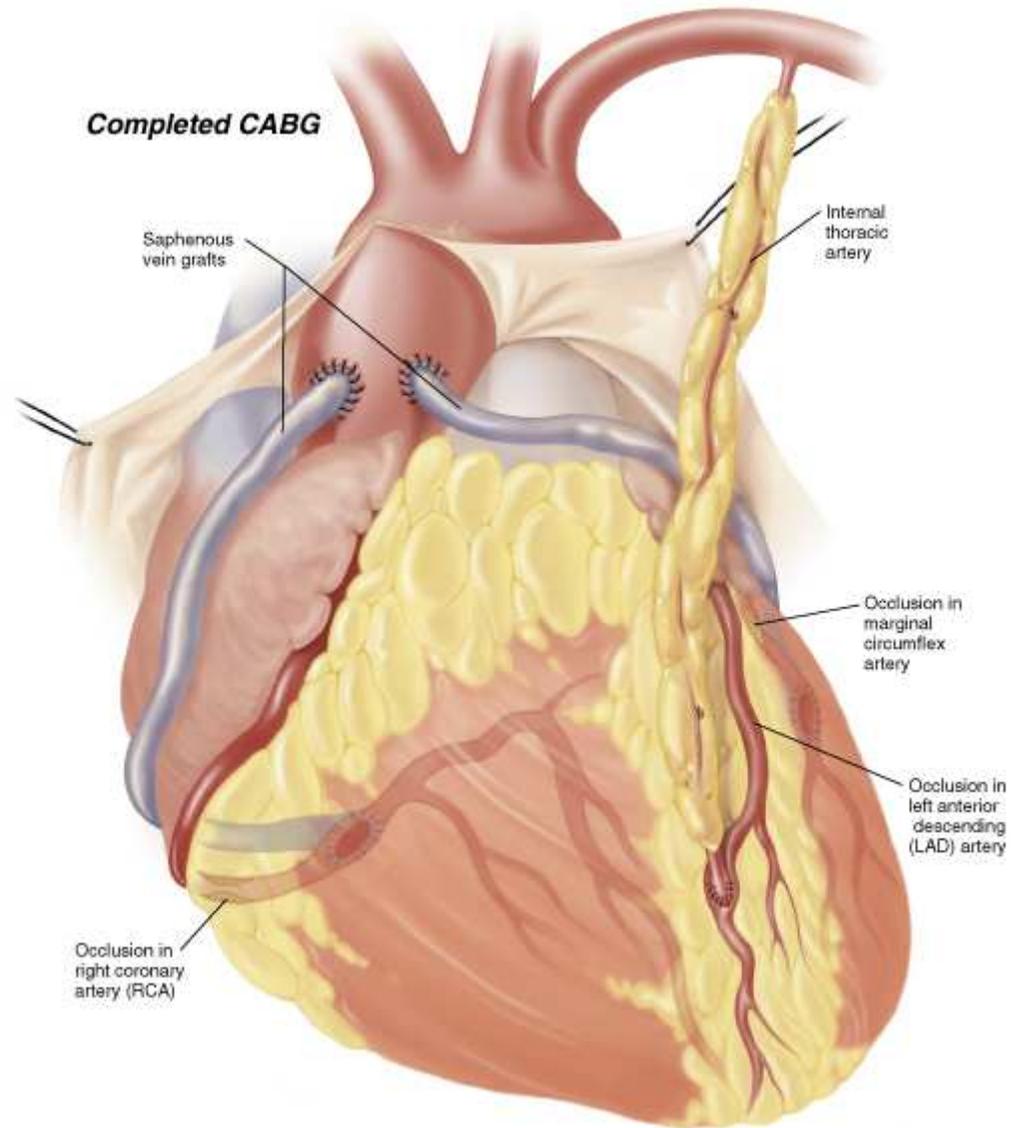
**Type A Aortic  
Dissection Post AVR**



Prosthetic valve

Right coronary artery

1. Dissection will not cross a suture line, so Right coronary artery is protected.
2. Aortic insufficiency is eliminated due to the prosthetic valve
3. Peri-aortic adhesions, resulted from previous surgery, protect against free rupture of the aorta.



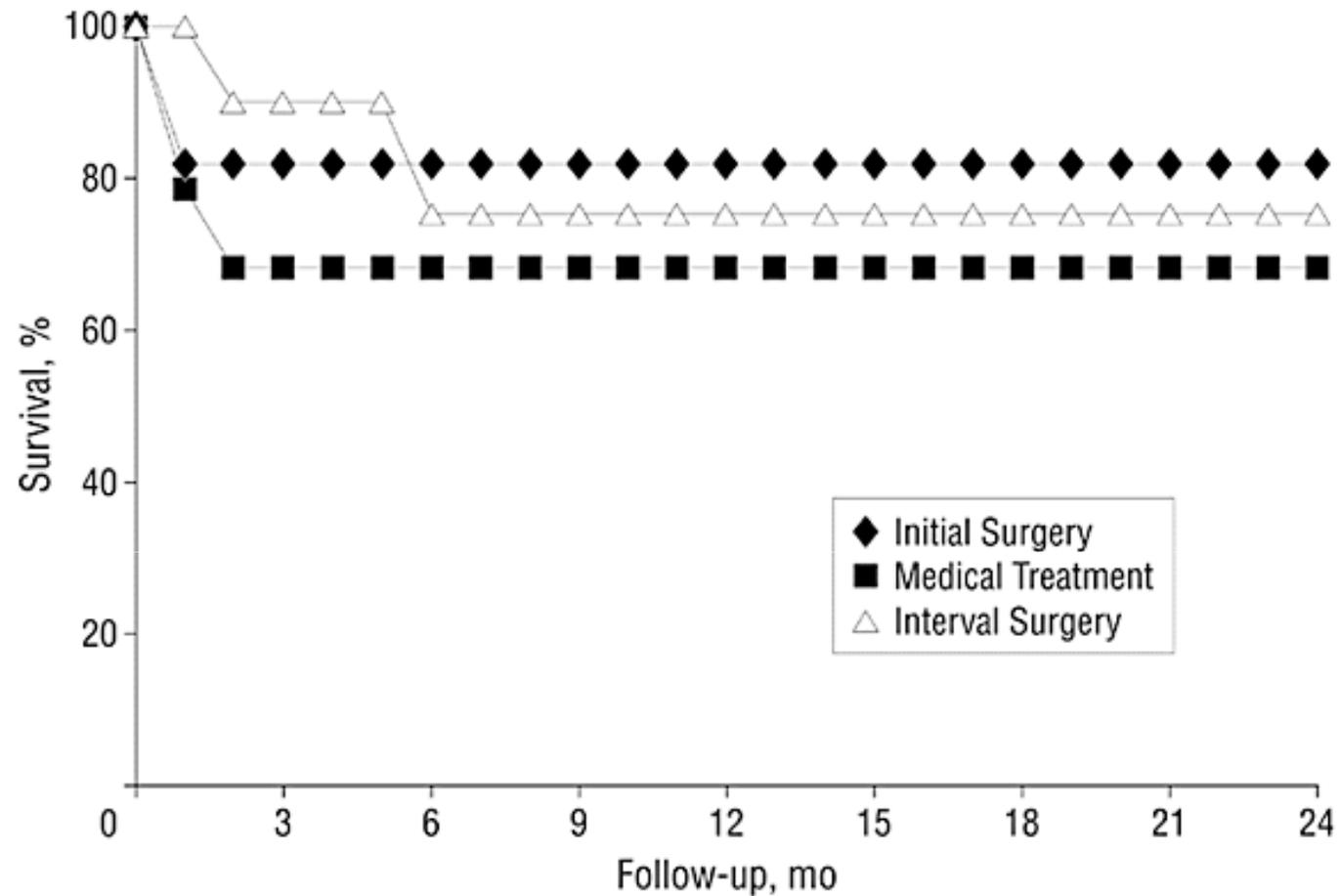
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Gillinov et al. J Thorac Cardiovasc Surg 1999;117:252-60.

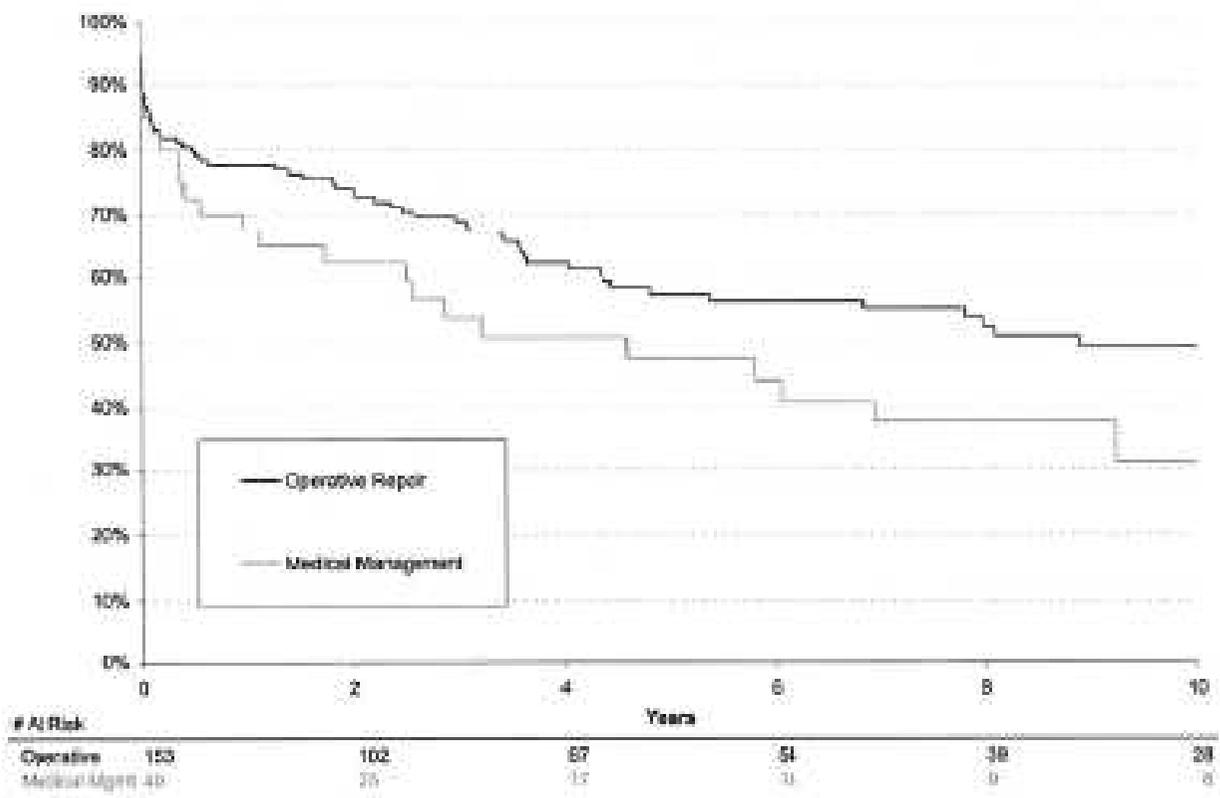
Myrmel T et al. Eur J Cardiothorac Surg 2004;25:236-42.

<b>Situations in which medical therapy may be appropriate for acute Type A aortic dissection</b>
<b>6. Permanent medical rx as alternative to surgery in selected patients (controversial)</b>

## Kaplan-Meier actuarial survival curve from date of initial presentation and treatment



Recent evidence that sole medical therapy in the present era can produce substantially higher survival rates than would ever have been expected in the past.



*Table 4. Subset Analysis of Reason for Delay or Avoidance of Surgery in Group A<sup>a</sup>*

Variable	Group A >48 hrs to Surgery (All Patients)		p Value
	Eventual Surgery n (%)	Medical Management (n %)	
Unknown	1 (1.9)	11 (28.2)	0.0002 <sup>b</sup>
Delay in diagnosis	27 (50.9)	7 (18.0)	0.0012 <sup>b</sup>
Overall medical condition	16 (29.4)	7 (18.0)	0.7374
Subacute dissection	6 (11.3)	2 (5.1)	0.2975
COPD	2 (3.8)	3 (7.7)	0.4126
ARF	0 (0.0)	1 (2.6)	0.2411
CHF	3 (5.7)	2 (5.1)	0.9114
CVA	1 (1.9)	3 (7.7)	0.1772
Patient refusal	4 (7.6)	2 (5.1)	0.5424
Other	10 (18.9)	4 (10.3)	0.2558

<sup>a</sup> Percentages may not sum to 100, as some patients had multiple reasons for delay. <sup>b</sup> Statistically significant at the  $p < 0.05$  level.

ARF = acute renal failure; CHF = congestive heart failure; COPD = chronic obstructive pulmonary disease; CVA = cerebrovascular accident.



- Change for a changing world—Maybe there is a role for Med Rx in Type A Aortic Dissection.