

1. Coronary Artery Disease

Coronary Artery Disease

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2. Determinants of Myocardial O₂ Consumption

Determinants of Myocardial O₂ Consumption

- Ventricular wall stress

- Heart Rate $\sigma = \text{Pressure} \times \text{Radius} / \text{wall thickness}$

- Contractility

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3. Coronary Artery Perfusion

Coronary Artery Perfusion

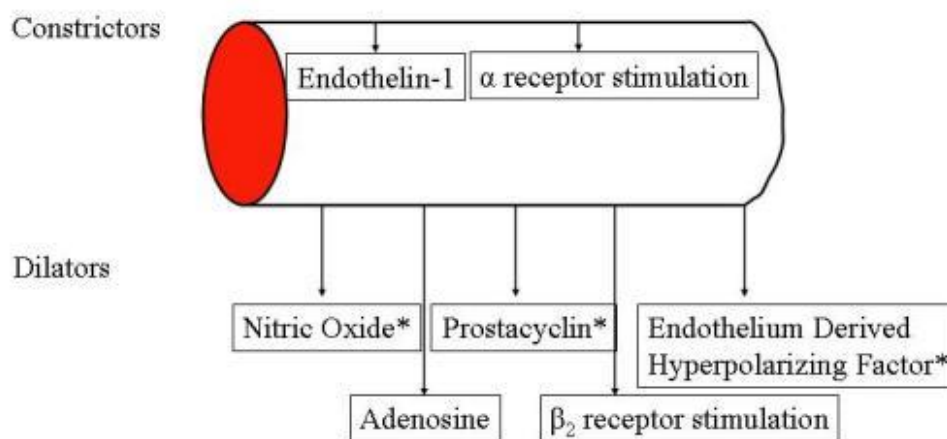
$$\text{Coronary Blood Flow} \propto \frac{\text{Perfusion Pressure (diastolic)}}{\text{Coronary Vascular Resistance}}$$

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4. Intrinsic Vasodilators

Intrinsic Vasodilators

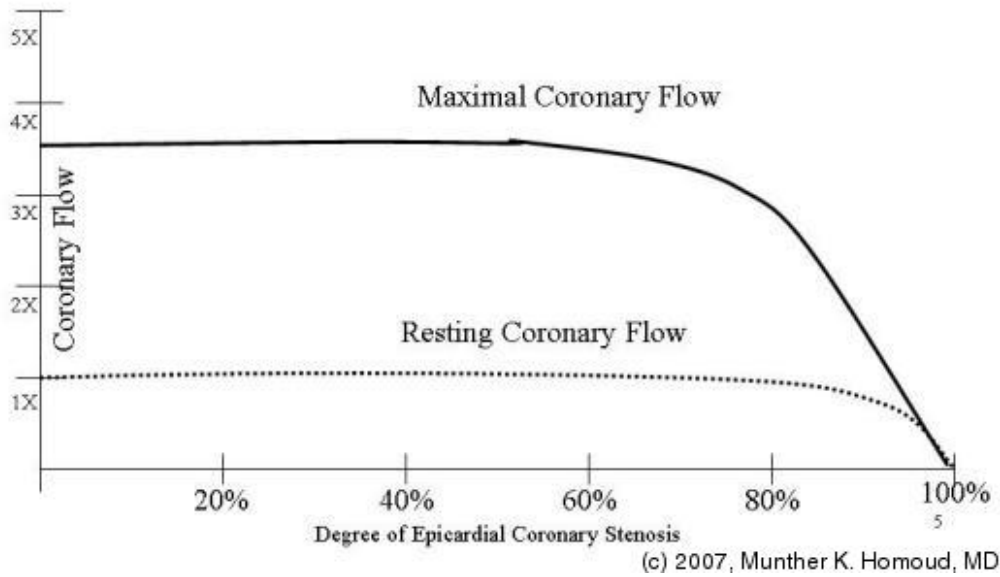


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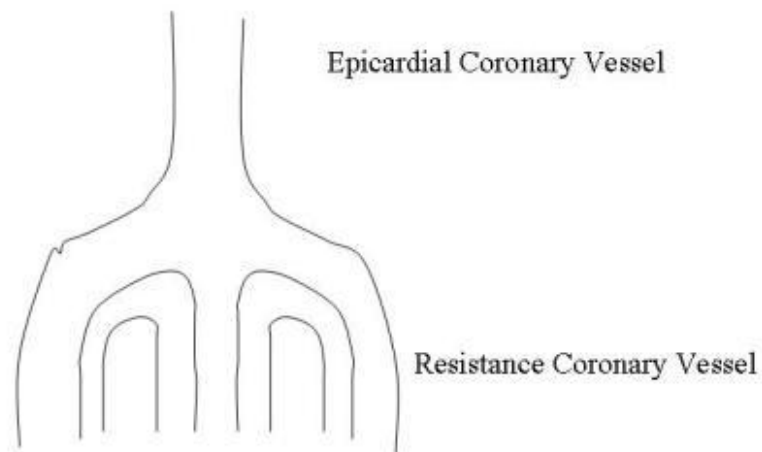
5. The Relationship Between the Degree of Stenosis and Coronary...

The Relationship Between the Degree of Stenosis and Coronary Flow



6. Coronary Reserve

Coronary Reserve

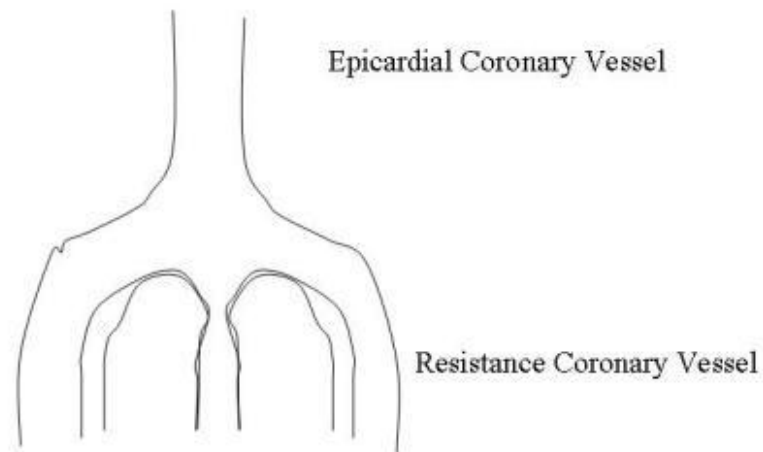


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7. Coronary Reserve (Coronary Stenosis)

Coronary Reserve (Coronary Stenosis)



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8. Coronary Artery Disease

Coronary Artery Disease

- **Magnitude of the problem**
 - > 13 million in the US with CAD
 - 8 million with h/o MI
 - Lifetime risk of developing CAD in males over 40 yrs. 50%
 - In women over 40 yrs 32%
 - Economic cost in the US in 2003 \$133 billion

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9. Risk Factors for Atherosclerotic Coronary Artery Disease

Risk Factors for Atherosclerotic Coronary Artery Disease

1. Dyslipidemias; particularly high low density cholesterol (LDL-C) and low high density cholesterol (HDL-C)
2. Hypertension
3. Diabetes mellitus
4. Smoking
5. Family history of premature coronary artery disease (CAD); First degree male relatives < 55 years or females < 65 years.
6. Obesity and lack of exercise
7. Male sex and advanced age
8. Others; homocysteinemia, C reactive protein (CRP), Lipoprotein a (Lpa), infection (? *Chlamydia pneumoniae*)

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10. Consequences of Atherosclerosis

Consequences of Atherosclerosis

1. Calcification, rigidity and increased fragility
2. Rupture of the fibrous cap exposing thrombogenic material to circulating platelets and coagulants leading to thrombosis. This would result in vessel occlusion and distal myocardial infarction (necrosis). **Unstable angina and myocardial infarction**
3. Plaque hemorrhage further narrowing the vessel lumen and occluding distal flow
4. Distal embolization of fragmented atheromatous plaque
5. Weakening of the vessel wall, wall expansion and dilatation (**aneurysm**)

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11. Coronary Artery Disease

Coronary Artery Disease

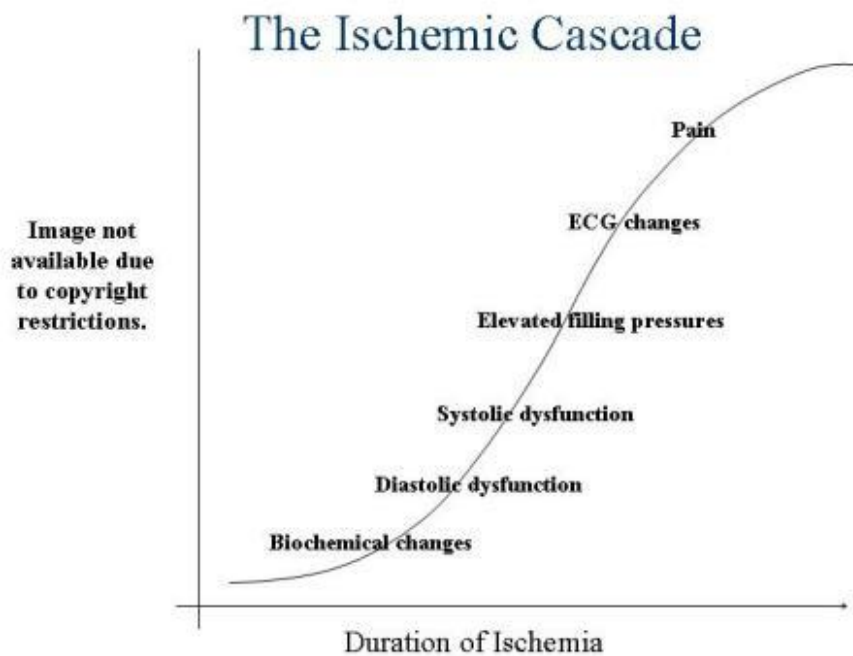
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See N Eng J Med 2004;351(27)

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12. The Ischemic Cascade



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13. Coronary Artery Disease

Coronary Artery Disease

- Chest pain (*angina pectoris*)
 - Relationship to exertion (stable vs. acute coronary)
 - Radiation
 - Association with nausea, diaphoresis (MI)
- Shortness of breath (*dyspnea*)
 - Exertional
 - Resting
 - Orthopnea (CHF)
 - Paroxysmal nocturnal dyspnea (CHF)

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14. Coronary Artery Disease

Coronary Artery Disease

Determinants of size of myocardial ischemia

- Location and size of involved coronary vessel
- Ischemic preconditioning
- Collateral circulation

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15. Coronary Artery Disease

Coronary Artery Disease

Consequences of Reduced Blood Flow to the Myocardium

- Hibernating Myocardium
- Stunned Myocardium
- Ischemic Preconditioning
- Collateral Circulation
- Remodeling

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16. Expansion, Aneurysm and Remodeling

Expansion, Aneurysm and Remodeling

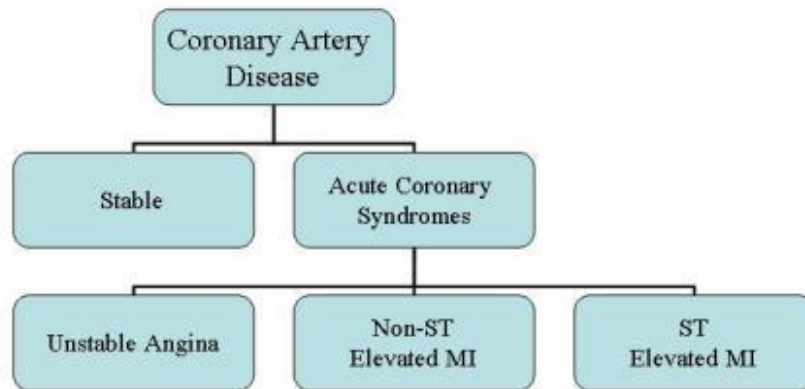
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17. Coronary Artery Disease Syndromes

Coronary Artery Disease Syndromes



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18. Acute Coronary Syndrome

Acute Coronary Syndrome

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19. Serial Cardiac Enzyme Elevation after Myocardial Infarction...

Serial Cardiac Enzyme Elevation after Myocardial Infarction

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(See Wu AH, Apple FS, Gibler WB, et al: National Academy of Clinical
Biochemistry Standards of Laboratory Practice: Recommendations
for the use of cardiac markers in coronary artery diseases. Clin Chem 45:1104-
1121, 1999)

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20. Characteristic Electrocardiographic Changes

Characteristic Electrocardiographic Changes

- Characteristic electrocardiographic changes associated with acute myocardial infarction

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21. Clinical Consequences of Myocardial Infarction

Clinical Consequences of Myocardial Infarction

- **Short Term**
 - Cardiac Arrest
 - Congestive Heart Failure
 - Cardiogenic Shock
 - Ruptured Papillary Muscle
 - Ruptured Interventricular Septum
 - Pseudoaneurysm
 - Rupture
 - Aneurysm

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22. Clinical Consequences of Myocardial Infarction

Clinical Consequences of Myocardial Infarction

- **Long term**
 - Congestive heart failure. Coronary artery disease is the commonest cause of congestive heart failure in the Western economies
 - Sudden cardiac death due to ventricular arrhythmias

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23. Management of Myocardial Infarction

Management of Myocardial Infarction

- Acute Management
 - Aspirin
 - Oxygen
 - Morphine or meperidine (*narcotic analgesics*)
 - Reperfusion
 - Fibrinolysis
 - Percutaneous catheter intervention
 - Beta blocker
 - Afterload reduction (*angiotensin converting enzyme inhibitor*)
 - Anticoagulation (*heparin*)
 - Statin

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24. Coronary Artery Disease

Coronary Artery Disease

Determinants of Poor Prognosis in Patients with Coronary Artery Disease

- Left ventricular dysfunction
- Extent of coronary artery disease
- Arrhythmias
- Advanced age
- History of congestive heart failure
- Diabetes mellitus
- Accelerating symptoms
- Resting ECG changes

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Coronary Artery Disease

Coronary Artery Disease

Determinants of Poor Prognosis in Patients with a Myocardial Infarction

- Advanced age
- Systolic blood pressure < 100 mmHg
- Heart rate > 100 bpm
- Heart failure

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