Angina and Myocardial Infarction: Comprehensive Overview

1 Definition

Angina Pectoris: A clinical syndrome characterized by chest pain or discomfort due to transient myocardial ischemia, typically caused by reduced blood flow to the heart muscle without infarction. It is often triggered by exertion or stress and relieved by rest or nitroglycerin.

Myocardial Infarction (MI): An acute condition involving necrosis of the heart muscle due to prolonged ischemia, usually resulting from occlusion of a coronary artery. It is commonly known as a heart attack and is a medical emergency.

2 Etiopathogenesis

Both angina and MI are primarily caused by coronary artery disease (CAD), with the following contributing factors:

- **Angina**:
  - **Atherosclerosis**: Plaque buildup in coronary arteries reduces blood flow, causing ischemia during increased myocardial oxygen demand (e.g., exertion).
  - **C**oronary Artery Spasm: Transient vasoconstriction (e.g., Prinzmetals angina).
  - **Other Causes**: Aortic stenosis, hypertrophic cardiomyopathy, or severe anemia.
  - **Risk Factors**: Hypertension, hyperlipidemia, diabetes, smoking, obesity, and family history of CAD.
- **Myocardial Infarction**:
  - **Atherosclerotic Plaque Rupture**: Leads to thrombus formation, causing complete or near-complete coronary artery occlusion.
  - **-**Non-Atherosclerotic Causes: Coronary embolism, vasospasm, or dissection.
  - **Risk Factors**: Similar to angina, with additional triggers like acute stress or cocaine use.

3 Clinical Manifestations

- **Angina**:

  - Chest pain or discomfort (pressure, squeezing, or heaviness), often retrosternal.
  - Pain may radiate to the arms, neck, jaw, or back.
  - Associated symptoms: Dyspnea, nausea, sweating, or fatigue.
  - Types: Stable (predictable, exertion-related), unstable (new-onset, worsening, or at rest), or variant (Prinzmetals, due to spasm).
- **Myocardial Infarction**:
  - Severe, prolonged chest pain (>20 minutes), not relieved by rest or nitroglycerin.
  - Radiation to arms, neck, or jaw.
  - Accompanying symptoms: Profuse sweating, nausea, vomiting, dyspnea, palpitations, or syncope.
  - Complications: Arrhythmias, heart failure, cardiogenic shock, or sudden cardiac death.

4 Pathophysiology

The pathophysiology of angina and MI involves reduced myocardial oxygen supply relative to demand, leading to ischemia (angina) or infarction (MI). The flowchart below illustrates the key mechanisms.

5 Symptoms

- **Angina**:
  - Retrosternal chest pain or discomfort, lasting 2–10 minutes.
  - Triggered by exertion, stress, or cold; relieved by rest or nitroglycerin.
  - Associated symptoms: Shortness of breath, sweating, or nausea.
- **Myocardial Infarction**:
  - Intense, prolonged chest pain (>20 minutes), unrelieved by rest.
  - Severe dyspnea, diaphoresis, nausea, or vomiting.
  - Feeling of impending doom or anxiety.
  - Atypical presentations (e.g., epigastric pain, fatigue) in elderly, women, or diabetics.

6 Diagnosis

- **Angina**:
  - **History and Physical Exam**: Assess chest pain characteristics and risk factors.

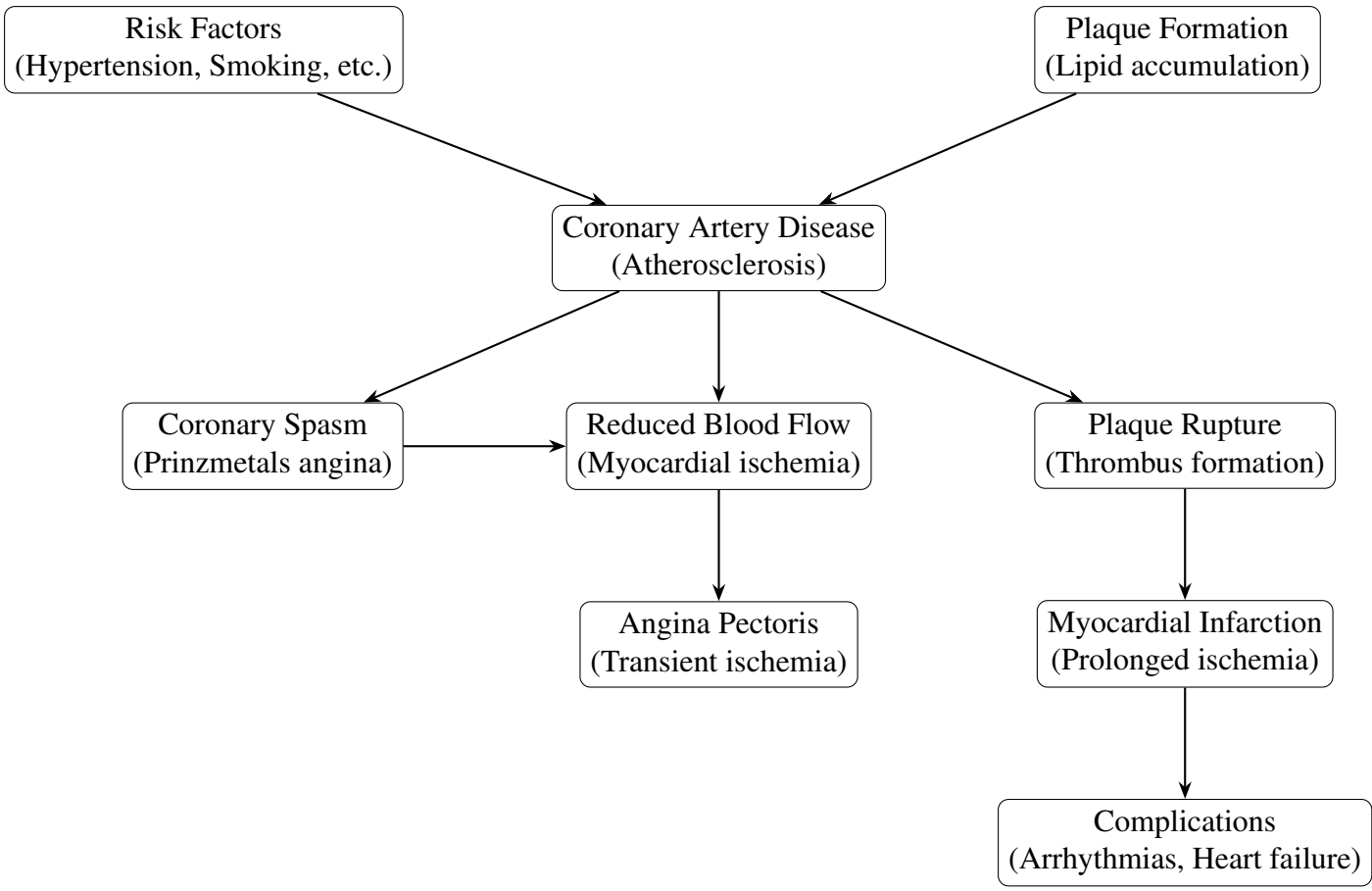

Figure 1: Pathophysiology of Angina and Myocardial Infarction

  - **Electrocardiogram (ECG)**: May show ST-segment depression or T-wave inversion during pain.
  - **Stress Testing**: Exercise or pharmacological stress test to provoke ischemia.
  - **Imaging**: Coronary angiography or CT angiography to assess coronary arteries.
- **Myocardial Infarction**:
  - **ECG**: ST-segment elevation (STEMI), new Q waves, or T-wave changes.
  - **Cardiac Biomarkers**: Elevated troponin I or T, CK-MB.
  - **Imaging**: Echocardiography to assess wall motion abnormalities or coronary angiography for vessel occlusion.
  - **Clinical Criteria**: Chest pain, ECG changes, and biomarker elevation.

7 Nonpharmacological Management

- **Lifestyle Modifications**:
  - **Diet**: Adopt a heart-healthy diet (e.g., Mediterranean diet) low in saturated fats and sodium.

  - **Exercise**: Regular aerobic exercise (e.g., 150 minutes/week) for stable angina patients, under medical supervision.
  - **Weight Management**: Achieve and maintain a BMI of 18.5–24.9 kg/m^2.
  - **Smoking Cessation**: Complete cessation to reduce cardiovascular risk.
  - **Stress Management**: Techniques like meditation or counseling.
- **Cardiac Rehabilitation**: Structured programs for MI patients to improve cardiovascular health and reduce recurrence risk.
- **Education**: Patient education on recognizing symptoms and seeking timely care.

8 Pharmacological Management

- **Angina**:
  - **Nitroglycerin**: Sublingual (0.3–0.6 mg) for acute relief; long-acting nitrates for prevention.
  - **Beta-Blockers**: E.g., metoprolol (25–200 mg/day) to reduce myocardial oxygen demand.
  - **Calcium Channel Blockers**: E.g., amlodipine (5–10 mg/day) for vasospastic angina or when beta-blockers are contraindicated.
  - **Antiplatelet Therapy**: Aspirin (75–325 mg/day) to reduce thrombosis risk.
  - **Statins**: E.g., atorvastatin (20–80 mg/day) to manage hyperlipidemia.
- **Myocardial Infarction**:
  - **Acute Management (MONA)**:
    * Morphine (2–5 mg IV) for pain relief.
    * Oxygen (if SpO2 <90
    * Nitroglycerin (sublingual) for ongoing ischemia.
    * Aspirin (162–325 mg chewed).
  - **Antiplatelet Therapy**: Clopidogrel or ticagrelor with aspirin for dual antiplatelet therapy.
  - **Anticoagulants**: Heparin or enoxaparin to prevent further thrombosis.
  - **Beta-Blockers**: E.g., metoprolol to reduce myocardial demand.
  - **ACE Inhibitors**: E.g., lisinopril (2.5–10 mg/day) for left ventricular dysfunction.
  - **Statins**: High-dose atorvastatin (80 mg/day) for plaque stabilization.
  - **Reperfusion Therapy**: Percutaneous coronary intervention (PCI) or thrombolytics (e.g., alteplase) for STEMI.