Congestive Heart Failure: Comprehensive Overview

1 Definition

Congestive heart failure (CHF) is a chronic condition where the heart cannot pump blood effectively to meet the bodys needs, leading to congestion in the lungs, peripheral tissues, or both. It results from systolic dysfunction (impaired contractility) or diastolic dysfunction (impaired filling), classified as heart failure with reduced ejection fraction (HFrEF, EF <40%) or preserved ejection fraction (HFpEF, EF >50%).

2 Etiopathogenesis

CHF arises from conditions that impair cardiac function or increase cardiac workload:

- **Primary Causes**:
  - Coronary artery disease (CAD) and myocardial infarction (MI).
  - Hypertension (chronic pressure overload).
  - Cardiomyopathies (dilated, hypertrophic, or restrictive).
  - Valvular heart disease (e.g., aortic stenosis, mitral regurgitation).
- **Secondary Causes**:
  - Arrhythmias (e.g., atrial fibrillation).
  - Thyroid disorders (hyperthyroidism or hypothyroidism).
  - Anemia or high-output states.
  - Toxins (e.g., alcohol, chemotherapy).
- **Risk Factors**: Obesity, diabetes, smoking, sedentary lifestyle, and genetic predisposition.

3 Clinical Manifestations

CHF presents with signs and symptoms of fluid overload and reduced cardiac output:

- **Left-Sided Heart Failure**:
  - Pulmonary edema (fluid in lungs).

  - Orthopnea (dyspnea when lying flat).
  - Paroxysmal nocturnal dyspnea (PND).
  - Fatigue and exercise intolerance.
- **Right-Sided Heart Failure**:
  - Peripheral edema (ankles, legs).
  - Jugular vein distension (JVD).
  - Hepatomegaly and ascites.
- **Complications**: Arrhythmias, thromboembolism, renal dysfunction, and sudden cardiac death.

4 Pathophysiology

The pathophysiology of CHF involves a cascade of cardiac and systemic responses to an initial insult. The flowchart below illustrates the key mechanisms.

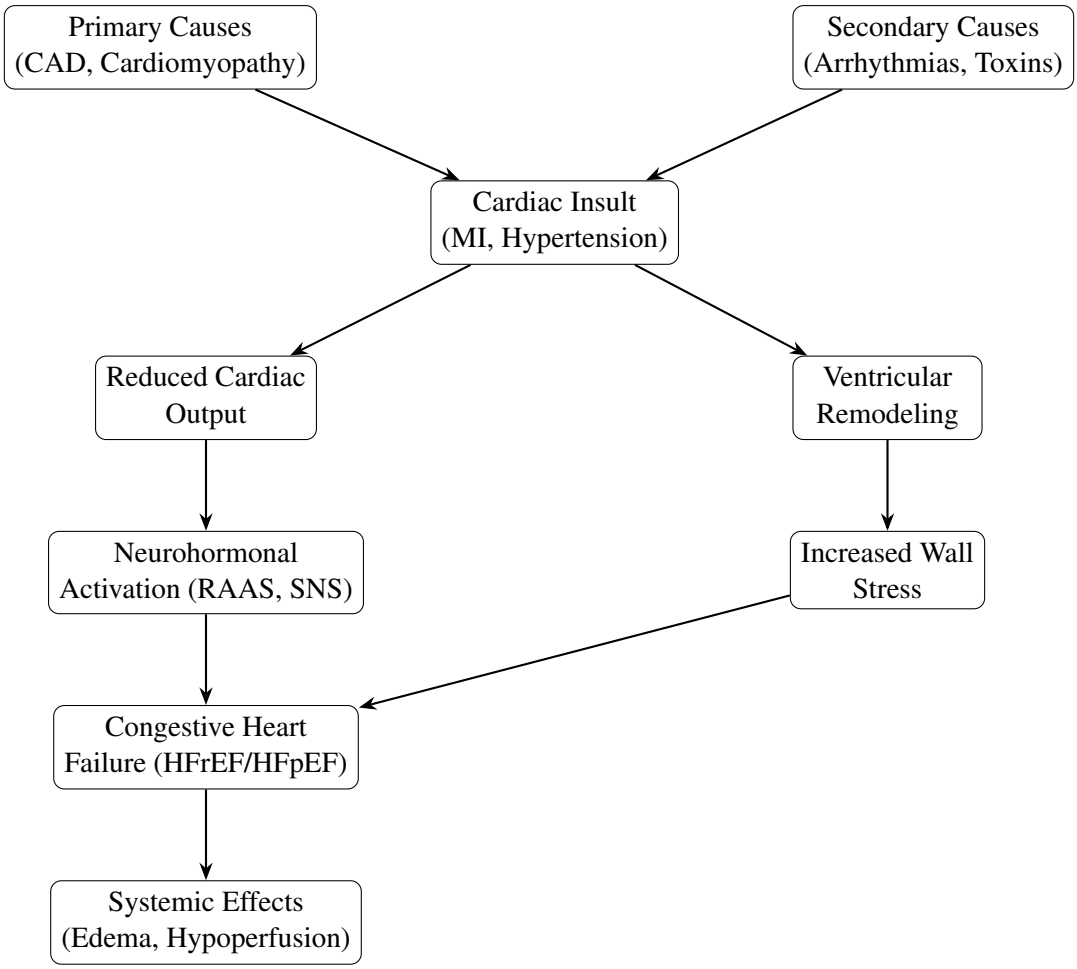

Figure 1: Pathophysiology of Congestive Heart Failure

5 Symptoms

- **Common Symptoms**:
  - Dyspnea (exertional or at rest).
  - Fatigue and weakness.
  - Swelling in legs, ankles, or abdomen.
  - Weight gain from fluid retention.
  - Cough (due to pulmonary congestion).
- **Severe Cases**:
  - Chest pain (if ischemic cause).
  - Confusion or reduced alertness (due to hypoperfusion).
  - Cyanosis or pallor.

6 Diagnosis

Diagnosis involves clinical evaluation, imaging, and laboratory tests:

- **History and Physical Exam**: Assess symptoms, risk factors, and signs (e.g., JVD, crackles in lungs, edema).
- **Echocardiography**: Measures ejection fraction (EF) to classify HFrEF (<40%) or HFpEF (>50%).
- **Blood Tests**: B-type natriuretic peptide (BNP) or NT-proBNP for heart failure severity; assess renal function, electrolytes, and thyroid function.
- **Electrocardiogram (ECG)**: Detects arrhythmias, ischemia, or hypertrophy.
- **Chest X-ray**: Identifies pulmonary edema or cardiomegaly.
- **Other Tests**: Stress testing or cardiac catheterization for ischemic etiology.

7 Nonpharmacological Management

Lifestyle and supportive measures are critical:

- **Dietary Changes**: Low-sodium diet (<2 g/day) to reduce fluid retention.
- **Fluid Restriction**: In severe cases, limit to 1.5–2 L/day.
- **Physical Activity**: Supervised cardiac rehabilitation with moderate exercise for stable patients.
- **Weight Management**: Monitor daily weight to detect fluid retention; aim for BMI 18.5–24.9 kg/m^2.
- **Smoking Cessation**: Eliminate smoking to reduce cardiovascular strain.

- **Device Therapy**: Implantable cardioverter-defibrillators (ICDs) or cardiac resynchronization therapy (CRT) for eligible patients.
- **Patient Education**: Teach symptom recognition and medication adherence.

8 Pharmacological Management

Medications aim to reduce symptoms, improve survival, and prevent progression:

- **ACE Inhibitors**: E.g., lisinopril (5–40 mg/day) to reduce afterload and improve EF.
- **Angiotensin Receptor-Neprilysin Inhibitors (ARNI)**: E.g., sacubitril/valsartan for HFrEF.
- **Beta-Blockers**: E.g., carvedilol (3.125–50 mg twice daily) to reduce heart rate and myocardial demand.
- **Diuretics**: E.g., furosemide (20–80 mg/day) for fluid overload.
- **Aldosterone Antagonists**: E.g., spironolactone (25–50 mg/day) for HFrEF and fluid retention.
- **SGLT2 Inhibitors**: E.g., dapagliflozin (10 mg/day) to improve outcomes in HFrEF and HFpEF.
- **Other Therapies**: Digoxin for symptomatic relief in advanced cases; anticoagulants for atrial fibrillation.

Treatment is tailored based on HF type, severity, and comorbidities.