Myocardial Infraction Disease: To Study of Pathology

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Abstract- Myocardial infarction (MI), commonly known as a heart attack, is the disease of the blood vessels supplying the heart muscle (Myocardium) i.e. coronary heart disease. The area of heart muscle that has either zero flow or so little flow that it cannot sustain cardiac muscle function is said to be infracted and the overall process is called a myocardial infarction. MI are of two types; transmural and subendocardial. Mainly it is caused due to oxidative stress and atherosclerosis. Chest pain is the most common symptom of acute MI and is often described as a sensation of tightness, pressure, or squeezing. Other symptoms include diaphoresis (an excessive form of sweating), shortness of breath (dyspnea), weakness, light-headedness, nausea, vomiting, and palpitations. The most common symptoms of MI in women include dyspnea, weakness, and fatigue, sleep disturbances. It can be treated by using blockers, diuretics, ACE inhibitors, calcium channel blockers and nitrates.

The pathophysiology of MI is multifactorial, with factors such as atherosclerosis, thrombosis, and inflammation playing crucial roles. Complications of MI can include heart failure, cardiogenic shock, and arrhythmias. Diagnosis of MI involves clinical evaluation, imaging studies, and biomarker testing. Treatment of MI includes reperfusion therapy, medical management, and cardiac rehabilitation. Reperfusion therapy, including thrombolytic therapy and primary percutaneous coronary intervention, is the cornerstone of treatment for ST-segment elevation MI. Medical management involves antiplatelet and anticoagulation therapy, as well as beta-blockers, while cardiac rehabilitation can help improve cardiovascular function and reduce the risk of further cardiac events. Prompt diagnosis and appropriate treatment are essential for improving outcomes and reducing morbidity and mortality associated with MI.

Keywords: Myocardial Infarction; Atherosclerosis; Transmural; Subendocardial; Oxidative Stress

I.INTRODUCTION

Myocardial infarction (MI), commonly known as a heart attack is the disease of the blood vessels supplying the heart muscle (Myocardium) i.e. cannot sustain cardiac muscle function is said to be infarcted and the overall process is called a myocardial infarction. coronary heart disease. The area of heart muscle that has either zero flow or so little flow that it.

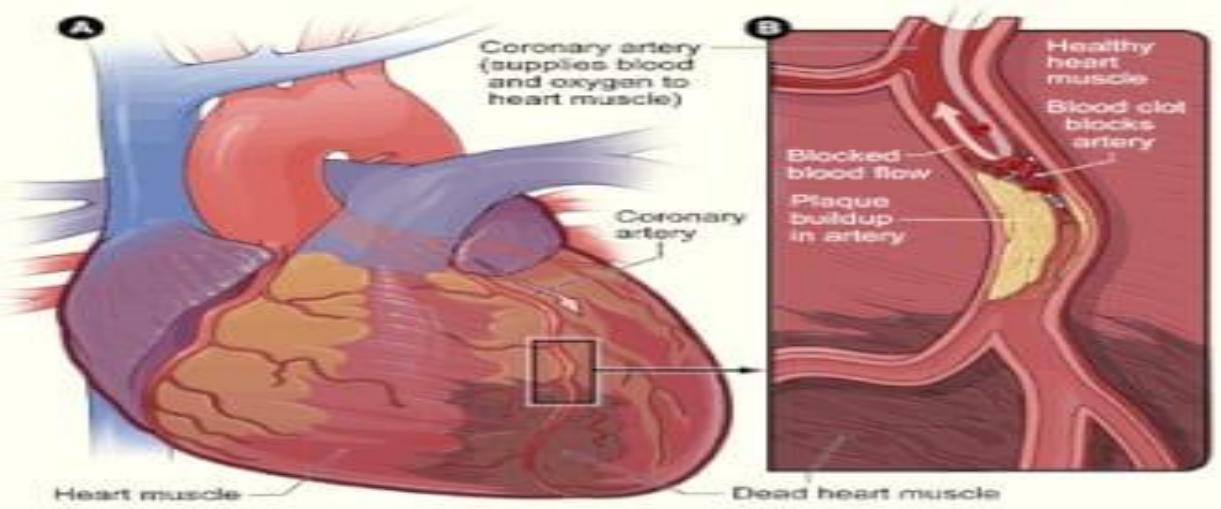

Figure 1.1 Myocardial infraction

The heart is a muscular organ that requires a constant supply of oxygen and nutrients to function properly. The coronary arteries, which branch off from the aorta, supply blood and oxygen to the heart muscle. When these arteries become narrowed or blocked due to a build-up of plaque, a blood clot can form, resulting in a heart attack. The risk factors for developing a heart attack include age, family history, smoking, high blood pressure, high cholesterol, obesity, diabetes, sedentary lifestyle, and stress. Men are more likely than women to have a heart attack, although women tend to have worse outcomes following a heart attack. The symptoms of a heart attack can vary, but the most common include chest pain or discomfort, shortness of breath, nausea or vomiting, light-headedness or dizziness, and pain or discom fort in the arms, neck, jaw, back, or stomach. Some people may experience no symptoms at all, particularly those with diabetes or older adults.

Here is the text from the image, detailing the Classification of Myocardial Infarction (MI):
Prior to 2018, myocardial infarction (MI) was classified into two types: ST-segment elevation myocardial infarction (STEMI) and non-ST-segment elevation myocardial infarction (NSTEMI).

- STEMI occurs when there is a complete blockage of a coronary artery, resulting in a significant amount of heart muscle damage. This type of MI is usually accompanied by ST-segment elevation on an electrocardiogram (ECG) and is considered a medical emergency. Treatment typically involves rapid reperfusion with medication or a mechanical intervention, such as percutaneous coronary intervention (PCI) or thrombolytic therapy.
- NSTEMI, on the other hand, occurs when there is a partial blockage of a coronary artery, resulting in less heart muscle damage than STEMI. This type of MI is usually accompanied by non-ST-segment elevation on an ECG and may not require urgent reperfusion therapy. Treatment may include medications, such as antiplatelet and anticoagulant drugs, and a conservative approach to revascularization (Fourth Universal Definition of Myocardial Infarction (2018) / Circulation, n.d.).

However, in 2018, a new universal definition of MI was proposed by the European Society of Cardiology and the American College of Cardiology that included a third type of MI, type 2 MI, and redefined STEMI and NSTEMI based on biomarker elevations and clinical presentations. The new classification system consists of five types of MI, as follows:

- Type 1 MI: Spontaneous MI related to atherosclerotic plaque rupture, erosion, or dissection.
- 2 MI: MI secondary to ischemia due to either increased oxygen demand or decreased supply, such as in cases of coronary artery spasm, anaemia, or hypotension.
- Type 3 MI: MI resulting in death when biomarker values are unavailable or unable to be obtained.
- Type 4a MI: MI associated with percutaneous coronary intervention (PCI).
- Type 4b MI: MI associated with stent thrombosis.
- Type 5 MI: MI associated with coronary artery bypass grafting (CABG).

This new classification system is intended to provide more accurate and specific diagnoses of MI, as well as to guide treatment decisions and improve patient outcomes (Fourth Universal Definition of Myocardial Infarction (2018) / Circulation, n.d.).

II.PATHOPHYSIOLOGY MYOCARDIAL INFRATION

Myocardial infarction (MI) occurs when there is prolonged ischemia (lack of oxygen) to a part of the heart muscle, resulting in the death of the affected tissue. The pathophysiology of MI involves a complex cascade of events, which can be broadly divided into three phases: acute ischemia, myocardial injury, and myocardial necrosis. Here is an overview of the pathophysiology of MI:

- Acute ischemia: MI typically begins with the sudden occlusion of a coronary artery, which supplies blood to the heart muscle. The occlusion is usually due to the formation of a blood clot over an atherosclerotic plaque, which narrows the lumen of the artery. The sudden occlusion results in an acute decrease in blood flow and oxygen delivery to the downstream myocardium, leading to acute ischemia.

- Myocardial injury: Within minutes of the occlusion, the affected myocardium begins to undergo injury, characterized by a loss of contractility and metabolic derangements. The duration of ischemia and the extent of collateral blood flow determine the severity of myocardial injury.
- Myocardial necrosis: If blood flow is not restored within a few hours, irreversible myocardial damage, or necrosis, occurs, leading to the formation of a non-viable scar. The size and location of the infarcted area determine the clinical presentation and long-term prognosis of the patient.

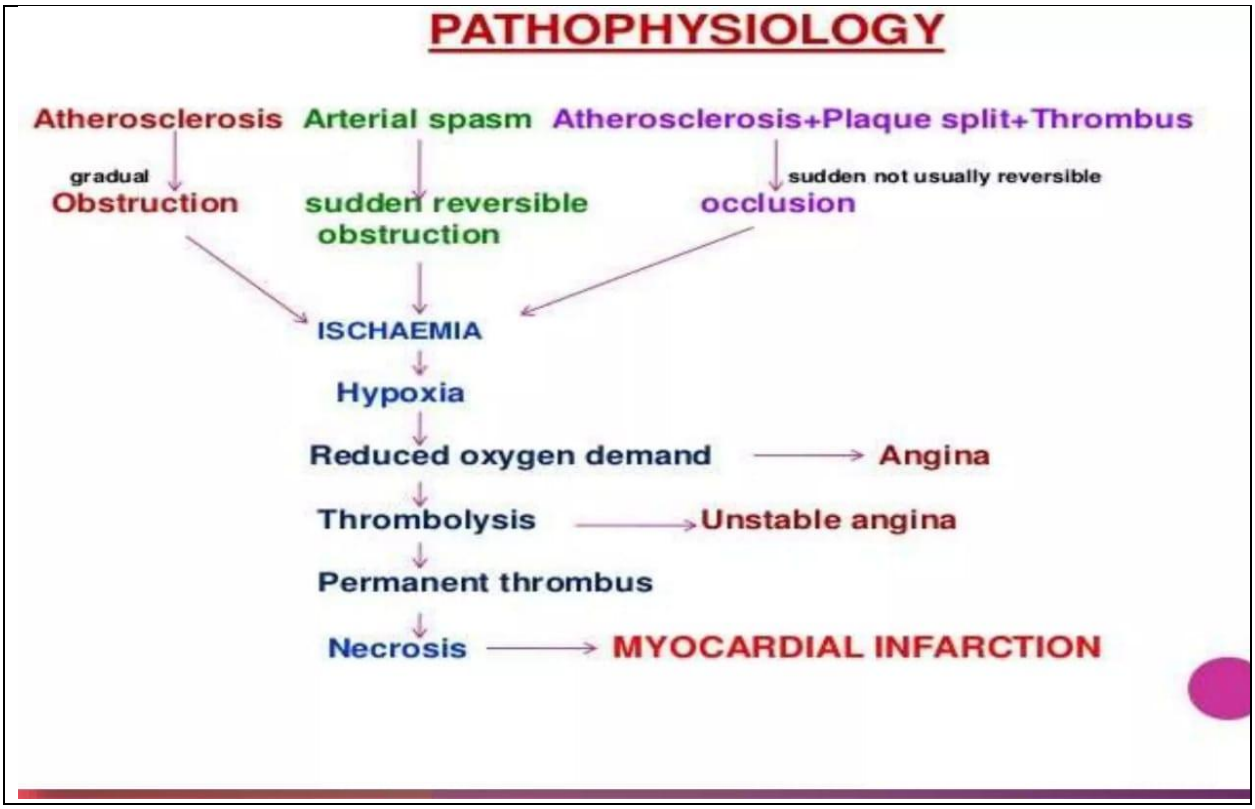

Figure 1.2 Pathophysiology myocardial infraction

The pathophysiology of MI involves multiple cellular and molecular mechanisms, including inflammatory responses, oxidative stress, apoptosis, and autophagy, which contribute to the progression of tissue damage and remodelling. The understanding of these mechanisms has led to the development of novel therapeutic strategies for MI (Hausenloy & Yellon, 2013; Libby, 2009; Xie et al., 2013).

III.COMPLICATION OF MYOCARDIAL INFRACTION

Myocardial infarction (MI) can result in several complications, which can significantly affect the prognosis and quality of life of the patient. Here are some of the common complications of MI:

- Arrhythmias: MI can disrupt the normal electrical activity of the heart, leading to various arrhythmias such as ventricular tachycardia, ventricular fibrillation, and atrial fibrillation. These arrhythmias can cause hemodynamic instability and sudden cardiac death.
- Heart failure: MI can result in the loss of contractile function of the affected part of the heart, leading to heart failure. Heart failure can present as acute pulmonary edema or chronic congestive heart failure, depending on the severity and extent of the myocardial damage.
- Cardiogenic shock: MI can result in severe myocardial damage and impaired cardiac output, leading to cardiogenic shock. Cardiogenic shock

is a life-threatening condition that requires urgent intervention.

- Mechanical complications: MI can result in various mechanical complications such as papillary muscle rupture, ventricular septal rupture, and free wall rupture. These complications can cause acute hemodynamic instability and require urgent surgical intervention.
- Thromboembolic events: MI can result in the formation of blood clots within the heart, which can embolize to other organs such as the brain, lungs, or kidneys, causing thromboembolic events such as stroke or pulmonary embolism.

IV.RISK FACTORS FOR MYOCARDIAL (Heart Attack):

1. Dyslipidemia – High LDL, low HDL, high total cholesterol, or elevated triglycerides.
2. Hypertension – Damages arterial walls, promoting atherosclerosis.
3. Smoking – Increases platelet aggregation, vasoconstriction, and endothelial injury.
4. Diabetes mellitus / insulin resistance – Accelerates atherosclerosis.
5. Obesity – Especially central (abdominal) obesity.
6. Physical inactivity / sedentary lifestyle
7. Unhealthy diet – High in saturated fat, trans fat, cholesterol, and refined carbohydrates.
8. Psychological stress – Chronic stress, depression, and social isolation.
9. Alcohol use – Excessive consumption increases risk (though moderate intake may be protective).
10. age – Risk increases with age (men >45 years, women >55 years or postmenopausal).
11. Sex – Males are at higher risk than premenopausal females.
12. Family history of premature coronary artery disease (CAD) – MI or sudden cardiac death in:
13. Male first-degree relative <55 years
14. Female first-degree relative <65 years
15. Genetic predisposition – Certain inherited lipid disorders (e.g., familial hypercholesterolemia).

V.SYMPYOMS

1. Typical Symptoms

- Chest pain or pressure Often described as tightness, squeezing, heaviness, or burning in the center or left side of the chest. May last more than a few minutes or come and go.
- Pain radiating Pain may spread to the left arm, shoulders, neck, jaw, or back.
- Shortness of breath
- Cold sweat or clammy skin
- Nausea or vomiting
- Light-headedness, dizziness, or fainting
- Extreme fatigue or sudden weakness

2. Atypical Symptoms (more common in women, older adults, and people with diabetes)

- Sharp or burning pain (instead of pressure)
- Pain in the upper abdomen, often mistaken for indigestion
- Unusual tiredness
- Shortness of breath without chest pain
- Sudden anxiety or a feeling of impending doom

VI.ELECTROCARDIOGRAM

Electrocardiogram (ECG) is a valuable tool in the diagnosis and management of myocardial infarction (MI). ECG changes can help identify the location and extent of myocardial damage, and guide the selection of appropriate treatment strategies. Here are some of the common ECG changes seen in MI:

- ST-segment elevation: ST-segment elevation is a hallmark of acute MI and indicates transmural myocardial damage. ST-segment elevation is most commonly seen in ST-segment elevation MI (STEMI) and is usually accompanied by T-wave inversion and Q-wave formation.
- ST-segment depression: ST-segment depression is seen in non-ST-segment elevation MI (NSTEMI) and indicates subendocardial myocardial damage.
- T-wave inversion: T-wave inversion is a common ECG finding in MI and can be seen in both STEMI and NSTEMI. T-wave inversion usually reflects the presence of ischemia or injury in the affected myocardiumz

- Q-wave formation: Q-wave formation is a late ECG finding in MI and indicates irreversible myocardial damage. Q-wave formation is seen in the leads that face the affected myocardium and can persist for several months or years after the MI.
- Other changes: Other ECG changes seen in MI include atrial and ventricular arrhythmias, conduction disturbances, and ST-segment elevation or depression in leads opposite to the affected myocardium.

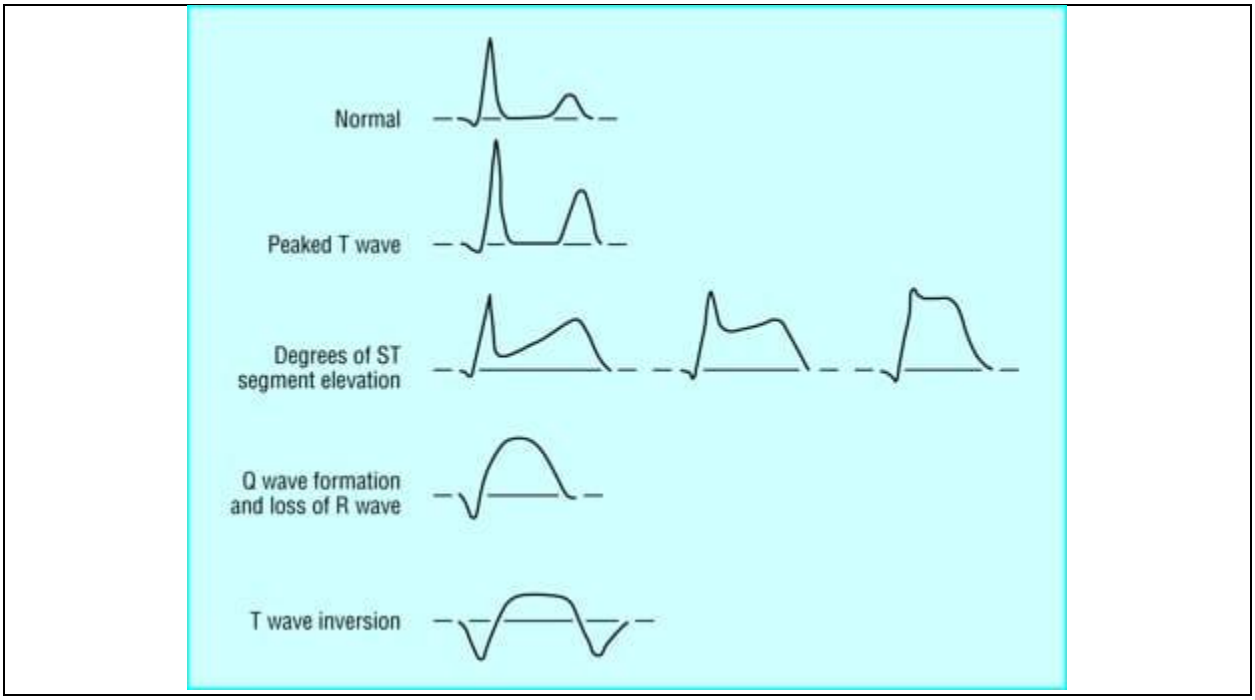

Figure 1.3 Electrocardiogram

VII.DIAGNOSIS

The diagnosis of myocardial infarction (MI) is based on a combination of clinical presentation, electrocardiogram (ECG) findings, and biomarkers of myocardial damage. Here are the diagnostic criteria for MI:

- Clinical presentation: The patient should present with typical symptoms of chest pain or discomfort, which is often described as pressure, heaviness, or tightness, and may radiate to the neck, jaw, shoulder, back, or arm. Other associated symptoms may include shortness of breath, nausea, vomiting, sweating, and light-headedness.
- ECG findings: The ECG should show evidence of myocardial damage, which is typically characterized by ST-segment elevation or depression, T-wave inversion, or Q-wave formation. The location and extent of ECG changes can help identify the type of MI (STEMI vs. NSTEMI) and guide the selection of appropriate treatment strategies.
- Biomarkers: Biomarkers of myocardial damage, such as troponin and creatine kinase-MB (CK-MB), should be measured in the blood. Elevated levels of these biomarkers indicate myocardial damage and confirm the diagnosis of MI.
- Troponin: Troponin is a protein complex found in cardiac muscle that is released into the bloodstream when the myocardium is damaged. Troponin is the preferred biomarker for the diagnosis of MI and is highly sensitive and specific. High-sensitivity troponin assays are now available that can detect very low levels of troponin in the blood, enabling the early diagnosis of MI.
- Creatine kinase-MB (CK-MB): CK-MB is an enzyme found in cardiac muscle that is released into the bloodstream when the myocardium is damaged. CK-MB was previously used as a biomarker for MI, but has been largely replaced

by troponin due to its lower sensitivity and specificity.

- Myoglobin: Myoglobin is a protein found in cardiac and skeletal muscle that is released into the bloodstream when the myocardium is damaged. Myoglobin is less specific than troponin and CK-MB and is often used in combination with other biomarkers for the diagnosis of MI.
- C-reactive protein (CRP): CRP is a marker of inflammation that is elevated in response to tissue damage or infection. Elevated levels of CRP have been associated with an increased risk of MI and may be used to assess the risk of future cardiovascular events.
- Natriuretic peptides: Natriuretic peptides, such as brain natriuretic peptide (BNP) and N-terminal pro-BNP (NT-proBNP), are hormones produced by the heart in response to increased pressure or volume. Elevated levels of natriuretic peptides are associated with heart failure and may be used to assess the severity of myocardial damage.

The choice of biomarker for the diagnosis and management of MI depends on several factors, including the sensitivity and specificity of the assay, the time of presentation, and the clinical context. The diagnostic criteria for MI have evolved over time, with the latest guidelines emphasizing the use of high-sensitivity troponin assays for the detection of myocardial damage.

VIII.ADVANCE TREATMENT OF MYOCARDIAL INFRACTION

1. Immediate Advanced Management (Reperfusion-Focused)

A. Primary Percutaneous Coronary Intervention (PCI) – GOLD STANDARD

- Should be performed within 90 minutes of first medical contact when available.
- Involves:
  - Coronary angiography
  - Balloon angioplasty
  - Stent placement (drug-eluting stents preferred)
- Mechanical thrombectomy devices may be used to remove large clots.

B. Fibrinolytic (Thrombolytic) Therapy

Used when PCI cannot be performed quickly. Best if given within 30 minutes of hospital arrival.

Medications:

- Tenecteplase (TNK)
- Alteplase (tPA)
- Reteplase

Often followed by pharmaco-invasive PCI within 3–24 hours.

2. Adjunct Pharmacologic Therapy

Given alongside reperfusion therapy.

Antiplatelets

Dual antiplatelet therapy (DAPT):

- Aspirin
- P2Y12 inhibitor (clopidogrel / ticagrelor / prasugrel)

Anticoagulants

- Unfractionated heparin (UFH)
- Enoxaparin
- Bivalirudin (special scenarios)

Anti-Ischemic and Cardioprotective Agents

- Beta-blockers: reduce myocardial oxygen demand
- Nitrates: symptomatic relief
- ACE inhibitors / ARBs: reduce remodeling
- High-intensity statins: stabilize plaques

Advanced Antithrombotics

- GP IIb/IIIa inhibitors (eptifibatide, tirofiban) in selected high-thrombus situations.

3. Advanced/Novel Interventional Therapies

A. Intravascular Imaging

Helps optimize stent placement:

- Intravascular ultrasound (IVUS)
- Optical coherence tomography (OCT)

B. Mechanical Circulatory Support (MCS) — for cardiogenic shock

- Intra-aortic balloon pump (IABP): improves perfusion (now less commonly used)
- Impella: ventricular assist device
- VA-ECMO: (veno-arterial ECMO) for severe pump failure

4. Surgical Options

Used when PCI fails or anatomy is unsuitable.

Coronary Artery Bypass Grafting (CABG)

- Recommended for complex multi-vessel disease or left main disease.

5. Post-MI Advanced Long-Term Therapy

- Cardiac rehabilitation: strong evidence for reduced mortality
- Implantable cardioverter-defibrillator (ICD): for patients with low EF (<35%) after 40 days
- SGLT2 inhibitors: for heart failure with reduced EF following MI (expanding role)

6. Emerging / Experimental Therapies

- Stem-cell based myocardial repair (still under research)
- Gene therapy targeting myocardial regeneration
- Precision medicine using AI-guided risk stratification
- Novel anti-inflammatory therapies (e.g., IL-1 inhibitors) to limit post-MI remodeling

Figure 1.4 Treatment Strategies of MI

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The treatment of myocardial infarction (MI) aims to restore blood flow to the affected part of the heart, relieve symptoms, prevent complications, and reduce the risk of future cardiovascular events.

Treatment of MI involves a combination of pharmacological and interventional therapies, as well as lifestyle modifications. Here are the different treatment options for MI with sources:

- Reperfusion therapy: Reperfusion therapy is the restoration of blood flow to the affected part of the heart and is the cornerstone of the treatment of MI. Reperfusion therapy can be achieved either by pharmacological thrombolysis or by percutaneous coronary intervention (PCI), also known as angioplasty. Both thrombolysis and PCI have been shown to improve outcomes in patients with ST-segment elevation MI (STEMI).
- Antiplatelet therapy: Antiplatelet therapy, such as aspirin and P2Y12 inhibitors (clopidogrel, ticagrelor, and prasugrel), is used to prevent further thrombotic events and reduce the risk of recurrent MI. Dual antiplatelet therapy (DAPT) with aspirin and a P2Y12 inhibitor is recommended for at least 12 months after PCI in patients with STEMI.
- Anticoagulant therapy: Anticoagulant therapy, such as unfractionated heparin or low-molecular-weight heparin, is used to prevent thrombus formation and reduce the risk of recurrent MI.
- Beta-blockers: Beta-blockers are used to reduce the workload on the heart, decrease myocardial oxygen demand, and improve survival in patients with MI. Beta-blockers are recommended for all patients with MI, unless contraindicated.
- ACE inhibitors or ARBs: Angiotensin-converting enzyme (ACE) inhibitors or angiotensin receptor blockers (ARBs) are used to reduce mortality and

prevent heart failure in patients with MI. ACE inhibitors or ARBs are recommended for all patients with MI, unless contraindicated.

- Statins: Statins are used to reduce cholesterol levels and prevent future cardiovascular events in patients with MI. Statins are recommended for all patients with MI, regardless of their cholesterol levels.
- Lifestyle modifications: Lifestyle modifications, such as smoking cessation, regular physical activity, healthy diet, and weight management, are important in the management of MI and can improve outcomes.

The choice of treatment for MI depends on several factors, including the type and severity of MI, the time of presentation, the patient's medical history, and the presence of other comorbidities.

Class of drug	Action	Drug
Beta blockers	Hearts work load	Nedolol, metoprolol, pindolal, bsopolol etc.
Diuretics	Rid body of excess fluid and salt	Hydro chlorothiazide, chlorothiazide, furosemide, spironolactone etc.
ACE inhibitors	Prevent blood vessles condtruction	Benaazepril, Lisinopril, captopril, Ramipril, fosinopril
Calciumn channel blokrs	Prevent blood vessles condtruction by blocking calcium ions	Verapamil, diltazem, nifdipine.
Nitrates	Help relax the myocardium and blood vessles	Nitroglycerin, isosorbide dinitrate

IX.MANAGEMENT OF MYOCARDIAL INFRACTION

The management of myocardial infarction (MI) involves a multidisciplinary approach that includes acute care, medical therapy, and secondary prevention. The goal of management is to limit the extent of damage to the heart muscle, prevent complications, and reduce the risk of future cardiovascular events.

Acute care: The immediate management of MI involves early recognition and prompt transport to a hospital with the capability to perform reperfusion therapy. Patients with STEMI should undergo urgent reperfusion therapy with either thrombolysis or PCI within 12 hours of symptom onset.

Medical therapy: Medical therapy is an important component of the management of MI and involves the use of antiplatelet therapy, anticoagulant therapy, beta-blockers, ACE inhibitors or ARBs, and statins. These medications are used to prevent further thrombotic events, reduce myocardial oxygen demand, improve survival, and prevent future cardiovascular events.

Secondary prevention: Secondary prevention is an essential component of the management of MI and involves lifestyle modifications (such as smoking cessation, regular physical activity, healthy diet, and weight management), as well as the use of medications to prevent future cardiovascular events. Secondary prevention medications include antiplatelet therapy, beta-blockers, ACE inhibitors or ARBs, and statins.

Cardiac rehabilitation: Cardiac rehabilitation is an important component of the management of MI and involves a structured exercise and education program to improve cardiovascular health, reduce the risk of future cardiovascular events, and improve quality of life.

Surgical interventions: In some cases, surgical interventions may be necessary to manage complications of MI, such as heart failure, cardiogenic shock, or ventricular arrhythmias.

X.PREVENTION OF MYOCARDIAL INFRACTION

Prevention of myocardial infarction (MI) involves reducing the risk factors that contribute to the development of the condition. Here are some pre-prevention strategies for MI:

Figure 1.5 Prevention of Myocardial Infarction

- Healthy lifestyle: Adopting a healthy lifestyle is one of the most important pre-prevention strategies for MI. This includes regular physical activity, healthy diet, maintaining a healthy weight, quitting smoking, and limiting alcohol consumption.
- Blood pressure control: Hypertension is a major risk factor for MI, and controlling blood pressure is an important pre-prevention strategy. Lifestyle modifications, such as weight loss, regular physical activity, and a healthy diet, can help control blood pressure. In addition, medications, such as ACE inhibitors and ARBs, are effective in reducing blood pressure and the risk of MI.
- Cholesterol management: High levels of LDL cholesterol are a major risk factor for MI. Prevention strategies for MI include maintaining healthy cholesterol levels through lifestyle modifications, such as a healthy diet and regular physical activity, as well as the use of medications, such as statins.
- Diabetes management: Diabetes is a significant risk factor for MI, and managing blood glucose levels is an important pre-prevention strategy. Lifestyle modifications, such as a healthy diet and regular physical activity, as well as medications, such as insulin and oral hypoglycaemic agents, can help manage blood glucose levels and reduce the risk of MI.
- Stress management: Chronic stress can increase the risk of MI, and managing stress is an important pre-prevention strategy. Techniques such as meditation, yoga, and deep breathing exercises can help reduce stress and improve overall cardiovascular health.

- Regular health check-ups: Regular health check-ups can help identify risk factors for MI and allow for early intervention and treatment.

XI.CONCLUSION

Myocardial infarction (MI) is a serious and potentially life-threatening condition that occurs when there is a blockage in one or more of the coronary arteries, which supply blood and oxygen to the heart muscle. MI can lead to significant morbidity and mortality if not treated promptly and appropriately.

The classification of MI has undergone significant changes over the years, with the most recent classification being proposed by the European Society of Cardiology and the American College of Cardiology. This new classification includes several types of MI, based on the underlying mechanism and clinical presentation. MI is a major public health problem globally, with a significant burden on healthcare resources and the economy. In India, MI is a leading cause of mortality and morbidity.

The pathophysiology of MI involves a complex interplay of factors, including atherosclerosis, thrombosis, and inflammation. Complications of MI can include arrhythmias, heart failure, and cardiogenic shock.

Diagnosis of MI involves a combination of clinical evaluation, imaging studies, and biomarker testing. Rapid assessment and triage are essential to ensure prompt treatment and improve outcomes. Treatment of MI includes reperfusion therapy, medical management, and cardiac rehabilitation. Reperfusion therapy is the cornerstone of treatment for STEMI, while medical management includes the administration of antiplatelet and anticoagulation therapy, as well as beta-blockers. Cardiac rehabilitation can help improve cardiovascular function and reduce the risk of further cardiac events.

In conclusion, MI is a significant health concern worldwide, with a complex pathophysiology and a range of clinical presentations. Rapid diagnosis and appropriate treatment are essential to improve outcomes and reduce morbidity and mortality.

REFERENCE

[1] Amsterdam, E. A., et al. (2014). AHA/ACC Guideline for the Management of Patients With Non–ST–Elevation Acute Coronary Syndromes. Journal of the American College of Cardiology.

[2] Anderson, L., et al. (2016). Exercise-based cardiac rehabilitation for coronary heart disease. Journal of the American College of Cardiology.

[3] Braunwald, E. (2021). Braunwald's Heart Disease: A Textbook of Cardiovascular Medicine. 12th ed. Elsevier.

[4] Hausenloy, D. J., & Yellon, D. M. (2013). Myocardial ischemia–reperfusion injury: A neglected therapeutic target. The Journal of Clinical Investigation, 123(1), 92–100.

[5] Xie, M., Kong, Y., Tan, W., May, H., Battiprolu, P. K., Pedrozo, Z., Wang, Z. V., Morales, C., Luo, X., Cho, G., Jiang, N., Jessen, M. E., Warner, J. J., Lavandero, S., Gillette, T. G., & Hill, J. A. (2013). Histone deacetylase inhibition blunts ischemia/reperfusion injury by inducing cardiomyocyte autophagy. Circulation, 129(10), 1139–1151.

[6] Mehta, L. S., et al. (2016). Acute myocardial infarction in women: A scientific statement from the American Heart Association. Circulation.

[7] O'Gara, P. T., et al. (2013). 2013 ACCF/AHA guideline for the management of ST-elevation myocardial infarction. Circulation, 127(4), e362–e425.

[8] Thygesen, K., et al. (2018). Fourth universal definition of myocardial infarction. European Heart Journal, 40(3), 237–269.

[9] Ibanez, B., et al. (2018). 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation. European Heart Journal, 39(2), 119–177.

[10] Ponikowski, P., et al. (2016). 2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure. European Heart Journal, 37(27), 2129–2200.

[11] Benjamin, E. J., et al. (2019).Heart disease and stroke statistics—2019 update. *Circulation, 139*(10), e56–e528.

[12] Libby, P., et al. (2019).Inflammation in atherosclerosis: From pathophysiology to practice. *Journal of the American College of Cardiology, 72*(17), 2071–2091.

[13] Amsterdam, E. A., et al. (2014).2014 AHA/ACC guideline for the management of patients with non–ST-elevation acute coronary syndromes.

Journal of the American College of Cardiology, 64(24), e139–e228.

[14] Canto, J. G., et al. (2012).Atypical presentations of acute coronary syndrome: The importance of symptoms in women and elderly patients. *JAMA, 307*(8), 813–822.

[15] Ponikowski, P., et al. (2016).2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure. *European Heart Journal, 37*(27), 2129–2200.

[16] Ridker, P. M. (2016).C-reactive protein and cardiovascular disease. *Circulation Research, 118*(1), 145–156.

[17] McMurray, J. J. V., et al. (2021).SGLT2 inhibitors in heart failure: A new standard of care. *Lancet.*

[18] Neumann, F. J., et al. (2019).2018 ESC/EACTS Guidelines on myocardial revascularization. *European Heart Journal.*

[19] Thiele, H., et al. (2019).Mechanical circulatory support for cardiogenic shock. *European Heart Journal.*

[20] Visseren, F. L., et al. (2021).2021 ESC Guidelines on cardiovascular disease prevention in clinical practice. *European Heart Journal, 42*(34), 3227–3337.

[21] Whelton, P. K., et al. (2018).2017 ACC/AHA guideline for the prevention, detection, evaluation, and management of high blood pressure in adults. *Hypertension, 71*(6), e13–e115.

[22] World Health Organization. (2021).WHO guidelines for risk reduction of cardiovascular disease.