
UNIT 3 ISCHEMIC HEART DISEASE

STRUCTURE

- 3.0 Objectives
- 3.1 Introduction
- 3.2 Epidemiology
- 3.3 Age associated cardiovascular changes in elderly
- 3.4 Pathophysiology of ischemic heart diseases
- 3.5 Risk factors
- 3.6 Clinical presentation
- 3.7 Diagnostic evaluation
- 3.8 Management of ischemic heart disease in elderly
 - 3.8.1 Medical management
 - 3.8.2 Revascularization in elderly
 - 3.8.3 Asymptomatic CAD or chronic stable Angina
 - 3.8.4 Acute coronary syndrome
- 3.9 Types of myocardial infarction
- 3.10 Prevention
- 3.11 Let Us Sum Up
- 3.12 Glossary
- 3.13 Answers to Check Your Progress
- 3.14 References and Further Readings

3.0 OBJECTIVES

After reading this unit you should be able to

- Grasp the age related cardiovascular changes that contributes to development of ischemic heart diseases.
- Diagnose acute coronary events in elderly with or without specific symptoms and signs
- Differentiate different types of angina pain and its management
- To follow Step wise evaluation of ischemic heart diseases
- Able to effectively Manage Acute Myocardial Infarction in elderly.
- To design prevention strategies for ischemic heart disease by Non pharmacological and pharmacological methods
- Effectively manage risk factors contributing to ischemic heart diseases in elderly

Did You Know ?

Coronary artery disease is the leading cause of death in both men and older women above 65 years

3.1 INTRODUCTION

This chapter talks about how coronary heart disease is the leading cause of morbidity and mortality in the older individuals. The mortality due to ischemic heart diseases in people aged above 65 years is around 80 %. We all know that hypertension is one of the common cause of coronary heart disease in elderly and it occurs in one half to two-third of people above 65 yrs. Advanced age is mostly associated with multiple cardiovascular changes in elderly. Elderly people with ischemic heart disease do not present with typical symptoms. They often present with multi morbidity state hence this chapter will guide you to plan an individualized approach in management of ischemic heart disease in elderly with competing morbidities and in accordance with goals of care.

3.2 EPIDEMIOLOGY

Prevalence of CHD increases with age in both men and women. Overt CHD represents only tip of coronary disease iceberg, with greater number of asymptomatic and subclinical cases in older age group. An acute MI manifests in around 40 % patients and sudden death in around 10-20 % cases of CHD. Conventionally women have a 10 year lag in CHD compared to men but above 75 years majority of CHD cases are women .

3.3. AGE ASSOCIATED CARDIOVASCULAR CHANGES IN ELDERLY

The age associated changes in cardiovascular system is given in the Table 3.1

Table 3.1 – age associated changes in cardiovascular system

<p>Arterial changes</p> <ul style="list-style-type: none">● Arterial wall thickening● Arterial stiffening● Widening of pulse pressure● Endothelial dysfunction● Increased intimal media thickening <p>Cardiac structural changes</p> <ul style="list-style-type: none">● Age related increase in Left ventricular wall thickness● Increase in collagen levels and cross linking of collagen occurs with ageing <p>Left ventricular diastolic dysfunction</p> <ul style="list-style-type: none">● Reduced LV diastolic filling rate due to ageing● Fibrosis of LV myocardium● Late diastolic filling associated with atrial hypertrophy -leading to fourth heart sound (atrial gallop)

Left ventricular systolic dysfunction

- Clinically measured as LV ejection pressure
- Systolic function is preserved in ageing but fails to augment with exercise

Changes in heart rate and cardiac output

- Heart rate is not altered in supine position and rest, but HR variability is less in older persons compared with younger population
- Cardiac output decreases by 30 % due to ageing

Impaired sympathetic cardiovascular regulation with ageing**Increased vascular load and left ventricular afterload due to increased LV wall thickness****Heart rhythm disturbances**

- Heart rate variability (beat to beat fluctuation of HR) steadily declines with ageing
- Short burst of paroxysmal supraventricular tachycardia, atrial fibrillation, atrial premature beats and ventricular ectopy occurs in healthy older persons.

3.4 PATHOPHYSIOLOGY

Advancing age is associated with multiple cardiovascular changes. Age associated arterial stiffness leads to isolated systolic hypertension and widened pulse pressure. Pulse pressure is an independent cardiovascular risk factor in elderly. The end diastolic filling is further impaired by elevated end diastolic pressure leading to heart failure with preserved ejection fraction due to ageing. There is also a blunted response to protective vasodilatory mechanism due to advanced age which increases endothelial dysfunction and increases the risk of atherosclerotic plaque formation. Calcification of plaques occurs in ageing leading to more stable plaques but more cardiovascular events .

The underlying pathophysiology in acute coronary syndrome are given in the **Box 3.1**:

Atherosclerotic plaque rupture,
 Platelet activation / aggregation and embolization,
 Endothelial dysfunction,
 Inflammation and thrombus formation.

Box 3.1 – Pathophysiology Of Acute Coronary Syndrome

Plaque rupture can cause a non occlusive thrombus resulting in sub-endocardial ischemia, but when a clot completely occludes a coronary vessel , patients suffers a Myocardial Infarction associated with ST elevation changes in ECG

3.5 RISK FACTORS

The risk factors of ischemic heart disease in elderly in the following table 3.2

Table 3.2 : risk factors of Ischemic Heart Disease in elderly

Non modifiable risk factors	Modifiable risk factors
Age	Hypertension
Genetic predisposition	Dyslipidemia
Ethnicity	Diabetes
Family H/o CVD	Smoking

Think and Reflect

Normal resting ECG does not rule out ischemic heart disease in symptomatic elderly. What is your experience ?

Did You Know ?

Studies have shown > 2/3 rd of patients > 65 yrs with MI fail to reach the hospital within 6 hrs of symptom onset

3.6 CLINICAL PRESENTATION

- Elderly people with Coronary Heart Disease often present with atypical symptoms.
- 20-50 % of elderly patients are asymptomatic inspiteof ECG changes.
- Extreme fatigue or exhaustion can be the only symptom in a few patients.
- Dyspnea, shoulder pain or back pain , epigastric discomfort , confusion or malaise are common presentations in elderly .
- Typical symptoms of chest pain with palpitations and sweating are usually not common in elderly population.
- Delay in recognising symptoms contributes to late presentations in older patients.

Significant pre hospital delay among older patients is multi-factorial and given in table 3.3

Table 3.3 : Pre Hospital Delay among older patients

Mainly Due To Atypical Presentations
Other Medical Morbidities
Socioeconomic status
Access To Health Care
Previous Experience In Health Care System
Cognitive And Functional Decline.

However the delay in MI presentations have strong prognostic implications in elderly.

3.7 EVALUATION

- A high index of suspicion for coronary heart disease is essential to make the diagnosis due to high prevalence and atypical presentation in older patients.
- Standard history taking, physical examination , simple laboratory risk assessment testing with baseline resting ECG is done in all older people with symptoms or high risk of CHD.
- A close attention is paid to history of previous CHD , major risk factors like smoking, hypertension, diabetes mellitus , dyslipidemia as well as symptoms suggestive of CHD.

Did You Know?

How to measure pulse pressure ?

Difference between systolic and diastolic blood pressure

- Patients with new or progressive or refractory symptoms may need in-hospital evaluation than those with chronic stable symptoms.
- Systematic approach in physical examination with awareness to age related cardiovascular changes provides further clue to the presence of CHD.
- Cardiac examination includes looking for signs of left or right heart failure (pulmonary edema (bilateral basal crepitations, displaced point of maximal impulse, an S3 or peripheral edema, enlarged tender liver) or characteristic murmurs of valvular heart disease.
- Assessment of risk factors is followed by baseline resting ECG evaluation.
- Treadmill testing can be done in elderly to assess the functional capacity and exercise tolerance but is difficult to perform in elderly due to physical disabilities
- Echocardiogram can diagnose significant ischemia if regional wall motion abnormalities are present
- Asymptomatic ischemia can be diagnosed non invasively by dobutamine stress test , especially if patient cannot perform treadmill testing.
- Nuclear scintigraphy (Myocardial perfusion scan) with pharmacological agents like dipyridamole and adenosine can also be done to assess the cardiovascular events in elderly.
- Role of CT angiography screening is limited in elderly due to coronary calcification.
- Cardiac biomarkers like Troponin T , CK-MB, BNP are also beneficial in evaluation of ischemic events in elderly

Coronary angiogram is still the gold standard to diagnose ischemic heart disease in elderly.

Check Your Progress 1

1. Clinical presentations of ischemic heart disease in elderly has the following features
 - a. Chest discomfort
 - b. Diaphoresis / fatigue
 - c. Extreme exhaustion
 - d. Altered mental status / stroke
 - e. All of the above
2. How will you evaluate ischemic heart disease in elderly ?

.....

.....

.....

.....
3. Better predictor of cardiovascular events in elderly ?
 - a. Systolic blood pressure

.....

.....

Cardiovascular Disorders

Think and Reflect

How do you think the comorbidities increase the incidence of infections in older people?

- b. Diastolic blood pressure
 -
 -
 - c. Pulse pressure
 -
 -
4. All the above are true about heart rate variability in elderly except :
- a. Indicator of cardiac autonomic dysfunction in elderly
 - b. Decreased heart rate variability is present in elderly
 - c. Increased morbidity and fatal outcome
 - d. Cardiac output is increased by 30 %
5. All are cardiac biomarkers except :
- a. Troponin T
 - b. CK-MK
 - c. CRP
 - d. BNP

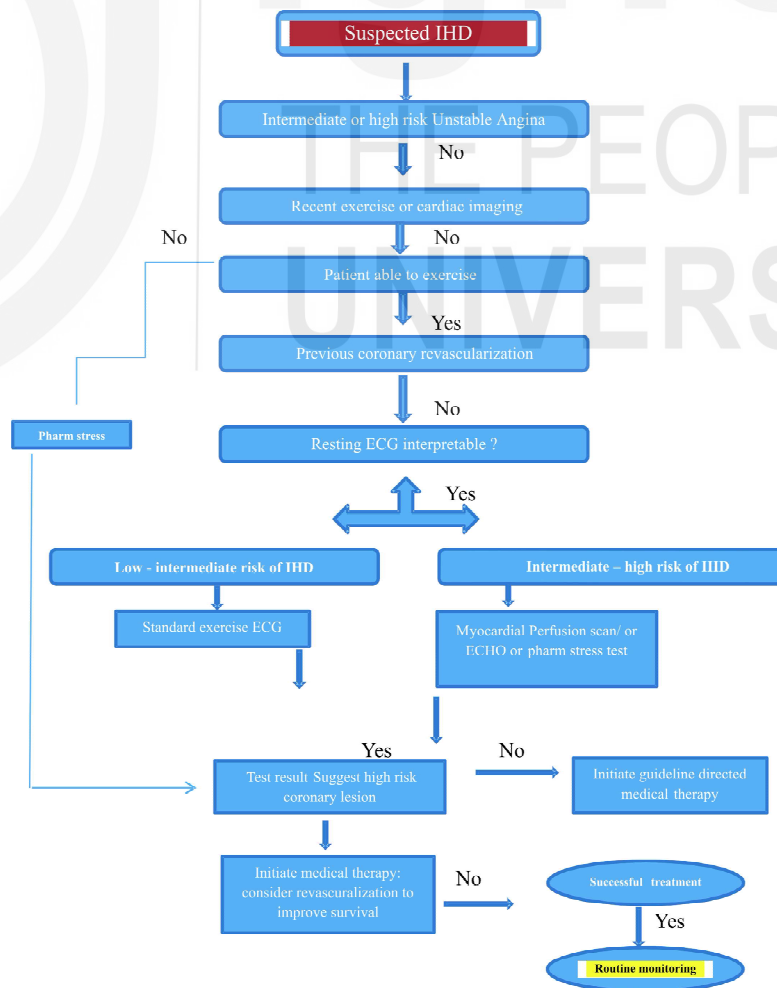


Fig. 3.1: The algorithm for evaluation of suspected elderly for ischemic heart disease

3.8 MANAGEMENT OF ISCHEMIC HEART DISEASE IN ELDERLY

Medical management of ischemic heart disease in elderly is given in **table 3.4**.

Table 3.4: Medical management of Ischemic Heart Disease in elderly

Anti platelet therapy	<ul style="list-style-type: none"> ➤ Aspirin - beneficial in patients for secondary prevention of CHD and primary prevention with risk factors. In Patients on dual anti platelet therapy or long term anti coagulation aspirin 81 mg / day is safe. ➤ Clopidogrel - an ADP- dependent platelet aggregator inhibitor adds incremental benefits to aspirin in patients with NSTEMI-ACS with 20 % relative risk reduction of cardiovascular ➤ Newer ADP- dependent platelet aggregator inhibitors like prasugrel and Ticagrelor are useful in patients post invasive interventions. Ticagrelor is safer in older patients above 75 yrs.
Anti thrombotic therapy	<ul style="list-style-type: none"> ➤ Anti thrombotic therapies reduce cardiovascular events in patients with ACS. Unfractionated heparin along with antiplatelet therapy is associated with significant reduction in death or MI but older people are at a increased risk of bleeding. ➤ LMWH is more beneficial but careful dosing is required due to renal clearance. ➤ Bivalirudin has equivalent anti thrombotic activity with less bleeding in several trials and is frequently used in invasively managed ACS patients in conjunction with oral anti platelet loading.
Betablockers	<ul style="list-style-type: none"> ➤ Beta blockers useful in chronic angina by decreasing myocardial oxygen demand and improving coronary blood flow. ➤ Beta blockers have long term benefits like symptom management and bp lowering especially in patients with heart failure and left ventricular function. ➤ Altered response to beta blockers occurs in elderly patients due to conduction system deterioration and the physiologic desensitization of beta adrenergic receptor function.
ACE inhibitors / ARB 's	<ul style="list-style-type: none"> ➤ ACEI is recommended in all patients having CHD with reduced ventricular function , diabetes or hypertension.

	<ul style="list-style-type: none">➤ ARB s also have the same role in management of CHD.➤ ACC/AHA guidelines recommends ACE inhibitors in the primary and secondary prevention of cardiovascular events and ARBs in patients intolerant to ACE inhibitors.➤ Monitor serum creatinine and serum electrolytes as both can cause alter renal function and hyperkalemia in elderly.➤ Statin therapy➤ Statin therapy useful in secondary prevention of CV events in patients > 65 years.➤ Statin therapy provides 22 % risk reduction is seen in all- cause mortality, 30 % reduction in CHD mortality and 26 % reduction in nonfatal MI.➤ The NCEP guidelines recommends tolerable dose of statin therapy in older population against a high intensity statin therapy in younger population.➤ In immediate post MI period intensive lipid lowering therapy has documented benefits in prevention of recurrent CV events in older patients.➤ Lipid lowering drugs are generally safe in elderly but liver function test has to be monitored.➤ Adverse effects like myopathy, myalgia and cognitive impairment are also common in elderly.
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Points to Ponder

Is high dose statins recommended in elderly ?

Answer

High dose statins are recommended in immediate post MI period only in elderly.

Think and Reflect

Advanced age is not a contraindication for revascularization procedures. What do you think ?

3.8.2 Revascularisation in elderly

- o Coronary artery disease or refractory ischaemia despite maximum tolerated medical treatment.
- o Defer cardiac catheterisation in patients with stable ischaemic heart disease.
- o In recent times though cardiac catheterisation is relatively safe in elderly rare complications like vascular injury, bleeding, myocardial infarction,stroke, even death can occur.
- o Life risk with cardiac catheterisation is less than 0.2% and the risk of other serious events is less than 0.5% even in patients above 75 years.
- o In some elderly patients cardiac catheterisation can be deferred based on other medical co morbidities, cognitive decline and personal preferences.
- o If patients are asymptomatic with medical therapy, then PCI does not benefit to patient's symptomatology.
- o PCI (percutaneous coronary intervention) gives than CABG due to better outcomes.

Indications of CABG in elderly patients

Indications for CABG in elderly is given below in **Box 3.2**

Reduced ejection fraction (less than 35% with viable myocardium)
Left main artery disease and its equivalent
Diabetes mellitus

Box 3.2: Indications for CABG in elderly

- o Mortality rate following revascularisation procedure increases with advancing age especially after 75 years. At any age patients undergoing CABG have 2 to 3 times higher mortality risk than those undergoing angioplasty. But due to advanced techniques, the death rates in elderly undergoing CABG has decreased by 20%.
- o Nonfatal procedural complication like stroke/MI/renal failure also rises in linear fashion with age in patients undergoing CABG .

Major side effect is stroke or loss of mental activity. Risk of stroke post CABG is 3-6 % while with PCI < 1 % .

Neurological decline post CABG was more at discharge though recovery occurred by 6 months but reappeared in many in long term follow up. No significant difference observed between CABG/ PCI was noted in terms of neurological decline.

Did You Know ?

Neurological decline is more common after CABG/PCI in elderly

Check Your Progress 2

1. Advanced age is a contraindication for revascularisation procedures in elderly – TRUE / FALSE
.....
.....
2. Dual anti –platelet therapy is always warranted in elderly - TRUE / FALSE
.....
.....
3. Beta blockers reduce cardiac workload and myocardial oxygen demand and is useful in ischemic heart disease in elderly - TRUE / FALSE
.....
.....
4. The following have proven benefits in reducing the risk of ischemic heart disease in elderly
 - a. Treatment with low dose aspirin
 - b. Blood pressure control
 - c. Smoking cessation
 - d. Treatment with statins
 - e. All of the above

5. Risk factors for increased intracerebral haemorrhage are all except:
- Age > 75 yrs
 - High BMI
 - h/o prior stroke
 - high systolic BP

3.8.3 Asymptomatic CAD or Chronic Stable Angina

- Optimal medical management in elderly patients with stable coronary disease is equivalent to interventional procedures
- Therapeutic goals are targeted at symptom relief, slowing disease progression, control of hypertension, diabetes, weight control, lipid lowering, smoking cessation and improving exercise tolerance.
- Single anti platelet therapy like low dose aspirin 75- 150 mg /day is sufficient
- Dual anti platelet therapy is indicated in patients undergone PCI or had ACS recently.
- Appropriate statin dosing to avoid statin induced myopathy

3.8.4 Acute Coronary Syndrome

- Atypical presentation of ischemic events often delay the presentation timing of elderly to medical emergency departments
- Though chest pain or discomfort can still be the presenting symptoms of young old , elderly above 75 years often complain of extreme physical exhaustion, diaphoresis and acute breathlessness
- Altered mental status, confusion, fatigue ,sudden pulmonary edema or neurogenic symptoms like syncope or stroke can be the presenting symptoms of very older patients above 75 yrs.
- Resting ECG is most often non diagnostic
- Strong suspicion and rapid laboratory testing for cardiac enzymes will aid diagnosis
- NSTEMI and unstable angina can be managed initially with aggressive medical management and intervention if symptoms persists.
- For STEMI – immediate thrombolysis (if patient has reached within window period) with antiplatelet therapy is started.
- Intracerebral haemorrhage is the most common complication of thrombolytic therapy, followed by cardiac rupture (0.5- 2.0 %).
- Risk factors for increased intracerebral haemorrhage – older patients > 75 yrs, low BMI, h/o prior stroke , high systolic BP > 160 mm of Hg.

Did You Know ?

There are 2 types of Myocardial Infarction - TYPE 1 MI & TYPE 2 MI

3.9 TYPES OF MYOCARDIAL INFARCTION

The types of Myocardial Infarction in elderly is given the following Table 3.5

Table 3.5 : Types of myocardial infarction in elderly

Spontaneous MI / Type 1 MI	Secondary MI / Type 2 MI
Spontaneous in onset usually due to : <ul style="list-style-type: none"> · plaque rupture · ulceration · fissuring · erosion · dissection with complex plaque & coronary arterial thrombus often seen during coronary angiography. 	Associated with conditions leading to increased myocardial oxygen demand or decreased oxygen supply.
Ischemic chest discomfort or equivalent often present	Ischemic chest discomfort or equivalent often absent.
Often associated with ECG changes like ST segment elevation or depression.	ECG changes are minimal , absent or nonspecific
Troponin levels are higher than type 2 MI mostly	Troponin levels show minimal elevation mostly
Treatment with anticoagulants , anti platelets and catheterization	Address causative factors, supportive care, anti platelets , risk stratification prior to catheterization

3.10 PREVENTION

- Early screening and treatment of risk factors
- Cardiac risk assessment must be done in all elderly hypertensive and diabetics and started on secondary prevention measures with anti-platelets and statins.

3.11 LET US SUM UP

Aging population and Age related changes in organ systems contributes to increased prevalence of ischemic heart disease in elderly. Diagnosis is based on strong degree of suspicion since most of the times the presentations are atypical. Early screening and treatment of risk factors is found to reduce cardiovascular events Appropriate medical management has to be initiated at the earliest. Revascularization procedures are not contraindicated in elderly and can be carried out as per guidelines. PCI has a better prognosis than CABG in elderly. Thrombolysis can increase the risk of intracerebral haemorrhage in very old elderly > 75 yrs with low BMI, or previous history of stroke.

3.12 GLOSSARY

- ECG - Electrocardiogram is the first investigation available in all health care set ups including primary care centres to diagnose ischemic heart diseases.
- ACEI - Angiotensin Converting Enzyme Inhibitors are used in cardiac remodelling of cardiac tissue apart from its antihypertensive actions.
- ARB - Angiotensin Receptor Blockers commonly used antihypertensive in elderly who are intolerant to ACE inhibitors
- MI - myocardial infarction do not present with typical symptoms in elderly.
- CABG - Coronary Artery Bypass Grafting is indicated in 3 vessel disease and age is not a contraindication to the procedure
- PCI - Percutaneous Coronary Intervention is done in single vessel disease in elderly.
- Coronary heart disease - a spectrum of clinical presentations resulting from insufficient oxygen supply to the myocardial demands.

3.13 ANSWERS TO CHECK YOUR PROGRESS

Check Your Progress 1

1. e. all of the above
2. Detailed history taking, resting ECG, treadmill testing . if not able to exercise pharmacological stress testing. Cardiac biomarkers.
3. c. pulse pressure
4. d. cardiac output is increased by 30 %
5. c. CRP

Check Your Progress 2

1. False
2. False
3. True
4. e. All of the above
5. b. High BMI

3.14 REFERENCES AND FURTHER READINGS

- Hazzard Geriatric medicine and Gerontology-7th Edition
- Brocklehurst's Text book of Geriatric Medicine and Gerontology 8th Edition
- HARRISON Principle of Internal Medicine 20th edition