Management of ACS

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Immediate management of ACS: in the first 12 hours

** Admission urgently to hospital because there is a significant risk of death or recurrent ischaemia

** If no complications, the patient can be mobilized from the 2nd day and discharged after 3–5 days.

*** Treatment of choice for inf. MI with RV infarction is IV fluid with avoidance of vasodilators, hypotensive agents and nitrate.*

1. Analgesia

* Analgesia: not only to relieve distress but also to lower adrenergic drive and thereby reduce vascular resistance, BP, infarct size and susceptibility to ventricular arrhythmias.

* Intravenous opiates (morphine sulphate or diamorphine) and antiemetic should be administered.

* i.m injections should be avoided because the clinical effect may be delayed by poor muscle perfusion, and a painful haematoma may form following thrombolytic or antithrombotic therapy.

2. *Antithrombotic therapy*

A. Antiplatelet therapy

a. In patients with ACS, oral administration of 75–325 mg aspirin daily improves survival. The first tablet (300 mg) should be given orally within the first 12 hours and continued, if no side-effects.

b. In combination with aspirin, the early (within 12 hours) use of clopidogrel (600 mg, followed by 150 mg daily for 1 week and 75 mg daily for one year).

c. In patients with ACS, ticagrelor (180 mg, followed by 90 mg twice daily) is more effective than clopidogrel in reducing vascular death, MI or stroke.

c. GPI IIb/IIIa, such as tirofiban, and abciximab, block the final common pathway of platelet aggregation and are potent inhibitors of platelet-rich thrombus formation. They are of particular benefit in patients with ACS who undergo PCI, those with recurrent ischaemia and high risk patients.

B. Anticoagulants

* Anticoagulation reduces the risk of thromboembolic complications, and prevents re-infarction in the absence of reperfusion therapy or after successful thrombolysis.

* Anticoagulation can be achieved using UFH, fractionated LMWH or a pentasaccharide. Clinical trials suggest that the pentasaccharides (subcutaneous fondaparinux 2.5 mg daily) have the best safety and efficacy profile, with LMWH (s.c enoxaparin 1 mg/kg twice daily) being a reasonable alternative.

* Anticoagulation should be continued for 8 days or until discharge from hospital or coronary revascularisation.

** Treatment with warfarin should be considered if there is persistent AF or evidence of extensive anterior infarction, or if echo shows mobile mural thrombus.*

3. Anti-anginal therapy

A. Vasodilators as S.L GTN (300–500 μg) is a valuable first-aid measure in unstable angina or infarction, and IV nitrates (GTN 0.6–1.2 mg/hr or isosorbide dinitrate 1–2 mg/hr) are useful for the treatment of LV failure and the relief of recurrent or persistent ischaemic pain.

B. IV B-blocker (e.g. atenolol 5–10 mg or metoprolol 5–15 mg given over 5 m) will relieve pain, reduce arrhythmias and improve short-term mortality in patients who present within 12 hours of the onset of symptoms. Avoided, if there is HF (pulmonary oedema), hypotension (systolic BP < 105 mmHg) or bradycardia (heart rate < 65/min).

C. CCB: ** Dihydropyridine group (e.g. nifedipine or amlodipine) can be added to the β-blocker if there is persistent chest discomfort but may cause tachycardia if used alone.

**Non-dihydropyridin group: verapamil and diltiazem are the CCB of choice if a β-blocker is contraindicated.

4. Reperfusion therapy

- *NSTEMI and UA*: Immediate emergency reperfusion thrombolytic therapy has ***no*** demonstrable benefit in patients with NSTEMI and may be harmful.

- *STEMI*: Immediate reperfusion therapy will restores patency, preserves LV function and improves survival.

A. Primary percutaneous coronary intervention (PCI)

* This is the treatment of choice for STEMI.

* Outcomes are best when it is used in combination with GPI IIb/IIIa.

* In comparison to thrombolytic therapy, it is associated with a greater reduction in the risk of death, recurrent MI or stroke.

B. Thrombolysis

* The benefit is greatest in patients who receive treatment within the first few hours: '*minutes mean muscle'.*

* Alteplase is a genetically engineered drug given over 90 minutes (bolus dose of 15 mg, followed by 0.75 mg/ kg body weight but not exceeding 50 mg, over 30 mins, and then 0.5 mg/kg body weight but not exceeding 35 mg, over 60 mins).

* Analogues of t-PA, such as TNK and rPA, have a longer plasma half-life than alteplase and can be given as an IV bolus.

Contraindications and cautions for usage of thrombolytic agents:

Absolute contraindication:

- Previous hemorrhagic stroke at any time, ischemic stroke within 3 m
- Known intracranial neoplasm, structural cerebral vascular lesion or closed head injury within 3 m.
- Active bleeding diathesis excluding menses
- Suspected aortic dissection

Relative contraindication:

- Severe uncontrolled HT at presentation (BP >180/110 mmHg or Hx of chronic severe HT)
- Hx of ischemic stroke > 3 mo, dementia, seizure, known intracerebral pathological condition not covered in absolute contraindication
- Current use of anticoagulant
- Traumatic or prolonged CPR (> 10 m)
- Non-compressible vascular punctures

- Recent major surgery (within 2-4 wks)
- For streptokinase antistreplase: prior exposure (>5 days) or prior allergic reaction
- Pregnancy
- Active peptic ulcer
- Severe thrombocytopenia
- LV thrombus, bacterial endocarditis
- Diabetic hemorrhagic retinopathy
- Suspected infected thrombus
- Severe renal failure or hepatic dysfunction

Clinical determination of successful reperfusion:

Successful therapy is associated resolution of acute ST elevation (partial 50% or complete 75%), transient arrhythmias (AIVR, accelerated idioventricular rhythm) and pain relief (?).

- **Serial assessment of ECG is reliable indicator of reperfusion, AIVR is fairly specific for reperfusion, other arrhythmias can occur but less reliable. The complete resolution of chest pain and ECG changes (>70% resolution of ST-segment elevation), accompanied by run of AIVR is highly specific.*

- ** Resolution of chest pain is inaccurate measure? because pain may be blunted with narcotic analgesia or partial denervation that occur in most of patients with AMI.*

Complication of thrombolytics:

Bleeding, mostly intracranial hemorrhage which occur in 0.5% - 0.7% of patients. The major risk factors for ICH include age >70 ys, HT, low body weight, female, and coagulopathy (e.g., prior coumadin use).

5. Intraaortic balloon pump (IABP) used in treatment of ACS by augmenting of diastolic coronary flow but it is contraindicated in patients with aortic regurgitation.

6. Inotropic agents: But should be avoided as possible as because it increase myocardium oxygen demand and increase the risk of tachycardia and arrhythmias.

7. Implanted cardioverter defibrillators (ICD): reduce the risk of sudden cardiac death in patients with decrease ejection fraction and autonomic dysfunction.

Complications of ACS:

Seen in all forms of ACS. Major mechanical and structural complications are seen only with significant transmural MI.

1. *Arrhythmias*:

In the majority of cases there is transient (may be of no haemodynamic or prognostic importance). Pain relief, rest and the correction of hypokalaemia may help prevent arrhythmias.

A. VF: This occurs in 5–10% of patients and thought to be the major cause of death in those who die before receiving medical treatment. Prompt defibrillation restores sinus rhythm and is life-saving. *VT* may occur also.

B. AF: common, transient, and usually does not require emergency treatment, if it causes a rapid HR with hypotension or circulatory collapse, synchronized DC shock is essential. Digoxin or a BB is the treatment of choice. Anticoagulation is required if AF if persist. *Atrial tacchycardia* may occur also.

C. Bradycardia: not require treatment, but if there is hypotension or haemodynamic deterioration, atropine (0.6–1.2 mg IV) given. AV block complicating inferior MI is usually temporary and often resolves following reperfusion therapy. If there is clinical deterioration due to second-degree or complete AV block, a temporary pacemaker should be considered. AV block complicating anterior infarction is more serious.

2. Ischaemia

Patients who develop recurrent angina at rest or on minimal exertion following an ACS are at high risk and should be considered for coronary angiography.

- Patients with dynamic ECG changes and ongoing pain should be treated with intravenous GPI. Post-infarct angina occurs in up to 50%
- Patients with resistant pain or marked haemodynamic changes should be considered for IABP and emergency coronary revascularization.
- All patients who have received successful thrombolysis should be considered for early (within the first 24 hours) coronary angiography

3. Acute circulatory failure

- Acute circulatory failure usually reflects extensive myocardial damage and indicates a bad prognosis.
- All other complications of MI are more likely to occur when acute HF is present.

4. Pericarditis

- This only occurs following infarction and is particularly common on the second and third days.
- The patient may recognize that a different pain has developed, even though it is at the same site, and that it is positional and tends to be worse or sometimes only present on inspiration.
- A pericardial rub may be audible.
- Opiate-based analgesia should be used.

* **NS**AIDs and steroidal drugs may increase the risk of aneurysm formation and myocardial rupture in the early recovery period, and should be avoided.

* Dressler's syndrome; usually occurs within one to 8 weeks after heart surgery or a heart attack, but it can take up to several months for symptoms to develop. Other names include: Post-myocardial infarction syndrome (about 7%) or Post-cardiac injury syndrome. is characterized by persistent fever, pericarditis and pleurisy, and is probably due to autoimmunity. Treatment with high-dose aspirin.

5. Mechanical complications

- *Rupture of the papillary muscle* can cause acute pulmonary oedema and shock due to the sudden onset of severe MR, which presents with a pansystolic murmur and S3. In the presence of severe regurgitation, the murmur may be quiet or absent. The diagnosis is confirmed by echo and emergency valve replacement may be necessary. Lesser degrees of MR due to papillary muscle dysfunction are common and may be transient.

- *Rupture of the interventricular septum (VSR)* causes left-to right shunting. This usually presents with sudden haemodynamic deterioration with new loud pansystolic murmur radiating to the right sternal border, but may be difficult to distinguish from acute MR. Patients with VSR tend to develop right heart failure.

- Rupture of the ventricle may lead to cardiac tamponade and is usually fatal

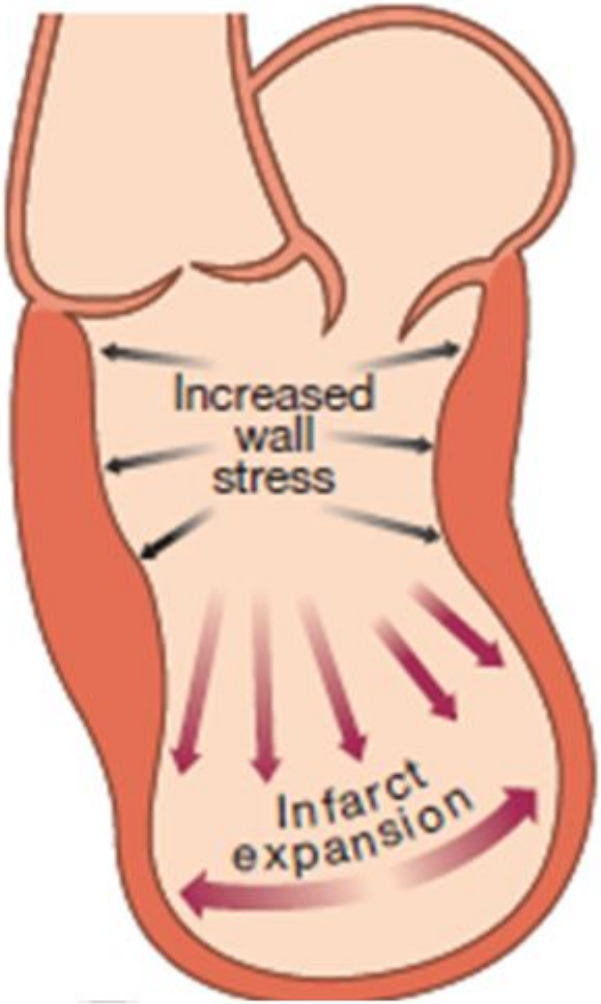
6. Embolism

- Mural thrombus often forms on the endocardial surface of freshly infarcted myocardium.
- This can lead to systemic embolism and occasionally causes a stroke or ischaemic limb.
- Venous thrombosis and pulmonary embolism may occur.

7. Impaired ventricular function, remodeling and ventricular aneurysm

- ✔ Acute transmural MI is often followed by thinning and stretching of the infarcted segment (infarct expansion). This leads to an increase in wall stress with progressive dilatation and hypertrophy of the remaining ventricle (ventricular remodeling)
- ✔ As the ventricle dilates, it becomes less efficient and heart failure may develop.
- ✔ ACE inhibitor and ARBs therapy reduces late ventricular remodeling and can prevent the onset of heart failure.

- ✔ A left ventricular aneurysm develops in approximately 10% of patients with MI.
- ✔ HF, ventricular arrhythmias, mural thrombus and systemic embolism are all recognized complications of aneurysm formation. Other features include a paradoxical impulse on the chest wall, persistent ST elevation on the ECG, and sometimes an unusual bulge from the cardiac silhouette on the chest X-ray.
- ✔ Echocardiography is diagnostic for V aneurym.
- ✔ Surgical removal of a left ventricular aneurysm carries a high morbidity and mortality.



Infarct expansion and ventricular remodelling.

Full-thickness MI causes thinning and stretching of the infarcted segment (infarct expansion), which leads to increased wall stress with progressive dilatation and hypertrophy of the remaining ventricle (ventricular remodelling).

Later in-hospital management

1. Risk stratification and further investigation

Simple clinical tools can be used to identify medium- to high risk patients. GRACE score (to risk stratify patients with diagnosed ACS to estimate their in-hospital and 6-month to 3-year mortality) include:

a. Killip`s classes (class I = no heart failure; class II = crackles audible halfway up the chest; class III = crackles heard in all the lung fields; class IV = cardiogenic shock),

b. SBP

c. HR

d. age

e. serum creatinine

f. ST-segment deviation

g. cardiac arrest at *presentation*

h. elevated cardiac marker…. Total GRACE Score (1 to 372 points)

Score <89: Low risk - Mortality <3%

Score 89-118: Intermediate risk - Mortality 3-8%

Score >118: High risk - Mortality >8%

*2. Left ventricular function (*Echo should undertake to assess EF).

The degree of LV dysfunction can be assessed from physical findings (tachycardia, S3, crackles at the lung bases, elevated venous pressure), ECG changes and CXR.

3. *Ischaemia*

* Patients with early ischaemia following ACS should undergo coronary angiography.
* Low-risk patients without spontaneous ischaemia should undergo TMT approximately 4 weeks after the ACS.

4. Arrhythmias

* The presence of ventricular arrhythmias during the convalescent phase of ACS may be a marker of poor ventricular function and may herald sudden death.

* Recurrent ventricular arrhythmias are sometimes manifestations of myocardial ischaemia or impaired left ventricular function.

Lifestyle and risk factor modification

1. Smoking

Mortality of patients who continue to smoke cigarettes is double that of those who quit smoking at the time of ACS.

2. Hyperlipidaemia

* Lipids should be measured within 24 hours of presentation.
* HMG CoA reductase enzyme inhibitors (statins) can produce marked reductions in total cholesterol (and LDL) and reduce the subsequent risk of death, re-infarction, stroke and the need for revascularization.
* Irrespective of serum cholesterol concentrations, *all patients should receive statin therapy after ACS.*

3. Other risk factors

Maintaining an IBW, eating a mediterranean-style diet, taking regular exercise, and achieving good control of HT & DM, all may improve the long-term prognosis.

Mobilization and rehabilitation

- The necrotic muscle of an AMI takes 4–6 weeks to be replaced with fibrous tissue and it is necessary to restrict physical activities during this period.

- When there are no complications, the patient can mobilize on the second day, return home in 3–5 days and gradually increase activity, with the aim of returning to work in 4–6 weeks.

- The majority of patients may resume driving after 4–6 weeks.

- Emotional problems, such as anxiety and depression, are common and must be treated.

- Rehabilitation programs, based on graded exercise protocols with individual and group counselling, are often very successful .

Secondary prevention drug therapy

1. *Aspirin and clopidogrel*

- Low-dose aspirin therapy reduces the risk of further infarction and other vascular events.
- Clopidogrel should be given in combination with aspirin for at least 3 months up to 1 yr.

2. *Beta-blockers*

- Continuous treatment with an oral BB reduces long-term mortality.
- Minority of patients do not tolerate BB because of bradycardia, AV block, hypotension or asthma.
- Patients with HF, COPD or PAD derive secondary preventive benefits from BB if they can tolerate it.

3. ACE inhibitors

- Should therefore be considered in <u>all</u> patients with ACS.

- Long-term treatment with an ACEI (e.g. enalapril 10 mg twice daily or ramipril 2.5–5 mg twice daily) can counteract ventricular remodeling, prevent the onset of heart failure, improve survival, reduce recurrent MI and decrease re-hospitalization.

- In patients intolerant of ACE inhibitors, ARBA (e.g. valsartan 40–160 mg twice daily or candesartan 4–16 mg daily) are alternatives and better tolerated.

- Patients with acute MI and left ventricular dysfunction (EF< 35%) and either pulmonary oedema or diabetes mellitus are further get benefit from additional mineralocorticoid receptor antagonism (e.g. eplerenone 25–50 mg daily).

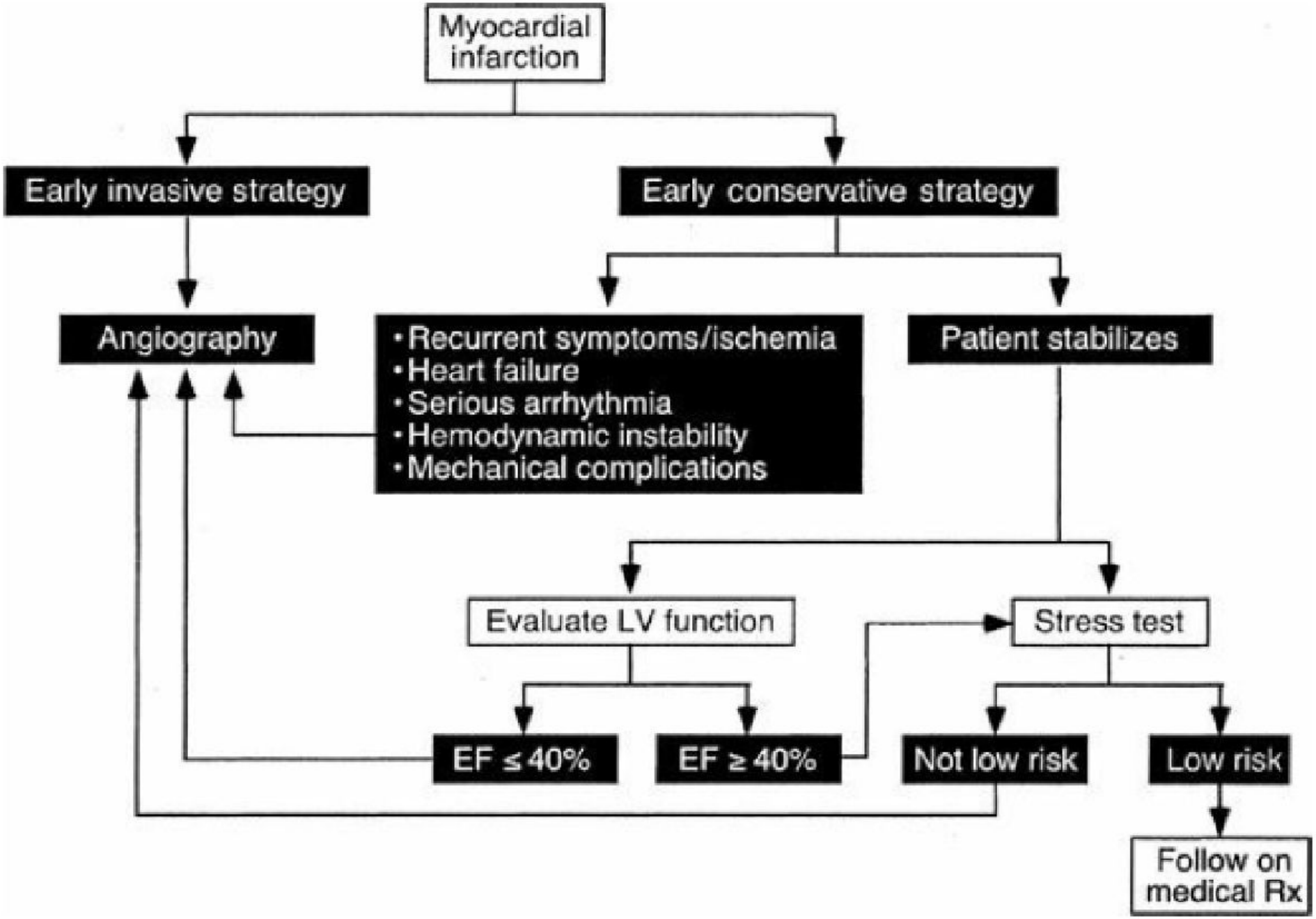
4. Coronary revascularisation

- Coronary angiography should be considered in all patients at moderate or high risk, including those who fail to medical therapy, extensive ECG changes, elevated troponin and those with severe pre-existing stable angina.

5. Device therapy

ICD are of benefit in preventing sudden cardiac death in patients who have severe left ventricular impairment (ejection fraction ≤ 30%) after MI.

Post MI risk stratification:



Prognosis

- In ¼ of all cases of MI, death occurs within a few minutes without medical care.
- Half the deaths occur within 24 hours of the onset of symptoms and about 40% of all affected patients die within the first month.
- Early death is due to an arrhythmia.
- Late outcomes are determined by the extent of myocardial damage, EF, AV block and persistent ventricular arrhythmias.
- Ant. AMI, old age, depression and social isolation are also associated with a higher mortality.


THANK YOU