- **Heart failure**
- Heart failure (HF), also known as congestive heart failure (CHF), defined by (ACC\AHA) as a complex clinical syndrome that can result from any structural or functional cardiac disorder that impairs the ability of the ventricle to fill with or eject blood which leads to blood output insufficient to meet the body requirement.

- Prevalence is 1-3% of the general population and 10% among the elderly population. The prognosis is poor, 25-50% of the patients die within 5 years.

Causes

Heart failure is a symptom complex that is caused by many diseases such as; ischemic heart diseases (the most common cause), congenital heart diseases, hypertension, pulmonary hypertension, pulmonary embolism, myocarditis, infective endocarditis, cardiomyopathies, valvular heart diseases, endocrine diseases, chronic anemia and arrhythmias.

- **Classification**
- The American Heart Association and the American College of Cardiology (AHA/ACC) classify heart failure into 4 stages:(reflecting the fact that HF is a *progressive disease and whose outcome can be modified* by early identification and treatment).
- • **Stage A: patients with risk factors that predispose to HF but with no left ventricular hypertrophy or dysfunction (structural heart disease).**
- • **Stage B: patients with risk factors that predispose to HF with left ventricular hypertrophy or dysfunction but with no symptoms.**
- • **Stage C: patients with past or present symptoms of HF with structural heart disease.**
- • **Stage D: patients with refractory HF who require specialized care.**

- Based on *severity of symptoms and the amount of effort needed to elicit symptoms*, another classification was developed by the New York Heart Association (NYHA); it is complementary to the previous system.

- ✓ **Class I: No limitation of physical activity, no signs or symptoms with ordinary activity.**
- ✓ **Class II: Slight limitation of the physical activity but the patients remains comfortable at rest.**
- ✓ **Class III: Marked limitation of activity but the patients are comfortable at rest.**
- ✓ **Class IV: Symptoms are present at rest and physical activity exacerbates the symptoms.**

- The term **compensated** HF is used when neurohumoral responses eliminate the symptoms while the symptomatic HF is termed as **decompensated** HF.

- **Signs and Symptoms**
- ❖ Dyspnea (perceived shortness of breath).
- ❖ Fatigue and weakness (especially muscular).
- ❖ Orthopnea (dyspnea in recumbent position)
- ❖ Paroxysmal nocturnal dyspnea (dyspnea that awakens patient from sleep)
- ❖ Acute pulmonary edema (cough or progressive dyspnea)
- ❖ Exercise intolerance (inability to climb a flight of stairs)
- ❖ Dependent peripheral edema (swelling of feet and ankles after standing or walking)
- ❖ Report of weight gain or increased abdominal girth (fluid accumulation; ascites)



ORTHOPNEA

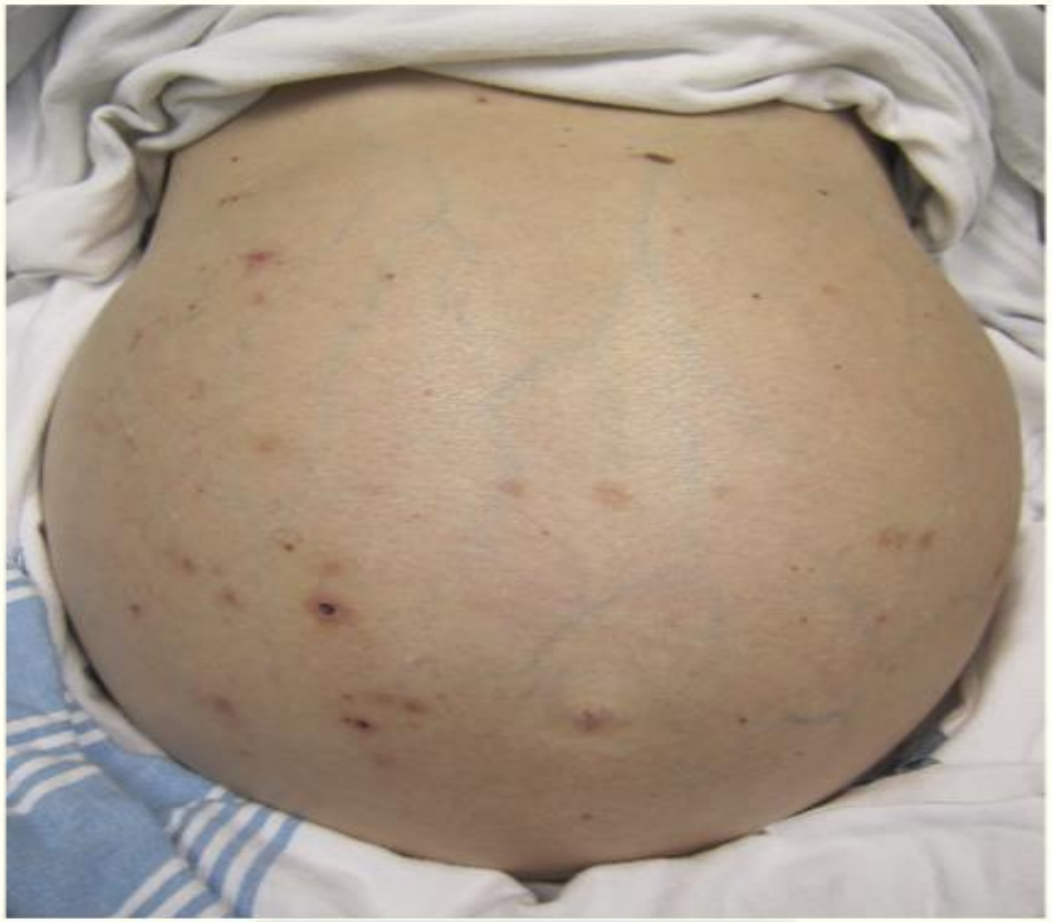
- It refers to dyspnea on supine position
- It results from increase in hydrostatic pressure in lung that occurs in assumption of supine position.
- Sitting up leads to rapid relief of sym







Ascites and Obesity



Ascites (bulging flanks)



Obesity

Images are adapted from wikipedia

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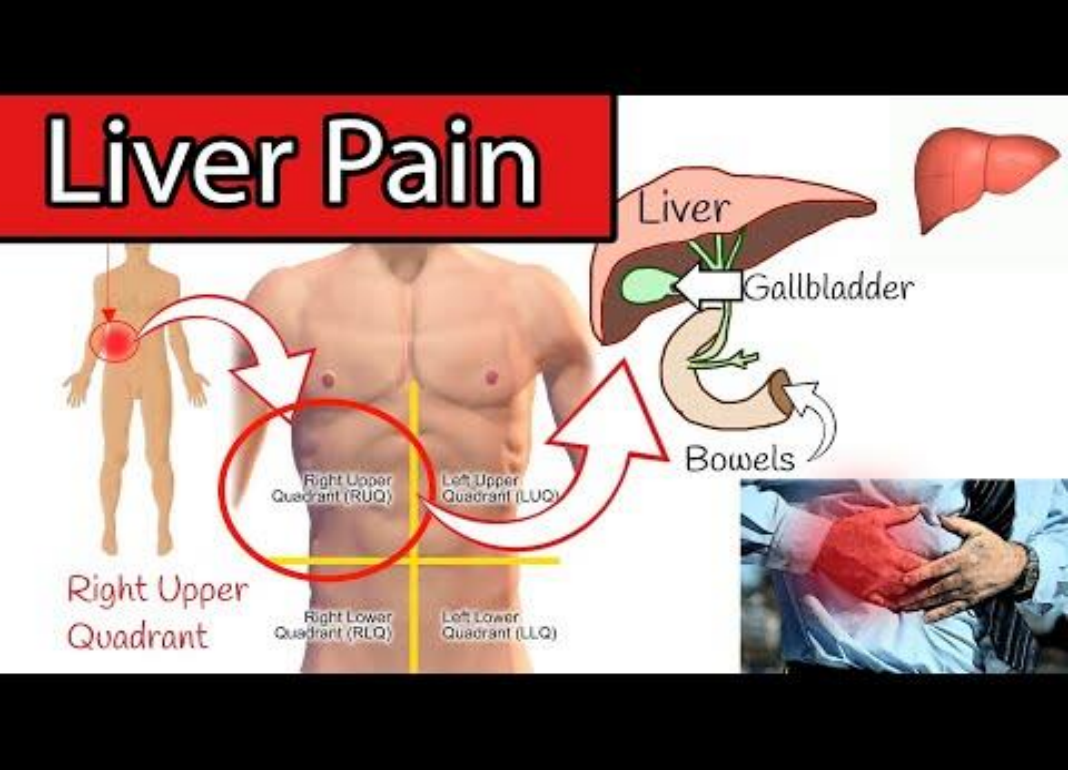
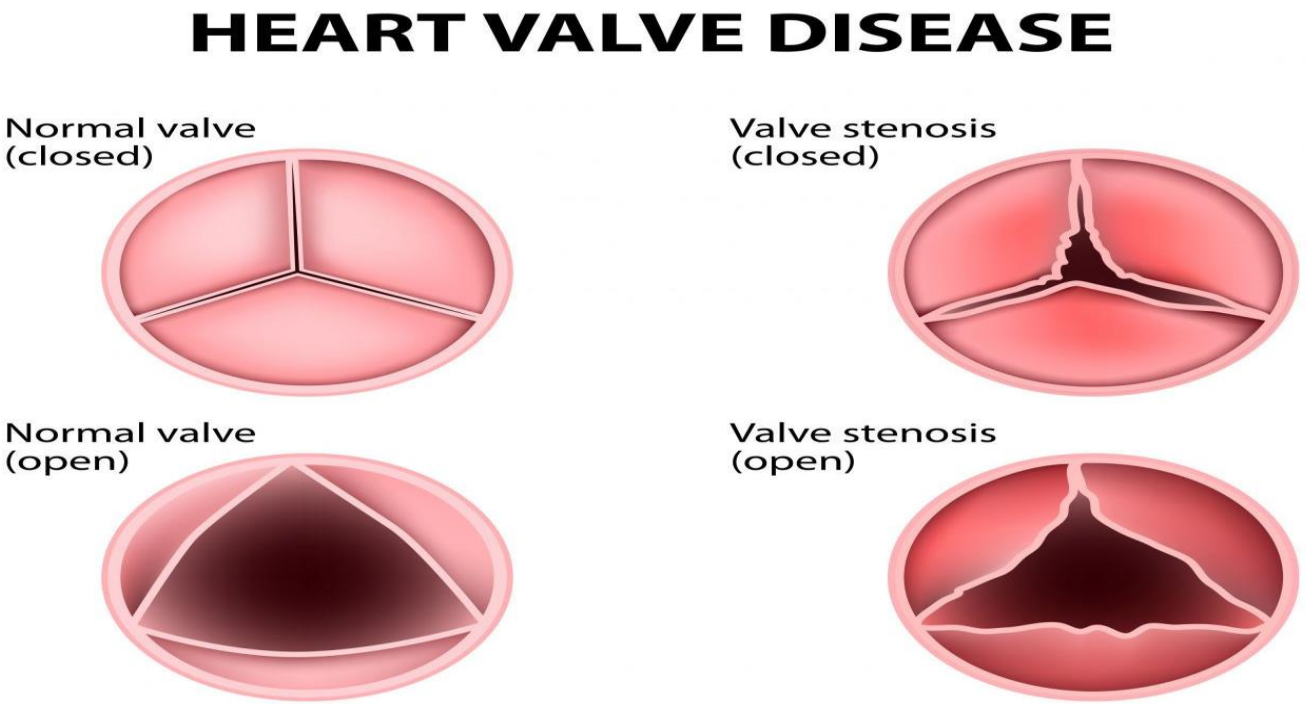
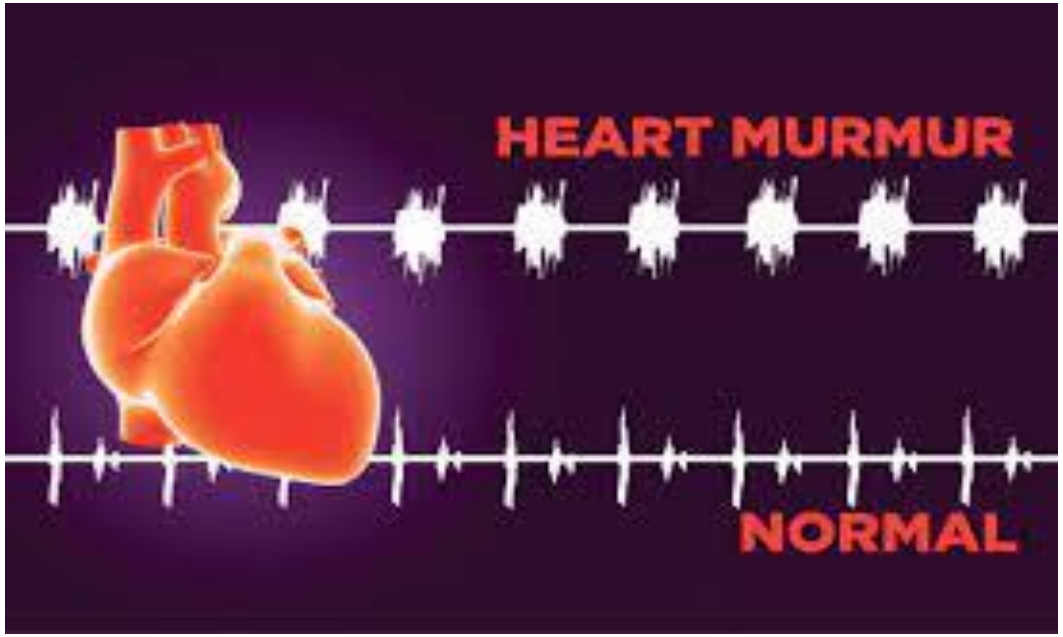
- **Right upper quadrant pain (liver congestion)**
- ❖ **Anorexia, nausea, vomiting, constipation (bowel edema)**
- ❖ **Cheyne-Stokes respiration (hyperventilation alternating with apnea during sleep)**
- ❖ **Heart murmur.**
- ❖ **Increased venous pressure.**
- ❖ **Enlargement of cardiac silhouette on chest radiograph**
- ❖ **Pulsus alternans; a regular rhythm with alternating strong and weak ventricular contractions.**
- ❖ **Distended neck veins.**
- ❖ **Cyanosis**
- ❖ **Clubbing of fingers**


Liver Pain
Liver
Gallbladder
Bowels
Right Upper Quadrant (RUQ)
Left Upper Quadrant (LUQ)
Right Lower Quadrant (RLQ)
Left Lower Quadrant (LLQ)
Right Upper Quadrant


HEART VALVE DISEASE
Normal valve (closed)
Valve stenosis (closed)
Normal valve (open)
Valve stenosis (open)


HEART MURMUR
NORMAL


MAHKOTA
Heart Murmur
(Valvular Lesion) Symptoms
Bluish skin
Chest pain or tightness
Dizziness or weakness
Palpitations
Shortness of breath
Chronic cough



FIGURE 1

Enlarged cardiac silhouette on chest x-ray



Prior sternotomy wires (small arrows) are noted from remote mitral valve replacement surgery (large arrow), approximately 30 years prior.

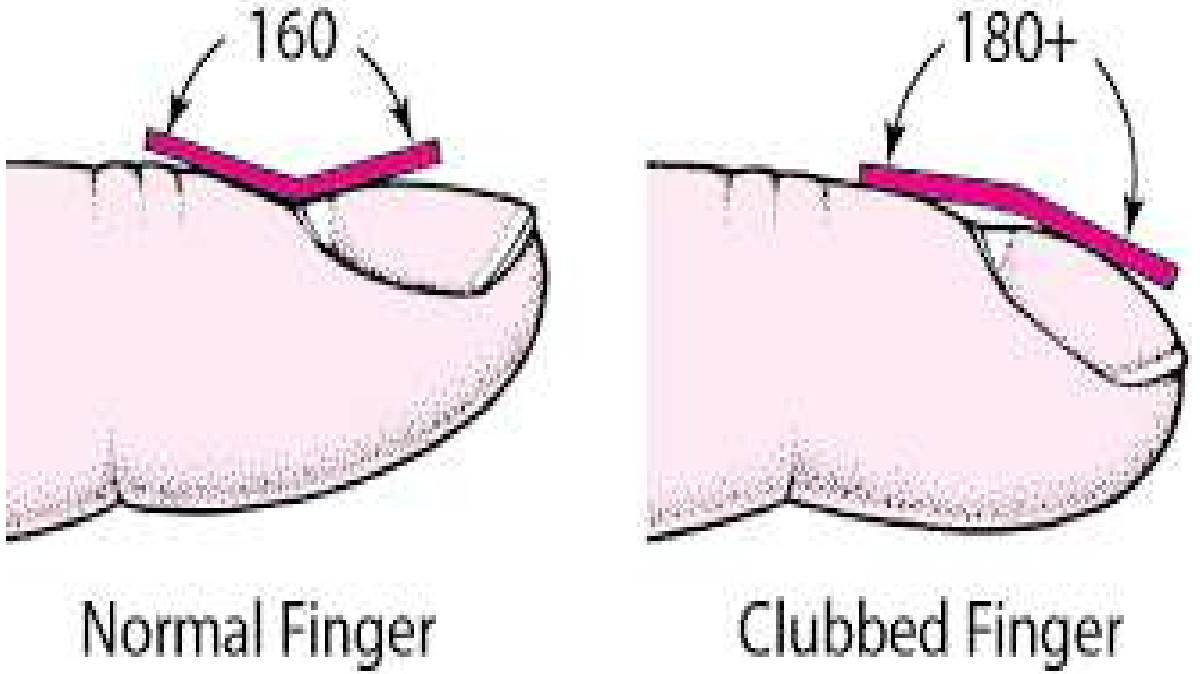





source: wikipedia.org






160
180+
Normal Finger
Clubbed Finger

- **Diagnosis**

- Heart failure is diagnosed clinically and by chest radiography (cardiomegaly), echocardiography, ECG and biochemistry. Echocardiography determines the **stroke volume** (SV; the amount of blood that exits the ventricles with each heartbeat), the **end-diastolic volume** (EDV; the amount of blood at the end of diastole), and the SV in proportion to the EDV (the **ejection fraction**; EF).
- Normally, the EF should lie between 50 and 70% but, in cardiac failure, it is < 40%.

- **Management**
- **The management depends on the stage (NYHA) of the disease, but the general lines of treatment are:**
- □ General measures; rest, control of stress, salt restriction and controlling hypertension, anemia or any underlying causes.
- □ Angiotensin-converting enzyme inhibitors ACE-I; **like enalapril and lisinopril**.
- □ Angiotensin II receptor blockers; **like losartan and valsartan.**
- □ Vasodilators **like isosorbide dinitrate plus hydralazine.**
- □ Diuretics like **furosemide and spironolactone.**
- □ Digoxin may be helpful when failure is associated with atrial fibrillation.
- □ Supplemental oxygen may be required.
- □ Heart transplantation.

- **Dental management**
- **The risk of treating a patient with symptomatic heart failure is that symptoms could abruptly worsen and result in acute failure, a fatal arrhythmia, stroke, or myocardial infarction.**

- **Identification** of patients with a history of heart failure, those with undiagnosed heart failure, or those prone to developing heart failure is the first step in risk assessment, this is accomplished by obtaining a thorough medical history, including a pertinent review of systems, and measuring and evaluating vital signs (i.e., pulse rate and rhythm, blood pressure, respiratory rate).

- ➢ For patients with symptoms of **untreated or uncontrolled heart failure**, defer elective dental care and refer to physician.

- ➢ For **patients diagnosed and treated for heart failure**:

- ✓ Confirm status with patient or physician
- ✓ Identify underlying cardiovascular disease (i.e., coronary artery disease, hypertension, cardiomyopathy, valvular disease), and manage appropriately.

- ✓ New York Heart Association (NYHA) class I patients (asymptomatic), routine care can be provided.

- ✓ NYHA class II (and some class III patients), obtain consultation with physician for medical clearance and provide routine care.

- ✓ NYHA (some class III and class IV) patients obtain consultation with physician; consider treatment in a special care or hospital setting.

- ➢ **Drug considerations**:
- ✓ For patients taking digitalis, avoid adrenalin; if considered essential, use cautiously (maximum 0.036 mg adrenalin or 0.20 mg levonordefrin), which is no more than 2 cartridges containing 1:100.000 adrenalin or 1: 20.000 levonordefrine with care to avoid intravascular injection; avoid gag reflex; avoid erythromycin and clarithromycin, which may increase the absorption of digitalis and lead to toxicity.

- ✓ For patients with NYHA class III and IV congestive heart failure, avoid use of vasoconstrictors; if use is considered essential, discuss with physician.

- ✓ Avoid adrenalin-impregnated retraction cord.
- ➢ Schedule **short, stress-free** appointments.
- ➢ Use **semisupine or upright** chair position.
- ➢ Watch for **orthostatic hypotension**, make position or chair changes slowly, and assist patient into and out of chair.
- ➢ **Avoid the use of nonsteroidal anti-inflammatory drugs** (NSAIDs) because they can exacerbate symptoms of heart failure.
- ➢ Watch for **signs of digitalis toxicity** (tachycardia, hypersalivation, visual disturbances) which if it occurs the patient must be referred to physician promptly.
- ➢ **Nitrous oxide/oxygen sedation** may be used with a minimum of 30% oxygen.
- ➢ The dentist should be **aware** that even these HF patients with NYHA **class I should not be considered "mild"** because they indeed could be decompensated during dental treatment.

- **Oral manifestations**
- **No oral manifestations are related to heart failure** but some drugs can cause:

- **Dry mouth** in patients taking diuretics or vasodilators.
- **Angioedema** of lip, face, or tongue, taste changes, burning mouth in patients taking ACE inhibitors.
- **Lichenoid reactions** in patients taking ACE inhibitors and Beta blockers.
- **Increased gag reflex and hypersalivation** in patients taking Digitalis.
- **Lupus like lesions** and lymphadenopathy in patients taking vasodilators.













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- **Cardiac Arrhythmias**

- Arrhythmia is simply defined as disturbance of heartbeat including disturbance rhythm, rate or conduction pattern of the heart, in which there is abnormal electrical activity in the heart.
- 15-17% of the population may have arrhythmias and the prevalence increases with age.
- It has been shown that potentially fatal arrhythmias can be precipitated by strong emotion such as anxiety or anger, as well as by various drugs, both of which can be precipitated by dental treatment.

- **Causes;** are broadly classified as:
- **Cardiac**; as in MI, mitral valve diseases, cardiomyopathy, pericarditis, or aberrant conduction pathways.
- **Non-cardiac**; caffeine, smoking, alcohol, fever, respiratory, autonomic, endocrine diseases, hypoxia or electrolyte disturbances. Surgery is sometimes implicated.

- **Classification**
- They are classified according to:
- **Rate** into: tachycardia and bradycardia.
- **Mechanism** into: automaticity, re-entry and fibrillation.
- **Site of origin** into: supraventricular and ventricular arrhythmias.

- **Clinical features**

- **Signs** include; slow (less than 60 beat/min) or fast (more than 100 beat/min heart rate, irregular rhythm.

- **Symptoms** include; palpitation, fatigue, dizziness, syncope, angina pectoris, dyspnea and those related to congestive heart failure (e.g., Shortness of breath, Orthopnea, Peripheral edema).

- The primary tool for diagnosis of arrhythmia is electrocardiogram (ECG).

- **Medical management**

- **Physical maneuvers**. In supraventricular arrhythmias, pressure on the neck may increase parasympathetic stimulation to the heart inhibiting electrical conduction through the AV nodes.

- **Antiarrhythmic drugs**; these are divided into 4 classes: *class I* are sodium channel blockers, *class II* drugs are beta blockers, *class III* drugs act on potassium channels and prolong the duration of action potential, while *class IV* drugs are calcium channel blockers.

- **Oral Anticoagulant (OAC) Therapy:** Patients who have AF are at increased risk for stroke and thromboembolism. To reduce this risk, the American Heart Association (AHA) recommends OAC therapy.

- **Defibrillation or cardioversion**:
- **Pacemakers**. Which is a subcutaneously implanted generator in the left infraclavicular area, it produces an electrical impulse that is transmitted by a lead inserted into the heart via subclavian vein to an electrode in contact with endocardial or myocardial tissue.
- **Implanted cardioverter-defibrillator** (ICD) which is similar to pacemaker. Both are subject to electromagnetic interferences (EMI). ICDs are capable not only of delivering a shock but also of providing
- antitachycardia pacing (ATP) and ventricular bradycardia pacing.
- **Radiofrequency catheter ablation**. In which a catheter is introduced through the vein to the area which is the source of arrhythmia, radiofrequency energy is then delivered that cause irreversible tissue destruction.
- **Surgery.** **Anticoagulants.**

- **Dental management**
- Stress associated with dental treatment or excessive amounts of injected adrenalin may lead to life threatening cardiac arrhythmias in susceptible dental patients.

- The keys to successful dental management of patients prone to developing a cardiac arrhythmia and those with an existing arrhythmia are **identification and prevention.**

- **Patients with cardiac arrhythmias may be identified by the following:**
- Medical history to identify: type of arrhythmia, treatment, presence of pacemaker or defibrillator and stability. The dentist may need to consult with physician to obtain or verify this information
- Risk for arrhythmia is increased in the presence of other cardiovascular or pulmonary disease
- Patient does not report an arrhythmia, but may be taking one or more of the antiarrhythmic drugs
- The presence of symptoms that could be caused by arrhythmias.
- Vital signs are suggestive of arrhythmia (rapid pulse rate, slow pulse rate, irregular pulse)

- Refer patient to physician if signs or symptoms are present that are suggestive of a cardiac arrhythmia or other cardiovascular disease
- □ Cardiac arrhythmias that may be associated with **major perioperative risk** during dental treatment include:

- □ High-grade atrioventricular (AV) block.
- □ Symptomatic ventricular arrhythmias in the presence of underlying heart disease.
- □ Supraventricular arrhythmias with uncontrolled ventricular rate.

- **Elective dental treatment is avoided in such cases, only urgent care is provided and preferably in hospital, the following should be considered:**
- Consult with physician.
- Provide limited care only for pain control, treatment of acute infection, or control of bleeding.
- Intravenous line.
- Sedation
- Electrocardiogram (ECG) monitoring
- Pulse oximeter
- Blood pressure monitoring
- Avoid or limit adrenalin.

- Other types of cardiac arrhythmias are associated with **intermediate or minor perioperative risk** during dental treatment in such cases elective dental treatment is allowed.

- ➢ **Stress and anxiety reduction**
- ✓ **Establish good rapport.**
- ✓ **Schedule short, morning appointments.**
- ✓ **Ensure comfortable chair position.**
- ✓ **Provide preoperative sedation (short-acting benzodiazepine night before and/or 1 hour before appointment).**
- ✓ **Administer intraoperative sedation (nitrous oxide/oxygen).**
- ✓ **Obtain pretreatment vital signs.**
- ✓ **Ensure profound local anesthesia.**
- ✓ **Provide adequate postoperative analgesia.**

- ➢ **The use vasoconstrictors**
- ✓ The use of vasoconstrictors in local anesthetics poses potential problems for patients with arrhythmias because of the possibility of precipitating cardiac tachycardia or another arrhythmia.
- A local anesthetic without vasoconstrictor may be used as needed.

- ✓ If a vasoconstrictor is deemed necessary, patients in the low- to intermediate-risk category and those taking nonselective beta-blockers can safely be given up to 0.036 mg of epinephrine (two cartridges containing 1: 100,000 epinephrine); intravascular injections should be avoided.
- Greater quantities of vasoconstrictor may well be tolerated, but increasing quantities are associated with increased risk for adverse cardiovascular effects.

- ✓ Vasoconstrictors should be avoided in patients taking digoxin because of the potential for inducing arrhythmias.

- ✓ For patients at major risk for arrhythmias, the use of vasoconstrictors should be avoided, but if their use is considered essential, it should be discussed with the physician.

- ✓ Avoid the use of adrenalin in retraction cord.

- ➢ **Patients who are taking Warfarin:**
- ✓ Should have current international normalized ratio (INR) (within 24 hours of surgical procedure).

- ✓ If INR is within the therapeutic range (INR, 2.0-3.5), dental treatment, including minor oral surgery, can be performed without stopping or altering the drug.

- ✓ Local measures include gelatin sponge or oxidized cellulose in sockets, suturing, gauze pressure packs, preoperative stents, and tranexamic acid or aminocaproic acid mouth rinse and/or to soak gauze.

- ➢ Patients with pacemakers:

- ✓ Antibiotic prophylaxis to prevent bacterial endocarditis is not recommended

- ✓ *Avoid the use of* **electrosurgery and ultrasonic scalers.**

- ➢ Patients taking Digoxin

- ✓ Watch for signs or symptoms of toxicity (e.g., hypersalivation)

- ✓ Avoid adrenalin or levonordefrine