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Medical Management of the Surgical Patient with Cardiovascular Disorder

Heart failure

Heart failure can be defined as insufficient contractile activity of the heart muscle with resultant inadequate cardiac output. This can lead to hypoperfused organ and fluid accumulation in lungs, liver and peripheral tissue.

Aetiology of heart failure (Findler *et.al.*, 2013):

1. Coronary artery disease
2. Untreated hypertension
3. Cardiomyopathies
4. Rheumatic heart disease
5. Congenital heart malformation
6. Toxic agents

American College of Cardiology Foundation/American Heart Association (ACCF/AHA) heart failure staging system

Stage	Description	Example
A	**At high risk** for heart failure but without structural heart disease or symptoms of heart failure	Patients with coronary artery disease, hypertension.
B	Structural heart disease **but without** signs/symptoms of heart failure	Patients who are asymptomatic but who have left ventricular hypertrophy and/or impaired left ventricular function.
C	Structural heart disease **with** current or past symptoms of heart failure	Patients with known structural heart disease and symptoms of shortness of breath, fatigue and reduced exercise tolerance.
D	**Refractory** heart failure requiring specialized interventions	Patients who have marked symptoms at rest despite maximal medical therapy.

General Sign and Symptom of patients having heart failure (Stage C and D) (Steinhauer *et.al.*, 2005)

1. Dyspnoea on mild exercise.
2. Fatigue.
3. Cough and dyspnoea when patient lay flat.
4. Abdominal swelling secondary to ascites (accumulation of fluid in peritoneal cavity).
5. Pitting edema of lower extremities.

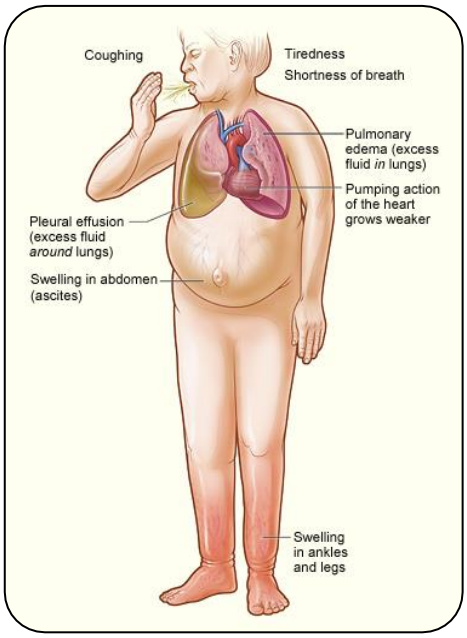

Figure 1 General Sign and Symptom of patients having heart failure (By National Institutes of Health)

Oral manifestations caused by the drugs used for heart failure (Cruz-Pamplona *et.al.*, 2011)

1. Angiotensin converting enzyme inhibitors (e.g. captopril) can cause Lichenoid drug reaction, burning mouth sensation and a loss of taste sensation.
2. Diuretics (e.g. furosemide) can produce xerostomia.

Dental consideration for management of heart failure patients

The dentist needs to consult the supervising physician to establish the current status of the patient (Compensated or Decompensated heart failure) and any prescribed medications. In compensated heart failure (stage A, B and some of stage C) the patient condition is stable, well controlled and symptoms are absent. In decompensated heart failure (Stage D and some of stage C) symptom of pulmonary edema and fatigue and dyspnoea are present (Millane *et.al.*, 2000).

1. Dental management for compensated patients (Cruz-Pamplona *et.al.*, 2011)

1. Short early appointment (Maximum of 30 Minutes).
2. Anxiety and stress should be avoided.
3. Patient should be placed in the semi-supine position (to prevent fluid redistribution into the lungs and precipitate dyspnoea).
4. Avoid postural hypotension with slow adjustment of back rest.
5. Patient taking Digoxin should have a maximum of 2 cartridges of LA with 1:100,000 epinephrine, as the digoxin can interact with the vasoconstrictor and precipitate arrhythmias.
6. NSAID can lead to sodium and fluid retention, and therefore should not be prescribed in patients with heart failure.

2. Dental management for decompensated patients

For stage C, elective treatment is best differed till the patient has been treated and is well compensated and any emergency treatment is done in hospital setting (Kalantzis and Scully, 2010).

For stage D, one recommendation is to avoid any surgical intervention and manage all conditions by palliation with analgesics and antibiotics treatment (Scully ,2010). Other management protocol suggested a three-level gradual approach for providing emergency treatment for those patients. The three levels included (Findler *et.al.*, 2013):

1. Home level: This included premedication of anxiolytics (Oxazepam 10mg) and diuretics (Furosemide).
2. Waiting room level: This includes patient monitoring by ECG, blood pressure, pulse rate, pulse oximetry and preparation of venous line.
3. Dental chair level: The patient is seated in up-right position to prevent pulmonary edema, oxygen administration and continuous monitoring throughout the procedure.

Emergency treatment of acute heart failure

Acute heart failure cause sudden transitions of fluid from the blood vessels into the lungs, resulting in acute pulmonary edema with sever dyspnoea. The patient in this case is in panic, unable to talk, have productive cough, wheezy chest and the respiratory rate will be doubled. Cyanosis will be apparent and if untreated cardiac arrest will occur.

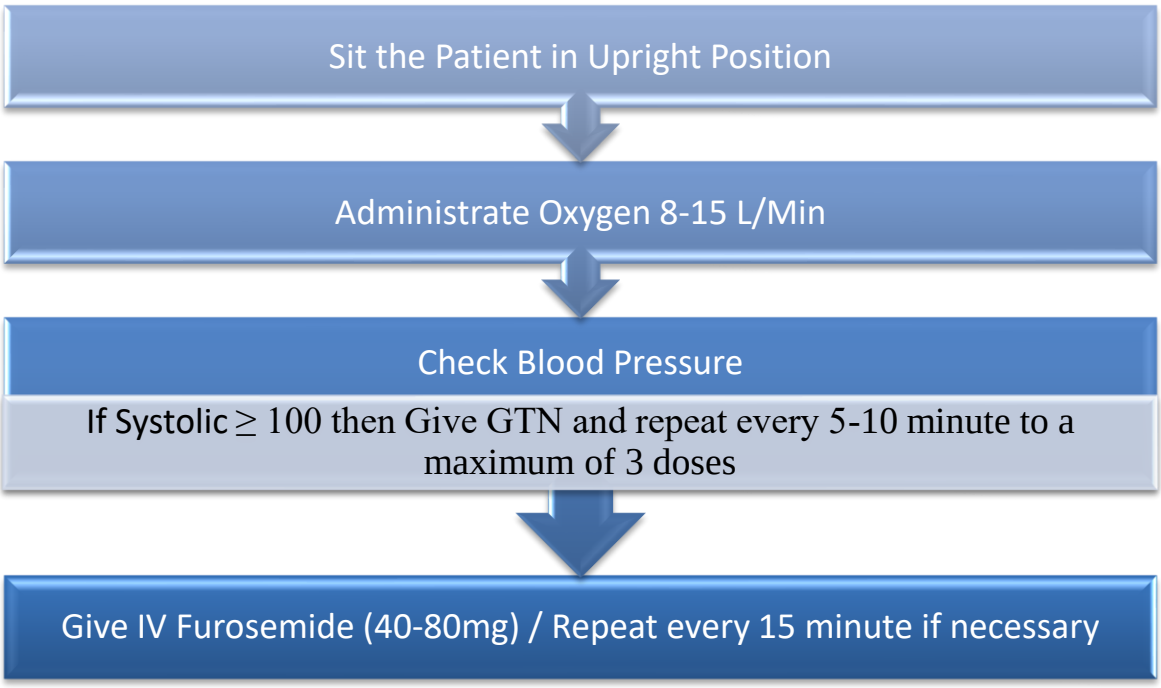

Figure 2 Emergency management of acute heart failure

Cardiac arrhythmias

A dysrhythmia describes any abnormality in the **rate**, **regularity** or **site** of origin of the cardiac impulse, or where there is a **disturbance in the conduction** of that impulse such that the normal sequence of atrial and ventricular activation is altered.

Causes of cardiac arrhythmias

1. Cardiovascular disorder
2. Pulmonary disorder (e.g. embolism, hypoxia, chronic obstructive pulmonary disease).
3. Systematic disorder (e.g. thyroid disease)
4. Drug-related side effects

Clinical manifestation of cardiac arrhythmias

1. Change in rhythm and rate of heart pulse
2. Fatigue
3. Dizziness
4. Syncope
5. Angina pectoris

ECG is needed to identify the true nature of the arrhythmias.

Dental considerations for patients having cardiac arrhythmias (Rhodus and Little, 2003)

Dentists are required to obtain detailed medical history to evaluate the current health status of the patient. Any suspected sign and symptom of cardiac arrhythmias require consultation with the patient's physician before providing any dental treatment. Patient with systematic conditions (e.g. advanced heart disease, chronic pulmonary disease, thyroid disease) must be accurately evaluated for any cardiac arrhythmias. If their status is not clear, medical consultation should be obtained.

The type of the cardiac arrhythmias can help to predict the associated cardiovascular risk (e.g. myocardial infarction, heart failure and death) for providing dental treatment (Table.1).

The minor predictors are associated with low risk for developing cardiac complications. However, those patients still require special precautions including:

- **Anxiety reduction protocol:**
    1. Premedication with benzodiazepines (e.g. Diazepam 5 -10 mg)
    2. Good communication skills with the patient
    3. Short morning or early afternoon appointment.
    4. Use of sedation if needed (I.V. or inhalation sedation)
- **Avoid excessive amount of epinephrine:**
    1. Use no more than 3 cartridges of local anaesthesia with epinephrine.
    2. Do not use gingival pack with epinephrine.
- **Determine if the patient on anticoagulant therapy:**

  Patients with certain arrhythmias (e.g. atrial fibrillation) might be on warfarin, which require INR measurements prior to any invasive procedure to determine their risk for post-operative bleeding. Those need to be managed as discussed previously.
- **Determine if the patient on Digoxin and any suspected toxic side-effects of this medication:**
    1. Medical consultation with prescribing physician, to establish the dosage of digoxin (digoxin toxicity associated with dosage greater than 2.5 ng/mL).
    2. Avoid use of erythromycin, as it increases digoxin absorption and toxicity.
    3. Patient assessment for digoxin toxicity, which affects the body in three systems:
        - Gastrointestinal (nausea, hypersalivation)
        - Neurological (fatigue, visual disturbance, headache)
        - Cardiovascular (arrhythmias)
- **Establish if the patient have pacemaker fitted and manage accordingly.**

Table 1 Clinical predictors of an increased cardiovascular risk during non-cardiac surgery

Major Risk	Minor Risk
• High grade AV block • Symptomatic Ventricular arrhythmias • Supraventricular arrhythmias with uncontrolled ventricular rate	• Rhythms other than sinus (atrial fibrillation)

The major predictors are associated with higher cardiovascular risks (e.g. myocardial infarction, heart failure and death). For this group of patients only emergency treatment is provided by using LA without vasoconstrictors.

Dental considerations for patients having a fitted pacemaker or implantable cardioverter defibrillator (ICD)

1. **Identify the type of pacemaker or ICD:** Older models usually are very susceptible to electromagnetic field; on the other hand, newer models have better shielding from external stimuli (Jowett and Cabot, 2000).

2. **Avoid the use of dental equipment with electric and electro-mechanical signal:** These equipment might interfere with normal function of the pacemaker or ICD, including electrosurgery units, electronic apex locators, ultrasonic scalers, and even ultrasonic cleaning baths and their use is contraindicated near those patients with all types of pacemaker. Older models are even affected by pulp testers and motorized dental chairs (Jowett and Cabot, 2000).

3. **No need for antibiotic prophylaxis:** Current scientific evidence DOES NOT recommend the regular prescription of antibiotics for those patients, as they are considered to have a low risk of infective endocarditis (Cruz-Pamplona, 2011).

Emergency management for patients developing cardiac arrhythmias in dental office (Cruz-Pamplona, 2011)

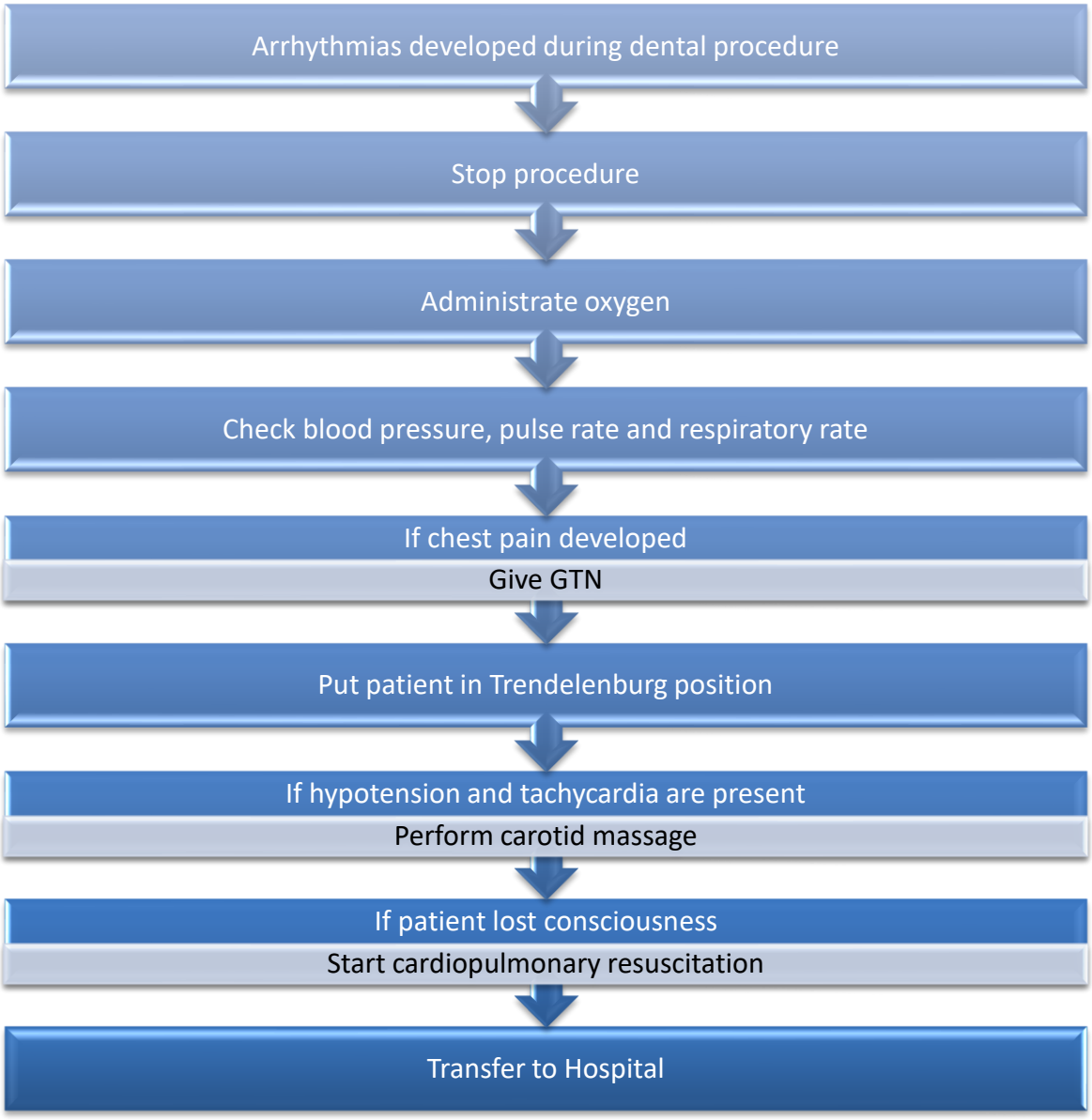

Figure 3 Emergency management for patients developing cardiac arrhythmias in dental office

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