Cardiovascular system II

**Hypertension**

Arterial hypertension affects almost 1 billion of adults worldwide. It is the leading cause of death in the world, the most common cause for an outpatient visit to a physician, and the most easily recognized treatable risk factor for stroke, myocardial infarction, heart failure, peripheral vascular disease, aortic dissection, atrial fibrillation, and end-stage kidney disease.

Currently, fewer than one in two patients with hypertension have their blood pressure (BP) treated and controlled to below 140/90 mm Hg. For this reason, hypertension remains one of

the world’s great public health problems.

Because most cases of hypertension cannot be cured, BP control requires lifelong treatment with prescription medications, which can be costly and may cause more symptoms than the underlying disease process.

***Hypertension is defined as a systolic blood pressure (SBP) of 140 mm Hg or more, or a diastolic blood pressure (DBP) of 90 mm Hg or more, or taking antihypertensive medication.***

***Aetiology***

In more than 95% of cases, a specific underlying cause of hypertension cannot be found. Such patients are said to have essential hypertension. The pathogenesis of this is not clearly understood. Many factors may contribute to its development, including renal dysfunction, peripheral resistance vessel tone, endothelial dysfunction, autonomic tone, insulin resistance and neurohumoral factors.

In about 5% of cases, hypertension can be shown to be a consequence of a specific disease or abnormality leading to sodium retention and/or peripheral vasoconstriction.

Causes of secondary hypertension include:

**1- Alcohol 2- Obesity 3- Pregnancy (pre-eclampsia)**

**4- Renal disease**

• Renal vascular disease • Polycystic kidney disease

• glomerulonephritis

**5- Endocrine disease**

• Phaeochromocytoma • Cushing’s syndrome • Acromegaly

• Primary hyperaldosteronism (Conn’s syndrome)

**6- Drugs**

- Oral contraceptives containing oestrogens - anabolic steroids

- corticosteroids - NSAIDs

**Clinical features**

A patient with hypertension could be asymptomatic or may present with one or more of the following:

1- headache, visual problems, tinnitus, dizziness, or epistaxis.

2- symptoms related to complications of hypertension:

 A- stroke B- myocardial infarction C- heart failure

 D- chronic kidney disease E- retinopathy

 F- peripheral vascular disease

3- Malignant (accelerated) hypertension: severe hypertension (180/110 mmHg) or hypertension with rapid rate of raising BP with features of target organs (cardiovascular, kidney, or brain) damage with papilledema. The most serious complication is hypertensive encephalopathy which presented with severe headache, nausea, vomiting, confusion, convulsions, and coma which needs hospital admission and intravenous antihypertensive medication to reduce blood pressure within minutes.

4- Urgent hypertension: Urgency is defined as severely elevated BP (ie, systolic BP >220 mm Hg or diastolic BP >120 mm Hg) with no evidence of target organ damage.

5- Clinical features of secondary causes.

**Classification of hypertension**



**Investigation**

Investigation is helpful to identify evidence of complication and exclude causes of

secondary hypertension or any associated medical conditions.

Required investigations include:

1- CXR 2- ECG

3- Renal function tests (blood urea, serum creatinine and GUE)

4- Plasma electrolytes (K, Na, Ca)

4- Lipid profile

**Treatment**

1- Life style modiﬁcation (decrease weight, exercise, restriction of salt and caffeine, and stop smoking).

2- Drugs

 A- Angiotensin converting enzyme inhibitors ACEIs- (captopril, Lisinopril, enalapril)

 B- Angiotensin receptor blockers ARBs- (losartan, valsartan, candesartan)

 C- Beta-blockers- (atenolol, metoprolol, bisoprolol)

 D- Calcium-channel blockers- (amlodipine, nifedipine, diltiazem)

 E- Diuretics- (thiazide, frusemide)

 F- Alpha blockers- (prazosin)

 G- Sympatholytics- (methyldopa).

Clinical tips

- Many antihypertensive drugs have orofacial side effects: hyposalivation, gingival swelling, salivary gland swelling or pain, angioedema, erythema multiforme, lichenoid

reactions, sore mouth, and paraesthesia.

- According to American Society of Anesthesiologists (ASA) to organize the dental care:

1. Grade I: B.P systolic &/or diastolic < 140 / 90 n1mHg: start routine dental care,

2. Grade II: B.P systolic &/or diastolic = 140 — 159 / 90 — 95 mmHg: recheck B.P before

and during routine dental care.

3. Grade III: B.P systolic &/or diastolic = 160 — 179 / 95 — 109 n1mHg: recheck B.P

before and during routine dental care, adrenaline restriction, and conscious sedation or

sedative premedication (temazepam) 1 hour before the surgical procedure.

4. Grade IV: B.P systolic &/or diastolic > 180 / 110 mmHg: avoid routine dental care

until BP is controlled unless acute emergency intervention required, then the dentist

should check B.P every 5 minutes, rest the patient, seek medical advice and schedule the

treatment in the hospital to manage any possible sudden increase in arterial pressure.

 - LA with or without vasoconstrictor should not be given in large doses to hypertensive

on beta-blockers since interactions between LA and BBs may induce hypertension

and cardiovascular complications.

- LA with vasoconstrictor is contraindicated if systolic&/or diastolic > 200/115 mmHg.

- Avoid adrenaline containing gingival retraction cords.

- Avoid sudden raising the patient from supine position.

- Facial palsy is a possible complication of hypertension.

- The dentist is not meant to administer emergency antihypertensive agents except in

case of repeated acute pulmonary edema where intravenous furosemide (Lasix) is

indicated and avoid sublingual nifedipine to decrease BP rapidly as it may result in MI or CVA.

**Orthostatic hypotension**

Orthostatic hypotension is defined as a decrease in systolic blood pressure of 20 mm Hg or a decrease in diastolic blood pressure of 10 mm Hg within three minutes of standing when compared with blood pressure from the sitting or supine position.

It results from an inadequate physiologic response to postural changes in blood pressure. Orthostatic hypotension may be acute or chronic, as well as symptomatic or asymptomatic. Common symptoms include dizziness, lightheadedness, blurred vision, weakness, fatigue, nausea, palpitations, and headache. Less common symptoms include syncope, dyspnea, chest pain, and neck and shoulder pain.

**Causes**

Diabetes, antihypertensive drugs, prolonged bed rest, pregnancy, parkinsonism, vitamin B deﬁciency, alcoholism, aging, and autonomic system failure (idiopathic orthostatic hypotension).

**Preventive measures in dental clinic**

- Careful medical history.

- Blood pressure monitoring in upright and sitting positions.

- Avoid sudden changes in chair position from horizontal to upright position.

**Congenital Heart Disease (CHD)**

Congenital heart defects are the most common group of birth defects, occurring in

approximately 9 of 1000 live births. Most adults with congenital heart disease need lifelong follow-up even the simplest lesions can be associated with long-term cardiac complications.

They represent a group of diseases with structural defects of the heart &/or great vessels leading to malfunction like arrhythmias or ﬂow problems.

They may be cyanotic with right to left blood shunt or acyanotic. Cyanosis is a bluish or purplish tinge of the skin and mucous membranes, it occurs when the unoxygenated hemoglobin in the capillaries exceeds 5 g/dL.

**Complication of CHD include:**

Heart failure, polycythemia, hypercoagulability, systemic infection (brain abscess and endocarditis), and growth retardation.

**Causes**

1- genetic abnormalities (e.g. Down's syndrome)

2- maternal infections (TORCH: Toxoplasmosis, Rubella, Cytomegalovirus, Herpes, HIV)

3- maternal drugs (alcohol, warfarin, anticonvulsant)

4- maternal disease (SLE, DM)

5- maternal irradiation.

**Classification of CHD**

I- Cyanotic

 1- Tetralogy of Fallot (TOF) 2- Pulmonary atresia (PA)

 3- Pulmonary valve stenosis 4- Transposition of great vessels

 5-Tricuspid atresia (TA)

2- Acyanotic

 A- Without shunt

 1- Aortic stenosis 2- Bicuspid aortic valve

 3- Coarctation of aorta

 B- With left to right shunt

 1- Atrial septal defect ASD 2- Ventricular septal defect VSD

 3- Patent ductus arteriosus PDA

**Treatment**

- Surgical correction

- Medical treatment for complications such as heart failure or infection.

Clinical tips

Oral abnormalities can be associated with cyanotic CHD include:

- Delayed eruption of both dentitions.

- Positional anomalies.

- Enamel hypoplasia (bluish — white teeth ‘skimmed milk‘ appearance).

- Gross vasodilatation in the pulps

**Arrhythmia**

*Arrhythmia is defined as a variation from normal rhythm which may include abnormalities in rate, rhythm, site of impulse origin, or the sequence of activation.*

Clinically, arrhythmias are classified as bradycardias and tachycardias, with further categorization according to arrhythmia origin.

Arrhythmias are often a manifestation of structural heart disease but may also occur because of abnormal conduction or depolarisation in an otherwise healthy heart.

**A heart rate > 100/min is called a tachycardia and a heart rate < 60/min is called a bradycardia.**

**Examples of the main types of arrhythmias are:**

sinus or supraventricular tachycardia, atrial ﬂutter, atrial ﬁbrillation, ventricular tachycardia, ventricular ﬁbrillation, ectopics (extrasystoles), and heart block.

**Causes**:

1- cardiac disease: e.g. valvular heart disease

2- respiratory disease: e.g. pneumonia

3- endocrinal disorder: e.g. thyrotoxicosis

4- fever,

5- hypoxia

6- electrolyte disturbance: e.g. hyper or hypokalemia

7- alcohol

8- drugs: e.g. erythromycin, digoxin, adrenaline

9- others: anxiety, stress, coffee, and heavy exercise.

**Clinical features**

Bradycardia tends to cause symptoms that reflect low cardiac output: fatigue, lightheadedness and syncope.

Tachycardia causes rapid palpitation, dizziness, chest discomfort or breathlessness. Extreme tachycardia can cause syncope because the heart is unable to contract or

relax properly at extreme rates. Extreme bradycardia or tachycardia can precipitate sudden death or cardiac arrest.

**Treatment**

Various modalities are present for treatment of arrhythmia on both short and long term, these include:

1- valsalva maneuver 2- carotid sinus massage 3- DC cardioversion

4- Drugs (beta-blockers, CCB) 5- Pacemaker 6- Surgery

7- Electrophysiological techniques.

Clinical tips

Patients with AF usually takes anticoagulant.

- Warfarin is the most common anticoagulant used, it has a duration of action of 72 hours, the dose is monitored by measuring PT.

- The newer oral anticoagulants (dabigatran and apixaban), do not require PT for monitoring the patients.

Valvular heart disease

A diseased valve may be narrowed (stenosed) or may fail to close adequately, and thus permit regurgitation of blood.

The principal causes of valve disease are shown in the following table:



**Acute rheumatic fever**

Acute rheumatic fever usually affects children (most commonly between 5 and 15 years) or young adults, and has become very rare in the developed countries.

The condition is triggered by an immune-mediated delayed response to infection with specific strains of group A streptococci, which have antigens that may cross-react with cardiac myosin and sarcolemmal membrane protein. Antibodies produced against the streptococcal antigens cause inflammation in the endocardium, myocardium and pericardium, as well as the joints and skin.

**Clinical features**

Acute rheumatic fever is a multisystem disorder that usually presents with fever, anorexia, lethargy and joint pain, 2–3 weeks after an episode of streptococcal pharyngitis.

There may, however, be no history of sore throat. Arthritis occurs in approximately 75% of patients. Other features include rashes, carditis and neurological changes.

The diagnosis, made using the revised Jones criteria, is based upon two or more major

manifestations, or one major and two or more minor manifestations, along with evidence

of preceding streptococcal infection.



**Investigation**

ASOT, culture of throat swab, CXR, echocardiography, ECG

**Treatment**

1- Bed rest and supportive treatment according to clinical presentation.

2- Aspirin

3- Corticosteroid

4- Prevention of further attack with monthly injection of 1.2 g benzathine penicillin for 5 years or till the age 21 years whichever is longer.

**Infective endocarditis (IE)**

Bacterial or fungal infection of endocardium especially if there is damaged valve, prosthetic valve, CHD, intravenous drug user, or rheumatic carditis.

**Pathophysiology**

Oral viridians streptococci (Streptococcus mutans and sanguis) from dental plaque or other source enter the bloodstream (bacteremia) during chewing, oral hygiene, or dental procedures (e.g. extraction) and then adhere to damaged endocardium.

Other implicated bacteria could be Staphylococcus aureus and enterococci.

**Clinical features**

Fever, night sweat, changing murmur, anemia, arthralgia, hepatosplenomegaly, hematuria, petechiae, retinal hemorrhages, and vasculitis.

**Investigation**

Echocardiography (see the vegetation and assess heart function), blood culture, GUE, ECG, CXR

**Treatment**

Antibiotics (penicillin and gentamycin) or vancomycin.

Surgery for valve damage.

**Dental aspect**

Prophylactic antibiotics is indicated in case of dental procedure associated with bleeding in patient with history of:

1- prosthetic cardiac valve 2- previous IE

3- unrepaired cyanotic CHD 4- repaired CHD with prosthetics

5- repaired CHD with residual defects 6- cardiac transplant patient with valve disease.

**Heart failure (HF)**

It is structural or functional inability of myocardium to pump enough blood to meet body demands, leading to congested lungs (acute pulmonary edema in left sided HF) or systemic circulation (generalized edema in right sided HF) or both (congestive HF).

**Causes**

IHD, valvular heart disease, CHD, heart muscle disease, hypertension, arrhythmia, thyroid disease, alcohol, chronic lung disease, and anemia.

**Clinical features**

Paroxysmal nocturnal dyspnea, orthopnea, cyanosis, coughing of pink frothy sputum, rapid weak pulse, basal lung crepitations, fatigue, generalized edema, poor concentration, distended neck veins, lower limb pitting edema, hepatomegaly, and ascites.

**Classiﬁcation of HF**

Class I: no physical limitation and asymptomatic with ordinary activity.

Class II: slight physical limitation and symptomatic with ordinary activity.

Class III: marked physical limitation and symptomatic with less than ordinary activity.

Class IV: symptomatic at rest and symptoms increased with any activity.

**Investigation**

CXR (cardiomegaly and pulmonary edema), ECG, echocardiography (ejection fraction low

cardiac MRI, biochemistry (raised serum beta-natriuretic peptide).

**Treatment**

Rest, weight loss, stress reduction, stop smoking, control hypertension, salt and water

restriction, treat hyperlipidemia, regular exercise, and control of associated disease.

**Drugs**

- ACEIs (captopril) - ARBs (valsartan) - BBs (metoprolol)

- aldosterone antagonist (spironolactone) - diuretics (furosemide)

- digoxin - vasodilator (isosorbide dinitrate),

- surgery (heart transplant)

**Dental aspect**

Any stress and anxiety may result in cardiac dysfunction and acute pulmonary edema.

Preventive measures before dental surgical procedure:

HF should be controlled, so written consent from the patient's physician and any elective dental care would be postponed until condition stabilized and any emergency.

Dental care should be done with conservative measures (analgesia and antibiotics).

Possible complications during dental care in patient with uncontrolled HF:

arrhythmia, acute HF (acute pulmonary edema), cardiac arrest, stroke, MI.

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