DEFINITION

• Increase arterial blood pressure
• Disease of vascular regulation
• Alteration in regulation of arterial pressure.

Predominant mechanisms of control are the
1. Central nervous system (CNS),
2. Renin-angiotensin-aldosterone system)
3. Extracellular fluid volume.
Renin-angiotensin System

- **Angiotensinogen** → **Angiotensin I** → **Angiotensin II**
  - **Pulmonary and renal epithelium:** ACE
  - **Increased sympathetic activity:**
    - **Tubular Na⁺ reabsorption, K⁺ excretion and water retention**
  - **Aldosterone secretion**
  - **Vasoconstrictor and increased BP**
  - **Antidiuretic hormone secreted from pituitary leading to water absorption**

- **Decrease in renal perfusion** → **Renin**
- **Water and salt retention. Effective circulating volume increases. Perfusion of the juxtaglomerular apparatus increases.**
TYPES OF HYPERTENSION

• PRIMARY HYPERTENSION

• SECONDARY HYPERTENSION

• ACCELERATED HYPERTENSION
# Classification of Blood Pressure for Adults

<table>
<thead>
<tr>
<th>BP Classification</th>
<th>SBP (MM HG)</th>
<th>DBP (MM HG)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>&lt; 120</td>
<td>&lt; 80</td>
</tr>
<tr>
<td>Prehypertension</td>
<td>120-139</td>
<td>80-89</td>
</tr>
<tr>
<td>Stage 1 hypertension</td>
<td>140-159</td>
<td>90-99</td>
</tr>
<tr>
<td>Stage 2 hypertension</td>
<td>&gt; 160</td>
<td>&gt; 100</td>
</tr>
</tbody>
</table>
PRIMARY HYPERTENSION

• Also called as Essential Hypertension
• Approx. 95% of patients
• Diastolic -- 90 mm of Hg
• Systolic -- 140 mm of Hg or more
CAUSES

• Idiopathic
• Hyperactivity of sympathetic vasoconstricting nerves
• Presence of vasoactive substance on smooth muscle
• Increased cardiac output, followed by arteriole constriction
• Excessive dietary sodium intake, sodium retention,
• Familial (genetic) tendency
ISOLATED SYSTOLIC HYPERTENSION

• Systolic BP elevation in the absence of elevated diastolic BP is termed isolated systolic hypertension
SECONDARY HYPERTENSION

• Occurs in approx. 5% of patients

• Renal pathology:
  – Congenital anomalies, pyelonephritis, renal artery obstruction, acute and chronic glomerulonephritis
  – Reduced blood flow to kidney causes release of renin. Renin reacts with serum protein in liver

• Coarctation of aorta

• Endocrine disturbances:
  – Pheochromocytoma
  – Adrenal cortex tumors
  – Cushing’s syndrome
  – Hyperthyroidism

• Medications such as estrogens, sympathomimetics, antidepressants, NSAIDs, steroids
Consequences of Hypertension

• Damages blood vessels in the brain, eyes, heart, and kidneys
• Increases the risk of stroke, angina, MI, blindness, and heart and kidney failure
• Blood vessel damage occurs through arteriosclerosis in which smooth muscle cell proliferation, lipid infiltration, and calcium accumulation occur in the vascular epithelium
• Damage to heart, brain, eyes, and kidneys is termed target organ disease; this is the major object of prevention in patients with high BP
Consequences of Hypertension

- Cerebro-Vascular stroke
- Angina, Myocardial Infarct
- Blindness
- Heart and Kidney failure
- Arteriosclerosis
- Lipid infiltration and calcium accumulation
- Target organ disease
Risk Factors

- Increase in incidence is associated with the following risk factors:
  - Age: between 30 and 70
  - Race: Black
  - Overweight, sleep apnea
  - Family history
  - Smoking
  - Sedentary lifestyle
  - Diabetes mellitus
  - Metabolic syndrome
CLINICAL MANIFESTATIONS

• Usually Asymptomatic
• May cause
  • Headache
  • Dizziness
  • Blurred vision in malignant hypertension
• BP readings more than 140/90 mm of Hg
DIAGNOSTIC EVALUATION

• FBS, PP2BS
• Lipid profile
• Renal Function
• Serum Potassium
• Urine Analysis
  • Proteinuria
  • Catecholamines (pheochromocytoma = VMA)
• ECG
• Chest X-ray
• Renal scan for Renal artery stenosis
MANAGEMENT (lifestyle modifications)

• Lose weight if BMI > 25.

• Limit addiction. e.g. alcohol, smoking

• Smoking cessation

• Regular aerobic exercise

• 30 to 45 minutes of brisk walking most days.

• Restrict sodium intake to 2.4 g or less per day

• Reduce dietary fat and cholesterol

• Consider reducing coffee and caffeine intake

• Yoga, Pranayam, Anti-Stress therapy, Meditation

• Only for Mild Hypertension and over 3 – 6 months
CONSIDERATIONS IN SELECTING THERAPY

• **Age**: some adverse effects may not be tolerated well by elderly people

• **Concomitant diseases and therapies**: some agents also treat migraines, benign prostatic hyperplasia, heart failure

• **Quality of life impact**: tolerance of adverse effects

• **Economic considerations**: newer agents very expensive
ANTI-HYPERTENSIVE DRUG GROUPS

• Diuretics
• Beta-adrenergic blockers
• Alpha-receptor blockers
• Central alpha agonists
• Peripheral adrenergic agents
• Combined alpha and beta-adrenergic blockers
• ACE inhibitors
• Angiotensin receptor blockers
• Calcium antagonists
• Direct vasodilators
1. Diuretics
   - Pottasium sparing – Spironolactone
   - Non Pottasium sparing – Frusemide
2. Beta-adrenergic blockers
   - Atenolol, Metoprolol, Proprenolol
3. Alpha-receptor blockers
   - Prazosin
4. Central alpha agonists
   - Clonidine, Alpha methy dopa
5. Combined alpha and beta-adrenergic blockers
   - Labetalol
6. ACE inhibitors
   • Enalapril, Captopril, Ramipril

7. Angiotensin receptor blockers
   • Losartan, Telmisartan

8. Calcium antagonists
   • Nifedipin, Amlodipin, Diltiazem

9. Direct vasodilators
   • Sodium Nitroprusside
   • Nitro-glycerine
<table>
<thead>
<tr>
<th>Anti-Hypertensive Group</th>
<th>Indication</th>
<th>Contraindication</th>
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<tbody>
<tr>
<td>Alpha Blocker</td>
<td>Benign Prostatic Hypertrophy</td>
<td>Postural Hypotension</td>
</tr>
<tr>
<td>Beta Blocker</td>
<td>Myocardial infarction, Angina</td>
<td>Asthma, Heart Block, Congestive Failure</td>
</tr>
<tr>
<td>ACE Inhibitor</td>
<td>Congestive Cardiac Failure, Left Ventricular dysfunction, Diabetic Nephropathy</td>
<td>Renal Vascular disease, Peripheral Vascular disease, Pregnancy</td>
</tr>
<tr>
<td>Angiotensine Receptor Blocker</td>
<td>Acute / Chronic Renal Failure, Diabetic Nephropathy</td>
<td>Renal Vascular disease, Peripheral vascular disease, Pregnancy</td>
</tr>
<tr>
<td>Calcium Channel Blocker</td>
<td>Isolated Systolic hypertension</td>
<td>Congestive Failure</td>
</tr>
<tr>
<td>Thiazide diuretics</td>
<td>Congestive Cardiac Failure, Left Ventricular dysfunction</td>
<td>Gout</td>
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