Pulse character

- Pulsus alternans
- Pulsus paradoxus
- Delayed pulse
- Collapsing pulse
- Slow rising pulse
- Pulsus bisferiens

CHH Values
Carotid
Brachial
Radial
Ulnar
Femoral
Popliteal
Posterior tibial
Dorsalis pedis
EXAMINATION OF PULSE

- DEFINITION OF PULSE
  Expansion and elongation of arterial wall imparted by the column of blood, passively produced by pressure changes during ventricular systole and diastole.

- ASSESSMENT OF PULSE
  1. RATE (beats/min)
     - Tachycardia (>100/min)
     - Bradycardia (<60/min)
  2. RHYTHM
     - Regular
     - Regularly Irregular (2nd degree heart block)
     - Irregularly Irregular (Atrial Fibrillation, VPB, APB)
  3. EQUALITY
  4. CHARACTER
     - Anacrotic Pulse
     - Dicrotic Pulse
     - Pulsus Bisferiens
     - Pulsus Alternans
     - Pulsus Parvus et Tardus
     - Pulsus Bigeminus
     - Pulsus Paradoxus
     - Bounding Pulse
     - Thready Pulse
     - Waterhammer Pulse
  5. PERIPHERAL PULSES (Femoral, Posterior Tibial, Dorsalis Pedis)
  6. APEX PULSE DEFICIT (Atrial Fibrillation)
  7. RADIO-RADIAL/RADIOFEMORAL DELAY

- SINUS ARRHYTHMIA
  Definition: Increase PR with inspiration and decrease in PR with expiration
  Physiological phenomenon seen in children and athletes

  Mechanism: Increase amount of blood which comes into LV increase SV.
  This stimulates the baroreceptors and leads to slowing of HR.

  Absent in: CCF and Autonomic Neuropathy
PULSE

A. Alternating pulse (pulsus alternans)
   Pulsus alternans is characterized by alternation of a pulsation of small amplitude with the pulsation of large amplitude while the rhythm is regular.

B. Pulsus bisferiens
   Pulsus bisferiens is best detected by palpation of the carotid artery. This pulsation is characterized by two main peaks. The first is termed percussion wave and the second, tidal wave. Although the mechanism is not clear, the first peak is believed to be the pulse pressure and the second, reverberation from the periphery.

C. Bigeminal pulse
   Bigeminal pulsations result from a normal pulsation followed by a premature contraction. The amplitude of the pulsation of the premature contraction is less than that of the normal pulsation.

D. Large, bounding pulse
   The large, bounding (also called hyperkinetic or strong) pulse is readily palpable. It does not "fade out" and is not easily obliterated by the examining fingers. This pulse is recorded as 3+.

E. Paradoxic pulse (pulsus paradoxus)
   Pulsus paradoxus is characterized by an exaggerated decrease (>10 mm Hg) in the amplitude of pulsation during inspiration and increased amplitude during expiration. (See text for measurement with sphygmomanometer.)

F. Water hammer pulse (Corrigan pulse)
   The water hammer pulse (also known as collapsing) has a greater amplitude than expected, a rapid rise to a narrow summit, and a sudden descent.
Pulse

**Alternating pulse (pulsus alternans)**

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**Water-hammer pulse (Corrigan pulse)**

The water-hammer pulse (also known as collapsing) has a greater amplitude than expected, a rapid rise to a narrow summit, and a sudden descent.
conjunctival haemorrhages
Roth's spots

**JVP**
large a wave
(pulmonary hypertension)
large v wave (TR)

**BP**
wide pulse pressure (AR)
narrow pulse pressure (AS)

**hands**
clubbing
Osler's nodes
Janeway lesions
splinter haemorrhages

**urine**
microscopic haematuria

**oedema**
peripheral and sacral

**face**
central cyanosis
malar flush (MS)

**lungs**
bilateral basal crepitations
consolidation
pulmonary effusion

**praecordium**
visible heaves or thrills
scars

**pulse**
slow rising
collapsing
bisferiens
radioradial delay
radiofemoral delay

**abdomen**
splenomegaly
hepatomegaly
ascites
## 6.15 Causes of a fast or slow pulse

<table>
<thead>
<tr>
<th>Heart rate</th>
<th>Sinus rhythm</th>
<th>Arrhythmia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fast (tachycardia, &gt;100 bpm)</td>
<td>Exercise</td>
<td>Atrial fibrillation</td>
</tr>
<tr>
<td></td>
<td>Pain</td>
<td>Atrial flutter</td>
</tr>
<tr>
<td></td>
<td>Excitement/anxiety</td>
<td>Supraventricular tachycardia</td>
</tr>
<tr>
<td></td>
<td>Fever</td>
<td>Ventricular tachycardia</td>
</tr>
<tr>
<td></td>
<td>Hyperthyroidism</td>
<td></td>
</tr>
<tr>
<td>Medication:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sympathomimetics, e.g salbutamol</td>
<td></td>
<td></td>
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<tr>
<td>Vasodilators</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slow (bradycardia, &lt;60 bpm)</td>
<td>Sleep</td>
<td>Carotid sinus hypersensitivity</td>
</tr>
<tr>
<td></td>
<td>Athletic training</td>
<td>Sick sinus syndrome</td>
</tr>
<tr>
<td></td>
<td>Hypothyroidism</td>
<td>Second-degree heart block</td>
</tr>
<tr>
<td>Medication:</td>
<td></td>
<td>Complete heart block</td>
</tr>
<tr>
<td>Beta-blockers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digoxin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Verapamil, diltiazem</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
A

Highest point of pulsation of the jugular vein

4 cm
5 cm

CVP = 9 cm H₂O

The sternal angle

Angle of elevation = 45 degrees
8) Pulse examination at other places

- 5) Femoral Artery (Inguinal region)
- 6) Popliteal Artery (Behind knees)
- 7) Dorsalis Pedis Artery (1st Intertarsal space)

- This examination is IMP to diagnose Peripheral vascular diseases like TAO (Thrombo Agitans Obliterans)
| Dicrotic Pulse                  | Twice beating  
First wave in systole, second wave in diastole  
(seen when PR and DP is low)  
Felt due to hypotonia of vessel wall | Fever (e.g. typhoid fever)  
Endotoxic shock  
CCF  
Cardiac Tamponade  
Following open heart surgery |
|-------------------------------|-------------|-------------|---------|
| Pulsus Parvus et Tardus       | Slow rising  
Anacrotic wave not felt | Aortic Stenosis |
| Pulsus Alternans              | Strong and weak beat occurring alternately | LVF  
Toxic myocarditis  
Paroxysmal Tachycardias  
Following Premature beat |
| Pulsus Paradoxus              | SBP fall more than 10mmHg during inspiration (exaggeration of normal)  
Does not happen if thoracic cage is immobile | SVC Obstruction  
Lung conditions(Asthma, emphysema, airway obstruction)  
Pericardial effusion  
Constrictive pericarditis  
Severe CCF |
| Reverse Pulsus Paradoxus      | Peripheral pulses disappear on inspiration, while heart sounds remain audible | Patient on Continuous airway pressure on mechanical ventilator |
| Pulsus Bigeminus              | Coupling of the pulses waves in pairs  
Followed by a pause | Alternate premature beats  
AV block  
Sinoatrial block with Vent. Escape |
| Thready Pulse                 | Pulse rate is rapid  
Pulse wave is small and disappear quickly | Cardiogenic shock |
| Bounding pulse, High Volume Pulse | Increased SV  
Hyperkinetic circulatory states | PHYSIOLOGICAL:  
Fever, Pregnancy, Alcoholism, Exercise  
PATHOLOGICAL:  
HIGH OUTPUT STATES:  
Anemia  
Beri-beri  
Cor pulmonale  
Cirrhosis liver(hypoproteinemia)  
Thyrotoxicosis  
AV fistula  
Paget’s disease  
CARDIAC CAUSE:  
Aortic regurgitation  
Bradycardia  
Complete Heart Block  
PDA  
Systolic HTN  
Rupture of sinus valsava into heart chamber  
Aortopulmonary window |
18.28 Some pathological causes of sinus bradycardia and tachycardia

<table>
<thead>
<tr>
<th>Sinus bradycardia</th>
<th>Sinus tachycardia</th>
</tr>
</thead>
<tbody>
<tr>
<td>• MI</td>
<td>• Cholestatic jaundice</td>
</tr>
<tr>
<td>• Sinus node disease (sick sinus syndrome)</td>
<td>• Raised intracranial pressure</td>
</tr>
<tr>
<td>• Hypothermia</td>
<td>• Drugs, e.g. β-blockers, digoxin, verapamil</td>
</tr>
<tr>
<td>• Hypothyroidism</td>
<td></td>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Sinus tachycardia</td>
<td>Thyrotoxicosis</td>
</tr>
<tr>
<td>• Anxiety</td>
<td>• Phaeochromocytoma</td>
</tr>
<tr>
<td>• Fever</td>
<td>• Drugs, e.g. β-agonists (bronchodilators)</td>
</tr>
<tr>
<td>• Anaemia</td>
<td></td>
</tr>
<tr>
<td>• Heart failure</td>
<td></td>
</tr>
</tbody>
</table>
3) Volume

- Uplift to middle finger

- It denotes **Pulse Pressure**

- Pulse Pressure = SBP – DBP

- If patient has high Systolic & low Diastolic BP, then Pulse pressure is more. Therefore Volume will be more