Abnormal Rhythms

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March 2011
Rhythms to Recognize

- Normal Sinus Rhythm (NSR)
- Sinus Bradycardia (SB)
- AV block (1\textsuperscript{st}, 2\textsuperscript{nd}, 3\textsuperscript{rd}) degree
- Sinus Tachycardia (ST)
- Atrial Flutter (AFI)
- Atrial Fibrillation (AF)
- Ventricular Tachycardia (VT)
- Ventricular Fibrillation (VF)
- Torsades de Pointes (TdP)
- Asystole
Rhythm Interpretation Checklist

- Analyze the rhythm
  - regular or irregular (beat to beat)
- Rate
  - 1:1 conduction
  - 60 to 100 beats per minute
- Analyze p waves
  - regular, rounded
- PR interval
  - normal, consistent
  - 120 to 200 milliseconds
- QRS complex
  - normal width, regular
  - 60 to 100 milliseconds
- QT Interval
  - 360 to 440 milliseconds
Normal Sinus Rhythm

✓ Electrical impulses are formed in the SA node and discharged regularly
✓ Rhythm: **Regular**
✓ Atrial rate: **60-100 bpm / 1:1 Conduction**
✓ PR interval: **120-200 ms**
✓ QRS complex: **60-100 ms**
✓ QT interval: **360-440 ms**
Sinus Bradycardia

- Rhythm: regular
- Rate: <60 bpm
- P wave: normal
- PR interval: 120-200 ms
- QRS complex: 60-100 ms
- QT interval: 360-440 ms

**Clinical Manifestations**
- no symptoms OR
- hypotension
- blurred vision
- altered mental status
- fatigue
- cool, clammy skin

**Common Etiologies**
- normal (ex: athletes)
- drugs (BB, CCB, digoxin)
- parasympathetic NS

\[ \text{CO} = \text{HR} \times \text{SV} \]
AV Block 1\textsuperscript{st} Degree

- Rhythm: \textit{regular}
- Rate: \textit{bradycardia, tachycardia, or regular}
- P wave: \textit{normal}
- PR interval: \textit{prolonged} > 200 ms
- QRS complex: 60-100 ms
- QT interval: 360-440 ms

- Clinical Manifestations
  - usually asymptomatic
  - may be temporary or lead to 2\textsuperscript{nd} or 3\textsuperscript{rd} degree AV block

- Common Etiologies
  - normal healthy patients
  - drugs (BB, CCB, digoxin)
  - ischemia or MI in the right coronary artery innervating the AV node
AV Block 2\textsuperscript{nd} Degree (Type I Wenckebach)

- Rhythm: atrial reg., ventr. irreg.
- Rate: atrial rate > ventr. rate
- P wave: normal
- PR interval: \textit{progressive lengthening} until p wave is not followed by a QRS (dropped beat!!!)
- QRS complex: 60-100 ms
- QT: 360-440 ms

- Clinical Manifestations
  - usually asymptomatic
  - hypotension, light-headedness, and/or dyspnea
  - may be temporary or lead to more severe AV block

- Common Etiologies
  - drugs (BB, CCB, digoxin)
  - ischemia or MI in the right coronary artery innervating the AV node
  - parasympathetic NS
AV Block 2\textsuperscript{nd} Degree (Type II Infranodal)

- **Rhythm:** atrial reg., ventr. irreg.
- **Rate:** atrial rate > ventr. rate
- **P wave:** normal
- **PR interval:** constant and set until an occasional dropped beat without warning (QRS dropped!)
- **QRS complex:** 60-100 ms or wide (>100 ms)
- **QT:** 360-440ms

- **Clinical Manifestations**
  - hypotension, light-headedness, dyspnea, fatigue, chest pain (more pronounced ↓ CO)

- **Common Etiologies**
  - anterior wall MI
  - severe CHD
  - degenerative changes in the conduction system
AV Block 3\textsuperscript{rd} Degree (complete block)

- **Rhythm**: atrial reg., ventr. reg.
- **Rate**: atrial and ventricular rates are independent and “dissociated”
  - Atrial 60-100 bpm,
  - Ventr. <60 bpm
- **P wave**: normal
- **PR interval**: No pattern
- **QRS complex**: 60-100 ms or wide (>100 ms)
- **QT**: 360-440ms

- **Clinical Manifestations**
  - severe hypotension, dyspnea, fatigue, chest pain, altered mental dyspnea, loss of consciousness (most pronounced ↓ CO)

- **Common Etiologies**
  - anterior or inferior wall MI
  - severe CHD
  - degenerative changes
  - digoxin toxicity
  - drugs (BB, CCB)
Sinus Tachycardia

- Electrical impulses are formed in the SA node and discharged regularly but at a fast rate
  - Rhythm: *regular*
  - Rate: >100 bpm
  - P wave: *normal*
  - PR interval: 120-200 ms
  - QRS complex: 60-100 ms
  - QT interval: 360-440 ms

- Clinical Manifestations
  - more of a physical sign than an arrhythmia

- Common Etiologies
  - normal exercise
  - fever
  - hypovolemia
  - anxiety
  - drugs (epinephrine, dopamine, atropine, amphetamine, etc)
Atrial Flutter

- Results from a rapidly firing ectopic site in the atria caused by accelerated automaticity or from a rapid reentry circuit in the atria to produce flutter “sawtooth” waves

- Rhythm: regular
- Rate: atrial rate 220-350 bpm
- P wave: V-shaped “sawtooth” waves
- PR interval: not measurable
- QRS complex: 60-100 ms
- QT interval: 360-440 ms

- Clinical Manifestations
  - asymptomatic OR
  - palpitations, dizziness, syncope, dyspnea, fatigue, hemodynamic instability, stroke

- Clinical Etiologies
  - 2nd degree AV block
  - structural heart disease

11
Atrial Fibrillation

- Arises from multiple ectopic pacemakers or sites of rapid reentry circuits in the atria producing fibrillatory waves
  - Rhythm: grossly irregular
  - Rate:
    - atrial rate 350-600 bpm
    - ventr. rate 120-180 bpm
  - P wave: irregular wavy deflections
  - PR interval: not measurable
  - QRS complex: 60-100 ms
  - QT interval: 360-440 ms

- Clinical Manifestations
  - asymptomatic OR
  - palpitations, dizziness, syncope, dyspnea, fatigue, hemodynamic instability, stroke

- Clinical Etiologies
  - age
  - structural heart disease
  - many more (see class notes)
Ventricular Tachycardia

- Originates in an ectopic focus in the ventricles associated with enhanced automaticity or reentry

  ✓ Rhythm: regular
  ✓ Rate:
    ✓ atrial rate unknown
    ✓ ventr. rate 140-250 bpm
  ✓ P wave: hidden in QRS
  ✓ PR interval: not measurable
  ✓ QRS complex: wide (>100 ms)

- Clinical Manifestations
  ✓ orthostasis
  ✓ hypotension, syncope OR
  ✓ hemodynamic instability
  ✓ no pulse, SCA, and death

- Clinical Etiologies
  ✓ recent MI
  ✓ left ventricular dysfunction
  ✓ electrolyte imbalances
  ✓ drug-induced (↑QT interval)\textsuperscript{13}
Ventricular Fibrillation

- Characterized as disorganized, chaotic, electrical focus in the ventricles and takes control of the heart
  - Rhythm: chaotic, irregular
  - Rate: unknown
  - P wave: absent
  - PR interval: not measurable
  - QRS complex: absent
  - QT interval: not measurable

- Clinical Manifestations
  - no pulse
  - cardiac collapse, unresponsive
  - agonal gasps
  - death

- Clinical Etiologies
  - recent MI
  - left ventricular dysfunction
  - electrolyte imbalances
  - drug-induced (↑QT interval)
Torsades de Pointes

Polymorphic VT, occurs in the setting of delayed ventricular repolarization – “Twisting of the Points”

- Rhythm: irregular
- Rate: ventr. 150-250 bpm
- P wave: absent
- PR interval: not measurable
- QRS complex: wide and display a “spindle node” pattern
- QT interval: prolonged

Clinical Manifestations
- orthostasis, hypotension, syncope, poor perfusion, no pulse

Clinical Etiologies
- most commonly due to prolonged QT interval
  - drug-induced (see class notes)
  - electrolyte and metabolic imbalances
Asystole (ventricular standstill)

- Rhythm: no ventr. activity
- Rate: no ventr. activity
- P wave: occasional
- PR interval: not measurable
- QRS complex: absent
- QT interval: not measurable

- Clinical Manifestations
  - unresponsive
  - no pulse or blood pressure
  - cardiac arrest (start CPR)

- Clinical Etiologies
  - end of life (death)
  - prolonged hypoxemia
  - massive electrical shock (electrocution, lightening strike)
  - “stunning” of heart after defibrillation, prior to resumption of spontaneous rhythm
References