CVS | Anti-arrhythmic drugs تفريغ ملاحظات د.عبدالمتعال

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فيديو ١٣ + ١٤

Arrythmias = disturbances in heart normal rythms.

Automaticity = The ability of certain cell to self propagate an impulse. SA > AV > Purkinji
↳ caused by the Na^+ leakage

① Impulse generation problems → Nodal abnormality / Ectopic foci

② Impulse conduction problems
- → Heart block
  - 1st degree HB: Slow conduction
  - 2nd degree HB: متقطع
  - 3rd degree HB: No conduction at all.
- → Re-entrant arrythmias: AV node exciting more than once.
  - ↳ Atrial fibrillation. **Re-entry = tachycardia**
- → Accessory pathway of conduction
  - ↳ WPW syndrome

In SA/AV/purkinji:

The drug decreases the excitability
=
The drug has a membrane stabilizing action.
=
Decreasing the slope of phase 4 depolarization.

The drug prolongs the action potential duration (↑APD)
=
The drug prolongs the effect of the refractory period. (↑ERP)
=
The drug prololongs the QT interval.

Pro-Arrhythmic effect = arrythmias دوا عالج نوع وسبب نوع تاني من ال

* أكثر مرحلة بيستجيب فيها القلب لل ectopic foci هي في Phase (4) من ال AP

Anti-arrhythmic drugs classes:

- Class 1: Na^+ channels blockers
  - (A) Prolong AP duration
  - (B) Shorten AP duration
  - (C) Work on the conduction sys. (No effects on AP duration)

  (A) and (B): in cases of ectopic foci
- Class 2: beta blockers (BB) → Membrane-stabilizing action.
- Class 3: K^+ channels blockers → Prolong AP duration
- Class 4: Ca^{2+} channels blockers → Prolong AP duration
- Class 5: Others → have more than one mechanism.

Class I drugs:

① Quinidine (Class IA «Na^+ channel blocker»)

- ↑ APD & ↑ ERP (in myocytes).
- ↓ Slope of phase 4 (in SA node).
- Affects the conducting sys.:
  - in small doses: Atropin-like actions (Vagolytic)
    - ↑ the conduction. (Bad)
  - in therapeutic doses: inhibits the conduction.
- It blocks the α-receptors → hypotension (SE)
- -ve inotropic effect → ↓ contraction. (SE)
- Anti-malarial effect.

SE:

- Cinchonism تسمم: Blur vision, salivation, ringing ears.
- Hypotension.
- Paradoxical tachycardia متناقض (لأنه بزيد ال conduction)
  - So we give Digoxin OR Verapamil (هدول بقللوا ال conduction)
- Syncope سكتة → due to the «torsade de pointe / Polymorphic ventricular tachycardia».
  - due to the other ectopic foci...
  - Mg Sulfate solves the prob.

② Procainamide (Class IA)

↳ = quinidin but with some differences:
- الصدر مختلف
- less atropine-like action لذا ممكن يعطى لحالة
- SLE like syndrome.

③ Lidocaine (Lignocaine/Xylcaine) (Class IB)

أسماء أخرى

- ↳ Used in arrythmias during acute myocardial infarction. لأنه بيشتغل على ال damaged tissues
- ↳ Supra Ventricular arrhythmias. ما بيشتغل عال conduction كتير، لذا ما بأثر عال
- ↳ IV only. أو ممكن يقال

اقرأ من اليمين

④ Mexiletine (Class IB)

- ↳ Orally
- ↳ Used in arrythmias during acut myocardial infarction.
  for maintainance therapy.

⑤ Phenytoin (Class IB)

↳ In digitalis-induced arrythmias (DIA) only.
↳ Linocain could be also used.

⑥ Flecainide (Class IC)

- ↳ Closes Na^+, Ca^+, K^+ channels.
- ↳ ↓ AV conduction (مهم) & ↓ Slope of phase 4 depolarization (in SA node)
- ↳ Used in Atrial fibrillation (Protects from Supraventricular tachycardia)
  after the cardioversion الصدمة الكهربائية
  *** ما لم يكن المريض يعاني من Structural heart disease
  OR Ischemic heart disease.

Class II drugs: (Beta blockers (BB)):

- ↳ ↓ Sympathatic over activity.
- ↳ ↓ AV conduction (Protects from Supraventricular arrythmias)
- ↳ Membrane-stabilizing action (↓ slope of phase 4 in SA node)
- ↳ Used in arrythmias due to thyrotoxicosis. ($T_4 \rightarrow T_3$) ((T_3 is cardiotoxic))
- ↳ Used in arrythmias with hypertrophic obstructive cardiomyopathy (HOCM)
- ↳ Used in arrythmias due to ↑ sympathetic overactivity (stress).
- ↳ Used in arrythmias of mitral valve prolapse. → palpitation خفقان → Because BB have -ve inotropic effects

↳ BB are contraindicated in arrythmias with heart block (HB) ↱ a prob. in conduction.

Class III drugs: (K^+ channels blockers «phase 3»)

① Amiodarone (the prototype)

- ↳ 40% Iodine
- → Contraindicated in arrythmias due to thyrotoxicosis (hyperthyroidism) (لأنه فيه I)
- → ↓APD, ↑ERP
- → ↓ Na^+, Ca^+, K^+ channels
- → ↓ AV conduction
- → Causes coronary vasodilatation. (useful in ischemic heart disease).
- → Used in MOST ARRYTHMIAS (including ventricular arrythmias).
- → Used in Wolff parkinson white syndrome (WPW).
- ↳ SE: Pulmonary toxicity  due to I Precipitation.
  - Liver toxicity.
  - Corneal microdeposits (reversible)
  - bradycardia, & hypotension.
  - Torsade de pointe.
  - Photosensitivity: 
  - thyroid dysfunction.

② Dronedarone

↳ = Amiodarone without I (Better)

Class IV drugs: (Ca^{2+} channels blockers)

2 Families

- ↳ Nifedipine (Dihydropyridine) → hypotension → reflex tachycardia. → NO ROLE IN ARRYTHMIAS
- ↳ Verapamil / Diltiazem
  - → ↓ AV conduction.
  - ↳ Excellent in Supraventricular tachycardia. ↙ only.

Other drugs:

① Adenosine (A1 receptors agonist)

- A-receptors (adenosine receptors) are found in the heart & the bronchi
- Quick ↓ conduction « for emergency instead of DC »
- Used in specific types of WPW syndrome. مش كلهم طبعاً
- Inhibited by theophylline drug.
  - ↳ like caffeine, blocks A receptors.
- Contraindicated in bronichial asthma patients (causes severe bronchial constriction)

Non-pharmacological methods of arrythmia treatment:

- ✪ WPW syndrome → laser ablation.
- ✪ DC cardioversion  then flecainide.
  - ↳ But first we should make sure that the patient has no atrial flutter for long time.
  - ↳ + we should give heparin, then warfarin..
    - ↳ to avoid the mural thrombus that may lead to stroke.
- ✪ Pacemaker implantation. 
- ✪ Cardiac arrests, due to →
  1. Coronary artery disease.
  2. Trauma.
  3. Prugada syndrome. → gene mutation. → Pacemaker implantation.

  - → CPR
  - ① → DC cardioversion. الصعق الكهربائي
  - ② → IV adrenalin → ③ DC
  - ④ → Amiodarone (300 mg IV) → ⑤ DC