

Cardiovascular Pharmacology

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Learning Objectives

- △ Identify the actions, effects, indications, adverse effects and precaution for agents from the following drug categories:
 - f* cardiogenic agents
 - f* antidysrhythmic agents
 - f* nitrates
 - f* miscellaneous agents

Cardiotonic Agents

Epinephrine

- △ Action- alpha1, beta1, beta2 stimulation

Epinephrine

- △ Effects:
 - ◆ increase systemic vascular resistance (SVR) blood pressure (BP), peripheral blood flow
 - ◆ increase coronary and cerebral blood flow
 - ◆ increase myocardial electrical activity
==> increased automaticity ==>
increased HR
 - ◆ increase myocardial contractility
 - ◆ increase myocardial O₂ requirements

Epinephrine

- △ Indications
 - f* resuscitation
 - f* shock, including anaphylaxis
 - f* severe asthma

Epinephrine

^ Routes

- f* Intravenous (IV)
- f* Subcutaneous (SC)
- f* Endotracheal tube (ETT)- double IV dosage

Epinephrine

^ Adverse effects

- f* Hypertension
- f* Myocardial infarction
- f* Tachycardia
- f* Peripheral tissue blood flow impairment (ischemia)

Norepinephrine (Levophed)

^ Actions- alpha, beta1 adrenergic

^ Effects

- f* increased SVR ==> increased BP
- f* increased HR
- f* positive inotropic

Norepinephrine (Levophed)

^ Indication- neurogenic or septic shock

^ Adverse effects

- f* Myocardial hypoxia ==> infarction
- f* renal failure
- f* Hypertension
- f* Necrosis of exposed tissues
- f* Peripheral ischemia

Dopamine

^ Actions- alpha1, beta1 adrenergic, dopaminergic

^ Effects (dose-dependent)

- f* Low dose- Cerebral, renal, mesenteric vasodilation
- f* Moderate doses- increase cardiac output
- f* High dose- generalized vasoconstriction

Dopamine

^ Indications:

- f* hypotension (shock)
- f* decreased urinary output

Dopamine

- ^ Adverse effects
 - f Tachycardia
 - f Renal necrosis
 - f Peripheral tissue necrosis

- f dysrhythmias

Dobutamine

- ^ Actions- alpha, beta1, beta2 adrenergic
- ^ Effects:
 - f positive inotropic ==> increased cardiac output
 - f Mild peripheral vasodilation ==> decreased PVR, SVR, increased coronary perfusion
 - f Does NOT increase myocardial O₂
 - f Combined with dopamine ==> maintain BP, without increasing PAP

Dobutamine

- ^ Indications
 - f Acute congestive heart failure (CHF)
 - f right ventricular failure

Milrinone (Primacor)

- ^ Action- phosphodiesterase inhibitor
- ^ Effects
 - f inotropic
 - f vasodilation

Link to milrinone
<http://milrinone.com/>

Digitalis glycoside- digoxin

- ^ Action- increased Ca⁺⁺ in myocardium
- ^ Effects
 - f positive inotropic
 - f negative dromotropic ==> depresses AV conduction

Digitalis glycoside- digoxin

- ^ Indication
 - f specific dysrhythmias
 - f Chronic CHF

Digitalis glycoside- digoxin

- ^ Adverse effects- digitoxicity more likely with hypokalemia
 - f Multiple types of dysrhythmias
 - f Agitation
 - f Nausea & vomiting

Antidysrhythmic Agents

Atropine

- ^ Action- parasympatholytic
- ^ Effects (cardiac)
 - f increased SA node automaticity
==> increased HR
 - f increased AV node conductivity

Atropine

- ^ Indications
 - f Bradycardia
 - f Heart block
 - f Asystole- may be worth a try
- ^ Routes
 - f IV
 - f instillation through ETT
- ^ Side effects- tachycardia

Lidocaine

- ^ Action- decreased automaticity, conduction
- ^ Effects increased threshold for fibrillation
- ^ Indications- rapid ventricular dysrhythmias
- ^ Routes
 - f ETT administration ==> double dose
 - f IV

Lidocaine

- ^ Adverse effects
 - f Psychoses, seizures
 - f decreased contractility
 - f Heart block- asystole
 - f increased threshold for defibrillation
 - f Lethal if given for heart block with escape beats

Amiodarone (Cordarone)

- ^ Action- multiple ion channel blocker
- ^ Effects
 - f decreased AV conduction
 - f decreased sinus node function
- ^ Indications- dysrhythmias
- ^ Adverse effects (circulatory):
 - f hypotension
 - f bradycardia

Amiodarone (Cordarone)

- ^ Adverse effects (pulmonary)- occurs over days-years of treatment
 - f pulmonary oxygen toxicity
 - f interstitial pneumonitis
 - f pulmonary infiltrates
 - f organizing pneumonia ± bronchiolitis obliterans (BOOP)
 - f pulmonary fibrosis

Link to amiodarone toxicity (requires free registration)
http://www.medscape.com/viewarticle/418090_4

Amiodarone (Cordarone)

- ^ Adverse effects (pulmonary):
 - f A-C membrane permeability edema with or without ARDS
 - f alveolar hemorrhage
 - f bronchospasm
 - f laryngeal edema
 - f anaphylactic shock
 - f pleural effusion
 - f pleural/pericardial thickening

Beta adrenergic blockers

- ^ Action- beta1 blockade
- ^ Effects
 - f decreased HR
 - f decreased vascular resistance
 - f decreased contractility
 - f decreased conductivity
 - f decreased myocardial O₂ consumption

Beta adrenergic blockers

- ^ Indications
 - f angina
 - f hypertension
 - f Post-MI
 - f Inhibit ventricular response to atrial flutter, fibrillation

Beta adrenergic blockers

- ^ Side effects
 - f Hypotension
 - f CHF
 - f Bronchospasm- non-selective agents

Beta adrenergic blockers

^ Agents

- f*propranolol (non-selective)
- f*atenolol
- f*metoprolol
- f*sotalol (Betapace)- non-selective
- f*esmolol- short duration of action
- f*nadolol (Corgard)- non-selective
- f*sotalol (Betapace)

Calcium Channel Blockers

^ action- block entry of Ca⁺⁺ to myocardium

^ indications

- f*angina
- f*dysrhythmias; e.g., PSVT
- f*hypertension

Calcium Channel Blockers

^ agents

- f*verapamil (Calan, Isoptan)
- f*diltiazem (Cardizem)
- f*amlodipine (Norvasc)

Magnesium Sulfate

^ Action- replacement for depletion of Mg⁺⁺

- f*malnourishment
- f*alcoholism

^ Effects

- f*reverses torsades des pointes
- f*relaxes bronchial smooth muscle
- f*relaxes uterine muscle

Magnesium Sulfate

^ Indications:

- f*hypomagnesemia
 - f*torsades des points VT
 - f*status asthmaticus
 - f*pre-eclampsia/eclampsia
- ^ Adverse effects- minimal

Nitrates

Sodium nitroprusside (Nipride)

- ^ Effects- vasodilation, arterial and venous
- ^ Indications
 - f Hypertensive emergency
 - f LV failure

Sodium nitroprusside (Nipride)

- ^ Adverse effects
 - f cyanide poisoning
 - f hypotension
- ^ Precaution- avoid exposure of agent to light

Nitroglycerine

- ^ Effect- decreased SVR ==> decreased afterload and preload
- ^ Side effects- hypotension, headache
- ^ Indication- angina pectoris, AMI
- ^ Preparations - sublingual tablets, IV, patches

Miscellaneous Agents

Nesiritide (Natrecor)

- ^ recombinant brain natriuretic peptide (BNP)
- ^ indicated for severe decompensated CHF

Angiotensin converting enzyme (ACE) inhibitors

- ^ action- block angiotensin II
- ^ indications
 - f hypertension
 - f heart failure
- ^ side effect- chronic, dry cough

Link to information on ACE inhibitors
<http://www.chfpatients.com/ace.htm>

**Angiotensin converting enzyme (ACE)
inhibitors**

^agents

- f*lisinopril (Zestril), (Prinivil)
- f*ramipril (Altace)
- f*enalapril (Vasotec)
- f*benazepril (Lotensin)
- f*captopril (Capoten)

END