Chapter (2)

Date / /
Page No.

Cholinergic drug

Defination - These are the drugs which produce action similar to that of acetylcholine (ACH) either by directly interacting with cholinergic receptor or by increasing availability of ACH at those site.

- often called parasympathomimetic drug, because their action mimics the action of PSNS ~~parasympathominatic ner~~ para Sympathetic Nervous System

Chlenergic agonists are two types —

① Direct acting
② Indirect acting

Classification of cholinergic drug

Cholinergic drug are classified main two classes are as follows —

Cholinergic drug

- cholinergic agonists
  - ① Cholinesters
    - Acetylcholine
    - Methacoline
    - Carbachol
- Anticholinesterase
  - ① Reversible
    - ① Carbamates
      - physostigmine
      - Neostigmine
      - Edrophonium

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Date / /
Page No.

(2) Alkaloids
- Muscarine
- Pilocarpine
- Arecoline

- Rivastigmine
(ii) Acridine
- Tacrine
(b) Irreversible
(i) Carbamates
- Propoxur
- Carbaryl

(ii) Organophosphate
- Dyflos
- Malathion
- Diazinon

Pharmacological action

The action of acetylene choline are generally classify in to 2 types —

(i) Muscarinic Receptor —
(ii) Nicotinic Receptor.

(i) Muscarinic receptor — The receptors are selectively stimulated by muscarine and blocked by atropin. They are located primarily on autonomic effector cell in heart, blood vessels eyes, smooth muscles and Gland of G.I.T receptor and urinary tract, sweat Gland etc.

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Heart – The effect of acetylcholine on heart is similar to that produced by stimulation of the vagal stimulation.

Smooth muscles – Smooth muscle is a most organ is contract.
Tone and peristalsis in the G.I.T that is ↑ease and Sphincters muscles relax abdominal cramps and eff evacuation boul.

Blood vessels – All blood vessels are dialated through only few receive cholinergic innervation.
fall in B.P and flusing specially in the flush area occur

Gland – Secretion from all parasympathetically inverted glands is increase via M_3 and some M_2 receptor sweating salivation and gastric secretion.

Eyes – Contraction of circular muscles of iris.
→ miosis

Contraction of ciliary muscles → spasm of accommodation increase out flow facility, reduction in intraocular tension.

(2) Nicotinic receptor – These receptor are selectively activated by nicotinic and blocked by tubocurarine.

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Nicotinic receptor is of 2 types —

① N_m

② N_n

Autonomic ganglia — Both Sympathatic and parasympathatic ganglia are stimulated these effect is masking sight on higher dose high dose of "Ach" given after atropin process tachycardia and rise in B.P. due to stimulation of Sympathatic ganglia.

Skeletal muscles — Application of "Ach" muscles end plate causes contraction of the fibers.

Intra arterial injection of high dose can cause twitching and fasciculation, but I.V. injection is generally without any effect due to rapid hydrolysis of Ach.

Dosage Indication

	Generic Name	Indication
①	Methacholine	→ paroxysal artial tachycardia and peripheral vascular disease
②	Carbachol	→ Glucoma ↦ post operatic paralytic ileus ↦ post operatic retention of urine

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Date / /
Page No.

(3) Pilocarpine → Glaucoma

(4) Physostigmine → Glaucoma
↳ Anti cholinergic poisoning.

(5) Neostigmine → • Myasthenia gravis
• Reversal of neuromuscular blockers
• Urine retention

Contra-Indication

- Bronchial asthma
- peptic ulcer
- coronary insufficiency
- Thyrotoxicosis
- Mechanical obstruction of the G.I.T and urinary bladder

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Date / /
Page No.

Anti cholinergic drugs

Are those which antagonise the effect of neurotransmiter "Ach" on autonomic effects and in the CNS exert through "muscuranic receptor" through nicotinic antagonists also block certain action of "Ach" they are refferto as "ganglionic blocker" & "neuromuscular blocker".

Muscuranic receptor Site -

1. Heart
2. Salivary Gland
3. Smooth muscles of like G.I.T
4. Urinary bladder

Nicotinic Ach receptor Site -

- Ach is also the neurotransmiter at post ganglionic nicotinic receptor located at the N.M.J. (Neuromuscular junction) and autonomic ganglia
- effect of antichalinergic drug at nicotinic "Ach" receptor is little as compared at muscuranin receptor.

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Date / /
Page No.

Pharmacological action :—

① **CNS (central nervous system) —**

Atropine has CNS stimulant action. However their effects are not appreciable at low dosage.

Atropine stimulate meany medullary centers vagal, respiratory, vasomotors

② **(C.V.S) Cardio vascular System —**

Most prominent effect is to cause tachycardia due to blocked of m2 receptor and S.A. Node. (Sino arterial node)

③ **Eyes —**

Topical instillation of atropine causes mydriasis abolition of light reflexes and cycloplegia resulting in photophobia blurring of near vision.

④ **Smooth muscles —**

All visceral smuscles that recieve parasympathetic motors innervation are relax by atropine due to M3 Blocked.

⑤ **Glands —**

Atropine markedly diminish sweat, Slavary tracheobronchial lacrimal secretion By M3 blocked.

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(6) Body temperature —

Rise in body temperature occurs at high dose due to both inhibition of temperature resulting center in the hypothalamus.

(7) Local anaesthetic —

Atropine has mild anaesthetic action on the cornea.

Dosage indication —

Anticholinergic Drug	Action	Dosage
Dicyclomine	Smooth muscles relaxant anti-spasmodic	20 mg oral
Oxybutynin	Sooth muscles relaxant anti-spasmodic Specific to urinary Bladder and Salivary Gland	Oxybutynin 5 mg BD/TDS oral flavoxate 200 mg TDS oral
Drotaverine	Antispasmodic muscles relaxant	40/80 mg T.D.S

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Date / /
Page No.

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Classification of anticholinergic drug

Anticholinergic drug are mainly classified in to 3 classes and as follows :—

(I) Natural Alkaloid
- Atropin
- Hyosin (Scopolamine)

(II) Semi Synthetic Derivatives
- Homatropine
- Atropine methonitrate

(III) Synthetic Compound

(a) Mydriatics
- Cyclopentamide
- Tropicamide
- Cyclopentolate

(b) Anti secretory

(i) Quaternary Compound
- Propantheline
- Isopropamide

(ii) Tertiary amines
- Dicyclomine
- Valethamate

(c) Vasicoselective
- Oxybutynin
- Oxyphlavoxate

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Date / /
Page No.

Contra indications – Contra indications are usually due to the drug pharmacological and adverse effect.

They include –

⇒ Glaucoma
⇒ Prostatic hypertrophy
⇒ Intestinal or urinary obstruction
⇒ Cardio vascular disease
⇒ Tracky arrhythyias
⇒ Angina
⇒ pregnancy
⇒ Urinary tract obstruction

Date / /
Page No.

Adrenergic Drug
or
Sympathomymatic drugs

Adrenergic drugs which block response by Adrenergic neurons system (ANS) by producing antagonistic effect are called as Sympathalytic and Adrenergic drugs.

eg- Propenal

Adrenergic drug can be classify based direct indirect or mixed action.

Drug with direct action - epinepheine, non-epinepheine produce their effect by directly stimulating the receptor site drugs with

Drug with indirect action - Release endogenous non-epinepheine which then stimulate the receptor.

Drug with mixed action - Either directly stimulate the receptor or release endogenous non-epinepheine.

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Classification of Adrenergic drugs

- Adrenergic Drug
  - Direct acting
    - α- Agonist
      - Non-Selective
        - Epinephrine
        - Non-Epinephrine
      - Selective
        - α_1 - Agonist
          - Phenylephrine
          - Methoxamine
        - α_2 - Agonist
          - Clonidine
          - Detomidine
          - Guanabenz
    - β- Agonist
      - Non-Selective
        - Isoproterenol
        - Epinephrine
      - Selective
        - β_1 - Agonist
          - Dobutamine
        - β_2 - Agonist
          - Terbutaline
          - Salbutanal
          - Ritodrine
  - Indirect acting
    - Amphetamine
    - Tyramine
  - mixed acting
    - Ephedrine
    - Mephentermine

Date / / Page No.

Scanned with CamScanner

Date / /
Page No.

Pharmacological action —

Heart —

- β_1 receptor are present on heart.
- Adrenaline or non-adrenaline increase heart rate
- Increase force of contraction
- Increase cardiac output
- Increase blood pressure

* Effect on blood vessels —

- Both vasoconstriction due to stimulation of α-receptor
- vasodilation due to stimulation of β_2 receptor.

* Effect on B.P —

- The effect depends on the amines its dosage and rate of administration.

(NA) non adrenaline cause rise in systolic, distalic and means B.P its does not cause vasodilation peripheral resistance increased consistantly due to a action.

* Effect on respiration —

- β_2 receptors are present on bronchial muscles only adrenaline and isoprinaline cause broncho-dialator.
- Non-toxic dosages pulmonary 'edema'

~~effect on eye~~

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Date / /
Page No.

* Effect on eye :-

Mydriasis occur due to constraction of radial muscle fiber but this is minimal after topical application because Adrenpenetrates cornea poorly.

* Effect of Gastrointestinal tract (G.I.T)

In isolated preparations of gut relaxation occurs through activation of both α & β receptors.

Effect on bladder —

Urine receptor occur
α and β - receptors are present.

Effects on Uterus -

(Adr) Adrenaline can both contract and relax uterine muscles, respectively through α and β receptors.

Effect on Skeletal muscles -

Neuromuscular transmission is facilitated in contrast to action on autonomic neurons ending. α receptor activation on motar nerve ending adjustment of 'Ach' releas (presynaptic) because it is α —

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Date / /
Page No.

α, α_1, subtypes.

Metabolic effects –

Adrenaline ↓ produced leukogenolysis

↓ Hyperglycemia, Hyperlactacidemia

↓ β_2 lipolysis

↓ Rise

Dosage indication of Adrenergic drugs –

- Adrenaline Injection – 0.2 to 0.5 ml
- Heart block
- Treatment of asthma – Salbutamol
- Hypertension, cardiogenic shock
- Used for prolongation of local anesthetic action by vasoconstriction – Adrenaline
- To control local bleeding – Adrenaline
- As Nasal deconjustant – Oxymethazoline
- Inhibition of Uterine constriction – Nylidrine

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Date / /
Page No.

Contra indication - Adv drugs

- Angina pectoris
- Hypertension
- Cardiac dysrhythmia
- Distal area with a single blood supply such as finger, toe, nose and ear.
- Renal impairment.

Scanned with CamScanner

Date / /
Page No.

Anti adrenergic drugs

These are the drugs which antagonised the receptor action of adrenaline and related drugs.

They are competative antagonist at α & β or both α and β adrenergic receptor.

They have opposite effect of adrenergic agents also known as adrenergic antagonist or adrenergic blocking agent.

Classification of antiadrenergic drugs

(i) Alpha receptor blocking agent

(a) Non-Selective α Blocking agent
- phenoxybenzamine
- phentolamine
- Tolazoline

(2) Selective α- blocking agent

(b) Selective α_1 blockers
- prazosin
- Terazosin

(c) Selective α_2 blockers
- yohimbin

Scanned with CamScanner

Date / /
Page No.

③ β- receptor blocking Agents

Non-Selective β- blocking agent
(first generation)

- Propranolol
- Timolol
- Nadolol
- Sotolol

④ Selective β_1- blockers (Second generation)

- Atenonal
- Bisoprolol
- Metoprolol

⑤ Mixed (α- and β) Adrenergic blockers
(Third generation)

- Carvedilol
- Labetalol

General effect of βα-blockers -

Vasodilator - Reduce peripheral resistance
Decrease Cardiac output
↓ fall in B.P

Reflex tachycardia - Due to fall in mean arterial pressure

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This is peripheral action exert directly on the muscles fiber (through β_2 receptors)

Eyes-

propanolol and some Other β-blocker reduced secretion of aqueous humer.
There is no constrant effect on pupil size or accommodation.

Uterus —

Relaxation of uterus in response to isoprenaline and Selective β_2-agonist is Blocked by propanolol.
However normal uterine activity is not Significantly affected.

Dosage Indication —

Scanned with CamScanner

Date / /
Page No.

Decrease renal blood flow.

G.R.F (Glomerular renal filtration) —
Decrease, increase Na, H_2O → reabsorption → Na retension → increase blood vessels.

Intestinal motality —

Increase lose motions may occurs
phenoxybenzamine lines to treat pheochromocytoma

phaumacological action

* C.V.S

Heart
propanolol decrease heart rate, force of contraction and cardiac output

Qs prolonge systol by retarding conduction So that synergy (imporve drug effect) of contraction ventricular fiber is distributed.

Blood vessels
propanolol blocker vasodialation and fall in B.P evoked by isoprenaline and hance the rise in B.P caused by adrenaline there is reversereible of vasomotor. (reversal that is seen after (alpha) α-blocked.

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