Routes of drug administration

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Medicines

Routes of drug administration

- Enteral
- Parenteral
- Topical
- Other routes

Routes for drug administration

Drug administration into the body can be through several routes

Depending on:

- Drug characteristics (Lipid solubility)
- Patient characteristic (Age, sex, site)
- Therapeutic aims regarding; onset and duration needed, & target organs to be treated.

Enteral Routes

- These Routes are given through the GIT & include:
  - Oral route
  - Sublingual route and buccal
  - Rectal route

Oral route

- Convenient, easy, acceptable by patients
- Suitable for most drugs (stable at PH of GIT)
- Absorption is good for lipid-soluble drugs
- Small intestine is the main site of drug absorption (due to its large surface area)
- For systemic & local effects

Disadvantages of oral route

- Unsuitable for drugs:
  - Inactivated by acidity of the stomach:
    - Penicillin G
  - Protein drugs destroyed in the intestine:
    - Hormones e.g. insulin
    - Enzymes (e.g. antithrombotic drugs)
  - Polar (water-soluble) drugs:
    - Heparin, aminoglycosides

-Drugs for high first pass hepatic metabolism

- lidocaine

Disadvantages of oral route

Not suitable in:

1- Emergencies (Delayed onset)

2- Convulsions

(during the fit; swallowing is not easy)

3- Vomiting

4- Coma

Buccal (sublingual) route

- Suitable for highly-lipid soluble drugs (e.g. nitrates) with high first pass metabolism
- Sublingual produces rapid onset of action
- E.g. Glyceryl trinitrate is used in acute attacks of angina pectoris (sublingual)
- Crosses rapidly mucosa into systemic circulation bypassing initially hepatic circulation
- Disadvantages: Local oral irritation

Rectal route

- Useful for systemic or local effects for:
- Children, comatose
- Uncooperative patients or cannot swallow
- Severe nausea & vomiting (like migraine attacks)
- To avoid upper GIT irritation e.g. by indomethacin or other NSAIDS.

- Disadvantages:
  - Local irritation
  - Rejection (due to physiological refuse)

Parenteral route

- Intravenous injection (IV)
- Advantages
  - Drugs are introduced directly into venous blood stream (immediate onset)
  - Not affected by first pass metabolism (bioavailability 100%)
  - Can be used for local irritant drugs (e.g. Anticancer drugs) and non absorbable drugs by GIT
  - Some drugs can be given rapidly (bolus) and some by infusion

Indications

1- Emergencies (rapid action)
e.g. in convulsions

2- Parenteral nutrition
(large volumes of fluids like saline, glucose)

3- Some general anesthetics
e.g. thiopental

❑ Disadvantages

1- Need technique (trained specialists)

2- Infections (sterilization must be done before injection)

3- Extravasation may cause tissue necrosis.

4- Wrong technique may cause air embolism

5- Once injected, no re-treat

Intramuscular (IM) injection

- Suitable for:
  - Oil preparations (absorbed slowly and suitable for long term)
    e.g. contraceptive injection
  - Aqueous preparations are rapid absorbed and for short term

- Disadvantages
  - Severe local pain
  - Tissue necrosis

❑Subcutaneous injection

- Suitable for non-irritant drugs
  e.g. aqueous solutions or suspensions.
- Suitable for self administration by patients
  e.g. insulin
- Long duration of action (slow absorption)
- Repeated injections of insulin S.C may produce lipoatrophy

Inhalation route

Advantages:

- Self administration
- Immediate onset of action
- Less first pass metabolism
- Low incidence of systemic side effects (using smaller doses)
- High surface area of respiratory tract and good absorption
- Inhalation route is useful to deliver drugs directly to respiratory system (e.g. ipratropium)

- Drugs delivered may be:

1- Gases (like oxygen and nitrous oxide)

2- Volatile liquids (as halothane general anesthetic)

3- Aerosols contain solution or suspension of a drug in a volatile substance that are held in dispenser

Inhalation route

- suitable for drugs given for systemic effects like general anesthetics
- Suitable for local effects on the respiratory system for treating asthma. e.g.

beclomethasone (inhaled corticosteroid)

Salbutamol inhaler (bronchodilator)

Mucolytic

❑ Disadvantages:

- Respiratory irritation.
- Beclomethasone may cause candida infection.
- Sometimes it is difficult for some patients (especially children) to understand proper method of use of inhaler or nebulizer.

❑ Topical routes

Include local application for local effects on:

- Skin (lotions, creams, ointments)
- Eye, ear, nose (drops and ointment)
  e.g. physostigmine (eye drops) for treating glaucoma
- Rectal suppositories
- Others
  - Intraarticular (inside joints) e.g. corticosteroids
  - Intrathecal (inside cerebrospinal fluid) e.g. spinal anesthesia

These agents can be applied topically

- Antiseptics (mouth wash).
- Local anesthetics

  (e.g. Lidocaine and benzocaine)for dental work
- Fungicidal agents.
- Ani inflammatory.

  e.g. indomethacin suppository
- Female sex hormones (e.g. estradiol)

  applied as cream, gel, spays as hormone replacement therapy

Transdermal route

- Drugs applied to the skin for systemic effects

Examples:

1- Glyceryl trinitie (patch)

Useful in long term prophylaxis of angina pectoris

2- Estradiol and clonidine patch

for post menopausal symptoms

3-Scopolamine

for motion sickness