

Routes of Drug Administration

The drug are administered to have effect on the whole body system or have localized effect on certain region.

Besed on the purpose,there is systemic administration or local application of drug by various routes are-

1.Oral. 2.Sublingual. 3.Per Rectal.
4.Injectable(Parenteral). 5.Local(Topical) Application. 6.Inhalation. 7.Other Method and Devices of drug delivery.

ORAL ROUTE=

- Drug which are absorbable and stable in GIT are given by this route.
- Though majority drugs are administered by this route but every drug cannot be given by this route or disadvantages of this route=it take some time before drug effect is seen and intensity of effect may not predictable thus ,this route will not be suitable for emergency condition.
- Patient have vomiting and diarrhoea,this route not preferred.

For majority of situation it serves the purpose or advantage of this route=

- Dose adjustment is easy. Self administration is possible, comparatively it is less costly and possibility of injury or infection is not there so it is most convenient to patient

Drug which are not absorbable;which are destroyed in GIT;

- Which are destroyed during portal circulation after absorption(having high first pass metabolism)and drugs which are irritant cannot given by this route.
- Patients who are appose non-cooperative unconscious patients should not be given drug by this route

SUBLINGUAL ROUTE=

- This is a peculiar route for the drugs undergoing high first pass metabolism.
- The tablet is kept underneath the tongue and drug is allowed to get absorbed.
- The drug rapidly absorbed and immediate systemic effect is produced.
- Very few drugs are given by this route. In case of angina pectoris glyceryl trinitrate and isosorbide dinitrate are used sublingually.
- Buprenorphine is used sublingually for chronic pain in malignancy.

PER RECTAL(PR)=

- It is less preferred route ,being cumbersome.
- For the purpose of sysemic action ,very few drugs are used in this route.
- Use of diazepam by this route for status epilepticus or febrile convulsion is important in children.

INJECTABLE(Parenteral)=

- As better and quicker absorption is expected by this route, it is an important route in case of emergency situations and for those not absorbable orally.
- This will be suitable in unconscious and uncooperative patients.
- Accurate dose adjustment is possible by this route

When drug cannot be given oral because of irritation or patient has vomiting, diarrhea and dehydration injection route is preferred.

There will no problem related to high first pass metabolism in port circulation, because portal circulation being bypassed.

It is not a convenient route for self administration of drug.

- Some injection(particular with irritant drugs)are pain ful.
- There is possibility of local damage(be care ful to nerve at the site of injection, repeated injection of insulin causes lipodystrophyin diabetic patient).
- Aseptic precaution are needed in this route.

Various way of injection eg. sc,im,iv,
intra-thecal;intra-peritoneal;

- Intra-articular;intra- arterial;sub-
conjunctival;retro-bulbar;

INTRA-DERMAL(id)=

Vary small quantity of the drug is administered(only0.1-0.2ml);the injection is painfull;only test dose is administered(to determine hypersensitivity reaction).

BCG vaccine is given by this route

Drug kept under the skin by this route.

INTRAVENOUS(IV)=

- There is very quick effect as drugs enters the circulation(no process of absorption is involved).
- Rapid(bolus)administration into high concentration reaching to the heart may causes cardiac toxicity.
- Suspensions and oily preparation cannot be injected(danger of embolism).
- Irritation of vein can lead to phlebitis and thrombosis.

- It is easy to adjust the rate of administration with accuracy by this route.
- By this route the drug is administered as
- (A) Bolus injection (diazepam for status epilepticus, diazoxide for the hypertensive emergency).
- (B) as slow intravenous administration after adequate dilution of drug (adrenaline for anaphylactic shock 1ml of adrenaline solution diluted to 10ml saline and 5ml of it is injected over a few minutes)

- (C) as intra venous infusion drug dilute in a large volume of suitable vehicle is given over a period of a few hours. Insulin 50 units added to 500ml of saline and infused as 15 drops per min. in a patient of 60kg for t/t of diabetic coma. Dopamine 10-12 drops per min for t/t of cardiogenic shock.
- Intra venous infusion needed when continuous blood level of drug is to be maintained. Drug having very short half life (like insulin, dopamine, oxytocin, lignocaine etc.) are preferred given by this route.

SUCUTANEOUS(SC)=

- About 1-5ml can be injected.
- Non-irritant drugs are injected.
- There is slow and steady absorption occur.
- If peripheral circulation is not maintained,absorption is poor and drug is not effective.
- Insulin and adrenaline are usually administered by this route.
- Lignocaine is given by this route for surgical procedure.
- In this route adrenaline retard the absorption of lignocaine and local aneathetic effect is prolonged.
- Irritation of vein can lead to phlebitis and thrombosis.

INTRAMUSCULAR(IM) =

- Deltoid, triceps and gluteus maximus muscles are usual sites.
- Injection is less painful.
- Soluble drugs are quickly absorbed.
- In case of repository (depot) preparation like oily solution and suspensions are absorbed slow and steady.
- Exercise and blood flow in the area are determinant of rate of absorption.

Some special routes of injection=

- Intra-thecal=for spinal anaesthesia
- Intra-peritoneal=large volume can be given;used for peritoneal dialysis.
- Intra-arterial =Radio-opaque dyes are injected for radiography.
- Intra-articular=Steroids can be given in joint cavity.
- Sub –conjunctival,retro-bulbar are specialized route in ophthalmology.

LOCAL (TROPICAL)APPLICATION=

- Application on the skin, mucous membrane or in body cavities for localized action is local application.
- Skin, mucous membrane including of the body cavities like mouth, vagina and rectum are common sites of local application.
- There is quick and localized action. As there is minimal systemic absorption chances of systemic unwanted effects are less. However, local irritation may occur.

INHALATION=

- By this route, the drug in the form of gas, volatile liquid, aerosols or fine powder are inhaled.
- They get absorbed and produce systemic effects (general anaesthesia by halothane, isoflurane, oxygen correct hypoxia and carbon dioxide stimulates respiration and corrects pH balance).
- If drug is not absorbed it produces local effect in respiration tract without producing systemic (unwanted) effects.
- Action is expected to be quick.
- Anti-asthma drugs salbutamol, beclomethasone are commonly used by this route.

OTHER METHODS AND DEVICES OF DRUG DELIVERY=

- **OCUSERT**: A device placed under the eyelid, delivers pilocarpine continuously over a long time (seven days) for treatment of glaucoma.
- **PROGESTASERT**: It produces continuous release of progesterone for a long period (a year) useful as an intrauterine contraceptive.
- **DRUG ELUTING STENTS**: Metallic stents are covered with a polymer containing drug; used in coronary angioplasty to reduce restenosis.

- **SUBCUTANEOUS IMPLANTS:** Solid pellets or drug packed in a capsule of suitable material is implanted underneath the skin is one the new drug delivery systems.
- **PRO-DRUG:** The drug is administered in an inactive form. Inside the body, it is converted into an active compound.
- By use of pro-drug availability of the active drug is increased (talampicillin, bacampicillin leads to better availability of ampicillin) or its distribution to particular sites is increased (levodopa reaches to brain and converted to dopamine to be effective in parkinsons disease).
- **TARGETED DELIVERY:** It is a new advancement in drug delivery system. A cytotoxic drug is attached to the monoclonal antibodies specific to cancer cell antigen; drug produces intense effect on cancer cells and general toxicity is very much reduced.
- Anti-cancer drugs and amphotericin B for kala-azar are used in this manner.

PATIENT RELATED ASPECTS=

- Whether pt requires rapid effect of the drug?
- Is pt in a position to comply with advice about administration?
- Is it emergency situation?
- Does pt suffer from vomiting, diarrhea?