

Pharma Chapter 2

Routes of drug administration:

Routes of drugs administration are the strategies that are used to administer a specific drug to a patient. They are divided into 2 main types.

1) Enteral

2) Parenteral

Enteral Routes:

Administration of drugs through the gastro intestinal tract is known as enteral route of administration. It is further divided into 3 varieties.

1) Oral

2) Sublingual

3) Rectal

(A) ORAL ROUTE:

In this method the drug is taken within the mouth so enclosed, usually with the help of some water or alternative fluid.

Benefits:

1) It is convenient.

2) It is generally economical as compared to other routes

3) This is the most typically used method of drug administration.

Limitations/Drawbacks:

1) Some drugs are not absorbed within the gut, for example gentamicin, or streptomycin. Due to which it's tough to administer in oral dosage type.

2) This method needs cooperation of patient.

3) Some drugs are destroyed by digestive enzymes of stomach or intestine e.g. benzyl penicillin and insulin.

4) Vomiting may occur due to unhealthy style, smell or irritant effect of the drug on the gastric mucous membrane. Examples are aspirin and indomethacin, which cause irritation of the stomach mucous membrane while castor oil has bad smell and quinine has bitter taste.

5) Food reduces absorption of some medicine e.g. iron and tetracycline. While some medication absorption is increased by food e.g. Griseofulvin.

6) Certain drugs could inhibit the motility of stomach and intestine e.g. opioids and antimuscarinics. Thus they will delay their own absorption which of alternative medication given long with them.

7) When two or a lot of medication are given together, they can interfere with the absorption of one another. Calcium, aluminium, magnesium, and iron can decrease the absorption of tetracyclines, because they react with chemicals to form insoluble salts.

8) First pass metabolism occurs in oral route due to which only a part of drug could reach into the circulation. e.g. oral administration of propranolol may cause metabolism of 70% of medication by first pass metabolism and so only 30% of drug reached the circulation.

(B) SUBLINGUAL ROUTE:

Some drugs with high lipid solubility can be chewed and then kept under the tongue. This causes rapid absorption of drugs from the sublingual and other blood vessels of the oral mucosa. Thus a quick effect of the drug will be produced. Following drugs can be used by sublingual route.

1) Ergotamine

2) Nitroglycerin

3) Nifedipine

ADVANTAGES/BENEFITS:

- 1) Patient can use the drug himself with out assistance.
- 2) It is economical.
- 3) Administration of drug by this route produces a rapid effect because it is quickly absorbed into systemic circulation.
- 4) As the drug join the systemic circulation directly ,first pass effect does not occur.
- 5) The effect of the drug given by sublingual route can be terminated by spitting the tablet or swallowing it.

LIMITATIONS/DISADVANTAGES:

- 1) We can't use this method in a person suffering from nausea.
- 2) Cooperation of patient is essential.
- 3) Drug can cause irritation of the mucosa with excessive saliva formation, and thus its swallowing can occur .This will prevent aim of sublingual administration.
- 4) We Can't give it to an unconscious person.

(C)RECTAL ROUTE:

Administration of All form of Drugs into the rectum is known as Rectal route while of the dosage form is solid it is called suppository, while if this is liquid then it is called enema. Rectal Route can be used for both local and systemic administration.

E.g Indomethacin a pain relieving drug, can be used in the form of suppository to produce systemic effect. while corticosteroids can be used locally into the rectum for its inflammatory conditions.

About 50% of drug administered from rectal route is absorbed into portal circulation, and other 50% is absorbed into the systemic circulation.

ADVATAGES/BENEFITS:

1. This can be use in unconcious person
2. This also can be used in uncooperative child.
3. Those who are suffering from nausea can take take drugs through this route.
4. Those drugs which cause irritation of the stomach can be given through this route .e.g Aminophylline and indomethacine

LIMITATIONS:

1. Some people are embarrassed to use this route.
2. Drugs absorbed into portal circulation can undergo fiest pass.
3. It requires the cooperation of a concious person.

4. Absorption of drug can be unpredictable through this route.
5. Repeated use of this route can cause irritation of rectal mucosa.

(2) PARENTERAL ROUTES:

Par means besides, Parenteral means gastrointestinal tract. So Administration of drugs by routes other than enteral routes are known as parenteral routes. Most often, the term parenteral is used when a drug is given by intravenous (IV), intramuscular (IM), subcutaneous (SC) injection. Here we will use the term parenteral for any route of drug administration other than enteral (From GIT). It can be further divided into the following three types:

1. Injection
2. Inhalation
3. Topical

1) INJECTIONS:

Here the drug is administered with the help of a special instrument known as a syringe or by an infusion apparatus. The following types of injections are commonly employed.

1. Intravenous (IV)
2. Intramuscular (IM)
3. Subcutaneous (SC)
4. Intradermal
5. Intrathecal
6. Intra-articular

Intravenous Route:

The drug is injected into a peripheral vein. Effects of the drugs may occur immediately. Intravenous administration of a drug can be done by two methods.

- A) Bolus
- B) Infusion

Bolus: In this method injection is made into a vein with the help of a syringe,

Infusion: Infusion is done with the help of an infusion apparatus. Drugs with short duration of action can be given by intravenous infusion. e.g. Dopamine, dobutamine etc. Similarly large quantities of fluid can also be given by intravenous infusion. Eg Normal Saline or dextrose solution etc.

Advantages:

- 1.It is highly effective and reliable route of drug administration.
- 2.A large volume of drug can be given by this method.
- 3.Effects of the drugs occur rapidly; this route is often used in emergency conditions.
- 4.An irritant Drug can be injected by this route the drug will be immediately diluted by the blood,and thus its irritant effect is reduced.
- 5.Rate of IV infusion of the drug can be controlled according to the response of the patient.Sodium nitroprusside can be given intravenous infusion for sever hupertension,and the rate of infusion can be adjusted according to the blood pressure of the patient.

LIMITATIONS:

- 1.This Require the help of a trained person,who is familiar with technique.
- 2.Proper aseptic precaution have to be observed during the procedure.
- 3.This method is often expensive
- 4.some drugs can cause irritation of the vien wall and thrombophelbitis e.g diazepam.
- 5.The drug is directly administered into the systemic circulation thats why serious adverse effects can occur.Hence injection should be given slowly,and response of the patient should be carefully monitored.if the ADR occur asministration of the drug should be immediately stpped.

INTRAMUSCULAR ROUTE:

In this method the drug is directly injected into a skeletal muscle with the help of a syringe.Commonly injection is made into one of the following skeletal muscle;

- 1.Vastus lateralis
- 2.Gluteus maximus
- 3.Deltoid

Absortion of drug is more feom deltoid and vastus lateralis than from Gluteus maximus due to better blood supply of the former two skeletal muscles,Drugs in aqueous solutions are more rapidly absorbed than those in oily solutions.Action of some drugs can be prolonged by combining them with some other substances e.g the effect of penicillin can be prolonged by combining it with procaine.This will cause slow absorption of penicillin from the site of injection.Thus intramuscular injection of procaine penicillin is effective for about 24 hours.intramuscular injection of oily solutionof penicillin will also prolonged its effects due to slow absorption of the drugs from the site of injection.

Benefits/Advantages:

- 1.This is reliable route ,liquid preparation produce their effects in 10-30 minutes.
- 2.certain depot preparations can be used by this route that are effective for a prolonged period.1 intramuscular injec of medroxyprogesterone may act as contraceptivr for about three months.One intramuscular injection of benzathine penicillin may be effective for about 1 month.
- 3.Rate of absorption of drug is more rapid as compared to the subcutaneous route.

Limitations:

- 1.A person trained for the technique is required for injection.
- 2.Only a limited amount of drug can be used by this route.
- 3.some drugs may cauee irritation of skeletol muscles,eg penicillin may cause pain when administered through an intramuscular injection.
- 4.If ADR (Adverse drug reactions)occur after its administration it can't be removed from the site of injection.
- 5.Proper aseptic precautions are essential during the procedure.

Subcutaneous Route:

Drug is inected under the skin with a syringe.absorption of drug is slow in this method as compare to intramuscular route.

Advantages:

- 1.It is reliable route.
- 2.Self injection is possible.

Disadvantes:

- 1.Drug may cause irritation of the subcutaneous tissue.
- 2.Poor absorption of drug occurs in peripheral circulatory failure.
- 3.Poor absorption.

2)INHALATION:

Drug is inhaled into the lungs and then its absorption occurs into the systemic circulation from alveoli.Drugs Can be inhaled by the following methods.

A)Powder inhalation:

Some drugs can be inhaled as a fine powder with the help of a special apparatus known as spinhaler.Sodium cromoglycate can be used by this method for the prevention of bronchial asthma.

B) Gas inhalation: Most of the general anaesthetics are available as a volatile liquids. Their inhalation causes rapid absorption of drugs into the blood circulation from the alveoli. There is a rapid distribution of drug from the blood into the brain .this causes loss of consciousness ,for example such an effect is produced by halothane ,enflurane etc.

C) Aerosol Inhalation:

The drug particles in this method are suspended in a gas. Particle size of a drug is 2-5 micrometers. e.g Terbutaline, Salbutamol, Ipratropium, Corticosteroids etc can be used as aerosol for the treatment of asthma. Drug particles are distributed uniformly in a gas that is present in a compressed form in a special apparatus known as inhaler. Drug is used by inhalation from the inhaler.

ADVANTAGES:

1. Aerosols and powders affect the lungs, and they have minimum systemic effects.
2. General anaesthetics are rapidly absorbed from the lungs, and they are also excreted from the lungs, thus their administration can be easily controlled.
3. Nitrous oxide is a gas with good analgesic effect. Though it does not produce full anaesthesia, it can be used by the patient himself during painful conditions e.g during labour.

DISADVANTAGES:

1. Patient may not be able to use the apparatus properly.
2. Drug can cause irritation of the bronchial tract.
3. A special apparatus is required.
4. Obstruction of the bronchial tree with mucous plugs may interfere with the effect of drug.

TOPICAL ROUTE:

Drug is applied locally on skin ,eye, ear, nose oral cavity urinary bladder, rectum and vagina. Drugs can be applied on the skin for local or systemic effects .eg nitroglycerin can be used in the form of an ointment or a sticking plaster on the skin to produce its systemic effects.

ADVANTAGES:

1. Patient can use it himself.
2. High local concentration of drug can be achieved usually without its systemic effects.

DISADVANTAGES:

1. Some drugs can cause allergic reaction e.g certain antimicrobials.
2. Systemic absorption of drugs can occur from the local site of application. This can produce

adverse effects on various parts of the body like administration of atropine or beta blocker in the eye. use of corticosteroids on skin can cause sufficient absorption into the blood to produce their systemic effects.