Route of drug administration

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ROUTE OF DRUGS ADMINISTRATION

Definition:-is the path by which a drug formula, fluid, poison or other substances are brought into contact with the body.

**THE ROUTES OF ADMINISTRATION DETERMINED PRIMARILY BY:-**

1- Properties of the drug (ex: water, lipid, solubility, ionization (pka; constant dissociation of acid-base concentration which is measure of the strength of the interaction compound with a proton, lower Pka of drug is stronger the acid, higher Pka of drug is stronger the base).

2- And by pharmacokinetical parameters.

3- And by therapeutic objectives (ex: desirability of rapid onset of action or for long term administration, or restriction to local site.

THERE ARE TWO MAJOR ROUTES OF DRUG ADMINISTRATION;-

a. PARENTERAL   B- ENTERAL

PARENTERAL

It is the most important and efficient route for systemic delivery of protein and peptide drugs, and it is the best choice achieved therapeutic activity.
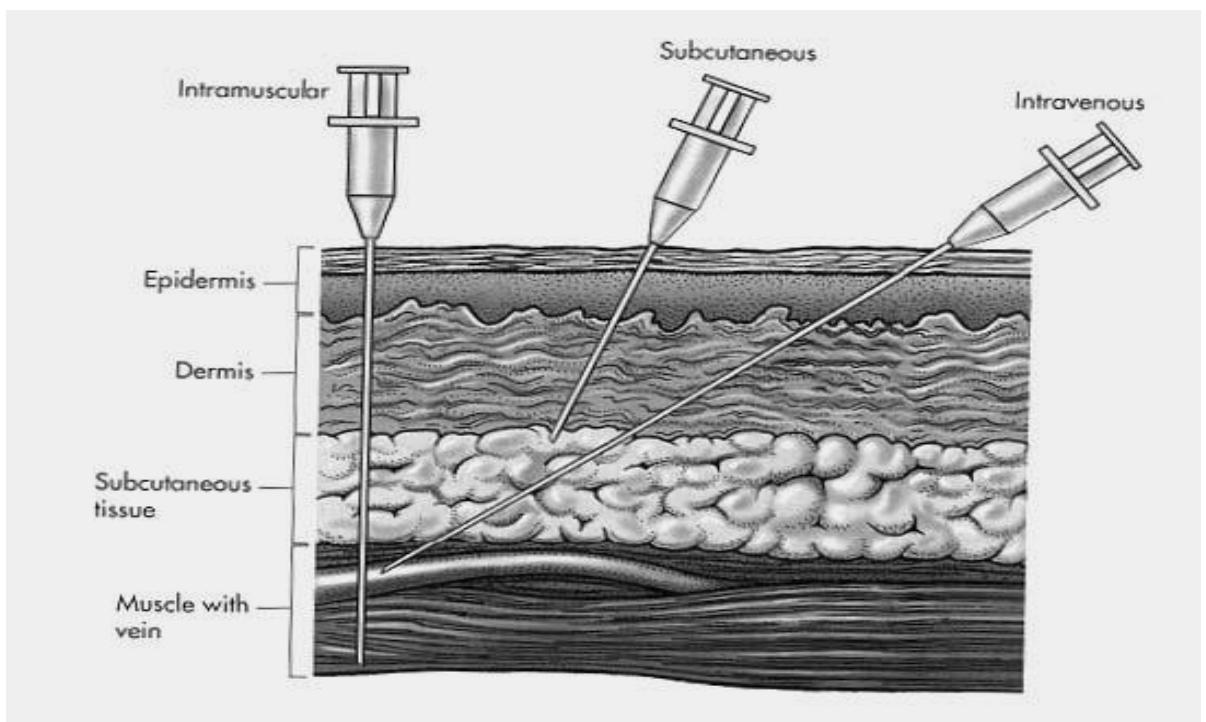
Intra-vascular (IV, IA)- placing a drug directly into the blood stream

Intramuscular (IM) - drug injected into skeletal muscle

Subcutaneous - Absorption of drugs from the subcutaneous tissues after injection subcutaneously

Inhalation - Absorption through the lungs

Intra-thecal:-administered region Intra- thecally

Intra-dermal: the drug is injected into the skin raising a bleb

A- Intravascular (IV, IA):

- placing a drug directly into blood stream.
-May be - **Intravenous** (into a vein) or **- intraarterial** (into an artery).

Advantages

1-immediate onset of action, 100% bioavailability.
2-rapid effect
3-sterlize

Disadvantages

1- risk of embolism.
2- high concentrations attained rapidly leading to greater risk of adverse effects.
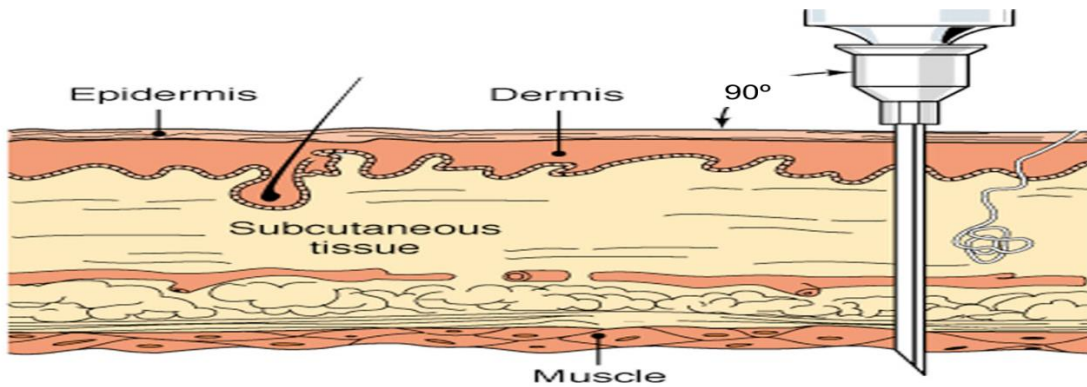
B-Intramuscular :(into the skeletal muscle).

Advantages

1- suitable for injection of drug in aqueous solution (rapid action) and drug in suspension or emulsion (sustained release).

Disadvantages

1- Pain at injection sites for certain drugs.

2-slow release preparations
3•Variability in bioavailability

SUBCUTANEOUS:

medication injected in to subcutaneous layer or fatty tissue of skin.

ADVANTAGES: Prompt absorption from aqueous solution.

•Little training necessary.

•Avoid harsh GI tract environment.

•Can be used for suspensions

DISADVANTAGES:

-cannot be used for large volumes

• potential pain and tissue damage

• absorption is limited by blood flow affected if circulatory problems exist
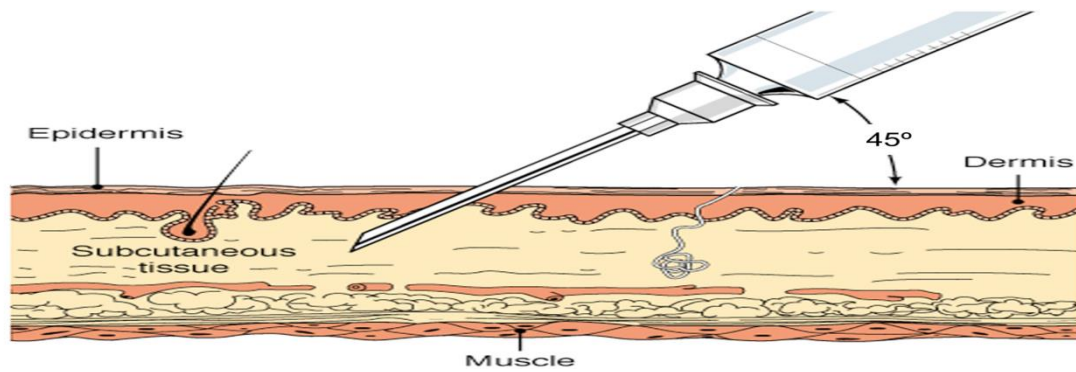
Intradermal: the drug is injected into the skin raising a bleb. This route is

used in diagnosis of tuberculosis (tuberculin testing in cattle) and (allergen sensitivity testing).

 Insert the needle, bevel up at
a 10-degree to 15-degree angle.
Intradermal Injection

ENTERAL

ORAL

Giving a drug by mouth is the most common route of administration. Drug placed directly in the GI tract:

Sublingual - placed under the tongue

Oral - swallowing

Rectum - Absorption through the rectum.

Physical factors affecting absorption:-

-Blood flow to the absorption site.

-Total surface area for absorption.

-Contact time at the absorption.

-PH on the drug absorption-

1-Oral route:

- It is intended for systemic effects resulting from drug absorption through the various epithelia and mucosa of the gastrointestinal tract

Advantages:
1- **Convenient** -Safe, no pain, easy to take.
2- **Cheap** - no need to sterilize,.

3- **Variety** - tablets, capsules, suspensions, mixtures

Disadvantages:

1- First-pass effect - drugs absorbed orally are transported to the general circulation via the liver. Thus drugs which are extensively metabolized will be metabolized in the liver during absorption. e.g. **propranolol**

3- Food - Food and G-I motility can affect drug absorption.

- Absorption is slower with food (milk and milk products) for **tetracyclines** and **penicillins,** etc. However, for **propranolol** bioavailability is higher after food, and for **griseofulvin** absorption is higher after a fatty meal.

4- Sometimes may have adverse reactions – e.g. Antibiotics may kill normal gut flora and allow overgrowth of fungal varieties. Thus, antifungal agent may be included with an antibiotic.

5- Not suitable for unconscious patient - Patient must be able to swallow solid dosage forms. Liquids may be given by tube

6- May cause irritation to gastric mucosa, nausea and vomiting.

2- Buccal/Sublingual route:

● Some drugs are taken as smaller tablets which are held in the mouth **(buccal**

tablet) or under the tongue **(sublingual tablet).**

- Buccal tablets are designed to dissolve slowly.

- E.g **Nitroglycerin**, as a softer sublingual tablet may be used for the rapid relief of angina.

● <u>advantage</u>

1- Avoid hepatic first pass - Bioavailability is higher.

2- Rapid absorption - Because of the good blood supply to the area, absorption is usually quite rapid enter directly systemic circulation.

3- Drug stability - pH in mouth relatively neutral .Thus a drug may be more stable.

<u>Disadvantages</u>

- . -inconvenient
- -small doses
- -unpleasant taste of some drugs

3-Rectal route

1- By-pass liver - Some of the veins draining the rectum lead directly to the general circulation, thus by-passing the liver reduced first -pass effect.

2- Useful -This route may be most useful for patients unable to take   drugs orally (unconscious patients) or with younger children.

           - if patient is nauseous or vomiting

1- Erratic absorption - Absorption is often incomplete and erratic.

2- Not well accepted

Other routs :-

-Inhalation route

Advantages -

A- Large surface area

B- Thin membranes separate alveoli from circulation

C- High blood flow

As result of that a rapid onset of action due to rapid access to circulation

1- Most addictive route of administration because it hits the brain so quickly.

2- Difficulties in regulating the exact amount of dosage.

3- Sometimes patient having difficulties in giving themselves a drug by inhaler.

Topical route

I Skin
A-Dermal – cream, ointment (local action)
B- Transdermal- absorption of drug through skin (i.e systemic action)
    I. stable blood levels (controlled drug delivery system)
    II. No first pass metabolism
    III. Drug must be potent or patch becomes too large

II Mucosal membranes

• Eye drops (onto the conjunctiva)
ear drops
.Intranasal route (into the nose)