

# SEMINAR ON

## PARENTRALS

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# INTRODUCTION



## DEFINITION

- According to USP :

“ an injection that is packaged in containers which are **sterile and pyrogen free in nature**”





## A BRIEF ABOUT PARENTERALS :

- **para: outside**  
**enteron: intestine**
- Any drug or fluid whose delivery **does not utilize the alimentary canal** for entry into body tissues.
- Parenteral products are injected **through the skin or mucous membranes** into the internal body compartments.
- These are the preparations which are given **other than oral routes**.

# ROUTES OF ADMINISTRATION



Three primary routes of parenteral administration are commonly employed :

- Subcutaneous
- Intramuscular
- Intravenous

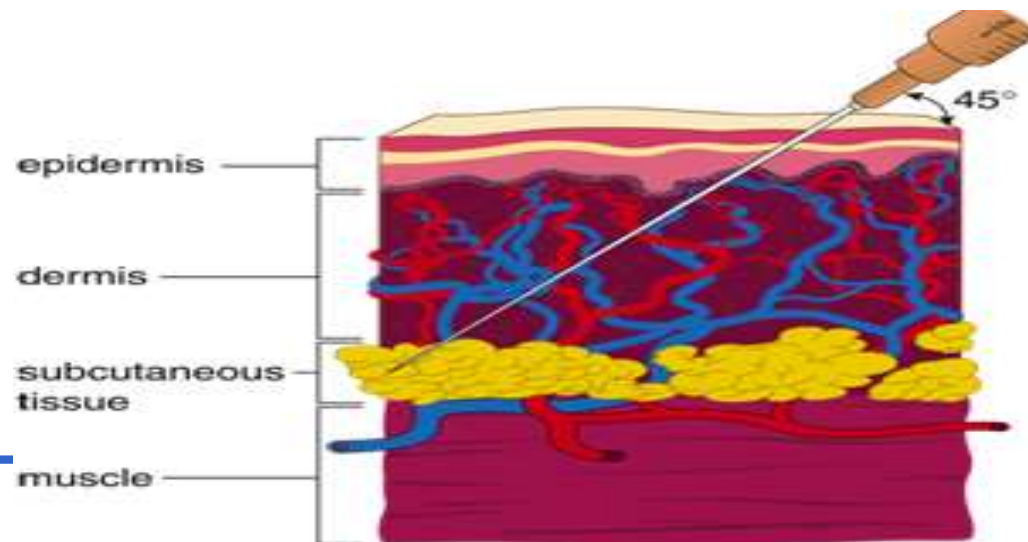
Other routes :

- Intra arterial
- Intra thecal
- Intra articular
- Intra cardial
- Intra ceribral
- Intra peridural
- Intra cisternal

# ● Subcutaneous



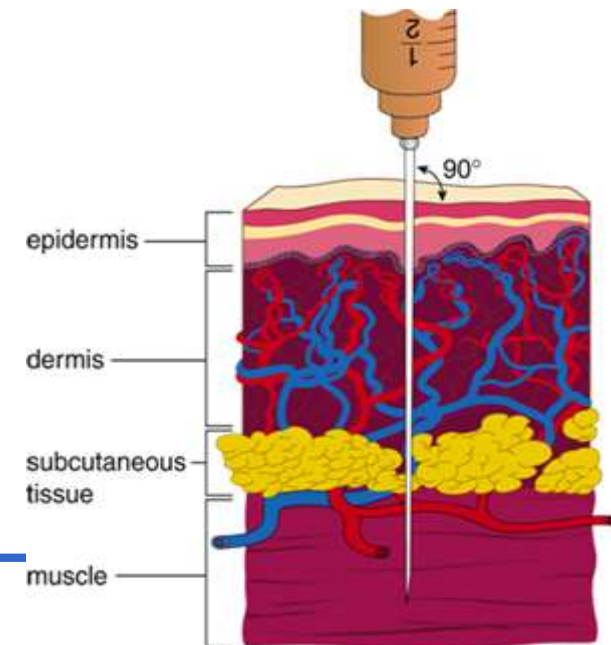
- Administer medications **below the skin into the subcutaneous fat**
- Often have a **longer onset of action** and a longer duration of action compared with IM or IV injection
- Given at a **45-degree angle**
  - **25- or 26-gauge needle**, 3/8 to 5/8 inch length
- No more than **1 ml** should be injected into the site to avoid pressure on sensory nerves causing pain and discomfort



# Intramuscular Injections



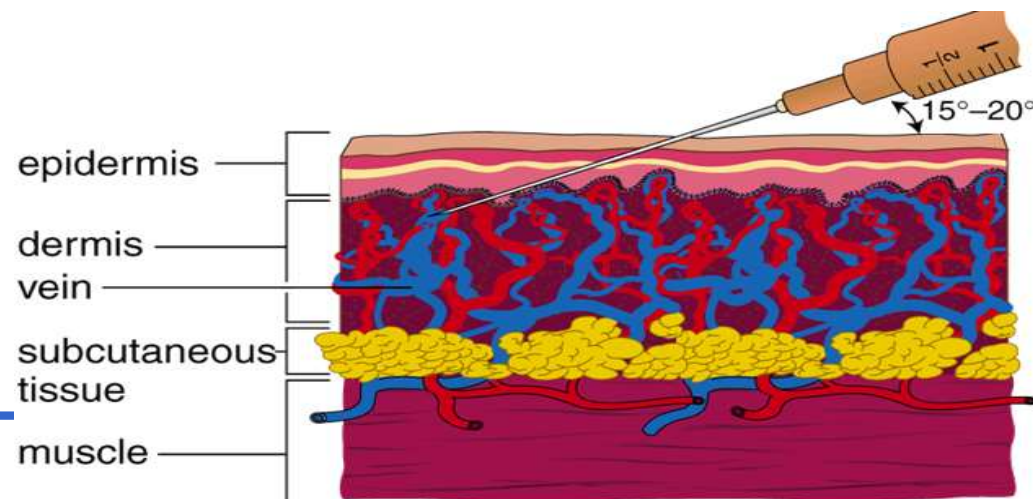
- In adults, IM injections are given into **upper, outer portion of the gluteus maximus**
- For children and some adults, IM injections are given into the **deltoid muscles of the shoulders**
- Typical needle is **22- 25 gauge ½- to 1-inch needle**
- IM injections are administered at a **90° angle**
  - volume limited **to less than 2 ml**



# Intravenous Injections



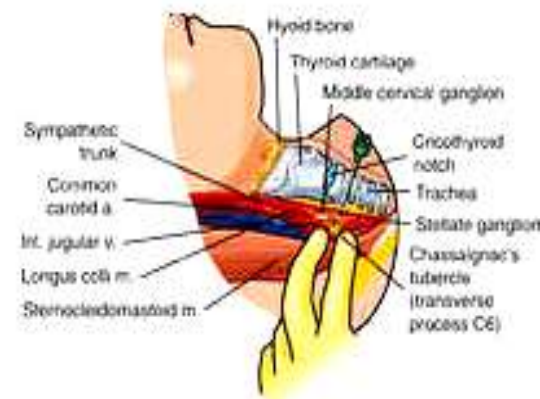
- Fast-acting route because the **drug** goes directly into the **bloodstream**
- often used in the **emergency department** and in critical care areas
- Commonly used
  - for **fluid and electrolyte replacement**
  - to provide necessary **nutrition** to the patient who is critically ill
- Intravenous (IV) injections are administered at a **15- to 20-degree angle**
- **Volume NMT 1 litre.**





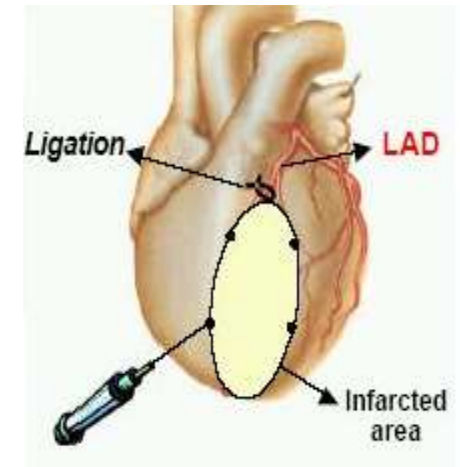
# Intra-arterial injection

The injection are given directly in to the artery



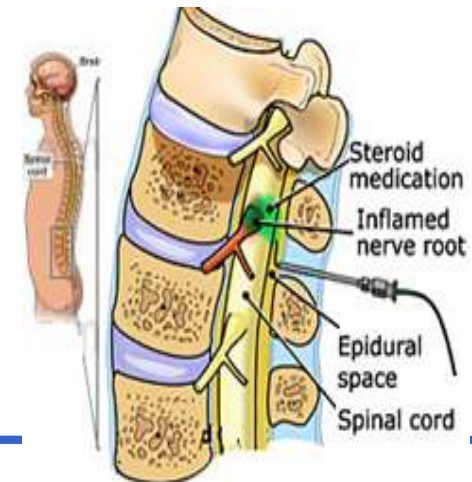
# Intracardiac injection

These are given into the heart muscle or ventricle at the time of emergency only.



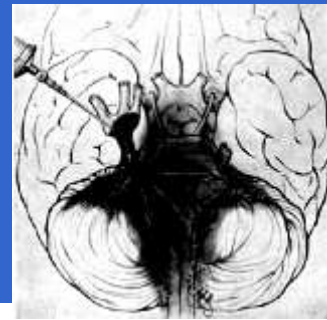
# Intrathecal injection

These are given into the subachonoid space the surround the spinal cord. This route is used for spinal anesthesia.



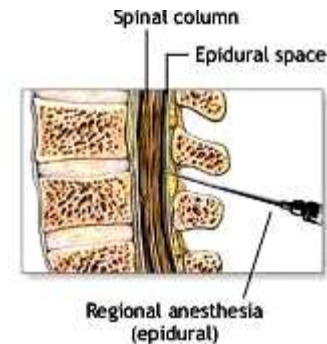
## Intracisternal injection

- ❖ These are given in b/w first & second cervical nerve.
- ❖ Used for CSF for diagnostic purpose.



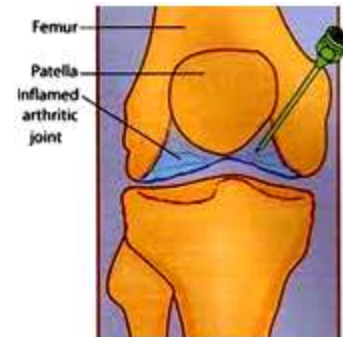
## Peridural injection

- ❖ These are given in b/w the dura matter & inner aspect of vertebra.
- ❖ Used for given spinal anesthesia.



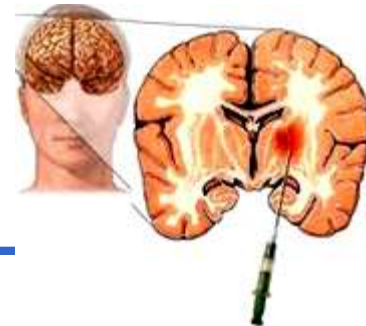
## Intra- articular injection

- ❖ These are given in into the articulating ends of bones in a joint.
- ❖ Used for lubricating the joints.



## Intracerebral injection

These are given into the cerebrum.





- Parenterals are classified into two types. They are

## 1. **Small Volume Parenterals (upto 100ml)**

### **Primary uses of SVP**

- **Therapeutic injections**
- **Ophthalmic products**
- **Diagnostic agents**
- **Allergenic extracts**





## 2. Large Volume Parenterals (100-1000ml)

### Clinical Utilization of LVP

- **Basic Nutrition**
- **Restoration of Electrolyte balance**
- **Fluid replacement**
- **Blood and blood products**
- **Drug carriers**



# ADVANTAGES



- **Quick onset** of action
- Suitable for the **drugs** which are **not** administered by **oral route**
- Useful for **unconscious or vomiting** patients.
- Useful for patients who **cannot take drugs orally**
- Useful for **emergency situations**
- Duration of action can be **prolonged** by modifying formulation.
- Can be **done in hospitals, ambulatory infusion centers,** and home health care

# DISADVANTAGES



- **Pain** on injection.
- **Difficult to reverse** an administered drug's effects.
- **Sensitivity or allergic reaction** at the site of injection.
- Requires **strict control of sterility & non pyrogenicity** than other formulation.
- **Only trained person** is required
- **Require specialized equipment**, devices, and techniques to prepare and administer drugs.
- **More expensive** and costly to produce.

# FORMULATION



## Aqueous vehicle :

### Water For Injection(WFI) USP :

- **Highly purified water** used as a vehicle for injectable preparations which will be subsequently sterilized.
- USP requirement include **not more than 10 parts per million** of total **solids**.
- pH of 5.0 to 7.0
- WFI may prepared by either **distillation or reverse osmosis**.
- Stored in chemically resistant tank.



## **Bacteriostatic Water for Injection (BWFI) :**

- This type of water used for making parenteral solutions prepared under aseptic conditions and **not terminally sterilized**.
- Need to meet USP sterility test.
- It can contain an **added bacteriostatic agent** when in containers of 30ml or less





## Sterile Water for Injection USP

- SWFI containing one or more suitable **bacteriostatic agents**.
- **Multiple-dose** containers not exceeding **30 ml**.
- They are permitted to contain higher levels of solid than WFI because of the possible **leaching** .
- Used for Washing wounds, surgical incisions, or body tissues.



## Water-miscible vehicles :

- primarily to effect solubility of drugs and/or reduce hydrolysis

## Non-aqueous vehicles :

Fixed oils (vegetable origin, liquid, and rancid resistance, unsaturated, free fatty acid content)

- Peanut oil
- Corn oil
- Cotton seed oil (depo-testosterone)
- Sesame oil
- Soybean oil (source of fat in intralipid)
- Ethyl oleate
- Isopropyl myristate

# OTHER ADDITIVES

## **Antibacterial Agents**

- Required to prevent microorganism growth
- Limited concentration of agents
  - Phenylmercuric nitrate and Thiomersol 0.01%
  - Benzethonium chloride and benzalkonium chloride 0.01%
  - Phenol or cresol 0.5%
  - Chlorobutanol 0.5%

## Buffers

- Added to maintain pH
- Results in stability
- Effective range, concentration, chemical effect
  - Citrate and Acetate buffer
  - Sodium benzoate and benzoic acid
  - Sodium titrate and tartaric acid
  - Phosphate buffer

## Antioxidant –

- Included to the formulation to protect from oxidation

Two types

- Reducing agent.eg- ascorbic acid, sodium bisulfite,thiourea
- Blocking agent.eg- BHT, Tocopherol

## Surfactants-

Included to solublise the active ingredient

- polyoxyethylene sorbitan monooleate
- sorbitan monooleate

## **Tonicity Agents**

- contribute to isotonicity of product
- Reduce pain of injection
  - Sodium chloride
  - Potassium chloride
  - Dextrose
  - mannitol
  - sorbitol

## **Chelating agents**

ethylenediamine tetraacetic acid