



University Of Peshawar

SAFE INTRAVENOUS THERAPY & HAZARDS OF IV THERAPY

Chap 8. Clinical Pharmacy II

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Intravenous Therapy

- Intravenous therapy is treatment that infuses intravenous solutions, medications, blood, or blood products directly into a vein.
- Effective
- Fast
- Emergency
- Comatose Patients
- 80 % in Hospitalized patients.



Type of Intravenous Therapy

1. PIVT

- Small Veins
- Short time

2. CIVT

- Superior vena cava
- Long time



Solutions for Intravenous Therapy

Colloid Solution

- Large molecule
- Albumin

Crystalloid

- Electrolytes

Based on Tonicity



Common reasons for IV therapy

1. Fluids and electrolytes Replenishment

2. 40% of all antibiotics are given intravenously

3. Transfusion

4. Nutrition



Guidelines Related to Safe Intravenous Therapy

- **1. Super Hygienic Condition**
 - Aseptic technique
 - Hand Hygiene
 - Preparing and maintaining equipment
 - Initiation and discontinuing an IV system
 - If Contaminated must be replaced



Guidelines Related to Safe Intravenous Therapy

- **2. Accurate Information.**

- Physician order

- Type of Drug

- Rate of infusion

- Duration

- Time

Iso osmotic
solution or
drug



Guidelines Related to Safe Intravenous Therapy

- **3. Setting of Peripheral IV Line.**

- Select a peripheral vein Upper extremity is preferred
- Percutaneous vein puncture
- Sterile transparent dressing to prevent accidental dislodgement
- Hub of catheter contains positive pressure cap
- Hub is connected to IV extension tubing



Guidelines Related to Safe Intravenous Therapy

- **4. Discontinuation of PIV Line**

- Every 72 to 96 hours.
- Patient is stable and no longer requires IV fluid therapy
- if tenderness
- Swelling, redness, or purulent drainage occurs at the insertion site
- When the administration set is changed (IV tubing)



Guidelines Related to Safe Intravenous Therapy

- **5. Central Venous Catheters**

- Also called central line
- Inserted into SVC
- Specialist Personnel
- Inserted surgically using ultrasound or CXR
- Central venous catheters can be inserted percutaneously or surgically through the jugular, subclavian.
- CVC are used where more than six days of intravenous therapy
- Retained for 1 yr



Guidelines Related to Safe Intravenous Therapy

• 5. Central Venous Catheters used for Pt

- Antineoplastic medications
- Seriously or chronically ill
- Irritant medications
- Require toxic medications or multiple medications
- Require central venous pressure monitoring
- Require long-term venous access or dialysis
- Require total parenteral nutrition
- Require medications with a pH greater than 9 or less than 5, or osmolality of greater than 600mOsm/L
- Have poor vasculature
- Have had multiple PIV insertions/attempts



Guidelines Related to Safe Intravenous Therapy

• 6. Assessing an IV System

- IV systems must be assessed
- Every 1 to 2 hours
- Beginning and end of shift
- Pain tenderness, swelling
- Any discomfort at insertion site
- PIV replaced after every 72 hrs
- Not-in-use PIV site is flushed every 12 hours



Guidelines Related to Safe Intravenous Therapy

- **7. Type of IV solution**
- Colloid solutions Albumin, Dextran's
- Crystalloid solutions e-g. Electrolytes or dextrose



Complications of Intravenous Therapy

Air Embolism

Air Embolism

- Iatrogenic Disease
- Gas in Vein
- Venous air embolism (VAE), a subset of gas embolism
- Mostly subclinical
- Direct communication
- Pressure gradient
- Morbidity and mortality relates to amount of air
- > 5ml/ kg... significant injury
- Inj of 2 or 3 mL of air into the cerebral circulation can be fatal.



Air Embolism pathophysiology

- Pulmonary artery pressure rises
- RV ejection drops
- Affecting venous return
- CO drops and cardiogenic shock
- Also

- Effects on the pulmonary vasculature
- Inflammatory changes in the pulmonary vessels
- Direct endothelial damage and accumulation of platelets, fibrin, neutrophils, and lipid droplets.

- Leading to pulmonary edema
- Ventilation perfusion mismatching



Air Embolism Causes

- Peripheral IV therapy
- Central IV therapy
- Surgery



Table 2. Examples of Nonoperative Procedures Associated with Vascular Air Embolism

Procedure

Direct vascular

- Central venous access related
- Radial artery catheterization
- Parenteral nutrition therapy
- Interventional radiology

Pain management procedures

- Epidural catheter placement (loss of resistance to air technique)

Diagnostic procedures

- Contrast-enhanced CT
- Contrast-enhanced CT chest
- Lumbar puncture
- Thoracentesis

Hemoperfusion

- Intraaortic balloon rupture
 - Rapid blood cell infusion systems
 - Blood storage container
-

CT = computed tomography.

Air Embolism Sign and symptoms

- Characterized by abrupt onset of signs and symptoms.
- Sudden dyspnea, cough, wheezing
- Chest and/or shoulder pain
- Tachycardia, hypotension
- Neurological findings consistent with cerebrovascular accident
- systolic murmur may be present
- Death



Air Embolism Diagnosis

- CT Scan
- MRI
- U/S Doppler



Air Embolism Treatment

- Stop the infusion by clamping the line
- Oxygen supply
- Endotracheal intubation
- Cardiopulmonary resuscitation (CPR)
- Vasopressors and mechanical ventilation are two other supportive measures that may be necessary



Phlebitis

Phlebitis

- Inflammation of Vein
- Tunica Intima
- Thrombophlebitis
- Common in peripheral veins
- Age 40-60 yrs
- Superficial or deep
- Pain and redness



Phlebitis



IV THERAPY AND ITS HAZARDS



Types of Phlebitis

1. Mechanical Phlebitis

2. Chemical Phlebitis

3. Infective Phlebitis



1. Mechanical Phlebitis

- Caused cannula
- Rubbing the cannula
- Injured tunica intima
- Risk reduced by using small gauge Cannula.



2. Chemical Phlebitis

- Caused by Strongly alkaline.
- Acidic or
- Hypertonic drugs can
- Cause significant irritation
- if injected into a small vein with an insufficient Blood flow
- Drugs should always be reconstituted

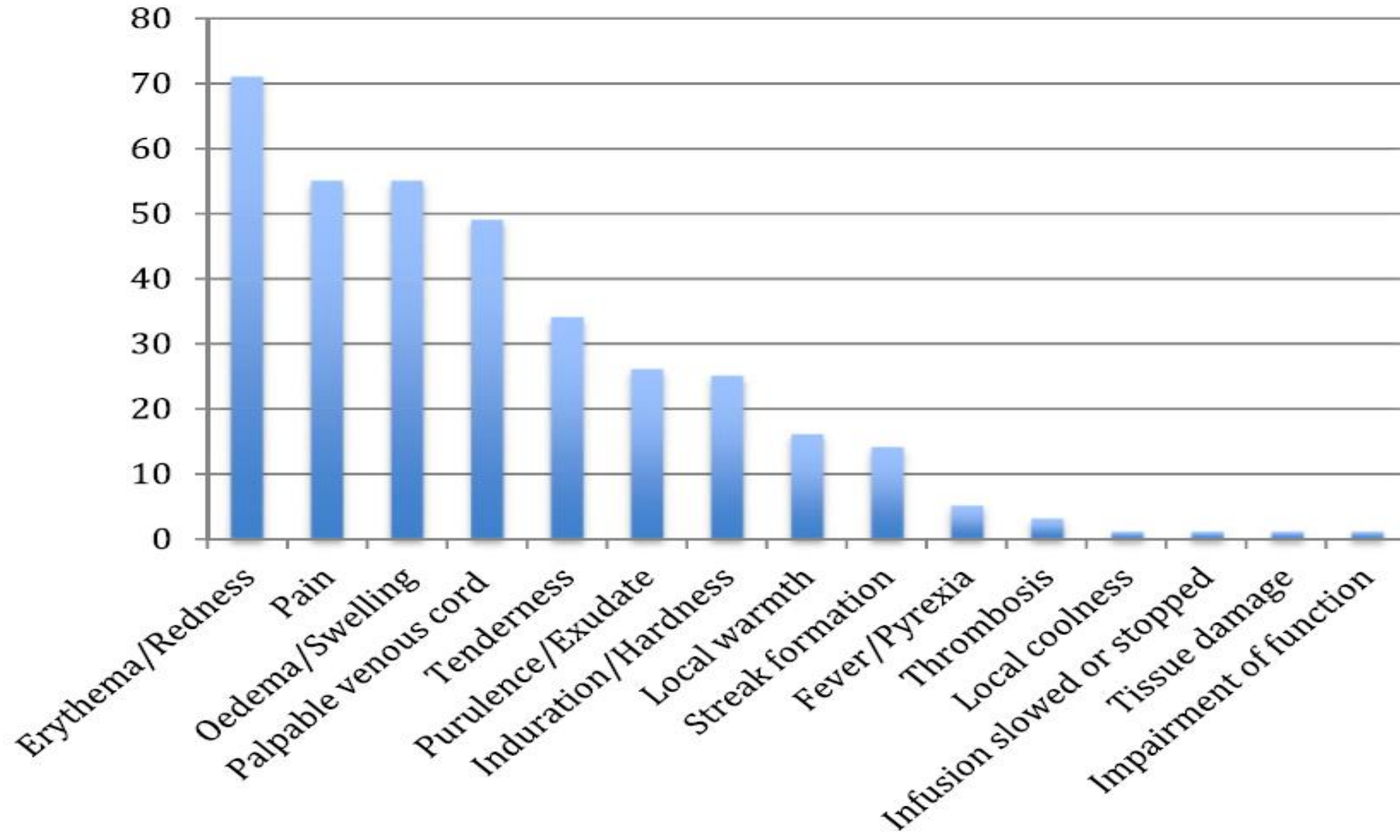


3. Infective phlebitis

- Infection
- Microorganism entering through puncture site
- Patients own skin flora
- Poor Hygienic Conditions



Sign and Symptoms Phlebitis



Diagnosis and Staging Phlebitis

FIG 2. **VISUAL INFUSION PHLEBITIS SCORE**

| | | |
|---|---|---|
| IV site appears healthy | 0 | No sign of phlebitis ■ Observe cannula |
| One of the following is evident: ● Slight pain near IV site ● Slight redness near IV site | 1 | Possible sign of phlebitis ■ Observe cannula |
| Two of the following are evident: ● Pale near IV site ● Erythema ● Swelling | 2 | Early stage of phlebitis ■ Resite cannula |
| All of the following are evident: ● Pain along path of cannula ● Erythema ● Induration | 3 | Medium stage of phlebitis ■ Resite cannula ■ Consider treatment |
| All of the following are evident and extensive: ● Pain along path of cannula ● Erythema ● Induration ● Palpable venous cord | 4 | Advanced stage of phlebitis or start of thrombophlebitis ■ Resite cannula ■ Consider treatment |
| All of the following are evident and extensive: ● Pain along path of cannula ● Erythema ● Induration ● Palpable venous cord ● Pyrexia | 5 | Advanced stage of thrombophlebitis ■ Initiate treatment ■ Resite cannula |



Management Phlebitis

- Remove cannula if VIP score 2 or greater.
- Dilute irritating solutions.
- Decrease speed of infusion.
- Reinsert new Small Gauge cannula if clinically indicated.
- Place away from points of flexion.
- If VIP score 5, take swab for culture



Extravasation

Extravasation

- Extravasation, the leaking of vesicant drugs into surrounding tissue, can cause severe local tissue damage.
- 0.5% to 6% of all patients receiving chemotherapy.
- **Cancer patients are at risk ?**
 - Multiple infusions
 - Malnourishment
 - Side effects of Chemo and Radiotherapy



Extravasation



Chemotherapeutic agents listed according to local toxicity

Vesicant

Doxorubicin, epirubicin, daunorubicin, idarubicin, dactinomycin (anthracyclines)
Vinkristin, vinblastin, vindesin, vinorelbine, vinflurin (vinca alkaloids)
Mitomycin-C, mechlorethamin, carmustin (alkylating agents)

Irritants

Mitoxantrone, aclarubicin (DNA-intercalating antibiotics)
Etoposid, teniposid (epipodo-phyllotoxin)
Fluorouracil, floxuridin (Antimetabolites)
Cisplatin, carboplatin, dacarbazin, oxaliplatin (Alkylating or DNA-binding)
Paclitacel, docetacel, bleomycin (others)

Non -
Vesicants

Metotrexat, cytarabin, pentostatin, gemcitabin, capecitabin (Antimetabolites)
Cyklofosfamid, ifosfamid, melphalan (Alkylating agents)
Irinotecan, topotecan, trastuzimab (other)



Extravasation Pathophysiology

1st Step

Sites pacific free radical Damage

2nd step

DNA damage.

3rd Step

Drug DNA complexes diffuses into adjacent tissue

Induced tissue necrosis may deteriorate tissue



Extravasation Clinical Signs and Symptoms

Early

Pain
Irritation,
Swelling,
Erythema,
Blistering

Late

Induration
Ulceration
Long term pain
tissue necrosis,
joint
destruction,
Permanent
dysfunctional and
cosmetic changes



Extravasation Management

- Discontinue Infusion
- Administer Antidote
- Do not flush the cannula
- Attempt to aspirate drug from the cannula
- Topical steroids
- Surgery



Infection

Infection

- Cannula insertion
- Management and care
- Aseptic techniques
- Local infection
- Sometimes get systemic



Infection Clinical Signs and Symptoms

- ❖ Redness
- ❖ Swelling, localized induration
- ❖ Skin discoloration
- ❖ Purulent discharge
- ❖ Pain
- ❖ Severe systemic infection (e-g, fever)



Infection Management

- ✓ Take swab from insertion site for culture
- ✓ Remove cannula and culture
- ✓ Clean insertion site with antimicrobial wipe
- ✓ Place sterile dressing over site
- ✓ Notify medical staff



Infection Management

- ✓ Systemic antibiotics may be necessary
- ✓ Monitor site 8 hourly
- ✓ Document the above actions and assessments



The End

Thanks