Volume 9, Issue 9, September– 2024 International Journal of Innovative Science and Research Technology
ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24SEP1417

Review on Acute Reactions while Administration of Intravenous Medications

Dr. Beulah Milton[1]; Abdul Mohammed Basha[2]; Christo Sebastian[3]; Dr. Ravi Kumar[4]
[1]Professor, Department of Clinical Pharmacy Practice, Krupanidhi College of Pharmacy, Bengaluru-560035
[2,3]Pharm D Interns, Department of Clinical Pharmacy Practice, Krupanidhi College of Pharmacy, Bengaluru-560035
[3]Professor, Department of Orthopaedics, MVJ Medical College & Research Hospital, Hoskote, Bengaluru-562114

Abstract:- The most common invasive procedure that patients admitted to hospital wards likely undergo is intravenous (IV) access. Medications through IV fluid injection is administered to up to 80% of hospital patients. Certain medications, such as phenytoin, vancomycin, ampicillin/sulbactam combinations, steroids, and cefotaxime, might result in abrupt responses when intravenous fluids are administered. antibiotics such as mitomycin, daunorubicin, dactinomycin, and doxorubicin. Antineoplastic drugs such as methotrexate, cyclophosphamide, etoposide, vinorelbine, carboplatin, oxaliplatin, paclitaxel, and epirubicin. Dopamine, noradrenaline, amiodarone, adrenaline, and pituitrin are examples of inotropic substances. Bevacizumab, Cisplatin, Heparin, Glucocorticoids, Tamoxifen, Testosterone, and Antidepressants. When administering IV medication, Clinical Pharmacist are crucial in identifying and reporting drugs that cause acute responses. Clinical Pharmacist can be involved because they can be crucial in ensuring safe pharmaceutical use in hospitals.

Keywords:- *Medications, Acute Reactions, Intravenous Fluids.*

I. INTRODUCTION

Intravenous (IV) access is probably the most frequently performed invasive procedure undergone by patients admitted in hospital wards. [1,2] Up to 80% of all hospital patients receive peripheral IV fluid administration. [3] Phlebitis, caused by irritation of blood vessels due to friction from the catheter tip, is a common complication from peripheral IV fluid administration. Medications themselves can also cause inflammation, as can blood clots formed at the IV catheter tip. Swelling from infiltration and extravasation are also common. These complications cause discomfort and pain and can lead to higher treatment costs and longer hospital stays. [4] These complications can lead to bloodstream infections, with a mortality rate of 12% to 25%. Prevention of complications must focus on proper technique, only using IV catheters when medically necessary and ensuring their prompt removal when no longer necessary, according to recommended guidelines.[5]

The availability of intravenous access allows the practitioner to administer medications that can immediately relieve airway obstruction, reverse bradycardia, and administer specific reversal drugs for patients who become inadvertently over sedated with benzodiazepines or opioids. [6] Technological and medical advancements have made IV therapy much safer than before, however there still is a risk for complications. [7] Apart from the necessity of vascular access, the peripheral vascular cannulation leads to risk of local and systemic infectious complications. [8] The complications associated with intravenous cannulation are thrombophlebitis, thrombosis, air embolism infections (Methicillin – resistant staphylococcus aureus, health care acquired infection). These complications increase the duration of hospitalization, cost of the treatment and even morbidity significantly. [9]

A leakage of non-vesicant drugs into the tissue surrounding of the IV cannula is called infiltration; leakage of a vesicant medication such as cytotoxic drugs is called extravasation. Both infiltration and extravasation can have serious consequences: the patient may need surgical intervention resulting in large scars, experience limitation of function, or even require amputation. Both can be prevented by early recognition and intervention upon the first signs and symptoms of infiltration and extravasations and treatment including the controversial use of antidotes, and heat and cold therapy. [10]

A. Infiltration

With IV therapy, fluids move down from a bag through a drip line and into an IV port in a vein in your arm. From there, the fluids enter the bloodstream to hydrate the body and deliver the drip bag's vitamins, minerals, or other supplements. On occasion, however, the fluids accidentally leak from the vein into the surrounding tissues. This is IV complication is called infiltration. Typically, infiltration occurs when the catheter for the IV port isn't inserted into the arm properly, or the patient moves, dislodging the port.

- *Medications and Solutions that can cause Infiltration:*

Dextrose solutions, Phenytoin, Vancomycin: Ampicillin/sulbactam combinations, Steroids and Cefotaxime.

- *Common Signs:*

The skin at the insertion point may redden or turn lighter (a term called blanching). There may also be swelling, tenderness, or some pain. The IV can stop working as well.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24SEP1417

➢ *How it is Treated:*

The IV port is removed and a compress applied to ease any pain or tenderness. Elevating the arm may also reduce swelling. Post-care instructions should be given to avoid possible complications.

Fig 1 Infiltration

Fig 2 Extravasation

B. Extravasation

Extravasation is similar to infiltration, as both involve fluid leakage. The difference is in the type of fluid in the IV. Extravasation involves fluids, specifically medications, that can irritate or inflame the tissues in the body. These are called vesicant medications. There are several types of these medications, including phenobarbital, epinephrine (or adrenaline), and many chemotherapy drugs.

➢ *Medications that can cause Extravasation:*

Many medications can cause extravasation, includes Antibiotics like Doxorubicin, dactinomycin, daunorubicin, and mitomycin. Antineoplastic agents like Epirubicin, paclitaxel, carboplatin, oxaliplatin, etoposide, vinorelbine, cyclophosphamide, and methotrexate. Inotropic agents like Dopamine, noradrenaline, amiodarone, adrenaline, and pituitrin. Hypotonic or hypertonic drugs like Parenteral nutrition solution, 10% potassium chloride, calcium, 50% glucose, iron sucrose, 20% mannitol, converted sugar electrolytes, albumin, and globulin. Strong acid or alkali drugs like Sodium bicarbonate, ampicillin, acyclovir, vancomycin, and ganciclovir can cause extravasation.

➢ *Common Signs:*

Many of the symptoms are similar to infiltration, such as swelling or pain. The irritating effect of extravasation may also cause the skin at the insertion point to feel cold or hot. Blistering or other skin damage, as well as infection, may occur.

➢ *How it is Treated:*

Treatment will vary somewhat, depending on the medication and the extent of any subsequent injury. In any case, the IV provider should immediately stop treatment, flush the medication from the area, and administer an antidote that neutralizes the medication's effects. Pain relievers may also be offered, and follow-up care is typically recommended.

C. Thrombosis

Thrombosis occurs when blood flow through a vein is obstructed by a local thrombus. Catheter related thrombus arises because of injury to the endothelial cells of the venous wall.

➢ *Medications that can cause Thrombosis:*

Heparin, Glucocorticoids, Tamoxifen, Cisplatin, Bevacizumab Testosterone and Antidepressants.

➢ *Common Signs:*

Painful reddened and swollen vein, sluggish or stopped IV flow.

➢ *How it is Treated:*

Remove the device, restart the infusion in the opposite limb, if possible, apply warm soaks, watch for IV therapy related infection.

Fig 3 Thrombosis

Fig 4 Phlebitis

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24SEP1417

Fig 5 Thrombophlebitis

D. Phlebitis and Thrombophlebitis

A damaged vein may become inflamed, causing phlebitis. This irritation can be triggered by a poorly placed catheter for the IV or by a medication in the IV bag. Thrombophlebitis also causes inflammation, and it can occur if you develop a blood clot in the vein after IV treatment.

Both phlebitis and thrombophlebitis can lead to infection at the IV site if left untreated.

➢ *Medications that can cause Phlebitis and Thrombophlebitis:*

Antibiotics such as dicloxacillin and erythromycin. Nafcillin, diazepam, pentobarbital, anaesthetics and narcotics, Macrolides, Bromopride, Ketoprofen, Enoxaparin, Furosemide, Sodium Heparin and Diazepam.

➢ *Common Signs:*

The skin near the inflamed vein can feel warm, tender, or swollen, and the vein itself may feel hard or ropy. You can also expect some pain or tenderness.

➢ *How it is Treated:*

It helps to elevate the affected arm and use a warm compress to reduce discomfort. You may also take ibuprofen for pain relief, or a physician may prescribe medication.

E. Air Embolism

An air bubble in an IV does not happen often, but it can be a rare complication with IV therapy if the air bubble enters the vein. An air embolism can be dangerous if it reaches the brain, lungs, or heart and causes a life-threatening problem such as a stroke or heart attack.

➢ *Medications that can cause Air embolism:*

- *Contrast Agents:*

Injecting IV contrast agents for CT scans, angiography, and cardiac catheterization can cause air embolism.

- *Common Signs:*

The severity of symptoms may depend on how much air has been introduced into the vein and the location of the embolism. Signs include low blood pressure, chest pain, headaches, muscle pain, confusion, and impaired breathing.

- *How it is Treated:*

A small air embolism can dissolve on its own, with no further action needed. A major air embolism that can block blood flow requires immediate treatment, such as surgery.

Fig 6 Air Embolism

Fig 7 Hematoma

F. Hematoma:

Occurrence of blood at the site of the IV. A hematoma occurs when blood leaks from the blood vessel into nearby tissues. Typically, happens because of passing through both sides of the vessel during insertion or poor application of pressure or an IV complication after removal.

➢ *Medications that can cause Hematoma:*

Warfarin, Clopidogrel, Aspirin and Dipyridamole.

➢ *Common Signs:*

Discoloration of the skin, Swelling and discomfort and usually goes away in a few weeks.

➢ *How it is Treated:*

Discontinue the IV and apply a pressure bandage. If you notice bruising or swelling, try putting ice or a cold pack on the area for 10 to 20 minutes at a time.

G. Fluid Overload

An excess of fluid disrupting homeostasis caused by infusion at a rate greater than the patient's system can accommodate.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24SEP1417

➢ *Medications that can cause Fluid Overload:*

Antihypertensives, corticosteroids and nonsteroidal anti-inflammatory drugs (NSAIDs) are known to cause fluid retention.

➢ *Common Signs:*

Shortness of breath, elevated blood pressure, bounding pulse, Jugular vein distention, increased respiratory rate and oedema.

➢ *How it is Treated:*

Slow the infusion rate and administer oxygen as needed.

Fig 8 Fluid Overload

Fig 9 Hypersensitivity Reactions

H. Hypersensitivity Reactions

This is a serious allergic reaction to the IV medication. This involves anaphylaxis (closing of airway and other problems), so treatment must be administered immediately to prevent life-threatening complications.

➢ *Medications that can cause Hypersensitivity Reactions:*

Vancomycin, intravenous iron, and monoclonal antibodies.

➢ *Common Signs:*

Typical symptoms include fever, rash, swollen joints, and restricted breathing.

➢ *How it is Treated:*

Immediate medical attention is required. Specific treatment depends on the symptoms and their severity.

II. CONCLUSION

When administering IV medication, Clinical Pharmacist are crucial in identifying and reporting drugs that cause acute responses. These drugs are employed because they regulate drug dosage in circumstances where patients need to receive treatment right away. It administers a drug straight into the bloodstream. Despite being typically safe, some drugs can have both harmless and harmful side effects. Adverse effects might occur quickly due to the rapid impact of IV drugs on the body. Infection at the injection site, infiltration, extravasation, thrombosis, hematoma, air embolism, thrombophilia, phlebitis, and hypersensitivity reactions are among the possible effects. Early detection and timely treatment are essential for the successful management of medication-induced responses by IV. Clinical Pharmacist can be quite helpful in ensuring that medications are used safely in hospitals.

REFERENCES

[1]. Gelena HJ. Complications occurring from diagnostic venepuncture. *J Fam Pract.* 1992; 34:582–4.

[2]. World Health Organization. WHO guidelines on drawing blood: Best practices in phlebotomy. 2010.

[3]. Mermel LA. Short-term peripheral venous catheter-related bloodstream infections: a systematic review. *Clin Infect Dis*. 2017;65(10):1757–1762. doi:10.1093/cid/cix562.

[4]. Dychter SS, Gold DA, Carson D, Haller H. Intravenous therapy: a review of complications and economic considerations of peripheral access. *J Infus Nurs*. 2012;35(2):84–91. doi:10.1097/NAN.0b013e 31824237ce.

[5]. Gorski LA, Hadaway L, Hagle ME, et al. Infusion therapy standards of practice. *J Infus Nurs*. 2021;44(1S suppl 1): S1–S224. doi:10.1097/NAN. 0000000000000396.

[6]. Lewis SM, Heitkemper MM, Dirksen SR. Medical surgical nursing. 6th ed. St.Louis: Westline Industrial Drive: 2000

[7]. Lundgren A, Jorfeldt L and EK A. The core and handling of peripheral IV cannulas on 60 surgery and internal medicine patients, an observation study. Journal of advanced Nursing,1983; July, 18, 963 971.

[8]. 8.Black JM; Hawks JH. Medical surgical nursing: Clinical management for positive outcomes. 8th ed. St. Louis: Westline Industrial Drive: 2009

[9]. Easterlow D, Hoddinott P, Harrisons, "Implementing & Standardising the use of Peripheral vascular access devices" J Clin Nurs 2010 Mar: 19 (5-6): 721-7.

[10]. 10.Tagalakis V, Kahn SR,Libman M ,The epidemiology of peripheral vein infusion thrombophlebitis, a critical review ,2004;Aug1;113 (2):146 151 .