Extravasation: Did Everything Right and It Still Goes Wrong!

Congress 2017
Simulation Clinic

Clinical Scenario

• Patient
  – Therapy related AML
  – 1.5 years post treatment for breast cancer
  – Starting induction chemotherapy requiring hospitalization

• Nurse
  – 6 month New Graduate RN
  – Just completed Chemo Bio course and skills validation for administering chemotherapy
  – Mother has just started chemotherapy for breast cancer

Question:
Does this regimen require a central line?
Venous Access

<table>
<thead>
<tr>
<th></th>
<th>Peripheral IV</th>
<th>Central venous access device</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non vesicant IV Push</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Non vesicant Minibag</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Non vesicant Continuous Infusion</td>
<td>X</td>
<td>X (preferred)</td>
</tr>
<tr>
<td>Vesicant IV Push</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Vesicant Minibag</td>
<td>X*</td>
<td>X</td>
</tr>
<tr>
<td>Vesicant Continuous Infusion</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

*Infusion < 60 minutes to gravity only

Definitions

- **Extravasation:** the leakage of an intravenously administered medication out of a vein into the tissues surrounding the vessel. Many agents when extravasated are capable of causing pain, necrosis, and/or tissue sloughing.
- **Irritant:** an antineoplastic agent capable of causing aching, tightness, and phlebitis at the injection site and/or along the vein, with or without an inflammatory reaction.
- **Flare reaction:** erythema, pruritis and localized urticaria at or adjacent to the site of drug administration

Anxiety

- **Generalized anxiety**
  - Worry is difficult to control
  - Restless
  - Fatigue
  - Poor concentration
  - Irritability
  - Tension
  - Poor sleep
- **Results in difficulty focusing on other tasks**
Disease and Treatment Factors

• Adverse effects from antiemetics or steroids
• Metabolic disorders, e.g. hypercalcemia, hypoglycemia
• Pulmonary embolism
• Abrupt substance withdrawal
• Hypoxia can result in sensations of distress and asphyxiation
• Brain lesions leading to complex partial seizures can present with symptoms resembling panic
• Anxiety is a cluster symptom with fatigue, pain, appetite disturbance, dyspnea, nausea and insomnia

Anxious Behaviors

• Significant anxiety can lead to a fear/avoidance cycle which can create chronic symptoms
  – Attempts to avoid pain by decreasing activity may increase pain sensitivity
  – Attempts to reduce dyspnea by decreasing activity may lead to increase dyspnea at rest

Frequency of blood return checks

<table>
<thead>
<tr>
<th></th>
<th>Peripheral IV</th>
<th>Central venous access device</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non vesicant IV Push</td>
<td>Before and After</td>
<td>Before and After</td>
</tr>
<tr>
<td>Non vesicant Minibag</td>
<td>Before and After</td>
<td>Before and After</td>
</tr>
<tr>
<td>Non vesicant Continuous Infusion</td>
<td>Before and After</td>
<td>Before and After</td>
</tr>
<tr>
<td>Vesicant IV Push</td>
<td>Before, every 2-5 mL and After</td>
<td>Before, During and After</td>
</tr>
<tr>
<td>Vesicant Minibag</td>
<td>Before, every 5-10 minutes and After</td>
<td>Before, During and After</td>
</tr>
<tr>
<td>Vesicant Continuous Infusion</td>
<td>N/A</td>
<td>Before, During and After</td>
</tr>
</tbody>
</table>
Anxiety Treatments - PEP

• **Recommended for Practice**
  – Cognitive Behavior Interventions
  – Mindfulness-based stress reduction
  – Psychoeducational interventions

• **Likely to be Effective**
  – Anxiolytics
  – Coaching
  – Massage
  – Music/Music therapy
  – Spiritual interventions
  – Yoga

• **Effectiveness not Established**
  – Accupressure/puncture
  – Antidepressants
  – Art therapy
  – Caregiver/partner interventions
  – Ginseng
  – Homeopathy
  – Methylphenidate
  – Rapid diagnostic and treatment pathways

• **Effectiveness unlikely**
  – Buspirone
  – Orientation and information provision
Is it an Extravasation?

<table>
<thead>
<tr>
<th>Signs and Symptoms</th>
<th>Vesicant Extravasation</th>
<th>Venous Irritation</th>
<th>Flare Reaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain</td>
<td>Immediate, may increase over time</td>
<td>Aching and tightness along a vein as drug infuses</td>
<td>None, may itch along vein</td>
</tr>
<tr>
<td>Redness</td>
<td>Immediate, but not always present, especially in deep veins, increases over time</td>
<td>Vein may be reddened or darkened</td>
<td>Blotches or streaks along vein, subside within a few minutes</td>
</tr>
<tr>
<td>Swelling</td>
<td>Immediate</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Blood return</td>
<td>Lost</td>
<td>Present</td>
<td>Present</td>
</tr>
<tr>
<td>Ulceration</td>
<td>Skin is intact but may blister or slough over time</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

Extravasation Treatment

<table>
<thead>
<tr>
<th>Antineoplastic Agent</th>
<th>Adjuvant</th>
<th>Local Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anthracyclines (doxorubicin, daunorubicin, epirubicin, idarubicin)</td>
<td>Dexrazoxane</td>
<td>*Cold may be applied prior to dexrazoxane administration, but must be removed at least 15 minutes prior to infusion. *Do NOT apply cold to site after dexrazoxane is initiated. *Warm compress for 15-20min 4 times per day X 48hrs. *Do NOT apply cold compress.</td>
</tr>
<tr>
<td>Vinca Alkaloids (vincristine, vinblastine, vinorelbine)</td>
<td>Hyaluronidase 150 IU/mL</td>
<td>*Inject 1-2 mL (total). *Use 5-10 injections of 0.1-0.2 mL each subQ around site of infiltration *Warm compress for 15-20min 4 times per day X 48hrs.</td>
</tr>
<tr>
<td>Taxanes (paclitaxel, docetaxel)</td>
<td>None</td>
<td>*Cold compress for 15-20min 4 times per day X 48hrs</td>
</tr>
<tr>
<td>Etoposide</td>
<td>None</td>
<td>*Warm compress for 15-20min 4 times per day X 48hrs</td>
</tr>
<tr>
<td>All other chemotherapy vesicants not listed above</td>
<td>None</td>
<td>*Cold compress for 15-20min 4 times per day X 48hrs</td>
</tr>
</tbody>
</table>

Documentation

[Image of documentation]
References

Charge Nurse: Rachael
Nurse: Angela
Patient: Molly
Facilitator

Location: Inpatient Oncology Unit

Advance slide:

Facilitator: Molly is recently admitted to your oncology unit with an AML diagnosis presenting 1.5 years after treatment for breast cancer. She is understandably anxious about her new diagnosis. Treatment with continuous infusion cytarabine for 7 days along with daily IVP of daunorubicin will start via peripheral IV until a central line can be placed in the next 1-2 days.

Angela is a nurse new to administering chemotherapy. She has completed her chemotherapy training and has completed her competency validation...this will be the first time she has administered chemotherapy independently.

Angela and Rachael (charge RN) touch base after Angela has completed her verification of the chemotherapy orders.

Rachael: Hi Angela, how are you feeling about this chemotherapy? I know this is the first time you have been on your own administering chemo and want to make sure you have all your concerns addressed before you start.

Angela: Thanks for checking in Rachael. I am a bit concerned because Molly does not have a central line and I know her chemo is going to be a continuous infusion and that one of her medications is a vesicant. Doesn’t she need a central line?

Rachael: I can totally understand your concern. Let’s take a look at our policies to see if this regimen can be given peripherally.

Advance slide: audience question: does this regimen require a central line?

Advance slide: IV access/vesicant guidelines

Facilitator: ONS guidelines show that most chemotherapy agents can be given peripherally, just that the method of delivery may be limited if the medication given is a vesicant. If the vesicant chemotherapy is infusing via a peripheral site, the fluids must run to gravity flow. Peripheral IV’s should avoid the bony prominences, areas of flexion or areas with decreased sensation and ideally should be less than 24 hours old. Only vesicant continuous infusions are excluded from
use of a peripheral IV although vesicant minibags can be infused if they are infused over less than a 60 minute infusion and should not be infused using an electronic infusion device. Additionally, although non-vesicant infusions may be infused peripherally, use of a central venous access device is preferred.

Rachael: So, Angela, based on our policies, can this regimen be safely given peripherally?

Angela: It looks like it, although we would prefer the continuous infusion be given through a central line. It’s unfortunate that it's Saturday and they won’t be able to get a long-term line into her until Monday. Can you help me talk through the importance of a central line with some types of therapy?

Advance slide: Definitions slide

Facilitator: From these definitions we can see the differences between extravasation and irritation. While we focus on chemotherapy agents as being medications that can cause tissue damage, there are also medications such as contrast media, phenytoin and TPN. Extravasation of vesicant agents can cause tissue damage if they infiltrate or are given directly into the tissues inadvertently, such as a vesicant being given IM or intrathecally. This tissue damage may not occur for weeks as health cells that have taken up the medication die and release the medication into surrounding tissue. Irritant medications may cause irritation to the vein during infusion, but may not cause tissue damage if they infiltrate unless sufficient quantity of the medication is infiltrated. A flare reaction occurs with some medications that may make a Patient or nurse think there is an infiltration, in fact, the vein is still patent.

Angela: Ah, that makes sense. So with these medications, the cytarabine is not a vesicant and so could be infused peripherally but the daunorubicin is a vesicant so we would prefer it be given through a central line but since it’s a push, don’t need to, but do need to watch for infiltration. I’ll make sure to check how frequently I need to look for blood return before I administer. You know, my mom is getting her second cycle of chemotherapy for breast cancer. She is receiving doxorubicin and had some redness along her vein during its administration but it did not infiltrate. That sounds like the flare reaction. Since daunorubicin is in the same class, should I expect the same reaction? I don’t remember hearing about it in chemo class.

Rachael: Angela, I’m so sorry to hear about your mom. I know it can be difficult to take care of people with cancer and be a caregiver for one at the same time... In answer to your question, while they are in the same class, flare reactions are much more common with doxorubicin but it’s great that you recognized the connection. Do you think you are ready to go?

Angela: Thank you Rachael. I have to admit it is kind of difficult taking care of someone who has leukemia after being treated with the same breast cancer regimen. I’m okay right now because I’m focusing on her chemo but I might need to talk about it later. As for giving the chemo, I think I’m as close to ready as I’m going to be. I want to get in there to get the chemotherapy started because Molly has asked me at least 10 times when we are going to get
the chemotherapy started and can’t settle in. I’m a little worried that she’s not going to be able to sit still.

Rachael: It sounds like Molly is a bit anxious about this. Her pacing and repeated questions sound like the same thing I have heard from many Patients over the years. It usually helps to be able to sit and talk with them and offer some suggestions on how to control the anxiety. It’s a good thing you’ll have some time to talk while giving your daunorubicin.

Angela: Yes, I’ll make sure and have some suggestions for her while we are talking. I’ll call you when I am ready to do bedside verification.

Facilitator: Angela gathers her supplies and medications and goes to Molly’s room to administer her chemo.

Angela: (Knock, Knock.) Hi Molly, it’s Angela. I’m here to start your chemotherapy.

Molly: Angela, can you tell me why I have to be in the hospital for this? When I got chemotherapy for my breast cancer, I could get it all outpatient. And, they tell me I have to have a central line placed on Monday. I already had a port, why did they have to take that out? Why do I have to have another one, especially one that I can’t hide like I did my port? I’d rather just have an IV and not have another central line.

Angela: I’m sorry, Molly. It must be hard to have to go through this again. I’m sure they took your implanted port out after you were in remission because ports have a risk of infection and clots. If the port was not being used, I am sure they would not want to put you at risk for either of those. And, with the type of chemotherapy and its’ side effects, we routinely need to run 2 IVs at a time, so a port would not have been enough. Even though this line will be visible, it will be one that requires the least amount of needing to start another IV and easiest access to administer all the medications and blood products you will need. I bet you are anxious and comparing this a lot to your previous treatment….what can I do to help?

Molly: I am very anxious and I’m having a hard time keeping any information in my head. So tell me what I can expect with this. Before I got an IV push and a short infusion and then I got to go home. What’s going to happen with this one?

Advance slide: Anxiety

Facilitator: There are many types of anxiety disorders but we will focus today on generalized anxiety. This is seen commonly in Patients with new diagnoses as well as those who are completing treatment. You can see some of the symptoms here. Molly is exhibiting restlessness and poor concentration as well as some irritability. These symptoms can result in shifting from one topic to another, focusing on concerns that may not be a priority at the moment and having difficulty focusing on other tasks.
**Advance slide: Disease and treatment factors**

**Facilitator:** In addition to underlying anxiety disorders with which the Patient may come to us, such as panic disorder, obsessive/compulsive disorder or post-traumatic stress disorder, the disease and treatment itself may also cause or exacerbate symptoms. We are all well aware of adverse effects from antiemetics or steroids or substance withdrawal. Metabolic disorders can cause confusion which is obviously distressing and PE or hypoxia lead to feelings of distress and asphyxiation. Symptom clusters are groups of symptoms that commonly occur together and can exacerbate one another. Anxiety is coupled with a number of symptoms in different clusters – it is always good to be aware of these and assess these symptoms in aggregate, not individually as treatment of one can improve another.

**Advance slide: Anxious Behaviors**

**Facilitator:** Anxious behaviors and coping mechanisms can create a fear/avoidance cycle which may, in fact, worsen symptoms. An example of this is a Patient with pain. A common fear in Patients with anxiety is inadequate pain control. The Patient may know that physical activity can worsen pain and therefore avoid that activity. However, this may increase sensitivity to pain as well as decrease the amount of activities in which the Patient may engage. This can lead to physical deconditioning as well as depressive symptoms from decreased engagement in activities. A similar example to this is Patients with dyspnea who avoid physical activity to reduce risk of dyspnea but then become deconditioned and therefore experience more dyspnea with even simple activities.

**Angela:** I’m going to start by connecting some IV fluids and giving you a medication to prevent nausea. I will then give you the IV push medication that has a risk of tissue damage if the IV infilrates. I’ll be checking to make sure your IV stays functional throughout that push and will need you to tell me if you are feeling any pain or discomfort at the IV site. After that I will connect you to the continuous infusion of chemotherapy. This medication is not known to cause any problems if it infiltrates, but we will be watching the IV site throughout the day. We’ll repeat this sequence for 2 more days, after that you will only be receiving the continuous infusion. We’ll be able to send you to have your central line placed on Monday, and after that our checks will be less frequent.

**Advance slide: Blood return checks**

**Facilitator:** Because this regimen will start peripherally, the daunorubicin IV push will have to have blood return checks every 2-5 mL but once the central line is placed, blood return checks can be done before and after. The continuous infusion will need to be checked at a minimum of each shift since it is going peripherally but should be checked as per institution guidelines.

**Angela:** Okay, Molly, let’s get this started. Rachael and I have checked your chemotherapy against the orders and we are good to go. I’m going to start with the IV push which will take 10-15 minutes, then hook up your continuous infusion. I’ll just pull up a chair and get started.
(Angela sits down and starts with the IV push). Do you want to talk a bit more about how you are feeling right now? As I said before, I bet you are still kind of reeling from this diagnosis, especially knowing your breast cancer is still in remission.

**Molly:** Yes, I just don’t get this. I did so well with my treatment, I felt fortunate. I was able to continue working just with scaled back hours. And now this. I have known other people who have been treated for breast cancer and none of them have been so unlucky as this. I wonder if I did something wrong. And, this is all so different from my first treatments, I feel like I am floundering again. I can’t sleep at night because I worry during the night that I won’t respond to treatment or that my breast cancer might come back along with this.

**Angela:** Molly, that is hard. We know that how a person responds or does with treatment has no bearing on whether they get another malignancy from that treatment. It sounds like you did well with your breast cancer regimen and we can support you on this so you can do well this time around. It will be different since you will need to spend time in the hospital with each cycle of treatment and you will be more susceptible to infection than with your prior treatment. Let’s talk about some of the things you can do to decrease your anxiety during this time.

**Advance slide:** Treatments

**Facilitator:** From our ONS Putting Evidence into Practice resources on Anxiety, we can see that the items most recommended for Patients with anxiety are non-pharmacologic. Cognitive behavior interventions such as relaxation training, goal setting and problem solving. Mindfulness-based training focuses on awareness of the present through feelings, thoughts and bodily sensations. Likely to be effective include anxiolytics but not antidepressants which have not established effectiveness. Many of the techniques in this category are also used in mindfulness stress reduction. **Advance slide.** Of the items mentioned in the Effectiveness Not Established category, many of them have shown benefit, the studies just have not been powered for significance. Interestingly, in the Rapid Diagnostic pathway, supposition was that receiving a more rapid diagnosis from biopsy and therefore more rapid transition to treatment would decrease anxiety. In the studies reviewed, while there might have been an initial difference between the rapid and usual care groups, the differences were not sustained over time. **Advance slide:** In the Unlikely to be Effective category, orientation and information provision differs from education because this is essentially giving the Patient information without allowing for questions or a teach back which have been shown to be effective and recommended for practice.

(Angela continues to administer the daunorubicin, checking blood return every 2-5 mL. When approaching the end of the push, she is unable to obtain a blood return. Molly notices.)

**Molly:** Angela, my IV is swollen and hurts and you look worried. What’s wrong?

**Advance slide:** Is it an extravasation?
Facilitator: As you can see from this table, there are similarities and differences between and extravasation, irritation and flare reaction. Molly noted having some pain at her IV site and there was some swelling there as well. This is differentiated from irritation as the pain did not extend up her vein and there was no swelling present. Angela was also unable to obtain a blood return when she checked.

Angela: Oh Molly, I think your IV has infiltrated. Can you push your call light so we can get some help? I’m going to stop your IV and try to pull back any of the chemotherapy and IV fluids that I might be able to. (Rachael arrives and sees Angela working)

Rachael: Hi there, do you need some help? Oh, it looks like you might have had an extravasation. Let me go get what you need to treat the site.

Advance slide: Antidotes and local treatment

Facilitator: There may or may not be an antidote for the medication that infiltrated and there may not be some sort of local measures to apply. What is most important is that you react immediately and document the site and measures taken. You will also need to ensure the Patient has adequate education regarding local measures and follow up, especially if they will be discharged home. Symptoms such as blistering, peeling and sloughing of skin and damage to tendons or joints can take days to weeks to appear, often when the Patient is at home and not due for a medical visit soon.

Advance slide: Extravasation pictures

Facilitator: Evolution of a port extravasation. If this had occurred in an area close to a joint, contractures and loss of mobility could occur due to scarring of tissue and tendons. In any of these situations, ensure that Plastic Surgery consults are done early.

Advance slide: Documentation

Facilitator: Standardized documentation that is easily obtained and viewed should be present. In an electronic medical record, it is important to not document in the vascular access as that may be discontinued. And, until it becomes a wound, it should not be documented as such.

Rachael: Okay Angela and Molly, I’ve got what we need. Molly, here is a cold compress. You need to keep this on the site for about 15-20 minutes. The physician has ordered another medication that will reduce tissue damage. We’ll make sure the compress is off at least 15 minutes before that medication starts. We will administer 3 times over the next 3 days through a new IV and we will continue your other chemotherapy as well.

Angela: Rachael, thank you so much for acting so quickly. Each time I checked I got great blood return until that last check. Molly, Let’s get this cold pack applied and get you comfortable before we start another IV. I’m also going to check with the physician to see if there is any way
we can get your central line placed more quickly. Once we get this going, I’m going to come back and get your medication going and we can talk some more. I’m sure this is just adding another level to the worry we were talking about earlier.

**Molly:** I know you did everything right. I hope I wasn’t distracting you while we were talking and you were working. Go take care of things and yes, I would really like to talk some more about this.

(Rachael and Angela leave)

**Rachael:** Angela, how are you feeling about this? I’m sure this adds another level of worry on to what we were talking about earlier as well. Do you want to talk through what happened?

**Angela:** Thank you Rachael. Yes I would like to talk some more. And then, when my shift is over, I’m going to call and talk with my mom.