Common Port Problems

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Disclosures

Disclosure of Relevant Financial Relationships

no financial relationships to disclose.

Disclosure of Off-Label and/or investigative Uses

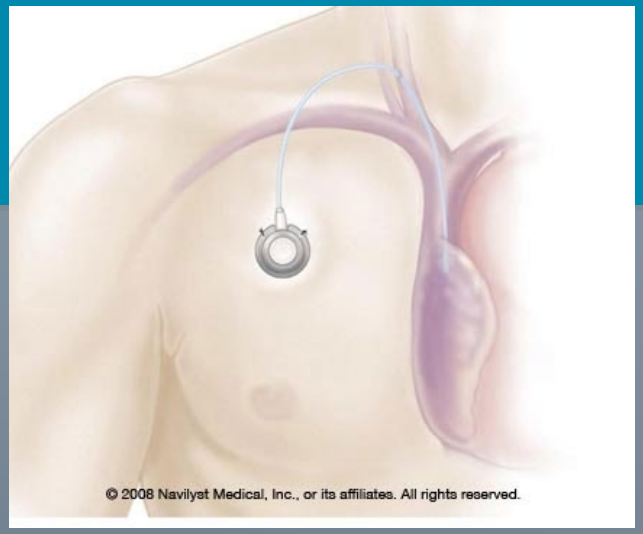
will not discuss off label use and/or investigational use in presentation.

Background Information

- Approximately 5 million central venous catheters are placed
- 41% are placed in Oncologic patients
- More than 400,000 TIVADS sold each year (iData Research. US Markets for Vascular Access Devices and Accessories, Vancouver, BC; iData Research 2012)

Common Ports @ MGH

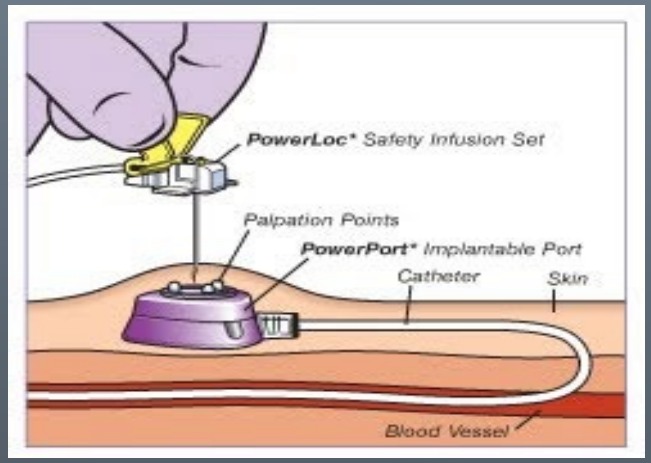
XCELA



Navilyst/Angiodynamics

Medcomp

DIGNITY LOW PROFILE



Common Ports @MGH

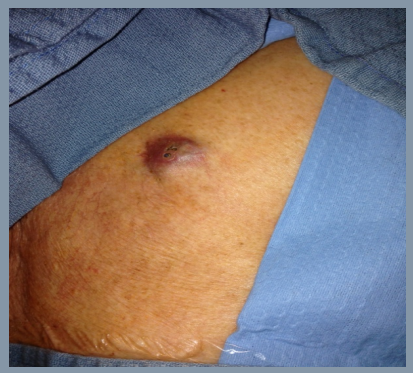
BARD

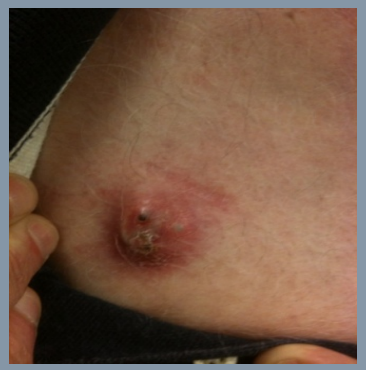
DUO

Palpation Points

Palpation point ports are not placed at MGH

Because of high incidence of erosion





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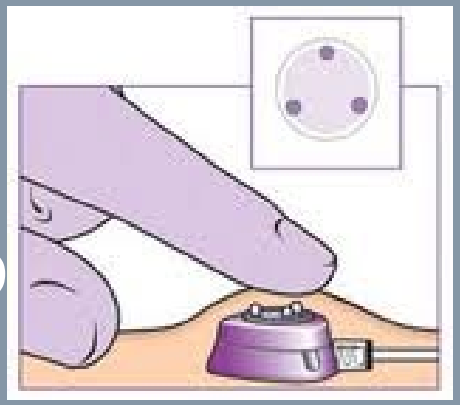


POWER PORT

All single lumen ports

at MGH are CT injectable

All double ports are CT injectable

Non power can be placed if necessary with special order

the exception is:

BARD

Rosenblatt

MGH Policy for Access

- Identification and Access of Implantable Venous Access Port (IVAP) Overview
- Before a device is used for the first time, both the type of device and catheter tip placement must be verified for ALL types of ports.
- Chest X-ray: power-injectable ports have the letters “CT” visible on the port when viewing the radiographic image.
- Confirmation of central catheter tip placement is required before initial use
- Ports must be accessed with a special non-coring needle

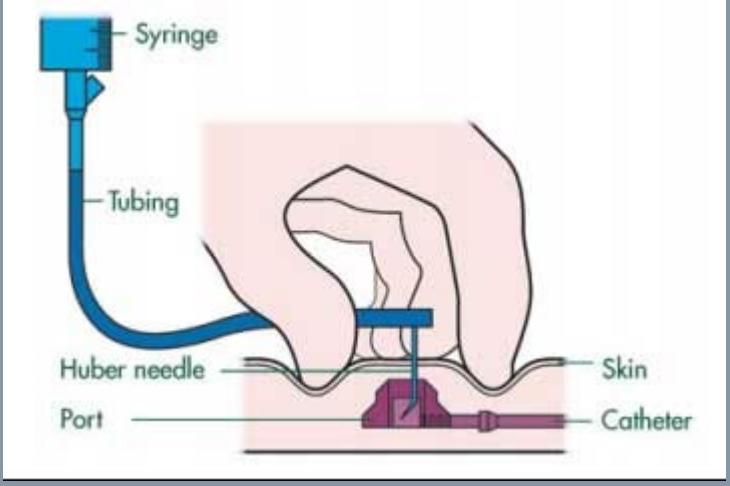
Port Access Video MGH

https://vimeo.com/187829115/6a98b585e7

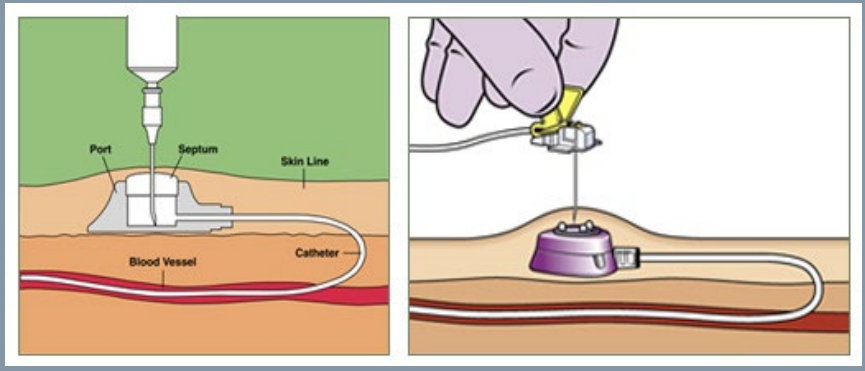
Use of Correct Needle

- Needle too long:

Can cause displacement result in infiltration



- Needle too short:
- Can cause infusing solution to back track from port to surrounding skin result in infiltration

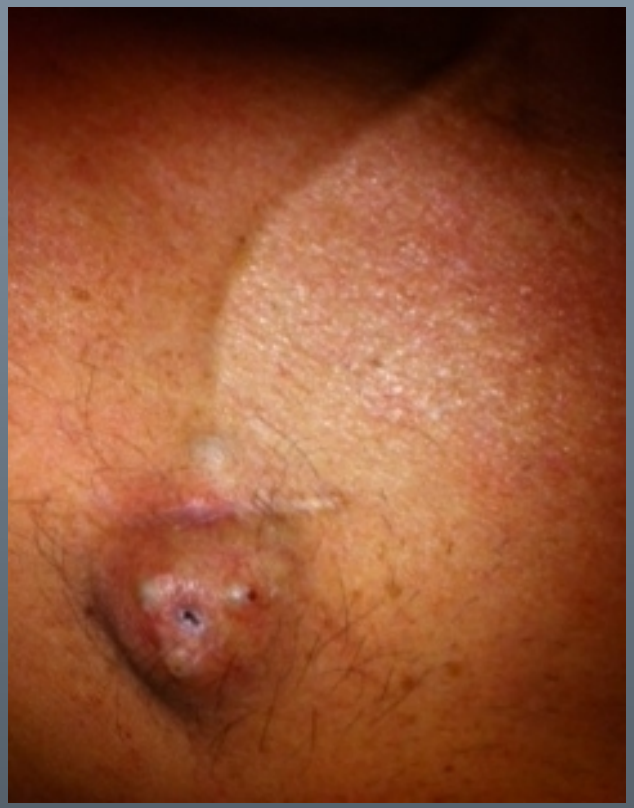


Needle rotation

Importance of needle

Rotation to avoid opening of puncture site

Port should be removed to present infection



Dressing Changes

- Chlorhexidine gluconate Biopatch on all accessed ports
- Suppress bacterial growth on the area of skin and catheter entry site
- Reduce risk of bacteria entering blood stream causing infection
- Transparent, semi-permeable membrane (TSM) dressings should be changed routinely every 7 days or when necessary
- MGH POLICY LINK:

CLABSI Reduction

- Minimize number of persons accessing the port
- Sterile technique
- Keep access to a minimum and only for what is needed
- Frequency of handling**
- **most important risk factor

- Alcohol caps
- MGH POLICY LINK:

MGH Port Flush Policy

- Port De-accessed 100 units/ml 5 ml
- 10 ml when De-accessing or Monthly Flush
- MGH POLICY LINK

Catheter Occlusion

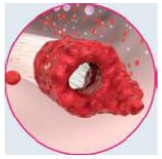
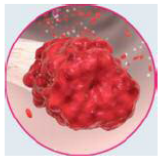
Table 3. Degrees/Types of Occlusion

Degree/Type of Occlusion	Symptoms/Signs	Causes
Partial	Decreased ability to infuse fluids into the CVAD; resistance with flushing and aspiration Sluggish flow through the catheter	Mechanical, chemical, or thrombotic occlusion
Withdrawal	Inability to aspirate blood but ability to infuse without any resistance Lack of free-flowing blood return	Mechanical or thrombotic occlusion
Complete	Inability to infuse or withdraw blood or fluid into the CVAD	Mechanical, chemical, or thrombotic occlusion

CVAD = central venous access device.
Source: Data from Baskin et al.[23] and Cummings-Winfield and Mushani-Kanji.[28]

Clotting of the Catheter

Table 4. Types of Thrombotic Occlusions

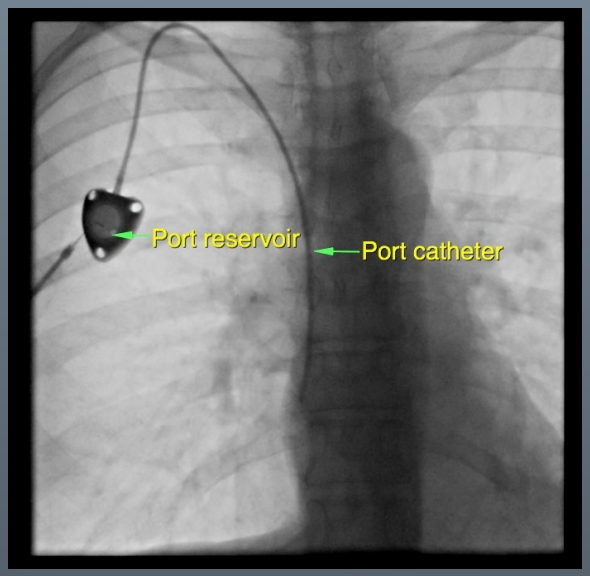
Intraluminal 	An intraluminal thrombus often causes complete catheter obstruction. Intraluminal thrombi account for 5–25% of catheter occlusions.[23] • Forms within the lumen of the catheter and may result in a partial or complete occlusion.[26] • Develops from blood buildup within the lumen of a catheter as the result of insufficient flushing, inadequate flow through the lumen of the catheter, or frequent withdrawals of blood via the catheter.[39] • May also be due to blood reflux caused by cough, change in intrathoracic pressure, and improper disconnection with negative displacement devices.[28]
Fibrin Tail 	A fibrin tail occurs when fibrin adheres to the end of the catheter. As the tail attaches to the catheter and "sticks out" or extends into the bloodstream, more cells and other blood products become deposited onto the tail. Fibrin tails can become quite long.[39] • Acts as a one-way valve that permits infusion but not withdrawal of fluid from the catheter.[26] • Gets "sucked back" over the opening when blood aspiration is attempted. The fibrin tail gets pushed aside by the positive pressure of injecting or infusing through the device.[32]
Fibrin Sheath 	A fibrin sheath forms when fibrin adheres to the external surface of the catheter, creating a "sock" over the end of the catheter or its whole length.[26] Fibrin sheaths can cover a catheter within 1 week or sooner after placement.[17,30,33–35] • Occasionally the sheath or sleeve covers the end-hole of the catheter and causes occlusion. Fluid can usually be injected, but blood cannot be aspirated.[30] • Serious infiltration/extravasation complications can result when medications are prevented from entering the bloodstream by the fibrin sheath. As a result, medications will infuse "up" the fibrin sheath back to the insertion site.[39] • May cause mixing of incompatible solutions.[36]
Mural 	A mural thrombus forms when fibrin from a vessel wall injury binds to fibrin covering the catheter surface.[26] Vessel wall injury may be due to the catheter rubbing in the vessel with motion, a traumatic insertion, poor blood flow, aberrant vasculature, or a high catheter-to-vein ratio.[37,38] • May occlude the tip of the catheter and cause partial venous obstruction or progress into a venous thrombosis that leads to complete occlusion of the vein.[23]

CVAD Occlusion

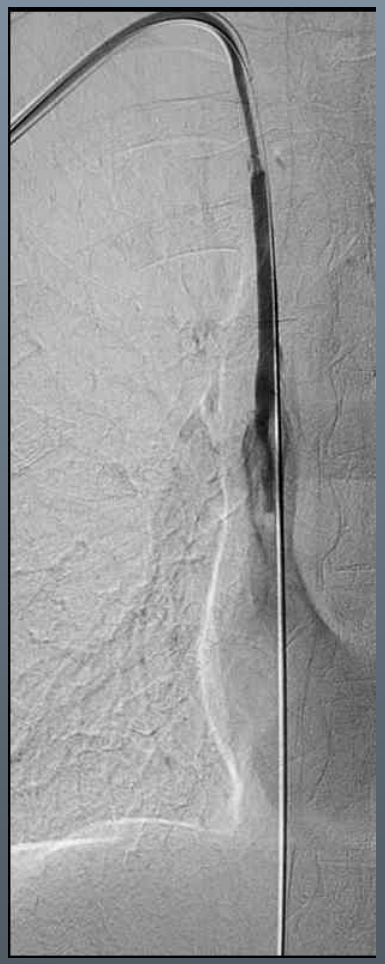
Table 5. Signs and Symptoms of CVAD Occlusions

Upon Infusion or Flushing
(1) Resistance when flushing[55]
(2) Sluggish flow[27,28,39,53]
(3) Inability to infuse fluids[26,27,53,56]
(4) Frequent occlusion alarm on infusion pump[27,39,57]
(5) Infiltration or extravasation or swelling or leaking at the insertion site[36,39]
Upon Aspiration of Blood
(1) Inability to withdraw blood[26,27,28,30,39,55–57]
(2) Sluggish blood return[28]

Unable to get Blood Return



- Normal Study



- Fibrin Sheath formation
- Soft scar tissue build up causing inability to aspirate

Treatment for Fibrin Sheath t-PA

TRADE NAME: Cathflo, Activase

PURPOSE: Thrombolytic agents t-PA are indicated for the restoration of function to central venous access devices as assessed by the ability to withdraw blood and/or infuse fluids.

Table 6. Pediatric Dosing of Alteplase

Patient Weight	Alteplase (Thrombolytic) Dose
Less than 30 kg	110% of fill volume
More than 30 kg	2 mg/2 mL

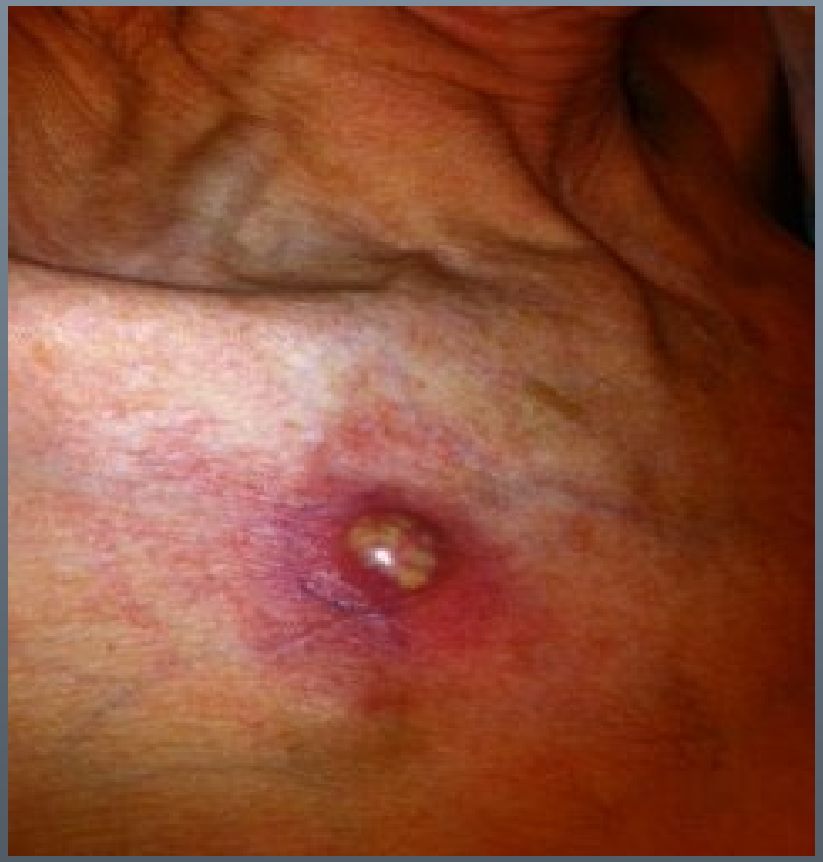
Source: Data from the Cathflo Product Monograph.[65]

A prescriber's order is required for the administration of t-PA

Dosage: for treating central venous catheter occlusion is:

- In patients > 30 kg (66 lbs): 2mg (2ml) per lumen; may instill a second dose if catheter remains occluded.
- Instillation of t-PA for adult patients should always be the entire 2ml per lumen, nothing less, regardless of catheter lumen size.

Infection



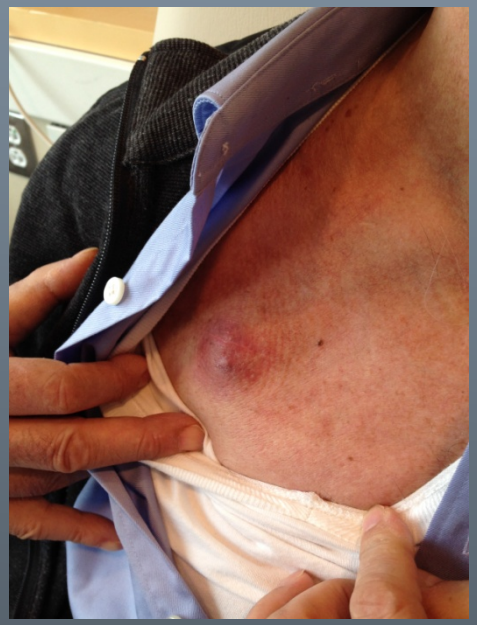
Infection

- Categories of Infection
  - Catheter colonization
  - Catheter related blood stream infection-CLABSI
  - Exit site/Pocket infections
  - Stitch Erosion
- Incidence
  - Relatively low rates of 0.1% to 1.6% per 1000 catheter days
- ***Pocket infection rates 0.8%-2.5%

Beheshti MV, Protzer WR, Tomlinson TL, et al. Long term results of radiologic placement of a central venous access device. 1998;AJR 170:731-34
Biffi R, Orsi F, Pozzi S et al. 2009 Best choice of central venous insertion site for the prevention of catheter related complications in adult patients who need cancer therapy. Ann Oncol 20:935-940.

Pocket Infection
Signs and Symptoms

- Pain
- Erythema
- Induration
- Tenderness
- Warmth



Risk Factors

- Modifiable
- Difficulty with the needle
- Use of TPN
- Frequency of handling**
- **most important risk factor

- Non Modifiable
- Age
- Hematologic malignancy
- Solid Tumor
- Transplant, neutropenia

Causative Organisms

CLABSI

Coagulase negative staphylococcus

Pocket/Exit site

Staphylococcus aureus

Staphylococcus epidermidis

Streptococcus species

Wolf HH, Leithauser M, Maschmeyer G, et al. 2008. Central venous catheter related infections in hematology and oncology. Guidelines for infectious disease working party of the German Society of Hematology and Oncology. Ann Hematol 87:863-786

Decision To Treat

- Clinical appearance- mild/severe
- Overall health status- frail/elderly
- Neutropenia
- Chemotherapy- nadir
- Treatment plan chemo break/near completion?
- History of difficult access/multiple ports

Treatment

- Get wound/BC cultures if possible
- Oral Antibiotics:
  - -Keflex 500mg QID
  - -Bactrim DS BID
  - -Augmentin 500 BID
- Port rest period- do not access
- IV antibiotics: Medical service collaboration, may need inpatient treatment

Indication for Removal

- Bacteremia
- Infection known to be staph aureus
- Obvious purulence
- S/S sepsis, fever, chills, WBC
- Have a low threshold to remove if unclear or unsure

Port removal

- Pocket presence of necrosis purulence
- Debride/flush
- Interrupted subcutaneous *Vicryl if clean*
- If necrotic; healing via secondary intention
  - First (only) packing *Iodoform* gauze
  - Replace NS wet to dry QD or BID

Prophylactic Guidelines

SIR Guidelines

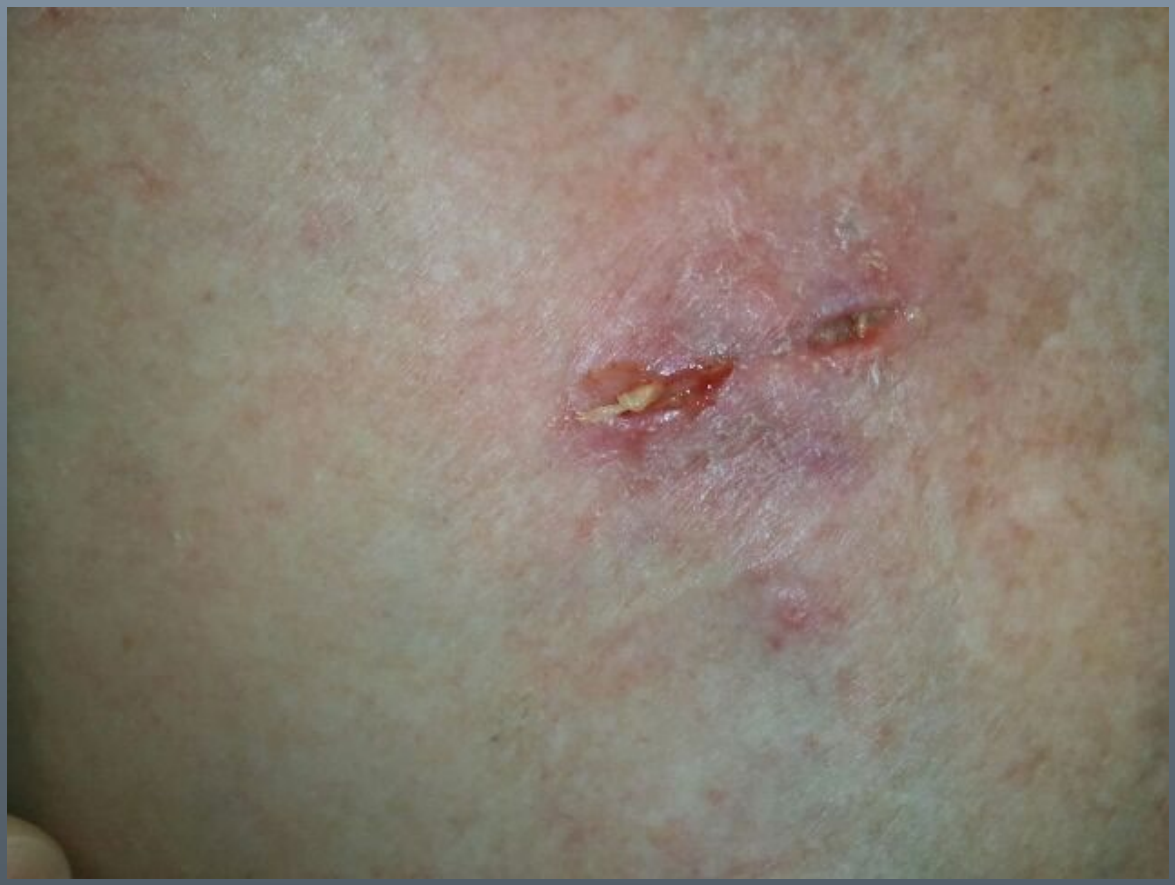
- Placement of TIVAD classified as “clean” procedure
- Strict sterile technique
- Prophylactic Antibiotics are recommended in immune-compromised

  -Ancef 2 GM

  -Clindamycin 900mg IV

  -Vancomycin 1 GM IV

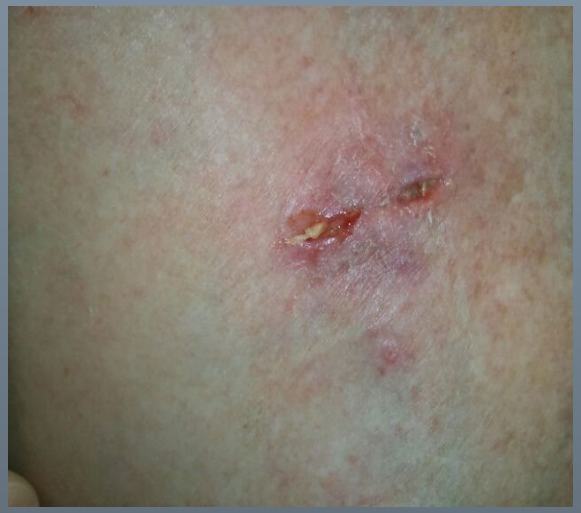
Stitch Erosion

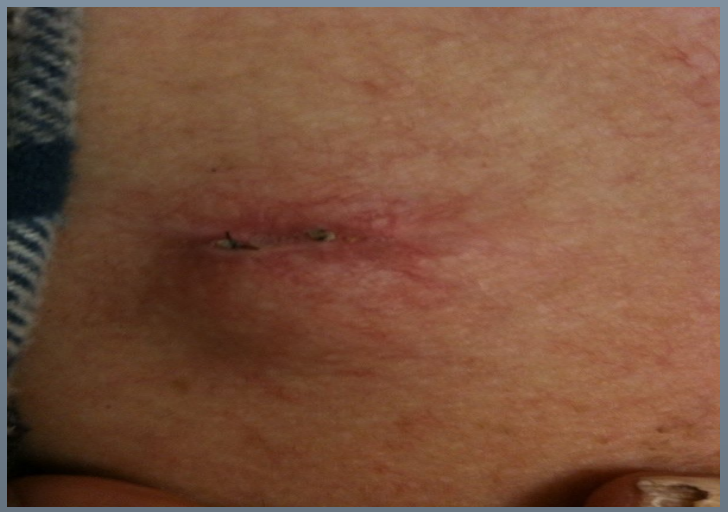


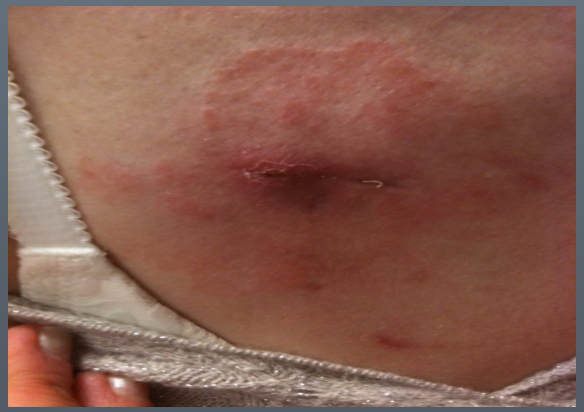
Signs and Symptoms- Stitch erosion

- Localized, along suture line
- Redness
- Inflammation
- Stitch exposed
- Skin opening around knot

Stitch erosion







Treatment

- Trim stitch as much as possible
- Allow body to clear the stitch on its own
- Avoid digging out, can cause would to open
- If incision opens, port is exposed MUST remove port

Skin Reactions
Allergens/Irritants

Allergic:

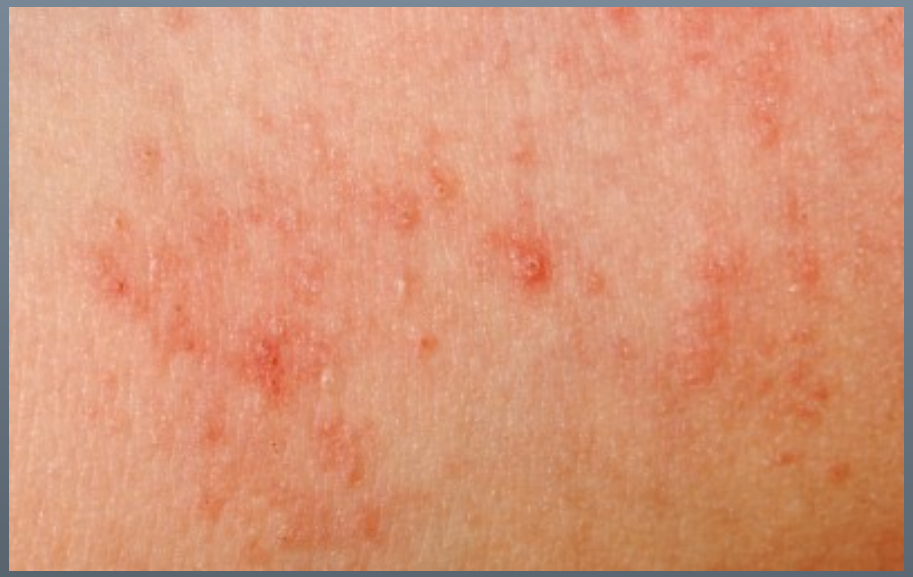
- Substance triggers an immune response/reaction in the skin
- May occur suddenly or after several months/years of exposure
- Likely lasts for life

Irritant:

- Substance causes damage to the skin

Allergic

- Often delayed, appearing 24-48 hours
- Appearance:
  - Red bumps, moist, weeping blisters
  - Warmth, tender
  - Ooze, drain, crusting
  - Become scaly, raw or thickened

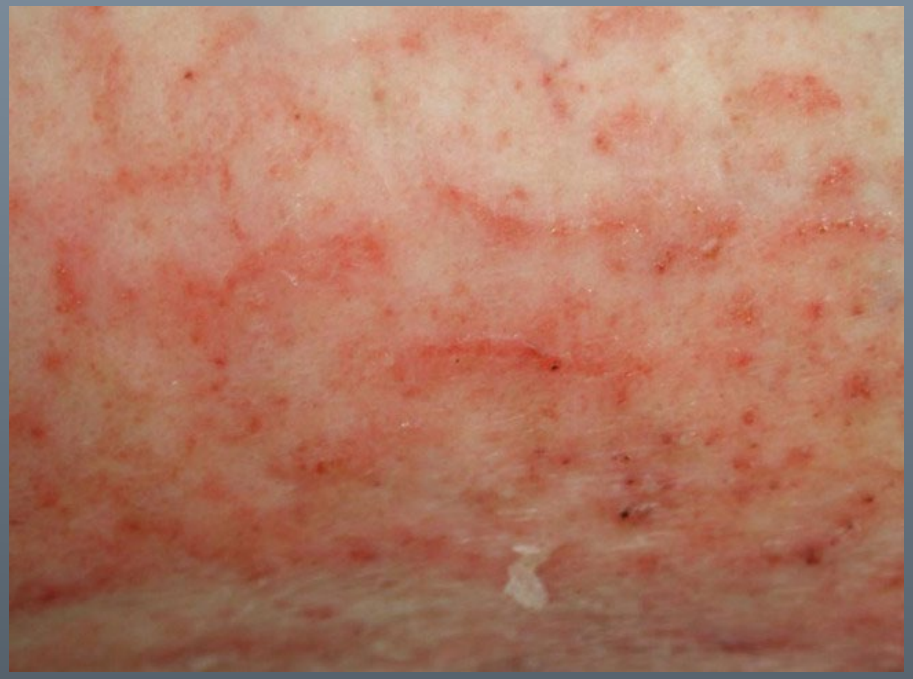


Common Allergens

- Adhesives: steri strips, transparent dressings
- Topical antibiotics: polymyxin, bacitracin
- Rubber: latex
- Soaps/cleansers: chlorohexidine, iodine

Irritants

- Severity depends on length of exposure
- Appearance
  - Dry, red, rough
  - Fissures on hands
  - The skin might be inflamed
  - Often on hands, fingers, face

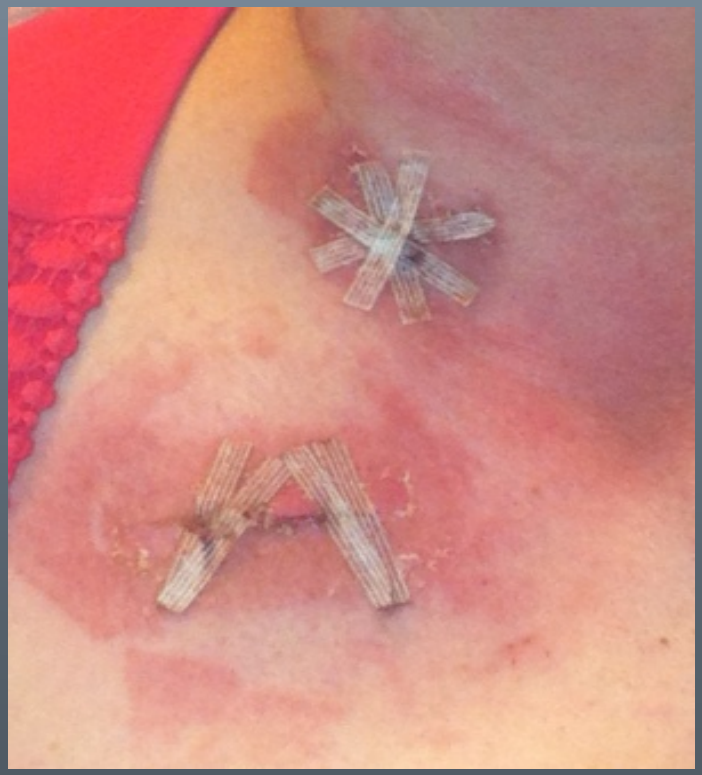


Common Irritants

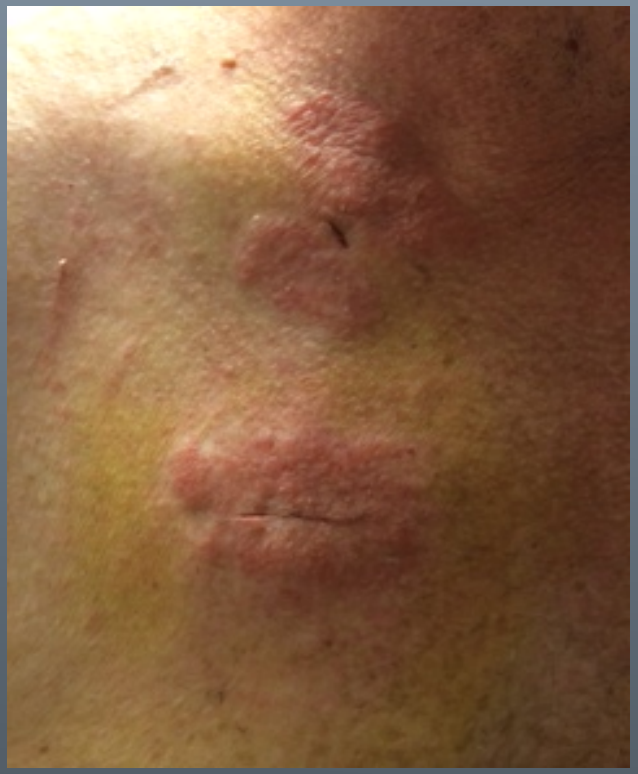
- Cements/adhesives
- Rubber gloves
- Chemotherapy
- Soaps/cleansers
- Long term moisture

Common skin reactions/irritants

Transparent dressings

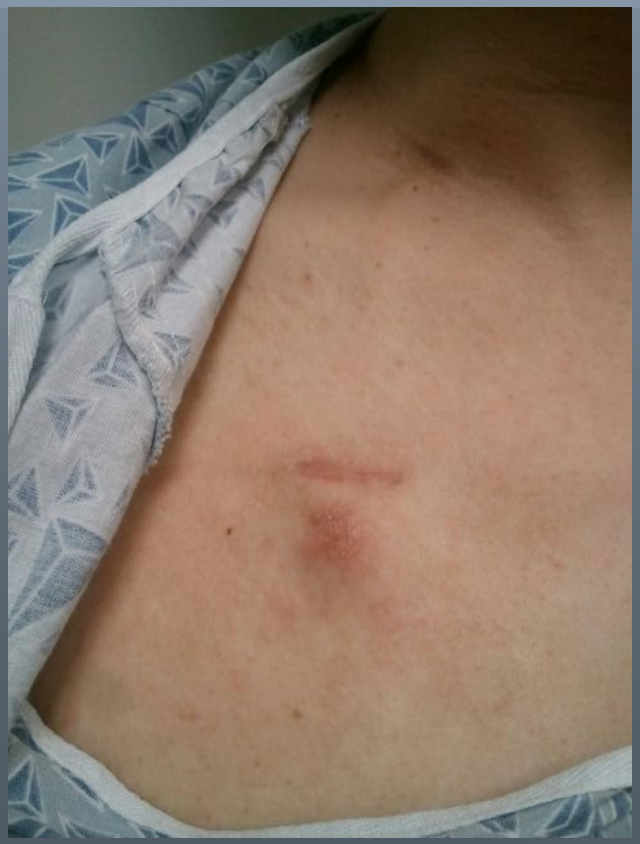


Benzoin

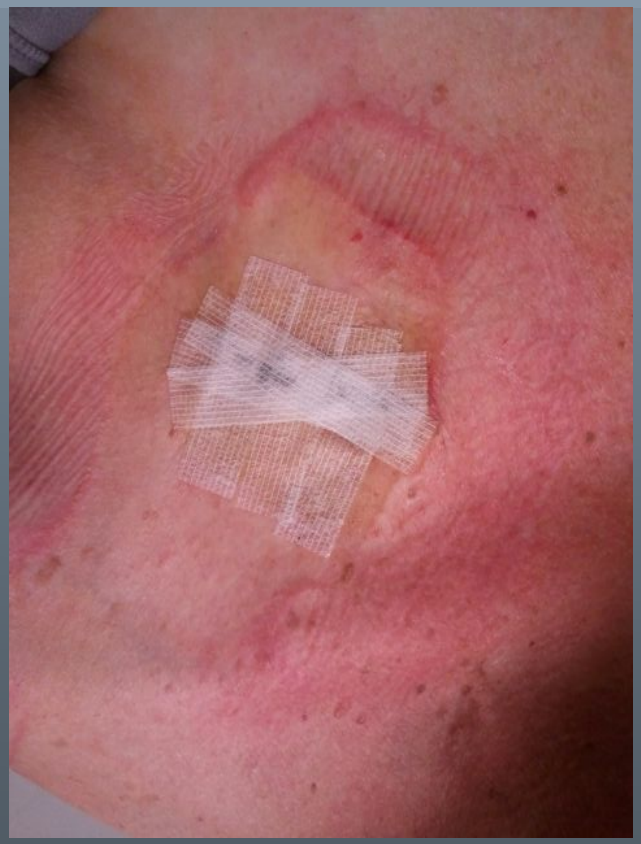


Common skin reations/irritants

Chlorohexidine patch



Transparent dressing



Port Pocket Hematoma

Incidence

- There is little clinical research available on chest port hematoma
- Hematoma is a common complication of percutaneous chest port placement with
  - Incidence of 0-4.5 %
- Cardiac literature , study of 3,164 pectoral pacemaker pockets hematoma incidence as high as 4.9%.
  Prolonged hospitalization 2 %

Management of anticoagulation before and after elective surgery, The New England The New England Journal of Medicine, 1997:336:1506-151

Vascular Intervention: A clinical approach, Perler, Bruce A, Becker, Gary J, Chest Journal, Oct 01,2004

Patient Risk Factors

- **Congenital/inherited platelet disorders**
  - Thrombocytopenia
    aplastic anemia
  - Von willebrands
    (most common inherited bleeding disorder)
- **Clotting disorders**
  - Hemophilia, Factor VIII deficiency, Hemophilia b (factor IX deficiency)
  - Due to need chronic anticoagulation
  - Leiden factor V, Lupus anticoagulant, Protein C/S deficiency
- **Medications**
  - Warfarin, Aspirin, Plavix, Pradaxa
- **Renal disease/ Hepatic disease**

SIR Guidelines for procedures with moderate risk bleeding

Testing

- INR
- APTT in patients receiving IV Heparin

Not Recommended

- Platelet count
- Hematocrit

Consensus Guidelines for Coagulation Status and Hemostasis Risk, J Vasc Interv Radiology 2012;23:727-736

Patel, Indravadan MD,Davidson,Jon C. MD, Nikolic, Boris, MD, MBA, Salazar, Gloria, M, MD, Marc S. Schwartzberg, MD T Gregory Walker, MD and Warel A Saad, MD for the Standards Of Practice Committee and Cardiovascular And Interventional Radiological Society of Europe

Management

INR: ≥1.5

- APTT : no consensus at correcting values >1.5 x control, 73 % consensus
- Platelet: correct if < 50,000
- Hematocrit: no consensus, per clinical indication
- Clopidogrel: hold 5 days pre procedure
- Aspirin: do not withhold
- LMWH (therapeutic dose) hold one dose pre procedure

Risks with Anticoagulation

Patients at MGH more complicated with need for anticoagulation and bridging procedurally

- Risk for pocket hematoma and bleeding risk
- Patients had 5 to10 fold > risk with heparin therapy vs. warfarin or no anticoagulation
- INR ≤ 2.0 is relatively safe
- ASA did not have effect of hematoma formation

Biffi R, Orsi F, Pozzi S et al. 2009 Best choice of central venous insertion site for the prevention of catheter related complications in adult patients who need cancer therapy. Ann Oncol 20:935-940.
Management of anticoagulation before and after elective surgery, The New England Journal of Medicine, 1997:336:1506-1511

Intra-procedural considerations for developing hematoma

- Dissection of sub pectoral vs. sub cutaneous tissue
- Consider administration of local anesthetics during pocket formation sharp dissection of smaller vessels
- Lack of puncture site hemostasis with bleeding along tunnel tract collecting in pocket contributing to develop hematoma

Biffi R, Orsi F, Pozzi S et al. 2009 Best choice of central venous insertion site for the prevention of catheter related complications in adult patients who need cancer therapy. Ann Oncol 20:935-940.

How to identify pocket bleeding

- Ecchymosis
- Patient will have pain and swelling
- Disfigurement of the skin
- Expanding hematoma
- Taut skin possible to cause wound dehiscence
- Consider most importantly blood is medium for Bacterial growth

Risk Reduction Strategies

Correct abnormal labs

- transfuse if necessary
- Platelets for thrombocytopenia, Vasopressin , Von Willebrands, FFP for hepatic dysfunction

Anticoagulation hold peri-procedurally

- Lovenox 24 hours pre/post
- Coumadin and Plavix 7 days (bridging maybe necessary)
- Do not access close to Lovenox injection
- Limit number access attempts, hold pressure after de access,

Choose low profile

- single vs. double
- Low profile

Consider use of:

- Lidocaine w/ epinephrine
- Intraprocedural electrocautery
- Injectable collagen coagulants such as *D-stat*

Anticoagulation Guidelines

- Warfarin (Coumadin) hold 7 days
- Lovenox(Enoxaparin) Hold 24 hours preprocedure and post procedure. Hold longer with renal dysfunction
- Heparin SC no risk
- Heparin IV 2-4 hours pre and post procedure
- Fondaparinux (Arixtra 4 days-half life 21 hours)
- NSAIDS, ASA no significant risk Hold am dose
- Pletal (Cilostazol) 48 hours
- Plavix (Clopidogrel) 7 days
- Pradaxa Dabigatran direct thrombin inhibitor(half life 12-17 hours with normal renal) Hold 5 days
- Rivaroxaban factor Xa inhibitor(Xarelto half life 7-11 hours) stop 24 hours pre and post procedure
- Ticlopidine (Ticlid) 14 days
- Tirofiban (Aggrastat) 8 hours

Suggested Guidelines for Anticoagulation and Neuraxial Anesthesia/Analgesia. Katharine Fleischmann, MD , MGH , Boston MA Jan 2008

Timing of port placement

- Administration of medications
- Inpatient vs outpatient placement

Wound Dehiscence or Failure to Heal following Venous Access Port Placement in Patients Receiving Bevacizumab Therapy

Walter J. Zawacki, NP, T. Gregory Walker, MD, Emily DeVasher, RN, Elkan F. Halpern, PhD,
Arthur C. Waltman, MD, Stephan T. Wicky, MD, David P. Ryan, MD, and Sanjeeva P. Kalva, MD

- Timing of Port Placement with medications
- Study demonstrates poor wound healing around administration of Avastin
- Recommendation do not give Avastin 2 weeks prior and 2 weeks post port placement

Outpatient Placement of Subcutaneous Venous Access Ports Reduces the Rate of Infection and Dehiscence Compared with Inpatient Placement

NirnimeshPandey,MD, JesseL.Chittams,MS ,andScottO.Trerotola,MD

- Timing of port placement
- Inpatient vs Outpatient had a higher risk for complications

Conclusion

- The need for totally implantable venous access devices (TIVAD) is on the rise
- Recognizing high risk patients and reduction strategies are key to preserving venous access
- Collaboration and multidisciplinary approach is essential

Contact Information

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Cathy Saltalamacchia, NP (csaltalamacchia@partners.org, pager 12726)
Melissa Chittle, PA-C (mchittle@partners.org, pager 20327)

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