

# Thrombolytic Therapy for the Management of Severe Frostbite

## Purpose

- Provide guidance on the administration of thrombolytic therapy (t-PA) for the purpose of improving tissue perfusion in the management of severe frostbite injuries.

## Background/Definitions

- Frostbite is the tissue damage resulting from exposure to cold temperatures, usually from the freezing of tissues, which results in cellular damage and tissue necrosis. The extent of frostbite depends on the temperature and duration of exposure.
- In more severe forms, frostbite can impair perfusion to digits and extremities.

## Inclusion Criteria

- Patients with severe frostbite (grades 3 or 4) in the distal limbs and digits with:
  1. Absent or weak doppler signals in limbs and/or digits, and no improvement after rewarming OR no perfusion on bone scan.
  2. Less than 24 hrs of warm ischemia time (defined as time from passive or active rewarming)

## Exclusion Criteria

- Contraindications to thrombolytic agents in frostbite include:
  - Repeated freeze-thaw cycles
  - Concurrent or recent (within 30 days) intracranial hemorrhage or traumatic injury with active bleeding
  - Recent (within 3 months) intracranial or intraspinal surgery
  - Recent (within 3 months) serious head trauma or stroke
  - History of gastrointestinal bleeding
  - Current severe and uncontrolled hypertension (SBP>180 mm Hg and/or DBP>105 mm Hg)
  - Pregnancy

- Uncorrected coagulopathies (INR>1.7, PT>50, PTT>40)
- Thrombocytopenia (Platelets <50)
- Recent hemorrhage or bleeding diathesis
- Drug or alcohol intoxication

*(Healthcare provider discretion may override some contraindications as patient's condition warrants)*

## Diagnostic Evaluation

- The healthcare provider should follow the "Guidelines for the Initial Management of Frostbite".
- In addition to those guidelines, the healthcare provider should also obtain the following:
  - a thorough history to identify indications and contraindications to t-PA use
  - a thorough physical exam should also be performed to include:
    - an extended neurologic examination
    - a detailed description of frostbite, grade of frostbite injury and vascular exam of the involved digit(s) or extremity, and photos of the involved areas.
- Order baseline labs: CBC, BMP + Mg/Phos, PT/INR, PTT, CK, TEG, and type and screen
- Obtain baseline vital signs
- Obtain CT head if there is any history of associated trauma or if patient is altered and unable to provide a reliable history.
- Obtain Tech-99 bone scan, if possible, to document perfusion status of involved extremity.

## Practice Recommendations for Management

- Based on history, physical exam findings, and additional imaging/lab results--the TRAUMA ATTENDING will make the decision to initiate t-PA for frostbite.
- if t-PA is indicated,
  - Insert 2-3 large bore peripheral IVs (if not already present) with one line dedicated to t-PA administration.
  - Ensure blood pressure is controlled prior to initiation of t-PA (SBP<180 and DBP<105)
  - Insert/perform any invasive tubes, lines or procedures (if possible) prior to initiating t-PA. Otherwise, wait until t-PA infusion is complete.
  - Order TDAP vaccination, if indicated, to be given prior to initiation of t-PA.
  - Admit patient to the surgical ICU.
  - Notify the ICU charge nurse and pharmacist that thrombolytic therapy is being ordered.
- The decision for systemic vs catheter directed intra-arterial thrombolytic therapy will be made at the discretion of the trauma attending.
  - Catheter directed intra-arterial thrombolytic therapy
    - Consult interventional radiology

- Orders and infusion rates of thrombolytics to be placed by interventional radiology
- Systemic t-PA
  - Order using the "t-PA for frostbite" order set in EPIC (*\*\*\*currently awaiting build, so in meantime discuss with pharmacy for assistance in ordering\*\*\**)
  - t-PA dose:
    - Bolus: 0.15 mg/kg IV bolus x 1
    - Infusion: 0.15 mg/kg/hr over 6 hours (total dose not to exceed 100mg)
- Patient care considerations during thrombolytic therapy:
  - Patients must undergo q1hr vitals and neurologic checks during infusion of t-PA and or 24 hours following completion of infusion.
  - Blood pressure should remain less than 180 mm Hg systolic and 105 mm Hg diastolic during t-PA infusion
  - Neurovascular checks of the affected extremity should occur q1hr while t-PA is infusion followed by q4-24 hr checks after infusion is completed.
  - CBC, PT/INR, and TEG should be performed q6 hrs while thrombolytics are infusing and for 24 hrs following completion of infusion.
  - Limit invasive procedures or punctures while thrombolytics infusing.
  - Patients should remain on bedrest while thrombolytics are infusion but should be encouraged to continue with active and functional range of motion while in bed to improve circulation.
- Once thrombolytic therapy is complete, the patient should be initiated on therapeutic anticoagulation with either Lovenox or Heparin infusion for 7 days. (If patient is to be discharged prior to 7 days, can consider DOAC for completion of therapy.)
- Additional frostbite wound care and management should follow those listed in the Guidelines for the Initial Management of Frostbite.

## Follow-up Care

- Patients with frostbite injuries will follow-up in trauma surgery clinic for ongoing wound care as needed with referrals to orthopedic and plastic surgery clinic as indicated.

## Outcome Measure and Guideline Adherence

- All frostbite patients receiving thrombolytic therapy will be reviewed yearly for adherence to guidelines, bleeding complications, status of wounds, need for amputations, and involvement of consulting services.

## Related Policies:

- Guidelines for the Initial Management of Frostbite

## Key Contributors

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## References

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