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Memorial Hermann Stroke System and UTHealth Protocol for Neurological Worsening After Alteplase

General Guidelines: In all cases, the stroke attending/stroke fellow should be notified of changes in exam. The following protocol was developed based on the 2017 AHA/ASA Scientific Statement on the Treatment and Outcome of Hemorrhagic Transformation After Intravenous Alteplase in Acute Ischemic Stroke (Stroke. 2017;48:e343–e361).

1. A patient with neurological worsening (increase in NIHSS of ≥ 4 points) should be reevaluated with a stat non-contrast CT to rule out symptomatic intracranial hemorrhage **(sICH).**
    a. Stop Alteplase infusion if an intracerebral hemorrhage, subarachnoid hemorrhage, or subdural hematoma is identified.
    b. A stat fibrinogen level should be sent on all patients with sICH.
    c. Empirically transfusing 10 U cryoprecipitate should be considered with the anticipation that more may be administered to obtain a fibrinogen level ≥ 150mg/dL.
2. Treatment of Post-thrombolytic ICH
    a. Indication for reversal of tPA induced coagulopathy: presence of the risk for hematoma expansion and the opportunity to benefit from treatment of sICH.
    b. Current evidence suggests sICH within 24 hours of Alteplase therapy or with hypofibrinogenemia may be reasonable indications for treatment.
3. Suggested reversal agents that may be considered on the basis of the mechanisms of action of the agent and Alteplase in patients with sICH occurring within 36 hours after Alteplase infusion:

Reversal Agent	Suggested Dose	Potential for Benefit	Adverse Effects
Cryoprecipitate	Consider sending a fibrinogen level immediately and empirically transfusing with 10 U cryoprecipitate, and anticipate giving more cryoprecipitate as needed to achieve a normal fibrinogen level of ≥150 mg/dL (10 U cryoprecipitate increases fibrinogen by nearly 50 mg/dL)	Potential for benefit in all sICH	Transfusion reaction and transfusion-related lung injury
Platelets	2 donors (8–10 U)	Potential for benefit is unclear except in patients with thrombocytopenia (platelets <100 000/μL), who may possibly benefit	Transfusion reaction, transfusion-related lung injury, volume overload
FFP	12 mL/kg	Potential for benefit is unclear except in patients on warfarin, in whom FFP may be considered	Transfusion reaction, transfusion-related lung injury, volume overload
PCC	25–50 U/kg (based on INR level)	Potential for benefit is unclear except in patients on warfarin, in whom PCC may be considered and is the preferred adjunctive treatment	Thrombotic complications
Vitamin K	10 mg intravenously	Potential for benefit is unclear except in patients on warfarin, in whom vitamin K may be used as an adjunctive treatment	Anaphylaxis
rFVIIa	20–160 μg/kg	Potential for benefit is unclear	Thrombotic complications
Antifibrinolytic agents	Aminocaproic acid: 4 g IV during first hour followed by 1 g/h for 8 h Tranexamic acid: 10 mg/kg 3–4 times/d (adjustment based on kidney function may be necessary)	Potential for benefit in all patients with sICH, particularly when blood products are contraindicated or declined by patient/family or if cryoprecipitate is not available	Thrombotic complications

FFP indicates fresh-frozen plasma; INR, international normalized ratio; PCC, prothrombin complex concentrate; rFVIIa, recombinant factor VIIa; and sICH, symptomatic intracranial hemorrhage.

4. Prevention of Hematoma Expansion
    a. Blood pressure goals should be discussed for each patient and:
        i. aimed at reducing the risk of worsening ischemia due to hypo-perfusion and hematoma expansion
5. Neurosurgical Treatment
    a. The risks and benefits of surgical decompression versus iatrogenic injury must be assessed.
    b. Should only be considered in patients where the surgery may improve outcomes despite ischemic injury.