Post-thrombolytic symptomatic intracranial hemorrhage

Who should get treated?

- Neurological deterioration with parenchymal hemorrhage (PH) thought to be causing or contributing to the acute worsening, within 24hrs of when thrombolytic was administered with anticipated risk for hemorrhage expansion
- Consider treated patients with identified PH who have not demonstrated neurological deterioration, within 24hrs of when thrombolytic was administered when the risk of hemorrhage expansion is high
- Consider treating hemorrhage occurring beyond 24hrs of when thrombolytic was administered, if fibrinogen is low
- The median time from thrombolytic administration to detection of symptomatic intracranial hemorrhages is 8 hours.
- Most are classified as parenchymal hemorrhage type 2 (PH2), which is defined as >30% of the infarcted volume with mass effect OR hemorrhage outside of the area of infarct.
- PH2 is associated with worse outcome, including close to 50% mortality

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- Cryoprecipitate is considered first-line treatment for post-thrombolytic intracranial hemorrhage, despite low-level data supporting efficacy at preventing further hemorrhage and death
- Tranexamic acid and aminocaproic acid inhibit plasmin, which causes breakdown of fibrin into its split products, thereby halting the action of alteplase. The data to support efficacy of either of these treatments, alone or in combination with cryoprecipitate, is severely limited. One small series of patients treated for post-thrombolytic ICH found no advantage of adjunctive tranexamic acid with cryoprecipitate vs cryoprecipitate alone (n=16). A smaller series demonstrated increased rate of hemostasis with aminocaproic acid combined with cryoprecipitate (n=6).
- If no reversal agent is available, transfusion of 8 units of platelets is reasonable as emergent transfer to a higher-level center is arranged.

Table 6. Management of Symptomatic Intracranial Bleeding Occurring Within 24 Hours After Administration of IV Alteplase for Treatment of AIS

COR IIb	LOE C-EO
Stop alteplase infusion	
CBC, PT (INR), aPTT, fibrinogen level, and type and cross-match	
Emergent nonenhanced head CT	
Cryoprecipitate (includes factor VIII): 10 U infused over 10–30 min (onset in 1 h, peaks in 12 h); administer additional dose for fibrinogen level of <150 mg/dL Check fibrinogen level 30 minutes after infusion. Goal 100-200mg/dL.	
Tranexamic acid 1000 mg IV infused over 10 min OR ε-aminocaproic acid 4–5 g over 1 h, followed by 1 g IV until bleeding is controlled (peak onset in 3 h) (Potential for benefit in all patients, but particularly when blood products are contraindicated or declined by patient/family or if cryoprecipitate is not available in a timely manner.)	
Hematology and neurosurgery consultations	
Supportive therapy, including BP management, ICP, CPP, MAP, temperature, and glucose control SBP goal should be lowered to <140mmHg.	

AIS indicates acute ischemic stroke; aPTT, activated partial thromboplastin time; BP, blood pressure; CBC, complete blood count; COR, class of recommendation; CPP, cerebral perfusion pressure; CT, computed tomography; ICP, intracranial pressure; INR, international normalized ratio; IV, intravenous; LOE, Level of Evidence; MAP, mean arterial pressure; and PT, prothrombin time.

Sources: Sloan et al,[138] Mahaffey et al,[139] Goldstein et al,[140] French et al,[141] Yaghi et al,[142–144] Stone et al,[145] and Frontera et al.[146]