Treatment and Outcome of Hemorrhagic Transformation After Intravenous Alteplase in Acute Ischemic Stroke

A Scientific Statement for Healthcare Professionals from the American Heart Association/American Stroke Association - 2017

Symptomatic intracranial hemorrhage (sICH) after thrombolytic therapy is typically based on 2 main factors: the radiographic appearance of the hemorrhage and the presence of associated neurological deterioration.

Stroke centers should:

- Classify the appearance of hemorrhagic transformation according to radiographic criteria: hemorrhagic infarction (HI), parenchymal hematoma (PH), or remote ICH (see appendix 1). Most hemorrhages after alteplase occur in already infarcted brain tissue
- Assess the degree of neurological worsening by NIHSS point change
- Provide an attribution of causality for the worsening.
- Close monitoring during and for at least 24 hours after the infusion in an intensive care or acute stroke unit. sICH attributed to alteplase occurs within 36 hours from the infusion, with only half of the events being diagnosed by 5 to 10 hours.

Treatment of Post thrombolytic Hemorrhage

The general principles of treating patients with post thrombolytic hemorrhage in the setting of ischemic stroke are similar to those used in treating spontaneous intracerebral hemorrhage (see spontaneous ICH Flagler protocol based on AHA/ASA guidelines.

Indications for Reversal of Alteplase-Induced Coagulopathy

- Overall, currently available literature suggests that sICH within 24 hours of alteplase therapy or with hypofibrinogenemia might be a reasonable indication for treatment.
- Although very limited data are available to support treatment of asymptomatic bleeding, the use of reversal agents for any asymptomatic parenchymal hematoma occurring within 24 h of alteplase infusion may be considered, particularly in the setting of an ongoing coagulopathy.

Agents for Reversal of Coagulopathy

Cryoprecipitate

- Obtain a baseline fibrinogen level immediately and empirically transfuse 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).

Platelets

- Potential for benefit is unclear except in patients with thrombocytopenia (platelets <100.000) in whom 2 donors unit platelet transfusion should be considered.

Prothrombin complex concentrates (PCCs)

- The use of PCCs in most patients with sICH is controversial but may be considered as an adjunctive therapy to cryoprecipitate in those on warfarin treatment before alteplase administration.

FFP

- The use of FFP in most patients with sICH is controversial but may be considered as an adjunctive therapy to cryoprecipitate in those on warfarin treatment before alteplase infusion when PCCs are not readily available.

Vitamin K

- The use of vitamin K in most patients with sICH is controversial but may be considered as an adjunctive therapy in those on warfarin treatment.

Neurosurgical treatment

- It may be considered in select patients with sICH for whom surgery may improve outcome despite the ischemic injury.

Appendix 1

Proposed Heidelberg Classification Scheme

- Hemorrhagic infarction (HI)
    - Type 1: Scattered small petechiae, no mass effect
    - Type 2: Confluent petechiae, no mass effect
- Parenchymal hematoma (PH)
    - Type 1: Hematoma within infarcted tissue, occupying <30%, no mass effect
    - Type 2: Hematoma occupying ≥30% of the infarcted tissue with obvious mass effect
    - Type 3a: Hematoma remote from infarcted brain tissue
    - Type 3b: Intraventricular hemorrhage
    - Type 3c: Subarachnoid hemorrhage
    - Type 3d: Subdural hemorrhage