Time Lost is Brain Lost: Impact of Ischemic Stroke

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Ischemic stroke begins in the brain metabolites needs of oxygen and glucose. Cerebral ischemia develops from vascular blocking lesions commonly caused by atherosclerosis from lipid aggregation and inflammation. According to White et al. (2011), ischemic stroke is the major cause of stroke and is tightly linked to the metabolism of free radicals.

As stated by Davis, Myers, and Dieterich (2015), excessive circulating levels cause endothelial dysfunction by affecting the inner and outer layers of an artery. This culminates in endothelial dysfunction that contributes to plaque formation and thrombosis.

Therefore, adhesion to the endoluminal injury initiates the expression of adhesion molecules notably the vascular cell adhesion molecule (VCAM) and intercellular adhesion molecule 1 (ICAM). Cytokines, such as interleukin-1 (IL-1), tumor necrosis factor-α, and fibroblast growth factor (FGF) are released from the ischemic tissue.

The brain becomes ischemic due to the death of neuronal, glial, and vascular necrosis and irreversible brain damage. Blood flow is still insufficient to remove lactic acid and carbon dioxide, nerve cells begin to die. Local edema results, create adaptive immune systems, vascular smooth muscle proliferation, and remodeling of extracellular matrix.

A 65-year-old Caucasian female arrives via EMS at 12:25 pm for chest pain. Care team, including a physician, assist patient arrival at the bedside. Background history: 11:00 am, the patient’s spouse ran an errand. He returned 5 minutes later finding her lying on the floor. The patient exhibited slurred speech, right facial droop, and was administered a National Institutes of Health Stroke Scale (NIHSS) of 15 upon arrival. No apparent signs of trauma was noted. A history includes three positive modifiable risk factors: diabetes mellitus, hypertension, and hyperlipidemia. Current medications include: Metformin, Hydrochlorothiazide, and Simvastatin. Physical exam is unremarkable with B/P 146/88, R 82, R 18.99% SPO2 on room air.

A standard brain attack treatment order was utilized. Lab results within normal limits include electrolytes, renal, complete blood count with platelet count, cardiac markers, prothrombin time, international normalized ratio, and activated thromboplastin time. Blood glucose was elevated at 120 mg/dL. CT scan at 12:35 pm with 12.40 min interval showed absence of brain hemorrhage.

The patient has no contraindications to tissue plasminogen activator (tPA) and the patient’s spouse agrees to treatment after witnessing risks and potential benefits of tPA administration. Drug was administered at 1:10:30, 120 minutes after the patient was last known normal. Drug administration was considered normal within the stroke unit. During first 24 hours the patient regained strength in the right upper and lower extremities. Facial droop and slurred speech was secondary, normal range and 15-mm CTA was negative prior to discharge.

Summary. The patient’s modifiable risk factors were well controlled with current medications. A positive outcome resulted from rapid identification by the spouse, calling 911, and arriving within 5 minutes from last known normal permitted tPA administration as established by the American Heart Association (AHA). Stroke Association (ASA) guidelines within time frames of symptom onset. National Institute on Neurological Disorders and Stroke (NINDS) efficiency guide for ED to stroke care (Jauch et al., 2013). Aquage outcome resulted from use of standard treatment order set (handout), and guidelines established by AHA/ASA and NINDS.

**Conclusions**

Stroke affects men and women equally in the United States, predominantly ischemic stroke. Oxidative stress and brain injury contribute to the neuropathology of cerebral injury leading to cell apoptosis and death (Pasquali et al., 2015). Immune responses within the CNS and systemic inflammatory events play important roles in the progression, growth, and stability of atherosclerotic plaques. Decreasing modifiable risk factors, particularly hypertension, smoking, has a potential role in reducing risk of ischemic stroke. For every 1 percent decrease in treatment delay, 3 minutes, 14 billion synapses and 12 km of myelinated fibers are destroyed (Matsuda et al., 2015, p. 891). Time is muscle. The patient was transferred to medical and surgical treatment facilities 52 minutes after door to treatment times continued. According to Adlon (2011), prehospital caregivers and EMS providers proved beneficial by reducing time to treatment. Current research supports the use of prehospital care. The prehospital care setting has the advantage of placing the CT scanners in ambulances with high-speed internet support to paramedics administering tPA enroute. Field ICA administration will facilitate direct angiography approach replacing time spent in ED’s (Matsuda et al., 2015).

The ICA recommends/endorse the neuropharmacologic and pharmacogenetic testing for future research on stroke prevention (Mochida et al., 2014).
HANDOUT

Use of Standard Treatment Order Set

According to Elder et al. "Current guidelines for ischemic stroke advocate the use of intravenous (tPA), the early use of thromboembolism (VTE) prophylaxis, anticoagulation in patient with atrial fibrillation (afib), and lipid lowering therapy." (2015, para. 1) The Joint Commission (JC) requires eight mandatory standards and two optional standards for hospitals to receive Primary Stroke Center (PSC) status:

- Venous thromboembolism (VTE) prophylaxis
- Anticoagulation therapy for afib or flutter
- Thrombolytic therapy
- Antithrombotic therapy by end of hospital day two
- Discharged on statin therapy
- Discharged on antithrombotic therapy
- Receive stroke education
- Assessment for rehabilitation
- Screening for dysphagia
- Smoking cessation services

Order sets ensure compliance with quality indicators, decrease length of stay and decrease overall costs. Order sets created by multidisciplinary stroke experts should follow American Heart Association (AHA)/American Stroke Association (ASA) guidelines. Incorporating order sets in the electronic medical records (EMR) whenever possible will prevent modifications or exclusions. Elder et al. (2015) performed a retrospective study reporting that adherence to national guidelines increased with standard order set use. Current AHA stroke guidelines recommend Emergency Medical Service (EMS) transport suspected stroke patients to the closest PSC unless contraindicated (Jansch et al., 2013).