Use of Acetylsalicylic Acid in the Prehospital Setting for Suspected Acute Ischemic Stroke

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ABSTRACT

Acute ischemic stroke (AIS) treatment guidelines include various recommendations for treatment once the patient arrives at the hospital. Prehospital care recommendations, however, are limited to expeditious transport to a qualified hospital and supportive care. The literature has insufficiently considered prehospital antiplatelet therapy. An otherwise healthy 30-year-old black man presented with headache for about 3 hours, left-sided facial and upper extremity numbness, slurred speech, miosis, lacrimation, and general fatigue and malaise. The presentation occurred at a time and location where appropriate resources to manage potential AIS were limited. The patient received a thorough physical examination and electrocardiogram. Acetylsalicylic acid (ASA) 325mg was administered within 15 minutes of history and examination. A local host-nation ambulance arrived approximately 30 minutes after presentation. The patient's neurologic symptoms had abated by the time the ambulance arrived. The patient did not undergo magnetic resonance imaging (MRI) until 72 hours after being admitted, owing to lack of neurology staff over the weekend. The MRI showed evidence of a left-sided, posterior-inferior cerebellar artery stroke. The patient was then taken to a different hospital, where he received care for his acute stroke. The patient eventually was prescribed a statin, ASA, and an angiotensin-converting enzyme inhibitor. The patient has no lingering symptoms or neurologic deficits.

Keywords: *stroke, acute ischemic; prehospital treatment; acetylsalicylic acid; antiplatelet*

Introduction

Acute ischemic stroke (AIS) is a significant and well-studied pathological phenomenon. It can affect any demographic or age group, although it is much more common in the elderly than the young. The following pathologies are the most common causes of AIS: atherosclerosis, vasculitis, arterial dissection, polycythemia, hypercoagulable state, and infection. The major vessels typically involved are ophthalmic, anterior cerebral, middle cerebral, vertebral, postero-inferior cerebellar, basilar, and posterior cerebral. AIS is atypical in young, otherwise healthy individuals. Ischemic strokes are estimated to make up to 87% of all strokes. Intracerebral hemorrhage (ICH; approximately 10%) and nontraumatic subarachnoid hemorrhage (SAH; approximately 3%) make up the remainder of strokes.[1]

Although these statistical trends are similar for young stroke sufferers, there are some important differences, as noted in Smaljović's comprehensive review.[2] Strokes in "young" patients make up approximately 10% to 15% of all strokes, but consensus on the age of a young stroke patient does not currently exist.[2] Typically, studies consider a young stroke patient to be between the ages of 45 and 49 years. Marini et al. performed a systematic review of 29 studies from 1980 to 2009 that included 3,589 patients under the age of 45 years who had had a first stroke.[3] The ranges for the different types of stroke varied significantly. Incidence of ischemic strokes ranged from 21.0% to 77.9%; of ICH, 3.7% to 38.5%; and of SAH, 9.6% to 55.4%. Smaljović et al.[2] found that ischemic stroke in young adults was diagnosed in 61% of cases, ICH in 17%, and SAH in 22%. Risk factors for strokes in both elderly and young patients are similar and include smoking, dyslipidemia, and hypertension. However, an unknown etiology of the stroke for young patients is more common than in elderly patients.[2]

Recently, U.S. Army Aviation units began rotating to Europe in support of U.S. European Command (EUCOM) Operation Atlantic Resolve, replacing an organically assigned Combat Aviation Brigade. The new rotational forces are now performing aviation missions and providing support to North Atlanta Treaty Organization training missions across Europe. As expected, a transient force within the theater of operation presented several new medical challenges, including unfamiliarity with host-nation resources, communication barriers, and different standards of care.

This article presents the case of a Soldier in the EUCOM theater who presented with AIS-like symptoms. Because of his unfamiliarity with the stroke protocols of the local hospital, one of the authors initiated antiplatelet therapy before cranial imaging with computed tomography (CT) scan or magnetic resonance imaging (MRI).

Case Presentation

A 30-year-old male Blackhawk pilot presented to a senior flight paramedic at approximately 23:00 on a Friday in his barracks having had a headache for about 3 hours, malaise, and obvious proprioceptive deficits: the Soldier could barely stand without assistance. The flight paramedic triaged the patient, including taking his history and obtaining a manual pulse,

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and performed an abbreviated physical examination, which revealed truncal ataxia. The flight paramedic then enlisted the help of another Soldier to call the unit's flight surgeon. Via telephone, the patient reported similar symptoms, but additionally reported left-sided facial numbness, lacrimation, and left arm sensory deficits. The flight surgeon recommended the patient go to the aid station, which was in the basement of the patient's barracks. The flight paramedic assisted the patient to the aid station.

Once in the aid station, the flight paramedic again obtained the patient's vital signs, which revealed marked tachycardia and acute hypertension (Table 1). Although a handheld rapid blood analyzer was available, its software was out of date; therefore, essential initial measurements like glucose were unattainable. Physical examination revealed ptosis, miosis, and numbness along the left side of the face in the distribution of the CN VII (facial nerve). The electrocardiogram revealed sinus tachycardia.

The differential diagnosis (Table 2) at this point was ICH, SAH, carotid artery dissection, vertebral artery dissection, AIS, transient ischemic attack, and cluster headache with neurologic symptoms. Considering a recent case at the local hospital in which specialists would not see urgent or emergent patients on weekends and holidays (this was now early Saturday morning), the flight surgeon administered aspirin (ASA) 325mg orally. The Soldier's neurologic symptoms abated within 30 minutes of ASA administration. An ambulance arrived and took the patient to the closest hospital. A CT scan showed no hemorrhage. The patient was then transferred to a hospital with higher level of care.

He received routine screening laboratory tests, a lumbar puncture, and plain film radiograph of the cervical spine. The lumbar puncture revealed a slight increase in lymphocytes and normal glucose and protein levels. The Soldier underwent intravenous acyclovir therapy until the culture eventually returned negative for infectious pathogens. No neurologist or internal medicine staff rounded on the patient on Saturday or Sunday. The patient underwent MRI early Monday morning after the staff neurologist made his rounds. The MRI revealed a large, right-side, posterior-inferior cerebellar artery stroke. The flight surgeon insisted that the patient be transferred to Landstuhl Regional Medical Center (LRMC). On Tuesday, the patient arrived at LRMC and was evaluated by cardiology and neurology. The patient eventually was prescribed a statin, ASA, and an angiotensin-converting enzyme inhibitor. The Soldier is currently without sequelae or symptoms and will hopefully return to aviation duties.

Discussion

Prehospital management of suspected AIS is often initiated by emergency medical services personnel or nonmedical citizens.

Table 2 *Differential Diagnosis in Suspected Acute Ischemic Stroke*

Migraine/cluster headache
Intracranial hemorrhage, subarachnoid hemorrhage, subdural hematoma
Bell's palsy
Transient ischemic attack
Meningitis
Carotid artery dissection
Vertebral artery dissection

Therefore, several sources focus on early detection, expeditious ambulance dispatching, and supportive care, rather than medical management.[4,5] In most sources, antiplatelet therapy is not recommended until the patient has reached the hospital and been evaluated by a physician. Other sources actively discourage ASA administration by paramedics. Ward et al.[6] gave two reasons for discouraging paramedic administration of ASA for suspected AIS: first, the difficulty of ruling out intracerebral hemorrhage (ICH) on clinical grounds makes potential harm to the patient a possibility; second, dysphagia secondary to stroke is also a potential risk (though rectal administration is a possibility). Ward et al.[6] concluded that a short delay in therapy will likely not result in harm to the patient; however, this conclusion assumes that the patient reaches a hospital within 1 hour.

Because of the time-sensitive nature of AIS, American Heart Association/American Stroke Association (AHA/ASA) guidelines[7] for therapy are understandably temporally correlated. Definitive medical treatment of AIS is centered on antifibrinolytic therapy (specifically, recombinant tissue-plasminogen activator [rt-PA]). The AHA/ASA currently recommends rt-PA therapy within 4.5 hours of onset of AIS. This intervention improves outcomes measured at 3 months after stroke occurrence. Endovascular therapy with stent retrievers is recommended it the patient meets the following criteria: prestroke modified Rankin scale score, 0 to 1; receipt of IV rt-PA within 4.5 hours of AIS onset; occlusion of the internal carotid or proximal middle cerebral artery; age greater than 18 years; National Institutes of Health Stroke Scale score of greater than or equal to 6; Alberta stroke program early CT score greater than or equal to 6; and treatment can begin within 6 hours of stroke onset. Signs, symptoms, and treatment for reperfusion injury were not mentioned in the AHA/ASA guidelines.[7]

The 2013 AHA guidelines recommend ASA therapy in the first 24 to 48 hours of suspected stroke, because of a small but statistically significant decrease in mortality and recurrent stroke.[4] A large study that combined the findings of the International Stroke Trial and Chinese Acute Stroke Trial concluded that significant benefits of early ASA administration (within the first 24 to 48 hours of stroke symptoms) include decreased morbidity and mortality without harm to patients.[8]

Table 1 *Patient's Prehospital Vital Signs*

Location	Heart Rate, bpm	Blood Pressure, mmHg	Temperature, °F	Respiratory Rate per Minute	Oxygen Saturation, %
Patient's room	80	Palpable pulse	—	—	—
Aid station	124	168/112	99.3	20	97
Before entering ambulance	108	156/98	98.9	22	98

—, no data; bpm, beats per minute.

Administration of ASA before ruling out hemorrhagic stroke is, admittedly, a less-than-ideal choice. However, in a truly emergent situation, and with a careful history and physical examination, some of the risks can be mitigated. The history should include recent head injury event or major trauma and family history of Berry aneurysm, arterial venous malformations, and polycystic kidney disease. The demographics of the patient are also vitally important. Exponential increase in ICH and SAH are seen with increased age, particularly after age 65 years. A study of the demographics of patients between age 0 and 34 years reported ICH and SAH each occurred at an incidence rate equal to or less than 10 per 100,000 patients. An ICH incidence rate of greater than 50 per 100,000 patients was found in those age 65 years and older, and the incidence rate for SAH was 20 per 100,000 in those age 75 years and older.[9]

If the administration of an antiplatelet worsens the patient's symptoms and a hemorrhagic stroke is now suspected, the health-care professional should know how to manage a hemorrhagic stroke. The first step is to protect the patient's airway via intubation in anticipation of aspiration and/or airway compromise. Second, the professional must take precautions against elevated intracerebral pressure by raising the head of the bed to 30 degrees and administering mannitol 20% at a dose of 1g/kg. The mean arterial blood pressure should be maintained below 130mmHg systolic. Third, platelets and desmopressin should be administered. Early hematoma formation is the major risk factor for poor outcome with a hemorrhagic stroke. Therefore, hemostatic and antifibrinolytic therapies could be considered once the patient is in a hospital setting, but these are too dangerous to administer in a prehospital setting.[10]

The case reported here is unique in that a paramedic and a physician began antiplatelet therapy of this patient before the patient reached a hospital. Army Special Forces units typically will have an 18D operating at the most forward positions on missions. One of the authors of this case report has had a Special Forces Soldier sustain an AIS while in a location where the closest physician did not speak English and misdiagnosed the Soldier with a routine headache for 3 days before the Soldier became incapacitated and now has permanent debilitating sequelae. This case may inform U.S. military medics, 18Ds, physician assistants, nurse practitioners, and physicians that prehospital administration of ASA in suspected AIS in an austere environment can significantly decrease morbidity and mortality of our most vulnerable and high-performing Soldiers.

Conclusion

Multiple large studies show the benefits of early administration in hospital of ASA for suspected AIS—primarily the prevention of recurrent stroke and decreased morbidity. Several sources discourage training paramedics to administer ASA for suspected AIS in a prehospital setting, because of possible dysphagia and potential harm to patient and on the assumption that a hospital with CT and MRI capabilities and a physician is nearby (within 1 hour).

In an operational setting with unknown or limited access to CT/MRI, in the absence of an acute traumatic injury, early administration of ASA for suspected AIS could save an Operator from death or permanent disability if proper measures are taken to mitigate the risk of causing intracranial bleeding. Our case is only one example, and although other anecdotal examples exist for prehospital administration of ASA for suspected AIS, we recommend additional studies in this area before officially recommending routine administration of ASA for suspected AIS.

Disclosures

The authors have no conflicts of interest or financial disclosures to disclose.

References

1. **Tintinalli JE, Stapczynski SJ.** Chapter 16. In: Cline DM, Ma OJ, Cydulka R, et al. (eds): *Tintinalli's Emergency Medicine: A Comprehensive Study Guide*. 7th ed. New York, NY: McGraw-Hill, 2011;1122–1135.
2. **Smaljović D.** Strokes in young adults: epidemiology and prevention. *Vasc Health Risk Manag*. 2015;11:157–164.
3. **Marini C, Russo T, Felani G.** Incidence of stroke in young adults: a review. *Stroke Res Treat*. doi:10.4061/2011/535672
4. **Jausch EC, Saver JL, Adams HP, et al.** AHA/ASA guidelines for the early management of patients with acute ischemic stroke. *Stroke*. 2013;6:43–46.
5. Crocco TJ, Grotta JC, Jauch EC, et al. EMS management of acute stroke—pre-hospital triage (resource document to NAEMSP position statement). *Prehosp Emerg Care*. 2007;11(3):313–317.
6. Ward M, Rothwell PM. Paramedics should delay giving ASA to patients with stroke. *BMJ*. 2000;321(7256):299.
7. Powers WJ, Derdeyn CP, Biller J, et al. 2015 American Heart Association/American Stroke Association focused update of the 2013 guidelines for the early management of patients with acute ischemic stroke regarding endovascular treatment. ***Stroke.*** 2015; 46(10):3020–3035.
8. Chen ZM, Sandercock P, Pan HC, et al. Indications for early ASA use in acute ischemic stroke. *Stroke*. 2000;30(6):1240–1249.
9. Broderick JP, Brott T, Tomisick T, et al. Intracerebral hemorrhage more than twice as common as subarachnoid hemorrhage. *J Neurosurgery*. 1993;78(2):188–191.
10. **Sahni R, Weinberg J.** Management of intracerebral hemorrhage. *Vasc Health Risk Manag*. 2007;3(5):701–709.

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