Title:
Use of the BeFASSTT Acronym to Improve Brainstem Stroke Recognition: A Case Study

Marietta Sperry, MSN
School of Nursing LPN to BSN Program, Indiana State University, Simi Valley, CA, USA
Amber Wilson, MSN
School of Nursing LPN to BSN Program, Indiana State University, Madison, IN, USA

Session Title:
Rising Stars of Research and Scholarship Invited Student Posters

Slot:
RS PST1: Sunday, 17 November 2019: 11:45 AM-12:15 PM

Applicable Category:
Clinical, Academic, Students, Leaders, Researchers

Keywords:
BeFASSTT, Brainstem stroke and Lateral medullary infarction

References:


Abstract Summary:

Brain stem strokes comprise approximately 10% of all strokes, are often in younger populations, and are commonly misdiagnosed. The proposed BeFASST acronym addresses the knowledge gap of pain and temperature sensory deficits that are characteristic of a lower brainstem infarct, as noted in this case study.

Content Outline:

A Main Point #1 Measurable Objectives

1. Supporting point #1 At the conclusion of this educational presentation, participants will be able to:
   a. Distinguish brainstem and cerebellum stroke symptoms
   b. Recognize key sensory deficit symptoms related to brainstem strokes
   c. Discuss each element of BeFASSTT (Balance, Eyes, Face, Arms, Speech, Sensory deficit of pain, Time, Temperature – sensory deficit)

B. Main Point 2- Patient History of undiagnosed brainstem stroke until 42 hours post admission

1. Supporting point #1 Problems with FAST or BeFAST
   a. FAST or BeFAST acronyms not adequate enough to identify 9x5x11 lateral medullary infarct to the brainstem
   b. Imaging usually limited to the cerebrum
2. Supporting point #2 - Ipsilateral Sensory deficits of pain and Temperature not recognized

3. Supporting Point #3 Methods and Results
   a. Literature rampant with case studies identifying gap
   b. Systematic Reviews and larger studies are older demonstrating need for comprehensive newer studies
   c. Neck trauma usually seen with younger population resulting in missed diagnosis

C. Main Point 3-Implications for Practice to reduce the phenomenon of delayed or misdiagnosis
   1. Accurate knowledge of defining symptoms of brainstem and cerebral strokes
   2. Implementing the modified BeFASSTT acronym to aid in proper identification of brainstem strokes when a neurologist is not available
   3. Imaging to include the neck for definitive diagnosis
   4. Attention to history of neck trauma, even if minor

Conclusion
   1. Sensory dysfunction related to pain and temperature are differentiating symptoms from stroke symptoms occurring in the cerebellum.
   2. Understanding manifestations of brainstem strokes is key when diagnosing stroke patients and implementing therapy in a timely manner.
   3. Outcome of patient case study
   4. Understanding of brainstem strokes assisted patient in coping with temperature and sensory deficits.

Topic Selection:
Rising Stars of Research and Scholarship Invited Student Posters (25201)

Abstract Text:
This case study is one example of many demonstrating the need for improved and quicker identification of brainstem strokes. The information in this case study developed from existing routine care to improve treatment procedures. The current FAST or BeFAST acronyms did not identify the stroke for this 62-year-old male patient, who had a 9x5x11 mm lateral medullary infarct (LMI). The patient was not diagnosed until 42 hours after presenting to the emergency department (ED) and not until after a repeat diagnostic imaging was performed to include the neck region. Brainstem strokes are not ruled out due to the current practice of ordering diagnostics on only the cerebrum and not the brainstem (Savitz et al., 2007). The patient had presented with feelings of unwellness and uncharacteristically high blood pressure (BP) from his home monitor (192/94), without any noticeable cognitive deficits in the late evening. He had also noted a lack of temperature sensation to his left foot and hand earlier the previous day with some
transient nausea that morning. Upon arrival to the ED, his BP was 228/111. An initial computed tomography (CT) scan was unremarkable.

Approximately 10% of strokes occur in the brainstem (Caswell, 2017). Oftentimes it occurs in a younger population, causing a misdiagnosis of the symptoms (Savitz, Caplan, & Edlow, 2007). Reported subsequent brainstem infarctions may occur one to two weeks after initial infarct (Bridgwood et al., 2018). A week later the case study participant experienced a second medullary stroke that increased the infarct area to 11x8x14 mm and contralateral symptoms to the face were noted.

The American Stroke Association (ASA) and the National Stroke Association (NSA) both utilize the FAST (face, arm, stroke, and time) acronym to educate people about symptoms possibly indicating an oncoming stroke (ASA, n.d.; NSA, n.d.a). For the almost 70,000 individuals who experience a stroke within the brain stem, the FAST or BeFAST tool may not be enough (Caswell, 2018; Internet Stroke Center, n.d.; National Stroke Association, n.d.b).

**Problem Statement**

Patients with lower brainstem stroke related symptoms have delayed diagnosis or are misdiagnosed. “Balance” and “Eyes” of BeFASST address upper brainstem infarcts (Aroor, Singh, & Godstein, 2017). There is a knowledge gap when identifying lower brainstem strokes which leads to poorer patient outcomes and delayed interventions.

**Methods**

A large amount of the articles were single case studies. This supports multiple authors’ views concerning the need to perform further research about identifying brainstem strokes. Several literature, systematic reviews, and larger studies were older and focused on one aspect of brainstem strokes. This reinforces the need for larger, more recent, and all-encompassing studies that address imaging, early diagnosis, association of neck trauma, and awareness of hemi-sensory neurological deficits.

**Results**

By examining individual studies, research summaries, and current clinical practice guidelines, the revision of the FAST or BeFAST acronym to BeFASSTT may eventually assist providers with more efficient and effective protocols when caring for patients who possess stroke manifestations (Brown, 2018). Using the systematic review process as a guide will compile current, evidence-based literature to evaluate the modification of the FAST acronym to improve brainstem stroke recognition (Brown, 2018).

**Implications for Practice**

The three clinical practice guidelines that would be significant recommendations are accurate knowledge of defining symptoms of brainstem and cerebral strokes, implementing the modified BeFASSTT acronym to aid in proper identification of brainstem strokes when a neurologist is not available, and imaging to include the neck for definitive diagnosis to reduce the phenomenon of delayed or misdiagnosis. Any level of neck injury should be an indication to rule out medullary infarct; the case study had spent the previous three mornings scraping and painting the eaves of his home. (Abrich, Martin, & Hennick, 2013; Fox, et al, 2017).

**Evidence-Based Findings**
Supporting literature of follow-up imaging, the importance of recognizing signs and symptoms of an LMI to initiate appropriate treatment, the sensory loss of pain and temperature related to LMI, and the frequency of LMI in young patients which can often cause a misdiagnosis. The BeFASSTT acronym includes the addition of sensory loss of pain and temperature to the original FAST or BeFAST acronym supported by the AHA and the NSA (ASA, n.d.; NSA, n.d.a).

Discussion

Implementation of the BeFASSTT acronym to include recognition of sensory deficits such as pain and temperature are important quick identifiers that can improve patient outcomes. While case studies are not the highest level of evidence, the numerous accounts of LMI among individuals are not to be discounted and may indicate the need for additional assessment. Additionally, obtaining pertinent history regarding even minor neck trauma is crucial in improving outcomes of brainstem stroke patients. Patients who would benefit from receiving recombinant tissue plasminogen activator (rt-PA) are often not recipients due to misdiagnosis related to insufficient or omission of a neurological examination when presenting to the emergency room, especially when exhibiting vertigo (Sangha et al., 2014). Several case studies, as well as literature reviews, indicate the most profound symptom of LMI is a loss of temperature and loss of superficial pain sensation that occurs to one half of the body (Day, Swartz, Chenkin, Shamji, & Frost, 2014; Kon et al., 2017; Ogawa, Suzuki, Oishi, & Kamei, 2015). These symptoms may be ipsilateral to the face and contralateral to the body. Dysarthria, hoarseness, and nystagmus may vary according to the size and location of the infarct to the medulla (Day et al., 2014; Kon et al., 2017; Ogawa et al., 2015). Although protocols support imaging, some do not include the area of the neck (Caplan, 2017). The addition of a few more inches may be a critical modification when performing a cerebral CT scan and may identify an infarct occurring in the brainstem (Ortiz de Mendivil, Alcalá-Galiana, Ochoa, Salvador, & Milán, 2013).

Conclusions

Identification of lower brainstem strokes can be accomplished by using the BeFASSTT acronym to improve patient outcomes. Understanding manifestations of brainstem strokes is key when diagnosing stroke patients and implementing therapy. Sensory dysfunction related to pain and temperature are differentiating symptoms from stroke symptoms occurring in the cerebellum (Abrich, Martin, & Hennick, 2013; Balamı, Chen, & Buchan, 2013; Day, Swartz, Chenkin, Shamji, & Frost, 2014; Kim, 2003; Kon et al., 2017; Ogawa, Suzuki, Oishi, & Kamei, 2015). Appropriate imaging confirms the suspected diagnosis originally based on signs and symptoms of the patient.

The most significant outcomes according to the patient were the sensory deficits (personal communication, September 15, 2018). The patient initially experienced extreme exhaustion and deviation to one side when ambulating short distances after the second stroke. Other symptoms, in addition to the sensory deficits, included labile blood pressure, trouble swallowing certain foods and fluids, hoarseness, and erectile response, which began to resolve with time.

Home rehabilitation took place over six weeks, after which the patient was able to travel to physical therapy for four months to resolve a tightened sternocleidomastoid muscle. The patient’s spouse noted that the patient appeared to have sleep apnea in the form of cluster breathing at night, which improved over time. Sleep studies were recommended by the patient’s primary physician, but the patient declined (personal communication, September 15, 2018). The patient was noted to have labile BP for several
months and presented to the ED twice for high BP within six months of the strokes. After the addition of a diuretic, the patient’s BP was consistently noted to be within a normal range. Adding 30-minute walks further decreased the patient’s BP.

One year post-stroke, the patient has minimal contralateral body sensory deficits with mild facial transitory ipsilateral sensory symptoms. Several months after the second stroke, the patient noted a hearing deficit to the ipsilateral ear. The hearing deficit was not initially known or measured by an audiologist, and it was uncertain if the improvement over time had occurred. All deficits have improved since the onset of the strokes with minor living adjustments. Extreme heat and cold causes localized burning and freezing sensations to areas innervated by the stroke-affected areas of the brainstem, with cold causing more disruption. The patient also incorporates a daily 30-minute hot tub soak at 97° after exercising 30 minutes on a treadmill. The patient reports the ability to walk a quarter of a mile daily and to drive short distances. Although he tires easily, he reports improved strength and stamina. He reiterates that overall knowledge of LMI aided in coping with symptoms as they slowly resolved.