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## C3: TIA

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\* *Drug doses are a guide only, always check a second source and follow local practice guidelines*

### Take Home Points:

- TIA exists on a spectrum with stroke – in some cases there will be signs of infarction on advanced imaging (technically a small stroke) and in some there will not
- The treatment of TIA and small stroke is essentially the same, namely to prevent a major stroke in the near future
- The ABCD2 score is flawed but still appropriate and effective at identifying high risk patients that should be admitted for expedited work-up
- It is important in to identify those patients, even with low-risk ABCD2 scores, that may benefit from emergent and urgent interventions such as anticoagulation and invasive vascular procedures

## Introduction

In this episode of C3, we review the management of the patient with transient ischemic attack (TIA). As a term and as a diagnosis, TIA has undergone significant evolution in the past couple of decades. Once thought of as a much less important diagnosis, TIA is now recognized as a critical warning sign of an impending stroke. If this warning sign is heeded, many strokes can be prevented and patient outcomes can be improved.

The old definition of TIA involved a sudden neurologic deficit of vascular origin (typically from loss of blood flow) that resolved with 24 hours. But we now can see on advanced neuroimaging studies like diffusion-weighted MRI that most patients with deficits that persist this long have evidence of infarction - e.g. completed stroke. In other words, they do not have anything “transient” at all. This understanding has led to a progressive change in the formal definition of TIA. In reality TIA exists on a spectrum with stroke - one contemporary classification is as follows:

- Stroke
  - Persistent deficits
  - Infarction on imaging
- Transient Symptoms with Infarction (TSI)
  - Deficits resolve
  - Infarction (stroke) on imaging
- Transient Ischemic Attack (TIA)
  - Deficits resolve
  - No Infarction (stroke) on imaging



The creation of a new category (TSI) helps us better incorporate the idea that the patient's deficits and imaging results do not always match up. There is no precise time cut-off involved in the above definitions and there is a great deal of variation as to when infarction is first seen on neuroimaging. Some patients display signs of infarction on DWI within minutes of symptoms, in other cases, no lesion is apparent even at 24 hours. As a matter of practical reality for the emergency provider, whether the imaging is positive or negative for infarction, patients with a resolving/fully resolved deficit can essentially be treated in the same fashion.

The degree to which TIA is a warning sign for an impending major stroke was made clear by a well publicized study in California. In that study, more than 10% of patients had a disabling stroke within 90 days of their visit to the ED with roughly half of those – returning within just 2 days.

- [EMA November 2001. SHORT-TERM PROGNOSIS AFTER EMERGENCY DEPARTMENT DIAGNOSIS OF TIA Johnston, S.C., et al, JAMA 284\(22\):2901, December 13, 2000](#)

## Diagnosing TIA

- The three key elements of diagnosing TIA
  - **Sudden**
    - The onset of symptoms in a vascular event is sudden
  - **Negative**
    - The patient should have a deficit – meaning that something is lost
    - A positive sensation (funny smell or paresthesia) is much more likely to indicate something else such as a seizure, migraine or even a tumor
  - **Focal**
    - In general, a TIA will result in a focal deficit (e.g. one referable to a certain area of the brain or spinal cord)
    - A global loss of consciousness is more suggestive of cardiac syncope
    - Generalized weakness is unlikely from a TIA
    - Episodes that involve more than one system (e.g. the neurological) are unlikely from a TIA
- Key history and physical
  - What was the deficit?
    - Time of onset and duration
  - Thorough neuro exam
    - Is there an ongoing new deficit?
    - Keep in mind that patients with prior stroke who are medically ill often have an exaggeration of their baseline neurological deficits
    - Check for upper motor neuron lesion reflexes (e.g., an upgoing plantar response can help confirm diagnosis)
  - Thorough cardiac exam
    - Are there any signs of atrial fibrillation?



- Are there any pulse deficits? (e.g. an extremity with a weaker pulse)
        - This raises suspicion of aortic dissection as a cause for the neurological event
  - TIA Mimics
    - The most typical events (unilateral weakness, slurred speech) are the easiest to recognize
    - Misdiagnosis is extremely common
      - Many true TIAs are misclassified as something else
      - Many other events are classified as TIA
        - Cardiac syncope is sometimes misdiagnosed as a TIA
    - The most common mimics are the same as for stroke
      - Seizure with Todd's paralysis
      - Complex migraine
      - Metabolic abnormality
        - Glucose, sodium, calcium
      - Brain lesion
      - Demyelinating disease
      - CNS infection
      - Acute vestibular syndrome
      - Peripheral nerve lesion
      - Radiculopathy, neuropathy
      - Psychogenic
    - *EMA March 2012: Transient Ischemic Attack Versus Transient Ischemic Attack Mimics: Frequency, Clinical Characteristics And Outcome Amort, M., et al, Cerebrovasc Dis 32(1):57, 2011*
  - TIA "Plus" Syndromes
    - The vast majority of TIAs result from atherosclerotic thromboembolic disease
    - But these less common (and life-threatening) etiologies have different therapies:

ETIOLOGY	SUGGESTIVE FEATURES	TREATMENT
Endocarditis	Fever, murmur, bacteremia risks	Antibiotics
Cervical artery dissection	Neck pain, minor trauma	Anticoagulation
Aortic arch dissection	Chest pain	Cardiovascular surgery
Temporal arteritis	Temporal tenderness, jaw claudication	Corticosteroids



## Initial Evaluation And Work-Up

- Cardiac monitor
  - Atrial fibrillation may be intermittent and only picked up on a monitor
- ECG
  - Signs of ischemia or infarction may point to a cardiac etiology (dissection or infarction)
- Labs
  - No labs should be considered mandatory
    - CBC, electrolytes, coagulation studies and troponin may be helpful in some cases
- Imaging
  - CT head
    - A non-contrast head CT may be performed
      - If performed, it is not time-critical as in stroke
    - CT is used as a screening test to identify life-threatening TIA/stroke mimics such as subdural hematoma and tumor
    - A previous (old) stroke may help confirm a new diagnosis of TIA
    - In patients with high risk TIAs, proceeding directly to CT angiography (CTA) of the head and neck is appropriate to identify lesions for intervention (e.g., carotid stenosis)
  - MRI
    - MRI/MR angiography (MRA) may be performed in addition to or as an alternative to a screening CT
    - If a new infarct consistent with the patient's symptoms is seen, it helps to confirm the diagnosis (and places the patient in the new category of TSI, see above)
    - Whether or not an infarct is seen, the goals of therapy are the same: to prevent a further, permanent stroke
    - EMA August 2017 – Have Clinicians adopted the use of brain MRI for patients with TIA and minor stroke?
  - Carotid imaging
    - CT angiography, MR angiography, or carotid ultrasound are all acceptable means of imaging the carotids for possible stenosis
  - Initial treatment
    - Aspirin (unless allergic or actively bleeding)
      - Initial dose of 162 mg is appropriate
    - Blood pressure
      - Markedly elevated BP should be treated with a goal toward a slow, gradual reduction over days – this is to avoid the effect of a rapid decline in brain perfusion pressure



## Disposition

- Because these patients are, by definition, asymptomatic after their episode when we evaluate them in the ED, so much of our decision-making has to do with disposition: should they stay for more work-up or should they go?
- Regardless of disposition, inpatient or outpatient, a specialized, organized approach to care improves patient outcomes
- The ABCD2 score has been widely studied as a tool for risk stratification in TIA
  - In general, patients with high ABCD2 scores are admitted for advanced imaging and possible intervention

ABCD2 SCORE	POINTS
<b>A</b> ge > 60	1
<b>B</b> P Systolic > 140 or diastolic > 90	1
<b>C</b> linical feature: unilateral weakness	2
<b>C</b> linical feature: speech disturbance without weakness	1
<b>D</b> uration of symptoms 10-60 minutes	1
<b>D</b> uration of symptoms > 60 minutes	2
<b>D</b> iabetes	1

Frequency of stroke after TIA using ABCD2 Score:

SCORE	AT 2 DAYS	AT 7 DAYS	AT 90 DAYS
0-3 (Low Risk)	1.0 %	1.2 %	3.1 %
4-5 (Moderate Risk)	4.1 %	5.9 %	9.8 %
6-7 (High Risk)	8.1 %	11.7 %	17.8 %

- The score has not performed well in a number of studies – therefore even when it is low (<3), a focus on treatable conditions is important to prevent future disabling strokes and poor outcomes
  - This can be done directly in the ED, in an observation unit, or in a specialized outpatient setting if available in a timely fashion
  - Shared decision making with the patient after a discussion of options and consultation with a neurologist is appropriate
    - Carotid stenosis
  - The most important intervention in terms of preventing major stroke is urgent carotid revascularization in those patients with symptomatic stenosis (e.g. TIA with carotid stenosis on the corresponding side)
    - This may be done by either open surgery (carotid endarterectomy) or interventional techniques (e.g., stenting)
  - The carotids may be imaged by CT or MR angiography, or by doppler ultrasound
- Anticoagulation is indicated in patients with:
  - Atrial fibrillation
  - Ventricular thrombi (usually in patients with dilated hearts post-MI)
    - Seen on echocardiogram



- Assess and treat modifiable risk factors:
  - Hypertension
  - High cholesterol
  - Diabetes
  - Smoking cessation
- Antiplatelet therapy
  - If allergic to ASA, clopidogrel (Plavix) is an option
  - Clopidogrel is also added to ASA in patients with high risk or “crescendo” TIAs despite ASA – it carries a higher bleeding risk however

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