• Steve M. Cordina, MD
• Stroke Mimics

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Stroke Mimics

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Outline

• Introduction
• Stroke/TIA
• Specific Mimics
• Unusual Syndromes
• Conclusion
• Definition of stroke:
  – The sudden onset of a focal neurologic deficit in a recognizable vascular distribution with a common presentation - such as hemiparesis, facial weakness and aphasia.
Introduction

- Differential diagnostic problems remain because there are several subtypes of stroke and also because some non-vascular disorders may have clinical pictures that appear identical to strokes.
Stroke

- Stroke is the fourth leading cause of death and the leading cause of disability in the US.

- Each year, about 795,000 people suffer a stroke. About 600,000 of these are first attacks, and 185,000 are recurrent attacks.

- Of all strokes, 87% are ischemic (IS), 10% are intracerebral hemorrhage (ICH), and 3% are subarachnoid hemorrhage (SAH).
Commonest Differentials

- Seizures
- TIA
- Migraine
- Syncope
**Differential Diagnosis**

<table>
<thead>
<tr>
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<th>Seizure</th>
<th>Transient ischemic attack</th>
<th>Migraine</th>
<th>Syncope</th>
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<tbody>
<tr>
<td><strong>Demographics</strong></td>
<td>Any age, often younger</td>
<td>Older patients</td>
<td>Younger age</td>
<td>Any age, often younger</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stroke risk factors present</td>
<td>Women&gt;men</td>
<td>Women&gt;men</td>
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<td></td>
<td></td>
<td>Men&gt;women</td>
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<tr>
<td><strong>Central nervous system symptoms</strong></td>
<td>Positive symptoms: limb jerking, head turning, loss of consciousness</td>
<td>Negative symptoms: numbness, visual loss, paralysis, ataxia</td>
<td>First positive symptoms, then negative in same modality: scintillating scotoma and paresthesia most common; second sensory modality is involved after first clears</td>
<td>Light-headed, dim vision, noises distant, decreased alertness</td>
</tr>
<tr>
<td></td>
<td>Negative symptoms may develop, remain postictally, and persist</td>
<td>All sensory modalities affected simultaneously</td>
<td></td>
<td>Transient loss of consciousness</td>
</tr>
<tr>
<td><strong>Timing</strong></td>
<td>20 to 80 seconds</td>
<td>Usually minutes, mostly &lt;1 hour</td>
<td>Usually 20 to 30 minutes</td>
<td>Usually a few seconds</td>
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<td></td>
<td>Absence, atonic seizures and myoclonic jerks are shorter</td>
<td>Recurrent spells over days, weeks, or months; not usually years</td>
<td>Sporadic attacks during years</td>
<td>Sporadic attacks during years</td>
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<td></td>
<td>Postictal depression</td>
<td></td>
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<td></td>
<td>Spells occur during years</td>
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<tr>
<td><strong>Associated symptoms</strong></td>
<td>Tongue biting, incontinence, sore muscles, headache after attack</td>
<td>Headaches may occur during time period of TIAs</td>
<td>Headache after attack, nausea, vomiting, photophobia, phonophobia</td>
<td>Sweating, pallor, nausea</td>
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</table>
Seizures

• Seizures and post-seizure events as common causes of stroke-like conditions.

• Postictal symptoms are manifestations of seizure-induced alterations in neuronal function that are reversible
  – structural neuronal alterations are not present.

• The postictal weakness or Todd’s paralysis usually follows partial motor seizures but may follow generalized seizures as well.

• Duration is usually brief but may last 48 hours.

• Rare inhibitory seizures with extremity weakness as a manifestation of the seizure event have been reported as well.

• Seizures may also present as a complication of acute stroke or develop in a patient with a history of stroke.
Transient ischemic attack (TIA) is defined as a transient episode of neurologic dysfunction caused by focal brain, spinal cord, or retinal ischemia, without acute infarction.

Concept first introduced in the early 1950s based upon the recognition that a transient focal loss of neurologic function often preceded strokes (Fisher M, AMA Arch Neurol Psychiatry 1951; 65:346.)

In the years after this initial description in patients with carotid artery disease, various groups and committees arbitrarily defined TIAs as lasting less than 24 hours (Caplan LR. Curr Atheroscler Rep 2006; 8:276.)

Subsequent data demonstrated that ischemic attacks that last longer than one hour are most often associated with brain infarction (Albers GW et al. N Engl J Med 2002; 347:1713)

Most TIAs last less than one hour.

Even relatively brief ischemia can cause permanent brain injury.
Symptoms of TIA

- Focal,
- Transient
- May fluctuate

Symptoms are *focal*, suggesting that they relate to dysfunction of a localized area of the brain.

Symptoms are also *transient* when the arterial blockage passes (eg, following dissolution or distal passage of an embolus) or when collateral circulation is able to restore adequate perfusion to the region of ischemia.

The symptoms and signs *may fluctuate* depending upon the adequacy of perfusion,

Perfusion dependent on:
- systemic factors (eg, blood volume, cardiac output, blood pressure, blood viscosity) and
- local factors (eg, propagation and embolization of clot, development of collateral circulation).
Migraine aura is the complex of neurologic symptoms that often accompanies migraine headache.

An aura presents as a progressive neurologic deficit or disturbance with subsequent complete recovery.

Auras are thought to be caused by cortical spreading depression occurring in regions of the cortex that correspond to the clinical manifestations of the aura.

Auras typically occur before the onset of migraine headache, and the headache usually begins simultaneously with or just after the end of the aura phase.

However, headache onset can rarely occur an hour or more after the end of the aura phase.

Although atypical, an aura can develop during or after the onset of headache, and many patients have migraine aura with only a minimal or no headache.
Most migraine auras resolve in 20 to 30 minutes and seldom last more than one hour. Typical auras may involve any of the following manifestations:

- Visual disturbances
- Sensory symptoms
- Motor weakness
- Speech disturbances

Visual disturbances are the most common type of aura.
Syncope

• Abrupt and transient loss of consciousness associated with absence of postural tone, followed by a rapid and usually complete recovery.

• Syncope is usually because of a sudden reduction of cerebral perfusion.

• Common types of syncope include:
  – Neurocardiogenic (vasovagal) syncope
  – Situational syncope (during or immediately after urination, defecation, cough, or swallowing)
  – Orthostatic syncope (associated with orthostatic hypotension)
  – Syncope related to cardiac ischemia or cardiac arrhythmia
Transient Global Amnesia

- TGA is a syndrome characterized by the acute onset of severe anterograde amnesia accompanied by retrograde amnesia, without other cognitive or focal neurologic impairment.

- The amnesia resolves within 24 hours.

- Most patients are male, middle aged or older adults.

- Episodes are usually not recurrent, but rare patients have infrequent attacks that recur over several years.

- Most TGA episodes are probably related to vasoconstriction, but some may be caused by transient ischemia or complex partial seizures.

- TGA can be associated with small focal abnormalities on diffusion-weighted MRI, but the significance of these remains unclear.
Mass Lesions

• Subdural hematoma, cerebral abscess, primary CNS tumors, and metastatic tumors are among the clinical conditions simulating stroke.

• The typical clinical presentation of a slowly increasing mass is a *progressive* syndrome; an abrupt onset of symptoms of these masses seems counter-intuitive.

• A review of patients with brain tumors presenting to an ED showed that 6% of patients had symptoms that were of less than one day’s duration; it was thought that these patients with brief symptom duration might reflect a sub-population who suffer acute deterioration from hemorrhage into the tumor or who develop obstructive hydrocephalus. (Snyder H et al. J Emerg Med. 1993;11:253-258.)

• Chronic subdural hematoma has been frequently reported as a cause of stroke and TIA-like symptoms. (Most ML et al. Ann Neurol. 1983;14:539-542.)
Conversion disorder is the most commonly assigned psychiatric disorder.

One study of emergency department presentations of conversion disorder noted that symptoms of paresis, paralysis, or movement disorders were common and were a presentation in almost 30% of patients. (Dula DJ et al. Acad Emerg Med. 1995;2:120-123.)

They noted significant comorbidity in this population, often other psychiatric disorders, and emphasized that conversion disorder is a diagnosis of exclusion.

Patients often undergo multiple diagnostic tests before the diagnosis is assigned.
Hyperglycemia with hyperosmolar state may be associated with focal neurologic deficits simulating stroke but focal seizures are reported in this condition as well.

Focal neurologic signs with hyperglycemia may include aphasia, homonymous hemianopia, hemisensory deficits, hemiparesis, unilateral hyperreflexia, and the presence of a Babinski sign.

Other metabolic encephalopathies reported to cause strokelike conditions include hyponatremia and hepatic encephalopathy.
Hypoglycemia

- Transient hypoglycemia may produce hemiplegia and aphasia. (Montgomery BM et al. Arch Int Med. 1964;114:680-684.)

- Patients may be drowsy but are often alert and do not show the more common response to hypoglycemia of confusion, diminished level of consciousness, or coma.

- Aphasia makes the history more difficult to elicit.

- The pathogenesis of this focal CNS dysfunction is unclear.

- The wide use of bedside rapid laboratory testing for glucose now makes this easily detectable and treatable.

- The hemiplegia may resolve immediately with the administration of intravenous glucose but resolution over a hours is also reported.
Other Mimics

- Multiple sclerosis occasionally can cause paroxysmal attacks, particularly of ataxia and dysarthria.

- Cerebral amyloid angiopathy, may also cause transient neurologic symptoms.
  - Affected patients complain of recurrent, brief (minutes), often stereotyped spells of weakness, numbness, paresthesias, or other cortical symptoms that can spread smoothly over contiguous body parts

- Hepatic, renal, and pulmonary encephalopathies can produce temporary aberrations in alertness, behavior and movement.

- Compressive myelopathy and spinal dural arteriovenous fistulas may occasionally present with sudden transient sensory changes and motor deficits, especially in the bilateral lower limbs.

- Pressure- or position-related peripheral nerve or nerve root compression can cause transient paresthesias and numbness.

- Peripheral vestibulopathies can cause transient episodic dizziness
Persistent Neurological Deficits with Abrupt Onset

- Intracerebral hemorrhages usually develop during minutes and cause gradually increasing focal signs.

- Brain tumors can cause an abrupt onset or worsening of symptoms
  - Hemorrhage
  - Critical mass

- Nonketotic hyperglycemic stupor is often associated with focal neurologic signs
  - There may be a focal region of brain edema on brain imaging tests
Attacks of multiple sclerosis can begin abruptly and may have paroxysmal transient attacks.

- Most often however, MS attacks develop over 5 to 21 days, a longer period than strokes. MS is most common in the third to fifth decades of life, while the frequency of stroke peaks later. A history of prior attacks is very important in making the diagnosis.

Demyelination can occur around veins after various viral infections which result in the abrupt onset of multifocal signs that develop over days.

- Acute disseminated encephalomyelitis (ADEM).
- Other viral infections, particularly cytomegalovirus, can cause focal brain lesions associated with focal neurologic signs.

Brain abscesses cause focal neurologic symptoms and signs which can begin abruptly; fever, headache, and seizures are common accompanying signs.
Aids to Diagnosis

• Useful historical features include

  – The focal or nonfocal nature of attacks
  – The nature of the symptoms and their progression
  – The duration and timing of symptoms
  – Associated symptoms during and after the attacks
Positive symptoms indicate active discharge from central nervous system neurons.

Typical positive symptoms can be:
- visual (e.g., bright lines, shapes, objects),
- auditory (e.g., tinnitus, noises, music),
- somatosensory (e.g., burning, pain, paresthesia), or
- motor (e.g., jerking or repetitive rhythmic movements).

Negative symptoms indicate an absence or loss of function, such as loss of vision, hearing, feeling, or ability to move a part of the body.

Seizures and migraine auras characteristically (but not always) begin with positive symptoms, while TIAs invariably are characterized by negative symptoms.
Progression and Course

- Migraine aura often progresses slowly within one modality.

- Scintillations or bright objects tend to move slowly across the visual field.

- Paresthesia may gradually progress from one finger, to all the digits, to the wrist, forearm, shoulder, trunk, and then the face and leg.

- This progression normally occurs over minutes.

- After the positive symptoms move, they are often followed by loss of function.

- Migrainous aura typically progresses from one modality to another.
Progression and Course

- Seizures usually consist of positive phenomena in one modality which progress very quickly during seconds.

- TIA symptoms are negative; when more than one modality or function is involved, all are affected at about the same time.

- Loss of consciousness is very common in seizures and syncope, which usually produce relatively stereotyped attacks;

- Loss of consciousness is extremely rare in TIAs, and symptoms can be stereotyped or different in various TIAs.
Duration and Tempo

• Migrainous auras characteristically last 20 to 30 minutes, although they may persist for hours

• TIAs are usually fleeting, almost always lasting less than one hour

• Seizures last on average about 30 seconds to 3 minutes; some seizures, including absence attacks, atonic seizures and myoclonic jerks, are shorter in duration

• Syncope is very brief (seconds) unless the patient is artificially propped up or otherwise cannot obtain a supine position

• Seizures occur sporadically over the years but sometimes appear in flurries

• TIAs usually cluster during a finite period of time and can occur as frequent "shotgun"-like attacks

• Syncopal attacks are scattered over years.
Precipitating Factors

- Activation of seizures is well known to occur in some patients after stroboscopic stimulation, hyperventilation, reading, cessation of anticonvulsants, fever, and alcohol or drug withdrawal.

- In some patients, TIAs occur when blood pressure is reduced, or upon sudden standing or bending.

- Dizziness and vertigo in patients with peripheral vestibulopathies are often triggered by sudden movements and positional changes.

- Syncope commonly occurs after certain triggers in some patients (eg viewing blood, prolonged standing etc.)

- Hypovolemia also frequently precipitates syncope.
Associated Symptoms

- Non-neurologic associated symptoms can be characteristic of certain disorders.

- Headache is common after migraine aura and following a seizure.

- Headache can also occur during a TIA, but rarely at the same time or directly after neurologic symptoms.

- Tongue biting, incontinence, and muscle aches are frequently associated with seizure.

- Vomiting is common after migraine and occasionally follows syncope, but is extremely rare after or during TIA and in relation to seizure.

- Nausea and a need to urinate or defecate often precede or follow syncope; sweating and pallor are other common features of syncope.
Patient age and gender

- Seizures occur at any age.

- TIAs are not very common in young individuals, particularly those who do not have prominent risk factors for vascular disease.

- In otherwise healthy women who are pregnant, transient focal neurologic symptoms are often related to migraine with aura, and usually have a benign outcome.

- Syncope has little predilection for age, but is more common in women.

- TIAs and strokes are somewhat more common in men, although after menopause the frequencies are nearly equal in the two sexes.

- Seizures have no strong sex predilection.
Unusual stroke presentations

- The presence of historical risk factors for cerebrovascular disease and the abrupt onset of symptoms may be the best clues available to the emergency physician to detect these unusual stroke syndromes.

- Uncommonly, movement disorders will present from a focal lesion.

- Confusional states, agitation, and delirium have all been reported as a consequence of focal neurologic injury.

- These states must be distinguished from the neglect syndromes and fluent aphasias in which patients are often reported as confused but careful examination demonstrates a clear focal deficit.

- Complaints of either unusual sensations or loss of sensation are common in parietal and thalamic strokes.

- Chest pain and limb pain that mimicked that of myocardial infarction were reported in a small series of patients.
Generalized Chorea Due to Basal Ganglia Lacunar Infarcts

K. D. Sethi, F. T. Nichols, F. Yaghmai

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The most important and frequent causes of discrete self-limited attacks:
- TIA
- Seizure
- Migraine Aura
- Syncope

Other less frequent causes of transient neurologic events include
- hypoglycemia,
- multiple sclerosis,
- brain tumor,
- subdural hematoma,
- cerebral amyloid angiopathy,
- toxic or metabolic encephalopathies,
- compressive myelopathy, nerve root compression,
- peripheral vestibulopathies, and
- psychogenic etiologies.
Useful features for distinguishing the various causes of transient attacks include

- focal or nonfocal nature of attacks,
- the nature of the symptoms and their progression,
- the duration and timing of symptoms, and
- associated symptoms during and after the attacks
- Some disorders cause focal abnormalities of brain function, while others cause dysfunction that is either widespread or difficult to localize to any one anatomic region.
- Certain disorders may cause both focal and nonfocal attacks.

Ischemic stroke is characterized by the abrupt or at least very acute onset of focal neurologic symptoms and signs that leave persistent neurologic deficits.

Other disorders that have acute onset and cause persistent focal signs should be considered in the differential diagnosis, including intracerebral hemorrhage, brain tumor, nonketotic hyperglycemic stupor, attacks of multiple sclerosis, acute disseminated encephalomyelitis, and brain abscess.
Thank you