Textbook for Postgraduate Candidate

Advance in Cerebrovascular Disease

脑血管病新进展

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前　言

近年来，我国的研究生教育蓬勃发展，相对而言，研究生专业英语教育滞后，尤其缺乏神经病学专业的相关书籍。为此，编者大量查阅国外文献，编写了此书，以便让神经病学及相关专业的研究生在短期内迅速提高专业英语，掌握脑血管病领域的基础知识、基本理论以及最新进展，从而满足专业发展国际化的要求。本书亦可作为高年资医生继续教育读物。

本书内容包括脑梗塞、脑出血、蛛网膜下腔出血、颅内动脉瘤、颅内静脉窦血栓、动静脉畸形、动脉夹层、淀粉样变性、代谢性脑病等疾病。对目前有循证医学证据的治疗措施及前沿手段，亦有详细描述。通过阅读本书，对开拓知识面，提高理论水平，提高临床技能亦有帮助。

由于编写时间短促，加之编者水平有限，书中难免有不尽完善之处，祈盼读者不吝指正。

编　者

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Section 1 Transient Ischemic Attack

INTRODUCTION

Background

A transient ischemic attack (TIA) is an acute episode of temporary and focal loss of cerebral function of vascular (occlusive) origin. TIAs are rapid in onset; symptoms reach their maximal manifestation in fewer than 5 minutes (usually <1 min). Manifestations are of variable duration and typically last 2–15 minutes (rarely as long as 24 h). Most TIA durations are less than 1 hour; median duration is 14 minutes in the carotid distribution and 8 minutes in vertebrobasilar ischemia.

Pathophysiology

Temporary reduction or cessation of cerebral blood flow adversely affects neuronal function in cortical, subcortical, and nuclear regions of the central nervous system (CNS).

Frequency

In the US

Previous estimates state that TIAs conservatively affect 50,000 Americans every year. Updated incidence rates that include blacks, whites, Hispanics, and out-of-hospital events suggest that approximately 240,000 TIAs occurred in 2002 in the United States. For many of these Americans, a TIA is not an isolated insult. In approximately one third of these patients, a TIA signals an impending stroke.

Race, age, and gender-adjusted incidence rates for TIA are specific based on race, gender, and age. Overall, incident rates for TIA have ranged from 83 cases per 100,000 up to more than 200 cases per 100,000.

The annual age-adjusted incidence of first ischemic stroke per 100,000 was 88 (75 to 101) in whites, 149 (132 to 165) in Hispanics, and 191 (160 to 221) in blacks.

More details about race and gender differences in incidence rates reflect a growing concern that more people are affected by TIA than previously appreciated. It is increasingly clear that blacks are more likely to have TIA than other races. This heightened awareness prompts an increased vigilance for TIA symptoms in the emergency patient.

Mortality/Morbidity

Death does not occur directly from a single episode of TIA. A TIA may be considered as a sign of generalized atherosclerotic disease. In fact, the primary cause of death following a TIA is coronary artery disease. The patient with a TIA should undergo cardiac evaluation to help stratify risk and management of potential coronary artery disease.

Race and Sex

Blacks and men had significantly higher rates of TIA than whites and women.

Age

TIAs are uncommon in persons younger than 60 years. Incidence of TIA is 4–8 cases per 1000 persons per year aged 50–59 years. The Rochester study included cases of individuals aged 45–54 years and reported incidence to be 16 cases per 100,000 people per year. The emergency provider must be aware of the overall incidence rate in their population. Fewer than 3% of all major cerebral infarcts occur in children. Pediatric strokes have different etiologies than adult strokes.

CLINICAL

History

A TIA may last only several minutes. Thus, historical questions should be addressed not just to the patient but also to family members, witnesses, and emergency medical services (EMS) personnel. Of concern is the careful detection of changes in behavior, speech, gait, memory, movement, and vision.

Significant medical history questions include the following:

Recent surgery (eg, carotid, cardiac);

Previous strokes;

Seizures;

CNS infections;

Use of illicit drugs;

Complete medication regimen;

Carefully investigate onset, duration, fluctuation, and intensity of symptoms.

Reviewing the patient's medical record is extremely important for identifying deficits from previous strokes, TIAs, seizures, or cardiac events. Use the results of previous diagnostic tests or therapeutic interventions to guide the next phase of testing and therapy. Contacting the patient's primary physician is important.

In a patient with a history of multiple TIAs, imaging studies and diagnostic tests are managed much differently than in the patient experiencing a first TIA episode.

Family members are an invaluable source of information concerning symptoms of a TIA.

Fleeting symptoms may be more noticeable to a family member or coworker.

By talking to the family, the examiner not only can discuss symptoms but also can begin an assessment

of the home environment.

Discharge may depend on the presence of reliable and safe home support.

These discussions should provide answers to the following questions:

Are family members at home who can notify EMS if symptoms return?

Can someone support the patient physically if falls occur during another TIA?

Can medications be administered reliably?

Can the patient be trusted to follow up with outpatient testing and repeat examination by the primary physician?

A patient with a TIA may present to the emergency department (ED) with very subtle complaints. If the ED physician can tabulate the chief complaint (CC) and ascertain exact onset and duration of the CC, then the examiner can better localize the cause of the TIA or CNS location of the deficit. For example, patients may complain vaguely of feeling short of breath and, some time later, feel they cannot speak properly. Careful questioning will elucidate complaints of shortness of breath preceded by palpitations or a little chest pain, which was followed by inability to articulate and facial droop.

Attempt to isolate the CC into symptoms that are clues to a neurologic disorder.

As a TIA has a duration of fewer than 24 hours, question the presence symptoms within the preceding 24 hours, 48 hours, or week.

Attempt to clarify when symptoms first occurred, how long they lasted, if the patient recovered completely (returned to baseline status), if a pattern of escalating symptoms is present, and if associated cardiac symptoms are present.

History of associated trauma or cardiac symptoms widens the differential diagnosis. Pertinent negative items in the review of systems also are important (eg, headache, chest pain, eye pain).

Carotid or vertebral dissection can occur from seemingly trivial trauma or injury. The patient may provide a history of blunt or torsion injury to the neck with subsequent mild neck pain and have an associated TIA symptom.

Determine the state of overall health of the patient and risk factors for various relevant diseases.

History of arteritis is very important.

Noninfectious necrotizing vasculitis, drugs, irradiation, and local trauma are known to cause inflammatory arterial injury.

Patients may complain of nonspecific symptoms, such as a low-grade fever or weight loss.

Elicit any history of substance abuse. Use of sympathomimetic drugs (eg, cocaine) is associated with the following risk factors for TIAs:

Hypercoagulable states;

Platelet aggregation;

Vasospasm;

Dysrhythmia;

Transient hypertension;

Hyperdynamic states;

Vasculitis.

Physical

A patient with a suspected TIA requires a complete physical examination with attention to a detailed neurologic examination. Approach the patient who has had an apparent TIA with the goals of accurately diagnosing conditions that resemble a TIA, correctly describing a true TIA, and identifying a patient with a stroke-in-evolution. The importance of a detailed neurologic examination is paramount, but the importance of

a thorough physical examination cannot be overstated.

Ideally, severity of neurologic deficits should be recorded with the aid of stroke scales (eg, National Institutes of Health Stroke Scale [NIHSS]). A stroke scale prompts the examiner to be thorough and allows different examiners to reliably repeat the examination during subsequent phases of the evaluation.

Initial vital signs should include the following:

Rectal temperature;

Blood pressure recorded in each arm;

Peripheral pulses compared to the apical pulse;

Respiratory rate and pattern.

The examiner should assess the patient's overall health and appearance, making an assessment of the following:

Attentiveness;

Ability to interact with the examiner;

Language and memory skills;

Overall hydration status;

Development.

Further assessment will contribute to the eventual discharge plan. Taking note of the following may be helpful:

Does the patient appear to be able to care for self in the event of another incident?

Is evidence of general deterioration in health and failure to thrive present?

Is indication of an injury or trauma that occurred during the TIA present?

If family members are present, are they supportive?

Identify signs of vasculitis, sinusitis, mastoiditis, and meningitis. Carotid arteries are examined for pulse upstroke, bruit, and presence of carotid endarterectomy scars.

Perform funduscopy to identify retinal plaques, retinal pigmentation, and pupil reaction to direct and consensual light exposure.

In addition to performing standard auscultation, identify the presence of surgical scars or pacemaker or other clues that the patient may have a cardiac disorder and increased risk of a cardioembolic phenomenon.

Cardioembolic events are significant causes of TIAs. Identify unusual rhythms and rates, murmurs, or rubs that might suggest valvular disease, atrioseptal defects, or ventricular aneurysm (a source of mural thrombi).

A neurologic examination is the foundation of the TIA evaluation. Subsets of the neurologic examination include the following:

Cranial nerve testing;

Somatic motor strength;

Somatic sensory testing;

Cerebellar system.

Mental status can be assessed formally (eg, Mini-mental Status Examination) or as part of the patient's overall response to questions and interactions with the examiner. The following signs may be present with cranial nerve dysfunction:

Ocular dysmotility;

Forehead wrinkling asymmetry;

Incomplete eyelid closure;

Asymmetrical mouth retraction;

Loss of the nasolabial crease;

Swallowing difficulty;

Lateral tongue movement;

Weak shoulder shrugging;

Visual field deficits.

Somatic motor testing are as folloing:

Test muscle stretch reflexes of biceps, triceps, and brachioradialis and patellar and Achilles reflexes using the standard grading system 0–4.

Inspect posture and presence of tremors. Formally test shoulder girdle, upper extremity, abdominal muscle, and lower extremity strength.

Test passive movement of major joints to look for spasticity, clonus, or rigidity.

The cerebellar system is tested by assessing ocular movement, gait, and finger-to-nose and heel-to-knee movements, looking for signs of past-pointing and dystaxia, hypotonia, overshooting, gait dystaxia, and nystagmus.

The following symptoms should raise the suspicion that the patient may have cranial arteritis:

Fever;

Visual disturbance (eg, blindness, diplopia);

Nodular or tender cranial arteries.

Causes

The majority of TIAs are caused by carotid and vertebral artery atherosclerotic disease. However, nonvascular causes occasionally produce TIA symptoms. Proper diagnosis is essential for choosing appropriate therapy.

Atherosclerosis of carotid and vertebral arteries (Large vessel stenosis of the carotid or vertebral arteries) is the single largest cause of TIAs.

The causes of TIAs also include the following:

Cerebral embolism;

Embolic sources — Valvular disease, ventricular thrombus, and thrombus formation due to atrial fibrillation;

Arterial dissection;

Arteritis — Inflammation of the arteries occurring primarily in the elderly, especially women, caused by:

Noninfectious necrotizing vasculitis (primary cause);

Drugs;

Irradiation;

Local trauma;

Sympathomimetic drugs (eg, cocaine);

Mass lesions (eg, tumors, subdural hematomas) — Rarely cause transient symptoms.

TIA etiologies in children, which are different than those in adults, include the following:

Congenital heart disease with cerebral thromboembolism (most common);

Drug abuse (eg, cocaine);

Clotting disorders;

CNS infection;

Neurofibromatosis;

Vasculitis;

Idiopathic progressive arteriopathy of childhood (moyamoya);

Fibromuscular dysplasia;
Marfan disease;
Tuberous sclerosis;
Tumor.

DIFFERENTIALS

Bell Palsy
Headache, Migraine
Hypoglycemia
Neoplasms, Brain
Stroke, Hemorrhagic
Stroke, Ischemic
Subarachnoid Hemorrhage

WORKUP

Lab Studies

Serum chemistry profile
Coagulation studies
Erythrocyte sedimentation rate (ESR)
Syphilis serology
Complete blood count
Platelet count
Antiphospholipid antibodies
Glucose level
Drug screens
Cardiac index markers (may be considered)
Optional studies
Screening for hypercoagulable states (particularly in patients younger than 50 years)
Levels of protein C and protein S
Antithrombin Ⅲ level
Thrombin time
Hemoglobin electrophoresis
Serum protein electrophoresis
Cerebrospinal fluid examination
Testing for silent myocardial ischemia
Anemia and elevated ESR (>100 mm/h) — Hallmarks of temporal artery arteritis

Imaging Studies

Location of the disease is very important for treatment and prognosis. Evaluation of the patient with a

TIA includes diagnostic tests for the following:

Carotid or vertebral artery plaques that produce arteriogenic emboli;

Flow-limiting stenosis;

Penetrating cerebral artery disease.

Noncontrast cranial computed tomography (CT) scan of the head

An area of infarction appropriate for the TIA symptoms has been identified in 29%–34% of patients with TIA. Support for obtaining a cranial CT scan includes the following:

Locating the new area of ischemia or infarction;

Locating a silent infarction from a previous undocumented stroke (may predict prognosis for further TIA/stroke);

Excluding other lesions that simulate TIA (eg, subdural hematoma, brain tumor, arteriovenous malformation, cerebral aneurysm).

Magnetic resonance imaging (MRI)

Acute infarcts are located more accurately using MRI than CT scan.

Abnormal vascular flow can be detected within minutes of onset of symptoms.

Limited availability and cost of MRI scanners restrict the immediate requirement for a stat MRI. MRI can be obtained on a less urgent or outpatient basis if less-costly tests do not identify the cause of TIA symptoms.

Magnetic resonance angiography

MRA provides noninvasive images of carotid and vertebral arteries.

Cerebral arteriography

Selective catheterization of the cerebral vessels is necessary to evaluate the carotid arteries prior to carotid endarterectomy, identify the vertebral and basilar arteries, and define intracranial stenosis or occlusion.

Cerebral arterial imaging

Carotid and vertebral artery ultrasound is required to identify the surgical candidate with high-grade carotid stenosis.

Other Tests

12-lead electrocardiogram (ECG)

12-lead ECG is indicated to assess the rhythm and guide case management.

Rhythms such as atrial fibrillation are associated with cardioembolic events.

Lumbar puncture (LP)

Lumbar puncture (LP) is indicated if the diagnosis is in doubt and subarachnoid hemorrhage, infectious etiology, or demyelinating disease is to be excluded.

TREATMENT

Prehospital Care

Rapid transport is essential to evaluate the patient who may have fleeting symptoms.

The following can facilitate immediate intervention and reduce delay in evaluation once the patient has

arrived in the ED:

Cardiac monitoring;

Rapid glucose assessment;

Pulse oximetry;

Establishing intravenous (IV) access.

Administer supplemental oxygen.

EMS personnel should collect prescription bottles and instruct family members or witnesses to go to the ED.

Emergency Department Care

Global CNS depression and airway or cardiac compromise are not features of a TIA. Therefore, ED intervention is relatively minimal.

Supporting the airway and restoring perfusion or a stable rhythm are tenets of emergency care. By definition, patients with TIA are hemodynamically stable and able to support their own airways. Rapid assessment excludes those conditions that mimic a TIA such as hypoglycemia or an intracranial hemorrhage.

Vital signs must be obtained promptly and addressed as indicated. Place the patient on a cardiac monitor and a pulse oximeter and establish an IV line (if one has not already been established by EMS).

Obtain a fingerstick glucose level and treat accordingly.

Obtain an ECG and initiate treatment for symptomatic rhythms or evidence of ischemia.

A significant area of controversy is whether to treat hypotension or hypertension during a stroke. For patients with TIA who are diabetic, recent evidence indicates that blood pressure (BP) treatment targets should be lower than previously recommended to less than 130/85 mm Hg.

While BP and perfusion should be supported, cerebral perfusion pressure may respond inconsistently to antihypertensive therapy.

Even a modest reduction in BP can extend a fragile ischemic penumbra.

If an antihypertensive agent is administered, closely monitor the patient's response by repeating the physical examination.

Consensus suggests not treating hypertension during an acute stroke unless the mean arterial peripheral pressure exceeds 130 mm Hg. Mean pressure is calculated as (systolic BP + 2×diastolic BP) /3.

When a TIA is caused by large or small vessel arteritis, distinguishing between pure arteritis and arteritis that produces penetrating arterial disease is important. The former is treated with dexamethasone, often on an outpatient basis, but the latter is better treated with IV steroids and observation.

Consultations

Contact the patient's primary care physician. Any further specialist consultation needed (eg, neurologist, vascular surgeon, cardiologist) should occur after consulting the patient's primary care provider. The decision to admit after a TIA appears to vary regionally; all patients require additional workup on an inpatient or outpatient basis. The following are some consultations:

Neurologist (particularly if questioning whether the presentation is consistent with TIA);

Vascular surgeon (not typically performed in the ED);

Cardiologist: Although not typically performed in the ED, cardiology consultation is useful, in particular when a cardiac etiology is suspected (eg, atrial fibrillation, valvular disease).