

MACEP Risk Management Course

Module 6: CNS-Brain Emergencies

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Course Objectives

- Understand the risk management issues of patients presenting with neurologic symptoms.
- Recognize high risk situations in patients with neurologic symptoms.
- Know these high risk situations are subarachnoid hemorrhage, stroke, meningitis, and closed head injuries.
- Be able to discuss the various risk factors for high risk neurological presentations.
- Know the pertinent history, physical findings, testing, management, and documentation needed when evaluating a patient with one of these high risk diagnoses.

Introduction

Claims Data Relating to CNS/Brain Emergencies

Failure to diagnose neurological problems account for about 28% of Emergency Medicine claims closed by ProMutual in Massachusetts between 2005-2009. Approximately 38% of cases resulted in payment (judgment or settlement) to plaintiffs and 45% of all payments go to neurological related claims. Brain related cases accounted for 55% of neurologic cases with payouts. Missed stroke/TIA accounted for 3 cases resulting in payments with an average of \$600,000. Intracranial bleeds accounted for 5 cases, also averaging \$600,000 payments each.

Reasons for plaintiff verdicts in ProMutual data were: failure to order test (most often CT but also MRI), failure to read CT correctly, failure to document physical exam, failure to consult appropriately, failure of a follow-up system, and failure to admit (patients with TIA).

Headache

Headache is a common complaint representing about 2% of emergency visits every year. Our task is to separate those patients with straightforward primary headaches (migraine, tension, cluster) from those with significant pathology (so called secondary headaches). There are dozens of secondary headache etiologies including metabolic, infectious, traumatic and vascular. Some are easily discovered and resolved (carbon monoxide poisoning, influenza, dehydration). Others require an extended, often invasive, evaluation and treatment (subarachnoid hemorrhage (SAH), subdural or epidural hematoma, meningitis, pituitary apoplexy, cerebral venous sinus thrombosis, arterial dissection, cerebellar stroke).

Since few headaches have a serious etiology, it may be easy to become complacent, however, each patient must be approached with an open mind; don't prejudge. Listen to what your patient tells you. Take a good history, do a thorough physical examination, document thoroughly, and be suspicious. Be cautious in situations involving hand-offs and the supervision of residents and mid-level providers.

History

The documented history should include the severity of headache, speed of onset, duration, location and intensity or quality of pain, inciting (or mitigating) factors, past history of similar episodes, associated symptoms and history of trauma. One must not overlook the possibility that an initial episode of headache (especially accompanied by nausea, vomiting or transient loss of consciousness) may represent a so-called "warning leak" producing a sentinel headache even if the headache has improved or resolved by the time of presentation. Approximately 40% of patients with SAH experience a warning leak.

Physical Examination

Your physical examination should be thorough (even for the well-known migraine patient) and good risk management means that you document it. Address abnormal vital signs. Is elevated blood pressure a cause of the headache? Fever may be meningitis, SAH, or the flu. Carefully examine the eyes, including fundus and cranial nerves. Is there any evidence of head trauma? Meningismus is almost always associated with a serious cause of headache. A stiff neck should be taken seriously. Be sure to document presence or absence of meningismus.

Do a thorough neurologic screening examination, documenting any change in mental status, altered speech, cranial nerve, motor, sensory or cerebellar deficits. The Glasgow Coma Scale (GCS) is often used as a standard in the literature and you may find it useful. Please remember that it is meant to be used as an indicator of change in a patient's condition. Additionally, EMS providers and nursing often document a GCS. The emergency physician must be sure to account for the any changes in patient's condition over time or otherwise account for any differences between other provider's documentation of patient condition and their own. The NIH stroke scale (NIHSS) is often documented as part of institutional thrombolytic protocols, but a NIHSS score of 0 does not rule-out stroke, particularly posterior circulation strokes presenting with truncal ataxia.

Document your thorough exam (especially neurologic) and include relevant negatives (for instance, normal fundoscopic exam, no meningismus, no evidence of trauma).

Diagnostic Studies

"Screening tests" are of little value, with rare exceptions (ESR for temporal arteritis, carboxyhemoglobin levels when indicated by history or physical examination).

CT Scan is the initial diagnostic study of choice for a patient with head injury, suspected SAH, stroke, and some patients with suspected meningitis. While studies have demonstrated good sensitivity (up to 97%) for detection of SAH by third generation scanners, many of the CT Scans in these studies were interpreted by neuroradiologists. The sensitivity depends on the skill and

experience of the interpreter, and at most institutions will undoubtedly be less than published reports. Be sure to let the radiologist know if you suspect a SAH.

Also remember that the smaller bleeds from subarachnoid hemorrhage are the most difficult to see on CT. These patients are frequently the ones who have little in the way of associated symptoms or physical findings, and their headache may have resolved by the time you see them. From a risk management perspective these are the high risk patients. Lumbar Puncture (LP) is usually diagnostic if SAH is suspected and there is a “negative” CT scan, especially in presence of a “warning” (small) bleed. If you are ever uncertain about the meaning of the CSF results call your consultant. Magnetic Resonance Angiography (MRA) is useful in patients with ambiguous CT and LP results, those who present more than 2 weeks after onset of symptoms, have a very high pre-test risk of SAH, or when you have been unable to obtain CSF.

An LP may be performed without CT scanning when there is high likelihood of CNS infection and no reason to suspect elevated intracranial pressure.

Discharge Instructions

Give good, detailed discharge instructions. Every patient with a headache/injury should be sent home with a responsible adult family member or other ‘observer’. Both the patient and family member /observer should be given appropriate discharge instructions. Be certain that everyone clearly understands where, when and with whom follow up is to occur and under what circumstances they should return to an emergency department. There are many preprinted instructions available (including MACEP’s) and many included in electronic medical records. Use them liberally.

High Risk Diagnoses

Subarachnoid Hemorrhage (SAH)

Headache related to intracerebral bleeding is most commonly caused by a stroke, trauma or subarachnoid hemorrhage. Stroke and post traumatic bleeding are easier to identify because of the antecedent history of injury or the presence of neurologic signs and symptoms. Patients with spontaneous SAH have no history of trauma and often normal neurological examinations. Our challenge is to determine which patients with headache and normal neurological examinations require evaluation and treatment for SAH.

Spontaneous SAH is most commonly the result of a ruptured cerebral aneurysm. Approximately one third of patients with SAH suffer early mortality without treatment, one third undergo treatment with eventual death or significant morbidity, and one third survive after treatment with favorable outcome. The best chance for a good outcome is prompt diagnosis and neurosurgical referral. Unfortunately, epidemiological studies indicate that at least a quarter of patients with SAH are misdiagnosed at the first emergency department visit.

The classic symptom of subarachnoid hemorrhage is the “thunderclap headache”, remarkable for its sudden onset and severity. This “worst headache of my life” has been shown to be a symptom

of serious intracranial pathology in about 30% of patients with about half of these having SAH. This complaint should always get your attention.

Previous headache history is important. Those patients with history of migraine who present with a typical headache and a normal exam can be treated for their usual headache. However, if the headache is atypical or their examination is abnormal, they may require further evaluation. Quite a few patients presenting with headache have a history of another severe headache within the previous weeks. This should make you suspicious of SAH with a sentinel bleed.

A variety of accompanying signs and symptoms have been described, including nausea, vomiting, neck stiffness, syncope, confusion, irritability, hemiparesis, aphasia and cranial nerve deficits (esp. oculomotor). It is easy to suspect a severe illness, such as SAH, in patients with neurologic symptoms. However, because of the understandable tendency to be less suspicious of the presence of severe illness in patients with headache only, or severe headache now resolved, these are the high risk patients.

Patients who you suspect have a SAH should have a non contrast head CT. Various studies have demonstrated good sensitivity with third generation scanners. However, the false negative rate can still approach 10%, and the smaller bleed (more likely to be a sentinel bleed, to have no neurological symptoms, and to have a resolved headache) is the most difficult to see with any generation scanner. Furthermore, if the bleed occurred more than twelve hours before the CT scan, the sensitivity of CT scan for SAH declines.

Even with the newest technology CT scanners, for patients with negative CTs in whom you suspect SAH, a lumbar puncture is indicated.

On rare occasions, the lumbar puncture will be negative or questionable but you may continue to have a high index of suspicion for SAH in your patient. In this situation, where the history and/or physical examination are in conflict with the results of diagnostic tests, your clinical judgment and that of your consultant should always take precedence. The next step is MRA or angiography with neurology/neurosurgery consultation.

Once the diagnosis of SAH is made, immediately consult your neurosurgery service. Remember that asymptomatic, apparently stable patients can decompensate rapidly. Patients who must be transferred to another facility for a higher level of care should go with an ALS team with appropriate EMTALA documentation.

“Minor” Head Trauma

While evaluation of the post-traumatic headache associated with significant neurological signs and symptoms is straightforward, there is considerable disagreement in the literature on the use of CT scanning in minor head trauma. There is no standard. There are American guidelines, Canadian guidelines, and Swedish guidelines which are all different. So-called standard practice has enormous variation around the world. Although the American or Canadian guidelines are reasonable to follow, there are no universally accepted decision rules.

Most patients with minor head injuries have a benign history and a normal examination and may be discharged home with good instructions and appropriate follow-up. However, several groups should raise your anxiety level. These include patients who are intoxicated/altered, anticoagulated, or elderly.

Intoxicated patients with head trauma pose a considerable risk management problem. They often have altered mental status and may not be able to provide a reliable history or symptoms. Any intoxicated patient with head trauma should either have a CT scan or be observed until his/her mental status returns to baseline. An intoxicated patient with head trauma should not be discharged from your emergency department until you are confident that there is no intracranial injury by imaging or that the patient's mental status is at baseline so that a reliably clinical determination can be made.

Anticoagulated patients suffering head trauma have a significant risk of intracranial injury. These patients are often elderly which is another independent risk factor for traumatic intracranial bleeding. Chronic alcoholics frequently have a coagulopathy and are therefore at higher risk for intracranial bleeding, both from acute injury and from prior trauma which may not be clinically evident. Have a low threshold for obtaining a head CT scan on these individuals.

Remember: Even a normal CT scan in the emergency department does not preclude the later development of intracranial hematoma. Give good discharge instructions.

Stroke

In general, the diagnosis of a stroke is straightforward. A patient comes to the emergency department for evaluation because of neurological symptoms. Examination confirms that the symptoms continue or have resolved and treatment is initiated. Until recently, emergent treatment of acute stroke was limited. Recently, with the American Heart Association guidelines promoting thrombolysis for stroke, the situation has changed dramatically. The debate over the appropriate use and effectiveness of thrombolytics continues and it is apparent that there is no defined standard of care. Not surprisingly, treatment of stroke has become a liability issue for emergency physicians. From a risk management point of view, whether you give or withhold thrombolytic treatment is not the issue, the important questions are: "Do you have a policy for stroke patients in your emergency department?" and "Do you follow it?" This policy must be an interdepartmental policy requiring the cooperation of emergency services, radiology and neurology. The policy should provide for expeditious CT for "fresh" strokes, checklists for exclusion, appropriate lab testing, protocols for administering thrombolytics, and an understanding about who makes the decision to give thrombolytics. Every emergency physician must be well versed in that policy's contents. Consent forms, drafted in layman's terms, should be available and used for both scenarios, patients accepting and refusing thrombolytics. The potential window of eligibility for thrombolytics has recently been extended (from 3 hours to 4.5 hours); be sure your institutional policy reflects this change.

A second issue in the management of ischemic stroke and transient ischemic attacks (TIA) is the question: anticoagulate or not? While there is little debate about anticoagulation in certain groups of patients (atrial fibrillation) there continues to be some disagreement about routine anticoagulation in all stroke/TIA patients. The report of the Joint Stroke Guideline Development

Committee of the American Academy of Neurology and the American Stroke Association on anticoagulants and antiplatelet agents in acute ischemic stroke has clarified this issue considerably. However, we should use our consultants freely when deciding on the appropriate course of therapy for strokes and TIAs.

Meningitis

Meningitis in the adult generally presents with headache, fever and severe malaise. When you suspect meningitis, the question arises: To CT or not CT? Concern about herniation in these patients is appropriate. However, you must know that while a CT scan can identify space occupying lesions and edema that may lead to herniation after a lumbar puncture, CT cannot identify the very rare patient with meningitis and normal CT who will herniate after lumbar puncture. So, do we get CT scans on every patient we suspect with meningitis? Obviously, no. There is good data to show that certain patients are at higher risk for post LP herniation and pre-LP CT is appropriate. These include patients with immunosuppression, eye abnormalities (papilledema, ocular muscle palsy, pupil changes), peripheral motor weakness, recent seizures, abnormal mental status or other evidence of increased intracranial pressure. You must understand that even a normal CT does not rule out the possibility of post LP herniation. Be prepared to treat it.

Once the diagnosis of meningitis is confirmed by lumbar puncture or strongly suspected on clinical grounds, start parenteral antibiotics as soon as possible. If you suspect meningitis but a CT is indicated before lumbar puncture, order blood cultures and start parenteral antibiotics.

Discharge Instructions

Give comprehensive discharge instructions. Every patient with a headache/injury should be sent home with a responsible adult family member or other “observer.” In patients who have suffered a traumatic brain injury, be sure to include discharge instructions about post-concussive symptoms. The patient and observer should both be given appropriate instructions. Be certain that everyone clearly understands under what circumstances they should return and where, when, and with whom follow up is to occur.

Summary Points

History

- “Worst headache of my life” should focus your attention.
- Previous isolated headache (sentinel bleed)?
- Previous headaches now with change of character?
- Onset, intensity, associated symptoms.
- Neurologic symptoms besides headache?
- Possible exposures: carbon monoxide, meningitis.
- Bleeding diathesis or anticoagulated?
- Alcohol/drugs on board?

Physical Exam

- Address abnormal vital signs.
- Meningismus? Document yes or no.
- Carefully examine the eyes (cranial nerves, fundus).
- Neurologic exam should be thorough and thoroughly documented.
- Use Glasgow Coma Scale (GCS) appropriately.

Evaluation

- Start with a head CT.
- Thinking subarachnoid hemorrhage and the CT is normal: LP.
- Still thinking subarachnoid hemorrhage and the LP is normal: contact your consultant.
- Worry about head trauma in the intoxicated/altered, anticoagulated and elderly.
- Be sure your department has a stroke policy, and be familiar with it.
- Understand when a CT precedes an LP in suspected meningitis.

Treatment

- Emergent consult or transfer for subarachnoid hemorrhage.
- Have a policy for thrombolytic use in strokes.
- Suspect meningitis but the patient needs a CT? Start antibiotics prior to CT/LP.
- Start antibiotics immediately when you have a positive LP.

Document everything

- Pertinent negative findings.
- Conversations with consultants.
- CT interpretation and LP results
- Give thorough discharge instructions
- A normal post trauma CT scan in the emergency department does not preclude the later development of an intracranial hematoma.

Give thorough discharge instructions

- A normal post trauma CT scan in the emergency department does not preclude the later development of an intracranial hematoma.

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