EM CASE OF THE WEEK.

BROWARD HEALTH MEDICAL CENTER
DEPARTMENT OF EMERGENCY MEDICINE

BROWARD HEALTH
Care Warriors

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Subdural Hematoma on CT

A 73-year-old man with a history of Type 2 diabetes mellitus, atrial fibrillation, and triple-vessel cardiac bypass surgery presents with a 2-month history of imbalance. His son, who is at bedside, reports that the patient slipped and fell in the bathroom 3 months ago. 1-week after the fall, the son took the patient to the ER and CT failed to show any bleeds or other abnormalities. The patient says that his imbalance is becoming progressively worse and causing him to fall more frequently. He denies any word-finding difficulties, memory deficits, dysesthesia, headaches, or vomiting. He says he is also taking warfarin for his atrial fibrillation. Today his vital signs and physical exam findings are all normal except mild gait imbalance. Routine labs are normal. His INR is 1.8. A non-contrast CT of the brain is ordered revealing a small hypodense collection of fluid in the left hemisphere of the patient's brain and a chronic subdural hematoma is diagnosed. You suspect this collection of fluid has been there since the patient's initial fall 3 months ago. Why did the CT scan done 1-week after the patient's initial fall fail to reveal the subdural hematoma?

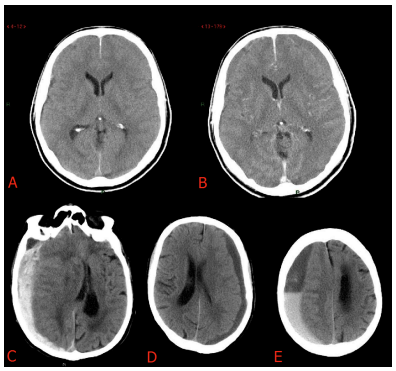
A. The lesion is subacute.

B. The hematoma extends into the brain from the subdural space.

C. The resolution of the CT machine is greater than 2 mm.

D. The subdural hematoma is less than 4 hours old.

E. The patient has extensive cerebral atrophy.



A. Subacute subdural hematoma poorly visualized on non-contrast CT

B. Subacute subdural hematoma visualized better with contrast CT

C. Acute subdural hematoma easily visualized as a hyperdense fluid collection on non-contrast CT

D. Chronic subdural hematoma easily visualized as a hypodense fluid collection on non-contrast CT

E. Acute on chronic subdural hematoma showing fluid levels as a new bleed superimposed on an older bleed, most commonly seen in patients on chronic anticoagulation

EM Case of the Week is a weekly "pop quiz" for ED staff.

The goal is to educate all ED personnel by sharing common pearls and pitfalls involving the care of ED patients. We intend on providing better patient care through better education for our nurses and staff.

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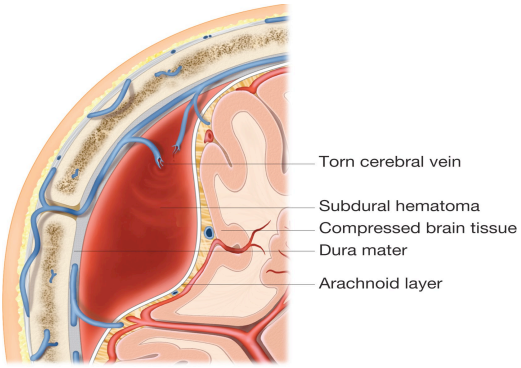
The correct answer is A. Initially, subdural blood will be denser than brain and thus readily apparent on CT scan. Within a few days of formation, the contents of a subdural hematoma are degraded into less dense fluid. This fluid is transiently similar in density to the cerebral cortex and may be difficult to distinguish by CT. Eventually it will be hypodense to brain. If the fluid collection is too small to produce substantial deformation of the underlying hemisphere, identification of the subdural collection may be difficult. Angiogram will reveal displacement of the cerebrocortical vessels, but more rapid and less invasive assessment of the patient is feasible with MRI.

Discussion

Subdural hematomas are caused by stretching and tearing of bridging cortical veins as they cross the subdural space and drain into the adjacent dural sinus. The bleed that occurs lies between the dura and arachnoid structures. The etiology of the bleed can be of any number of reasons but usually correlates with the patient's age. In infants, it is often due to non-accidental injury, in young adults due to significant trauma such as motor vehicle accidents, and in the elderly due to falls.

In the majority of cases, non-contrast CT is enough to make the diagnosis. However, when there is a small subdural hematoma or if the hematoma is subacute, contrast is used to better visualize the bleed. Depending on the stage of the hematoma, the appearance of the bleed can vary significantly.

During the hyperacute phase in the first couple of hours, patients are often not imaged as the bleed can appear isodense to the adjacent cortex and therefore making it difficult to visualize. This bleed appears isodense to the surrounding cortex because there is a mixture of clot, serum, and ongoing unclotted blood. When the bleed progresses to the acute phase, the bleeding slows down and the clot retracts. This is when the hematoma takes the classic appearance of a cresent-shaped, homogenous, hyperdense extra-axial collection over the affected hemisphere.



Once the hematoma begins to age and the remaining protein beings to degrade, the density of the fluid collection begins to drop. During this subacute phase, usually between 3 and 21 days, the fluid collection becomes isodense with the surrounding cortex, making identification of the subdural hematoma very difficult on non-contrast CT. At this point, a few indirect signs can help identify the bleed: 1) the sulci that are usually filled with CSF do not reach the skull and instead fade out into the subdural hematoma, 2) mass effect signs such as midline shift and sulcal effacement may be seen, and 3) the cortex may appear thickened. During this phase, however, MRI or contrast-enhanced CT is often used to better visualize the hematoma. As the hematoma progresses to the chronic phase, maximal protein degradation occurs and the fluid collection becomes hypodense with respect to the surrounding cortex. This gives it a darker appearance that is isodense to the CSF.

Treatment

The management of a patient with a subdural hematoma depends primarily on mass effect and whether the patient is experiencing any neurological symptoms. For small, chronic collections that are not symptomatic, patients are often managed with serial CT scans. If the hematoma becomes symptomatic, it is often treated surgically using burr holes as the clot is liquefied and can simply be washed out. For acute bleeds, surgical evacuation via craniotomy is usually done, especially if under 4 hours as the clot is not as easily evacuated as

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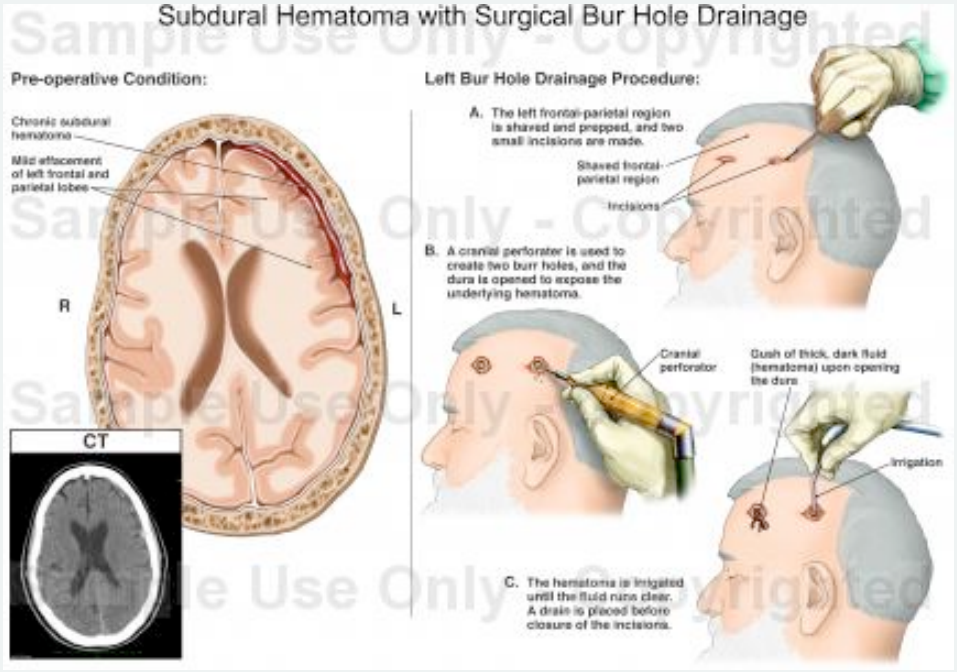

with burr holes.

Subdural hematomas that do not cause mass effect or neurological symptoms carry a great prognosis. However, as the mass effect increases, the prognosis becomes worse. It should also be noted that patients that require surgical evacuation carry a high mortality (50-90%), especially if anticoagulated, and that only about 20% completely recover.

Take Home Points

- There are many causes of subdural hematomas; however, the most likely etiology is often correlated with the patient's age group.
- The appearance of a subdural hematoma on CT can appear vastly different depending on the age of the bleed.
- For patients who have small chronic subdural hematomas without mass effect and neurologic symptoms, conservative management with serial CT scans is recommended.
- Depending on the degree of mass effect, symptomatic subdural hematomas can be managed with either burr holes or craniotomy.
- For those patients that require surgery, the prognosis is not great even for those who survive the procedure.

This month's case was written by Uday Malhotra. Uday is a 4th year medical student from FIU. He did his emergency medicine rotation at BHMC in November 2016. Uday plans on pursuing a career in Interventional Radiology after graduation.

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