Neurology & Neurosurgery Associates, P.A.

Providing complete neurological and spinal care

Volume 4 No. 1 **Newsletter** **SEPTEMBER 2002**

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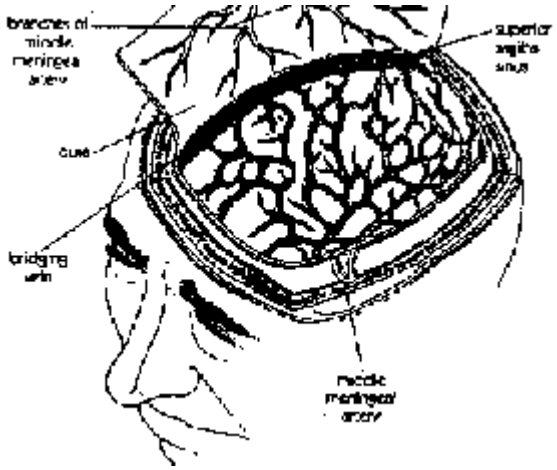
"There are three types"

Traumatic Intracranial Hematomas

By Michael A. Campanelli, D.O.

There are three types of intracranial hematomas based on location. These are epidural hematoma, subdural hematoma and intracerebral hematomas. The brain is surrounded by the dura mater which lies between the skull and the brain itself. A traumatic intracranial epidural hematoma results when blood collects between the skull and the dura mater as a result of a head injury. The most common location for such a hematoma is along the lateral wall of the middle cranial fossa. The events that cause this classic example are as follows: a blow to the side of the head fractures a portion of the temporal bone which causes separation of the dura mater from the bone and produces a tear in the middle meningeal artery which normally lies against or actually within the bone. Blood escapes from this vessel under arterial pressure and in doing so it dissects the dura inward away from the bone permitting a hematoma to form. The brain, especially the temporal lobe, is also displaced inward. If the process continues, brain hemiation occurs with caudal displacement of the brain stem and downward hemiation as the uncus of the temporal lobe pushes up against



Veins are shown extending from the surface of the brain to the superior sagittal sinus. Differential movement of the brain within the skull at the time of head injury may tear one or more of these veins, leading to the formation of a subdural hematoma.

In a typical patient with a temporal arterial epidural hematoma the events progress over hours with about 1/3 of the

treated patients coming to the operating room within 12 hours of the injury and between 60 and 75% within 48 hours.. If the patient does not have an initial deficit from the associated brain injury he or she will ordinarily experience progressive reduction in the level of consciousness as the hematoma enlarges. Symptoms and signs of downward brain stem displacement and brain herniation may then develop rapidly including the onset of a dilated pupil. As the brain is displaced to the opposite side by the pressure of the epidural hematoma, the opposite side of the brain may be compressed resulting in a hemiparesis that is ipsilateral to the epidural hematoma, opposite to the effect expected from direct compression of a motor cortex by the hematoma. Thus the development of hemiparesis does not necessarily herald the side of the epidural hematoma and it may be a false localizing sign. The dilated pupil is a better clue to the side of the hematoma, that is ipsilateral to the dilated pupil.

In the unusual case when an epidural hematoma is venous in origin, for example arising from a laceration of the middle meningeal vein or a dural venous sinus, the time course is slow, evolving over two to seven days rather than from a few hours to two days as with an arterial epidural hematoma. The clinical picture is that of an expanding supratentorial mass with alteration in mental status and development of hemiparesis are likely to appear before the symptoms and signs of brain herniation.

A traumatic intracranial epidural hematoma can be diagnosed by CT or MRI. The hematoma classically has a biconvexed lens shape appearance. On occasion an epidural hematoma may achieve only a small size and remain asymptomatic and not require treatment. However, the usual sequence of events dictates that the hematoma must be evacuated to provide the best chance of preserving or restoring brain function and preventing a fatal outcome.

The surgical treatment of a traumatic intracranial epidural hematoma involves making a sufficient opening in the skull, evacuating the blood and stopping the source of the bleeding; usually the middle meningeal artery. If this is done early enough in the evolution of the hematoma, complete recovery can be achieved. In contrast, if brain herniation and irreversible secondary brain stem hemorrhages develop, evacuation of an epidural hematoma cannot be expected to provide a better result and a persistent vegetative state or death may occur.

SUBDURAL HEMATOMAS

In contrast to an epidural hematoma, a traumatic intracranial subdural hematoma usually results in venous bleeding and collects more slowly. In a typical case, the brain moves within the skull at the time of impact, cutting off one or more of the bridging veins that extend across the space between the surface of the brain and adjacent dural venous sinus such as the superior sagittal sinus. The blood then escapes from the venous system, dissects an open space between the dura mater and brain, and collects over the surface of one cerebral hemisphere. In about 15-20% of cases, blood collects over both hemispheres and bilateral subdural hematomas are formed.

A subdural hematoma is liquid initially but then forms a clot. With time it is either reabsorbed or goes on to form an encapsulated and liquified hematoma that has a propensity to enlarge. Acute traumatic intracranial subdural hematomas are usually discovered within two to three days of onset. The blood appears hyperdense white (on CT scan) and the shape resembles the blade of a sickle with its outer surface lying against the inner surface of the dura.

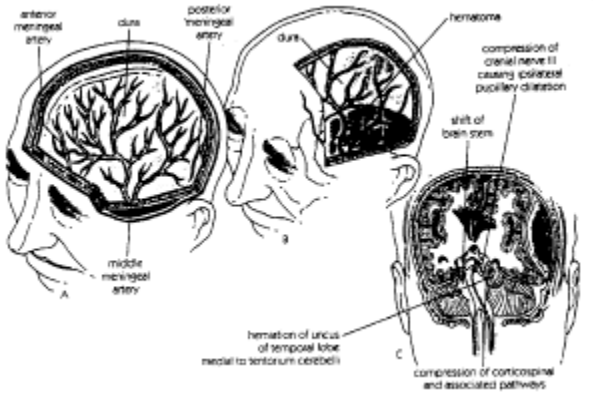
In the usual setting an acute subdural hematoma is discovered during the evaluation of a patient with a severe brain injury and the poor prognosis with or without treatment reflects this association. The overall mortality rate of patients with a treated acute subdural hematoma is roughly 50%.

The treatment of acute subdural hematoma involves surgical evacuation. This is ordinarily best accomplished by creating a large cranial opening via craniotomy, and evacuating the subdural hematoma through various surgically created openings in the dura. Usually the dura is not fully opened as a flap because the underlying brain has a tendency to herniate outward, interfering with the optimal closure of the dura, skull and scalp. If a subdural hematoma is left untreated, it can become a subacute subdural hematoma which consists of clotted blood that eventually may be lysed and reabsorbed. During this process it becomes isodense in its relation to the brain on CT scanning and it may be difficult to diagnose unless the position of the cortical vessels is shown by intravenous administration of a contrast agent. Depending on the stage of the subacute subdural, it is treated either by a formal craniotomy, as with the acute subdural hematoma, or with smaller burr holes for drainage of the liquid type material. The prognosis is usually somewhat better with a subacute subdural hematoma.

CHRONIC SUBDURAL HEMATOMAS

The chronic traumatic intracranial subdural hematoma develops insidiously, typically in an elderly or alcoholic individual with some degree of

brain atrophy. In this condition, the patient may fall or otherwise strike the head and may not remember the blow. The atrophic brain is less likely than a normal brain to tamponade the hemorrhage and a subdural hematoma begins, which will then progress causing symptoms such as altered mental status, reduced level of consciousness, and headaches or focal neurological deficits such as hemiparesis occurs. After about two weeks membranes begin to form around the hematoma with the outer membrane being thicker and more vascular than the inner membrane. The center of the encapsulated hematoma liquifies and becomes hypointense with respect to the brain on the CT scan. Instead of being



The middle meningeal artery. The typical traumatic epidural hematoma is caused by a laceration of this vessel. (B,C) A linear fracture of the squamous portion of the temporal bone has torn the middle meningeal artery, which has resulted in an epidural hematoma.

absorbed, the fluid collection enlarges, apparently from repeated bleeding from the vascular outer membrane. The hematoma thus enlarges assuming a progressively larger shape. In an infant a chronic subdural hematoma may result in head enlargement or restriction of brain growth. Subdural fluid collections in infants can be evacuated through a needle inserted via the coronal suture. The existence of a subdural hematoma in a child who has not been involved in an accident raises the possibility of child abuse. The treatment of chronic subdural hematomas in an adult usually requires less surgery than does the treatment of an acute or subacute subdural hematoma. The liquid can ordinarily be evacuated through a small hole in the skull called a burr hole with or without the insertion of a drain. At this point the fluid is most likely the consistency of motor oil. The main danger of a chronic subdural hematoma is that the existence may not be recognized and it may be left untreated, causing a severe neurologic deficit or death. If the diagnosis is considered, it can be confirmed easily by CT. The treatment is not complicated or associated with much risk and satisfactory outcome of the surgical evacuation of the chronic subdural hematoma is usually easier to achieve than the other two types of subdural hematomas.

INTRACEREBRAL HEMATOMAS

A significant intracranial hematoma resulting from direct non penetrating head trauma is unusual. However, cerebral contusions commonly occur especially in the under surfaces and tips of the frontal lobes and the tips of the temporal lobes. At times such contusions will coalescence into a hematoma that reaches a significant size. When this occurs and is the cause of symptoms and signs of cerebral dysfunction, surgical evacuation via craniotomy may be necessary. When downward brain stem displacement and uncal herniation occur, secondary brain stem hemorrhage may develop as part of the process. Multiple hemorrhagic areas within the pons and membranes are commonly found in a postmortem examination of a patient who died from a severe head injury that resulted in these types of brain herniations. Secondary brain stem hemorrhages are not amenable to surgical evacuation and the neurosurgeon s emphasis is on the prevention of brain herniation rather than the treatment of the effects of the herniation.

CONCLUSION

A patient who sustains a head injury may develop a hematoma in the epidural space, subdural space or brain parenchyma. These types of hematomas differ significantly in the mechanism and course of development, clinical presentations and specifics of diagnosis and treatment. However, they all may enlarge with time and be visualized by CT scanning. The success of their surgical treatment is in part related to how soon they are treated. Therefore, for optimal results a physician in the emergency room and the neurosurgeon must consider the possibility of all intracranial hematomas in any patient with a head injury especially if the patient is unconscious or has a focal neurological deficit.

The above intracranial hemorrhages are frequently diagnosed and treated by the neurologists and neurosurgeons at Neurology and Neurosurgery Associates.

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Dr. Alain Delgado joins staff of NNA

Dr. Alain Delgado

Dr. Alain Delgado has recently joined Neurology and Neurosurgery Associates, and started full-time at the Lakeland office on July 1, 2002. Dr. Delgado is Board Certified. Dr. Delgado completed his Internal Medicine Internship at the National Naval Medical Center in Bethesda, Maryland. He then went on to complete his Neurology Residency at the National Capital Consortium. This program combined the National Naval Medical Center, Walter Reed Army Medical Center, Malcolm Grow Medical Center, and the Uniformed Services University of Health Sciences. He went on to proudly serve three years at Naval Hospital Camp Pendleton. There, Dr. Delgado provided quality health care to all active duty members, their dependents, and retirees.

Dr. Delgado looks forward to becoming a part of the Lakeland community.

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Stroke is the 3rd leading cause of death in the United States

By Neeraj Dubey, M.D.

Stroke is the leading cause of morbidity in the United States. It affects nearly three quarter of million people every year. Stroke is the third leading cause of death in the United States.

Stroke is manifested commonly by sudden onset of weakness affecting one side of the body, numbness affecting one side of the body, difficulty speaking, sudden onset of headache, vertigo, difficulty with vision or coma.

Stroke is commonly classified into two categories.

I. Ischemic Stroke commonly caused by a blood clot to the brain and accounts for nearly 90%.

2. Hemorrhagic stroke accounts for nearly 10%, and commonly caused by aneurysms or increased blood pressure.

TREATMENT OF STROKE

Stroke treatment is a major challenge to the treating physicians as the treatment is complex and requires urgent management. Patients experiencing stroke like symptoms should seek medical treatment at the earliest onset of symptoms as described above. This has been the focus of major advances in stroke treatment.

1. Clot busting medications - This particular treatment which is indicated within the first three hours of onset of stroke symptoms requires patients to reach the nearest emergency room soon as the patients start experiencing stroke like symptoms. In the ER patients are required to get a CAT scan of the brain and upon evaluation by either a neurologist or a neuro-surgeon and after meeting strict guidelines of inclusion or exclusion criteria, thrombolytic therapy (IV -rt-PA) can be given. This particular therapy was approved in 1996 and has revolutionized the treatment of stroke. This particular therapy is effective both in decreasing the mortality and morbidity in stroke patients.

2. Blood thinners - This kind of therapy was the mainstay of stroke treatment prior to the approval of clot busting

medication. Again patients upon reaching the ER would be evaluated by a CAT scan of the brain. Different kinds of blood thinners can be given which can include the use of Aspirin, Plavix, Aggrenox or anti-coagulation with heparin.

3. Heammorhagic strokes - These varieties of stroke are manifested by bleeding within the brain either through ruptured vessels or increased blood pressure and or can be associated with trauma. This constitutes a medical emergency and may require an urgent operation.

CAUSES OF STROKE

There are number of causes of having a stroke, common causes of Ischemic stroke include family history of stroke, high blood pressure, diabctes, cigarette smoking, high cholesterol, carotid stenosis, arrythimas.heart disease and abnormal clotting mechanisms Common causes of having a hemorrhagic skoke include aneurysms, trauma or increased blood pressure.

PREVENTION OF STROKE

There are number of drugs which can be used to prevent strokes effectively.

1. Anti-platelet therapy - This includes the use of Aspirin, Plavix or Aggrenox.

2. Anti-Coagulation Therapy - Coumadin has been shown to be of particular benefit in stroke prevention in patients who have atrial fibrillation and patients who have abnormal clotting mechanisms.

3. Blood-pressure medications - Certain class of blood pressure agents (ACE Inhibitors) have been shown to be more effective than others in stroke prevention.

4. Cholesterol lowering agents - Statin drugs have been shown to be effective in secondary prevention of stroke.

5. Certain kinds of surgery are also indicated in stroke preventions such as a high grade carotid stenosis requires a carotid surgery and if patients have an aneurysm may also require clipping or coiling of the aneurysm.

In summary stroke is a true medical emergency and requires immediate medical attention. Time is brain and patients experiencing stroke like symptoms are best evaluated and managed in the hospital settings at the earliest time.

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