

A head injury

A head injury

- is any trauma that leads to injury of the scalp, skull, or brain.
- The injuries can range from a minor bump on the skull to serious brain injury
- Head injury is a trauma to the head, that may or may not include injury to the brain
- Head injury is classified as either closed or open penetrating

A closed head injury

A closed head injury means you received a hard blow to the head from striking an object

Traumatic Closed Head Injury

A. Head and brain in neutral position prior to impact



B. Initial impact from behind causing front of brain to impact anterior aspect of skull



C. Contra coup action causing back of brain to impact posterior aspect of skull



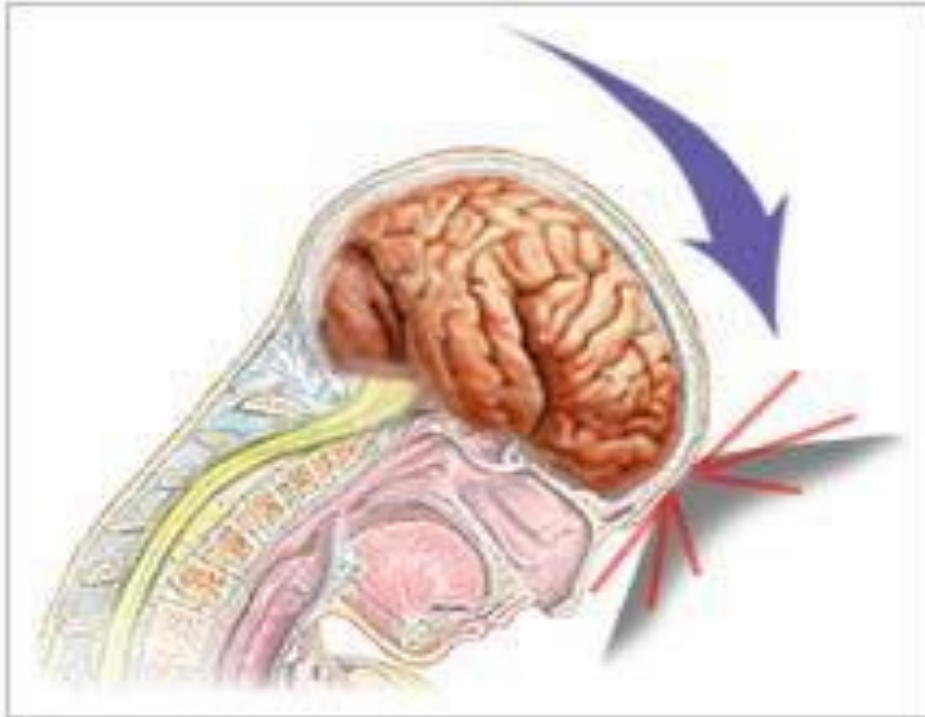
D. Subsequent coup contra-coup injury to front and back of brain



Symptoms Secondary to Diffuse Brain Injury

1. Memory loss
2. Confusion
3. Concentration problems

A concussion is a violent jarring or shaking that results in a disturbance of brain function



An open head injury

- An open, or penetrating, head injury means you were hit with an object that broke the skull and entered the brain.
- This usually happens when you move at high speed, such as going through the windshield during a car accident.
- It can also happen from a gunshot to the head

An open, or penetrating, head injury

- The signs and symptoms of a head injury may occur immediately or develop slowly over several hours

Types of head injury

- A head injury may cause a skull fracture, which may or may not be associated with injury to the brain. Some patients may have linear or depressed skull fractures
- If intracranial hemorrhage, or bleeding within the brain occurs, a hematoma within the skull can put pressure on the brain. Types of intracranial hematoma include subdural, subarachnoid, extradural, and intraparenchymal hematoma. Craniotomy surgeries are used in these cases to lessen the pressure by draining off blood

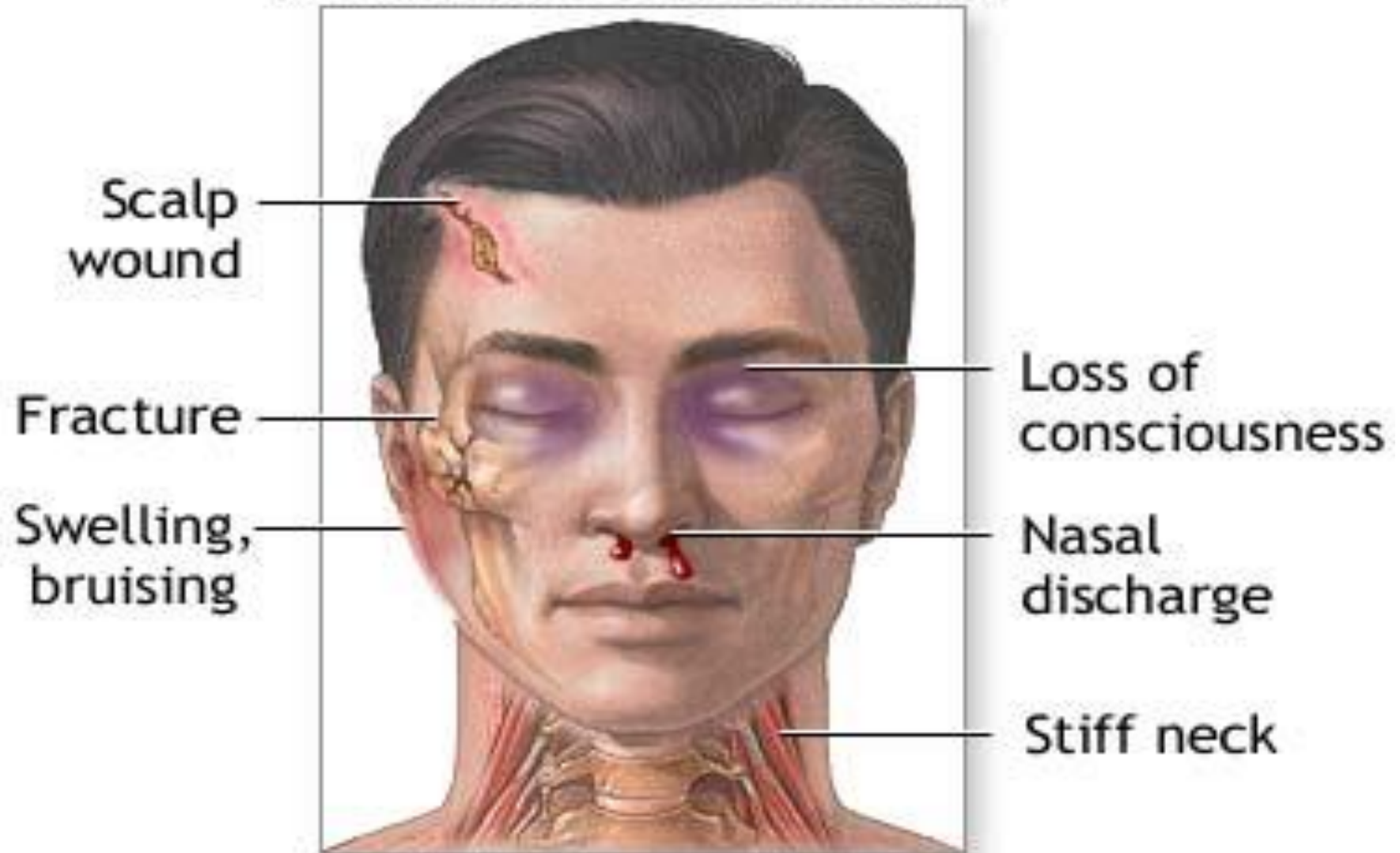
Types of head injury

- Brain injury can be at the site of impact, but can also be at the opposite side of the skull due to a contrecoup effect
- the impact to the head can cause the brain to move within the skull, causing the brain to impact the interior of the skull opposite the head-impact

Types of head injury

- If the impact causes the head to move, the injury may be worsened, because the brain may ricochet inside the skull (causing additional impacts), or the brain may stay relatively still (due to inertia) but be hit by the moving skull

Indications of a head injury



Causes of head injury

- Common causes of head injury include traffic accidents,
- falls,
- physical assault
- accidents at home, work, outdoors, or while playing sports
- common cause of head injury-related death and disability, especially among children

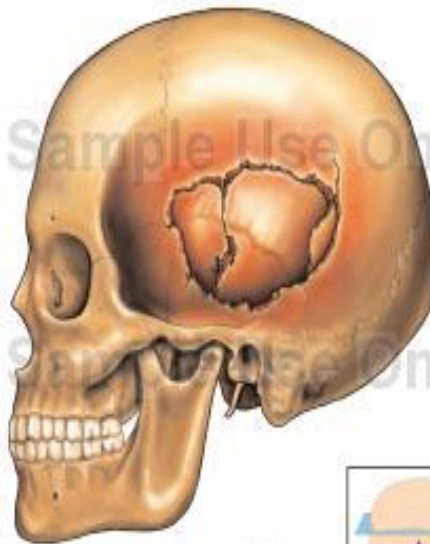
These more serious head injuries may cause:

- Changes in personality, emotions, or mental abilities
Loss of sensation, hearing, vision, taste, or smell
- Seizures
- Paralysis
- Coma

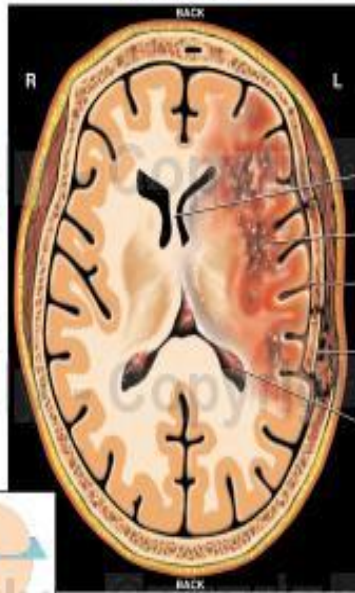
Specific problems after head injury

Post-accident Skull Fracture and Brain Injuries

DEPRESSED FRACTURE OF TEMPORAL AND PARIETAL BONES



BRAIN INJURIES



- RIGHT SHIFT OF MIDDLE STRUCTURES
- INTRAPARENCHYMAL HEMORRHAGE OF BRAIN
- SUBARACHNOID HEMORRHAGE
- DEPRESSED TEMPORO-PARIETAL FRACTURE
- BLOOD IN VENTRICLES

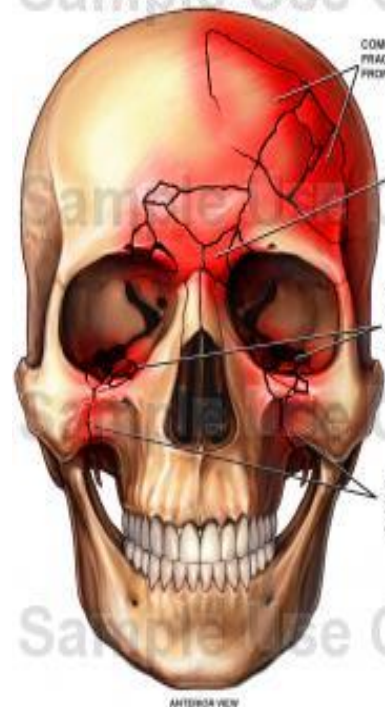
AXIAL SECTION THROUGH SKULL AND BRAIN



Post-accident Head Injuries

FRACTURES OF THE SKULL

BRAIN INJURIES



- COMMUNICATED FRACTURE OF LEFT FRONTAL BONE
- COMMUNICATED NASAL ORBITAL FRACTURES
- ORBITAL FLOOR BLOW-OUT FRACTURES BILATERALLY
- LEFORT TYPE II FRACTURE EXTENDING THROUGH BOTH SIDES OF THE MAXILLA

EPIDURAL HEMATOMA OVERLYING LEFT FRONTAL LOBE OF BRAIN

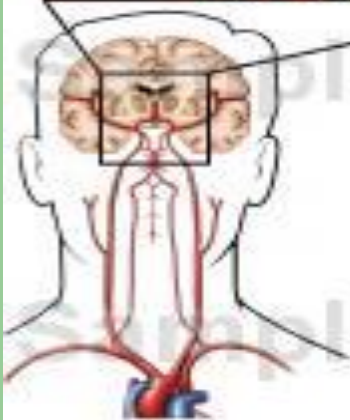
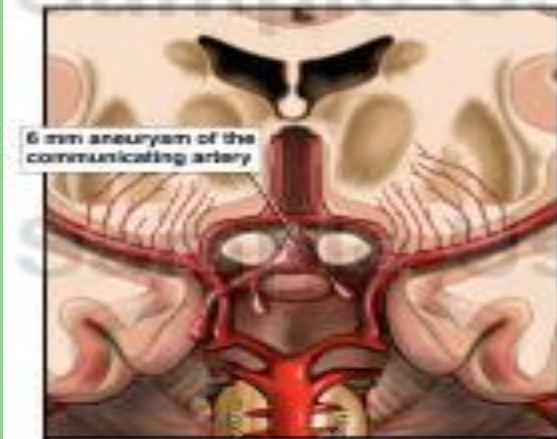
ANTERIOR VIEW

ANTERIOR CUT-AWAY VIEW

- Lacerations to the scalp and resulting hemorrhage of the skin
- Traumatic subdural hematoma, a bleeding below the dura mater which may develop slowly
- Traumatic extradural, or epidural hematoma, bleeding between the dura mater and the skull

Traumatic subarachnoid hemorrhage

Subarachnoid Hemorrhage with Surgical Repair



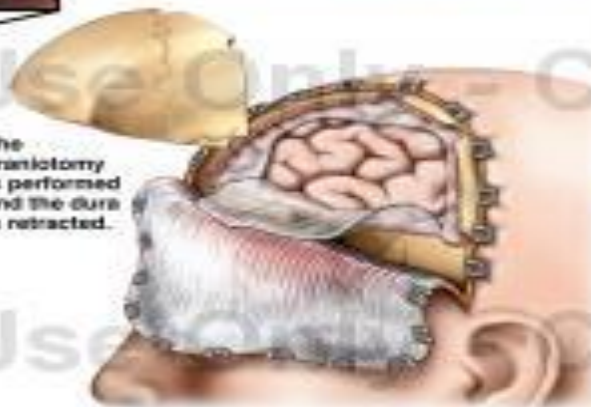
A. A standard left preauricular incision is made and Raney clips are placed on the scalp.



B. Midas Rex is used to drill a small temporal bur hole.



C. The craniotomy is performed and the dura is retracted.



D. Using a Greenberg retractor system the subarachnoid hemorrhage is revealed and a fenestrated clip is used to stop the hemorrhage.



Traumatic subarachnoid hemorrhage

- Cerebral contusion, a bruise of the brain
- Concussion, a temporary loss of function due to trauma
- Dementia pugilistica, or "punch-drunk syndrome", caused by repetitive head injuries, for example in boxing or other contact sports
- A severe injury may lead to a coma or death

Concussion

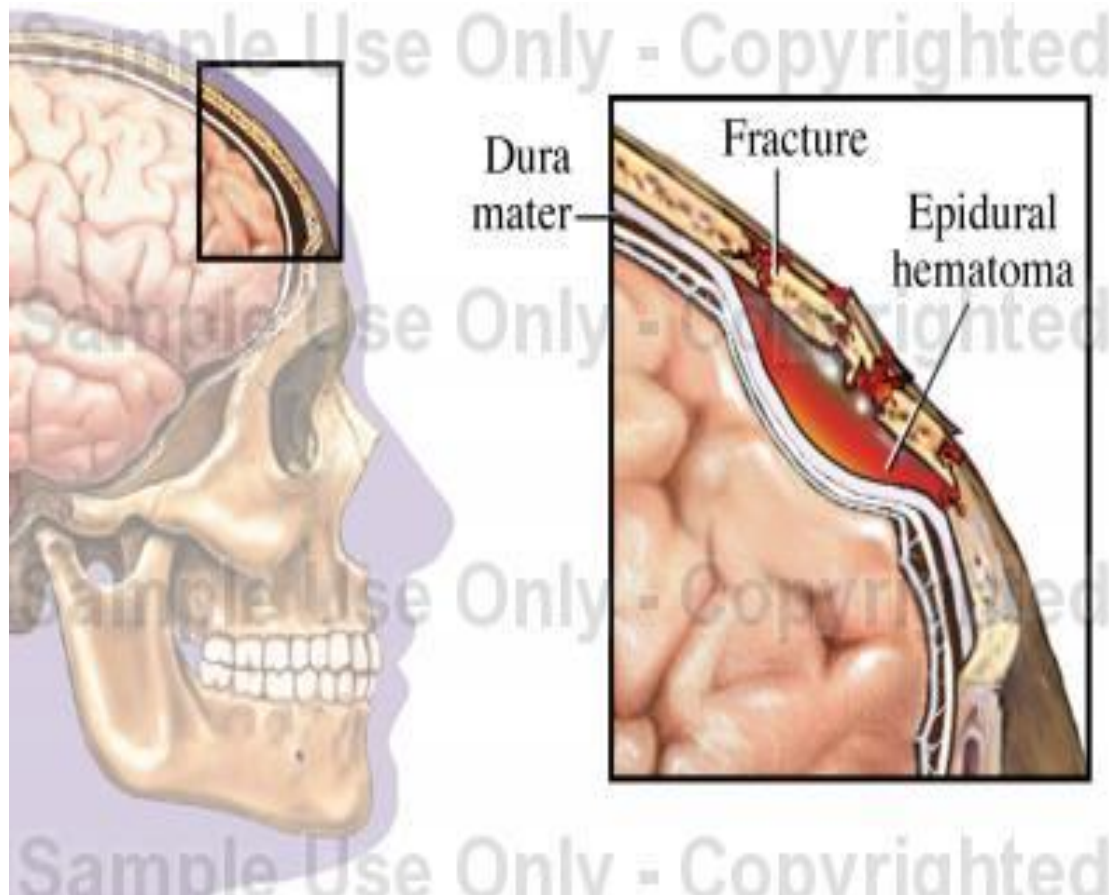
A concussion is a violent jarring or shaking that results in a disturbance of brain function



Concussion

- Mild concussions are not associated with any sequelae. However, a slightly greater injury can be associated with both anterograde and retrograde amnesia (inability to remember events before or after the injury).
- The amount of time that the amnesia is present correlates with the severity of the injury.
- In some cases the patients may develop postconcussion syndrome, which can include memory problems, dizziness, and depression.
- Cerebral concussion is the most common head injury seen in children

Epidural hematoma



Epidural hematoma

- A rapidly accumulating hematoma between the dura mater and the cranium.
- These patients have a history of head trauma with loss of consciousness, then a lucid period, followed by loss of consciousness.
- Clinical onset occurs over minutes to hours.

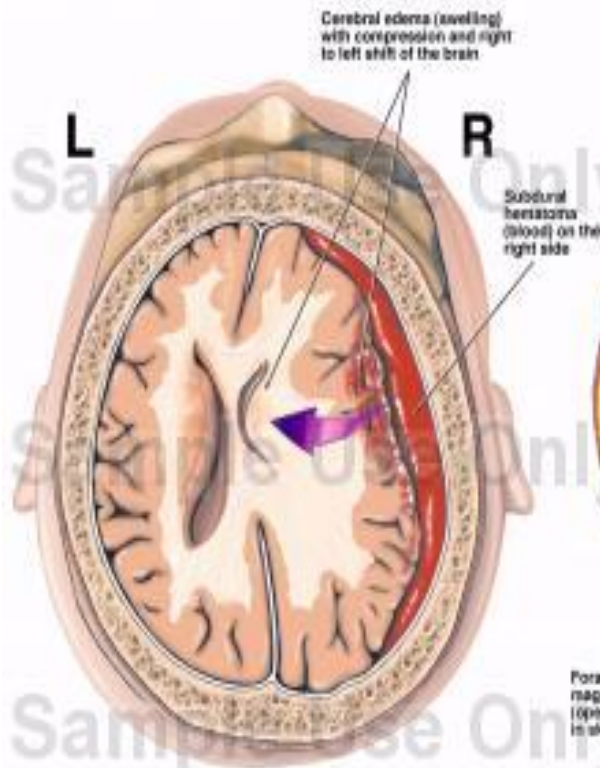
Epidural hematoma

- Many of these injuries are associated with lacerations of the middle meningeal artery.
- A "lenticular", or convex, lens-shaped extracerebral hemorrhage will likely be visible on a CT scan of the head.
- Although death is a potential complication, the prognosis is good when this injury is recognized and treated

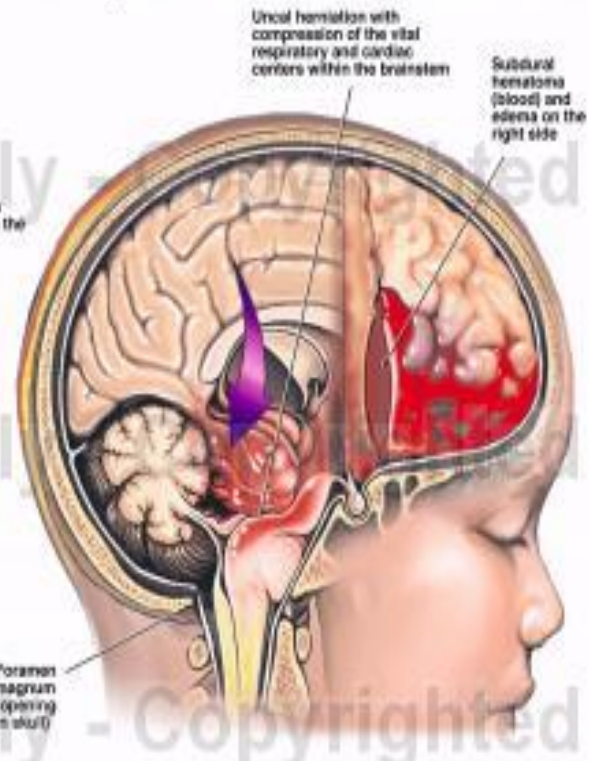
Subdural hematoma

Child Brain Injury - Subdural Hematoma, Uncal Brainstem Herniation and Death

Injuries seen from above



Injuries seen from the right side

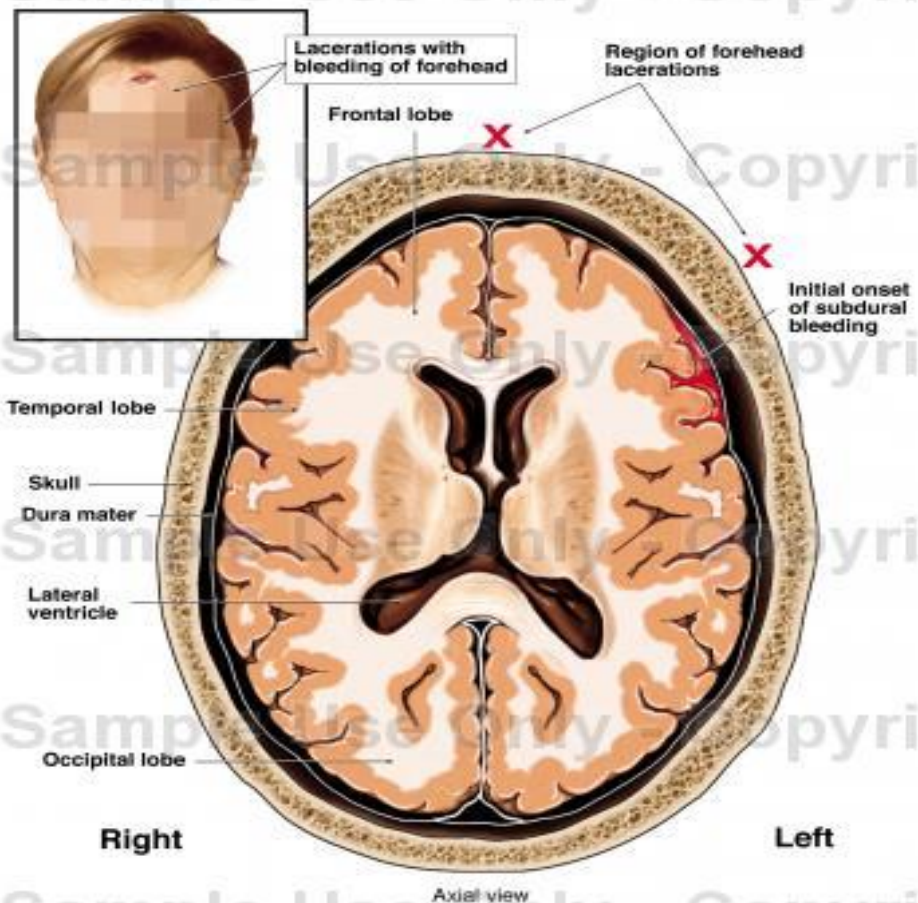


Subdural hematoma

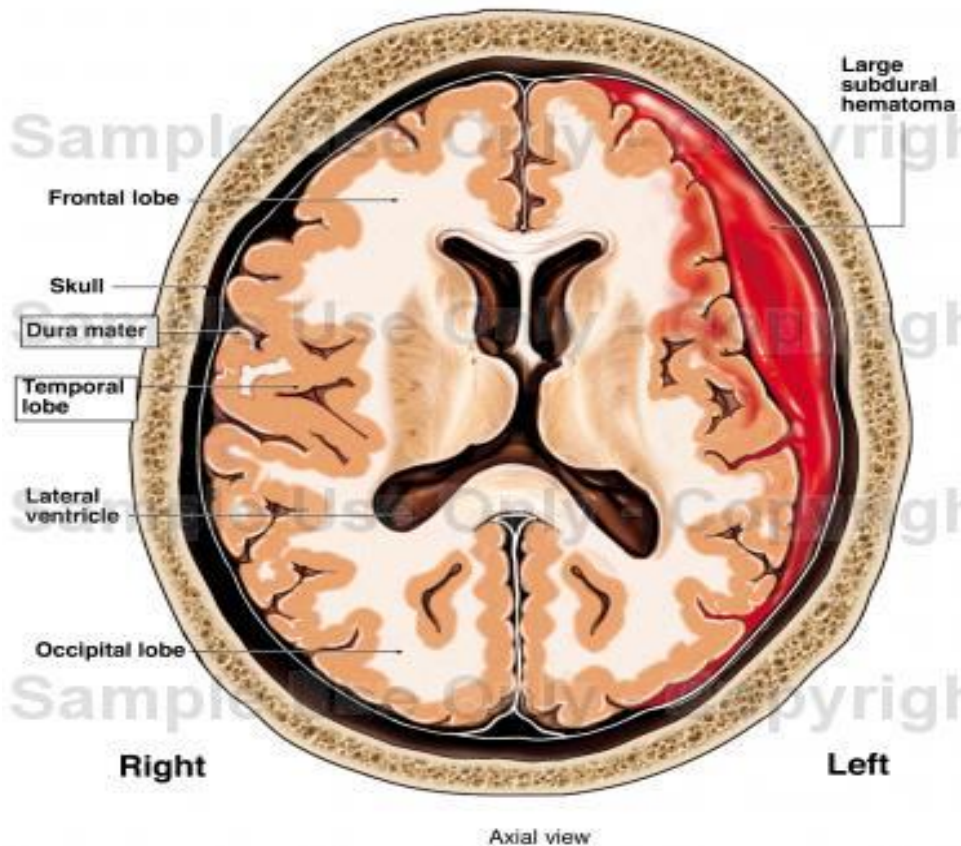
- Occurs when there is tearing of the bridging vein between times they may be caused by arterial lacerations on the brain surface.
- Patients may have a history of loss of consciousness but they recover and do not relapse.
- Clinical onset occurs over hours.
- A crescent shaped hemorrhage compressing the brain will be noted on CT of the head.
- Surgical evacuation is the treatment.
- Complications include uncal herniation, focal neurologic deficits, and death. The prognosis is guarded

Subdural hematoma

Brain Injury - Subdural Hematoma



Worsening of Head Injury (Subdural Hematoma)



Subdural hematoma

- Examples

- These arise between the dura and arachnoid, often from ruptured veins crossing this potential space. The space enlarges as the brain atrophies and so subdural haematomas are more common in the elderly.



Subdural hematoma

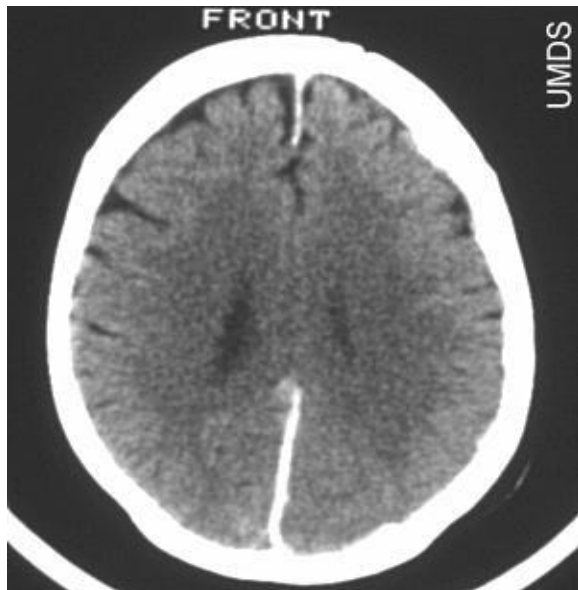
- Acute subdural

- This presents in a similar fashion to the extradural haematoma, and can have equally severe consequences due to mass effect, requiring urgent surgery. Differentiating the two is therefore not so important in the acute situation.
- The blood is again of high attenuation, but may spread more widely in the subdural space, with a crescentic appearance and a more irregular inner margin

Subdural hematoma

- **Examples**

- These two illustrations show a falcine subdural haematoma, a more unusual distribution. Note the abnormally bright falx due to the adjacent fresh blood.



● **Chronic subdural**

- The aetiology is not always clear. It is probably due to trauma, often minor, in the preceding few weeks, but no such history is obtainable in 50% of cases. Symptoms are vague and often develop slowly with a gradual depression or fluctuation of consciousness. Subdural haematomas are bilateral in 10% of patients

● **Chronic subdural**

- While acute subdural haematomas have increased attenuation, this decreases with time, becoming isodense after a week or so, and hypodense thereafter. Consequently chronic subdurals are often hypodense crescentic collections, often with mass effect. The collection may be more complex with layering of more dense material posteriorly and a gradual transition. Expansion due to osmosis may tear further veins leading to recurrent bleeds; hyperdense red blood cells from fresh bleeding may layer posteriorly, and complex septated collections may develop.

● Chronic subdural

- Isodense collections may be better demonstrated after intravenous contrast as the density will then be less than that of the brain. However this is rarely a problem with more modern scanners.



● Examples

- Note the crescentic low density collection typical of a chronic subdural haematoma, with associated midline shift.



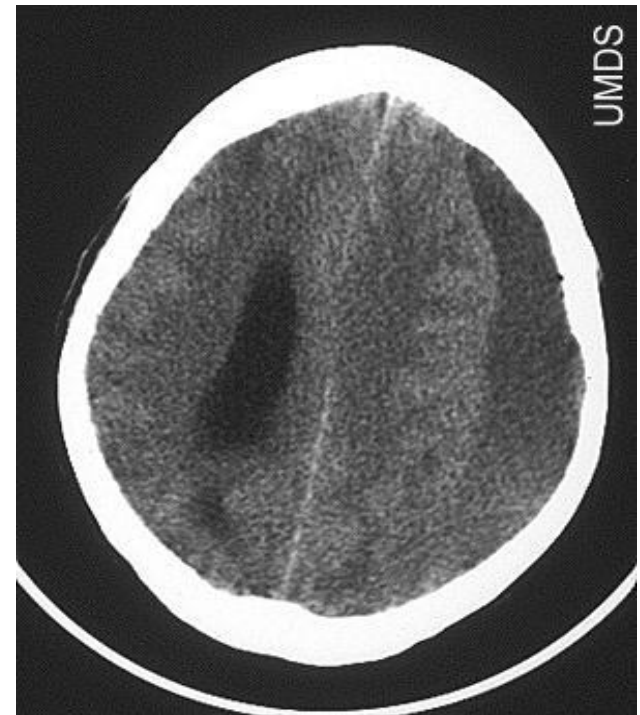
- **Examples**

- **This haematoma is not so old and is almost isodense. It is probably about one to two weeks old. This could be missed on older scanners with poorer quality images, but this is rarely a problem now.**



● Examples

- This is the same case, higher up. Note the dilated opposite lateral ventricle. Midline shift often distorts the Foramen of Munro of the opposite side, causing obstruction.

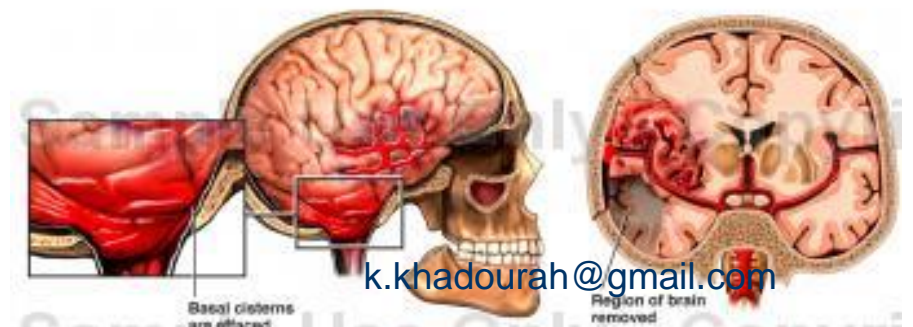
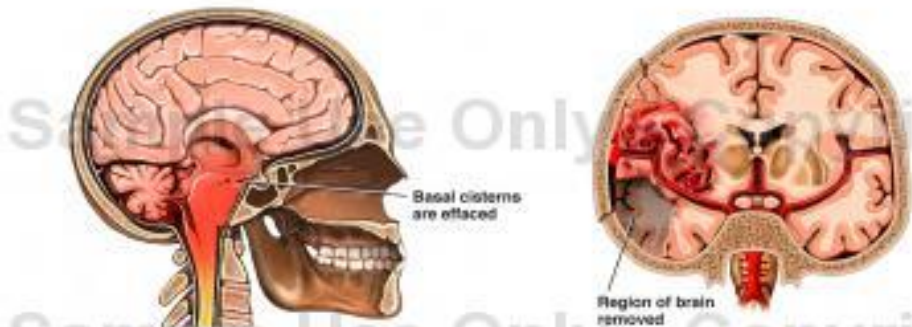
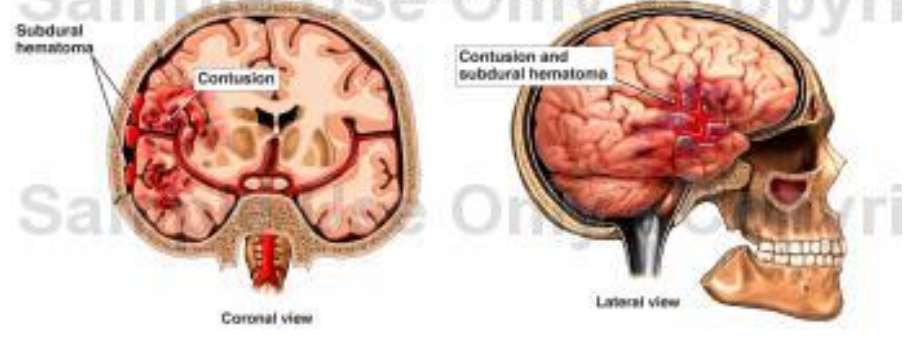


Cerebral contusion

Progression of Cerebral Injury



Progression of Cerebral Injury



Cerebral contusion

- Cerebral contusion is bruising of the brain tissue. The majority of contusions occur in the frontal and temporal lobes. Complications may include cerebral edema and transtentorial herniation. The goal of treatment should be to treat the increased intracranial pressure. The prognosis is guarded

The following symptoms suggest a more serious head injury

- Loss of consciousness, confusion, or drowsiness
- Low breathing rate or drop in blood pressure
- Convulsions
- Fracture in the skull or face, facial bruising, swelling at the site of the injury, or scalp wound
- Fluid drainage from nose, mouth, or ears may be clear or bloody

The following symptoms suggest a more serious head injury

- Severe headache
- Initial improvement followed by worsening symptoms
- Irritability (especially in children), personality changes, or unusual behavior
- Restlessness, clumsiness, lack of coordination

The following symptoms suggest a more serious head injury

- Slurred speech or blurred vision
- Inability to move one or more limbs
- Stiff neck or vomiting
- Pupil changes
- Inability to hear, see, taste, or smell

Symptoms of skull fracture can include

- leaking cerebrospinal fluid (a clear fluid drainage from nose, mouth or ear) may be and is strongly indicative of basilar skull fracture and the tearing of sheaths surrounding the brain, which can lead to secondary brain infection
- visible deformity or depression in the head or face; for example a sunken eye can indicate a maxillary fracture an eye that cannot move or is deviated to one side can indicate that a broken facial bone is pinching a nerve that innervates eye muscles

Symptoms of skull fracture can include

- **Basilar skull fractures**, those that occur at the base of the skull, are associated with Battle's sign, a subcutaneous bleed over the mastoid, hemotympanum, and cerebrospinal fluid rhinorrhea and otorrhea
- Because brain injuries can be life threatening, even people with apparently slight injuries, with no noticeable signs or complaints, require close observation. The caretakers of those patients with mild trauma who are released from the hospital are frequently advised to rouse the patient several times during the next 12 to 24 hours to assess for worsening symptoms

The Glasgow Coma Scale

- The Glasgow Coma Scale is a tool for measuring degree of unconsciousness and is thus a useful tool for determining severity of injury. The Pediatric Glasgow Coma Scale is used in young children

The Glasgow Coma Scale

Glasgow coma scale

		Score
Eye opening	spontaneously	4
	to speech	3
	to pain	2
	none	1
Verbal response	orientated	5
	confused	4
	inappropriate	3
	incomprehensible	2
	none	1
Motor response	obeys commands	6
	localises to pain	5
	withdraws from pain	4
	flexion to pain	3
	extension to pain	2
	none	1
Maximum score		15