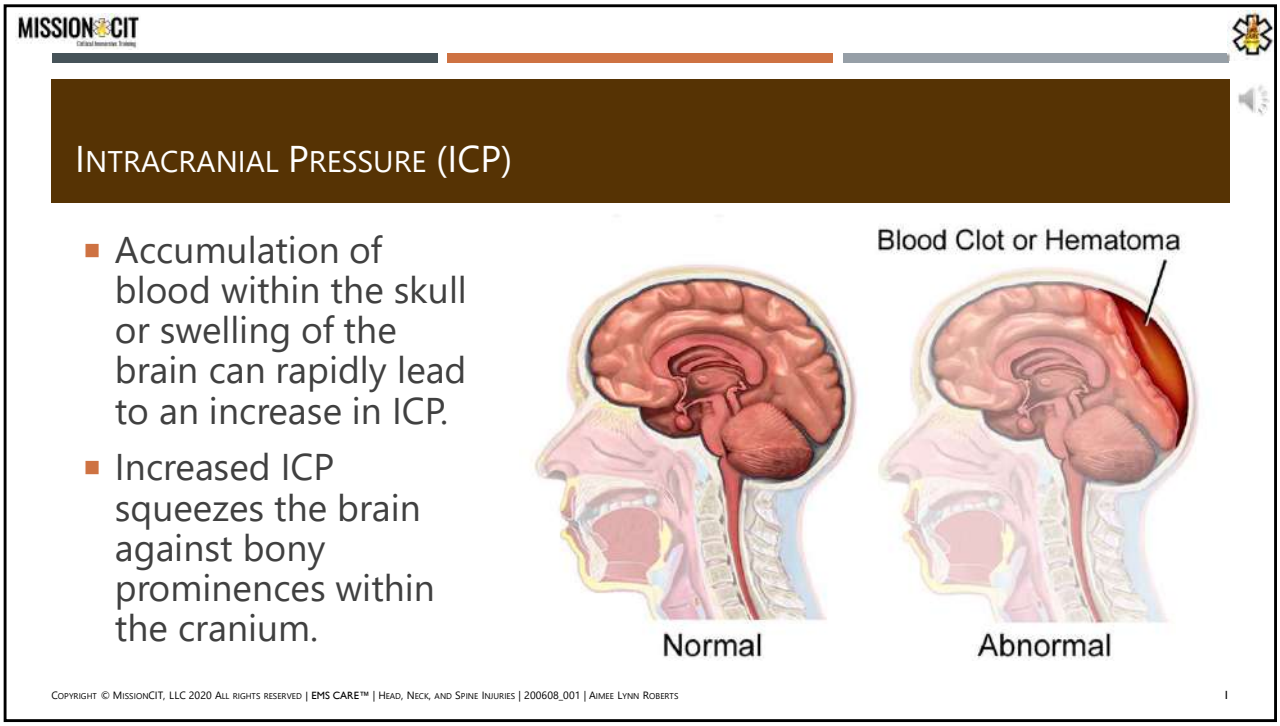
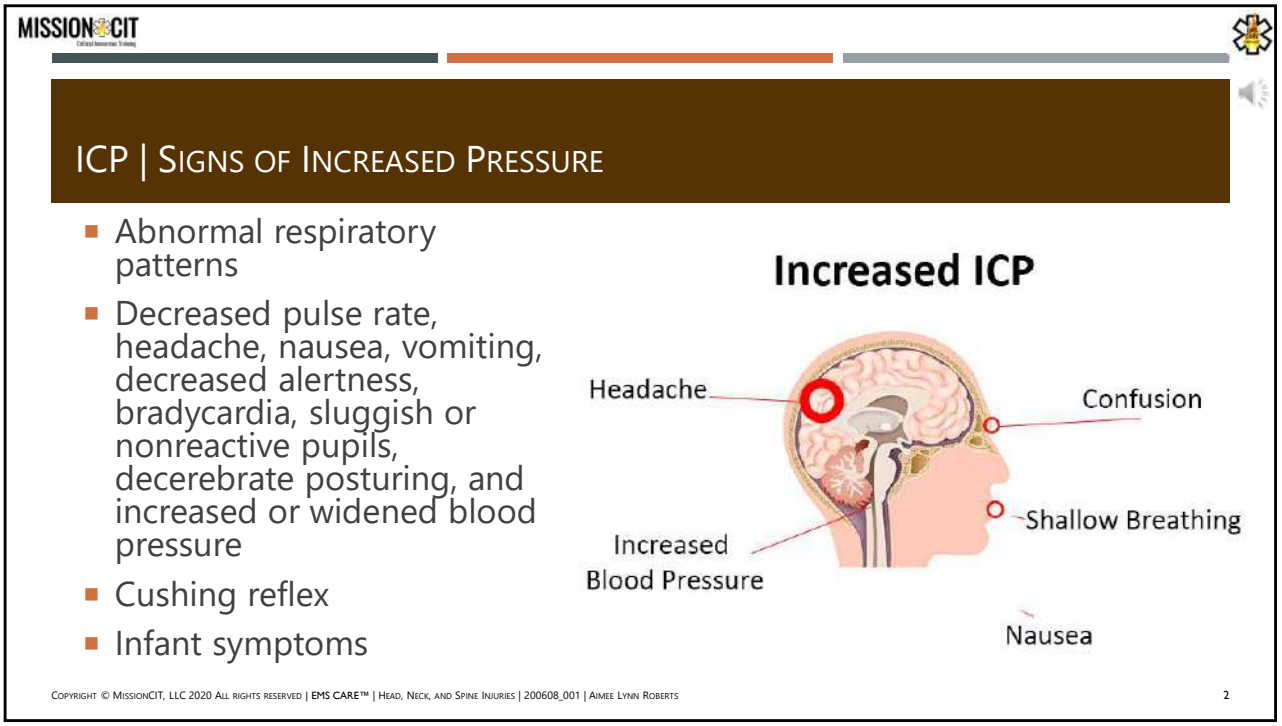


Welcome back. Let's get started on Part B of this lesson on Head Neck and Brain Injuries. We'll begin by discussing Intracranial Pressure, move on to concussions, and finish with wounds to the neck.

To understand intracranial pressure (ICP), think of the skull as a rigid box. After brain injury, the skull may become overfilled with swollen brain tissue, blood, or CSF. The skull will not stretch like skin to deal with these changes. The skull may become too full and increase the pressure on the brain tissue. This is called increased intracranial pressure.

Increased ICP can also mean that the brain tissue itself is swelling, either from injury or from an illness such as epilepsy. Increased ICP can be the result of a brain injury and, it can also be the cause of a brain injury.



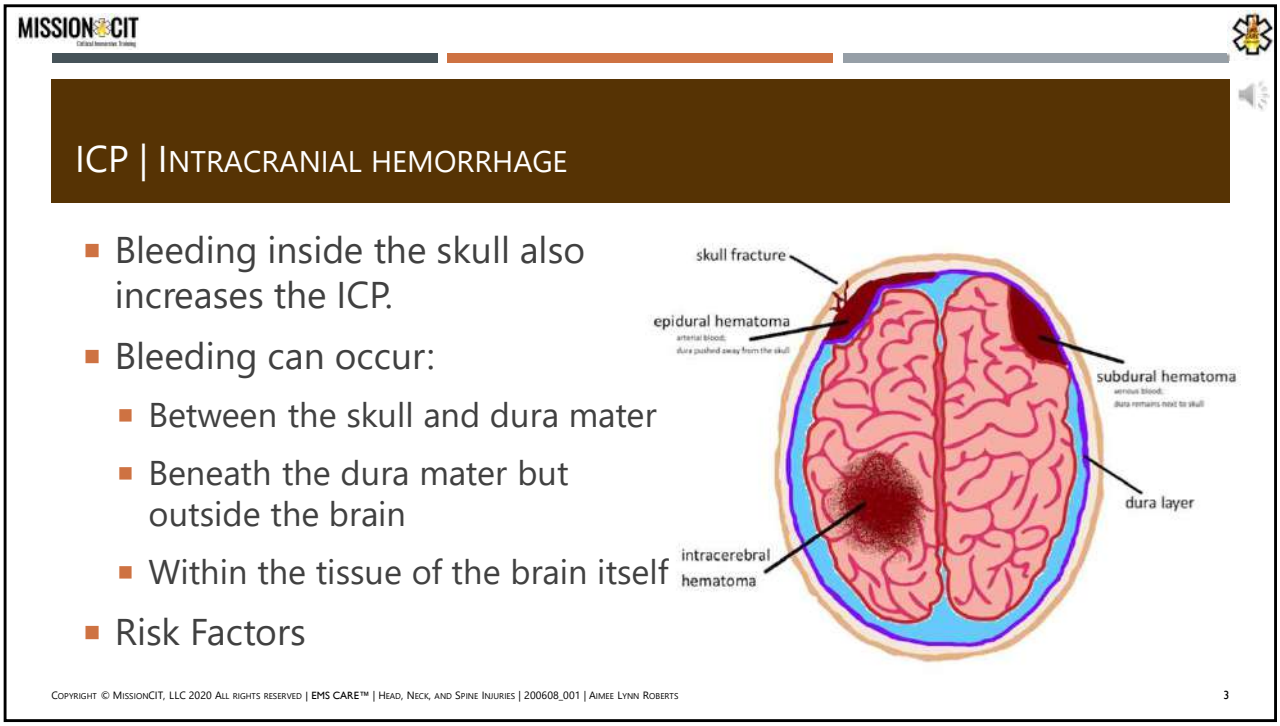
Signs of increased intracranial pressure may include

- Abnormal respiratory patterns
- Decreased pulse rate, headache, nausea, vomiting, decreased alertness, bradycardia, sluggish or nonreactive pupils, decerebrate posturing, and increased or widened blood pressure, and
- Cushing reflex: the symptom triad of increased systolic blood pressure, decreased pulse rate, and irregular respirations.

These signs could indicate other serious conditions besides increased ICP, such as a stroke, a brain tumor, or

a recent head injury.

Increased ICP in infants can be the result of injury, such as falling off a bed, or it can be a sign of child abuse known as shaken baby syndrome, a condition in which a small child has been roughly handled to the point of brain injury. Symptoms are similar to adults, but Increased ICP can also cause the fontanel, the soft spot on the top of a baby's head, to bulge outward.



Intracranial hemorrhage (ICH) refers to acute bleeding inside the skull or brain.

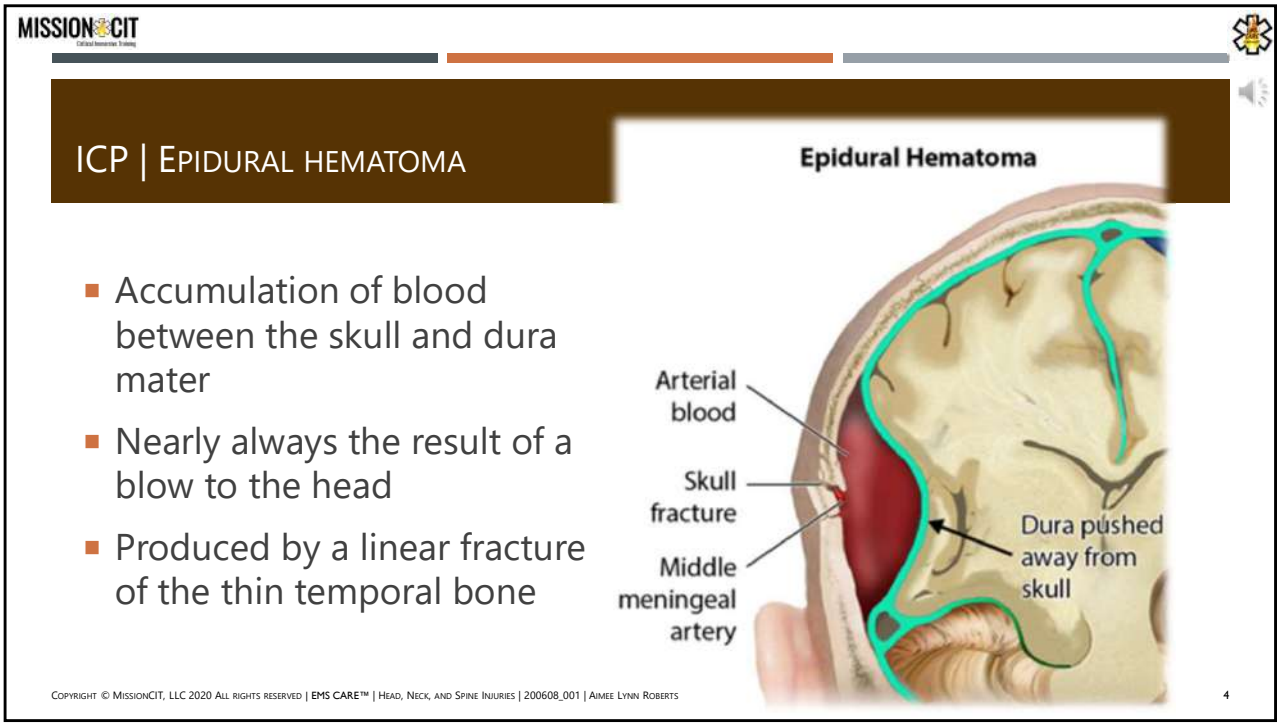
Bleeding can occur between the skull and dura mater, beneath the dura mater but outside the brain, or within the tissue of the brain itself.

There are four types of ICH:

- epidural hematoma.
- subdural hematoma,
- subarachnoid hemorrhage, and
- intracerebral hemorrhage.

Most ICHs are due to a head injury. Factors that increase ICH risk include:

- a family history of ICH
- heavy alcohol use
- hypertension
- cigarette smoking
- the use of certain drugs
- extreme physical exertion



An epidural hematoma (EDH) occurs when blood accumulates between the skull and the dura mater, the thick membrane covering the brain.

- They typically occur when a skull fracture tears an underlying blood vessel; often as a result of a blow to the head that produces a linear fracture of the thin temporal bone
- EDHs are about half as common as a subdural hematomas and usually occur in young adults.
- They occur four times as often among males compared with females and rarely before age 2 or

after age 60.

Classic symptoms of EDH involve brief loss of consciousness followed by a period of awareness that may last several hours before brain function deteriorates, sometimes leaving the patient in a coma.

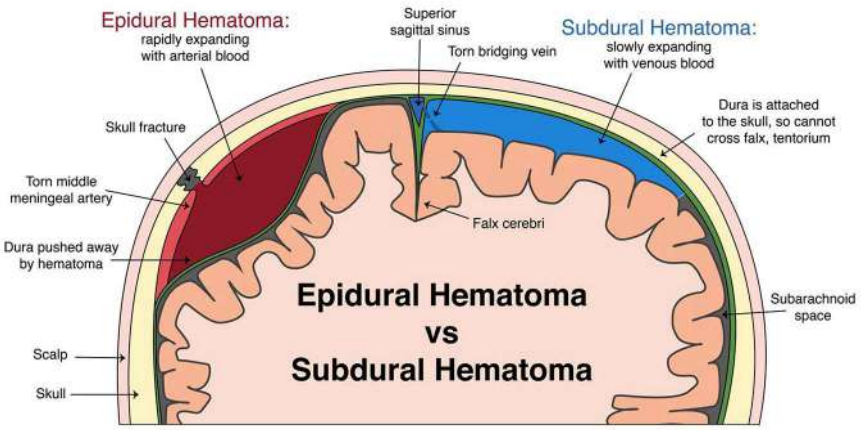
If untreated, the condition can cause increased blood pressure, difficulty breathing, damage to brain function and even death.

Other symptoms include headache, vomiting and seizure.

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ICP | SUBDURAL HEMATOMA

- Accumulation of blood beneath the dura mater but outside the brain
- Occurs after falls or injuries involving strong deceleration forces
- 3 types



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A Subdural hematoma is an accumulation of blood beneath the dura mater but outside the brain. They often occur after falls or injuries involving strong deceleration forces.

This occurs when blood vessels — usually veins — rupture between the brain and the dura mater. The leaking blood forms a hematoma that presses on the brain tissue. An enlarging hematoma can cause gradual loss of consciousness and possibly death.

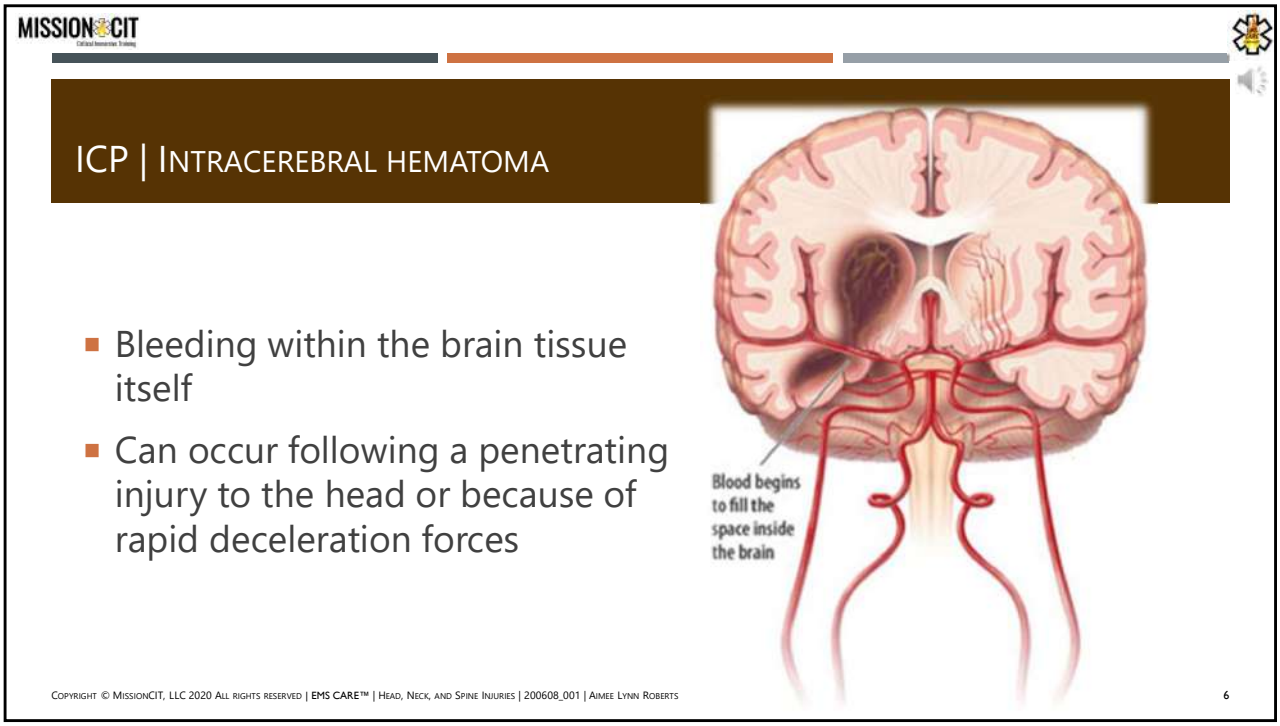
The patient often experiences a fluctuating level of

consciousness or slurred speech.

The three types of subdural hematomas are:

1. Acute. This most dangerous type is generally caused by a severe head injury, and signs and symptoms usually appear immediately.
2. Subacute. Signs and symptoms take time to develop, sometimes days or weeks after injury.
3. Chronic. The result of less severe head injuries, this type of hematoma can cause slow bleeding, and symptoms can take weeks and even months to appear.

Any patient with a suspected subdural hematoma needs to be evaluated by a physician.



Intracerebral hemorrhage occurs when a blood vessel within the brain bursts, allowing blood to leak inside the brain. The sudden increase in pressure within the brain can cause damage to the brain cells surrounding the blood. If the amount of blood increases rapidly, the sudden buildup in pressure can lead to unconsciousness or death.

An Intracerebral hematoma can occur following a penetrating injury to the head or rapid deceleration forces. The most common cause of intracerebral

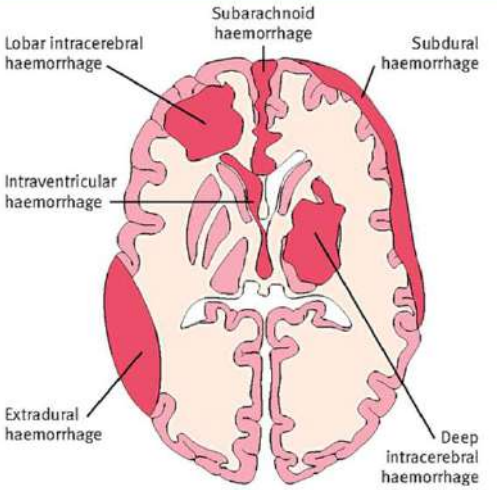
hemorrhage is hypertension. Less common causes of intracerebral hemorrhage include trauma, infections, tumors, blood clotting deficiencies, and abnormalities in blood vessels.

Intracerebral hematomas have a high mortality rate, even if the hematoma is surgically evacuated.

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ICP | SUBARACHNOID HEMORRHAGE

- Bleeding occurs into the subarachnoid space, where the CSF circulates.
- Results in bloody CSF and signs of meningeal irritation
- Common causes include trauma or rupture of an aneurysm.



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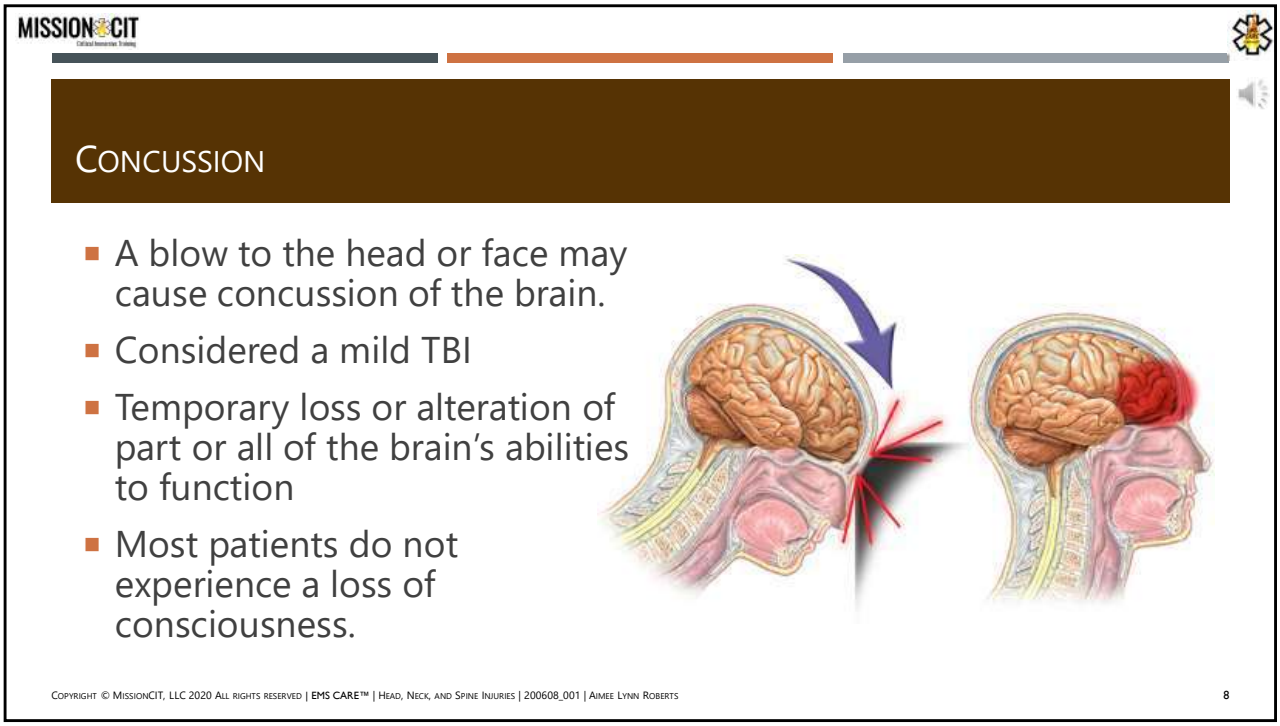
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A subarachnoid hemorrhage is bleeding in the space between the brain and the surrounding membrane called the subarachnoid space. The primary symptom is a sudden, severe headache. The headache is sometimes associated with nausea, vomiting and a brief loss of consciousness.

Bleeding usually results from the rupture of an abnormal bulge in a blood vessel called an aneurysm. Sometimes bleeding is caused by trauma, an abnormal tangle of blood vessels called an arteriovenous malformation, or other blood vessel or health problems. There also may

be bloody cerebrospinal fluid and signs of meningeal irritation

Untreated, a subarachnoid hemorrhage can lead to permanent brain damage or death.



A concussion is a type of traumatic brain injury—or TBI—caused by a bump, blow, or jolt to the head or by a hit to the body that causes the head and brain to move rapidly back and forth. This sudden movement can cause the brain to bounce around or twist in the skull, creating chemical changes in the brain and sometimes stretching and damaging brain cells.

Concussion is a closed injury with a temporary loss or alteration of part or all of the brain's abilities to function without demonstrable physical damage to the brain.

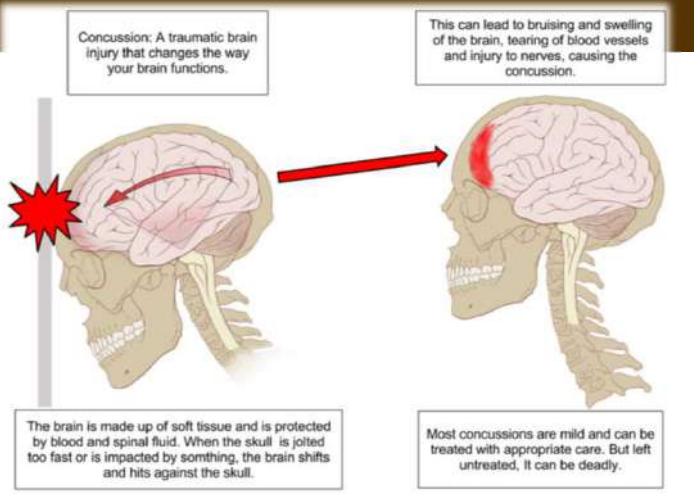
Falls are the most common cause of concussion.

Concussions are also common in contact sports, such as football or soccer. Most people usually recover fully after a concussion.

Most patients who sustain a concussion do not experience a loss of consciousness. A patient with a concussion may be confused or have amnesia.

Concussion Symptoms

- A patient may be confused or have amnesia.
- Usually lasts only a short time
- Assume that a patient with signs or symptoms of concussion has a more serious injury until proven otherwise.



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The signs and symptoms of a concussion can be subtle and may not show up immediately. Symptoms can last for days, weeks or even longer. Common symptoms after a concussive traumatic brain injury are headache, loss of memory (amnesia) and confusion. The amnesia usually involves forgetting the event that caused the concussion.

Physical signs and symptoms of a concussion may include: Headache, Ringing in the ears, Nausea, Vomiting, Fatigue, drowsiness, or Blurry vision.

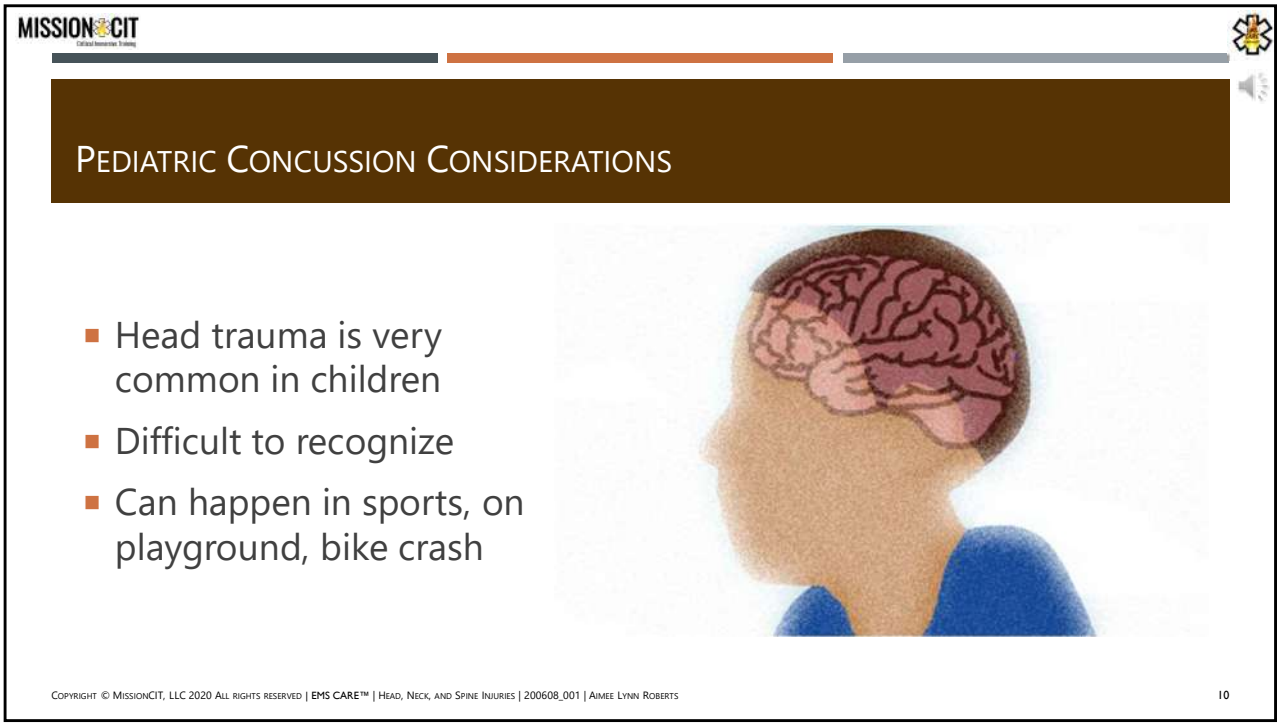
Other signs and symptoms of a concussion include:

- Confusion or feeling as if in a fog
- Amnesia surrounding the traumatic event
- Dizziness or "seeing stars"

A witness may observe these signs and symptoms in the concussed person:

- Temporary loss of consciousness
- Slurred speech
- Delayed response to questions
- Dazed appearance
- Forgetfulness, such as repeatedly asking the same question

Assume that a patient with signs or symptoms of concussion has a more serious injury until proven otherwise by a CT scan at the hospital or by evaluation by a physician.

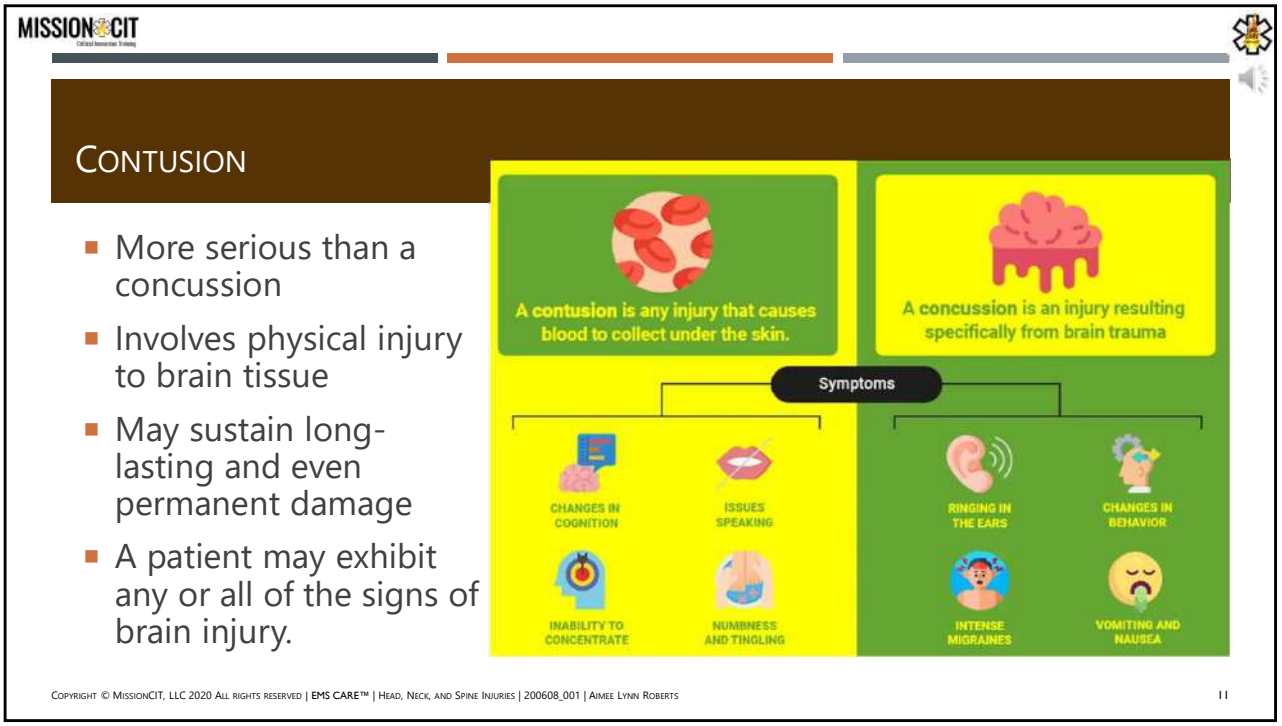


Head trauma is quite common in young children. Concussions can happen for many reasons, including a bike crash, a fall on the playground, or while playing sports. But concussions can be difficult to recognize in infants and toddlers because they can't describe how they feel. Concussion clues may include:

- Dazed appearance,
- Listlessness and tiring easily,
- Irritability and crankiness,
- Loss of balance and unsteady walking,
- Excessive crying,

- Change in eating or sleeping patterns,
- Lack of interest in favorite toys,
- Vomiting, or
- Seizures.

Symptoms of a concussion don't always show up right away, and can develop within 24 to 72 hours after an injury. Young children usually have the same physical symptoms as older kids and adults, but cognitive and emotional symptoms such as irritability and frustration can appear later. These will be harder to notice, and last longer. Sleep-related issues are more common in teens.



Cerebral contusions are scattered areas of bleeding on the surface of the brain, most commonly along the undersurface and poles of the frontal and temporal lobes. They occur when the brain strikes a ridge on the skull or a fold in the dura mater, the brain's tough outer covering. These bruises may occur without other types of bleeding or they may occur with acute subdural or epidural hematoma.

Cerebral contusions and lacerations involve structural brain damage and thus are more serious than

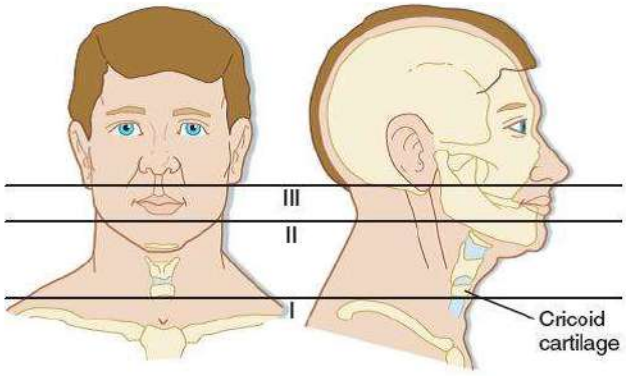
concussions, which are an alteration in mental function or level of awareness caused by an injury that does not cause visible damage to brain structures.

Contusions may be caused by the sudden acceleration of the brain against the skull after a jolt—as may be delivered by a forceful blow to the head—or by the sudden deceleration that occurs when a moving head strikes an immovable object as when a person's head hits the dashboard or the steering wheel in a frontal-impact motor vehicle crash. The brain can be damaged at the point of impact and on the opposite side when it strikes the inside of the skull. Contusions may get larger in the hours and days after the injury, causing brain function to deteriorate.

A patient who has sustained a brain contusion may exhibit any or all the signs of brain injury.

Wounds to the Neck

- 3 zones
- Injury Concern for
  - Vascular
  - Neurologic
  - Digestive tract
  - Airway



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The neck is a particularly tricky area of assessment and management in the trauma patient, as it is the location for many vital structures. Concern for vascular, neurologic, digestive tract, and airway injury are of paramount importance in the evaluation of these patients, as all can be life-threatening. Oftentimes, the neck trauma patient may appear stable, only to have delayed injury found later, causing increased morbidity and mortality. Neck trauma can be split into penetrating injury and blunt injury.

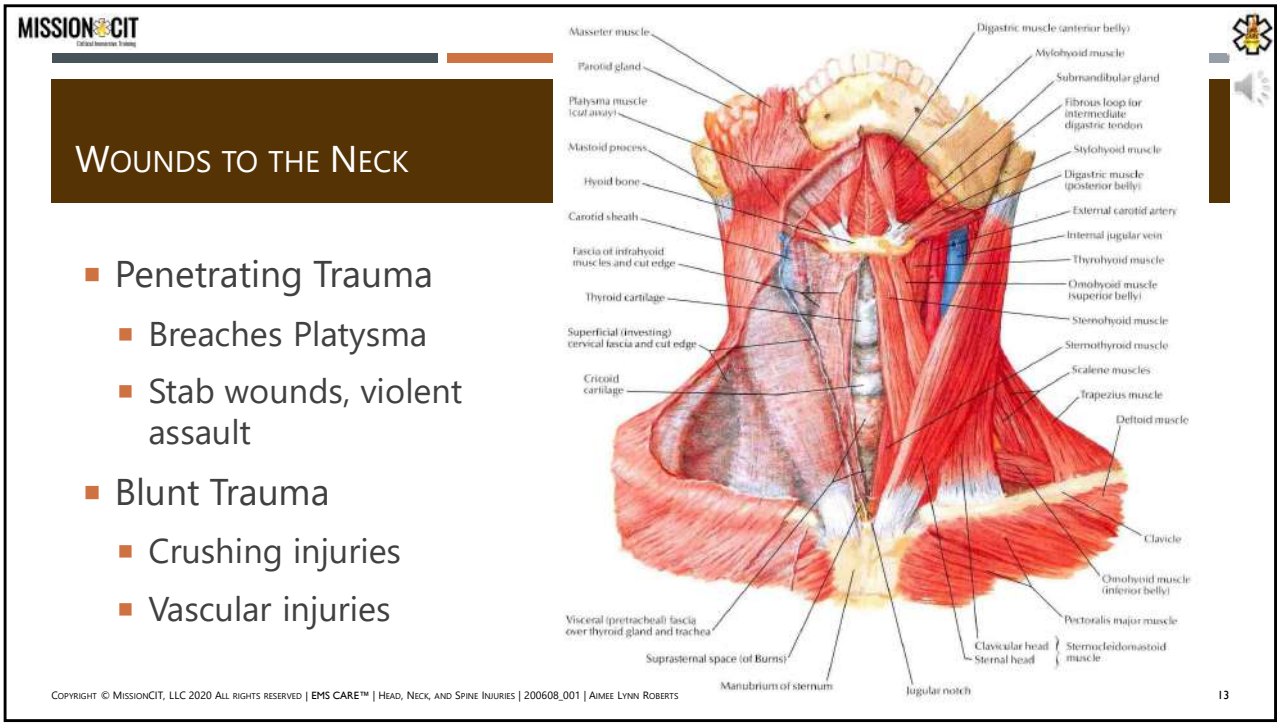
The neck is divided into 3 Zones, which become

important in evaluating and managing these patients, especially with regard to the structures lying within each division.

Zone I (base of neck) – below the cricoid cartilage (to the sternal notch): mediastinal structures, thoracic duct, proximal carotid artery, vertebral/subclavian artery, trachea, lung, esophagus

Zone II (mid-neck) – from the cricoid cartilage to the angle of the mandible: carotid/vertebral artery, larynx, trachea, esophagus, jugular vein, vagus and recurrent laryngeal nerves

Zone III (upper neck) – above the angle of the mandible: distal carotid artery, vertebral artery, distal jugular vein, salivary/parotid glands, CNs 9-12



Neck trauma is usually divided into two categories, blunt and penetrating trauma.

Penetrating neck injury describes trauma to the neck that has breached the platysma muscle. The platysma is a large, thin sheet of muscle extending from the facial muscles to the thorax, and is the traditional surgical landmark for penetrating trauma.

The most common mechanism of injury is a stab wound from violent assault, followed by gunshot wounds, self harm, road traffic accidents and other high velocity objects. Penetrating trauma-may result in injury to

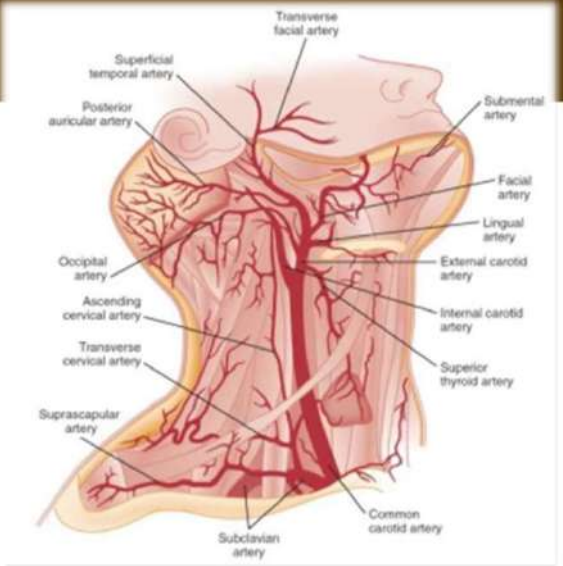
major vascular structures, including the pharynx, larynx, traikia, and esophagus.

Blunt Trauma-may result in a crushed larynx, tracheal disruption, expanding hematoma, and esophageal leak. The majority of blunt neck trauma is from motor vehicle collisions, as well as assault and strangulation. Patients sustaining significant blunt trauma require cervical spine precautions, including cervical spine immobilization and supine placement of the patient on a backboard.

Blunt trauma also has the potential for vascular injuries. Direct blows to the anterior neck can compress and potentially rupture the carotid, causing a rapidly expanding hematoma that has the potential to distort or occlude the airway.

Wounds to the Neck | Complications of Vascular Injury

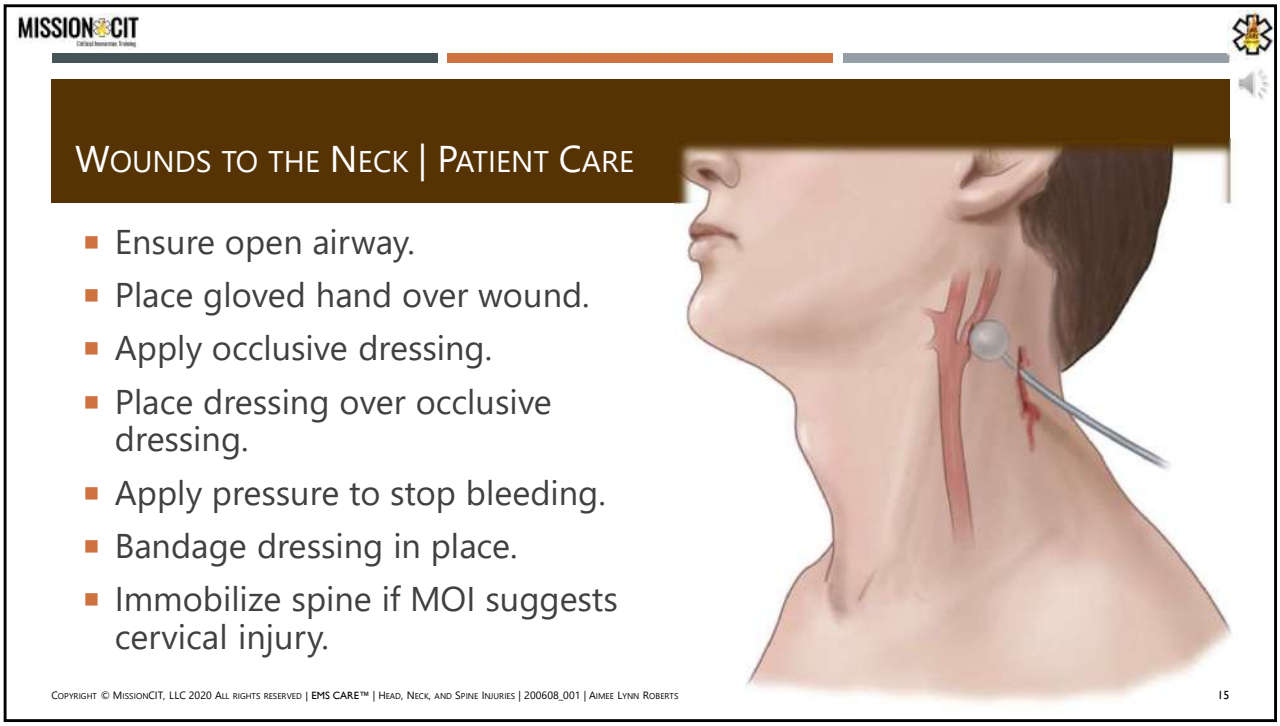
- Large arteries and veins close to surface creating the potential for serious bleeding.
- Pressure in large vein is lower than atmospheric pressure



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Because large arteries and veins lie close to the surface of the neck, the potential for serious bleeding from an open wound is great. Since the pressure in a large vein is likely to be lower than atmospheric pressure, the risk of an air embolus is great.

Consider the use of an occlusive dressing for neck wounds.



In addition, to the steps shown in the slide, there are several additional factors for neck wounds. For a conscious patient consider providing supplemental oxygen and clearing the airway of all secretions and foreign bodies, including unfastened dentures and loose teeth.

Be sure to use Impregnated gauze to cover sucking neck wounds or lacerations exuding bubbling air. Also, defer removal of helmets or other headgear until neck stabilization has been ensured.

Finally, Impaled objects should not be extracted in the

field. If your training permits, Intravenous access may best be established en route to the hospital.