UNITED STATES MARINE CORPS
FIELD MEDICAL TRAINING BATTALION
Camp Lejeune, NC 28542-0042

FMST 408

Manage Head, Neck, and Face Injuries

TERMINAL LEARNING OBJECTIVE
1. Given a casualty in an operational environment, equipment and supplies, treat head, neck, and facial injuries to reduce risk of further injury or death. (8404-MED-2005)

ENABLING LEARNING OBJECTIVES
1. Without the aid of reference, given a description or list, identify the anatomy of the head, within 80% accuracy, per Prehospital Trauma Life Support, current Military Edition. (8404-MED-2005a)

2. Without the aid of reference, given a description or list, identify the types of head injuries, within 80% accuracy, per Prehospital Trauma Life Support, current Military Edition. (8404-MED-2005b)

3. Without the aid of reference, given a description, select the appropriate treatment for a head injury, within 80% accuracy, per Prehospital Trauma Life Support, current Military Edition (8404-MED-2005c)

4. Without the aid of reference, given a description or list, identify the anatomy of the neck, within 80% accuracy, per Prehospital Trauma Life Support, current Military Edition. (8404-MED-2005d)

5. Without the aid of reference, given a description or list, identify the types of neck injuries, within 80% accuracy, per Prehospital Trauma Life Support, current Military Edition. (8404-MED-2005e)

6. Without the aid of reference, given a description or list, select the appropriate treatment for a neck injury, within 80% accuracy, per Prehospital Trauma Life Support, current Military Edition. (8404-MED-2005f)

7. Without the aid of reference, given a description or list, identify the anatomy of the face, within 80% accuracy, per Prehospital Trauma Life Support, current Military Edition. (8404-MED-2005g)
8. Without the aid of reference, given a description or list, **identify the types of facial injuries**, within 80% accuracy, per Prehospital Trauma Life Support, current Military Edition. (8404-MED-2005h)

9. Without the aid of reference, given a description or list, **select the appropriate treatment for a facial injury**, within 80% accuracy, per Prehospital Trauma Life Support, current Military Edition. (8404-MED-2005i)

10. Without the aid of reference, given a simulated casualty with head, face, and/or neck injuries and standard field medical equipment and supplies, **manage the simulated casualty**, to prevent further injury or death, per Prehospital Trauma Life Support, current Military Edition. (8404-MED-2005j)
1. **ANATOMY OF THE HEAD**

   **Head** (see Figure 1)

   **Cranial Vault** - the part of the skull that contains the brain. Divided into six sections:

   - **Occipital** - the posterior lobe of each cerebral hemisphere that bears the visual cortex and has the form of a 3-sided pyramid
   - **Temporal** - a large lobe of each cerebral hemisphere that is situated in front of the occipital lobe and contains a sensory area associated with the organ of hearing
   - **Parietal** - forming the upper posterior wall of the head
   - **Frontal** - the anterior division of each cerebral hemisphere
   - **Sphenoid** - a winged compound bone of the base of the cranium
   - **Ethmoid** - a light spongy cubical bone forming much of the walls of the nasal cavity and part of those of the orbits

   **Brain** - divided into three major areas:

   - **Cerebrum** - The largest of the three subdivisions of the brain, superiorly situated and sometimes called the “gray matter.” It controls willful movement and sensory information such as hearing, speech, visual perception, emotions and personality.

   The brain is protected and cushioned by approximately 75 ml of an internal fluid called Cerebral Spinal Fluid (CSF). The CSF also combats infection and cleanses the brain and spinal cord.
Cerebellum - situated posterior to the brain stem and is sometimes called the “little brain” or “white matter.” It coordinates the various activities of the brain, particularly movement, coordination and balance.

Brain Stem - broken down into four parts which connect the spinal cord to the brain and cranial nerves:

- Medulla - the most inferior part of the stem which contains the center that regulates respiratory rate, blood pressure, heart rate, breathing, swallowing and vomiting.
- Pons - sleep center and respiratory center.
- Midbrain - regulates muscle tone.
- Reticular Activating System - scattered throughout the brain stem and is important in arousing and maintaining consciousness.

2. **TYPES OF HEAD INJURIES**

   **Soft Tissue Injuries**

   Definition - injury to the overlying skin of the scalp, which may be in combination with injury to the skull, brain and/or face. (See figure 2)

   **Causes**
   - Penetrating trauma (rifle, impaled objects, missile wounds)
   - Blunt trauma (MVA, blast)

   **Signs and Symptoms**
   - Profuse bleeding no matter how minor the injury
   - Lacerations
   - Avulsions
   - Pain
   - Anxiety
   - Edema
   - Ecchymosis
   - Signs/symptoms of hypovolemic shock

   **Skull Injuries**

   **Open Skull Injuries**

   Definition - injury where cerebral substance is visible through a scalp laceration. Open head injuries usually combine lacerations of the scalp, fragmentation of the skull from fractures, and lacerations of the membranes that cover the brain. The brain may be relatively untouched, or it may be extensively bruised or lacerated.
Causes
- Penetrating trauma
- Blunt trauma

Signs and Symptoms
- Profuse bleeding no matter how minor the injury
- Crepitus
- Edema
- Depressions
- Deformities
- Skull or bony fragments visible

Closed Skull Injuries

Definition - in closed head injuries there may or may not be lacerations of the scalp, but the skull is intact, and there is no opening to the brain. Injury to the brain itself may be far more extensive in a closed head injury because more of the injuring force is transmitted deeper into the brain due to pressure build-up (see figure 3).

Causes
- Coup-Contrecoup - also known as a deceleration injury. It occurs when the brain strikes the frontal lobe of the skull, then is thrown back against the occipital lobe of the skull (or in the reverse order), causing the brain to bounce off both sides of the cranial vault, resulting in soft tissue damage.
- Blunt Trauma - rising intracranial pressure (ICP) produces complications because the brain is enclosed and pressure cannot be relieved.

Figure 3. Closed Head Injury

Figure 4. Pupils
Signs and Symptoms
- Crepitus around injury site
- Headache
- Neurological symptoms:
  - Altered LOC
  - Restlessness
  - Unequal pupils (see figure 4)

- Bruising, such as:
  Racoon Eyes (see figure 5) - discoloration of the soft tissue under the eyes indicates basilar skull fracture.

  Battle’s Sign (see figure 6) - discoloration of the soft tissue behind the ear indicates temporal bone fracture. This is a late sign and may not be readily seen.

- Drainage - drainage of cerebral spinal fluid from the ears, nose, or eyes. Blood or fluid (CSF) in the ears or nose may indicate a skull fracture.
  - Bradycardia
  - Increased systolic blood pressure
  - Nausea/vomiting
  - Decreased Respirations/Cheyne Stokes breathing pattern
  - Deformity of the skull (see figure 7).

Figure 5. Racoon Eyes
Figure 6. Battle’s Sign
Brain Injuries

Definition - results from contusion, hemorrhage and/or edema. Damage to the brain and associated intracranial hemorrhage may occur with or without scalp lacerations or skull fractures. If the cranial vault is intact, the resultant swelling or bleeding produces more brain injury by increasing the intracranial pressure.

Causes
- Blunt trauma
- Penetrating trauma
- Coup-Contrecoup injuries

Signs and Symptoms – in addition to the signs and symptoms for closed skull injuries, the following signs and symptoms may also indicate a brain injury:
- Unusual behavior patterns. You must be careful not to misinterpret these symptoms for a psychiatric casualty. (This is the number one indicator of an injury.)
- Altered level of consciousness
- Paralysis
- Convulsions/seizures
- Hyperthermia

Determining Level of Consciousness - The Glasgow Coma Scale (GCS) (see figure 8 below) is a quick and easy method for determining level of consciousness. It is a simple method for determining cerebral function and is predictive of casualty outcome. The GCS score is divided into three sections – eye opening, best verbal response, and best motor response. A score of less than 8 indicates a major injury, 9 to 12 indicates a moderate injury, and 13 to 15 indicate a minor injury. A score of 8 or below is an indication the casualty should be intubated. In the case of operating in a tactical setting, a GCS of less than 8 means to provide some means of an artificial airway (i.e. oral airway, nasal airway, or emergency cricothyroidotomy).
Eye Opening
Spontaneous eye opening 4
Eye opening on command 3
Eye opening to painful stimulus 2
No Eye opening 1

Best Verbal Response
Answers appropriately (oriented) 5
Gives confused answers 4
Inappropriate responses 3
Makes unintelligible noises 2
Makes no verbal response 1

Best Motor Response
Follows command 6
Localizes painful stimuli 5
Withdrawal to pain 4
Responds with abnormal flexion to painful stimuli (decorticate) 3
Responds with abnormal extension to pain (decerebrate) 2
Gives no motor response 1

Total ________

Figure 8. Glasgow Coma Scale (GCS)

3. TREATMENT OF HEAD INJURIES

- Provide and maintain patent airway
- Apply c-spine precautions
- Hemorrhage control. Cover open wounds securely enough to aid in the clotting process without pressing skull fragments or impaled objects inward by using donut o-ring.
- Fluid resuscitate to maintain a palpable radial pulse (Do not want to raise intracranial pressure)
- Do not remove foreign bodies or impaled objects
- Check for drainage of CSF from the wound, nose, or ears. Do not pack or suction nose and/or ears if CSF leakage is suspected. Do not let patient clear their nose by blowing. If the casualty has drainage from their nose, check to see if it is CSF by:
  - Use the Halo, or Target Test to check for CSF. Dip a 4 x 4 in the drainage then lay it flat and wait a few minutes. If there is CSF in the blood, the blood will collect in the center, while the CSF remains to the outside creating a halo around the blood.
- Give nothing by mouth (NPO)
- TACEVIC in the High Fowler’s position
- Do NOT give pain medications

NOTE: There is a high mortality rate associated with head trauma. All head trauma patients are assumed to have a cervical spine injury until proven otherwise. See the Military Acute Concussion Evaluation (MACE) information in the Traumatic Brain Injury (TBI) lesson.
4. **ANATOMY OF THE NECK**

**Structures**

- **Esophagus** - passage from the mouth to the stomach
- **Trachea** (windpipe) - air passage from the larynx to the lungs made of connective tissue and reinforced with 15-20 C-shaped cartilaginous rings
- **Thyroid gland** - stimulates the metabolism of all cells
- **Larynx** (voicebox) - the first part of the trachea which contains the vocal cords
- **Pharynx** - area that extends from the soft palate to the esophagus/trachea
- **Epiglottis** - leaf shaped structure that acts like a gate, directing air to the trachea and solids and liquids into the esophagus

**Vasculture**

- **Arteries** - left/right common carotid (carry blood to brain)
- **Veins** - left/right internal and external jugular (carry blood away from brain to heart)

**Cervical Spine**

- **Vertebrae** - seven cervical vertabrae
- **Spinal Cord** - protected by the cervical vertebrae

5. **TYPES OF NECK INJURIES**

Trauma of any kind to the neck is significant because of the risk of associated injuries to the respiratory tract, the alimentary tract (especially the esophagus), the major vascular structures, major nerves and the cervical spine.

**Structures**

- **Definition** - injury to associated anatomy of the neck most commonly the trachea and esophagus.

**Causes**

- Blunt trauma
- Penetrating trauma

**Signs and Symptoms**

- Subcutaneous emphysema
- Hematemesis
- Hemoptysis
- Dysphagia (difficulty swallowing)
- Dyspnea
- Hoarseness
- Deformity
Vasculature

Definition - injury to the carotid arteries and/or the jugular veins. These are the most commonly injured structures of the neck.

Causes
- Blunt trauma
- Penetrating trauma

Signs and Symptoms
- Hemorrhage
- Hemoptyensis
- Hematemesis

Cervical Spine

Definition - fractures of the cervical vertebrae which are very susceptible to injury because of the relation and position of the skull. These fractures may result in irreversible spinal cord injury.

Causes
- Compression injury (see figure 9).
- Flexion, hyperextension and hyperrotation
- Lateral bending

Signs and Symptoms
- Deformity
- Head fixed in an abnormal position
- Muscle spasms
- Parasthesia in the arms
- Pain
- Paralysis or other neural deficits

6. TREATMENT FOR NECK INJURIES

- Consider C-spine
- Control hemorrhage with occlusive dressing.
  Apply pressure only to the affected vessels
- Consider cricothyroidotomy if airway is compromised
- Administer fluids (see Combat Fluid Resuscitation lesson)
- NO PAIN MEDICATIONS!
- TACEVAC

The only definitive diagnosis for C-spine injury is x-ray. Patient should remain in C-collar until x-rays are read!

FYI!
Cricothyroidotomy may be necessary if neck trauma causes blood to be present on the vocal cords, thus causing laryngo-spasms.
7. **ANATOMY OF THE FACE** (see figure 10)

The facial bones form the structure of the face in the anterior skull but do not contribute to the cranial vault.

The major facial bones are:
- Nasal
- Zygomatic - a bone of the face below the eye that in mammals forms part of the zygomatic arch and part of the orbit
- Right/left Maxilla - bones that lie on each side of the upper jaw
- Mandible (jawbone) - the lower jaw.

![Figure 10. Major Facial Bones](image)

8. **TYPES OF FACIAL INJURIES**

Generally serious because of the danger of hemorrhage due to the vast blood supply of the area and obstruction of the respiratory passages.

**Soft Tissue Injuries**

**Definition** - damage to the soft tissues of the face without bone injuries

**Causes**
- Blunt trauma
- Penetrating trauma

**Signs and Symptoms**
- Massive hemorrhage even with minor wounds
- Edema
- Laceration
- Ecchymosis
- Avulsion
Bone Injuries (Maxillofacial and Mandibular)

**Definition** - fracture of the major bones of the face (maxillofacial and mandibular). These fractures require great force and may be open or closed.

**Causes**
- Blunt trauma
- Penetrating trauma

**Signs and Symptoms**
- Lacerated gums may indicate an underlying fracture
- Casualty cannot open mouth without pain
- Misaligned teeth
- Difficulty swallowing
- Pain at fracture site
- Edema
- Facial asymmetry
- Epistaxis (Nose bleed)
- Ecchymosis
- Lacerations
- Visual disturbances
- Limited ocular movements
- Crepitus

Eye Injuries

**Definition** - injuries to the eyes that may be associated with other forms of head injury. Injury to the structures of the orbit and eye are not uncommon and often result from direct trauma to the face.

**Causes**
- Blunt trauma
- Penetrating trauma
- Burns
- Foreign objects-debris

**Signs and Symptoms**
- Loss of vision
- Pain
- Anxiety
- Hemorrhage
- Subconjunctival hemmorhage
- Orbital bony deformity
- Intraorbital deformity

**Fractured Nose** - prior to control of bleeding, you must determine that there is no cerebral spinal fluid escaping. If fluid is escaping, treat as a skull fracture. Signs and symptoms will include blood or CSF from the nose and bruising.
9. **TREATMENT OF FACIAL INJURIES**

**Soft tissue injuries**
- Consider C-spine precautions
- Assess and secure airway
- Hemorrhage control
- Fluid resuscitation protocol for associated shock

**Bone injuries**
- Maintain open airway. Consider use of Nasopharyngeal Airway (NPA)
- Control hemorrhage
- **NO PAIN MEDICATIONS!**
- Cold pack
- Modified Barton bandage for mandibular fracture (see figure 11)
- TACEVAC

**Eyelid laceration and injury to the globe (Open Globe)**
- If the eyelid is lacerated, consider the possibility that the globe has been penetrated.
- Field treatment consists of covering the eye with a protective rigid shield (NOT a pressure patch) that is placed over the bones of the orbit.
- Avoid any pressure on the eye that might force intraocular contents out through a corneal or scleral laceration.
- In combat, only shield the affected eye. Member can function effectively with one eye. Member becomes a litter patient if both eyes are covered.
- A penetrating injury to the eye is not always obvious. Clues include hemorrhage and swelling of the conjunctiva, dark uveal tissue (the colored iris) that protrudes through the border of the cornea, distorted pupil, or decrease in vision.
- Consider the mechanism of injury, which can also be a clue.

**Treatment of penetrating eye injuries**
- Check visual acuity. A useful field quantification of visual acuity is (from best to worst): (1) able to read print; (2) can count the number of fingers held up; (3) can see hand motion; and (4) can see light. Vision should be checked with the other eye closed or covered.
- Cover eye immediately with a rigid eye shield (see Figure 12) – NOT a pressure patch
- If the rigid eye shield isn’t available, an intact set of protective eyewear may be placed on the casualty to protect the eyes from further trauma.
- Have casualty take 400 mg moxifloxacin in his/her Combat Pill Pack
- Give IV/IM antibiotics if unable to take PO meds
- TACEVAC as soon as possible.
- If shrapnel is suspected, removal of the shrapnel can wait several days as long as aggressive antibiotic therapy is provided and the injury to the eye is repaired as soon as possible after the injury is sustained.

**Treatment for chemical burns of the eye**

- Field treatment consists of irrigating the eyes with a sterile isotonic saline solution. If not available, use Ringers Lactate through IV tubing. Regular water can worsen Alkali burns.
- Flush eyes 5-10 minutes for acid burns
- Flush eyes 20 minutes for alkali

**Treatment for thermal burns of the eye**

- The blink reflex usually causes the eye to close in response to heat therefore, thermal burns tend to affect the eyelid instead of the cornea.
- Eyelid burns should be cleaned thoroughly with sterile isotonic saline solution or Ringers Lactate followed by bacitracin and a saline moistened dressing on the lid.
- Thermal burns involving the cornea should be irrigated thoroughly with sterile isotonic saline solution or Ringers Lactate in order to remove debris and provide cooling.
- Apply a saline moistened dressing and place the eye shield.
- Casualties with both the eyelid and the globe burned should be evacuated as soon as possible so the eyelid does not stick to the globe.

**Treatment for light injuries**

- Flash Blindness: visual impairment from a sudden light flash of extremely high intensity. It is painless and can be temporary or permanent.
- Cover eye with loose dressing
- Flash burns: exposure to intense UV rays from natural (sun) or artificial (welding, tanning beds) sources. It is basically a sunburn to the cornea and/or conjunctiva (see snow blindness in the Environmental Cold Injuries lesson). It is very painful and usually not noticed until hours after the initial injury.
- Treat with moist compresses to the eyes, and light protection (a dark place or sunglasses).

**Treatment for impaled object**

- Do not remove the object
- Make a thick dressing and cut a hole in the center the size of eye opening
- Pass dressing over impaled object
- Position crushed cup over dressing and bandage in place
- Elevate head to decrease intraocular pressure
Treatment for protruding globe

- DO NOT attempt to place the eye back in socket
- Apply bulky dressing around eye, moist gauze over the globe and cover with a cup secured in place.
- Monitor and TACEVAC all eye injuries

Treatment of nose injuries

- Control hemorrhage from nose by pinching nostrils together (if possible). Do not tilt the casualty’s head back due to postnasal drainage
- Apply ice or a cold pack to bridge of nose
- When bleeding slows, fold a 4x4 guaze in half and tape underneath the nostrils to absorb drainage.
- Monitor and TACEVAC
CASUALTY ASSESSMENT AND THE HEAD, NECK, AND FACE

**Care Under Fire Phase:** Head, Neck, or Face injuries are not addressed in the Care Under Fire phase.

**Tactical Field Care Phase:** During Tactical Field Care, you will be required to inspect the head, neck, and face for any signs of injury. This includes looking for bone deformities and soft tissue injuries. Head and face trauma can affect the airway therefore, you must always suspect the potential of airway difficulties. When head trauma has occurred, consider the possibility of Traumatic Brain Injury (TBI) and any mechanism of injury that causes head and face trauma can also injure the cervical spine. Use caution to protect the cervical spine, if possible. You must visually inspect the eyes, ears, nose, and throat. Complete a head to toe assessment using DCAP-BTLS noting and treating additional injuries. Determine if vascular access is required (see Tactical Fluid Resuscitation lesson) and give fluids if necessary. Consider pain medications and give antibiotics for all open wounds. Never give pain medications to a casualty with a head injury and do not give fluids by mouth in case the casualty has a compromised swallow reflex from their head injury. Continually reassess all care provided, document care given, TACEVAC.

**REFERENCE**
Prehospital Trauma Life Support, current Military Edition
1. Identify the function of the Cerebellum.

2. List the six key points for treatment of a neck wound.

3. List the appropriate treatment for an eyelid laceration to one eye in a combat situation.

4. What is the number one indicator of a concussion?