

Management of Head Injury

American College of Surgeons
Committee on Trauma
April 1998



Management of Head Injury

This publication is designed to offer information suitable for use by an appropriately trained physician. The information provided is not intended to be comprehensive or to offer a defined standard of care. The user agrees to release and indemnify the American College of Surgeons from claims arising from use of the publication.

by **Thomas G. Saul, MD, FACS**, in conjunction with the Joint Section on Neurotrauma and Critical Care of the American Association of Neurological Surgeons and Congress of Neurological Surgeons

I. Initial Management

A. Airway

Intubate* if:

1. Airway or ventilation is inadequate
2. Patient remains unresponsive (cannot protect airway)
3. Patient requires sedation for diagnostic maneuvers

**If C-spine injury is suspected, intubation should be performed by the most experienced person available. Use techniques that cause the least movement of head and neck.*

B. Breathing

- Maintain P_{CO_2} at normal levels (>35 mmHg)
- Obtain chest X ray as soon as possible
- Check ABGs or end tidal CO_2 regularly

C. Circulation

- Shock is usually due to bleeding from other sources
- Control bleeding
- Fluid resuscitate with isotonic saline solutions as dictated by other body injuries
- Shock will worsen the head injury (keep systolic blood pressure >90 mmHg)

C1 Cervical Spine

- Immobilize head and neck
- Obtain C-spine film as soon as possible

II. Initial Neuro-Assessment

Key History

- Mechanism of injury
- Response at scene
- Neuro-examination at scene
- Changes in neuro-status

Examination: Glasgow Coma Scale

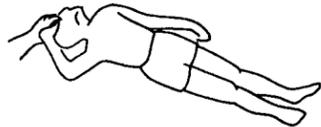
Best Eye Opening

- 4 Spontaneously
- 3 Voice
- 2 To pain
- 1 Not at all

Best Verbal Response

- 5 Converses, oriented
- 4 Converses, disoriented
- 3 Inappropriate words
- 2 Incomprehensible sounds
- 1 No verbalization

Best Motor Response

- | | | |
|------------------------------------|---|---|
| 6 Obeys | Follows motor commands |  |
| 5 Localizes | Clearly pushes painful stimuli away |  |
| 4 Withdraws (flexion-withdrawal) | Only withdraws arm or leg to painful stimuli |  |
| 3 Abnormal flexion (decorticate) | Flexion of arms with extension of legs to stimuli |  |
| 2 Abnormal extension (decerebrate) | Extension of all extremities to painful stimuli |  |
| 1 Flaccid | No response to painful stimuli | |

Glasgow Coma Scale Total = 3–15

Note Symmetry of Motor Examination

- Do both arms move the same and equally strong?
- Do both legs move the same and equally strong?

Asymmetrical motor responses should increase suspicion of an intracranial mass lesion that requires immediate operation.

Examine Pupils and Record

	SIZE	SHAPE*	REACTION*
Right	_____	_____	None _____ Brisk _____ Sluggish _____
Left	_____	_____	None _____ Brisk _____ Sluggish _____

*An oval pupil or sluggish reaction may indicate impending herniation.

III. Immediate Neurosurgical Management

Obtain CT scan of head if:

- Patient is comatose
- $GCS \leq 13$
- Lateralizing neuro-examination reveals
 - unequal pupils
 - focal weakness
- Patient with abnormal level of consciousness is to be sedated for diagnostics or treatment

Obtain neurosurgical consultation if:

- Patient is comatose
- $GCS \leq 13$
- Lateralizing neuro-examination reveals
 - unequal pupils
 - focal weakness
- CT scan is abnormal

IV. Recognize and Treat Herniation

A. Look for:

- Sudden deterioration in level of consciousness (if patient initially responsive)
- Dilating pupil
- Deterioration of motor response (especially if on side opposite dilating pupil)

B. Treatment

- Contact neurosurgeon
- Hyperventilation ($P_{CO_2} = 25-30$ mmHg)
- Mannitol, 1 g/kg IV push (if BP stable and after neurosurgical consultation)
- Immediate CT scan or take to operating room for intracranial operation (as directed by neurosurgeon)

V. Other Considerations

- A. Lateral C-spine X ray (C1–C7/T1). Spine fracture can be present in 5%–20% of patients with severe head injury.
- B. Control bleeding.
- C. Immobilize obvious extremity fractures.
- D. Remove from spine board, BUT log-roll until entire spine is cleared radiographically, especially if C-spine fracture is present. 5%–10% of patients with one spine fracture may have another spine fracture.

VI. Pitfalls

1. Assume a spine injury until it is ruled out.
2. Use an orogastric tube, not a nasogastric tube, if an anterior basilar skull fracture or midface fracture is suspected.
3. Hyperextension injury of head and neck or direct trauma to neck can cause a carotid artery injury.
4. Systolic blood pressure <90 mmHg can lead to secondary brain injury.
5. Never attribute neurologic abnormalities solely to the presence of drugs or alcohol.