

PHTLS

Prehospital Trauma Life Support

NINTH EDITION

LESSON 7B

Disability: Spinal Trauma

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Lesson Objectives

- Identify the signs and symptoms of spinal injury and neurogenic shock.
- Describe the pathophysiology of spinal injury and neurogenic shock.
- Demonstrate evidence-based care for spinal injury.
- Identify the indications for spinal motion restriction.
- Select appropriate pain management interventions.

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Presentation/Dispatch

- Warm and sunny afternoon, temp: 82°F (27°C)
- Dispatch Information
 - 24-year-old male
 - Patient is unable to move his arms or legs after diving head-first into backyard pool.
 - Patient has been removed from the pool by bystanders.



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Discussion

- What are your concerns about the scene?
- What are your concerns about this patient?
- Do you suspect a traumatic spinal injury?
- Should manual spinal stabilization be performed?

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Scene Size-Up and General Impression

- Scene size-up
 - Scene appears safe.
 - Patient dove into pool and did not surface.
 - Bystanders pulled patient from pool and placed him on pool deck.
- General impression
 - Patient lying supine
 - Complaining of neck pain

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Primary Survey

- Primary survey
 - X—No severe external bleeding found
 - A—Open, patent
 - B—Fast, normal chest rise
 - C—Slow, thready radial pulse; skin is pink and warm
 - D—GCS = 10 (E4, V5, M1)
 - E—Minor abrasion to forehead

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Spinal Cord Injuries

- Causes
 - MVCs: 48%
 - Falls: 21%
 - Penetrating injuries: 15%
 - Sports injuries: 14%
 - Other: 2%
- Spinal cord injuries can be life threatening.
- Severity is dependent on:
 - Region of the cord injured
 - Damage to nearby structures

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Anatomy and Physiology of the Spine

- Cervical Spine Anatomy

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Pathophysiology of Spinal Cord Injury

- Primary injury
 - Moment of initial impact
- Secondary injury
 - After the initial impact
- Prehospital care should be directed at minimizing or preventing secondary injury.
- Progressing spinal cord injury can result in poor outcome.

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Secondary Injury: Intrinsic Causes

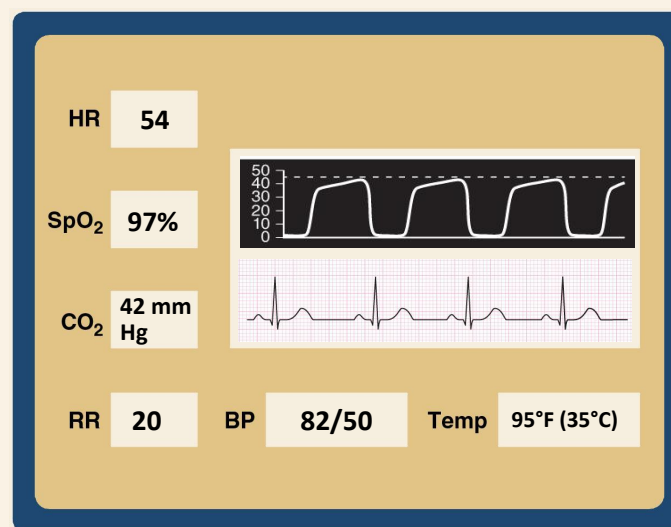
- Intrinsic causes
 - Edema
 - Hematoma
 - Increased ICP
 - Seizures

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Secondary Injury: Systemic Causes

- Systemic causes
 - Anemia (hemorrhage)
 - Hypotension
 - Hypocarbica/hypercarbia
 - Hypoglycemia/hyperglycemia
 - Hypoxia/hyperoxia

Vital Signs



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Secondary Survey

- Head: Abrasion to the top of the head with minimal bleeding
- Neck: Pain on palpation to C5 and C6 without deformity/crepitus
- Chest: Lungs clear, diaphragmatic breathing
- Abdomen: Soft, nontender, no signs of trauma
- Pelvis: Stable
- Genitals: Priapism noted
- Back: Unremarkable (assessed when moving patient onto splinting device)
- Extremities: Patient is unable to feel/move his arms or legs.

Discussion

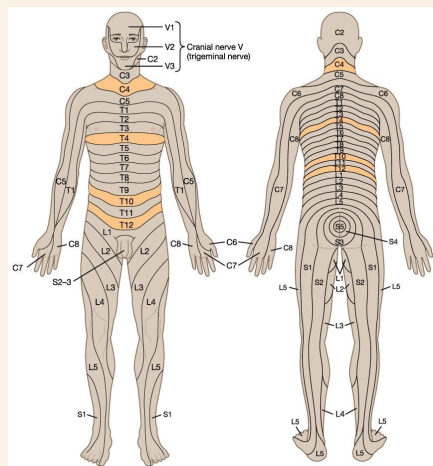
- What pathologic processes explain the patient's presentation?
- What immediate interventions need to be performed?

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Assessing Sensory Function

- Dermatome assessment can be helpful in determining the level of a spinal injury.
- Loss of sensation at:
 - Clavicles: C4/C5 injury
 - Nipples: T4 injury
 - Umbilicus: T10 injury
 - Pelvic rim: T12 injury



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Signs and Symptoms of Spinal Cord Injury (1 of 2)

- Pain in the neck or back
- Pain on movement of the neck or back
- Pain on palpation of the posterior neck or midline of the back
- Deformity of the spinal column

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Signs and Symptoms of Spinal Cord Injury (2 of 2)

- Guarding or splinting of the muscles of the neck or back
- Paralysis, paresis, numbness or tingling in the legs or arms at any time after the incident
- Signs and symptoms of neurogenic shock
- Priapism (in male patients)

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Spinal Motion Restriction (1 of 2)

- Spinal motion restriction based on MOI
 - The primary focus of prehospital care is to recognize the indications for spinal motion restriction rather than to attempt to clear the spine.
 - Mechanism of injury can be used as an aid to determine indications for spinal immobilization.



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Spinal Motion Restriction (2 of 2)

- Continued spinal motion restriction is based on the patient assessment.
 - A complete physical assessment coupled with good clinical judgment will guide decision making.

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Indications for Spinal Motion Restriction

- Any blunt mechanism that produced a violent impact on the head, neck, torso, or pelvis
- Incidents that produce sudden acceleration, deceleration, or lateral bending forces to the neck or torso
- Any fall from a height, especially in older persons
- Ejection or a fall from any motorized or otherwise powered transportation device
- Any shallow-water diving incident

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Discussion (1 of 3)

- Is the patient reliable to evaluate his condition?
- What conditions would be concerning and make you doubt a patient's reliability?

Discussion (2 of 3)

- How should this patient be packaged for transport?
- How would packaging be different if the patient were unconscious?



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Discussion (3 of 3)

- What condition could be causing the patient's vital signs to be abnormal?
- How should this patient be managed?

Spinal Shock vs. Neurogenic Shock

	Spinal Shock	Neurogenic Shock
Definition	Immediate temporary loss of total power, sensation and reflexes below the level of injury	Sudden loss of the sympathetic nervous system signals
Blood pressure	Hypotension	Hypotension
Pulse	Bradycardia	Bradycardia
Motor	Flaccid paralysis	Variable
Time	48-72 hours immediate after SCI	48-72 hours immediate after SCI
Mechanism	Peripheral neurons become temporarily unresponsive to brain stimuli	Disruption of autonomic pathways □ loss of sympathetic tone and vasodilation

Source: <http://www.orthobullets.com/spine/2006/spinal-cord-injuries>

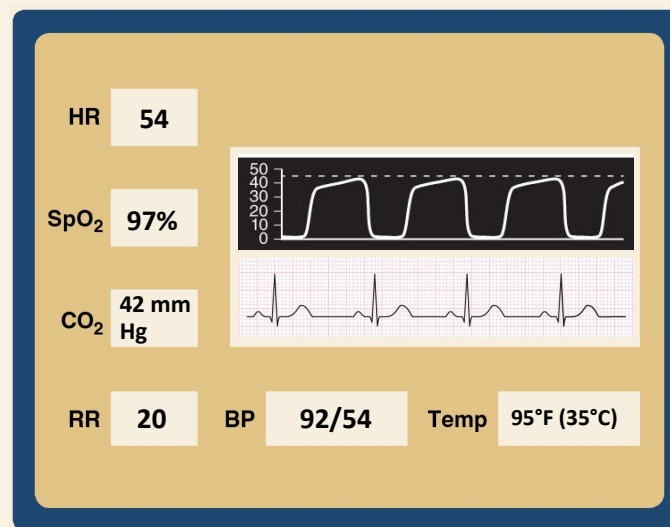
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Management Options

- Maintain a patent airway.
- Maintain SpO₂ between 95 and 99%.
- Titrate IV fluids to maintain systolic BP of 90 mm Hg.
- Spinal motion restriction to prevent further injury.
- Maintain normothermia.
- Transport to appropriate facility.

Reassessed Vital Signs



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Discussion

- Could this patient have been given pain medications?
- Could atropine have been used for the bradycardia?
- Should steroids be used as a treatment for spinal cord injuries?

Case Summary

- Transported by ground ambulance to a level I trauma center
- Patient had an incomplete spinal cord injury with excellent potential for neurologic recovery.
- Patient was discharged several weeks later to a rehabilitation facility and discharged home 3 months later with almost full mobility; however, he will require further rehabilitation over time.

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Critical Actions

- Disability assessment to identify potential life threats
- Determination of the best management for this patient
- Reassessment of interventions

Wrap-Up

- Spinal motion restriction should be determined by MOI and through a thorough patient examination.
- Immobilization should focus on appropriate treatment and reducing secondary injury to the spine.
- Neurogenic shock should be treated as appropriate to maintain good perfusion to the spinal cord to prevent further damage and a poor neurologic outcome.