Objectives

1. Define key terms introduced in this chapter.
2. Describe the structure and function of the spinal column, spinal cord, and tracts within the spinal column (slides 17-19).
3. Recognize common mechanisms of spinal injury and describe the incidence of neurological deficits in patients with spinal column trauma (slides 20-21).

Objectives

4. Give examples of forces that would produce each of the following mechanisms of spinal injury (slide 21):
   a. Compression
   b. Flexion
   c. Extension
   d. Rotation
   e. Lateral bending
   f. Distraction
   g. Penetration
Objectives

5. Differentiate spinal column injury and spinal cord injury (slides 22-23).

6. Describe the concept of complete spinal cord injury and differentiate between the concepts of spinal shock and neurogenic hypotension (slides 24-27).

7. Describe the concept of incomplete spinal cord injury and syndromes that may result from incomplete spinal cord injury (slides 28-29).

8. Use scene size-up, patient assessment, and patient history to develop an index of suspicion for spinal injuries (slides 31-36).

Objectives

9. Given a series of scenarios, demonstrate the assessment-based management of patients suspected of having an injury to the spine (slides 31-41).

10. Demonstrate the assessment of pulse, motor function, and sensory function in the extremities of a patient who is suspected of having an injury to the spine (slides 35-37).

11. Recognize signs and symptoms of injury to the spinal column and spinal cord (slides 36-37).

12. Explain how complications of spinal injury may result in inadequate breathing, paralysis, and inadequate circulation (slide 37).

Objectives


14. Describe correct immobilization techniques for the following (slides 54-59):
   a. Supine or prone patient
   b. Standing patient
   c. Seated patient

15. Describe the indications for rapid extrication and the correct procedures for rapid extrication (slides 60-61).
Objectives

16. Explain special handling and immobilization considerations when spinal injury is suspected for the following (slides 63-68):
   a. Helmet removal
   b. Football injuries, including removal of face mask and immobilization
   c. Infants and children, including extrication from a car seat

Multimedia Directory

- Slide 45  Cervical Injuries and Application of a Cervical Collar Video
- Slide 47  When to Use a Long Board Video
- Slide 50  How to Use a KED Video

Topics

- Anatomy and Physiology of Spine Injury
- Emergency Care for Suspected Spine Injury
- Guidelines for Immobilization
- Special Considerations
CASE STUDY

Dispatch

EMS Unit 106

Respond to Rita’s Dance and Gym at 1403 Lisbon Road for a 12-year-old female who has fallen.

Time out 1552

Upon Arrival

- Assistant tells you that a young girl fell during a gymnastic meet
- A woman says, “She missed a maneuver off the top bar. She fell and hit the bottom bar with the middle of her back, then landed head first on the floor.”
How would you proceed to assess and care for this patient?

Anatomy and Physiology of Spine Injury

The Nervous System

Parts of the Nervous System
Parts of the Nervous System

- Central nervous system (CNS)
- Peripheral nervous system (PNS)
- Voluntary nervous system
- Autonomic nervous system

The Skeletal System

- Skull
- Vertebrae
- Spinal column
  - Cervical spine
  - Thoracic spine
  - Lumbar spine
  - Sacral spine
  - Coccyx
Spinal Cord

- Motor tracts
- Pain tracts
- Light touch tracts

Common Mechanisms of Spine Injury

- Causes
- Need for spine immobilization
Spinal (Vertebral) Column Injury vs. Spinal Cord Injury

• Spinal column injury
• Spinal cord injury

Complete Spinal Cord Injury
Complete Spinal Cord Injury

- Definition
- Presentation of patient

Spinal (Vertebral) Column Injury vs. Spinal Cord Injury

Spinal Shock

- Definition
- Presentation
- Neurogenic hypotension
Spinal (Vertebral) Column Injury vs. Spinal Cord Injury

Incomplete Spinal Cord Injury

• Central cord syndrome
• Anterior cord syndrome
• Brown-Séquard syndrome

Emergency Care For Suspected Spine Injury
Assessment-Based Approach: Spine Injury

Scene Size-Up

- Scene safety
- Mechanism of injury

Primary Assessment
Primary Assessment

• General impression
• Mental status
• ABCs
• Transport priorities

Secondary Assessment

Assessment-Based Approach: Spine Injury
Complications of Spine Injury

• Inadequate breathing effort
• Paralysis
• Inadequate circulation

Assessment-Based Approach: Spine Injury

Emergency Medical Care

• Take Standard Precautions
• Establish manual in-line stabilization
• Assess ABCs
• Assess pulse, motor function, sensation
• Assess the cervical region
• Apply cervical spine immobilization collar
• Immobilize patient to long backboard
• Reassess pulse, motor function, sensation
• Transport
Assessment-Based Approach: Spine Injury

Reassessment

- Reassess every five minutes
- ABCs
- Vital signs
- Signs of shock
- Mental status
- Interventions

Guidelines for Immobilization
Tools

Cervical Spine Immobilization Collar

Cervical Spine Immobilization Collars

• Purpose
• Sizing
• Application

Cervical Injuries and Application of a Cervical Collar

Click here to view a video on cervical injuries and application of a cervical collar.

Return to Directory
Tools

Full Body Spine Immobilization Devices

When to Use a Long Board

Click here to view a video on when to use a long board.

Return to Directory

• Types
• Use
• Application covered in EMS Skill 32-9

Full Body Spine Immobilization Devices
Tools

Short Spine Immobilization Devices

How to Use a KED

Click here to view a video on how to use a KED.

Return to Directory

Short Spine Immobilization Devices

- Types
- Use
- Application covered in EMS skills 32-9
Tools

Other Immobilization Equipment

- Head immobilizer
- Cravats
- Straps

Immobilization Techniques

Immobilizing a Supine or Prone Patient
Immobilizing a Supine or Prone Patient

- Log roll patient onto spine board
- Pad voids
- Immobilize torso
- Immobilize head
- Secure legs

Immobilization Techniques

Immobilizing a Standing Patient

- Slowly lower board to the ground while maintaining in-line stabilization
- Secure patient to long backboard
- Cervical spine stabilization and cervical collar placement
- Position the long board behind patient
- Two EMTs stand on either side of patient
Immobilization Techniques

Immobilizing a Seated Patient

- Use manual in-line stabilization and cervical collar
- Place device behind patient and secure
- Position patient onto long backboard
- Secure to long backboard

Immobilization Techniques

Rapid Extrication

Back to Objectives
Removal criteria
Helmet removal and techniques

Helmets

Football Injuries

Removal of face mask
Immobilization of the player
Infants and Children

• Pad shoulders
• Proper cervical collar sizing
• Extrication from car seat

CASE STUDY

Follow-Up
**CASE STUDY**

**Primary Assessment**
- Partner establishes manual in-line spine stabilization
- Patient states her legs are numb and tingly
- RR: 28; P: 125; SpO₂: 98 percent on room air

**CASE STUDY**

**Secondary Assessment**
- Coach witnessed fall, instructed patient to lie still
- Patient complains of pain around C6 upon palpation
- Chest, abdomen, and pelvis have no signs of injury

**CASE STUDY**

**Secondary Assessment**
- Has movement and some sensation in pinched feet
- Place cervical collar; log roll patient onto long backboard
- BP: 104/76 mmHg; P: 118; skin cool, pale, and dry
CASE STUDY

Treatment and Reassessment
- Patient complains of pain in back from backboard
- Assess motor and sensory function and find no change
- Reassess and record vital signs
- No other change

CASE STUDY

Treatment and Reassessment
- Give report to hospital; transfer care to ED staff
- Later that day you find out that the patient has a spinal contusion and will completely recover

Critical Thinking Scenario
- Unknown age elderly female complaining of severe weakness to her upper extremities
- Patient states that she fell while coming down the stairs and struck her face on the floor
Critical Thinking Scenario

Physical exam:
• She is alert and responding appropriately to your questions
• Contusion to the bottom of her chin
• Pain to her neck and cervical spine
• The anterior and posterior neck areas are tender; no deformities are noted
• Pupils are equal and reactive to light

Critical Thinking Scenario

Physical exam, continued:
• Breath sounds equal and clear bilaterally
• Abdomen is soft and nontender
• Pelvis is stable
• Radial pulses are present
• She has severe weakness in the upper extremities, but she’s moving her lower extremities with no problem

Critical Thinking Scenario

SAMPLE history:
• S – Denies getting dizzy, lightheaded, or passing out
• A – Unknown
• M – Takes Coumadin for the a-fib
• P – History of arthritis and atrial fibrillation
• L – Last ate ~20 minutes prior to her fall
• E – Her fall was caused by tripping over her slipper
Critical Thinking Scenario

Vital signs:
• BP: 168/88 mmHg
• HR: 92 bpm at the radial pulse
• RR: 22 per minute with good tidal volume
• Skin is warm and dry
• SpO₂ is 95 percent on room air

Critical Thinking Questions

1. What initial emergency care would you provide to the patient?
2. What would you assess in your neurological exam on the patient?
3. Based on the presentation, what type of spinal cord injury do you suspect?
4. What other assessment findings would confirm the type of spine injury suspected?
5. How would you manage the spine injury?

Reinforce and Review

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