

1 **Chapter 24 Spinal Trauma**

2 Introduction to Spinal Injuries (1 of 2)

- Annually 15,000 permanent spinal cord injuries
- Commonly men 16-30 years old

Mechanism of Injury:

- Vehicle crashes: 48%
- _____ : 21%
- _____ trauma: 15%
- _____ injury: 14%

3 Introduction to Spinal Injuries (2 of 2)

- 25% of all spinal cord injuries occur from _____ handling of the spine and patient after injury
- _____, based upon MOI, that patient's have a spinal injury.
- Manage ALL spinal injuries with immediate and _____ care
- Lifelong care for spinal cord injury victim exceeds \$1 million.
- Best form of care is public safety and _____ programs.

4 Spinal Anatomy and Physiology: Vertebral Column (1 of 2)

- _____ bones comprise the spine.
- Function
 - Skeletal support structure
 - Major portion of axial skeleton
 - _____ container for spinal cord
- Vertebral body
 - Major _____ -bearing component
 - Anterior to other vertebrae components

5 Spinal Anatomy and Physiology: Vertebral Column (2 of 2)

6 Cervical Spine (1 of 2)

- _____ vertebrae
- Sole support for head
 - Head weighs 16–22 pounds
- C-1 (atlas)
 - Supports _____
 - Securely affixed to the occiput
 - Permits _____

7 Cervical Spine (2 of 2)

- C-2 (axis)
 - Odontoid process (dens)

- Projects _____
- Provides _____ point so head can rotate
- C-7
 - _____ spinous process (vertebra prominens)

8 Thoracic Spine (2 of 2)

- _____ vertebrae
- 1st rib articulates with _____
 - Attaches to transverse process and vertebral body
- Next nine ribs attach to the _____ and superior portion of adjacent vertebral bodies
 - _____ rib movement and provides increased rigidity

9 Thoracic Spine (2 of 2)

- Larger and _____ than cervical spine
 - Larger muscles help to ensure that the body stays erect
 - Supports _____ of the thoracic cage during respirations

10 Lumbar Spine

- _____ vertebrae
- Bear forces of _____ and lifting above the pelvis
- _____ and thickest vertebral bodies and intervertebral disks

11 Sacral Spine

- _____ fused vertebrae
- Form posterior plate of _____
- Help protect urinary and reproductive organs
- Attach pelvis and lower extremities to _____ skeleton

12 Coccygeal Spine

- _____ - _____ fused vertebrae
- Residual elements of a _____

13 Spinal Cord

- Transmits _____ input from body to brain through 31 pairs of nerves
- Conducts motor impulses from brain to muscles and organs
- Protected by 3 layers of meninges
 - _____ Mater
 - _____ Mater
 - _____

14 Mechanisms of Spinal Injury (1 of 3)

Extremes of Motion:

- _____
- Hyperflexion: “Kiss the Chest”
- Excessive _____
- _____ bending

15 Mechanisms of Spinal Injury (2 of 3)

Axial Stress:

- _____ Loading: compression of spine
 - Falls, lifting too much weight
 - Compression common between T-12 and L-2
- _____ : Opposite of axial loading: stretching of the spine
 - Hangings, _____ injuries
- Combination
 - Distraction/Rotation or Compression/Flexion

16 Mechanisms of Spinal Injury (3 of 3)

Other MOI:

- Direct
- _____
- _____ trauma
- _____

17 Mechanisms Causing Spinal Injury

18 Column Injury (1 of 2)

- Movement of vertebrae from normal position
- _____ (incomplete dislocation) or Dislocation
- Fractures
 - Spinous process and _____ process
 - Vertebral _____
- Ruptured intervertebral _____

19 Column Injury (2 of 2)

Common sites of injury:

- C-1/C-2: _____ vertebrae
- C-7: Transition from flexible cervical spine to _____
- T-12/L-1: Different _____ between thoracic and lumbar regions

20 Cord Injury (1 of 4)

Concussion:

- Similar to cerebral concussion
- _____ and transient disruption of cord function

Contusion:

- _____ of the cord
- Tissue damage, vascular leakage and _____

21 Cord Injury (2 of 4)

Compression Injury:

- Secondary to:
 - displacement of the vertebrae
 - _____ of intervertebral disk
 - displacement of vertebral bone _____
 - _____ from adjacent tissue

22 Cord Injury (3 of 4)

Laceration:

- Causes
 - Bony _____ driven into the vertebral foramen
 - Cord may be _____ to the point of tearing
- Hemorrhage into cord tissue, swelling and disruption of _____
- Hemorrhage is also associated with contusion, laceration, or stretching

23 Cord Injury (4 of 4)

Transection Cord Injury:

- Injury that partially or completely _____ the spinal cord
- S/S depends on _____ of transection

24 Complete Transection

- Cervical Spine:
 - _____
 - Incontinence
 - Respiratory _____
- Below T-1
 - Incontinence
 - _____

25 Points of Paralysis

26 Incomplete Transection Cord Injury (1 of 2)

- _____ Cord Syndrome
 - Anterior vascular disruption
 - Loss of motor function and sensation of pain, light touch, & temperature below injury site
 - Retain motor, positional and vibration sensation
 - _____ injury
- _____ Cord Syndrome

- Hyperextension of cervical spine
- Motor weakness affecting upper extremities
- _____ dysfunction

27 Incomplete Transection Cord Injury (2 of 2)

- Brown-Sequard's Syndrome
 - Penetrating injury that affects _____ side of the cord
 - _____ (injured side) sensory and motor loss
 - _____ (opposite side) pain and temperature sensation loss

28 General S/S of Spinal Injury

- Extremity _____
- Pain with & without movement
- Tenderness along spine
- Impaired breathing
- Spinal _____ (rare)
- _____
- _____
- Loss of bowel or bladder control
- Nerve impairment to extremities

29 Spinal Shock (1 of 2)

Spinal shock is a temporary form of _____ shock that presents with hypotension, _____, and the signs and symptoms of cord injury.

30 Spinal Shock (2 of 2)

- _____ insult to the cord
- Affects body below the level of injury
- Affected area may be:
 - Without feeling
 - Loss of movement (_____ paralysis)
 - Frequent loss of bowel & bladder control
 - Priapism
 - Hypotension secondary to _____

31 Neurogenic Shock (1 of 2)

- Spinal-Vascular Shock
- Occurs when injury to the spinal cord disrupts the brain's ability to control the body
- Loss of _____ tone
- Dilation of arteries and veins which;
 - _____ vascular space
 - Results in relative hypotension
 - Reduced cardiac _____

-Reduction of the strength of contraction

- 32 Neurogenic Shock (2 of 2)
- Autonomic Nervous System (ANS) loses sympathetic control over adrenal medulla
 - Unable to control release of _____ & norepinephrine
 - Thus warm dry _____
 - Could depress _____
- 33 S/S of Neurogenic Shock
- _____
 - _____
 - Cool, Moist & Pale skin above the injury
 - Warm, Dry & Flushed skin _____ the injury
 - Priapism in males
- 34 Other Causes of Neurologic Dysfunction
- Any injury that affects the nerve impulse's path of travel
 - _____
 - Dislocations
 - _____
 - _____ syndrome
- 35 Assessment of the Spinal Injury Patient
- 36 Scene Size-Up
- Put special emphasis on your analysis of the mechanism of injury with a potential spinal injury patient.
 - Determine _____ of spinal trauma
 - Maintain suspicion with _____ injuries
 - If unclear about MOI take spinal precautions
- 37 Primary Assessment (1 of 2)
- ABC's
 - Immobilize spine as needed
 - _____
 - Consider Oral or _____ Intubation if required
 - Maintain in-line _____ c-spine control
- 38 Primary Assessment (2 of 2)
- Control C-spine
 - _____ injury
 - Intoxicated patients
 - All _____ to the torso
 - Maintain manual stabilization
 - Vest style versus rapid extrication
 - Maintain _____ alignment

– Increase of pain or resistance, restrict movement in position found

39 Rapid Trauma Assessment (Scan)

Perform a RTA on all patients with:

- Suspected or likely spinal cord/column injury
- Multi-system trauma patient
- Evaluate for:
 - Neck Deformity, Pain, Crepitus, _____, Tenderness
 - Bilateral Extremities: Push, Pull, Grips
 - Motor & Sensory Function
 - _____ Sign Test

40 Babinski's Sign Test

- Stroke _____ aspect of the bottom of the foot
- Evaluate for movement of the toes
- _____ of the toes and lifting of the great toe is a positive sign
- Indicates injury along the pyramidal (descending spinal) tract
- Positive Babinski's sign is normal in patients under _____ years of age
- May be permanent or _____

41 Vital Signs and Reassessment

Vital Signs:

- Body _____
- Pulse, BP, Respirations

Reassessment:

- Recheck elements of initial assessment
- Recheck vital signs
- Recheck _____
- Recheck any _____ deviations

42 Spinal Clearance

- Some services have protocols to “_____” the spine, thus requiring no spinal immobilization
- Controversial but growing in popularity
- Follow local _____
- Never “clear” spine without protocols
 - Immobilize based on _____

43 Sample Spinal Clearance Protocol

44 Management of Spinal Injuries

45 Spinal Alignment

- Move patient to a _____, in-line position
 - Position of function
 - Hips and knees should be slightly _____ for

maximum comfort and minimum stress on muscles, joints, & spine if possible

- Place a rolled blanket under the knees
- ALWAYS support the _____ and neck

46 Contraindications to Neutral Position

- Movement causes a noticeable increase in _____
- Noticeable _____ met during procedure
- Increase in neurological deficits occurs during movement
- Gross _____ of spine

LESS MOVEMENT IS BEST!

47 Manual Cervical Immobilization of Seated Patient

- Approach from _____
- Assign a care giver to hold GENTLE manual

 - Reduce _____ loading
 - Evaluate posterior cervical spine
- Position patient's head slowly to a neutral, in-line position

48 Manual Cervical Immobilization of Supine Patient

- Assign a care giver to hold _____ manual traction
- Adult
 - Pad head off ground 1-2" if needed to assure neutral, in-line position
- Child
 - Position head at ground level: Avoid flexion.
_____ under upper shoulders

49 Pad as Needed

50 C-Collar Application

- Apply the _____ as soon as possible
- Assess neck prior to placing
- C-Collar limits some movement and reduces axial loading
- DOES _____ completely prevent movement of the neck
- Size and apply according to the manufacturer's recommendation
- Do NOT release manual control until the patient is fully secured in a spinal
_____ device

51 Standing Takedown (1 of 2)

- Minimum _____ rescuers
- Have patient remain immobile
- Rescuer provides manual stabilization from _____
 - _____ neck
- Size and place c-collar

52 Standing Takedown (2 of 2)

- Position board _____ patient

- Grasp board under patient's _____
- Lower board to ground
- Secure patient

_____ WITH PARTNERS AND PATIENT!!

53 Helmet Removal

54 Remove Helmet if: (1 of 2)

- Helmet does not immobilize the patient's head within
 - Fits too _____
- Cannot securely immobilize the helmet to the long spine board
- Helmet prevents _____ care
 - remove mask only if football helmet

55 Remove Helmet if: (2 of 2)

- Helmet prevents assessment of anticipated injuries
 - _____, burns, etc
- Present or anticipated airway or _____ problems
- Removal will not cause further _____
- If helmet is removed, remove _____ pads as well to maintain alignment

56 Helmet Removal Technique

- 2 Rescuers
- Remove face mask and _____ strap
- Immobilize head
- Slide one hand under back of _____ and head
- Other hand supports anterior neck and jaw
- 2nd rescuer removes helmet
- TRANSPORT _____ and any other safety device (HANS) with patient
- _____ is the KEY

57 Helmet removal may be a tricky endeavor. You should familiarize yourself with the types of _____ used by sporting teams and venues in your area.

58 Movement of the Spinal Injury Patient

- Any movement MUST be _____
- Move patient as a unit
- NO _____ PUSHING
 - Move patient up and down to prevent lateral bending
- Rescuer at the head "CALLS" all moves
- ALL MOVES MUST be slowly executed and well coordinated
- Consider the _____ positioning of the patient prior to beginning move

59 Types of Moves

- Log Roll
- _____ Slide
- Rope-Sling Slide
- Orthopedic Stretcher
- Vest-Type Immobilization
- Rapid _____
- Long Spine Board
- Diving/Swimming Injury Immobilization
 - In the _____

60 During all movement of a spinal injury patient, keep the spine in the neutral, in-line position by keeping the patient's eyes facing directly _____, and the shoulders, pelvis, and toes in the same _____.

61 Transport Considerations

- Make sure patient is fully immobilized _____ transporting
- _____ route is not always the best
- Often, the smoothest route is more important than the quickest route
- Try to avoid _____ that can cause unnecessary jarring and movement of the patient
- Give the patient a gentle trip
- Consider air transport if in _____ terrain

62 Medications and Neurogenic Shock (1 of 2)

- Fluid Challenge to fill vascular space
 - Isotonic Solution: _____ ml/kg
 - At least _____ ml initially for an adult
 - Monitor response and repeat as needed to maintain systolic BP
- PASG
 - _____
 - Research shows no positive outcome

63 Medications and Neurogenic Shock (2 of 2)

- _____ to increase BP
- Atropine to speed up heart
- _____ if neurodeficit is identified
 - Reduce the body's response to injury
 - Reduce swelling and pressure on cord
 - Administered within 1st 8 hours of injury

64 Summary

- _____ is the single most important indicator for need to immobilize
- Ability to walk and move is not sufficient to rule out spinal injury
- _____ movement of the patient is of utmost

importance

- Use IV fluids to “top off the tank” and fill _____
space