

SPINAL INJURIES

Fractures and Dislocations of the Spines



SPINAL INJURIES

- *Fractures and dislocations of the vertebrae are important as they may produce spinal cord and nerve root injuries.*
- *Fractures are more frequent at the junction of the mobile and rigid parts in the lower cervical and dorso-umbar regions.*



Aetiology of spinal injury

A. Trauma :

***1• Hyper-flexion trauma.** This is the most frequent type of trauma, e.g., fall of a heavy object on the back of the trunk or the head.*

2• Hyperflexion and rotation.

3• Vertical compression trauma.

** Fall from a height on the feet or the buttocks.*

** Fall on the head, e.g., diving in shallow water.*

***4• Hyper-extension injuries** are uncommon.*

B. Pathological fractures

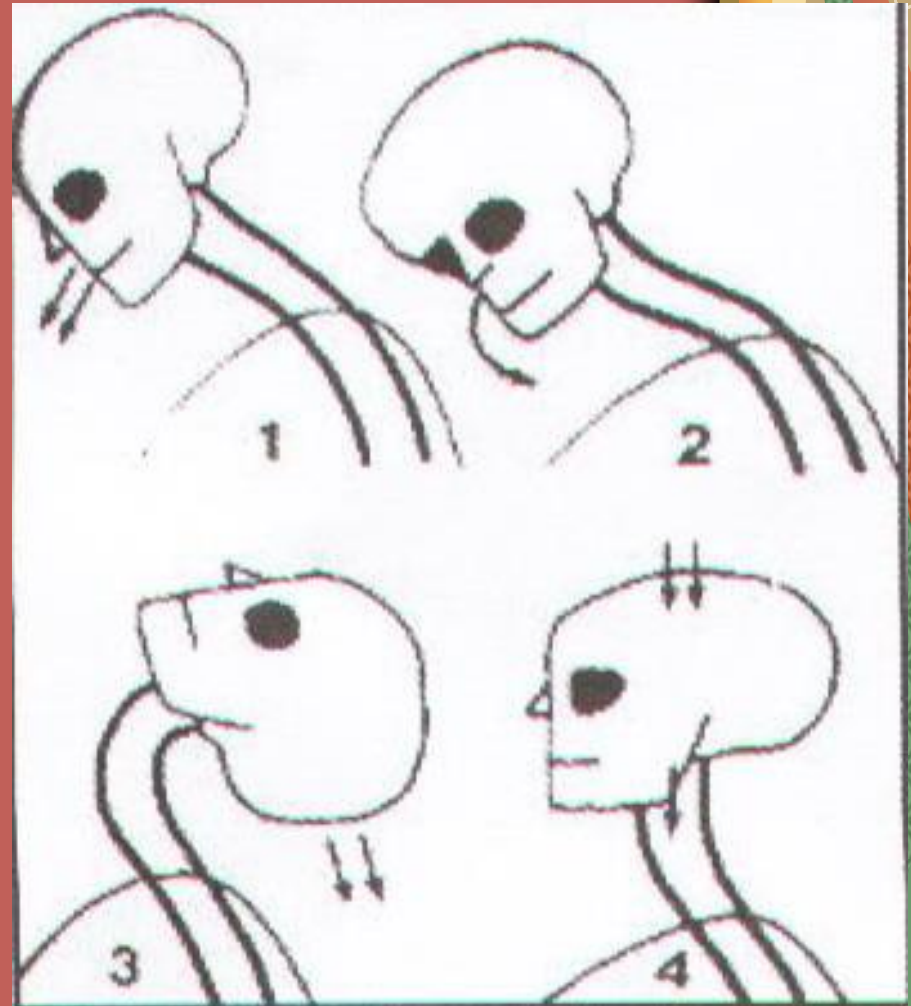
1• Metastases

2• Osteoporosis



Aetiology of spinal injury

- 1. Hyperflexion.*
- 2. Hyperflexion and rotation.*
- 3. Hyperextension.*
- 4. Vertical compression.*



Types of spinal injuries

 *A . According to stability*

 *B. According to morphology*




Spinal Injuries According to Stability

- *1. Stable Fractured spines.*
- *2. Unstable Spinal fracture.*



Spinal Injuries According to Stability


Clinically:


 *Spinal instability has been defined as "the loss of the ability of the spine under physiologic loads to maintain relationships between vertebrae in such a way that there is neither **damage** nor subsequent **irritation** to the spinal cord or nerve roots and , in addition, there is no development of incapacitating **deformity** or **pain** due to structural changes."*



Spinal Injuries According to Stability

Radiologically:

 *Numerous sets of radiographic criteria have been developed in an attempt to predict which patients are or will become unstable after a spinal injury. The most commonly used is the **three-column model of Denis**.*

 *In this model, the spine is divided into a **posterior, middle, and anterior column***





Spinal Injuries According to Stability

- *The **posterior column** includes all of the posterior bony and ligamentous elements while the **middle column** includes the posterior longitudinal ligament and all of the elements comprising the posterior half of the vertebral body and intervertebral disc.*
- *The **anterior column** is comprised of the remaining portions of the vertebral body and intervertebral disc, as well as the anterior longitudinal ligament.*



Spinal Injuries According to Stability

 *Injuries with incompetence of two or three columns are inferred to be unstable.*

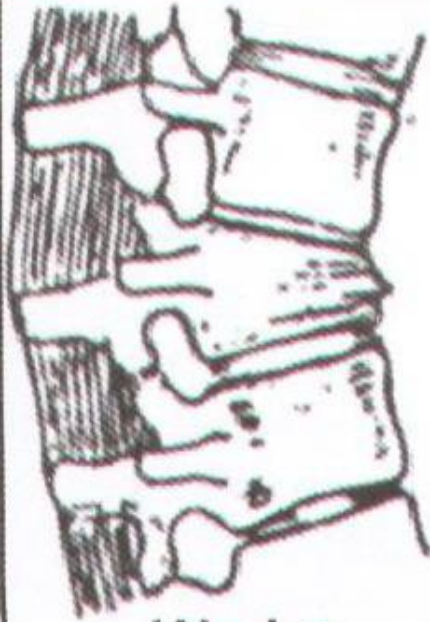
 *The three-column theory applies to the thoracolumbar spine only.*



Spinal Injuries According to morphology

- *1. **Wedge compression fracture.** Hyper-flexion trauma. The fracture is stable. The cord is undamaged and is in no danger.*
- *2. **Fracture dislocation.** Hyper-flexion is accompanied by rotation. Obviously, this is an unstable fracture. Commonly there is damage to the spinal cord and nerve roots.*
- *3. **Dislocation.** Pure dislocation without a fracture is possible in the **cervical spine** because its articular processes are rather horizontal.*
- *4. **Comminuted (burst) fracture.** This is an uncommon injury. If at the time of a vertical compression the spine is straight, the vertebral body is comminuted. Ligaments are not ruptured and the fracture is stable.*
- *5. **Avulsion fractures of transverse and spinous processes** are not accompanied by neurological injury and require no special treatment.*

Spinal Injuries According to morphology



Wedge
compression



Fracture
dislocation



Comminuted
fracture

Neurological injury

A. Level of lesion

B. Nature of the lesion



Spinal cord transection

- 1. It produces an early stage of **spinal shock** with complete flaccid paralysis below the line of cord section, loss of tendon reflexes and an atonic distended bladder.*
- 2. Spinal shock lasts for a few days.*
- 3. The cord below the level of transaction then recovers reflex function, which results in spastic paralysis and a reflexly emptying bladder.*


Spinal cord transection

 *In spinal shock phase cord transaction is suspected with the following findings:*


- 1. If there is **complete loss** of all forms of sensation below the level of the lesion. In concussion, joint position sense which ascends in the posterior column is preserved.*
- 2. If the sensory loss and paralysis **rises after injury** indicating ascending edema.*
- 3. A damaged cord, which has **not recovered in 48 hours**, will never recover.*

Clinical features of Spinal Injuries

1. Pain :

-  -local pain, due to bone/soft tissue injury.
- radicular pain, due to nerve root compression.


2. Vital signs:

-  -bradycardia indicating loss of sympathetic input to the heart from cervical or high thoracic lesion.
- hypotension due to loss of sympathetic input to systemic vasculature ("spinal shock").




Clinical features of Spinal Injuries

3. External Features:

-  -tenderness, bruising, or swelling due to local soft tissue damage .
- palpable step-off due to malalignment .
- paraspinous muscle spasm .
- torticollis due to muscle spasm or unreduced vertebral dislocation.

4. Weakness:

-  -partial vs. complete .
- level: motor level is defined as the most caudal level with grade III (antigravity) strength, assuming that more cranial levels have grade IV strength .



Clinical features of Spinal Injuries

5. Sensation:

 *-decreased vs. absent vs. hyperesthesia.*

-level : sensory level is defined as the most caudal dermatome with normal sensation .

-saddle region needs to be tested - may be the only region of preserved sensation ("sacral sparing").



Clinical features of Spinal Injuries

6. Reflexes:

 *-normal vs. absent vs. increased.*

-absent may indicate the presence of spinal shock.

-increased may indicate the presence of an older complete or incomplete injury .

7. Sphincters:

 *-decreased or absent tone.*

-loss of voluntary contraction.

-loss of bulbocavernosus reflex.



Radiography of spinal injury

- ***Plain X-ray :***


Besides A-P and lateral views, a special view through the open mouth is needed to diagnose fractures and dislocations of the atlas vertebra.

Cervical spine films should show all seven cervical vertebrae and T1.

- ***CT scan and MRI must be done to assess encroachment on the spinal cord.***

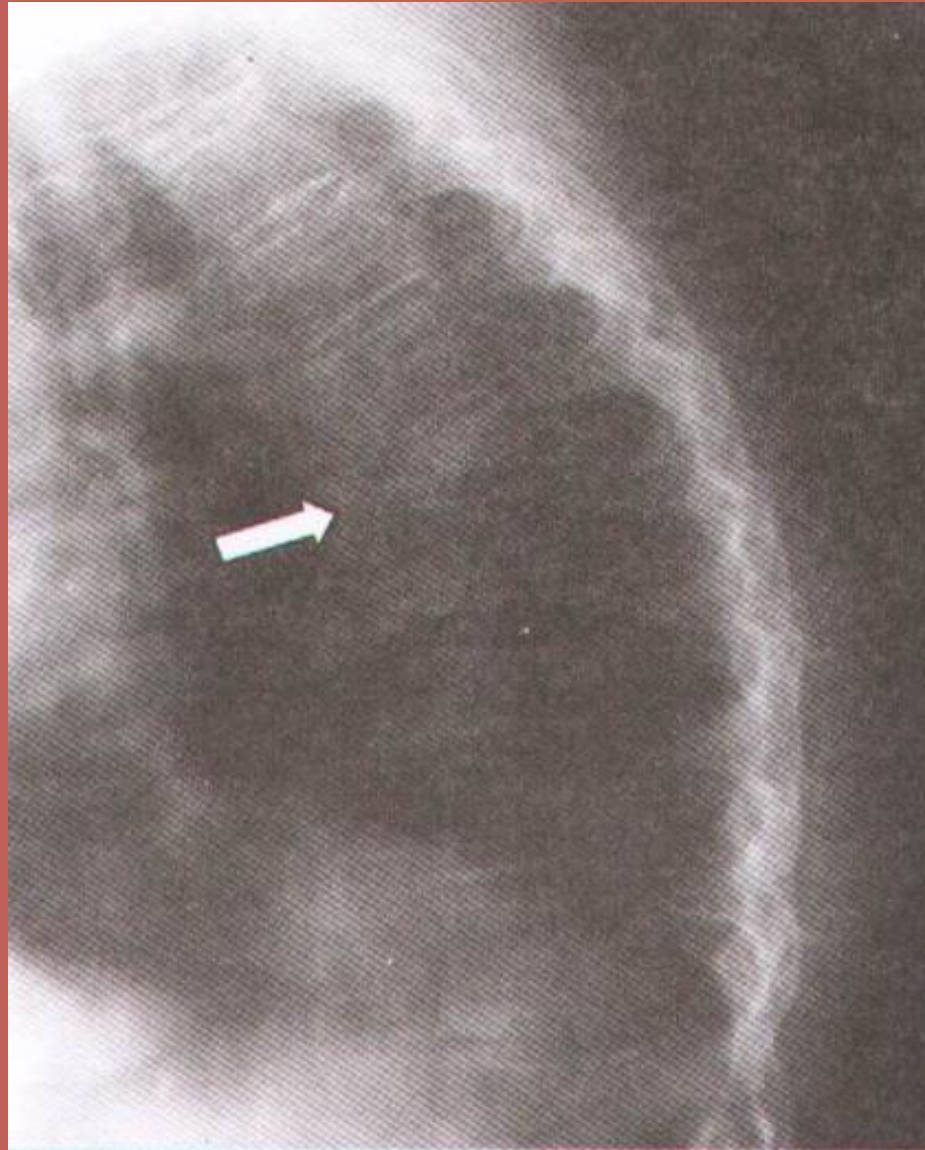


Dislocation of C2 vertebra

 *Spinal cord transection is likely and may cause respiratory paralysis and death.*







Wedge compression fracture



MRI encroachment on the cord by bone fragment



Treatment of spinal injuries

-  ***A. Initial acute management of spinal cord injuries***
-  ***B. Subsequent Management principles of the unstable spine***
-  ***C. Indications for decompressive surgery***
-  ***Treatment of medical complications associated with cord injury***



A. Initial acute management of spinal cord injuries

I. Immobilization.

II. Steroids.


III. Systemic measures.



A. Initial acute management of spinal cord injuries

I. Immobilization:

a. Cervical: by using cervical collar:

 *Traumatic cervical spine injury should be presumed to be present until it is ruled out by physical examination and appropriate radiographic studies.*

b. Thoracolumbar: maintenance of a neutral position during the prehospital phase. The trauma victim is moved on to the stretcher all in one piece; he should never be lifted by the shoulders and the thighs.



A. Initial acute management of spinal cord injuries

***II. Steroids:** patients with spinal cord injury who were treated with methylprednisolone within **eight hours** of injury had significantly greater improvement in their neurologic function than those given a placebo.*



A. Initial acute management of spinal cord injuries

III. Systemic Measures:

- a. Respiratory: Maintenance of an adequate airway and breathing remains the first priority in the trauma patient.*
- b. Cardiac: Hypotension, due to loss of sympathetic vascular tone, and bradycardia, due to loss of sympathetic innervation of the heart, are the most important elements of spinal shock due to spinal cord injury.*
- c. Genitourinary: Placement of an indwelling urinary catheter is mandatory in the severely injured patient for monitoring of urine output volume. Continuous urinary drainage prevents the complication of bladder rupture due to overdistension.*



B. Subsequent Management principles of the unstable spine


I. Decompression of neural element. (see indications below).

II. Mobilize the patient as soon as possible: to prevent atelectasis, pneumonia, deep venous thrombosis, and decubitus ulcers.

III. Stabilize the spine that is not likely to heal without surgical intervention: by arthrodesis or fusion, and by internal fixation (spinal instrumentation).



C. Indications for decompressive surgery

 *The most important indication for decompressive surgery in spinal cord injury is the presence of an **incomplete neurologic injury with persistent neural compression at the site of injury.***

 *Compression may be due to:*

 *1. Indriven bone fragments.*

 *2. Traumatic disc herniation.*

 *3. Epidural hematoma.*

 *4. Persistent vertebral malalignment.*




Treatment of medical complications associated with cord

I. Care of the Skin:

- 1. Bedsores develop rapidly unless the patient is well nursed. The skin is kept clean and dry. The skin is washed, dried and powdered.***
- 2. The patient is turned over every two hours.***
- 3. Established bedsores need general treatment and nutritive diet to build the patient's resistance. Sloughs are removed and daily dressings are applied in preparation for skin grafting.***



II. Care of the bladder

- 1. The bladder is kept empty by an indwelling catheter.***
 - 2. Stroking the side of the thigh initiates bladder contraction.***
 - 3. In lesions of the cauda equina, the bladder remains paralyzed and micturition occurs by abdominal straining.***
 - 4. Urinary infection is prevented by attention to asepsis during catheterization.***
 - 5. Patients left with high residual urine need specially investigations including cystography and cystometry. Transurethral resection of the bladder neck or sphincterotomy may be indicated.***
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III. Bowel training


- 1. An enema is done every third day.*
- 2. Mild laxatives may be needed.*
- 3. The patient is trained to strain and evacuate the bowel*



VI. Muscles and joints

- 1. Contractures are prevented by passive movements of the joints.***
- 2. Positioning is also important particularly for equinus deformity.***
- 3. Established contractures may need correction by tenotomy.***

Rehabilitation of the permanent paraplegic

- 1. The trunk and shoulder muscles are developed so that the patient can sit up and use his arms to turn himself and hold crutches.*
 - 2. A wheel chair may be used for life.*
 - 3. Ambulation using leg braces and crutches may be possible.*
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THANKS

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