Traumi vertebro-midollari

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"La Sapienza"

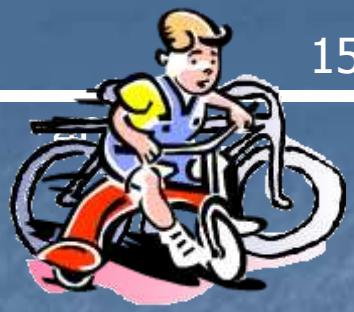
- Le prime testimonianze sui traumi vertebro-midollari sono riportate nell'Edwin Smith Surgical Papyrus.
- 6 case reports (Casi 29-33 e 48)
- L'autore descrive in maniera dettagliata la diagnosi ed il trattamento delle fratture vertebrali

1700 b.C. 150 b.C. 1750 a.D. 1970 a.D.

400 b.C. 650 a.D. 1900 a.D.

- Ippocrate (460–377 BC), trattò ampiamente i traumi vertebro-midollari ed è considerato il padre della metodologia della trazione per la riduzione delle fratture/lussazioni
- Ideò lo "scamnum"
- Riteneva comunque che nei casi di paralisi non esistessero trattamenti adeguati e che questi pazienti fossero comunque destinati a morire

1700 b.C. 150 b.C. Galeno 650 a.D. Paulus Aegina 1750 a.D. James/Heister 1900 a.D. 1950 a.D.



- Tra alterne fortune attraversando periodi di entusiasmo e di rassegnazione si giunge ai primi del ‘900

1700 b.C. 150 b.C. Galeno 1750 a.D. James/Heister 1950 a.D.

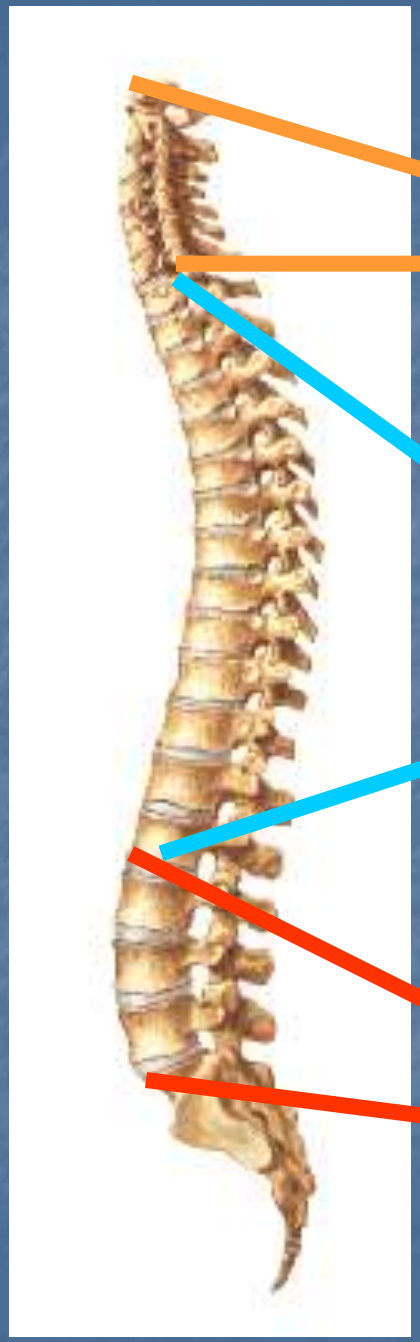
400 b.C. 650 a.D. Paulus Aegina

E’ con i due conflitti mondiali e i successivi sviluppi delle tecniche e dei materiali che si arriva alla chirurgia del trauma vertebro-midollare che oggi conosciamo

Epidemiologia

- 12000/14000 nuovi casi per anno di traumi vertebro-midollari nel Nord-America
- 906 casi/milione di ab.
- Cause del trauma:

  - Incidenti stradali (60%)
  - Traumi sportivi (12%)
  - Traumi da pecipitazione (28%)



Rachide cervicale
53%

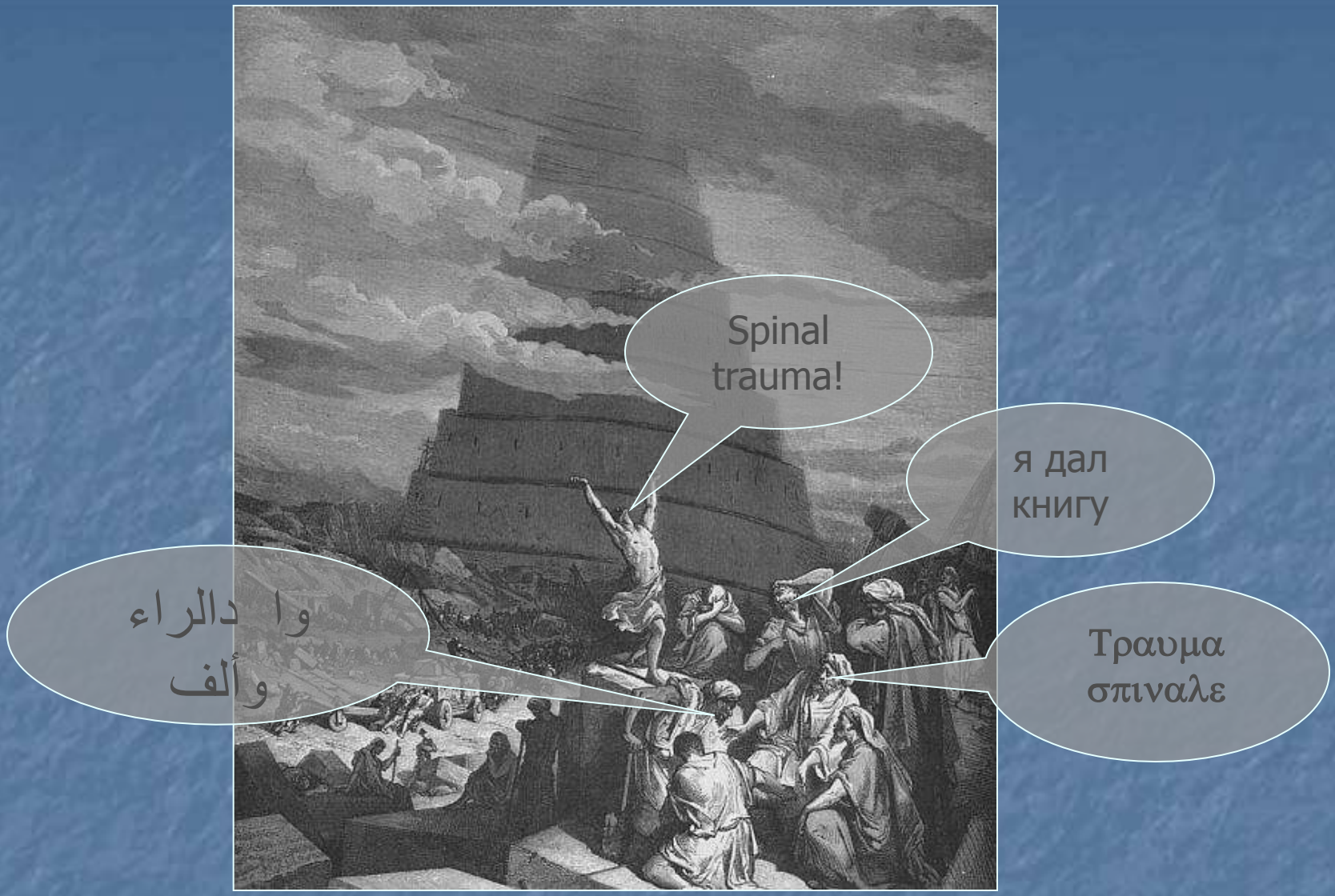
Rachide toracico (20%)
e
Giunzione toraco-lombare
(23%)

Rachide lombare
4%

Epidemiologia

- Rachide cervicale superiore: 28.5%
- C3: 2.7%
- C4: 7.2%
- C5: 22%
- C6: 22%
- C7: 17.6%

} 68.8% Rachide cervicale inf.


Spinal trauma!
я дал книгу
وا دالراء وألف
Τραυμα σπιναλε

Management del traumatizzato vertebro-midollare

- ***Guidelines for management of spinal cord injury***
  From th Spinal Surgery Study Group of the Italian Society of Neurosurgery (1997)

- ***"Guidelines for the management of acute cervical spine and spinal cord injuries"*** *Hadley MN, Clinic Neurosurgery 2002;49:407-98*

- ***"Contemporary treatment paradigms in spinal injury"*** *Kilburn MP, Hadley MN .Clinic Neurosurg. 2000;46:153-69*

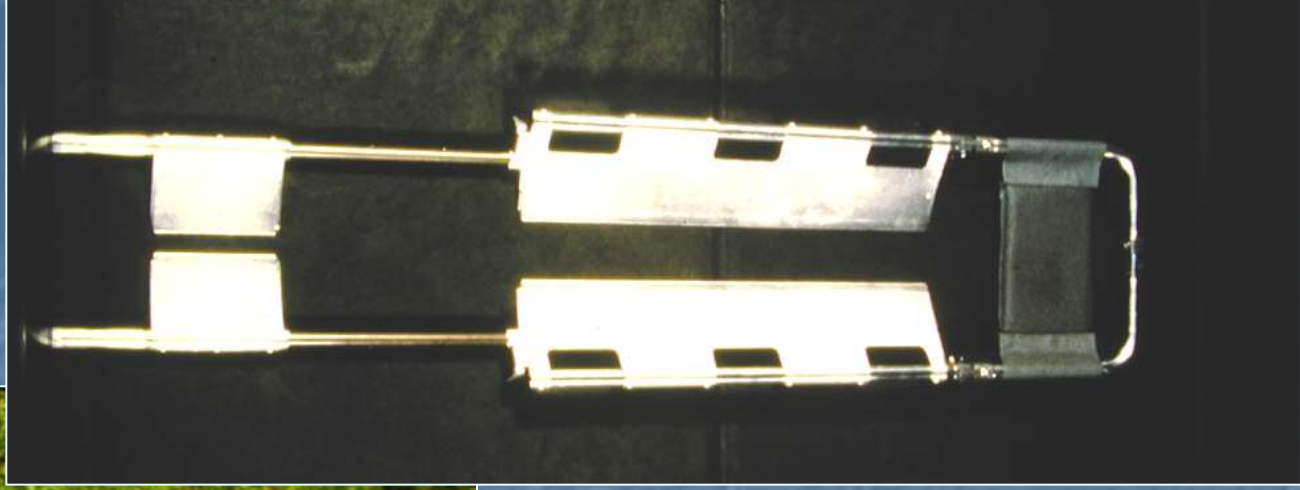
"Guidelines for the management of acute cervical spine and spinal cord injuries"
Hadley MN, Clinic Neurosurgery 2002;49:407-98

- "It is estimated that 3% to 25% of spinal cord injuries occur after the initial traumatic insult, either during transit or early in the course of management."
- "Consequently, complete spinal immobilization has been used in pre-hospital spinal care to limit motion until injury has been ruled out."
- "The recommendations of the American College of Surgeons consist of a hard backboard, a rigid cervical collar, lateral support devices, and tape or straps to secure the patient, the collar and the lateral support devices to the backboard."

"Guidelines for the management of acute cervical spine and spinal cord injuries"

Hadley MN, Clinic Neurosurgery 2002;49:407-98

- "A more uniform, universally accepted method for pre-hospital spinal immobilization for patients with potential spinal injury following trauma may reduce the cost and improve the efficiency of pre-hospital spinal injury management."



Tipo di disturbo neurologico

- Tetraparesi: 31.2%
- Paraplegia: 28.2%
- Paraparesi: 23.1%
- Tetraplegia: 17.5%

Patofisiologia della lesione del midollo spinale

- Danno primario:

  Trauma diretto per compressione e stiramento del midollo spinale

- Danno secondario:

  Morte cellulare ritardata che si verifica a distanza di tempo dalla lesione traumatica, come risultato delle reazioni ischemiche e infiammatorie che accompagnano il danno tissutale primario

American Spinal Injury Association (ASIA) Scala di compromissione neurologica

ASIA grade	Tipo di lesione	Definizione
A	Completa	Nessuna funzione motoria o sensitiva
B	Incompleta	Preservazione della funzione sensitiva, ma non della motoria al di sotto del livello di lesione
C	Incompleta	Preservazione della funzione motoria, ma la maggioranza dei muscoli hanno forza grado < 3
D	Incompleta	Preservazione della funzione motoria, con la maggioranza dei muscoli hanno forza grado => 3
E	Nessuna	normale

Trasferimento

UNITA' MOBILE DI RIANIMAZIONE

- Stabilizzazione clinica
- Ripristino delle vie aeree
- Mantenimento della pressione arteriosa (>100 mmHg)
- Somministrazione O2
- Terapia farmacologica al fine di ridurre il danno midollare primario
- Eventuale sedazione

Accertamenti diagnostici

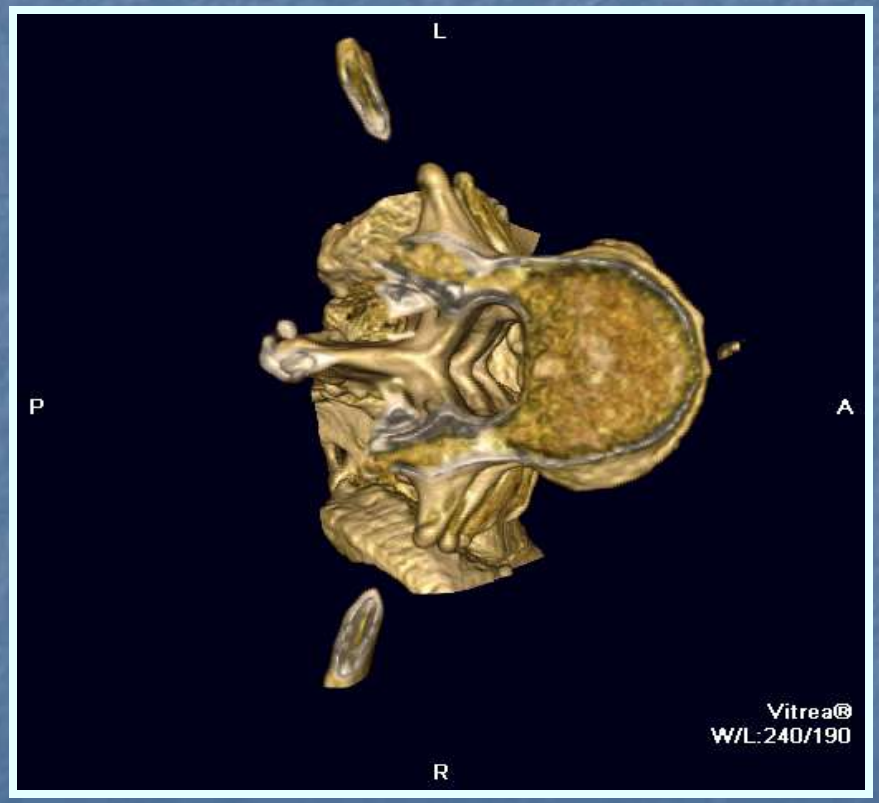
- **RX: è ancora un esame fondamentale**

L’esame deve essere completo: occorre evitare i falsi negativi

Esame incompleto: Integrare con TC

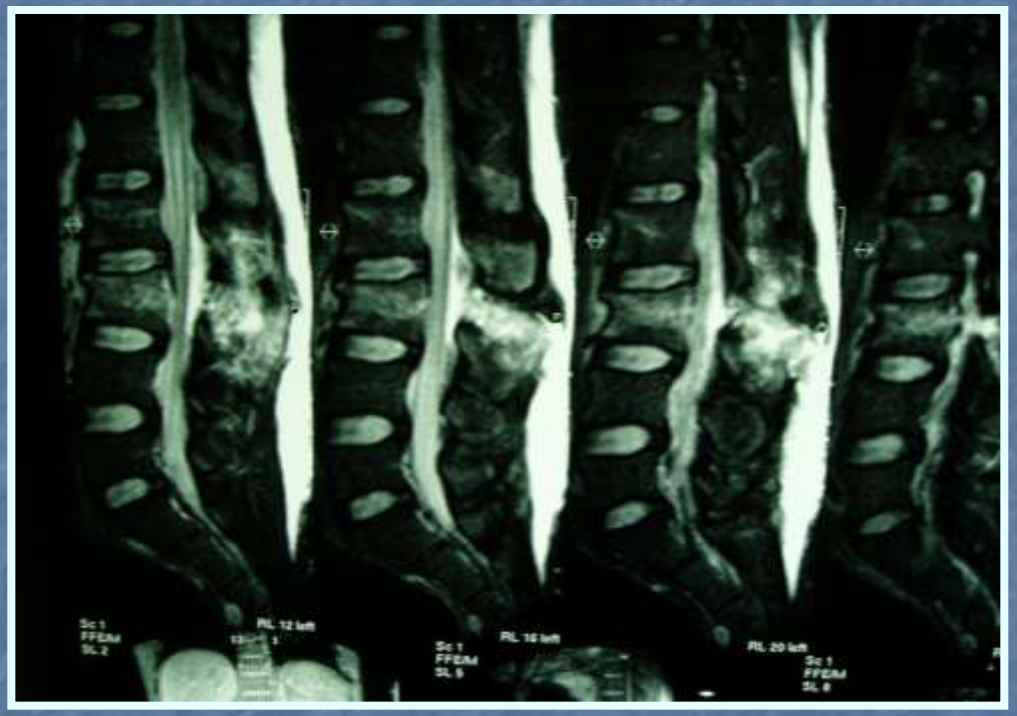
Accertamenti diagnostici

- **TC spirale multislice 3D:**
  - Maggiore velocità
  - Navigazione 3D canale spinale
  - Possibilità di diagnosticare patologie concomitanti

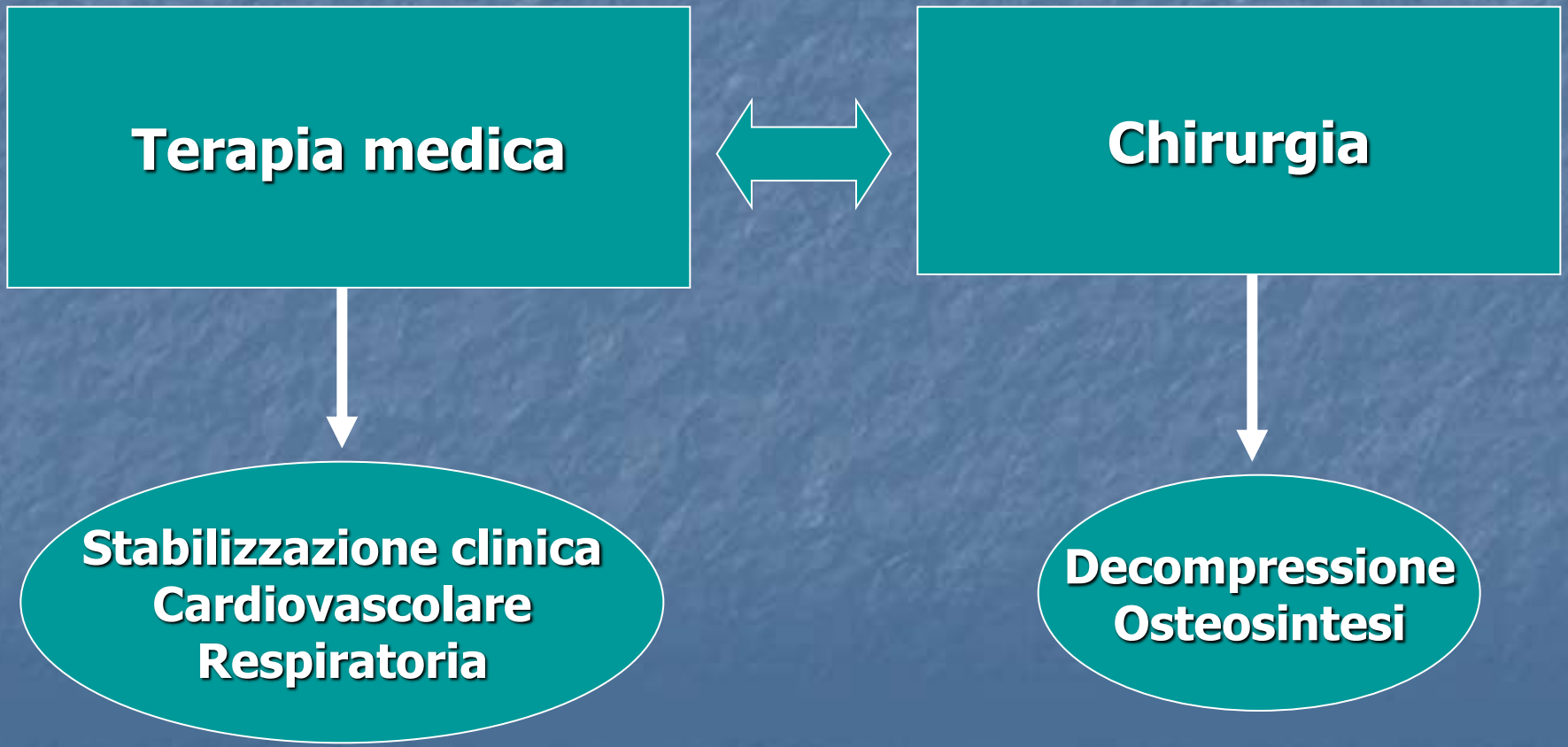


Accertamenti diagnostici

- **RMN di nuova generazione:**
  - Maggiore velocità
  - Accurato studio dell'osso
  - Studio reale delle strutture disco-legamentose



Trattamento traumatizzato vertebro-midollare in fase acuta



Trattamento del traumatizzato vertebro-midollare in fase acuta

Terapia medica

Ischemia
Ipossia
Danno midollare secondario

Trattamento del traumatizzato vertebro-midollare in fase acuta

Terapia medica

- Supporto pressione arteriosa per ottenere un'adeguata irrorazione midollare nelle ore successive al trauma
- Adeguata ossigenazione tissutale
- Controllo delle condizioni respiratorie
- Emogasanalisi seriate

Trattamento del traumatizzato vertebro-midollare in fase acuta

Terapia medica

- **NASCIS II :** Metilprednisolone 30 mg/kg in bolo seguita da infusione continua per 23 h di MPS 5,4 mg/kg/h

"Spinal Cord Injury. Role of Steroid Therapy".Ducker B. Spine Vol. 19, N. 20, 2281-2287, 1994

- **NASCIS III** : *"Administration of methylprednisolone for 24 or 48 hours or tirilazad mesylate for 48 hours in the treatment of acute spinal cord injury" JAMA 277: 1597-1604, 1997*
  - MPS 5,4 mg/kg/h per 24 h
  - MPS 5,4 mg/kg/h per 48 h
  - tirilazad 2,5 mg/kg ogni 6 h per 48 h

Gestione del traumatizzato vertebro-midollare in fase acuta

Terapia medica

- "From an evidence-based approach, methylprednisolone cannot be recommended for routine use in acute nonpenetrating SCI. Prolonged administration of high-dose steroids (48 hours) may be harmful to the patient"

- "Motor and sensory scores were not different between any of treatment groups. FIM scores werw reported improved in the areas of self care and sphincter control for the 48 hour group at 6 months. This effect was lost at 1 year. There was a 2xhigher incidence of severe pneumonia and 4xhigher incidence of severe sepsis in the 48-hour compared with the 24-hour patients"

"The role of steroids in acute spinal cord injury: an evidence-based analysis"
Hurlbert RJ.

Spine 2001 Dec 15;26(24 Suppl):S39-46

Gestione del traumatizzato vertebro-midollare in fase acu

Terapia medica

- **GM-1 Ganglioside:** 300 mg dose di carico seguita da somministrazione 100mg/die per 56 giorni. Integrazione con il NASCIS II

- "There is insufficient evidence to support treatment guidelines. Options: Treatment of patients with acute spinal cord injuries with GM- ganglioside is recommended as an option without demonstrated clinical benefit"
"Pharmacological therapy after acute cervical spine cord injury". Neurosurgery 2002 Mar, 50 (3 Suppl): S63-72

Trattamento del traumatizzato vertebro-midollare in fase acuta

Intervento chirurgico precoce

- Riduzione delle complicanze associate
- Minor rischio di polmoniti
- Mobilizzazione precoce
- Prevenzione dei decubiti

Trattamento chirurgico

- Trauma senza deficit neurologici

  -Trattamento differibile a 24-48h

  -Esecuzione di esami neuroradiologici che permettano un planing di trattamento ottimale

  -Minori perdite ematiche durante l'intervento

Trattamento

Deficit neurologici

Trattamento chirurgico urgente

Trattamento

Deficit neurologici

Sindrome incompleta

Decompressione
Osteosintesi

Prevenire il peggioramento sintomi neurologici

Miglioramento

Sindrome completa

Decompressione
Osteosintesi

Prevenzione danno midollare secondario

Mobilizzazione precoce

Riabilitazione

Trattamento

- Fase decompressiva
- Fase ricostruttiva

Trattamento
Fase decompressiva

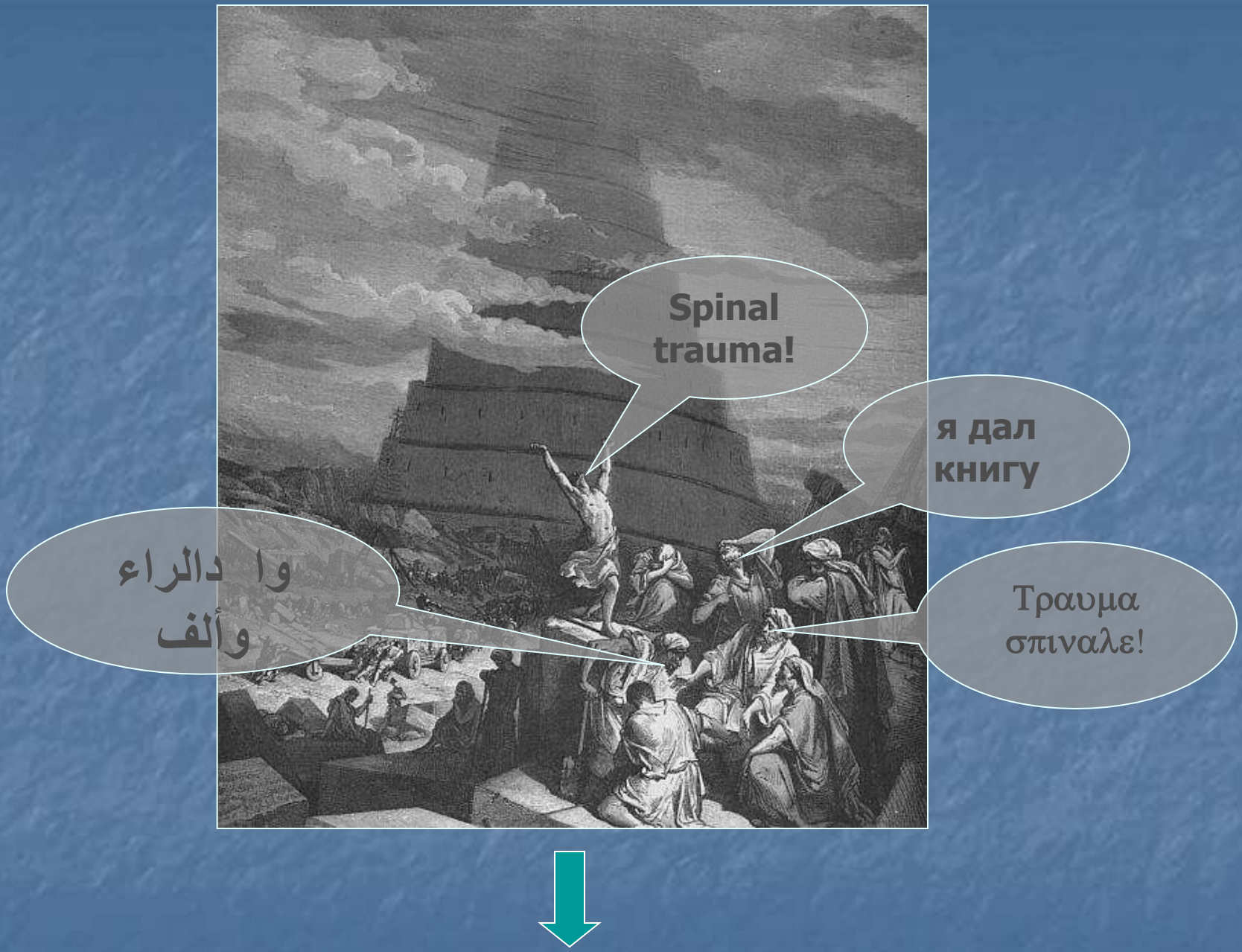
- Riduzione:

  Rimane una tecnica fondamentale cui va dato un ruolo prioritario

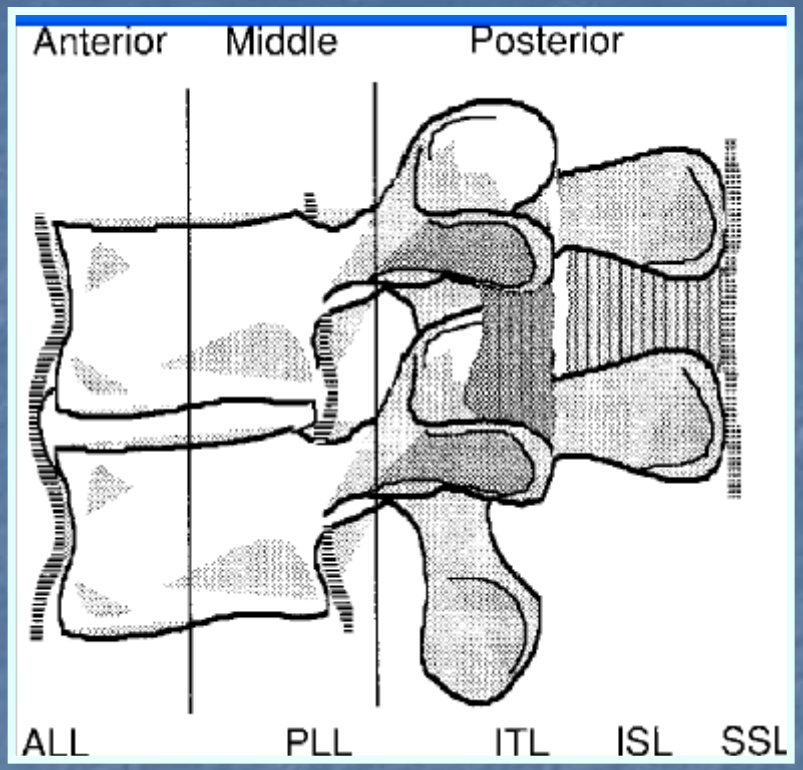
Trattamento rapido
(talvolta è sufficiente la riduzione posizionale)
Eseguibile ovunque
Eseguibile di fronte a qualsiasi condizione clinica
Permette di dilazionare il trattamento chirurgico

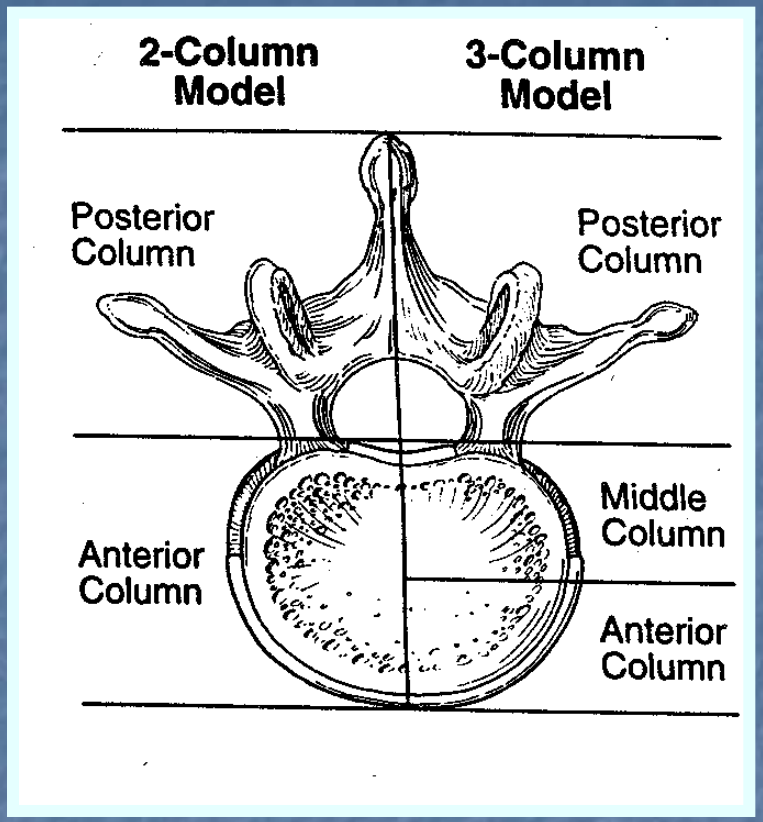
Trattamento
Fase decompressiva

Riduzione



1983 Denis 1994 Argenson 1998 Aebi





Denis F. et al. The three column spine and its significance in the classification of an acute thoracolumbar spinal injuries. Spine 1983; 8: 817-831

Type	Findings
Compression fracture	Failure of anterior column alone with intact middle column
Burst fracture	Failure of both anterior and middle columns
Type A	Fracture of both end plates at involved level
Type B	Fracture at level of the superior end plate
Type C	Fracture at level of the inferior end plate
Type D	Burst fracture with rotation
Type E	Lateral burst fracture
Seat-belt-type injuries	Failure of posterior and middle columns with a competent anterior column
One-level lesion	Failure develops either through the bone or ligamentous complex
Two-level lesion	Failure at two adjoining levels involving either the bone or ligamentous column
Fracture dislocation	Failure of posterior and middle columns with incompetent anterior column
Shear-type	Failure of anterior longitudinal ligament, allowing subluxation either posteroanteriorly or anteroposteriorly
Flexion-distraction type	Failure of anterior portion of disk allows stripping of the anterior longitudinal ligament

Denis F. et al. The three column spine and its significance in the classification of an acute thoracolumbar spinal injuries. Spine 1983; 8: 817-831

"A scheme for the classification of lower cervical spine injuries" Argenson C. et al

- Compression "A"
- Flexion-extension distraction "B"
- Rotation "C"

- Permette inquadramento morfologico e biomeccanico della frattura e indica la tipologia del trattamento

"A scheme for the classification of lower cervical spine injuries" Argenson C. et al

A Compression	I Anterior compression	II Comminuted fracture	III Teardrop fracture
B Flexion Extension Distraction	I Moderate sprain dislocation	II Severe sprain	III Bilateral fracture
C Rotation	I Unifacet fracture (UFF)	II Fracture separation of the articular pillar (FSAP)	III Unilateral dislocation (UD)

CLASSIFICATION OF LOWER CERVICAL SPINE INJURIES

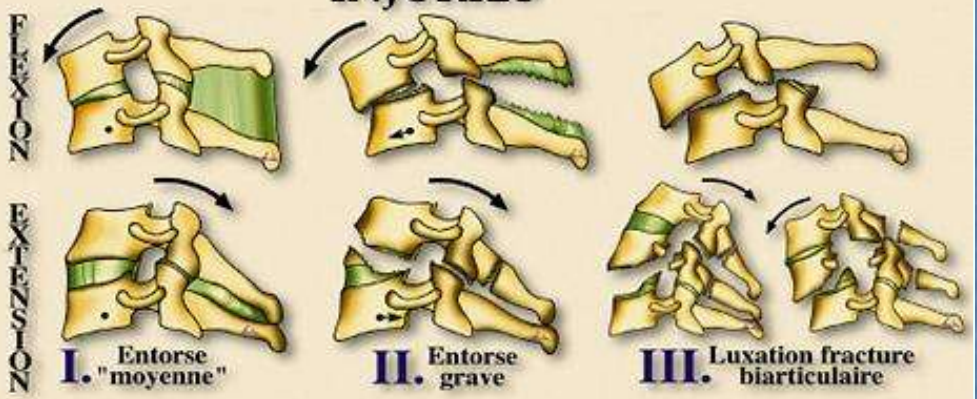
A COMPRESSION INJURIES

I. Tassement antérieur

II. Comminutive fracture

III. "Tear drop" fracture

B FLEXION-EXTENSION-DISTRACTION INJURIES



I. Entorse "moyenne"

II. Entorse grave

III. Luxation fracture biarticulaire

C ROTATION INJURIES

I. Fracture uniarticulaire (F.U.A.)

II. Fracture-séparation du massif articulaire (F.S.M.A.)

III. Luxation uniarticulaire (L.U.A.)

Trattamento

- Tipo I: Inizialmente conservativo
- Tipo II:Previo approccio anteriore artrodesi strumentata a uno o due livelli e plating
- Tipo III:

  - Se possibile riduzione non cruenta artrodesi strumentata per via anteriore

  - Approccio combinato anteriore e posteriore quando necessaria riduzione cruenta della lussazione

AO Classification

TABLE 5-2 ■ AO Classification. Type A Injuries: Groups, Subgroups, and Specifications

Type A. Vertebral body compression
A1 Impaction fractures
- A1.1 Endplate impaction
- A1.2 Wedge impaction features
  1. Superior wedge impaction fracture
  2. Lateral wedge impaction fracture
  3. Inferior wedge impaction fracture
- A1.3 Vertebral body collapse

A2 Split fractures
- A2.1 Sagittal split fracture
- A2.2 Coronal split fracture
- A2.3 Pincer feature

A3 Burst fractures
- A3.1 Incomplete burst fracture
  1. Superior incomplete burst fracture
  2. Lateral incomplete burst fracture
  3. Inferior incomplete burst fracture
- A3.2 Burst-split fracture
  1. Superior burst-split fracture
  2. Lateral burst-split fracture
  3. Inferior burst-split fracture
- A3.3 Complete split fracture
  1. Pincer burst fracture
  2. Complete flexion burst fracture
  3. Complete axial burst fracture

Source: Aebi et al.[1]

TABLE 5-4 ■ AO Classification. Type C Injuries: Groups, Subgroups, and Specifications

Type C. Anterior and posterior element injury with rotation
C1 Type A injuries with rotation (compression injuries with rotation)
- C1.1 Rotational wedge fracture
- C1.2 Rotational split fracture
  1. Rotational sagittal split fracture
  2. Rotational coronal split fracture
  3. Rotational pincer split fracture
  4. Vertebral body separation

C2 Type B injuries with rotation
- C1.1—B.1 injuries with rotation (flexion-distraction injuries with rotation)
  1. Rotational flexional subluxation
  2. Rotational flexional subluxation with unilateral articular process fracture
  3. Unilateral dislocation
  4. Rotational anterior dislocation without/with fracture of articular processes
  5. Rotational flexional subluxation without/with unilateral articular process fracture + type A fracture
  6. Unilateral dislocation + ty
  7. Rotational anterior disloca ture of articular processes
- C2.2—B.2 injuries with rotation (fl juries with rotation)
  1. Rotational transverse bico
  2. Unilateral flexion-spondyl of the disc
  3. Unilateral flexion-spondyl
- C2.3—B.3 injuries with rotation (h juries with rotation)
  1. Rotational hypertension-s fracture of posterior vertel
  2. Unilateral hyperextension
  3. Posterior dislocation with

C3 Rotational-shear injuries
- C3.1 Slice fracture
- C3.2 Oblique fracture

Source: Aebi et al.

TABLE 5-3 ■ AO Classification. Type B Injuries: Groups, Subgroups, and Specifications

Type B. Anterior and posterior element injury with distraction
B1 Posterior disruption predominantly ligamentous (flexion-distraction injury)
- B1.1 With transverse disruption of the disc
  1. Flexion-subluxation
  2. Anterior-dislocation
  3. Flexion-subluxation/anterior dislocation with fracture of the articular processes
- B1.2 With type A fracture of the vertebral body
  1. Flexion-subluxation + type A fracture
  2. Anterior-dislocation + type A fracture
  3. Flexion-subluxation/anterior dislocation with fracture of the articular processes + type A fracture

B2 Posterior disruption predominantly osseous (flexion-distraction injury)
- B2.1 Transverse bicolumn fracture
- B2.2 With disruption of the disc
  1. Disruption through the pedicle and disc
  2. Disruption through the pars interarticularis and disc (flexion-spondylolysis)
- B2.3 With type A fracture of the vertebral body
  1. Fracture through the pedicle + type A body
  2. Fracture through the pars interarticularis (flexion-spondylolysis) + type A fracture
- B2.3 With type A fracture of the vertebral body
  1. Fracture through the pedicle + type A body
  2. Fracture through the pars interarticularis (flexion-spondylolysis) + type A fracture

B3 Anterior disruption through the disc (hypertension-shear injury)
- B3.1 Hyperextension-subluxations
  1. Without injury of the posterior column
  2. With injury of the posterior column
- B3.2 Hyperextension-spondylolysis
- B3.3 Posterior dislocation

Source: Aebi et al.

Aebi M. et al: AO ASIF Priciples in Spine Surgery. Berlin: Springer-Verlag, 1998, pp 1-143

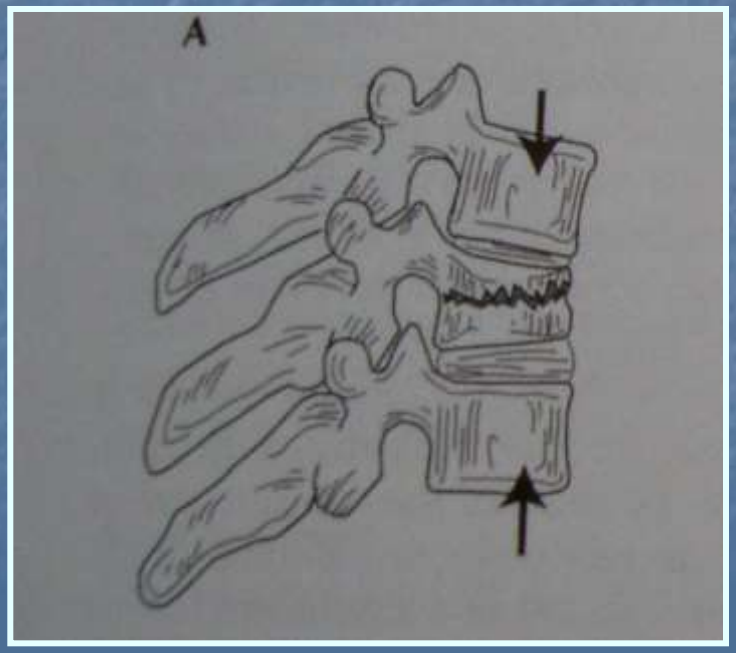
AO Classification

- Tipo A: Vertebral body compression
- Tipo B: Anterior and posterior element injury with distraction
- Tipo C: Anterior and posterior element injury with rotation

Aebi M. et al: AO ASIF Priciples in Spine Surgery. Berlin: Springer-Verlag, 1998, pp 1-143

AO Classification

- Type A: Vertebral body compression

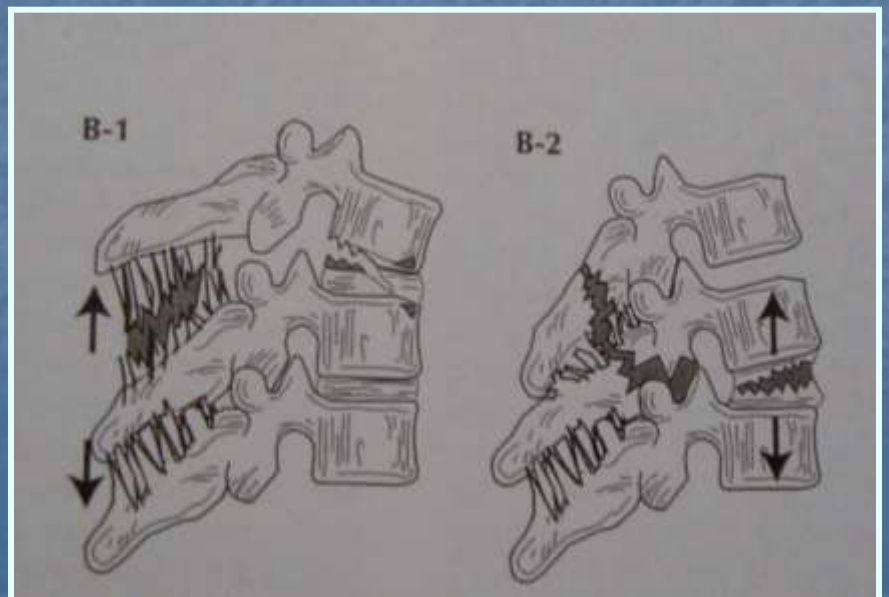


AO Classification

- Type B: danno degli elementi anteriori e posteriori in distrazione

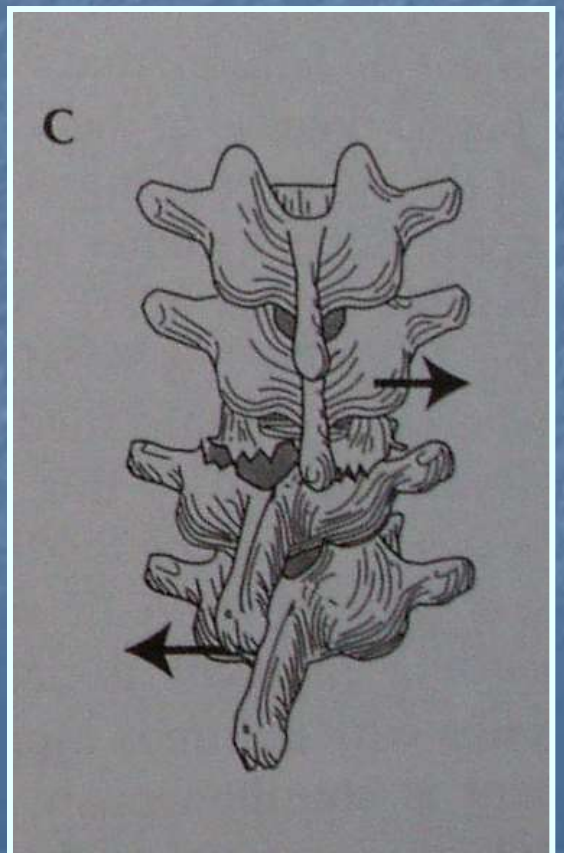
  -B1: Danno legamentoso posteriore (flesso distrazione)

  -B2: Danno osseo posteriore



AO Classification

- Tipo C: Danno degli elementi anteriori e posteriori con rotazione



Rachide cervicale superiore

Fratture del dente

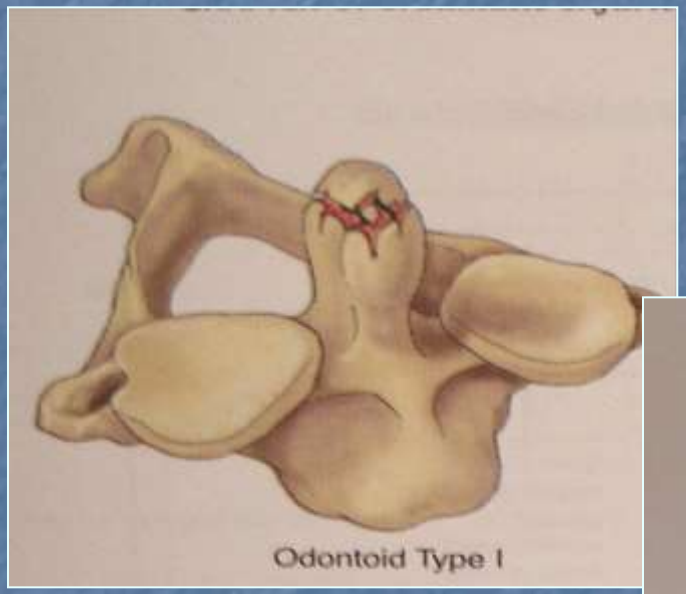
1974 Anderson e D'Alonzo

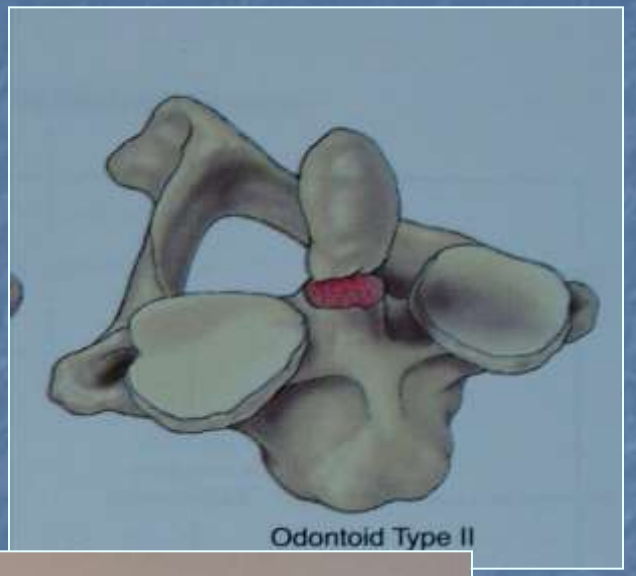
Tipo I: Fratture dell'apice (5%)
Tipo II: Fratture della base del dente (60%)
Tipo III: Frattura del dente che si estende al corpo (30%)

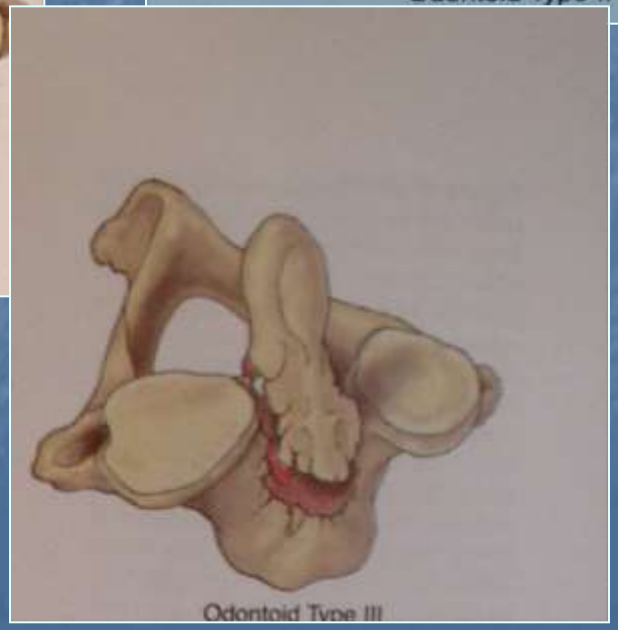
Anderson LD, D'Alonzo RT: Fractures of the odontoid process of the axis. J Bone Joint Surg Am 56A: 663-674,1974

Clark CR, White AA; Fractures of the dens. A multicenter Study. J Bone Joint Surg Am 67A: 1340-1348,1985

Fratture del dente







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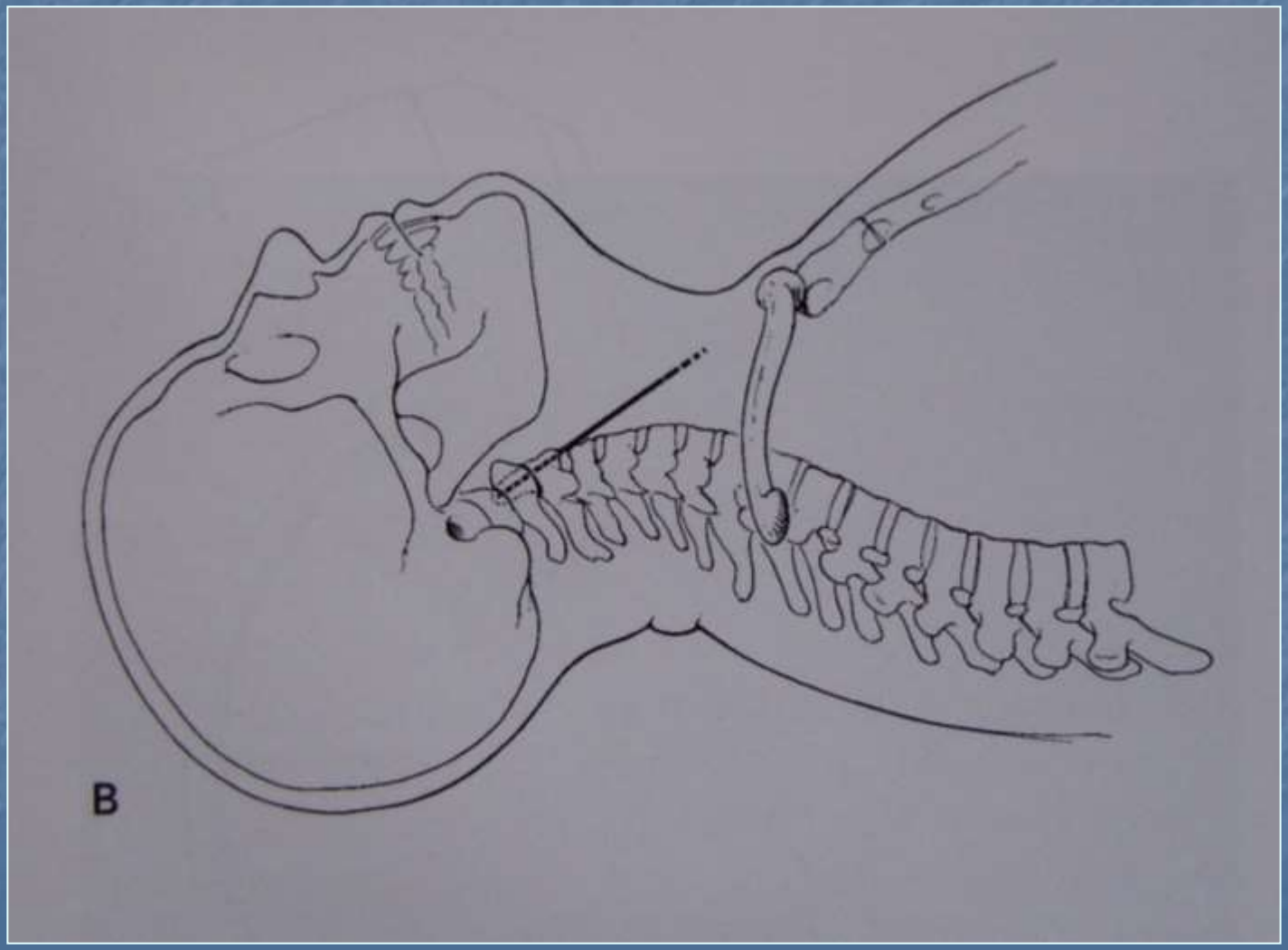

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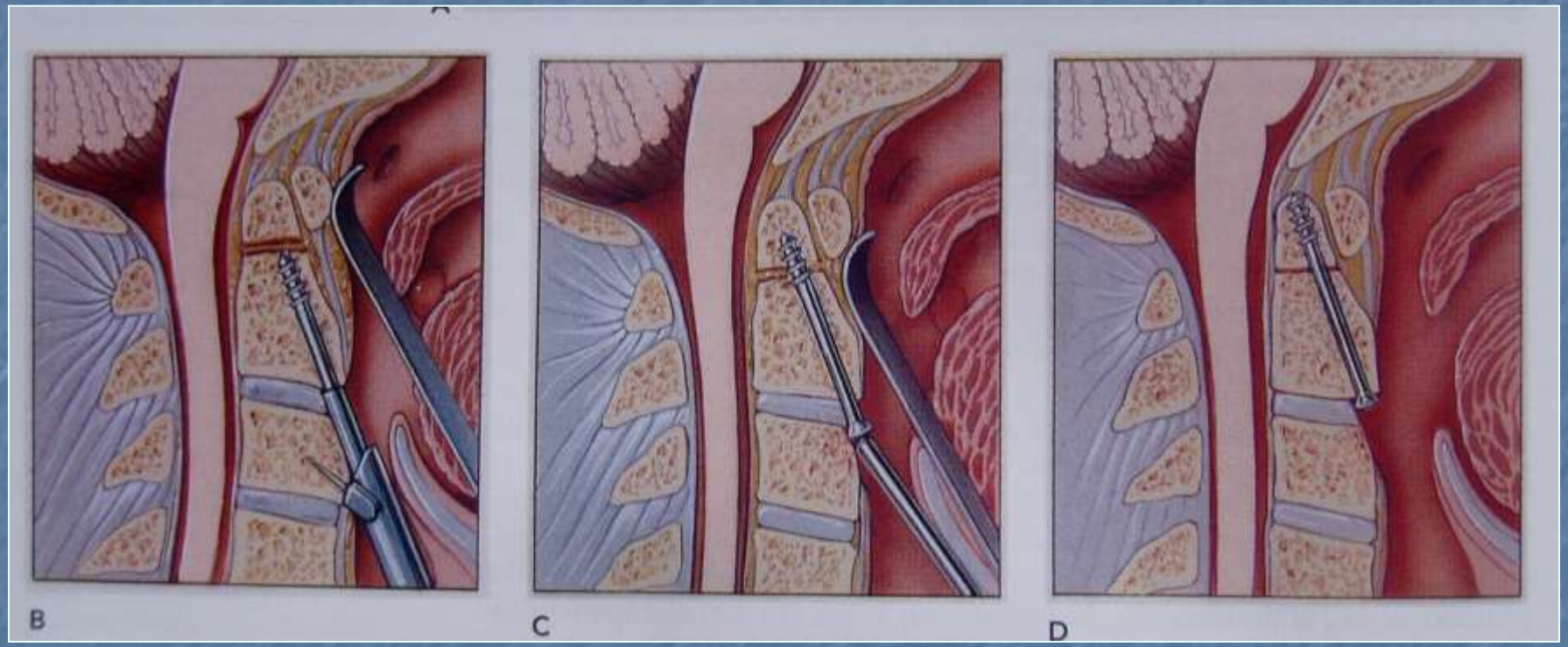

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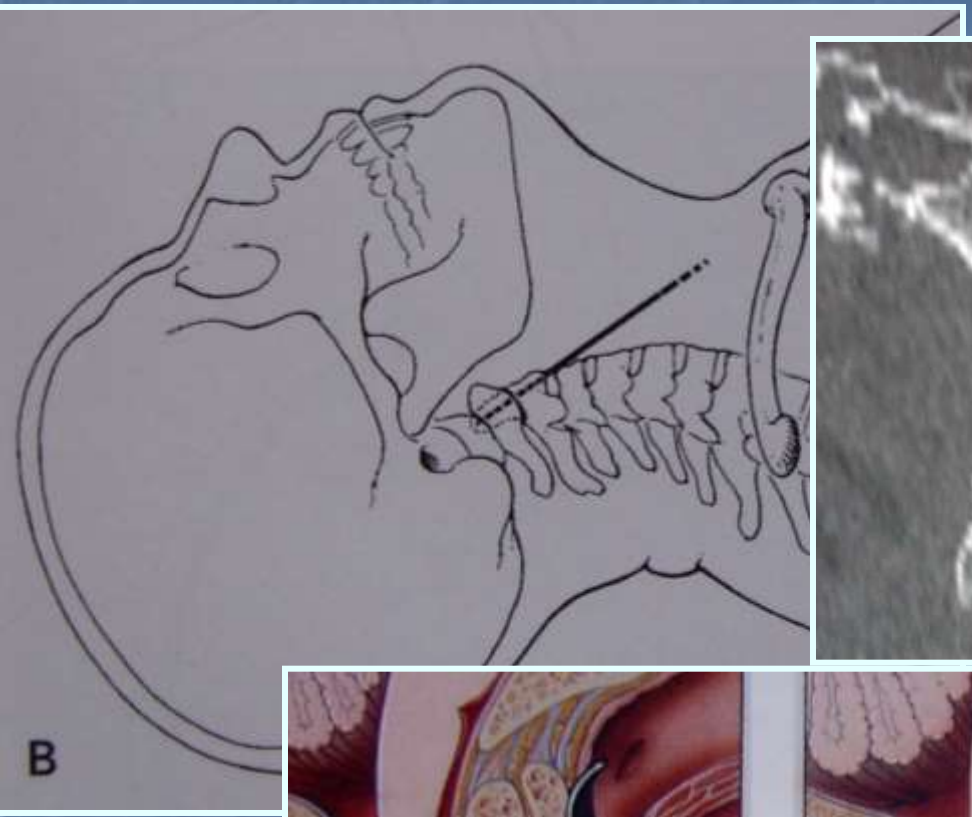
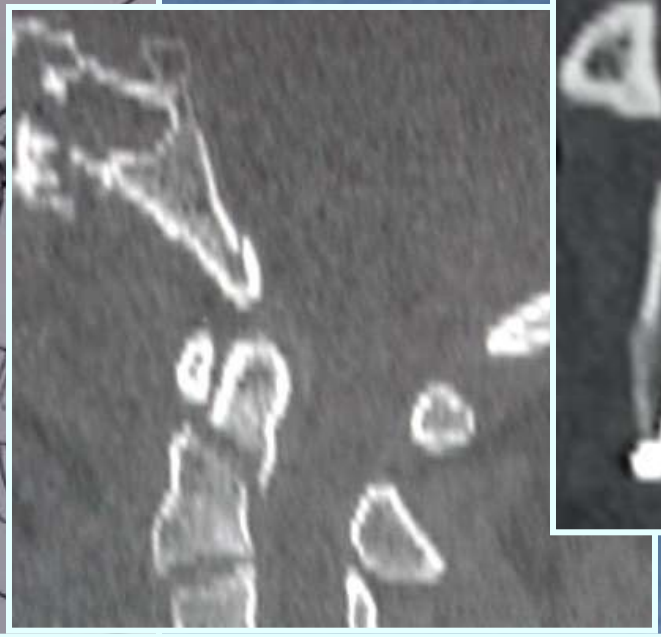
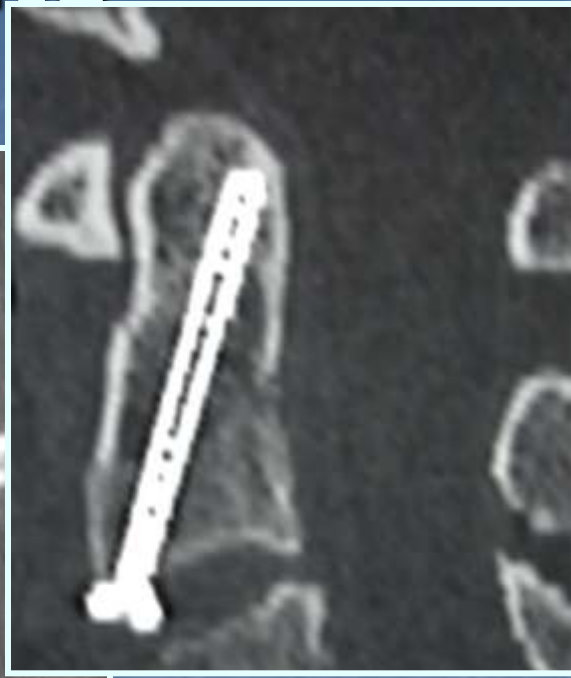
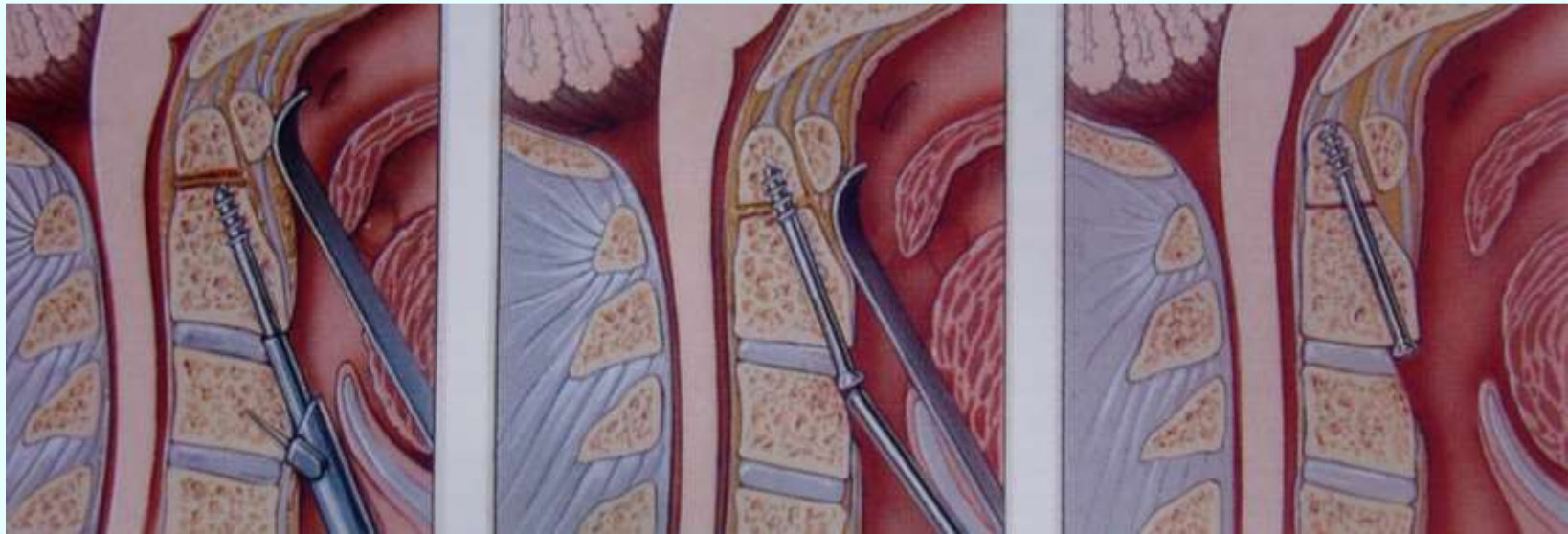








Spondilolisi Traumatiche (Hangman's fracture)

- Nel 1965 Schneider conia il termine "Hangman's fracture"
- Nel 1866 Haugthon descrive il meccanismo nelle fratture da impiccagione.

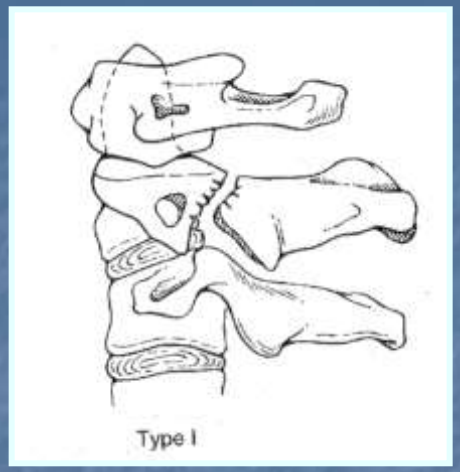
  Nodo sotto il mento: sezione del midollo spinale e morte "più umana" rispetto al nodo subauricolare in cui la morte avviene per soffocamento (1886 Lord Aberdare: Capital senteces comittee)

Spondilolisi traumatiche

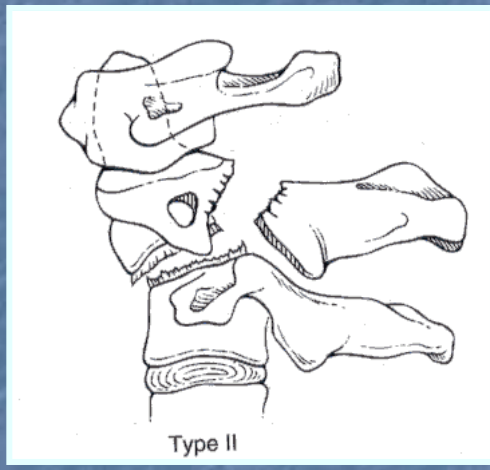
- Mentre le Hangman's fracture hanno un meccanismo di iperestensione pura che causa lisi istmica bilaterale traumatica, le Hangman's fracture cliniche sono spesso associate anche ad altri meccanismi di azione

Spondilolisi Traumatiche

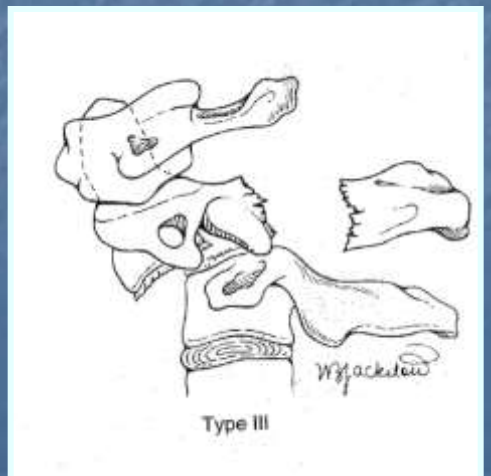
- Tipo I: isolata rima di frattura del ring di C2 con minima listesi del corpo di C2 (axial loading ed iperestensione)



- Tipo II: depiazzamento del corpo di C2 con lesione del disco C2-C3 (iperstensione e flessione)

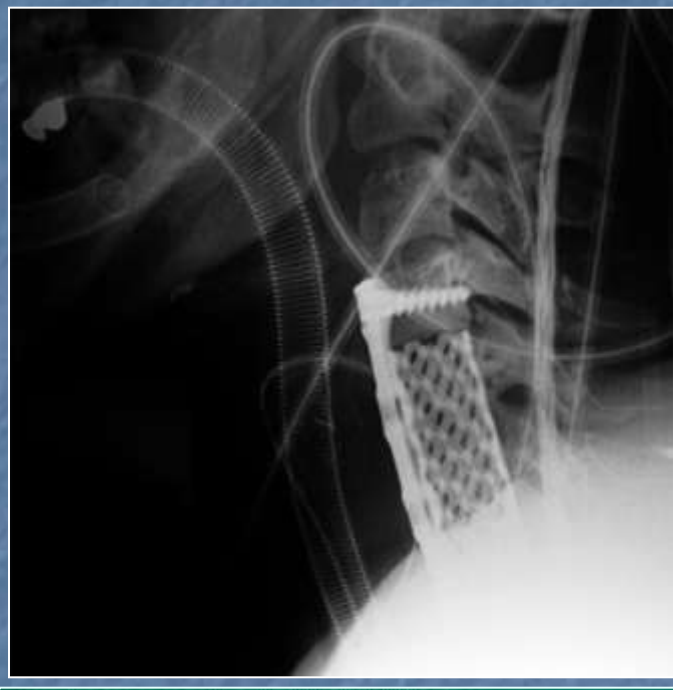


- Tipo III: depiazzamento del corpo di C2, lussazione delle faccette articolari (flessione e estensione)

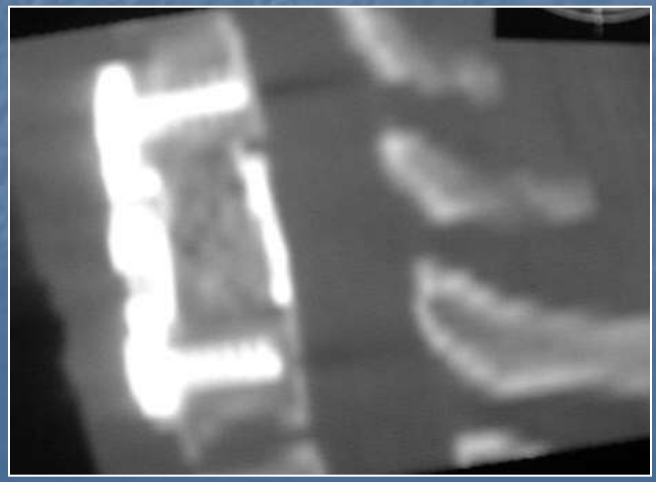


Rachide cervicale inferiore

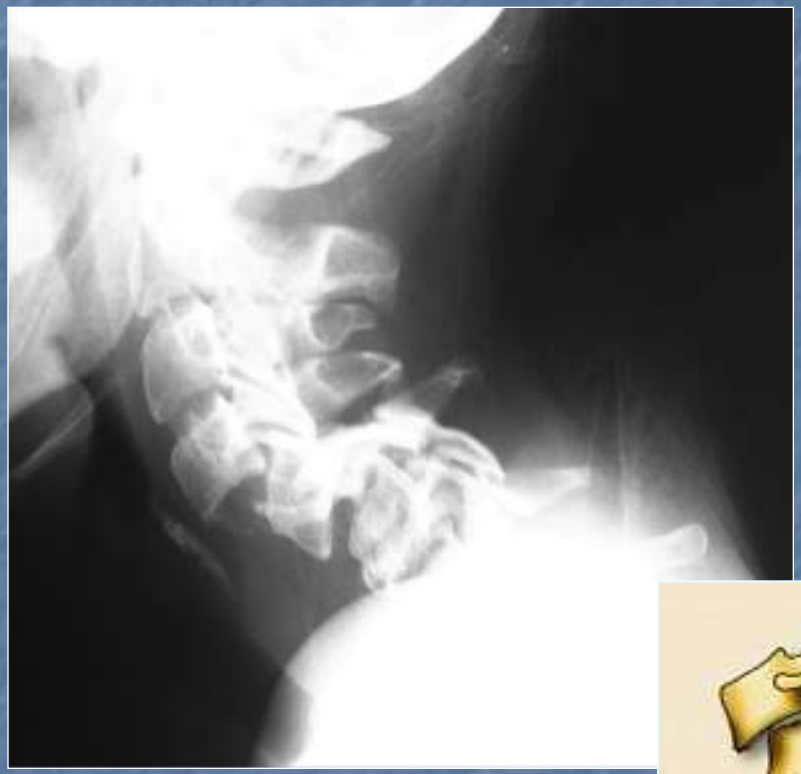
Compression injuries
Comminuted fracture: AII

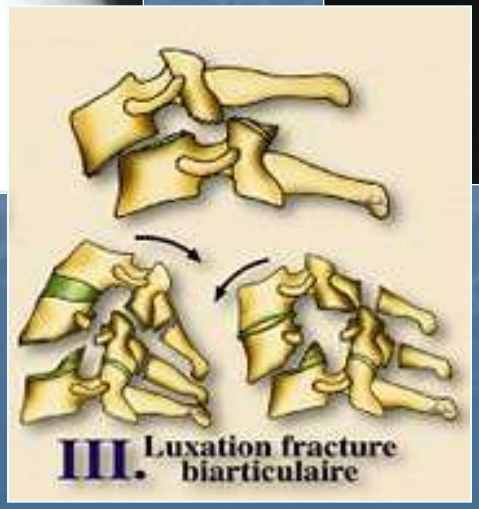


Compression injuries
Teardrop fracture: AIII

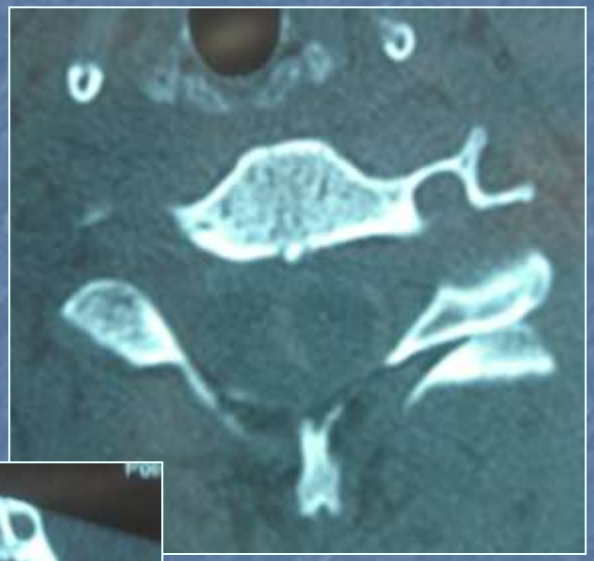


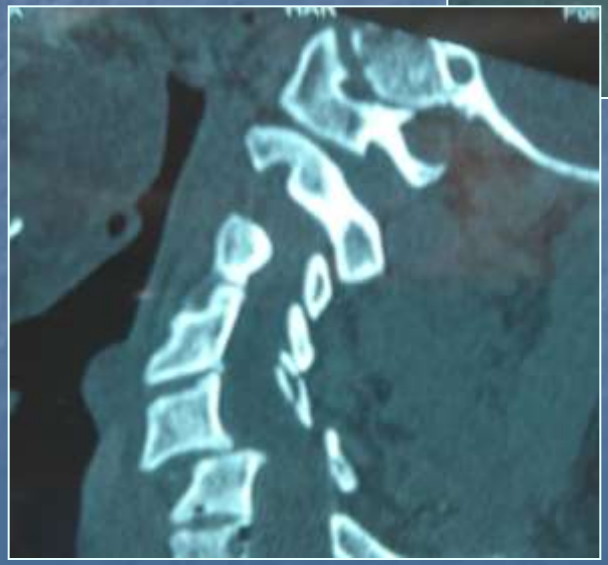
Flexion-extension-distraction injuries
Bilateral fracture dislocations: BIII





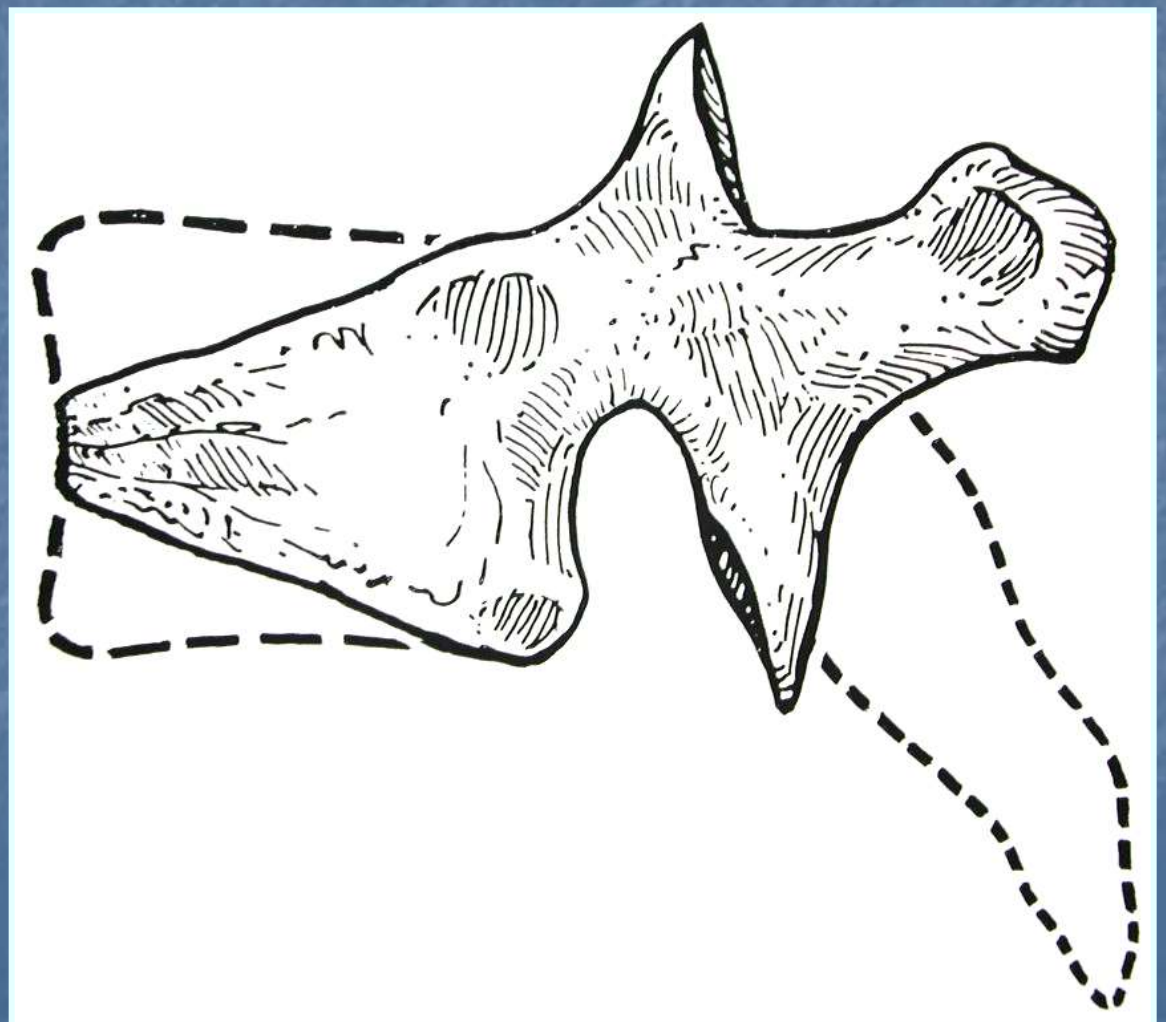
Rotation injuries
Unilateral dislocation: CIII

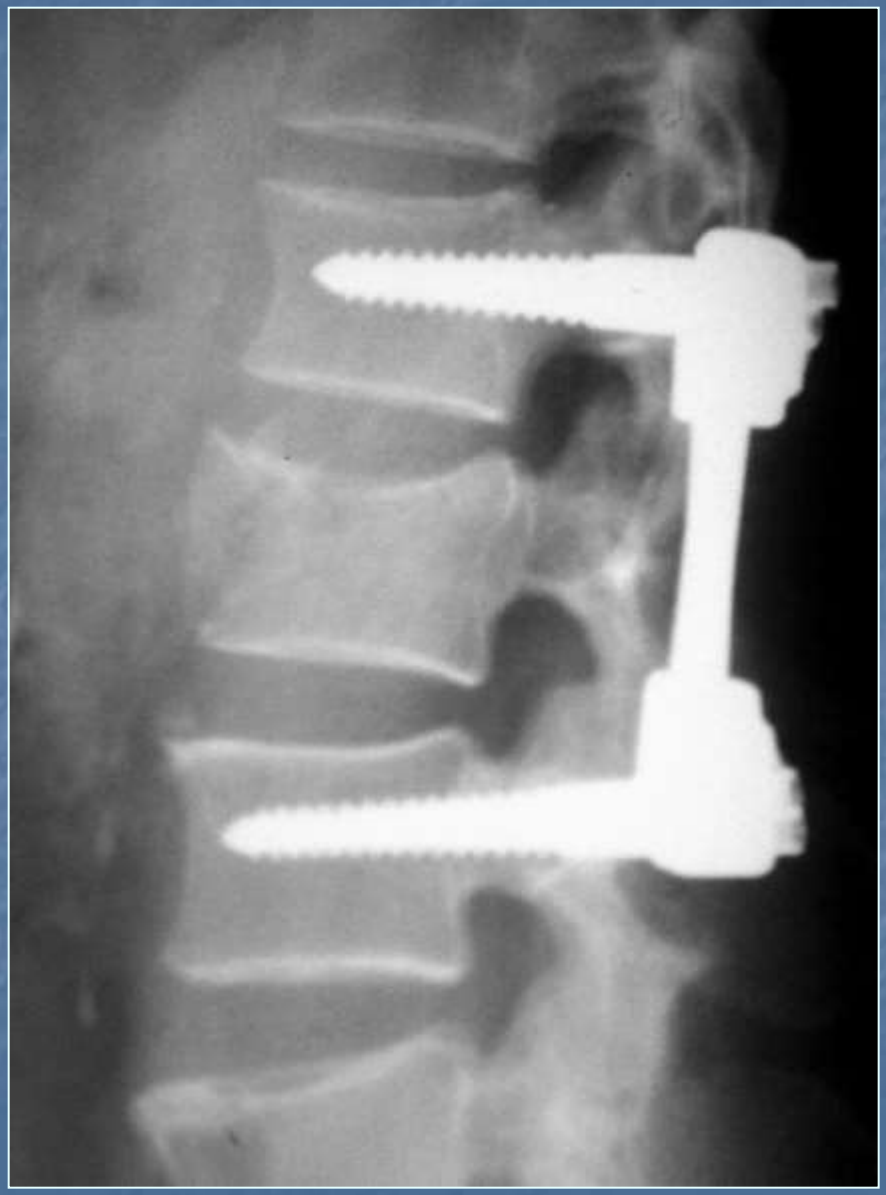


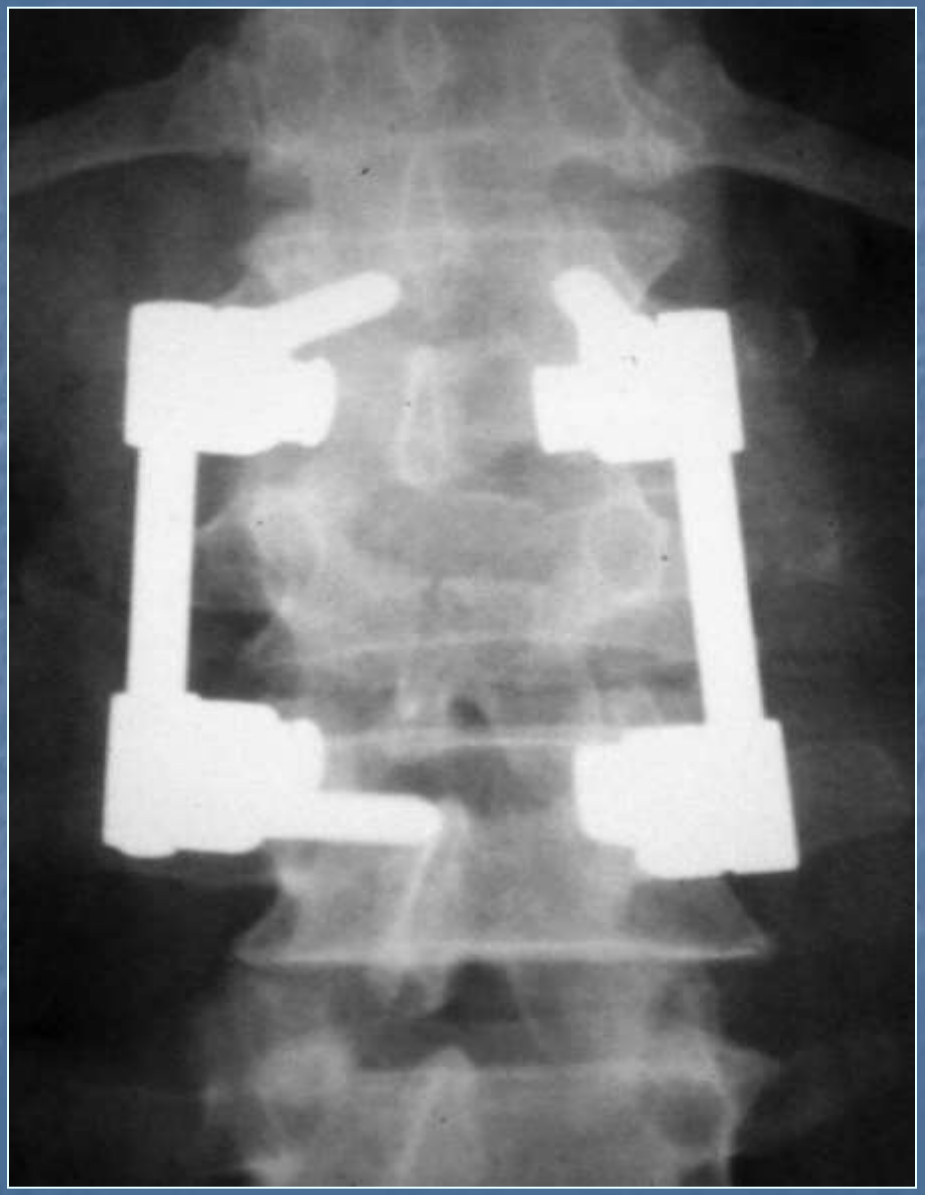


Rachide toraco-lombare

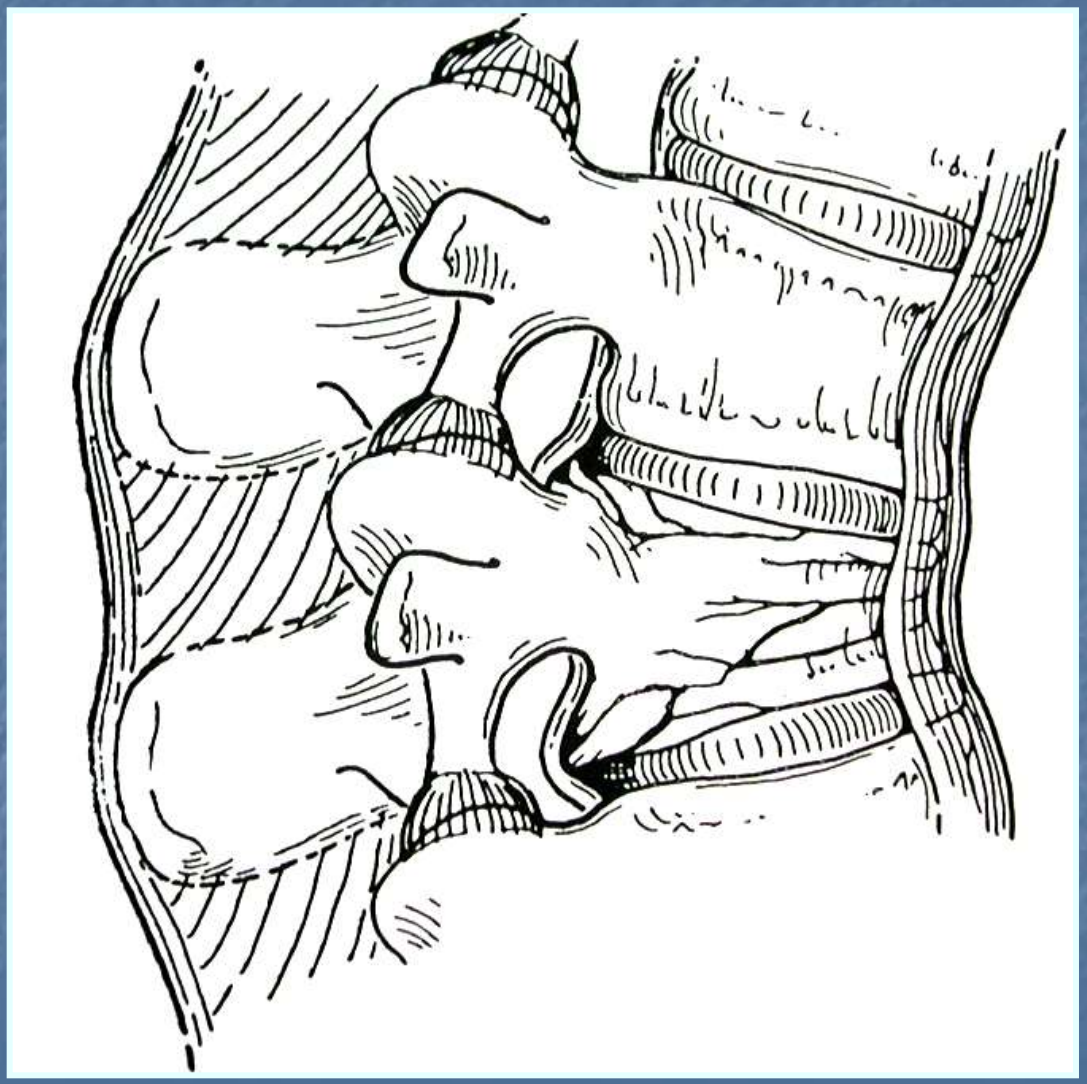
Fratture in compressione o a cuneo (grave)





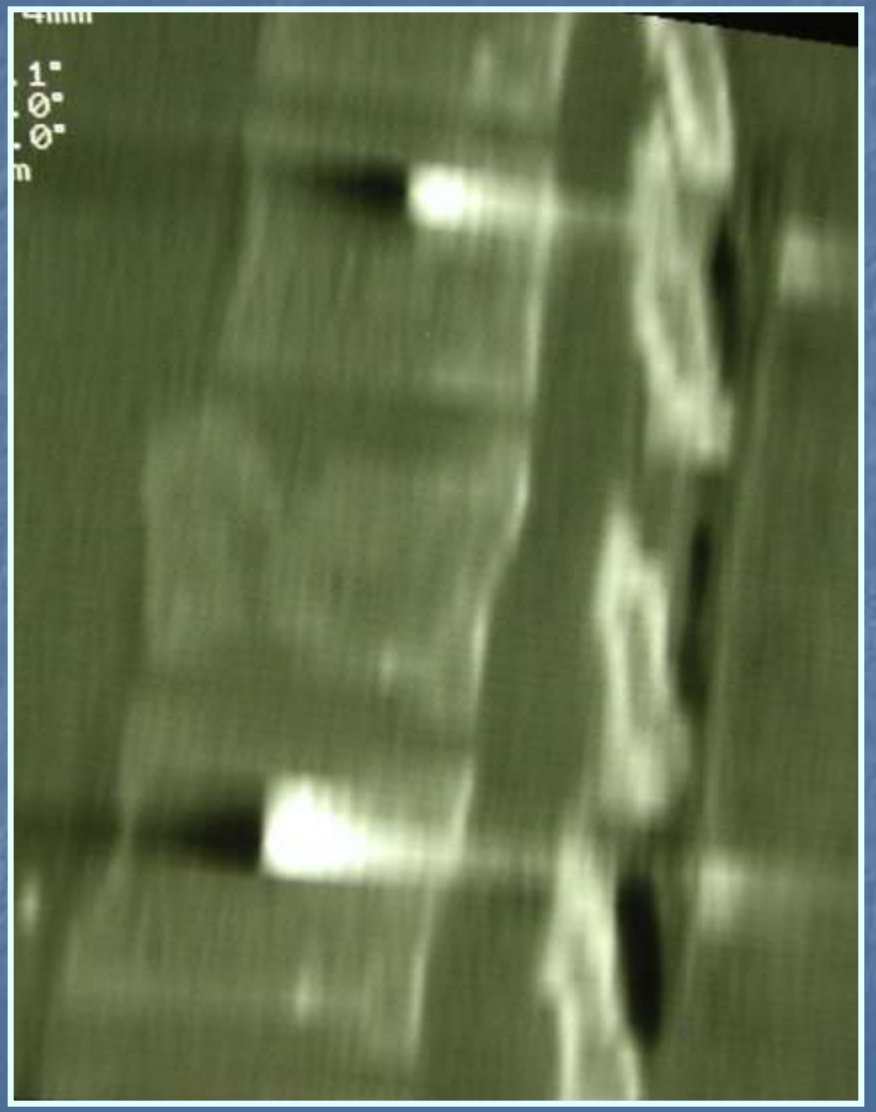


Fratture a scoppio (Burst fracture)
Tipo A

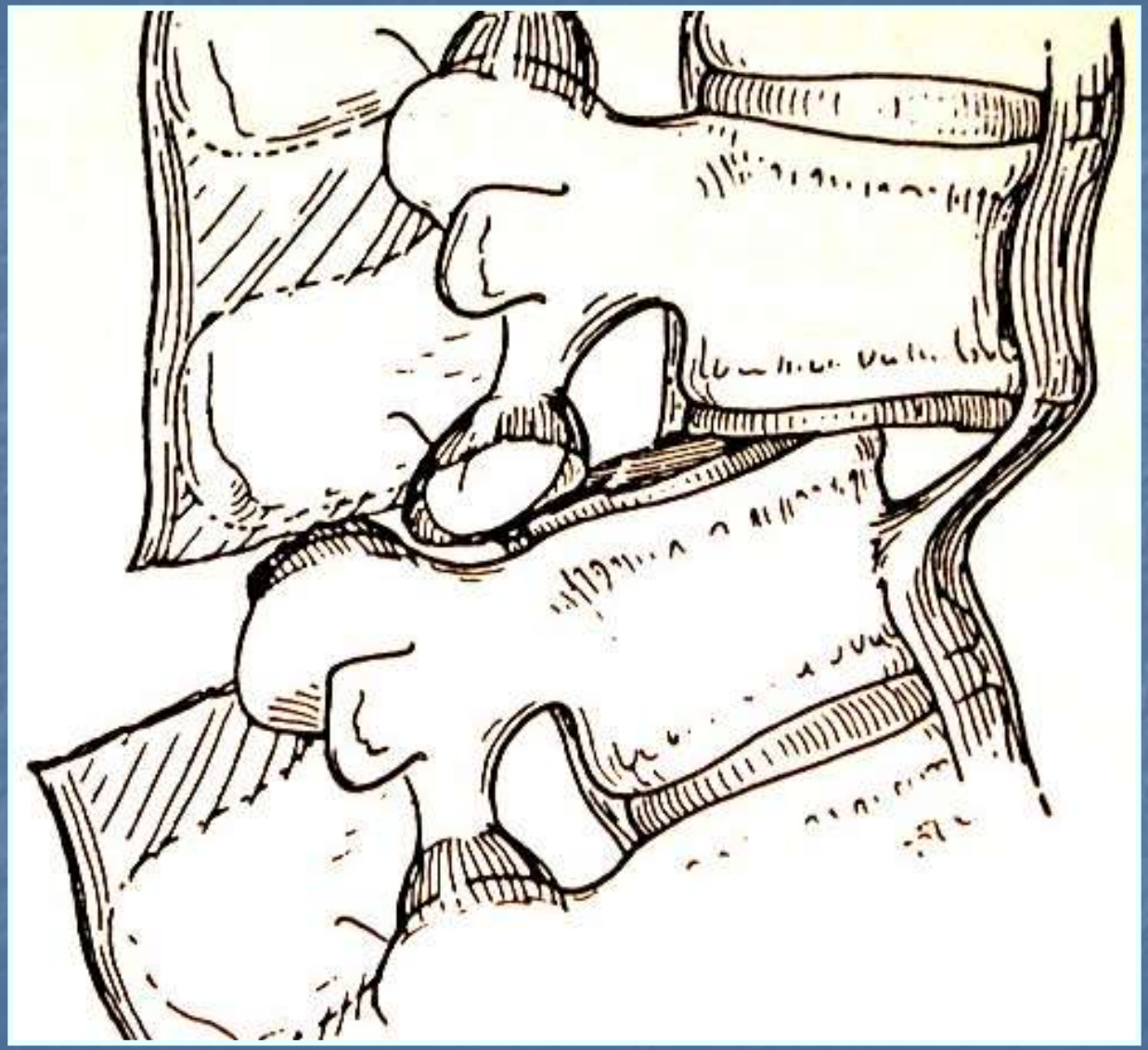


Tipo A (entrambi i piatti vertebrali)

BURST FRACTURE

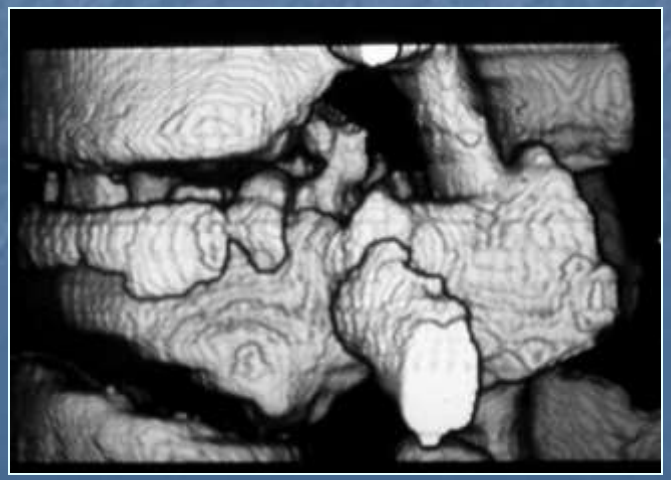


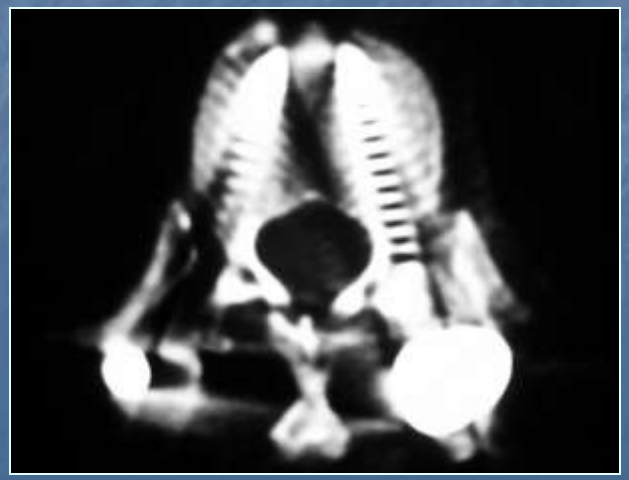
Fracture-dislocation Tipo B



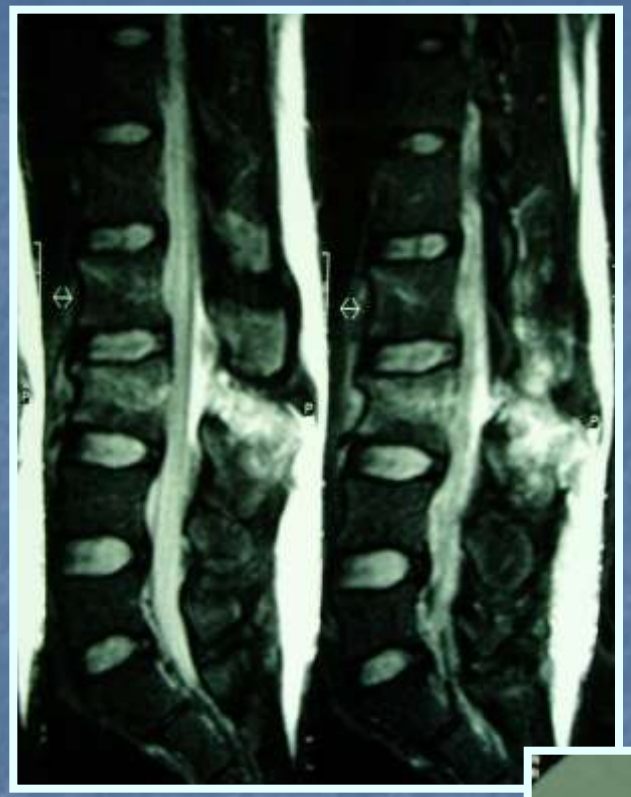
Tipo flessione - distrazione

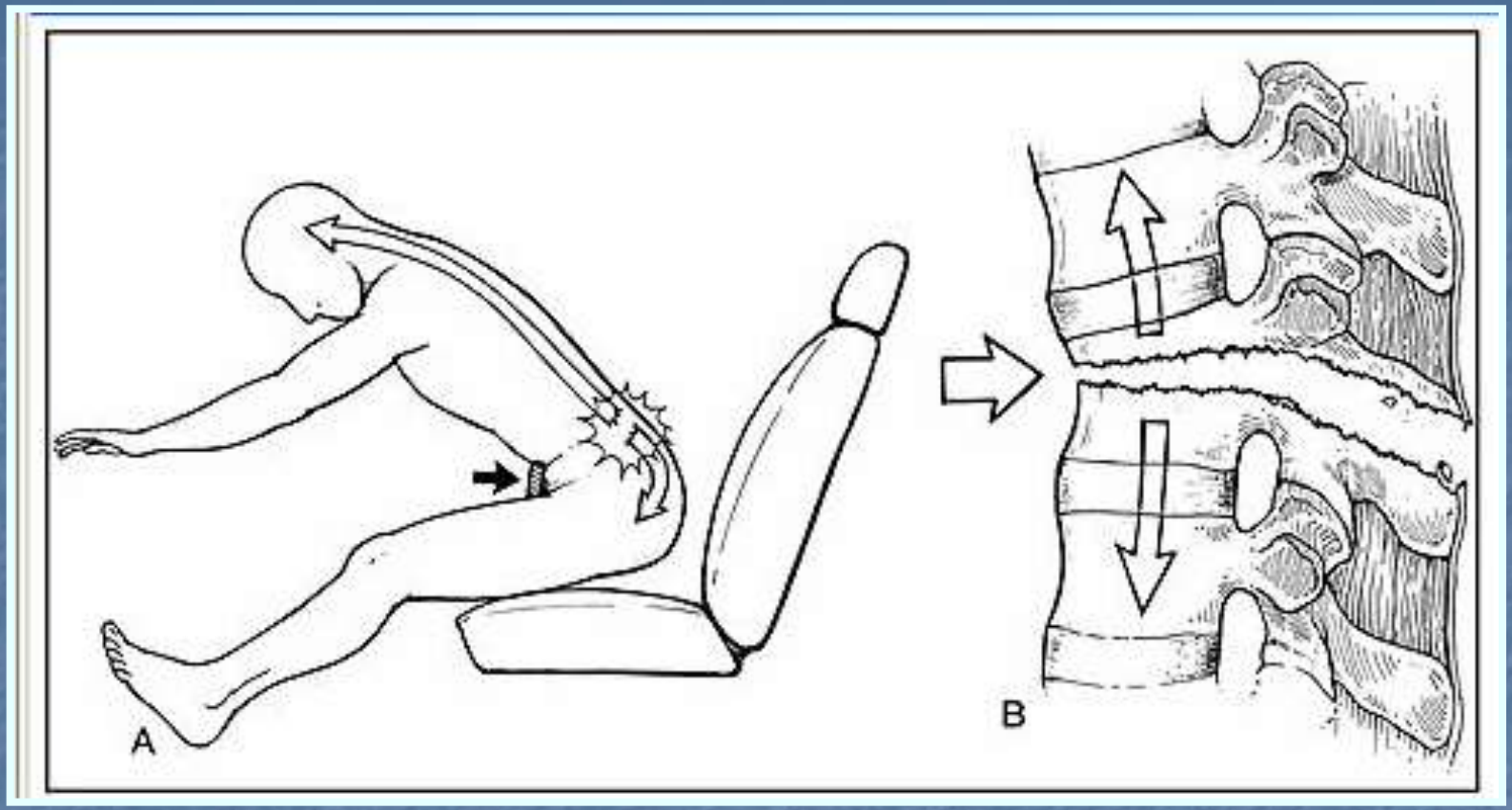
FRACTURE - DISLOCATION



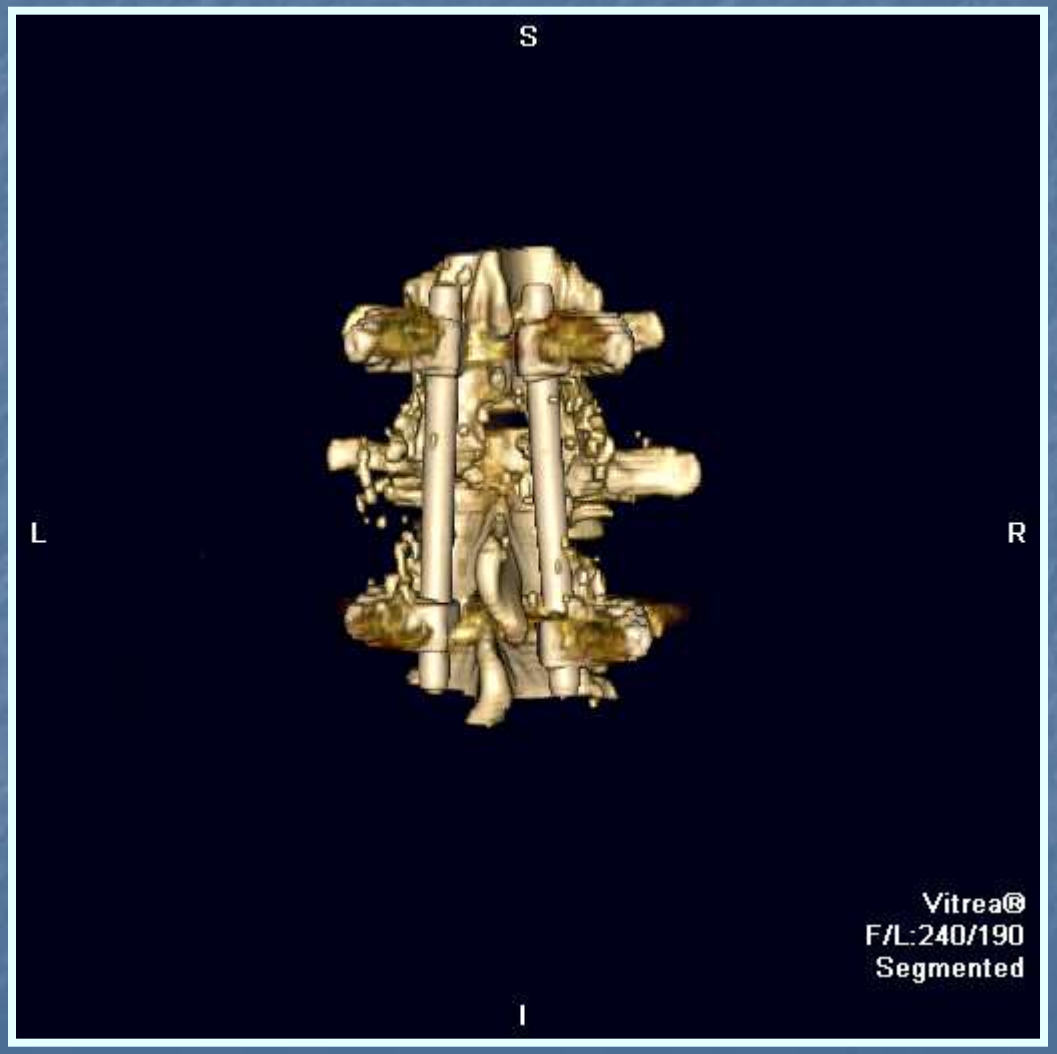


Seat belt fracture L3





- Si originano in seguito ad un meccanismo di flessione-compressione-distrazione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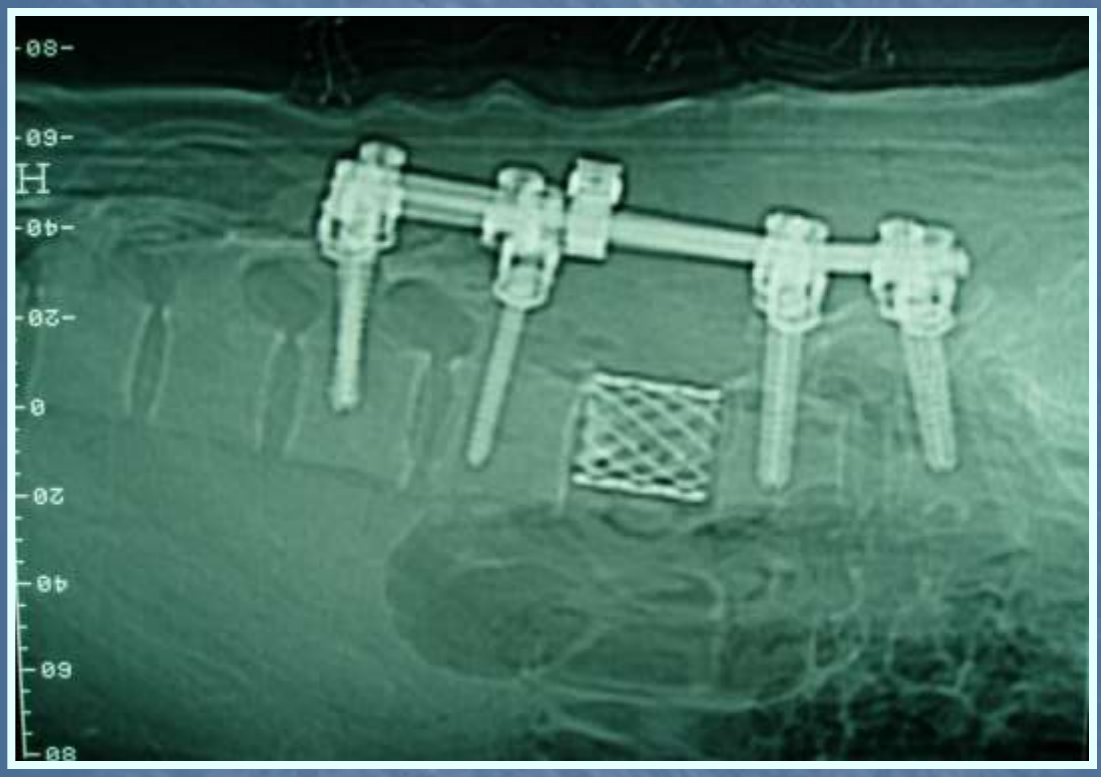
I
Vitrea®
F/L:240/190
Segmented

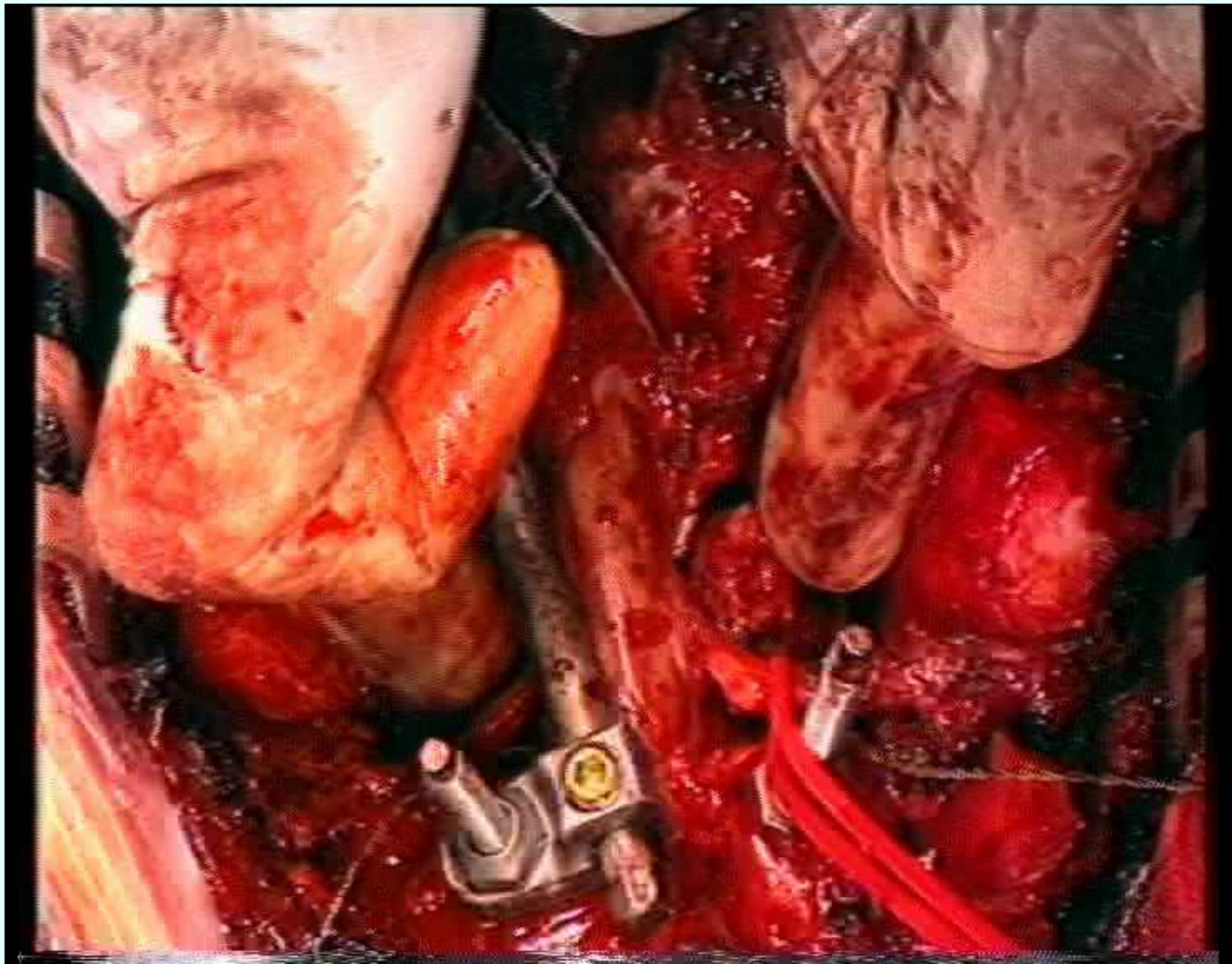
Trattamento
Fase decompressiva
Innovazioni

- Approcci mininvasivi e tecnologie avanzate permettono la decompressione neurologica e l'osteosintesi evitando di effettuare approcci chirurgici gravosi per il paziente come le vie transtoraciche o transaddominali sovrautilizzate negli anni '90

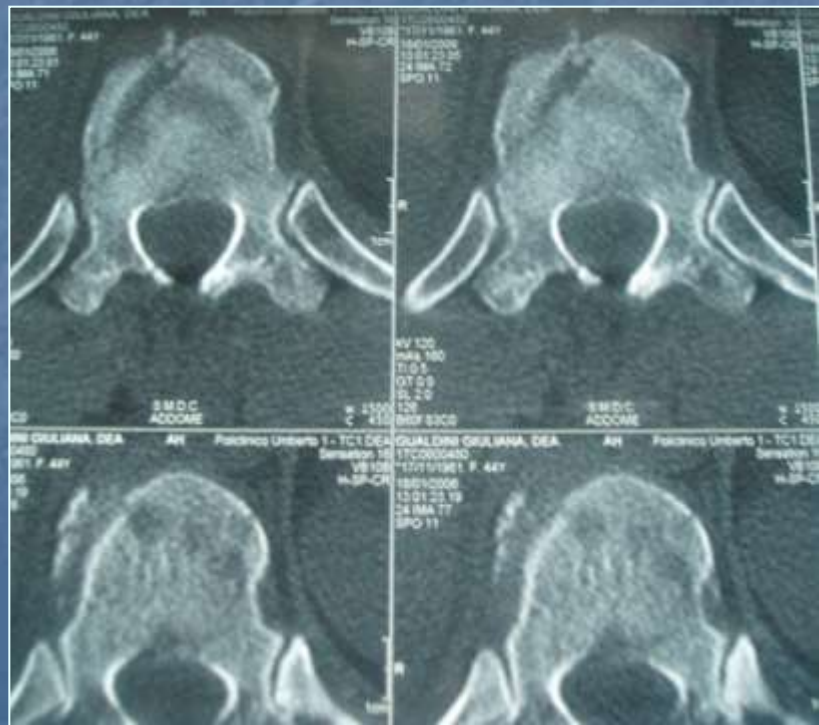

-80
-60
H
-40
-20
0
20
40
60
80

Trattamento Fase decompressiva

Innovazioni



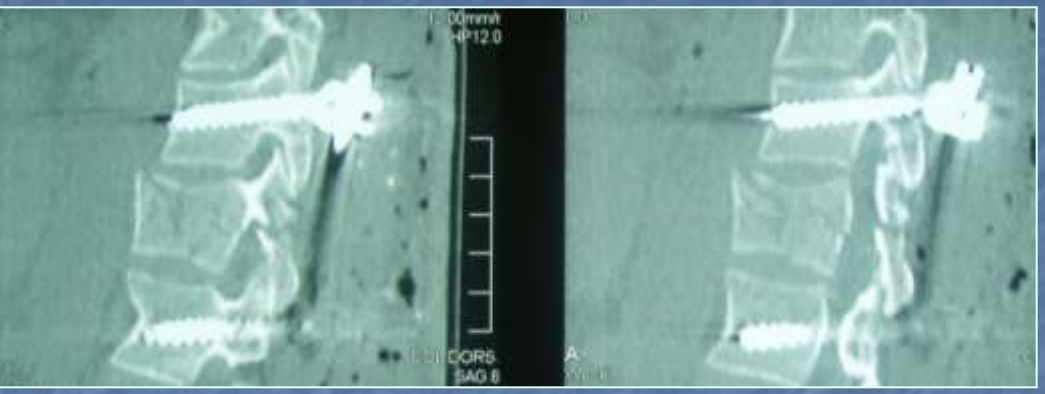
Frattura D11

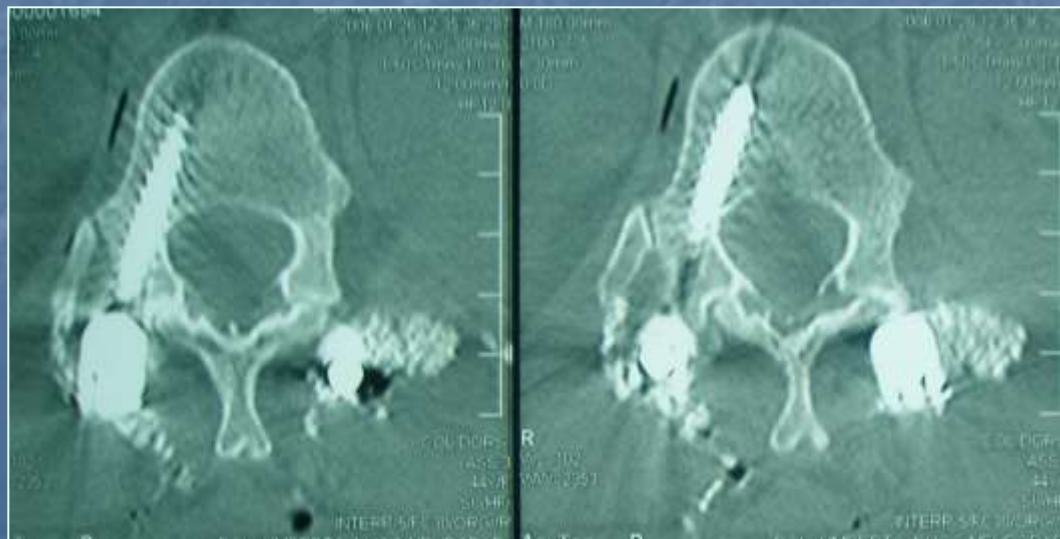



90 kV
3.55 mA
57
24
11.4Bradcm2
OEC

In casi selezionati

- Minore trauma chirurgico
- Minori perdite ematiche
- Riduzione dei rischi infettivi
- Riduzione del tempo di degenza
- Diminuzione del ricorso a farmaci
- Precoce recupero funzionale





Conclusioni

- Il panorama dei traumi vertebro-midollari è estremamente ampio e variegato
- Il trauma vertebro-midollare necessita del coinvolgimento di un'equipe multispecialistica
- L'utilizzo e la conoscenza di linee-guida e classificazioni adeguate permette l'inquadramento della frattura e la corretta strategia di trattamento

Grazie