

Lesioni Rachidee nello Sport



Epidemiologia

- U.S.A. = circa 10.000 casi /anno lesioni traumatiche vertebrali ; sports-related activities : 10-15%
 - Lesioni traumatiche vertebrali = 2-3% di tutte le lesioni traumatiche sportive
-
- Sport più implicati – Rachide Cervicale :
 - American football, diving, gymnastics, skiing, ice hockey, wrestling, rugby, hang gliding, surfing, equestrian events

Epidemiologia

- U.S.A. = 7% sport-related lumbar injuries .
-

- G.B. = spinal injuries : 15% of all injuries sustained in sports

- Lesioni rachide toraco-lombare :
 - automobile racing, horseback riding, parachuting, mountain climbing, weightlifting

• Lesioni non diagnosticate

- Rachide toraco-lombare : 4.9%
- Rachide cervicale : 22.9%
- Mancata esecuzione RX
- Scarsa qualità o incompletezza immagini
- Sottostima
- Danno neurologico secondario (e forse evitabile) più frequente in T-L :
 - 10,5 % in “overlooked injuries”
 - 1.4% nelle lesioni diagnosticate dall’inizio

Overlooked Spinal Column Injuries

- Lesioni vertebrali multiple **5%–15%**
- Fratture non contigue : 1.6 – 16.7 %

- Fratture vertebrali in associazione con :
 - Trauma cranio-facciale 26%
 - Trauma toracico maggiore 16%
 - Trauma addominale maggiore 10%
 - Frattura ossa lunghe, piatto tibiale, calcagno, bacino 8%

Overlooked Spinal Column Injuries

- Dolore persistente e deformità progressiva
- ~~Trattamento conservativo chirurgico~~
- ~~Interventi chirurgici più complessi~~

- Risultati meno soddisfacenti (?)
 - (se comparati con le fratture riconosciute e trattate d'emblée)

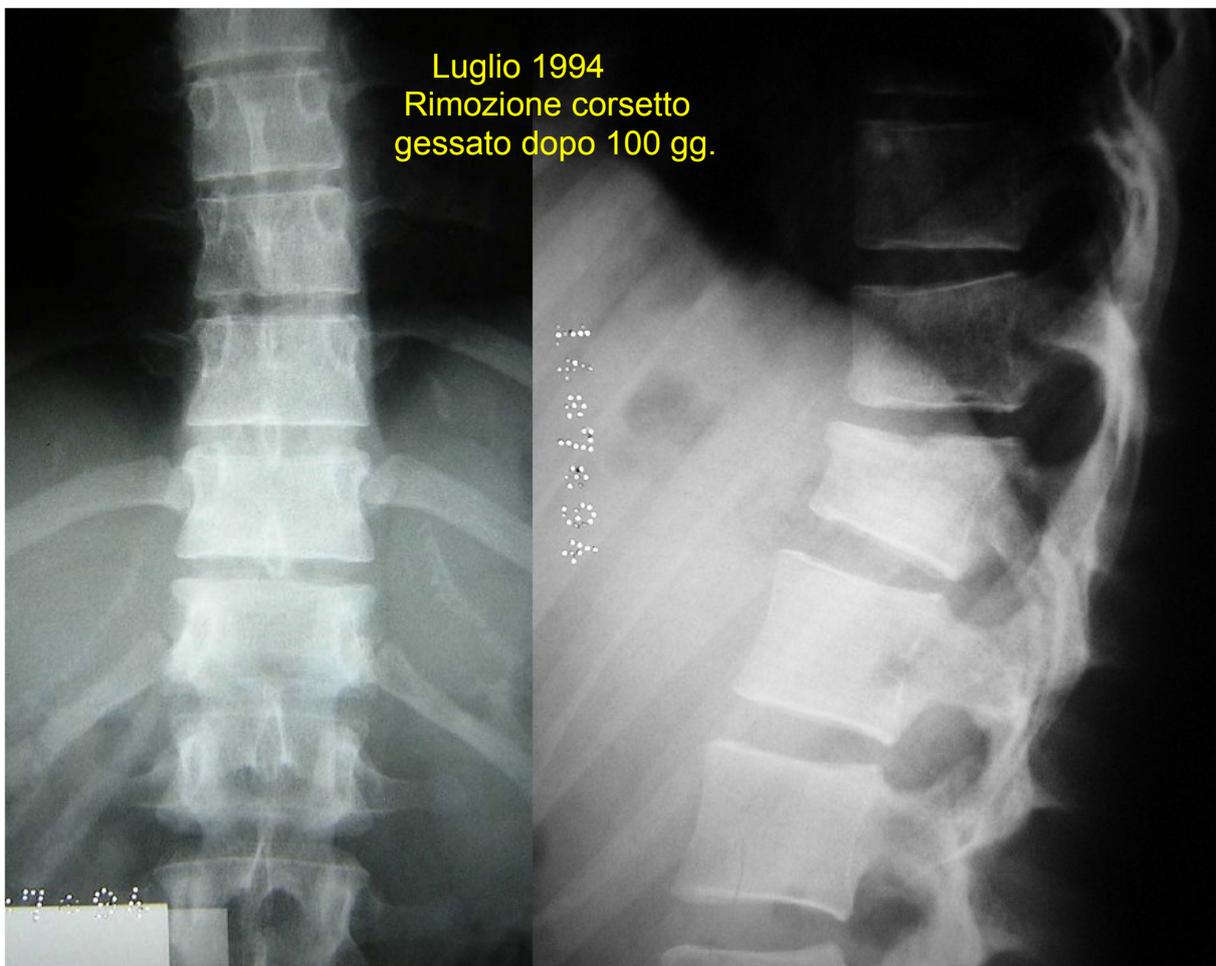


Esiti frattura T8 – T10 – T12 – L1



Correzione – artrodesi T3 – L3

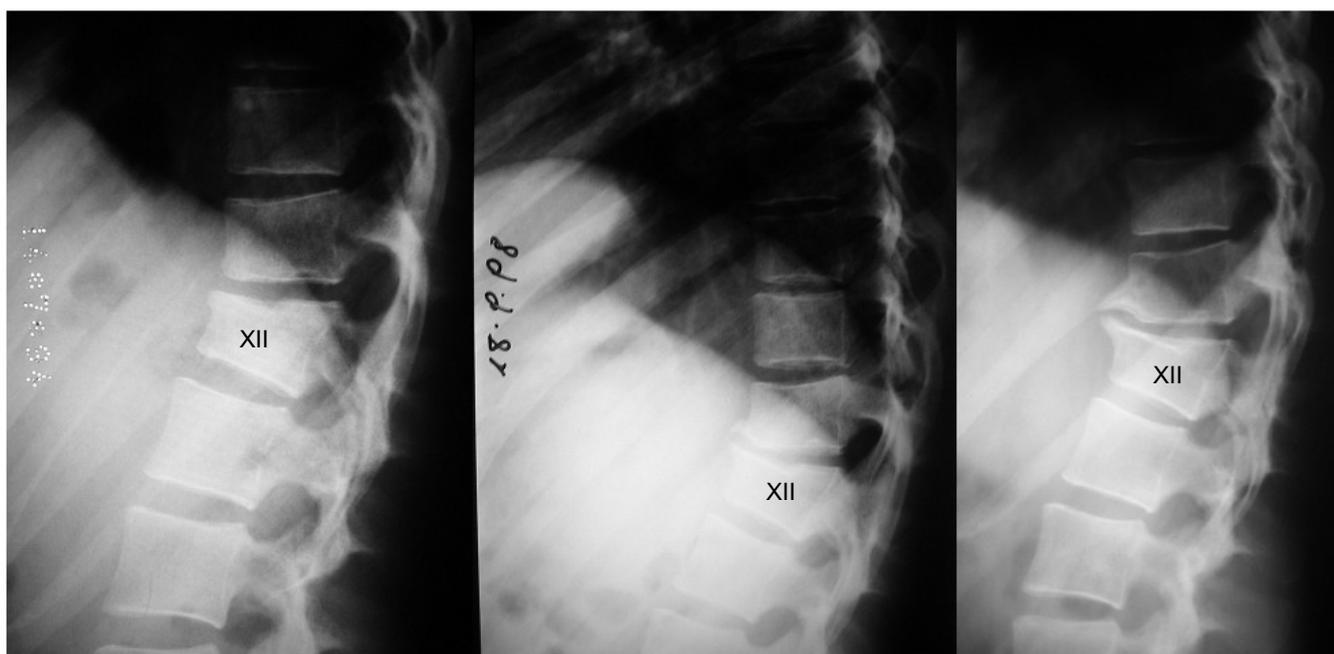
Luglio 1994
Rimozione corsetto
gessato dopo 100 gg.



Luglio 1994

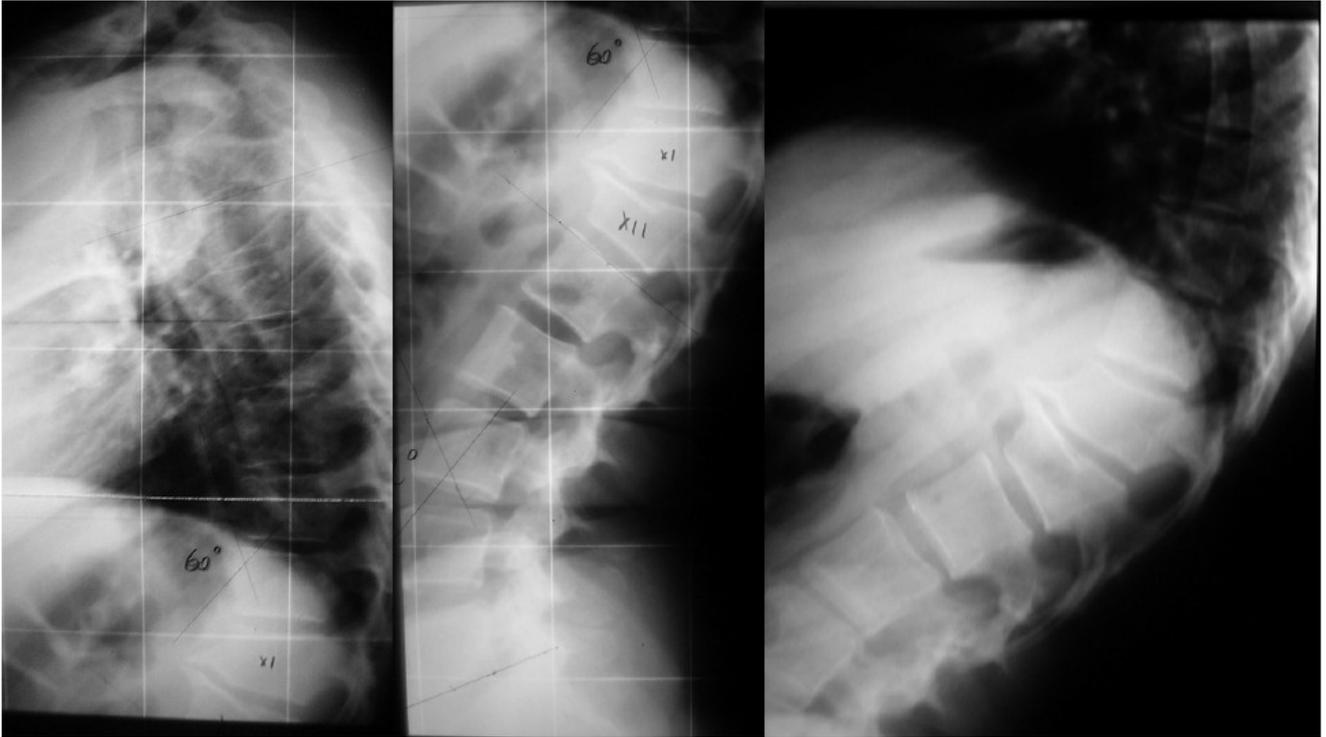
1998

2001



Novembre 2006

Max. estensione



Diagnosi

- La diagnosi iniziale di una lesione del rachide si fonda su una corretta :

1. Valutazione clinica dei pazienti

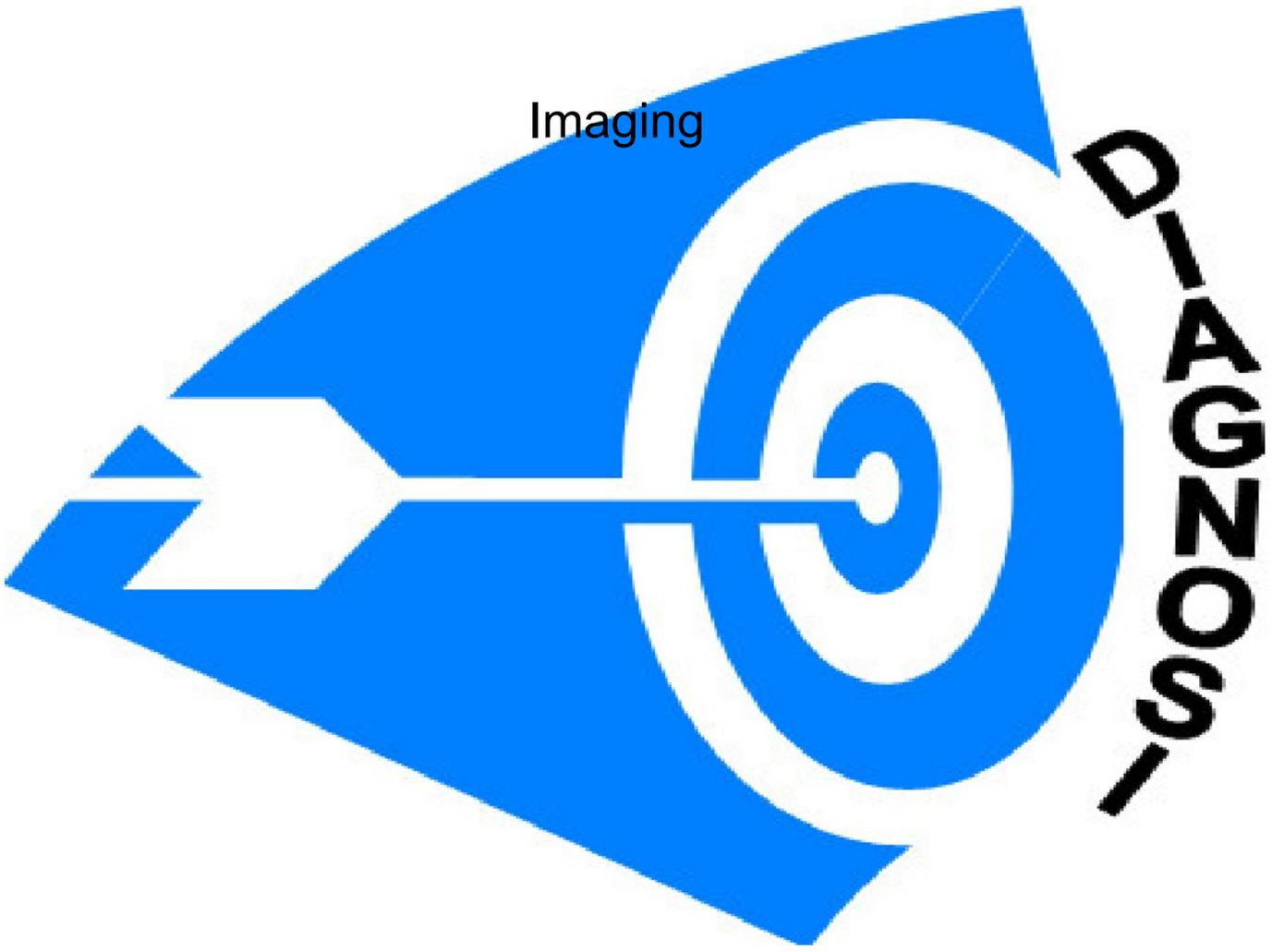
2. Richiesta di indagini RX
3. Esecuzione RX
4. Interpretazione RX

Valutazione clinica

- ispezione (abrasioni, lacerazioni, ecchimosi, tumefazioni, dermografismo)
- palpazione (contrattura, scalini, disallineamento)
- valutazione neurologica



Imaging



Overlooked Spinal Column Injuries

RACHIDE CERVICALE

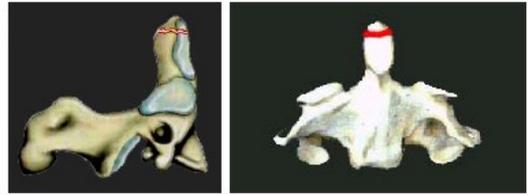
- Alcune fratture possono più frequentemente sfuggire ad uno studio RX tradizionale
-



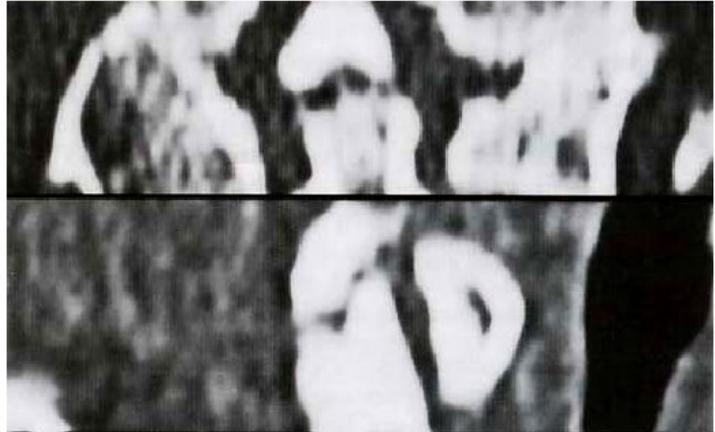
- Dente epistrofeo 23 %
- Tear-drop 16%
- Fratture e fratt.-lussazioni unilaterali 14 %
- Hangman 10 %

Fratture dente epistrofeo

50% fratture C2

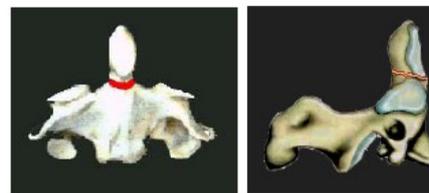


–Tipo I (< 5%) = frattura obliqua che interessa la parte craniale dell'odontoide sopra il leg. trasverso



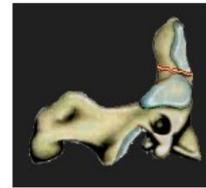
Classificazione Anderson – D'Alonzo

Frattura tipo II : > 60 %



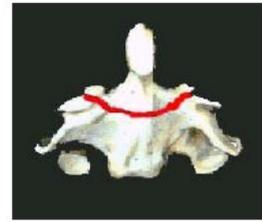
Tipo II (> 60%) = rima di frattura alla base dell'odontoide secondaria a iperestensione, flessione o forze di rotazione

Frattura tipo II : > 60 %

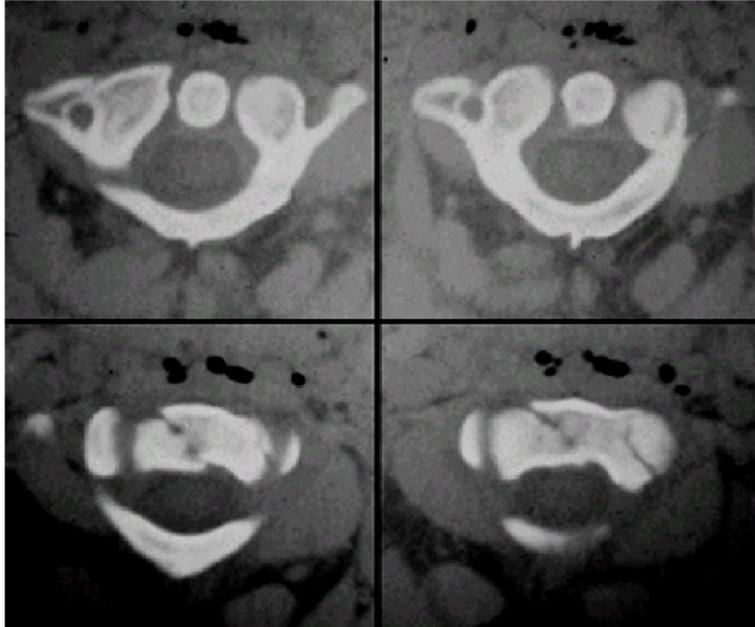


fratture con angolazione > 10° o traslazione > 5mm. vanno più facilmente in pseudartrosi

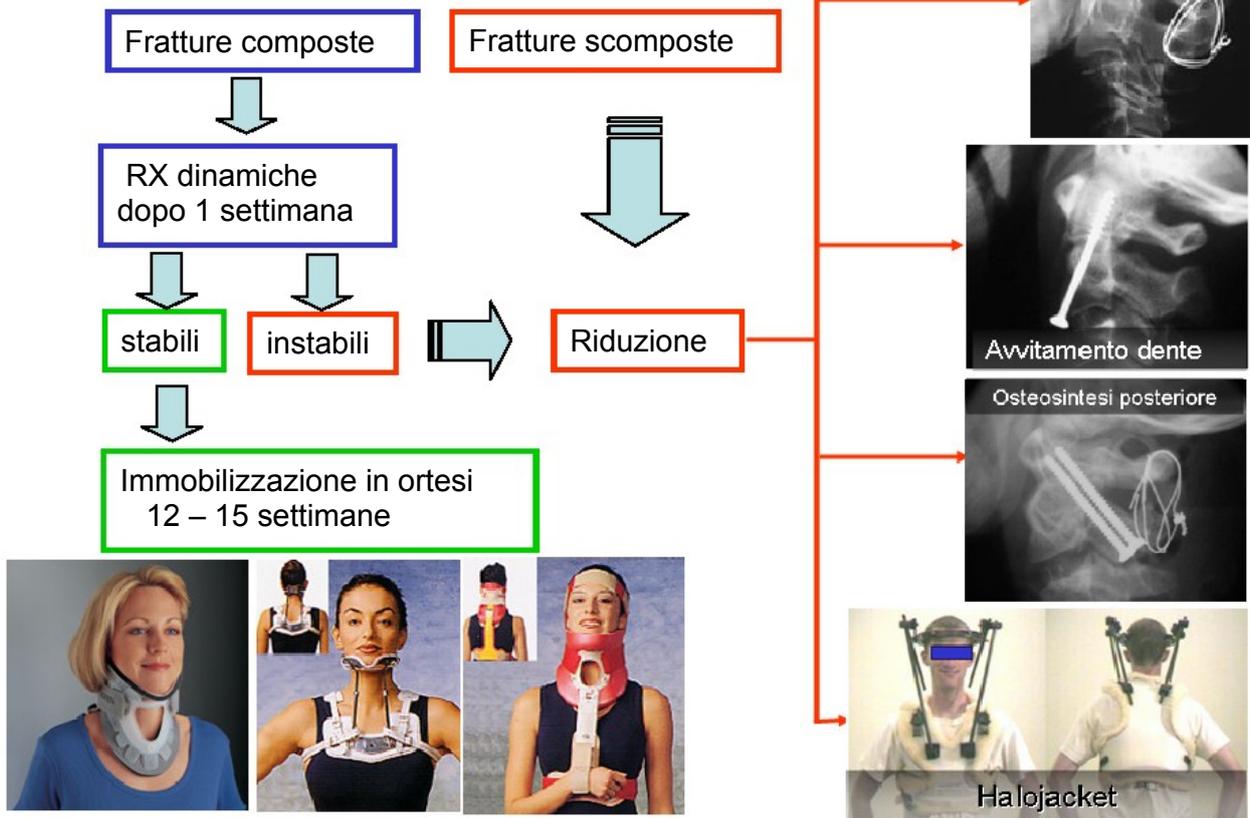
Frattura tipo III : 30%



Rima di frattura
attraverso il corpo di C2
Prognosi favorevole



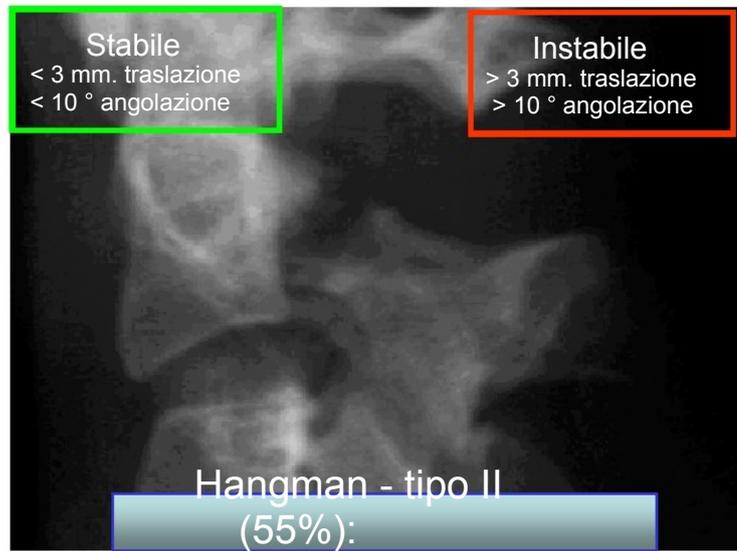
Fratture dente epistrofeo trattamento



Frattura dei peduncoli di C2:
HANGMAN o spondilolisi traumatica di C2

Classificazione di Levine e Edwards (Effendi modif.)

RX dinamiche



Hangman - tipo II A e III trattamento chirurgico

Instabile
> 3 mm. traslazione
> 10 ° angolazione



Hangman - tipo II A (5%)
notevole angolazione e traslazione ant.

Instabile
> 3 mm. traslazione
> 10 ° angolazione



Instabile
> 3 mm. traslazione
> 10 ° angolazione

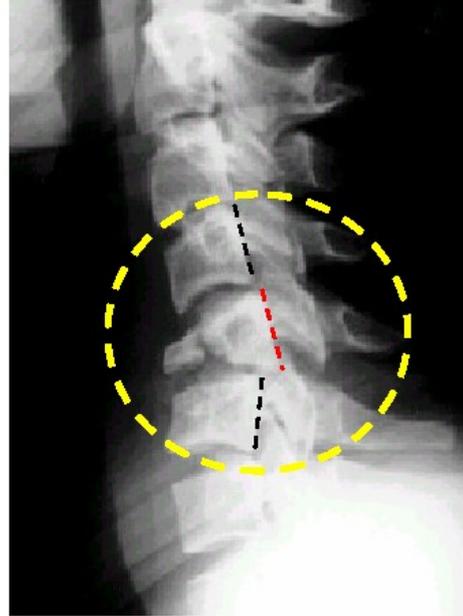


Hangman - tipo III (10%)

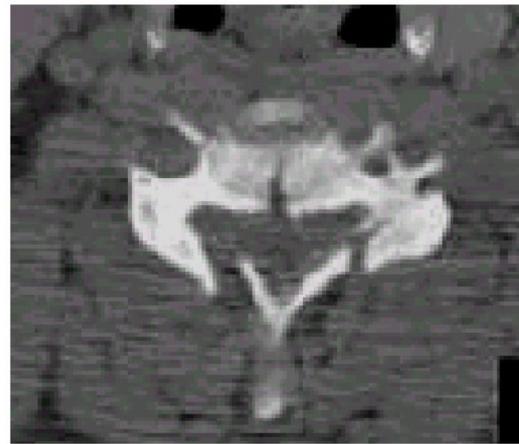
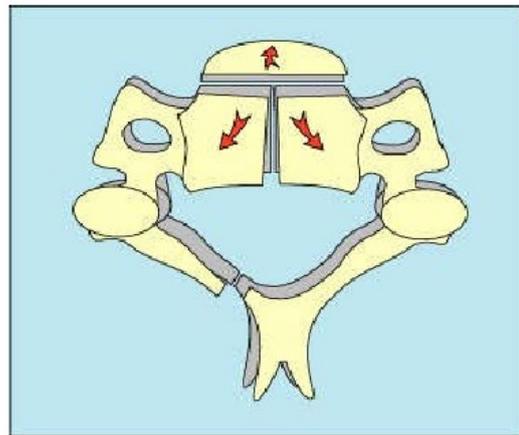
Tear-drop

(compressione-flessione)

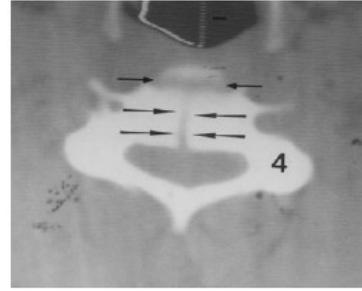
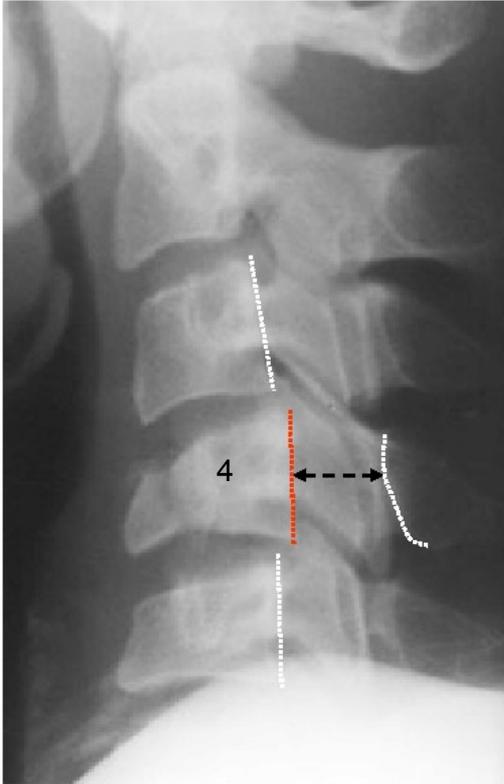
- Frattura scomposta
spigolo antero-
inferiore corpo
vertebrale
- Lesione discale
- Lesione legamentosa
posteriore
- Retrolistesi



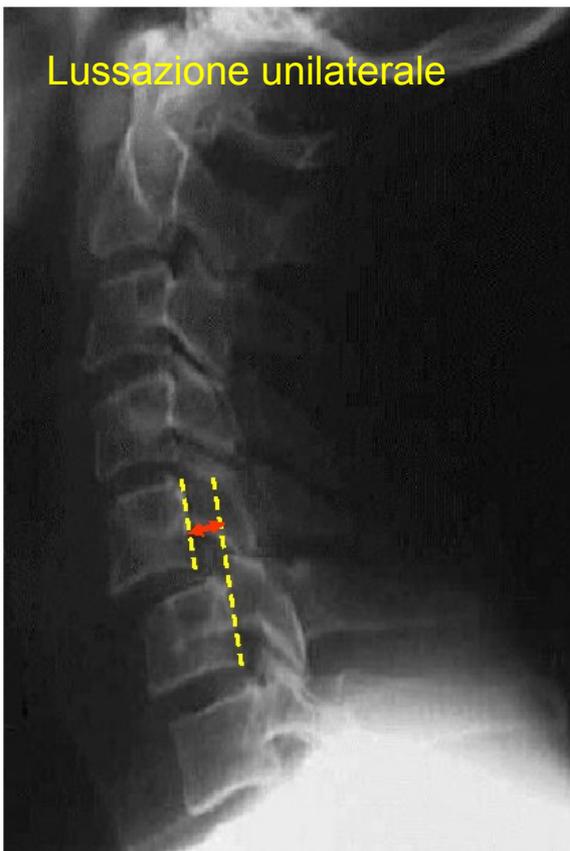
Tear-drop



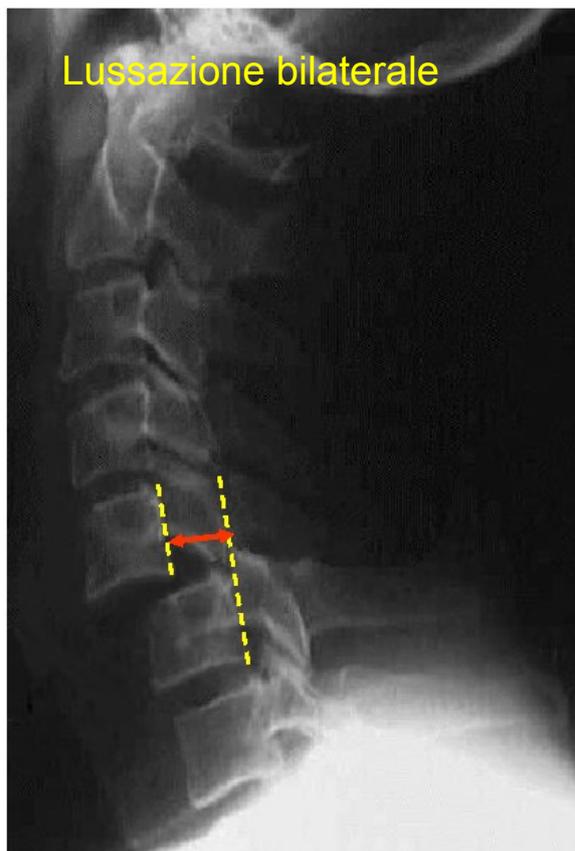
Tear-drop



Lussazione unilaterale

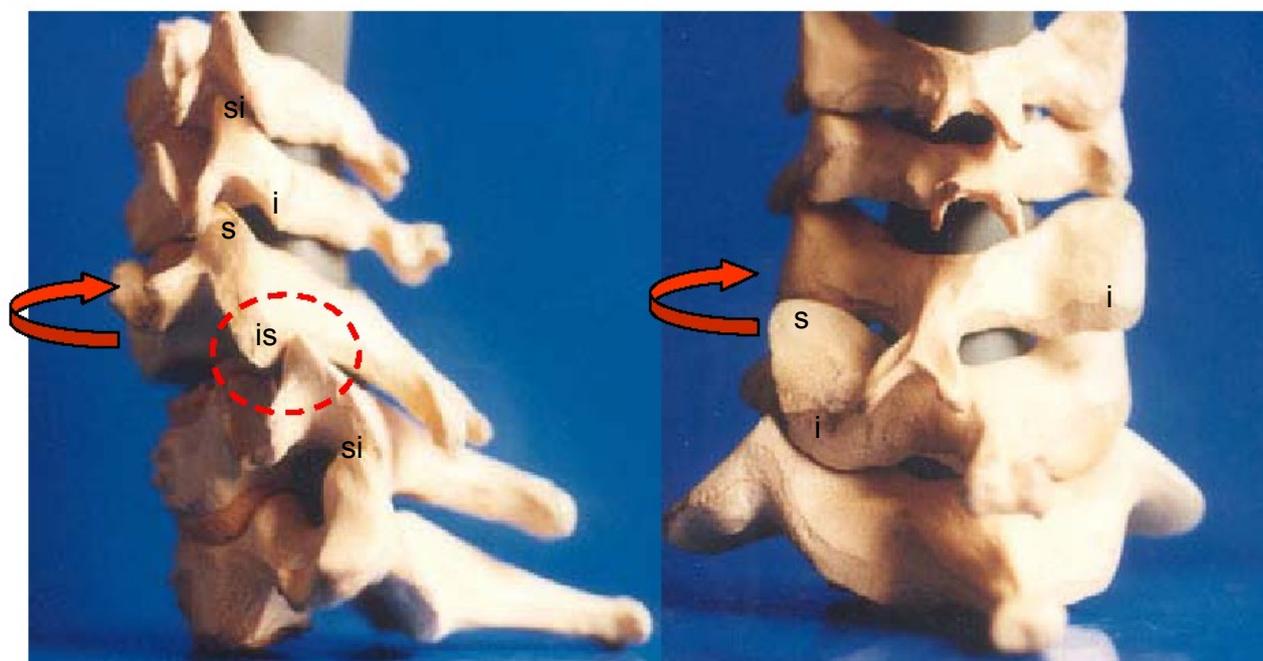


Lussazione bilaterale

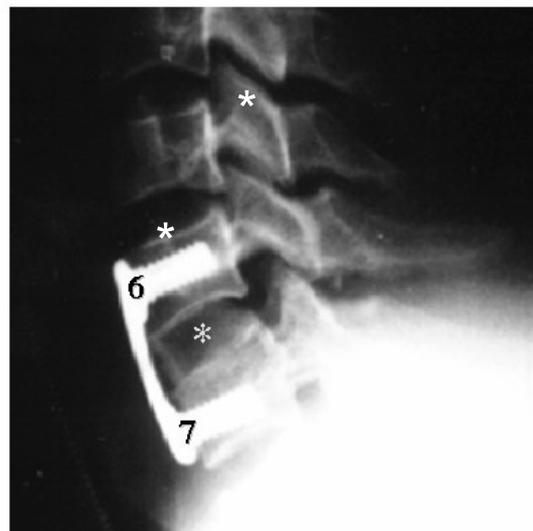
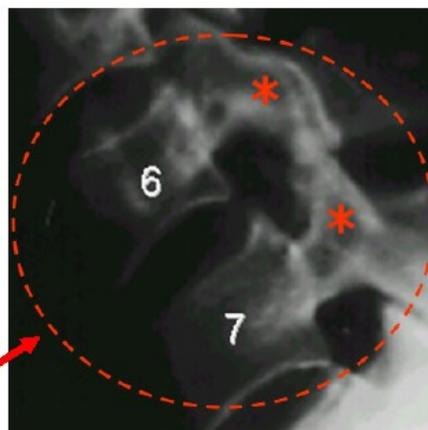
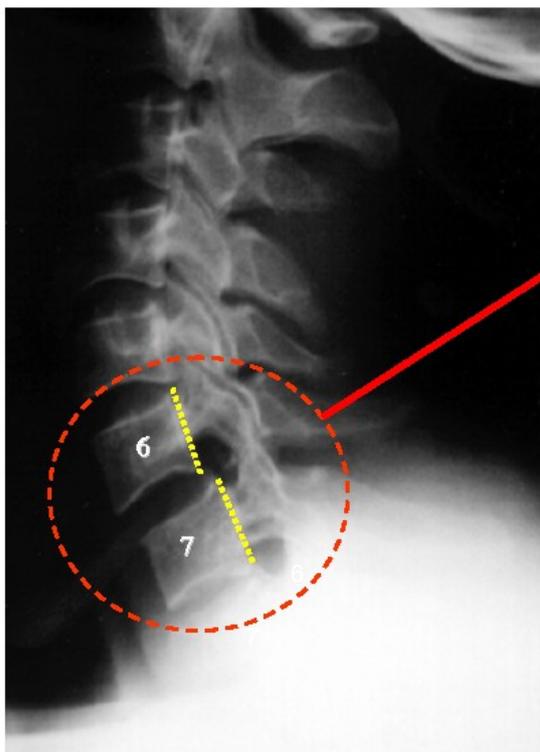


Fratture e Fratture-Lussazioni unilaterali (rotatorie)

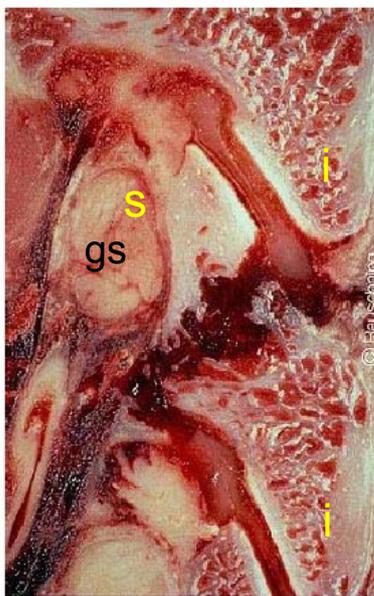
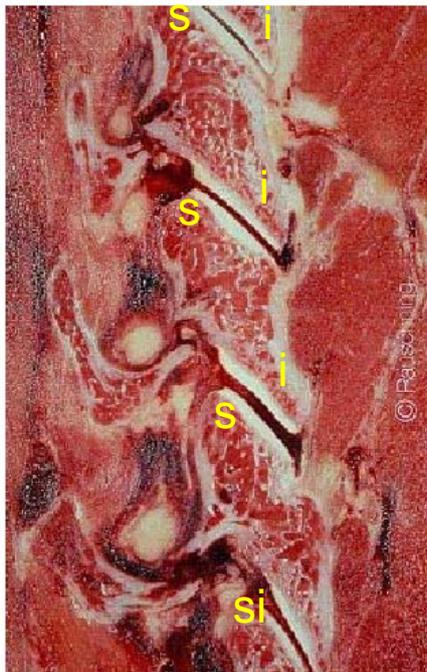
Traslazione anteriore modesta !



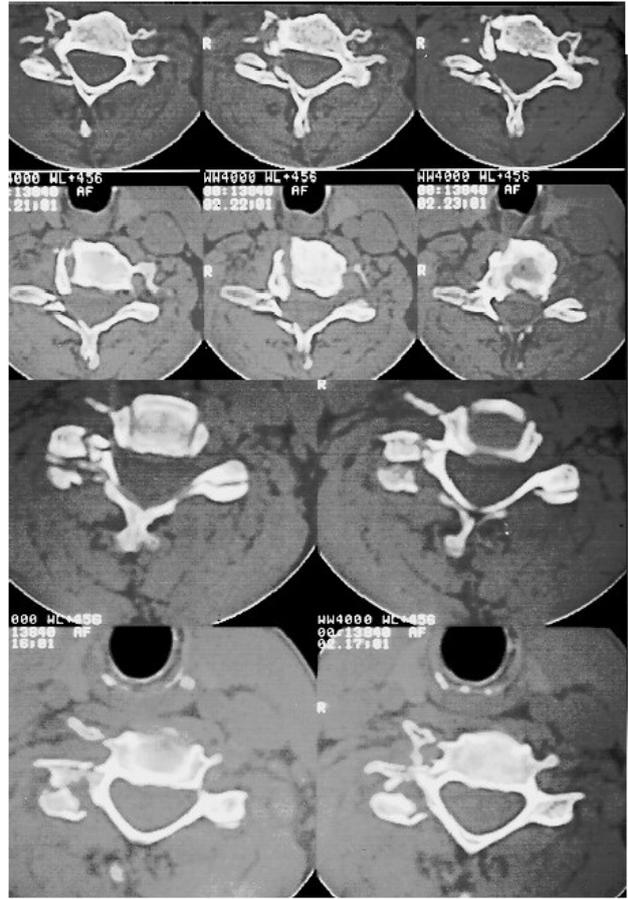
Fratture – lussazioni unilaterali



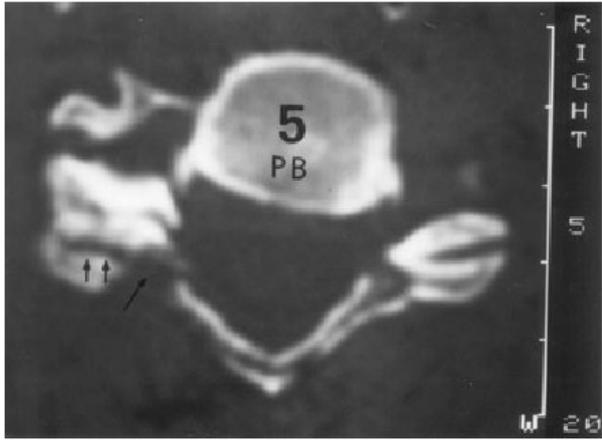
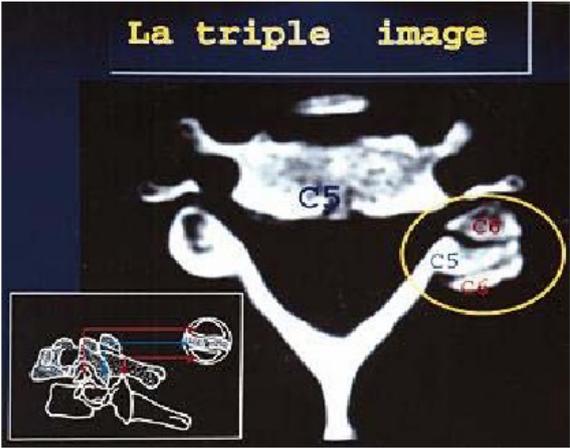
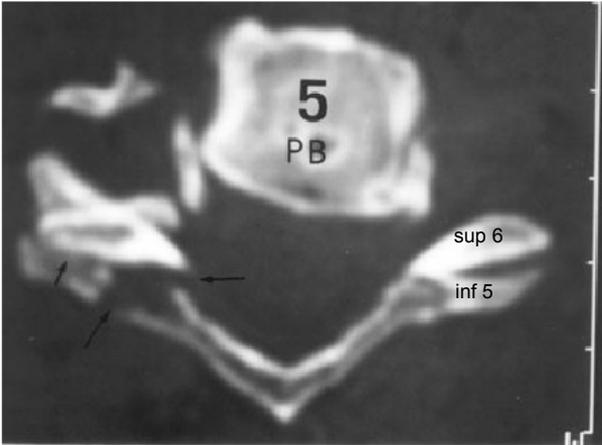
Fratture e Fratture-Lussazioni unilaterali danno radicolare



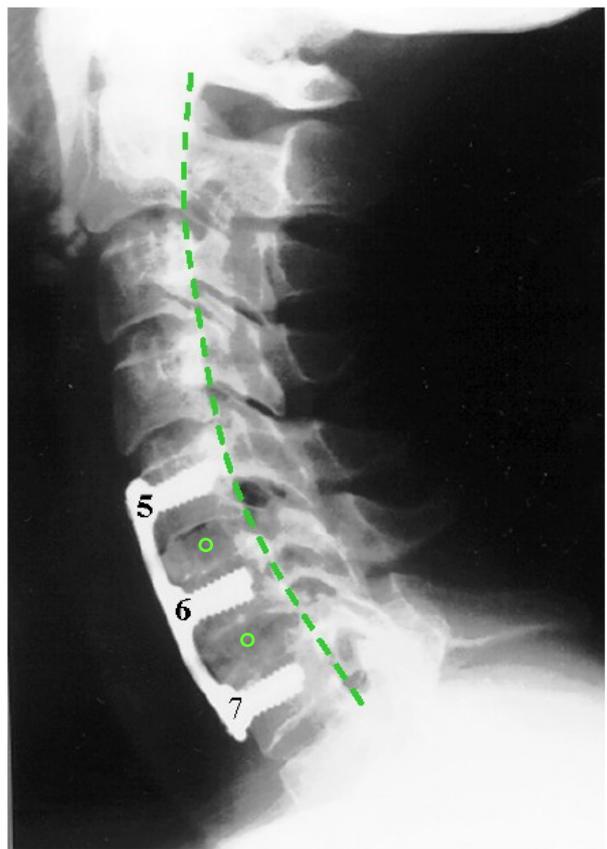
Fratture – lussazioni
unilaterali



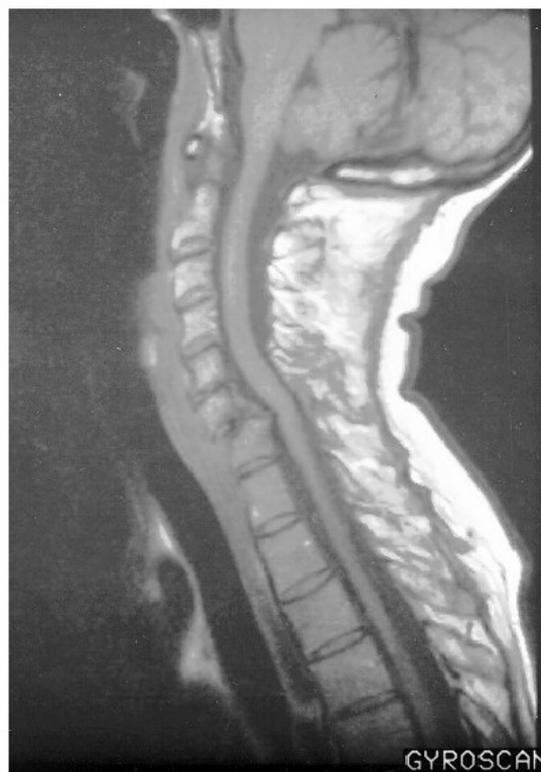
La "triple image" di Argenson



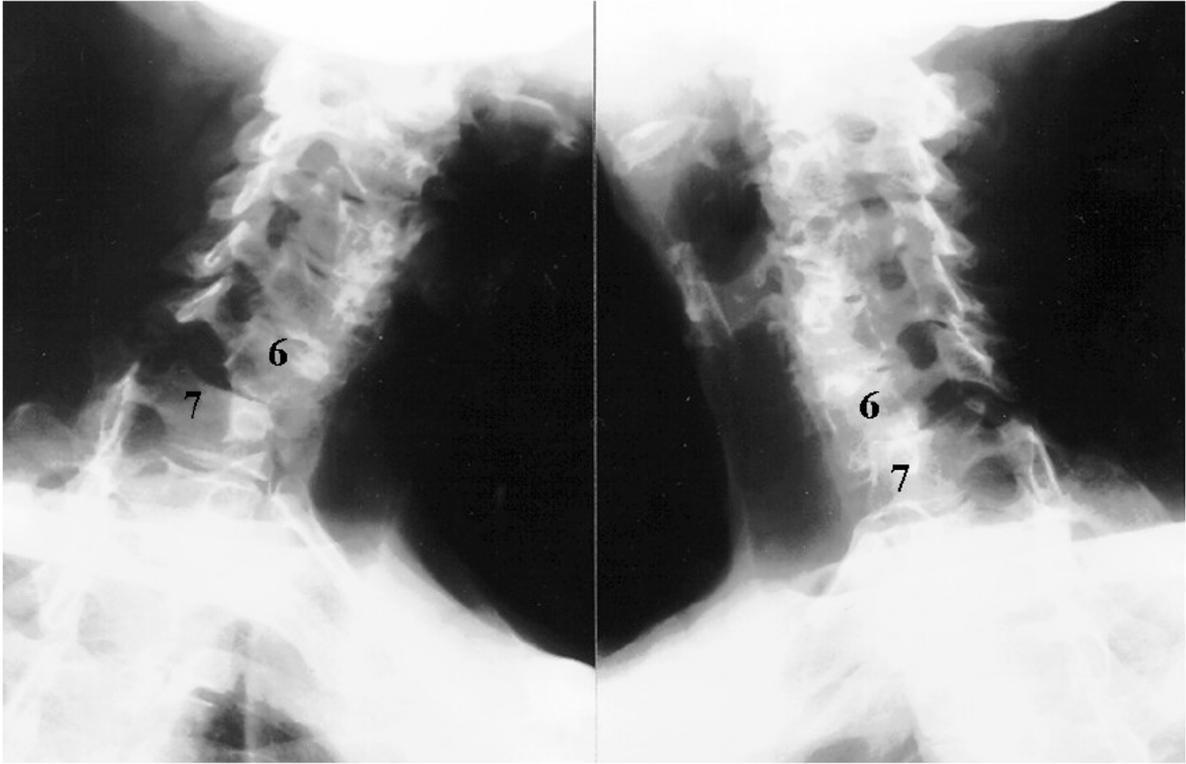
Fratture – lussazioni unilaterali



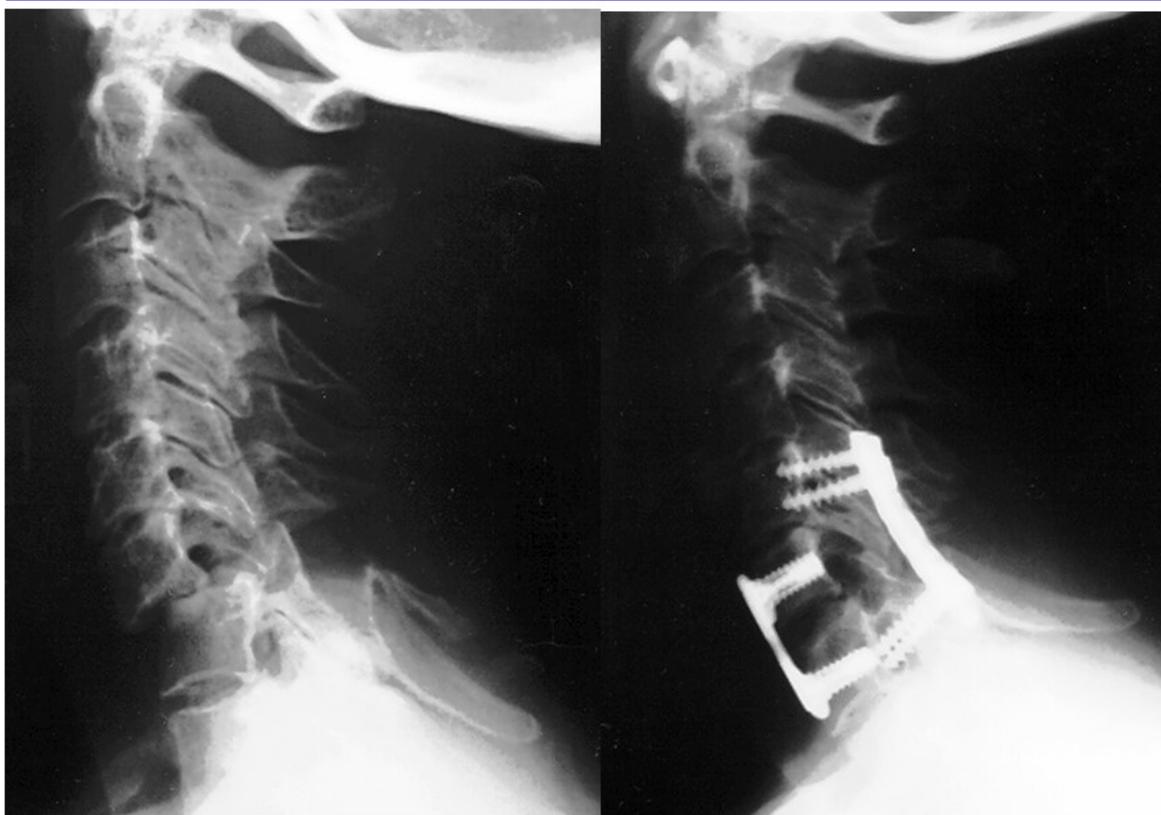
Fratture – lussazioni unilaterali



Fratture – lussazioni unilaterali

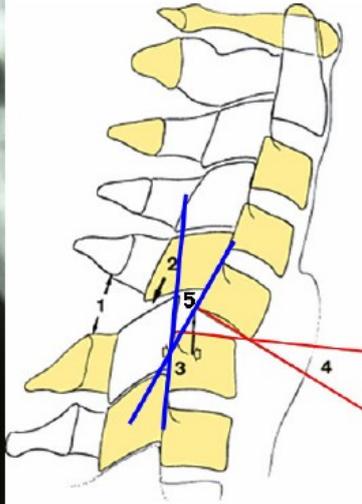
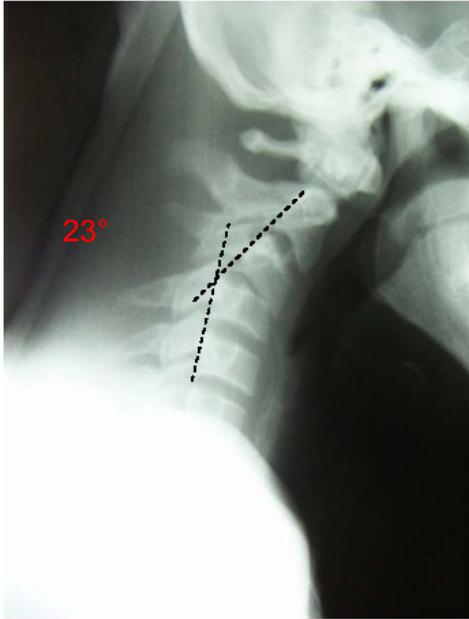


Fratture – lussazioni unilaterali



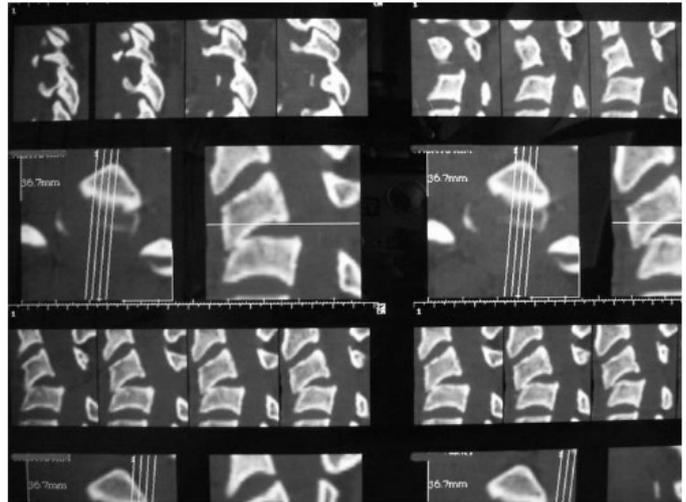
Traumi Distorsivi Gravi

Criteria radiografici di instabilità

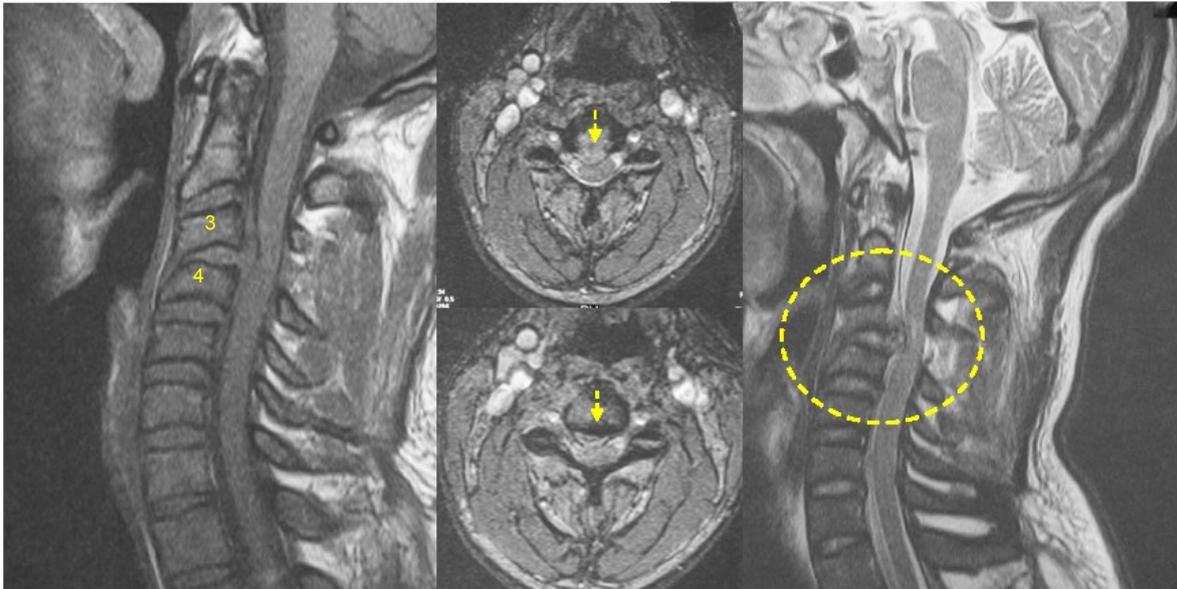


- 1 : aumento della distanza interspinosa
- 2 : disallineamento delle articolari posteriori
- 3 : anterolistesi > 3,5 mm
- 4 : cifosi discale > 11° rispetto ai livelli adiacenti
- 5 : angolo somatico post. > 15 °

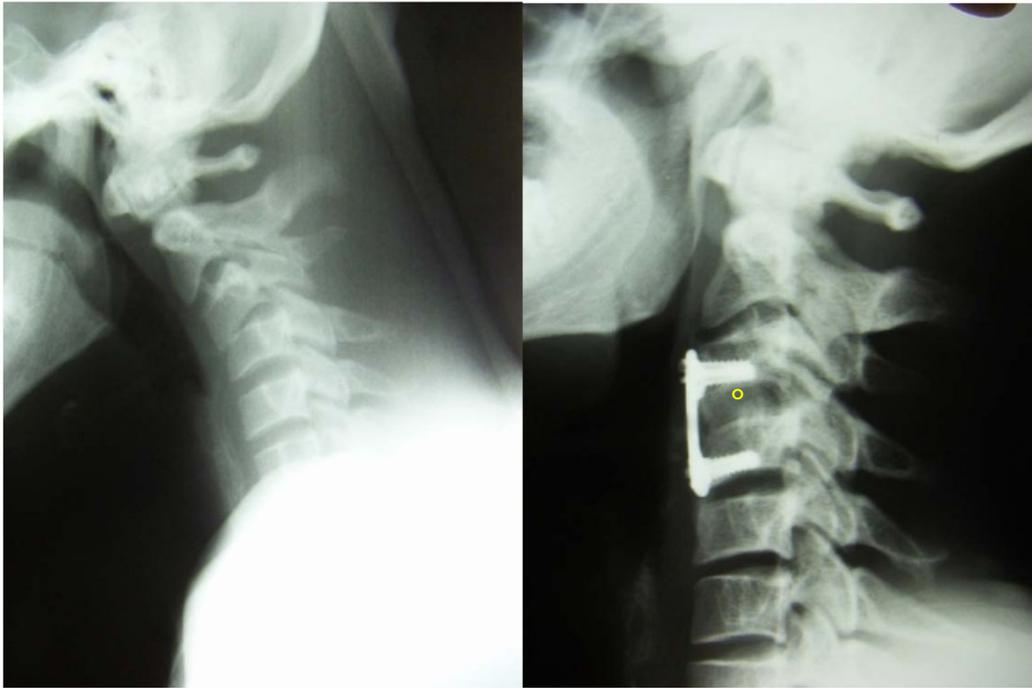
Trauma distorsivo grave



Trauma distorsivo grave
ernia traumatica – compressione midollare



Trauma distorsivo grave
ernia traumatica – compressione midollare



FRATTURE TORACO – LOMBARI

A comprehensive classification of thoracic and lumbar injuries .

Eur Spine J 1994, 3: 184 – 201 .

Tipo	gruppo
A : COMPRESSIONE 	1 – wedge (tassement)
	2 – frattura-separazione
	3 – burst (scoppio)
B : DISTRAZIONE 	1 – les. Post. legamentosa
	2 – les. Post. ossea
	3 – les. in iperestensione
C : ROTAZIONE 	1 – tipo A + rotaz
	2 – tipo B + rotaz
	3- tipo C + rotaz

Fratture Toraco-Lombari

Oltre 2/3 delle fratture concentrati tra T 12 e L 3

Oltre 2/3 tipo **A** (fratture in **compressione**)

#	%
T 12	246 17.02
L 1	402 27.82
L2	208 14.39
L3	114 7.88

(Tot. 1445) N° CASI % TOT. % TIPO			
<small>Magerl F, Aebi M, Gertzbein SD, Harms J, Nazarian S : A comprehensive classification of thoracic and lumbar injuries. Eur Spine. 1994; 3, 184-201.</small>			
TIPO A	956	66.16 %	
A 1 wedge	502	34.74 %	52.51 %
A 2 split burst	50	3.46 %	5.23 %
A 3	404	27.96 %	42.26 %
TIPO B	209	14.46 %	
B 1	126	8.72 %	60.29 %
B 2	80	5.54 %	38.28 %
B 3	3	0.21 %	1.44 %
TIPO C	280	19.38 %	
C 1	156	10.80 %	55.71 %
C 2	108	7.47 %	38.57 %
C 3	16	1.11 %	5.71 %

A1 = impaction / wedge : 34.74% - 52.51%



- Compression più che frammentazione del corpo vertebrale
- Riduzione altezza corpo vertebrale
- Colonna posteriore integra

• Interessamento esclusivo del corpo vertebrale

A2 = Split – fractures : 3.46% -

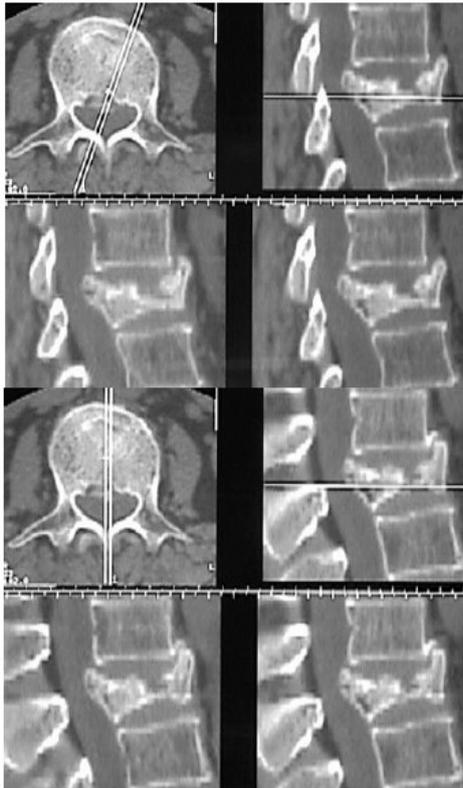
5.23%

Separazione corpo vertebrale sul piano frontale o sagittale
Dislocazione dei frammenti principali di grado variabile



Quando lo sono in maniera significativa il gap viene colmato da
materiale discal **rischio di pseudartrosi**
Danno neurologico raro , ma possibile a distanza

A2 = Split – fractures : 3.46% - 5.23%



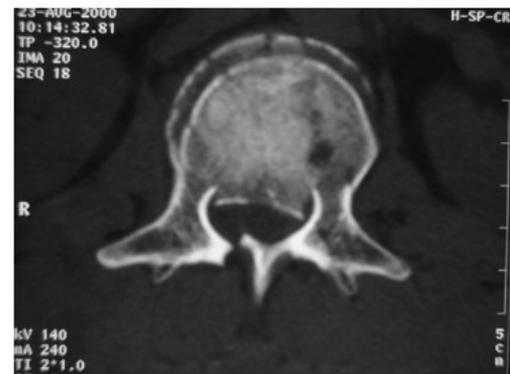
Neuroaggressività tardiva



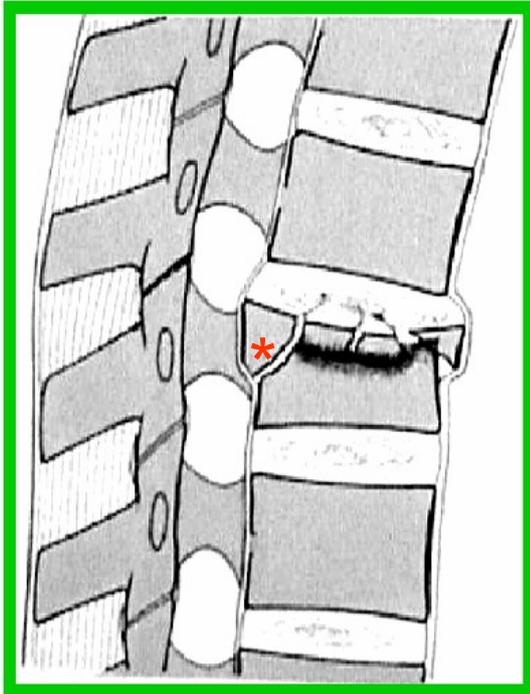
A3 = Burst fractures : 27.96% -

42.26%

- Comminuzione del corpo vertebrale
- Scomposizione in senso centrifugo
- Coinvolgimento **muro posteriore**
- Frattura lineare lamina o spinosa
- Possibile danno neurologico
 - ~~Diretto per invasione canale~~
 - Strappo / lacerazione dura



A 3.1.1 - Superior Incomplete Burst

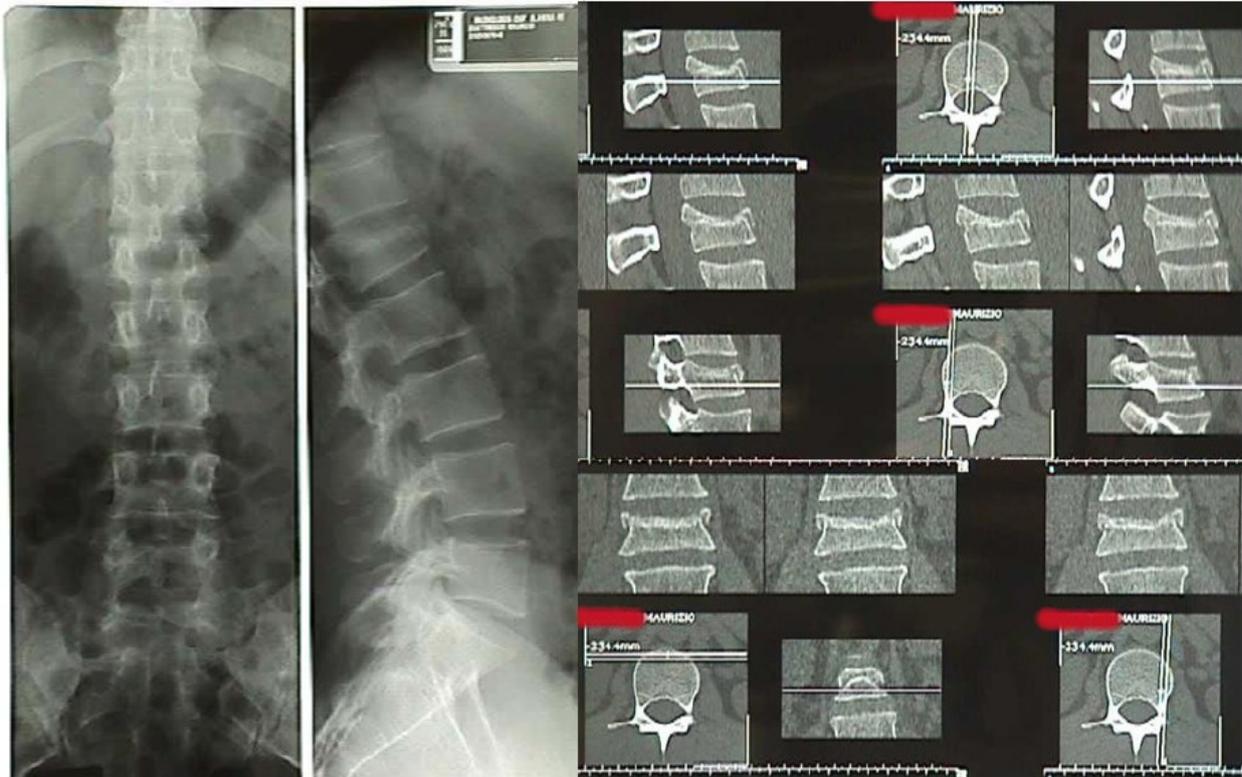


Ridotta stabilità in
flessione – compressione :

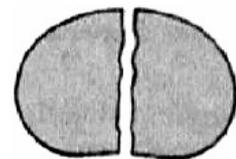
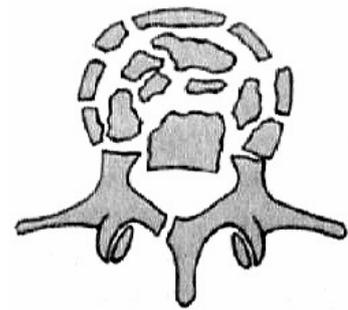
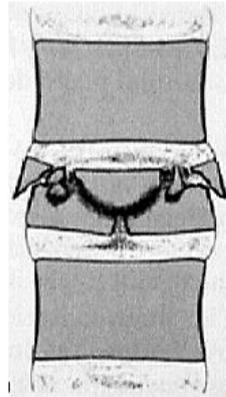
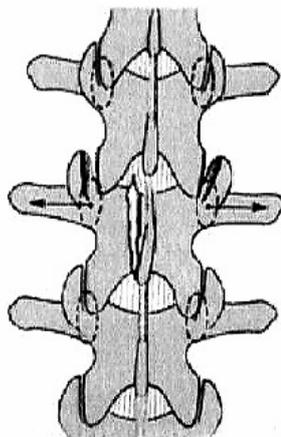
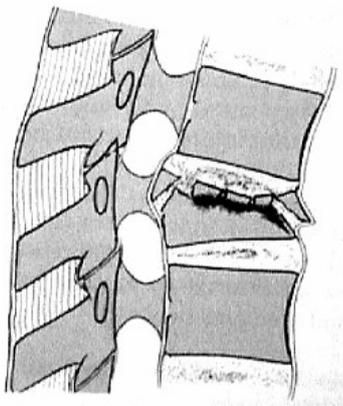
+/-

- Distretto
- Invasione canale
- Deformità angolare

A 3.1.1 - Superior Incomplete Burst

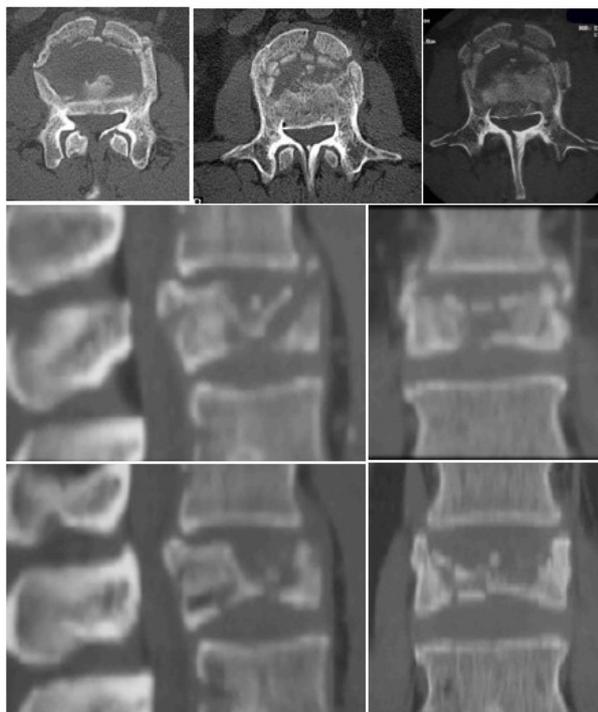


A 3.2.1 - Superior Burst Split

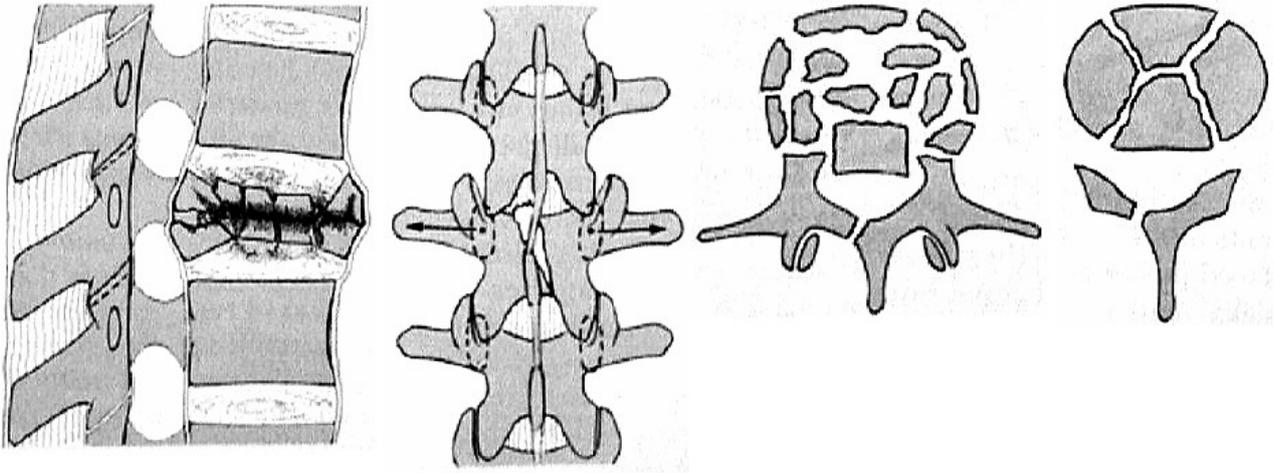


Instabili
in flessione – compressione : ++

A 3.2.1 - Superior Burst Split



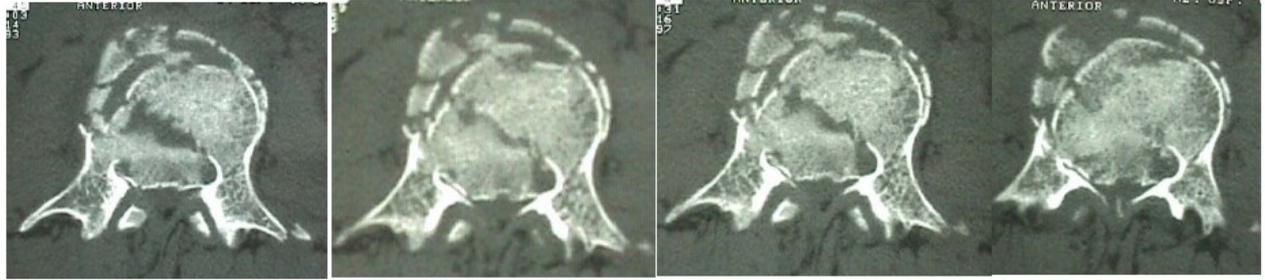
A 3.3.3 - Complete Axial Burst



Instabili in flessione – compressione :

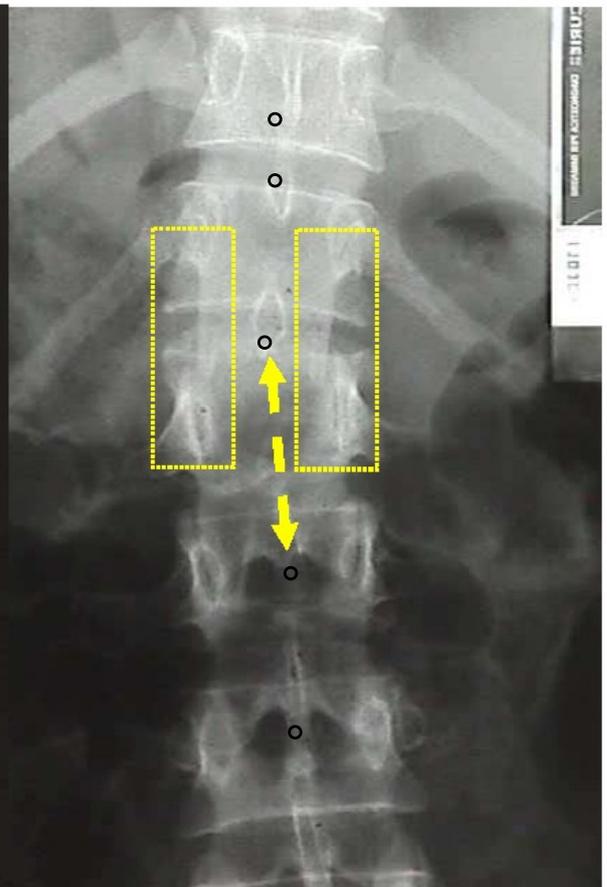
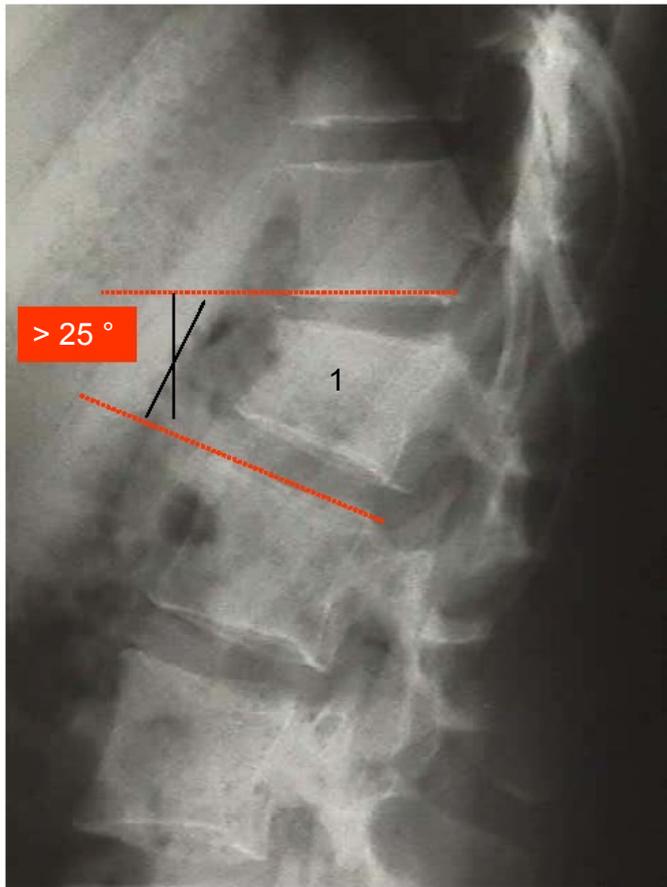
+++

A 3.3.3 - Complete Axial Burst









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	3 – burst (scoppio)
B : DISTRAZIONE  14,5 %	1 – les. Post. legamentosa
	2 – les. Post. ossea
	3 – les. in iperestensione
C : ROTAZIONE 	1 – tipo A + rotaz
	2 – tipo B + rotaz
	3- tipo C + rotaz

Fratture tipo B : 14.5%
(iperflessione–distrazione o “seat - belt injuries”)

Interessamento di entrambe le colonne

- B 1 : lesione posteriore a predominanza

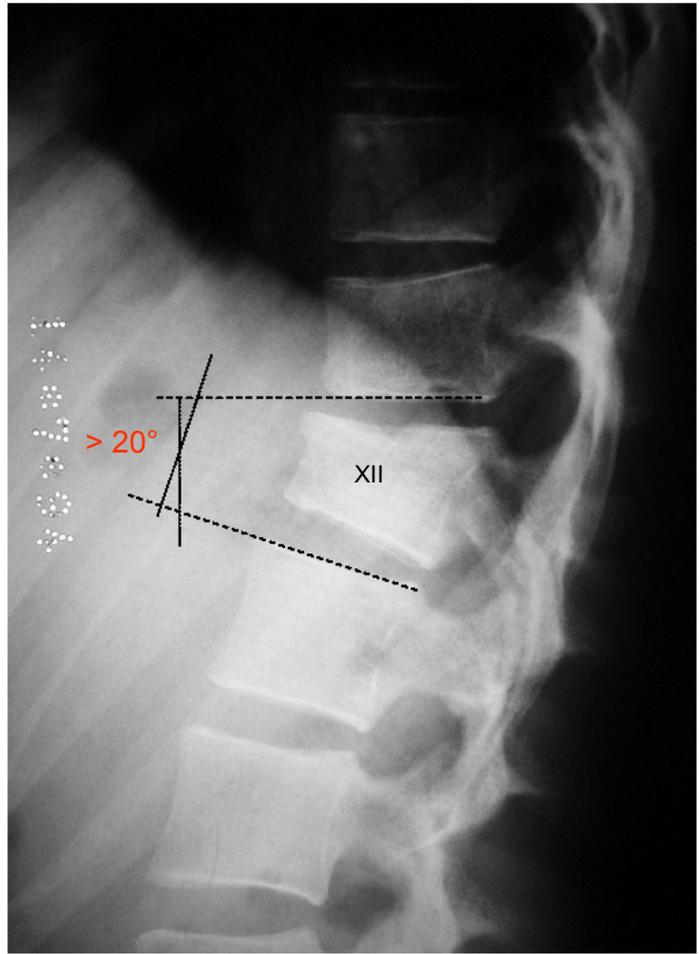
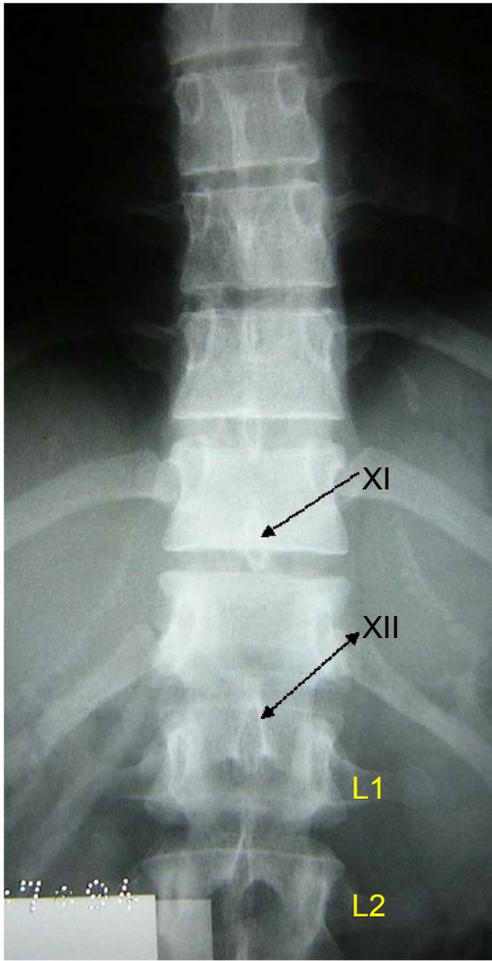
legamentosa

- B 2 : lesione posteriore a predominanza ossea

-
- B 3 : rottura anteriore attraverso il disco

– (iperestensione con lesione transdiscale)





Fratture tipo B 1 : 8.72% -

60.29%

lesione posteriore prevalentemente legamentosa



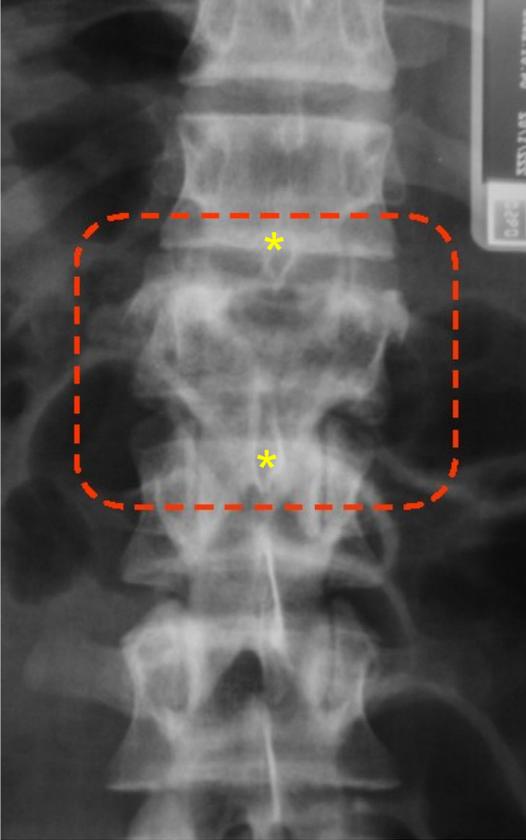
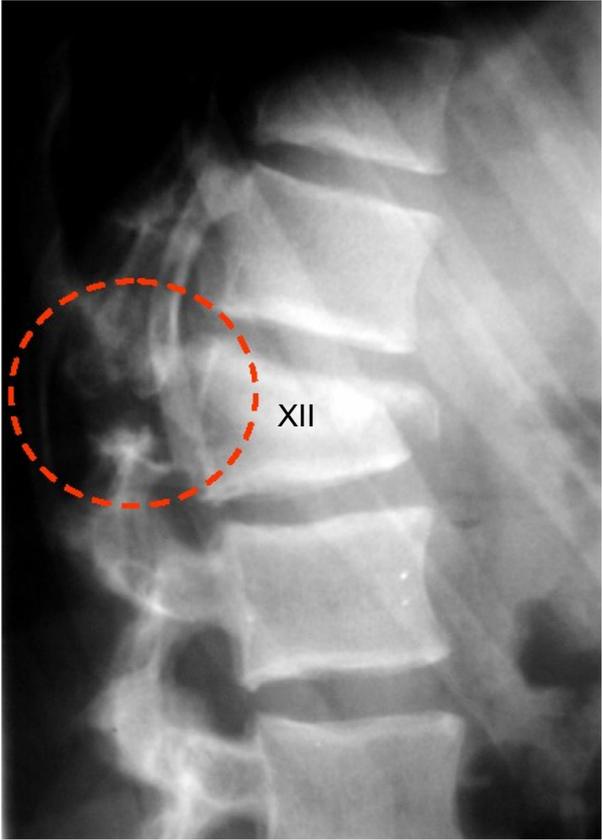
Fratture tipo B 2 : 5.54% -

38.28%

lesione posteriore prevalentemente ossea

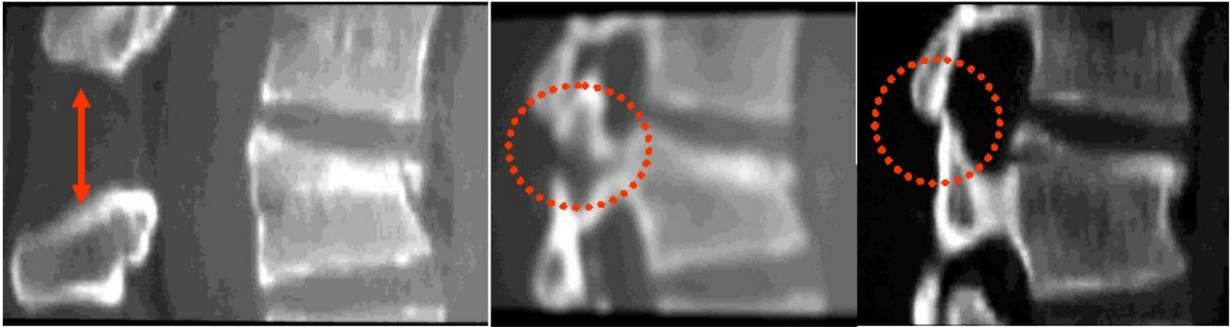


B 2 : lesione posteriore prevalentemente ossea

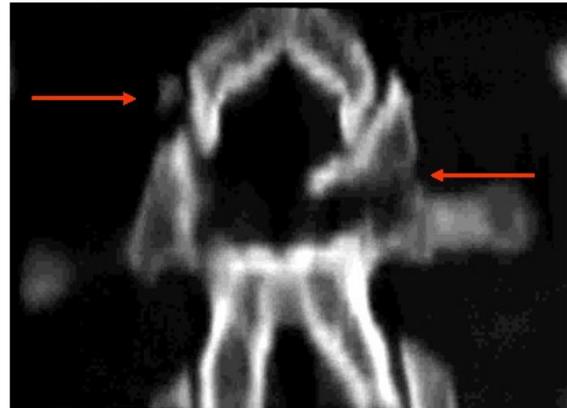
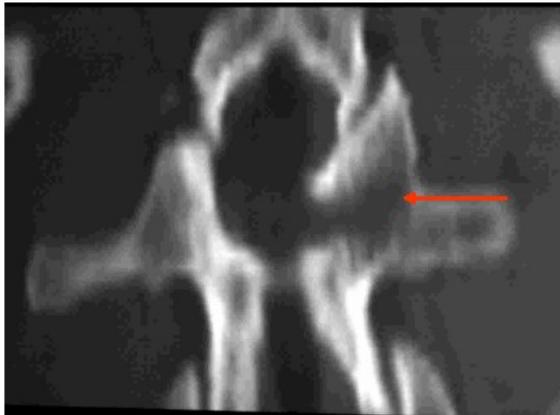


Fanning / sbadiglio
delle spinose

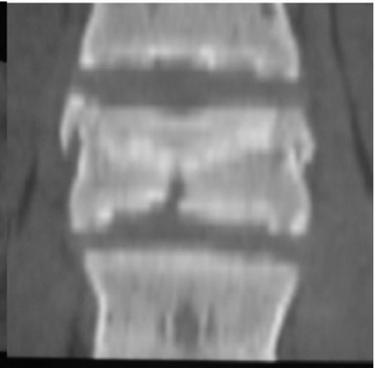
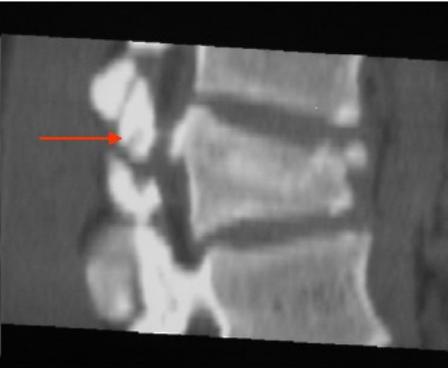
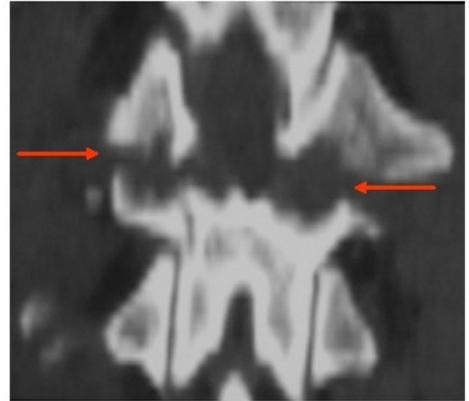
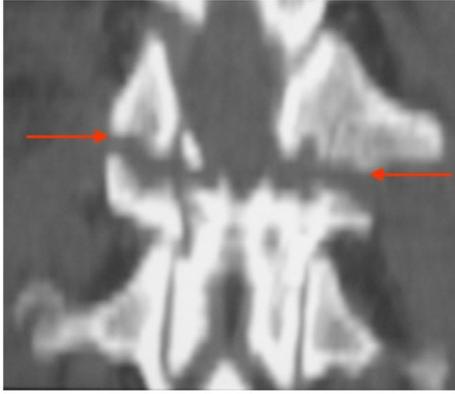
frattura / incongruenza delle articolari



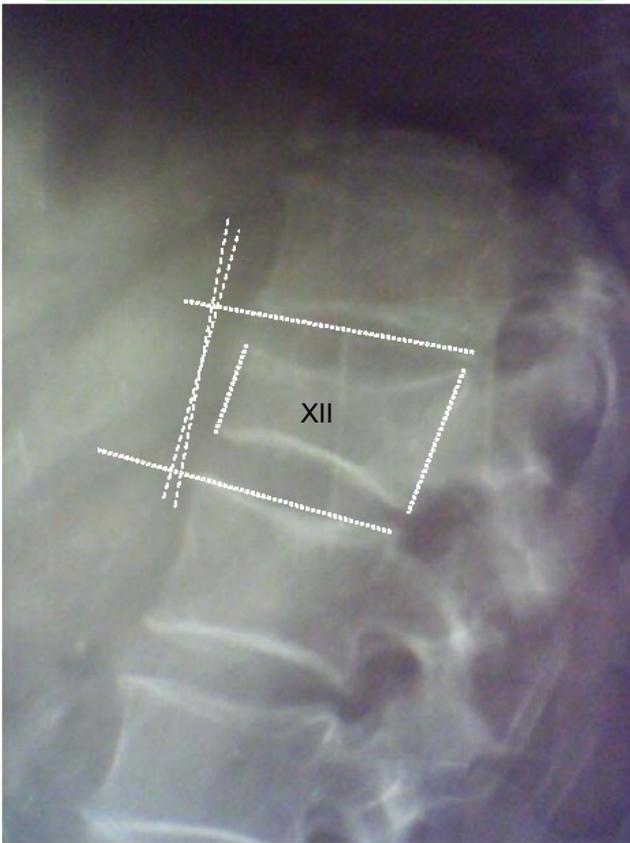
B 2 : lesione posteriore prevalentemente ossea



B 2 : lesione posteriore prevalentemente ossea

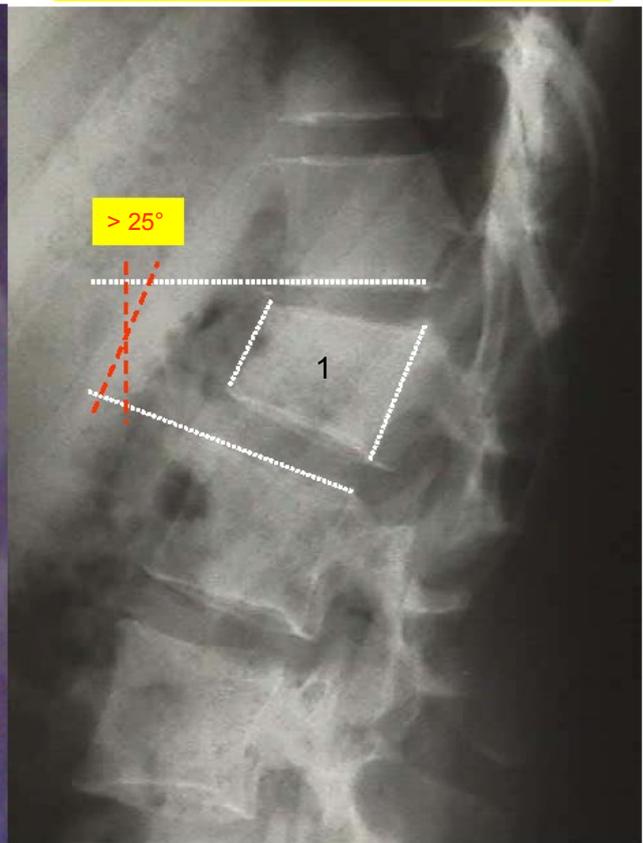


A1 = stabile



Solo colonna anteriore (corpo)

B1 = instabile



Colonna anteriore + colonna posteriore

Fratture tipo C : 19.38%

- C 1 : lesione tipo A con rotazione
- C 2 : lesione tipo B con rotazione
- C 3 : lesione da taglio e rotazione

Fratture tipo C : 19.38%

caratteristiche morfologiche

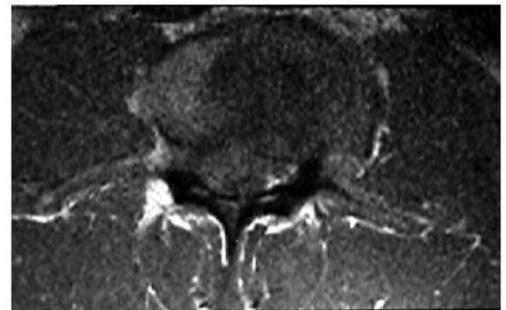
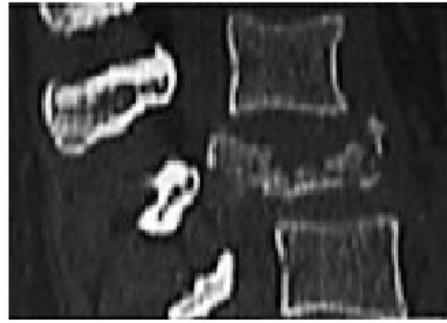
- decalage rotatorio delle spinose
- frattura asimmetrica del corpo vertebrale

- fratture apofisi trasverse
- concomitanti fratture costali adiacenti
- frattura irregolare dell'arco neurale
- frattura unilaterale di un processo articolare associata a lussazione interapofisaria controlaterale

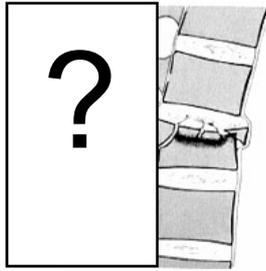


Frattura tipo C

Frattura tipo C



F R A T T U R E



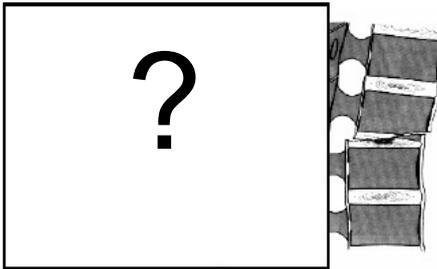
Solo
Colonna
Anteriore



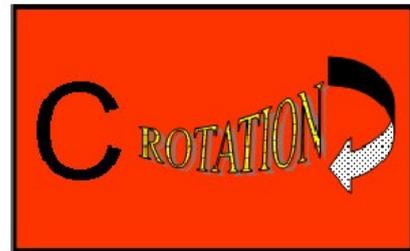
T O R A C C O - L O M B A R I



Colonna
Anteriore
+
Colonna
Posteriore



Colonna
Anteriore
+
Colonna
Posteriore
+
Rotazione



FRATTURE TORACO-LOMBARI

criteri generali di trattamento

- - Danno neurologico
- - Tipo di lesione e potenziale evolutività
- - Deformità sagittale (cifosi vertebrale)
- - Timing e lesioni associate
- - Età del paziente e condizioni generali



Scopo del trattamento

- ☺ raggiungere una guarigione ossea e capsulo-legamentosa
- ☺ per ricreare una colonna vertebrale stabile e asintomatica
- ☺ nel rispetto dei concetti biologici e biomeccanici
- ☺ con il minor rischio e la minore morbidità possibile

FRATTURE TORACO-LOMBARI

trattamento – tipo A

Le fratture A1 (35 % di tutte le fratture vertebrali e 52.5% delle fratture in compressione) sono in gran parte stabili : _____



12 settimane in ortesi
o corsetto gessato

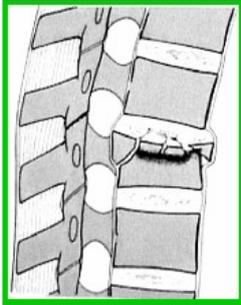
- Le A 2.3 (“pincer “) presentano il rischio di pseudartrosi
- Attenzione alle “burst” (A3) con grossa comminuzione e alle lesioni con interessamento della colonna posteriore, che sono instabili

FRATTURE TORACO-LOMBARI

Trattamento – Burst (A3) : 28 %

A 3.1.1

Conservativo



Riduzione

Corsetto in
ipercorrezione
12 settimane

- Distretto
- Invasione canale
- Deformità angolare

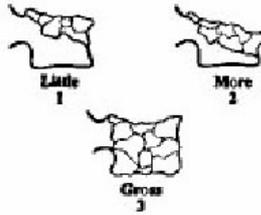
Chirurgico

- Invasione canale > 50 %
- Rischio cifosi residua >15°
- Comminuzione severa
- Perdita altezza soma >50%
- Fallimento riduzione incruenta (riduz. discale)
- Impossibilità di trattamento conservativo (obesità, lesioni toraciche, politrauma)



Il vantaggio della fissazione peduncolare è il ripristino della stabilità rachidea attraverso una fissazione corta ed un risparmio di Unità Funzionali Spinali

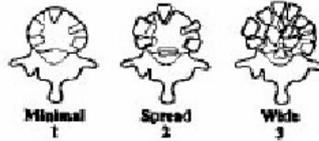
Comminution/Involvement



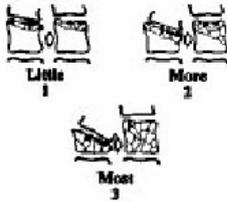
- 1 Little = < 30% Comminution on sagittal plane section CT
- 2 More = 30% - 60% Comminution
- 3 Gross = > 60% Comminution

Apposition of Fragments

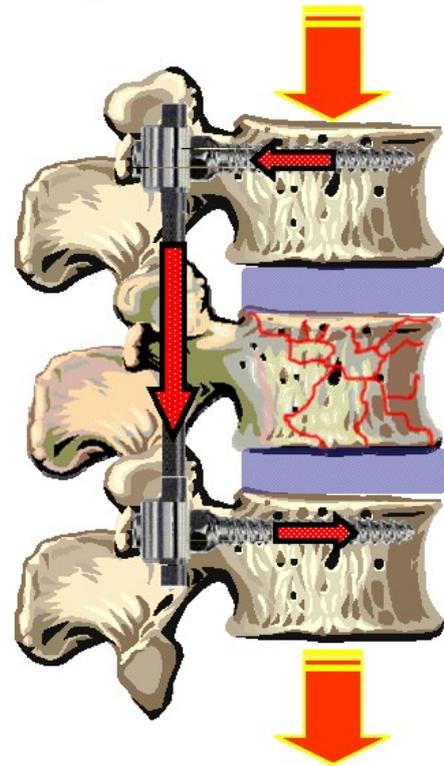
- 1 Minimal = Minimal displacement on axial CT cut.
- 2 Spread = At least 2mm displacement of < 50% cross section of body.
- 3 Wide = At least 2mm displacement of > 50% cross section of body.



Deformity Correction

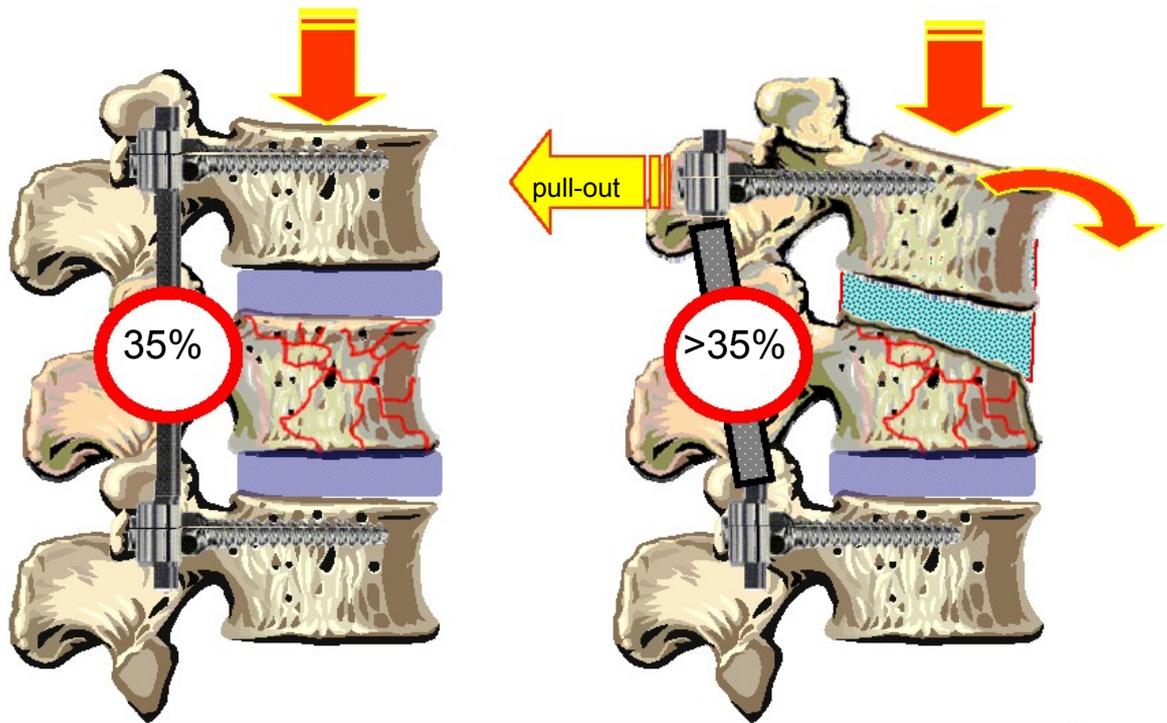


- 1 Little = Kyphotic correction $\leq 3^\circ$ on lateral plain films.
- 2 More = Kyphotic correction $4^\circ - 9^\circ$.
- 3 Most = Kyphotic correction $\geq 10^\circ$.



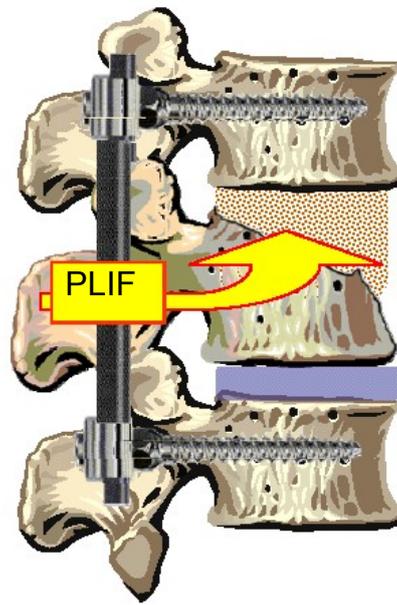
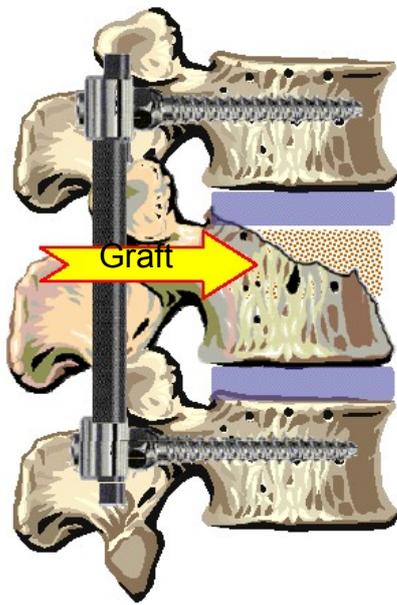
Load Sharing : capacità di trasferire un carico (o parte di esso) da una sede a un' altra.

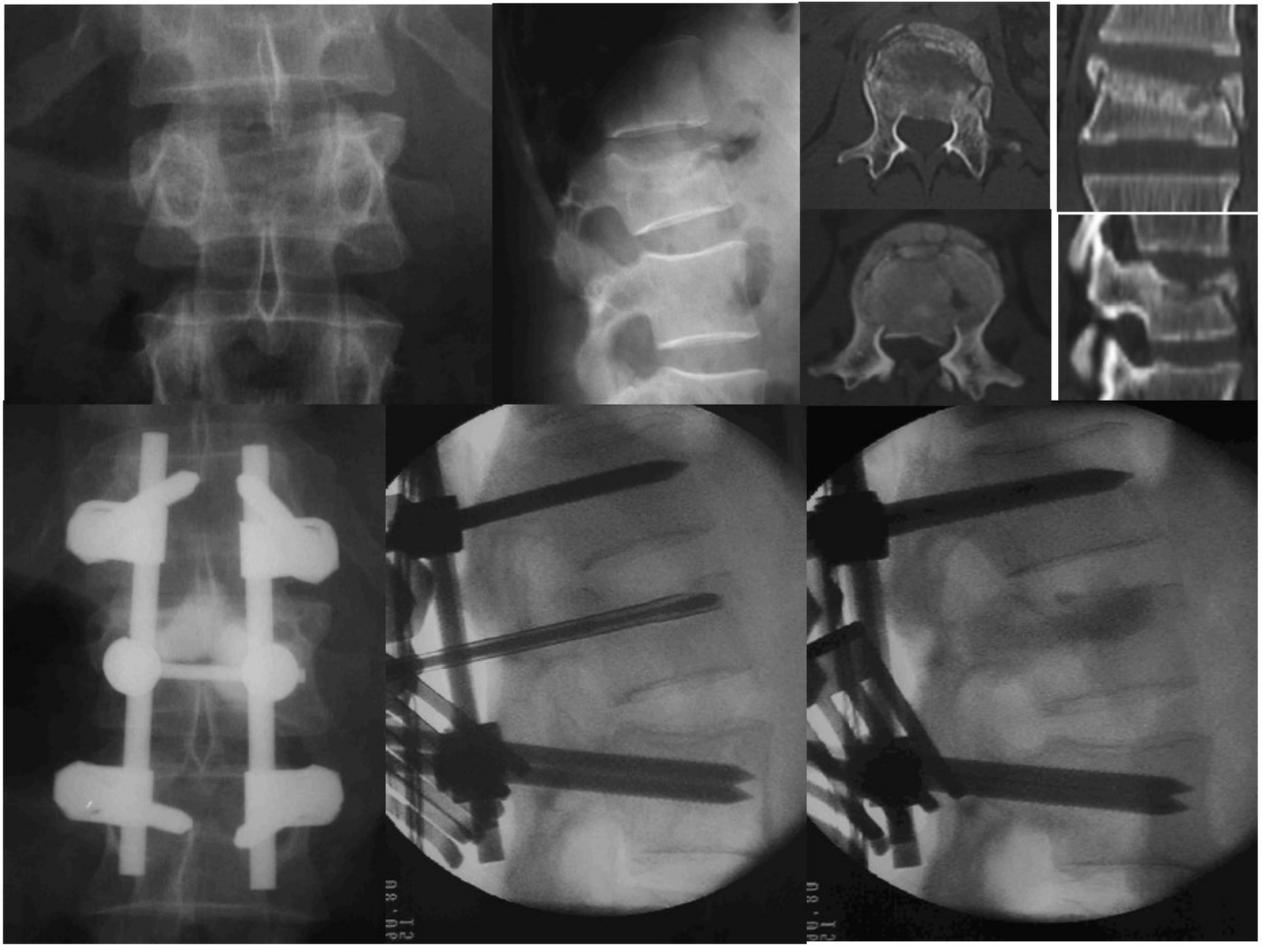
Senza un supporto anteriore adeguato, (grosse comminuzioni, sovradistrazione-ipercorrezione, gap fratturativo) carichi fisiologici eccedono la resistenza alla flessione di ogni impianto post.



fallimento , perdita di correzione , deformità e pseudartrosi .

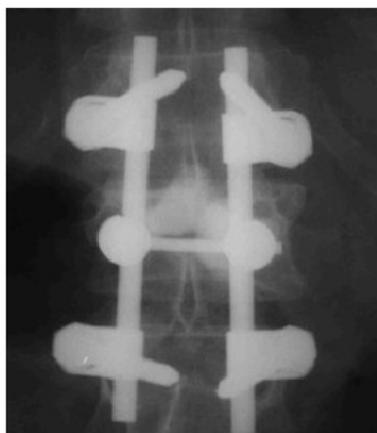
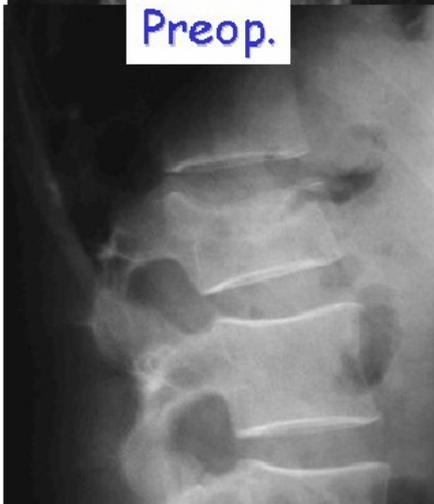
Supporto anteriore



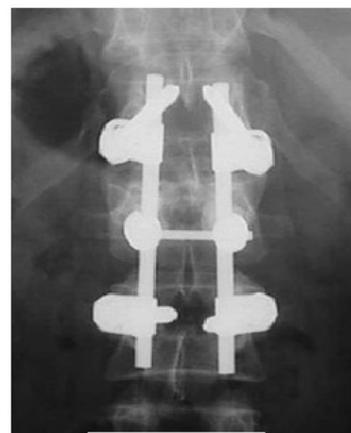
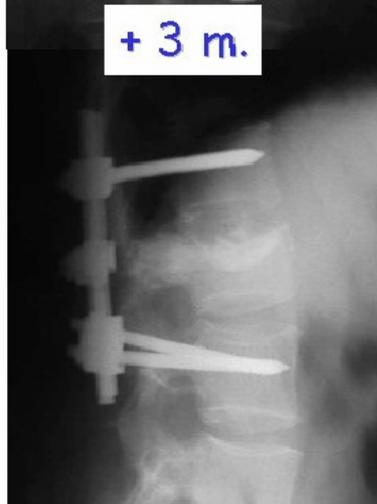




Preop.

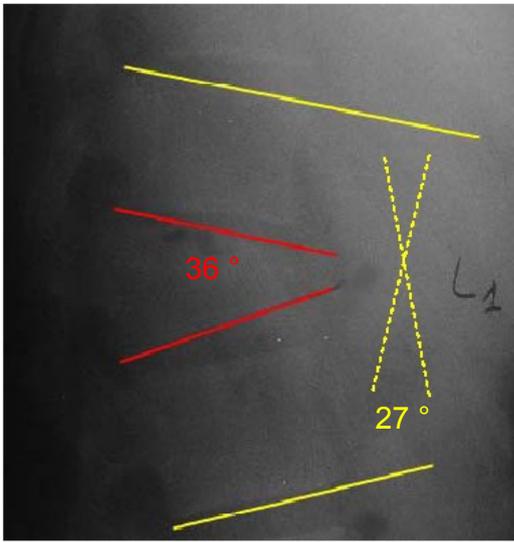


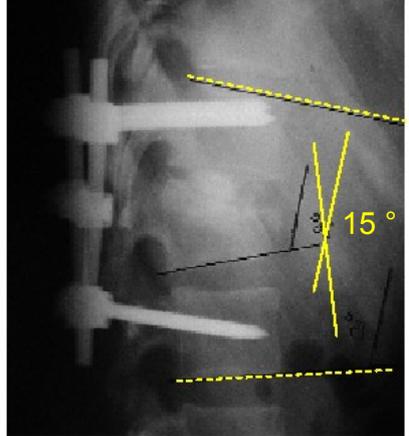
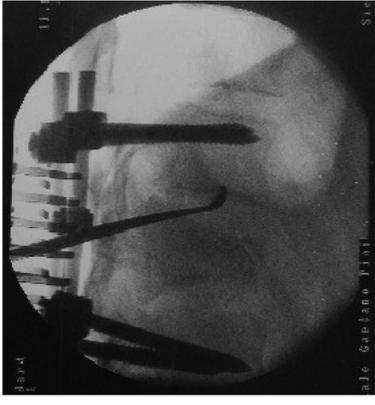
+ 3 m.



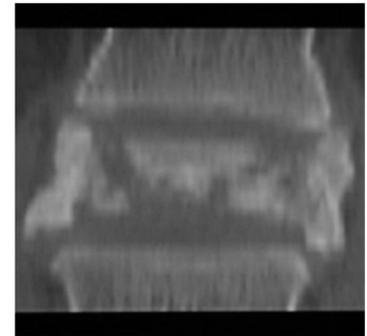
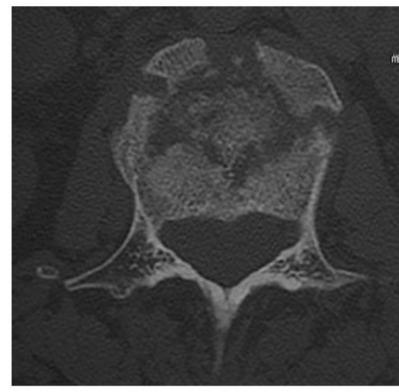
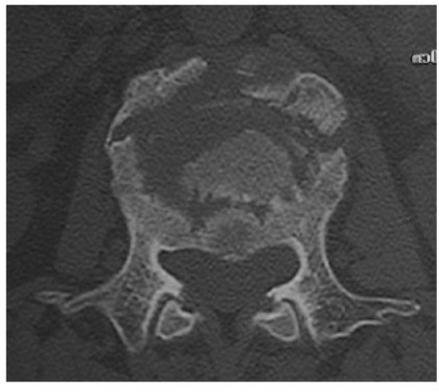
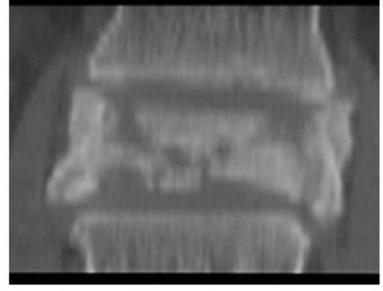
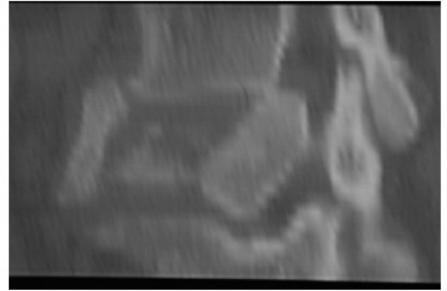
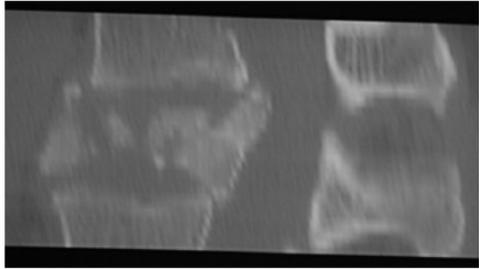
+ 15 m.

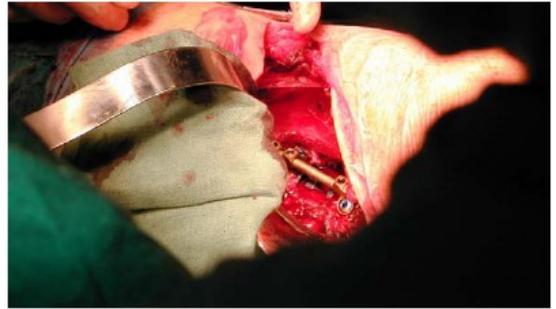
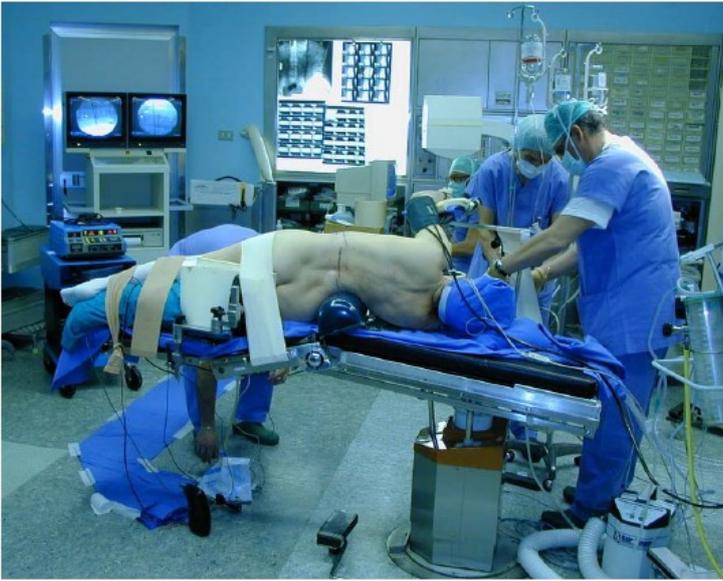


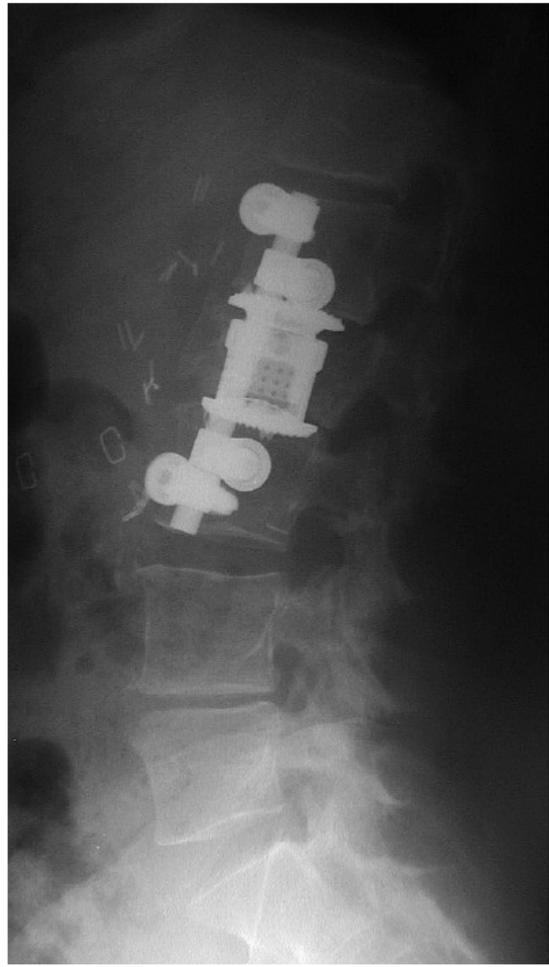
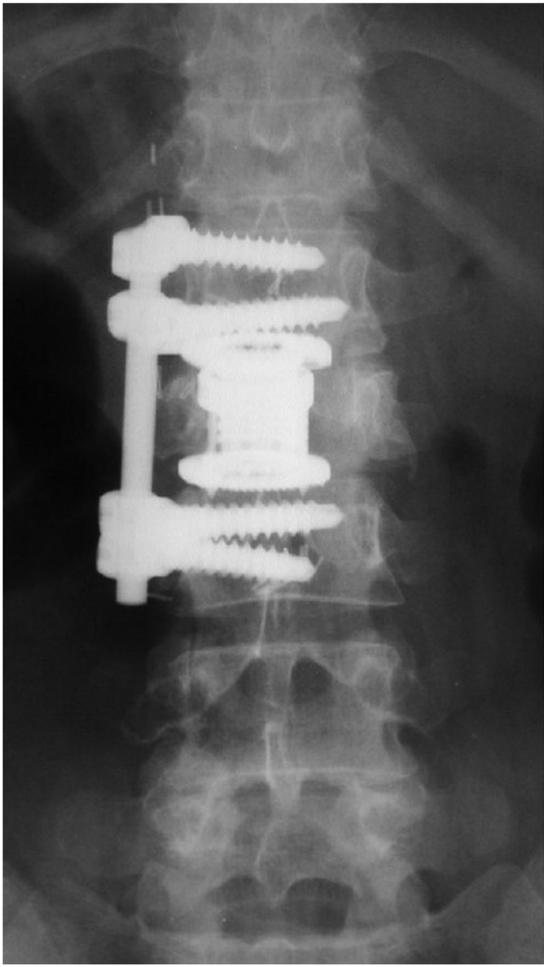












B2 – 5.5 % : lesione post.
prevalentemente ossea (Chance)



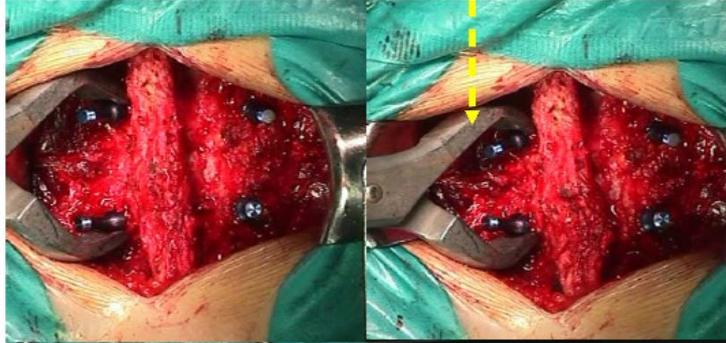
- **Trattamento conservativo**
 - Riduzione
 - Corsetto in iperestensione

- **Trattamento chirurgico**
 - Riduzione e fissazione corta in compressione

B 1 : 9%



Stabilizzazione corta in compressione
Artrodesi posteriore monosegmentaria



FRATTURE TORACO-LOMBARI

Trattamento – C : 20 %



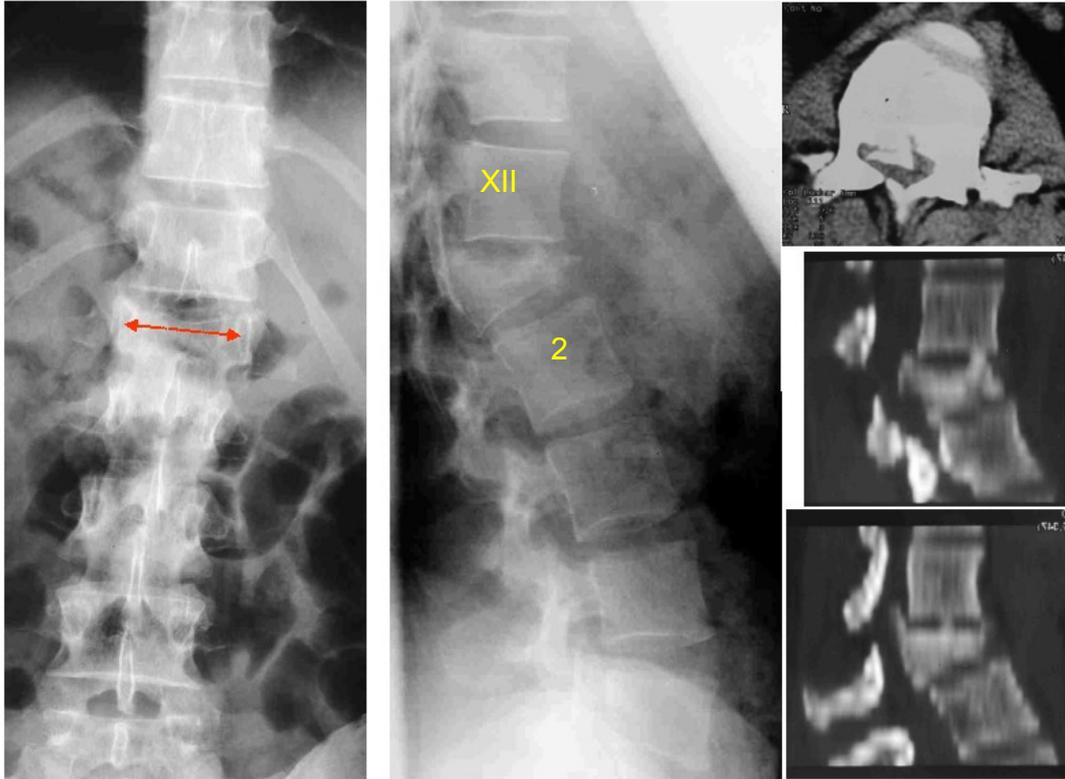
- **Trattamento chirurgico**

- Via anteriore
- Corporectomia
- Ricostruzione somatica

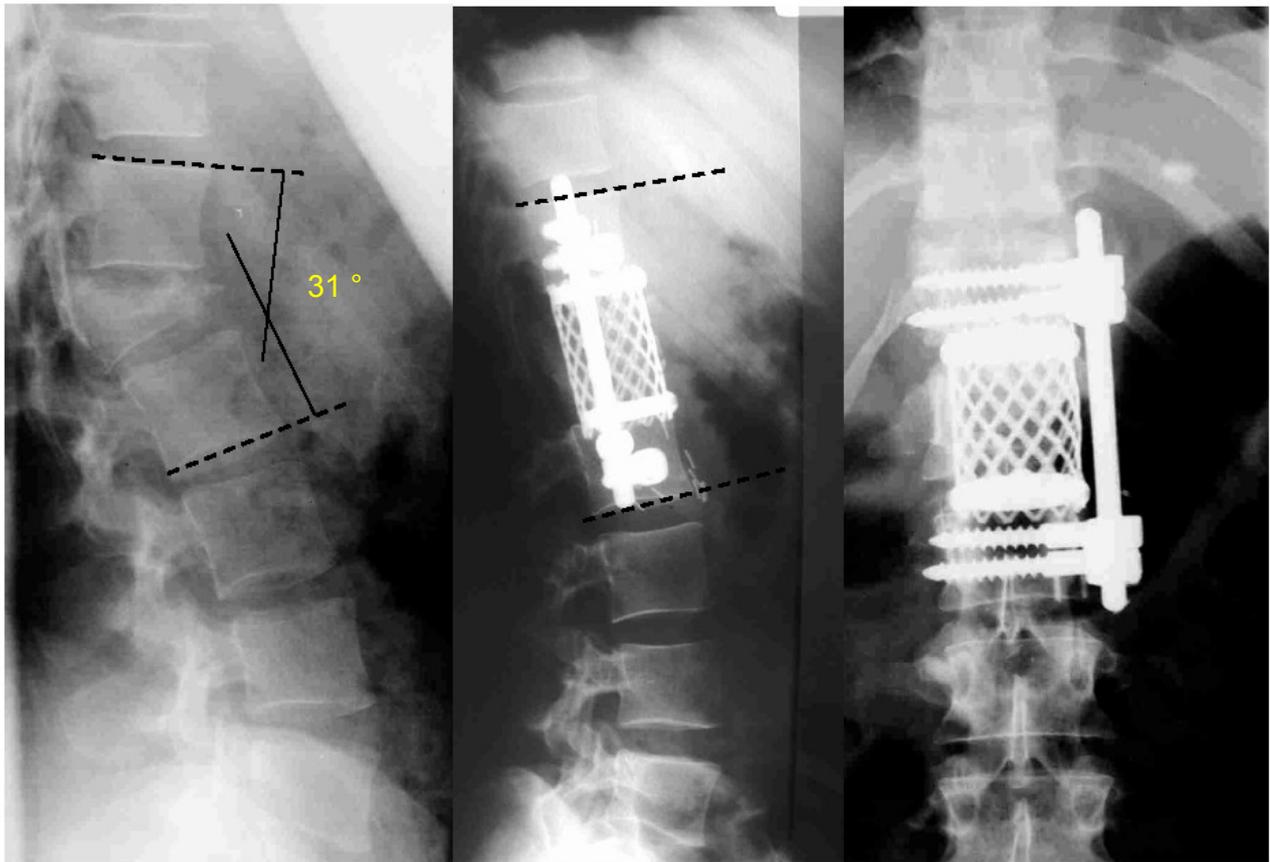
- A volte duplice accesso ant. e post.

FRATTURE TORACO-LOMBARI

Trattamento – C : 20 %



Trattamento – C : 20 %



Ripresa dell'attività

- Storia clinica dell'atleta
- Valutazione obiettiva
- Imaging (presenza di anomalità)
- Motivazioni (implicazioni psicologiche)
- Età
- Livello di competitività

Return-to-play criteria in athletes with traumatic injuries to the cervical spine

David H. Kim, MD, Alexander R. Vaccaro, MD, and Scott C. Berta, MD

Current Opinion in Orthopaedics 2003, 14:170-173

No contraindications to return to play for

Healed C1 or C2 fractures with normal cervical spine range of motion

Healed subaxial fracture without sagittal plane deformity

Asymptomatic clay shoveler's (C7 spinous process) fracture

Relative contraindication to return to play

after a two-level anterior or posterior surgical fusion, excluding posterior segmental lateral mass screw fixation

Return-to-play criteria in athletes with traumatic injuries to the cervical spine

David H. Kim, MD, Alexander R. Vaccaro, MD, and Scott C. Berta, MD

Current Opinion in Orthopaedics 2003, 14:170-173

Absolute contraindications to return to play

After a C1-to-C2 surgical fusion

After a cervical laminectomy

After a three-level anterior or posterior cervical spine fusion

When there is radiographic evidence of segmental instability ($>11^\circ$ kyphotic deformity compared with the cephalad or caudal vertebral spinal segment or 3.5 mm of translational motion)

When there is radiographic evidence of C1 to C2 instability (anterior atlantodental interval > 3.5 mm in an adult and > 4 mm in a child)

When there is radiographic evidence of a distraction/extension cervical spine injury

In the presence of a healed subaxial spine fracture with sagittal plane kyphosis or coronal plane deformity



Clinical outcome and return to sport after the surgical treatment of spondylolysis in young athletes

U. K. Debnath, B. J. C. Freeman, P. Gregory, D. de la Harpe,
R. W. Kerslake, J. K. Webb
From the University Hospital, Nottingham, England

We studied prospectively 22 young athletes who had undergone surgical treatment for lumbar spondylolysis. There were 15 men and seven women with a mean age of 20.2 years (15 to 34). Of these, 13 were professional footballers, four professional cricketers, three hockey players, one a tennis player and one a golfer. Preoperative assessment included plain radiography, single positron-emission CT, planar bone scanning and reverse-gantry CT. In all patients the Oswestry disability index (ODI) and in 19 the Short-Form 36 (SF-36) scores were determined preoperatively, and both were measured again after two years in all patients. Three patients had a Scott's fusion and 19 a Buck's fusion.

The mean duration of back pain before surgery was 9.4 months (6 to 36). The mean size of the defect as determined by CT was 3.5 mm (1 to 8) and the mean preoperative and postoperative ODIs were 39.5 (SD 8.7) and 10.7 (SD 12.9), respectively. The mean scores for the physical component of the SF-36 improved from 27.1 (SD 5.1) to 47.8 (SD 7.7). The mean scores for the mental health component of the SF-36 improved from 39.0 (SD 3.9) to 55.4 (SD 6.3) with $p < 0.001$. After rehabilitation for a mean of seven months (4 to 10) 18 patients (82%) returned to their previous sporting activity.

J Bone Joint Surg [Br] 2003;85-B:244-9.

Athletic Activity After Spine Surgery in Children and Adolescents

Results of a Survey

Paul T. Rubery, MD,* and David S. Bradford, MD

■ Key Points

- Surgeons vary widely in their preferences with regard to patients returning to sport after spinal surgery.
- Most surgeons allow their scoliosis and Meyerding Grade I and II spondylolisthesis postoperative patients to resume low-impact, noncontact sport, noncontact sport, and gym class by 6 months after surgery.
- Many surgeons withhold noncontact sports for slightly longer after fusion for Grades III and IV spondylolisthesis.
- The majority of surgeons withhold contact sports for 1 year, and the majority prefer that patients who have undergone fusion for scoliosis and high-grade slip never return to collision sports.

- Low-impact, noncontact sports (swimming, cross-country skiing)

- Noncontact sports (tennis, running)

- Contact sports (basketball, soccer or European football and baseball)

- Collision sports (American football, rugby, ice hockey, wrestling, weight-lifting, bungee jumping, sky diving, trampoline, gymnastics,)

Lumbar spine injuries in athletes

IAN F. DUNN, M.D., MARK R. PROCTOR, M.D., AND ARTHUR L. DAY, M.D.

Center for Neurologic Sports Injury, and Department of Neurosurgery, Brigham and Women's/Children's Hospitals, Harvard Medical School, Boston, Massachusetts

Neurosurg Focus 21 (4):E4, 2006

possible. Sports involving repetitive hyperextension, axial loading (and jumping), twisting, or direct contact carry higher risks of low-back injuries. The higher rates seen in football players, gymnasts, wrestlers, and rowers are supported in a study of 4790 college athletes in which the incidence of lumbar spine injury was 7%; most were football players or gymnasts.^{14,15,20} Interestingly, 80% of low-back injuries occurred during practice, 14% during preseason conditioning and 6% during actual competition; a little more than 50% of these injuries were acute in nature.^{16,17}

Minor Fractures

Major fractures causing spinal instability are uncommon, except in high-speed collision sports such as auto racing and skiing. In other contact sports in which the athlete is exposed to direct blows, forceful rotation, flexion, and compression, fractures of the transverse processes, spinous processes, facets, vertebral bodies, and endplates are uncommon. Most individuals with acute fractures present with back pain immediately after the injury. In most cases, results of the neurological examination are normal.

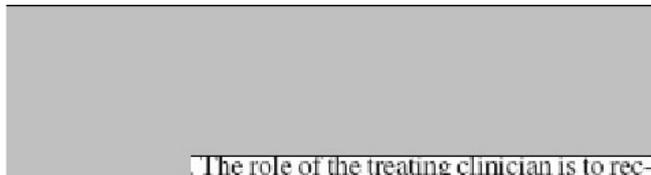
So-called minor fractures are generally managed conservatively, because only one column is injured, so that spinal stability is not threatened. The athlete with a fracture of the transverse and/or spinous processes can resume full activity when symptoms have subsided and full ROM has returned. Mild compression fractures, not uncommon in weight lifters, can occur in the anterior aspect of the vertebral body, which lacks horizontal trabeculations. Exercises like squats or the military press involving repetitive flexion and compression of lumbar vertebral bodies may lead to endplate fracture, disc space collapse, or mild vertebral body fracture.²⁸ Once healing occurs, these activities must thereafter be restricted to reduce the risks of recurrence.

Fractures of the facet joints are only now becoming a recognizable entity in sports medicine, and may actually be more common than originally thought. Patients with facet fractures usually present with unilateral pain and pain on extension. In young athletes in particular, radicular symptoms may be a manifestation of an associated epidural hematoma presumably caused by bleeding from the fracture site. Recognition is important, because the injury can usually be treated conservatively and monitored with neuroimaging for resolution (Fig. 3). As with most stable fractures, athletes may return to vigorous activity when symptoms and compressive radiographic abnormalities are resolved.

Return to contact sports after spinal surgery

MARK G. BURNETT, M.D., AND VOLKER K. H. SONNTAG, M.D.

Division of Neurological Surgery, Barrow Neurological Institute, St. Joseph's Hospital and Center, Phoenix, Arizona



The role of the treating clinician is to recommend the best course for maintaining optimum health while avoiding an unnecessarily high risk of devastating injury. Therefore, physicians' recommendations regarding return to contact sports should be the same for both amateur and professional athletes. (See Table 1 for a summary of recommendations for return to contact sports after surgical procedures in various locations.)



TABLE 1
Recommendations for return to contact sports after spinal surgery*

Op Location/Procedure	Return to Contact Sports
cervical	
occiput-C2 region	no
subaxial region	
posterior	
foraminotomy	
single-level	yes
multilevel	yes
laminectomy (w/ or w/o fusion)/laminoplasty	yes
single-level	
2-level	yes
>2-level	no
anterior	
discectomy & fusion/arthroplasty	
single-level	yes
2-level	yes
>2-level	no
foraminotomy	
single-level	yes
multilevel	yes
corpectomy	
single-level	yes
multilevel	no
thoracic	
cervicothoracic junction zone	no
midthoracic	
w/ deformity	yes
w/o deformity	yes
thoracolumbar junction zone	no
lumbar	
discectomy/laminectomy/laminoplasty	
single-level	yes
multilevel	yes
anterior or posterior fusion/arthroplasty	
single-level	yes
multilevel	yes

Lesioni Rachidee nello Sport

