

RADYOLOJİ KİŞ OKULU 2019

4 -10 Şubat 2019
Mirage Park Otel, Antalya



Omurga ve Spinal Kord Yaralanmaları



Prof. Dr. Nail Bulakbaşı,
Radyoloji & Nöroradyoloji (EDINR, EDiPNR)
Girne Üniversitesi Tıp Fakültesi
nail.bulakbasi@kyrenia.edu.tr



Spinal travma

- Kranioservikal bileşke
 - C0-C1-C2
- Subaksiyal servikal vertebra
 - C3-C7
- Torakolomber vertebra
 - T1-L5





Spinal travma

- Yılda 5/100.000
- Genç erkeklerde sık
 - 15 -40 yaş
 - E / K = 4/1
- 6000/yıl ölüm (USA)
- 5000/yıl yeni kuadripleji (USA)



C1 %10

C2 %33

C6-C7 %50

T4 %10

T12-L2 %60-70





C1 %10

C2 %33

C6-C7 %50

T4 %10

T12-L2 %60-70





C1 %10

C2 %33

C6-C7 %50

T4 %10

T12-L2 %60-70

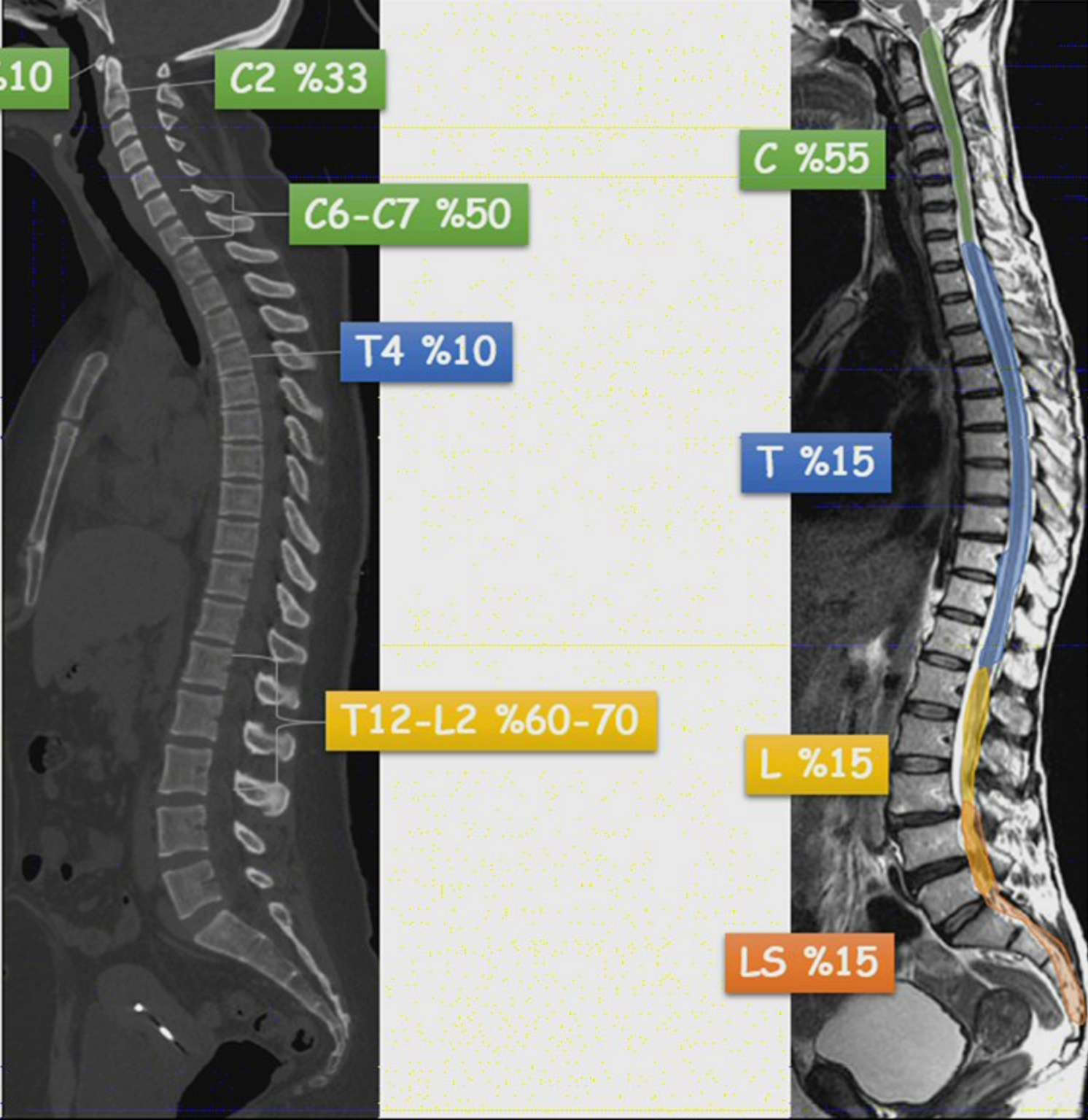


C %55

T %15

L %15

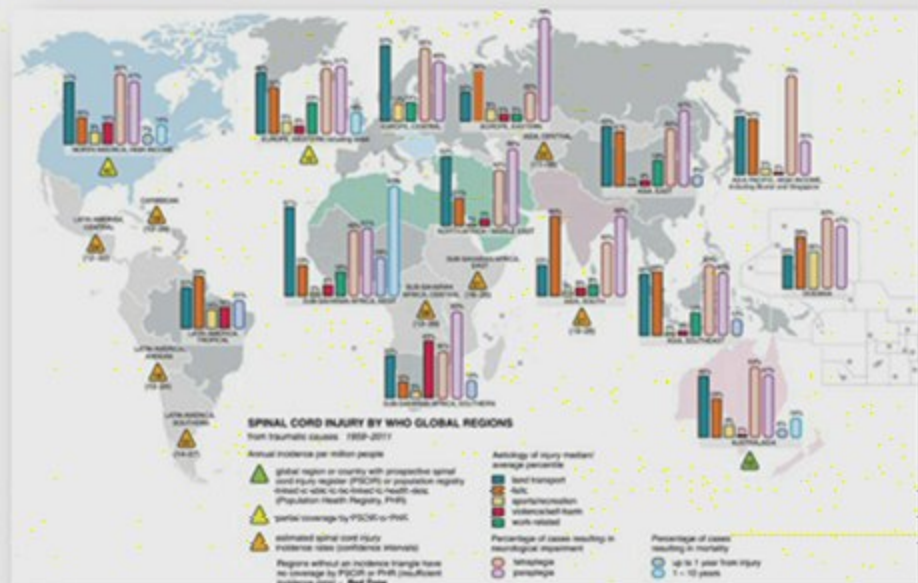
LS %15





Neden önemli ?

- % 50 spinal hasar + nörolojik defisit
 - İnkomplet tetrapleji %30.1
 - Komplet parapleji %25.6
 - Komplet tetrapleji %20.4
 - İnkomplet parapleji % 18.5



Spinal cord injury by WHO Global Regions from traumatic causes 1959-2011.



Etyoloji

Neden	3 yaş ↓	1-20 yaş	Genel
Trafik kazaları • Whiplash injury	%66	%44	%50
Düşmeler	%15	%14	%20-25
Spor yaralanmaları • Balıklama atlama • Kayak		%16	%15-20
Diğer yaralanmalar • Delici silah yaralanmaları • Ateşli silah yaralanmaları • Asılar			%14-15



Radyoloji'nin görevi

- Tanı koymak
- Lezyonu sınıflamak
- Stabilitayı saptamak
- Gerekirse ileri tetkiklere karar vermek



Radyoloji'nin görevi

- Tanı koymak
- Lezyonu sınıflamak
- Stabilitayı saptamak
- Gerekirse ileri tetkiklere karar vermek

Kimleri görüntüleyelim ?



NEXUS

(National Emergency X Ray Utilization Study)

- Düşük risk ölçütleri
 - Orta hatta gerginlik ⊖
 - Fokal nörolojik defekt ⊖
 - İntoksikasyon ⊖
 - Diğer ağırlı hasar ⊖
 - Normal uyanıklık
- Tümü varsa spinal hasar riski çok düşüktür
- Görüntüleme gerekmez
- NPV = % 99.8
- Spesifite ve PPV düşük



NEXUS

(National Emergency X Ray Utilization Study)

- Düşük risk ölçütleri
 - Orta hatta gerginlik ⊖
 - Fokal nörolojik defekt ⊖
 - İntoksikasyon ⊖
 - Diğer ağırlı hasar ⊖
 - Normal uyanıklık
- Tümü varsa spinal hasar riski çok düşüktür
- Görüntüleme gerekmez
- NPV = % 99.8
- Spesifite ve PPV düşük

Değerlendirme için GSC=15 ve hasta uyanık olmalıdır



Canadian C spine Rule

%100 duyarlılık, %42,5 özgüllük

Yüksek risk

- >65 yaş
- Tehlikeli durumlar
 - 3 m / 5 merdiven yukarıdan düşme
 - Başa aksiyal yük
 - AİTK (>100 km/s)
 - Devrilme, araçtan fırlama
 - Motosiklet/bisiklet
- Parestezi

Düşük risk

- Basit arkadan çarpma
 - Büyük araç kazası ☹
 - Takla atma ☹
 - Yüksek hızlı çarpışma ☹
- Ayakta durabilme
- Geç başlayan boyun ağrısı
- Orta hatta gerginlik ☹



Canadian C spine Rule

%100 duyarlılık, %42,5 özgüllük

Yüksek risk

- >65 yaş
- Tehlikeli durumlar
 - 3 m / 5 merdiven yukarıdan düşme
 - Başa aksiyal yük
 - AİTK (>100 km/s)
 - Devrilme, araçtan fırlama
 - Motosiklet/bisiklet
- Parestezi

Düşük risk

- Basit arkadan çarpma
 - Büyük araç kazası ☹
 - Takla atma ☹
 - Yüksek hızlı çarpışma ☹
- Ayakta durabilme
- Geç başlayan boyun ağrısı
- Orta hatta gerginlik ☹

Görüntüleme gerekir



Canadian C spine Rule

%100 duyarlılık, %42,5 özgüllük

Yüksek risk

- >65 yaş
- Tehlikeli durumlar
 - 3 m / 5 merdiven yukarıdan düşme
 - Başa aksiyal yük
 - AİTK (>100 km/s)
 - Devrilme, araçtan fırlama
 - Motosiklet/bisiklet
- Parestezi

Görüntüleme gerekir

Düşük risk

- Basit arkadan çarpma
 - Büyük araç kazası ⊖
 - Takla atma ⊖
 - Yüksek hızlı çarpışma ⊖
- Ayakta durabilme
- Geç başlayan boyun ağrısı
- Orta hatta gerginlik ⊖

Boynunu 45° çevirebiliyor mu?

- Evet → Gerekmez
- Hayır → Gerekir



AOspine

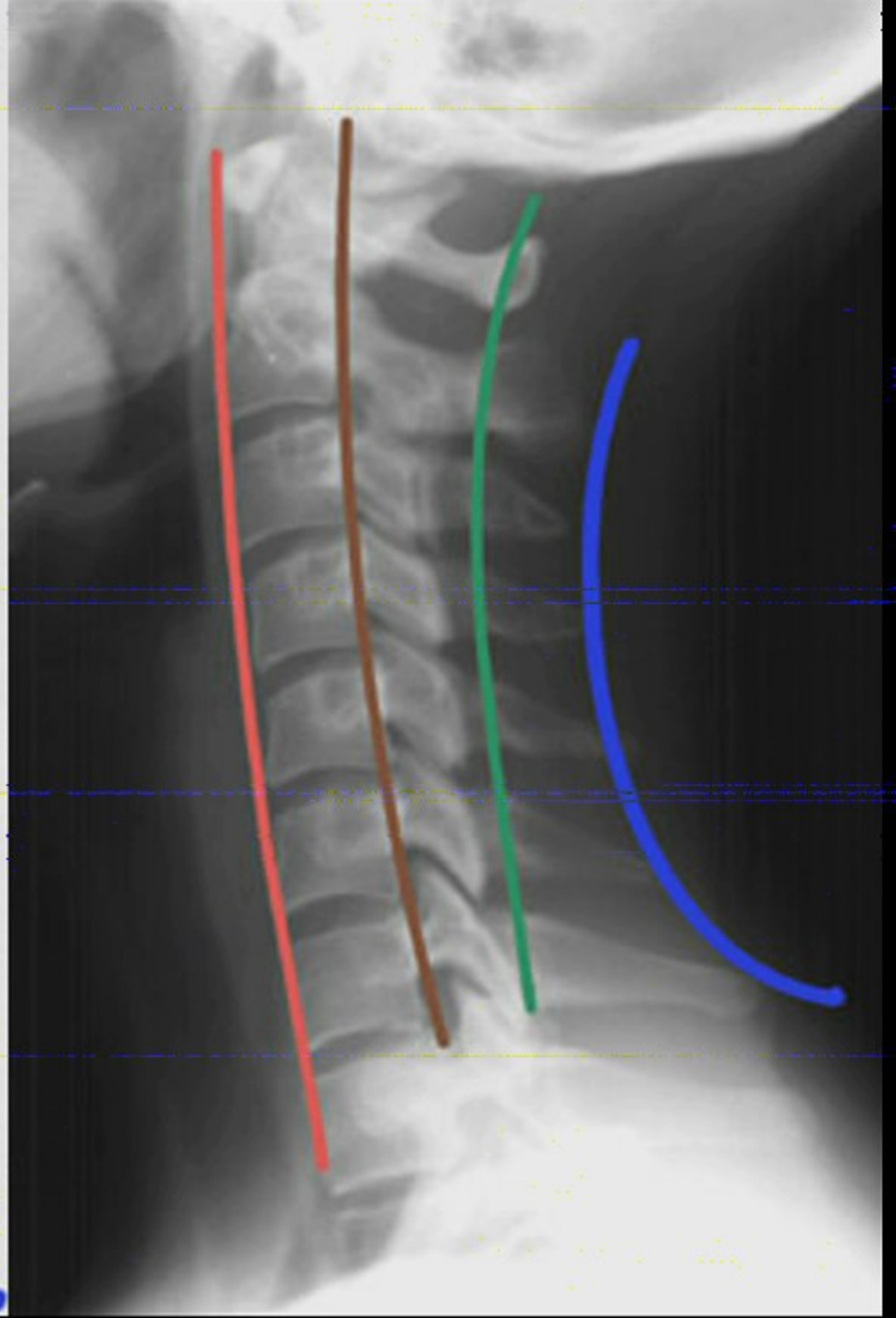
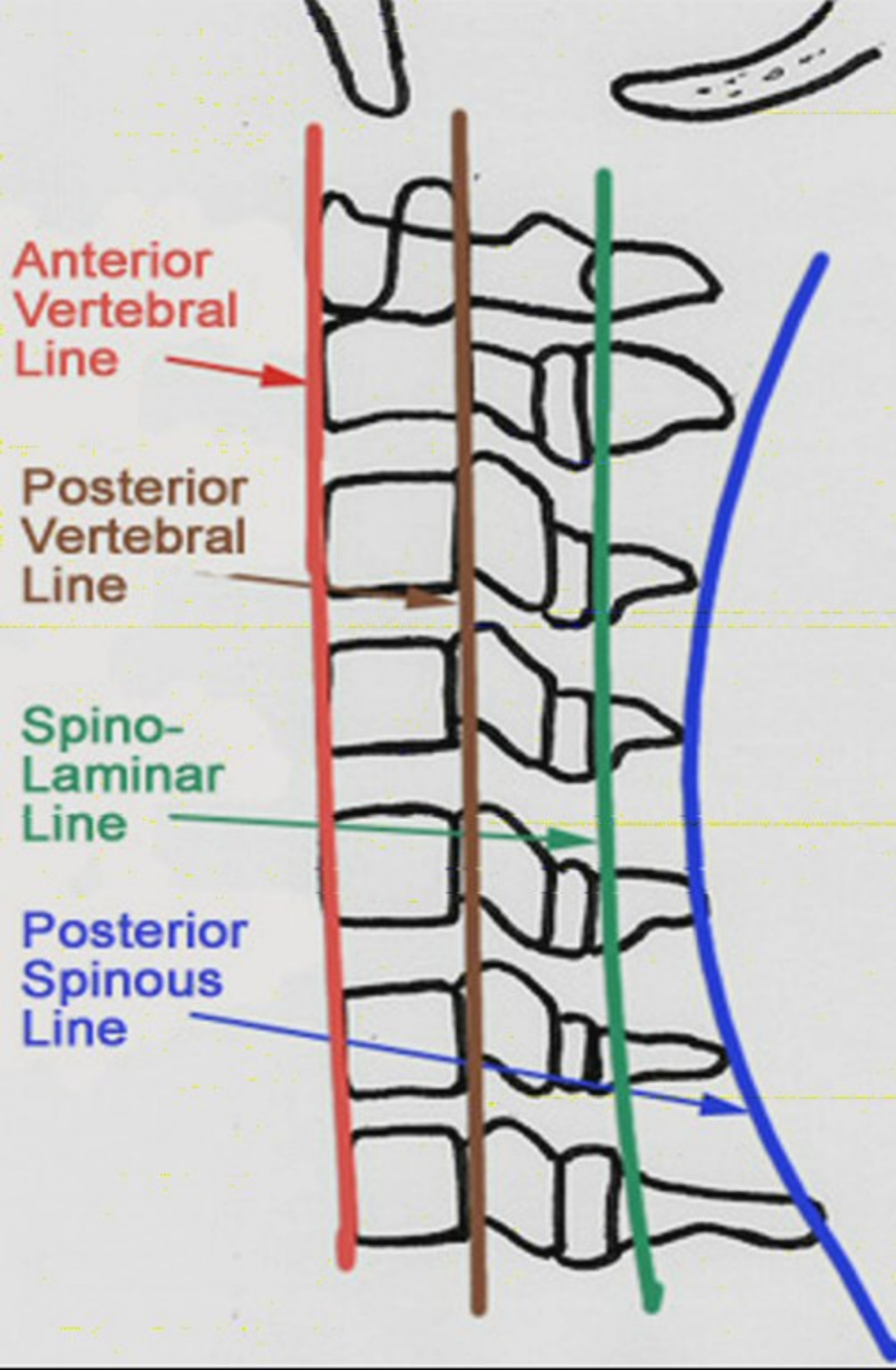
Ryken TC, et al. Radiographic Assessment. Neurosurgery 72:54-72, 2013

- Bilinçli ve asemptomatik hastada radyolojik değerlendirme gerekmez
- Bilinçli semptomatik veya bilinçsiz hastada
 - Yüksek çözünürlüklü BT ilk yöntem
 - BT çekilemiyorsa 3 plan radyografi alınır ancak BT'nin çekilebildiği ilk durumda hasta BT ile mutlaka tekrar değerlendirilmelidir
- Tedavinin sonlandırılması
 - Hasta asemptomatik olunca
 - Flex-Ext grafileri normalse
 - İlk 48 saatteki MR normalse
 - Uzman hekimin öngöreceği sürede



Direkt grafi

- 3 yönlü grafiler (%93)
 - AP
 - Lateral
 - Ağız açık dens
- Lateral grafi (%75)
- AP grafi
 - rotasyonel deplasman
 - lateral dislokasyon
- Yanılgı oranı
 - %61 kırık
 - %36 subluksasyon
- Teknik & yorum hataları
 - Az/yüksek ekspozur
 - Hatalı pozisyon
 - Eksik plan
- Kemik süperpozisyonu
 - Kranioservikal bölge
 - Alt servikal-üst torakal bölge
- Ayrılmamış / iç içe geçmiş kırıklar

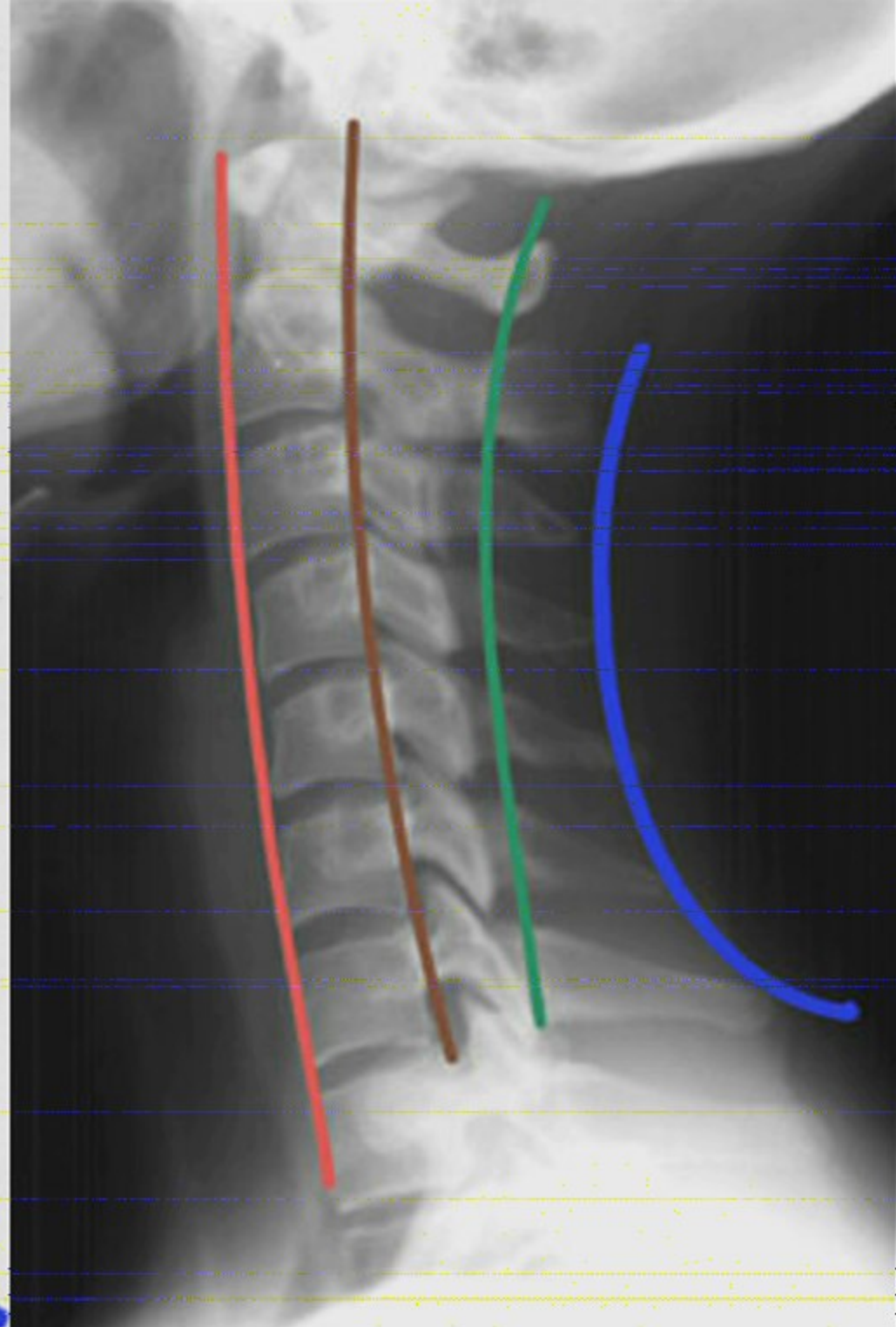
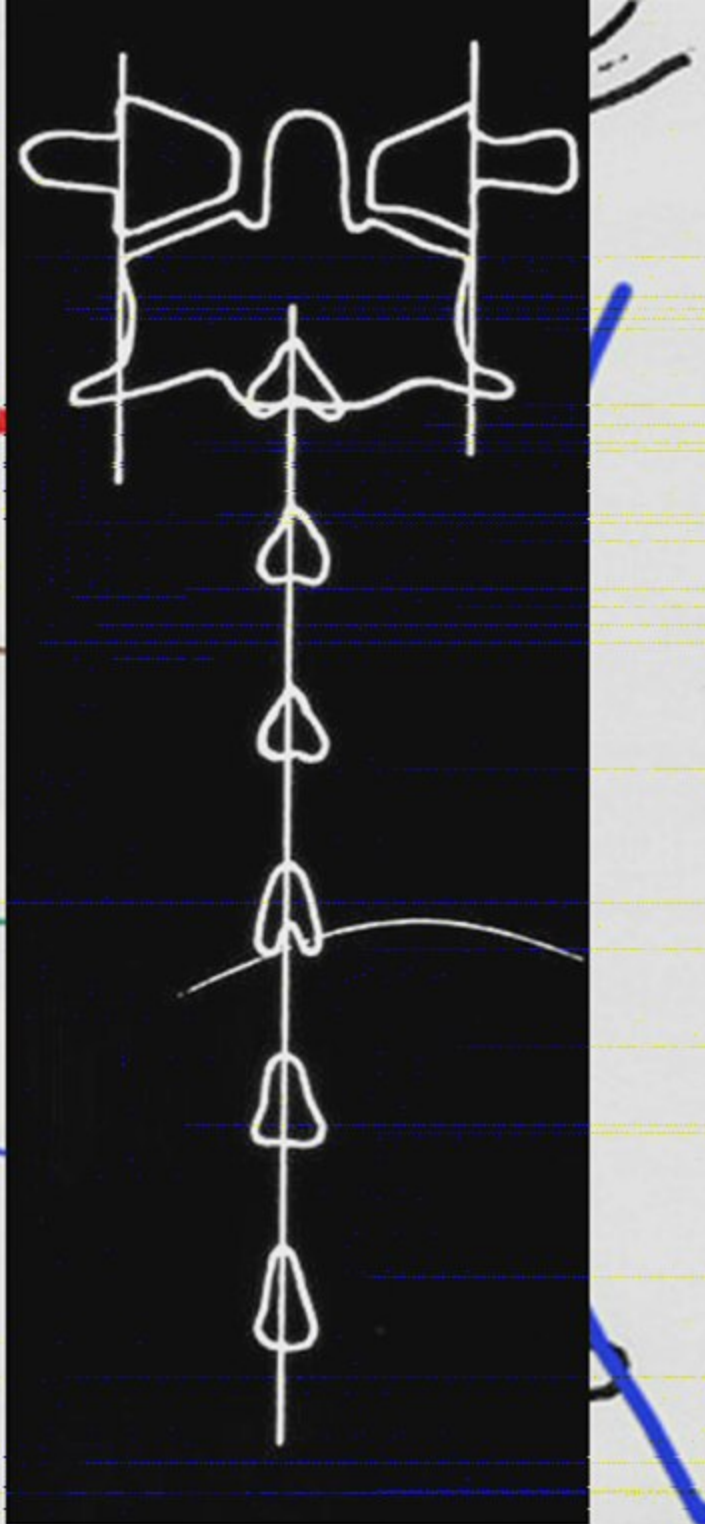


Anterior
Vertebral
Line

Posterior
Vertebral
Line

Spino-
Laminar
Line

Posterior
Spinous
Line





Ne zaman MR ?

- Klinik
 - Hasta stabilize edilmiş olmalıdır
 - BT'de görülen hasarın daha üst seviyesinden kaynaklanan nörolojik bulgu varlığı
 - İlerleyen nörolojik bulgular
 - Radikülopati, myelopati veya kord hasarı bulguları
- Radyolojik
 - İnstabil kırık varlığı
 - Ligament hasarı şüphesi (PLK görüntülenmesi)
 - Vertebralarda genişleme, kayma veya dönme



Spinal travma sekansları

- SE T1 ve T2
- TSE (FSE) T1 / T2
 - Daha hızlı
 - Çözünürlük iyi
 - Artefakt az
- FS T2 (STIR)
 - PLK
 - Kord hasarı
 - Pleksus hasarı
- MRA
 - VA hasarı
- 3D TSE T2
 - SPACE (Siemens)
 - DRIVE (GE)
 - VISTA (Philips)
 - Nöral yapı ve kök hasarı

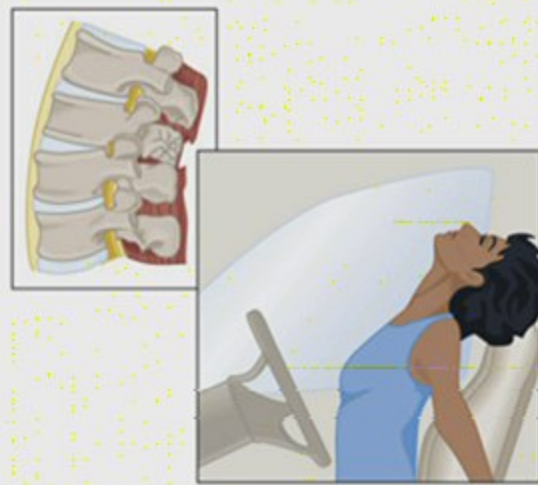


Hasar tipleri

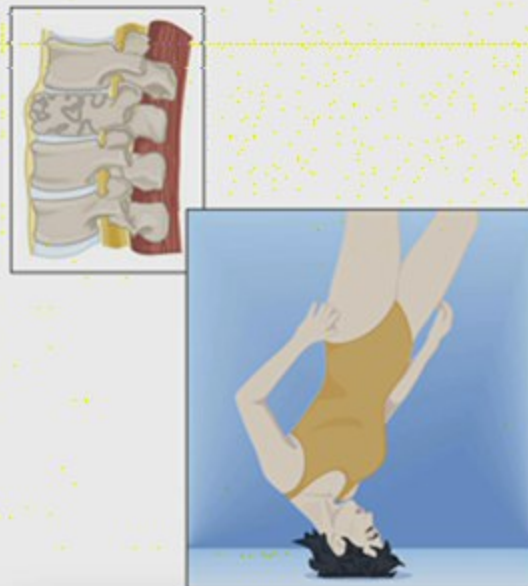
FLEXION INJURY



HYPEREXTENSION INJURY



COMPRESSION INJURY



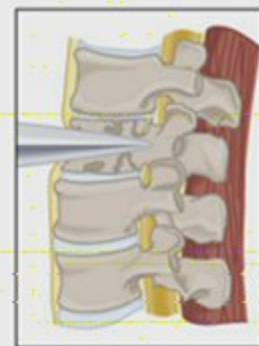
FLEXION-ROTATION INJURY



DISTRACTION INJURY



PENETRATION INJURY





Stabilite / İnstabilite

- Normal hareketler sırasında ve fizyolojik sınırdaki yük altında **potansiyel olarak nörolojik hasara** neden olabilecek her türlü spinal yaralanma, instabil olarak kabul edilir.

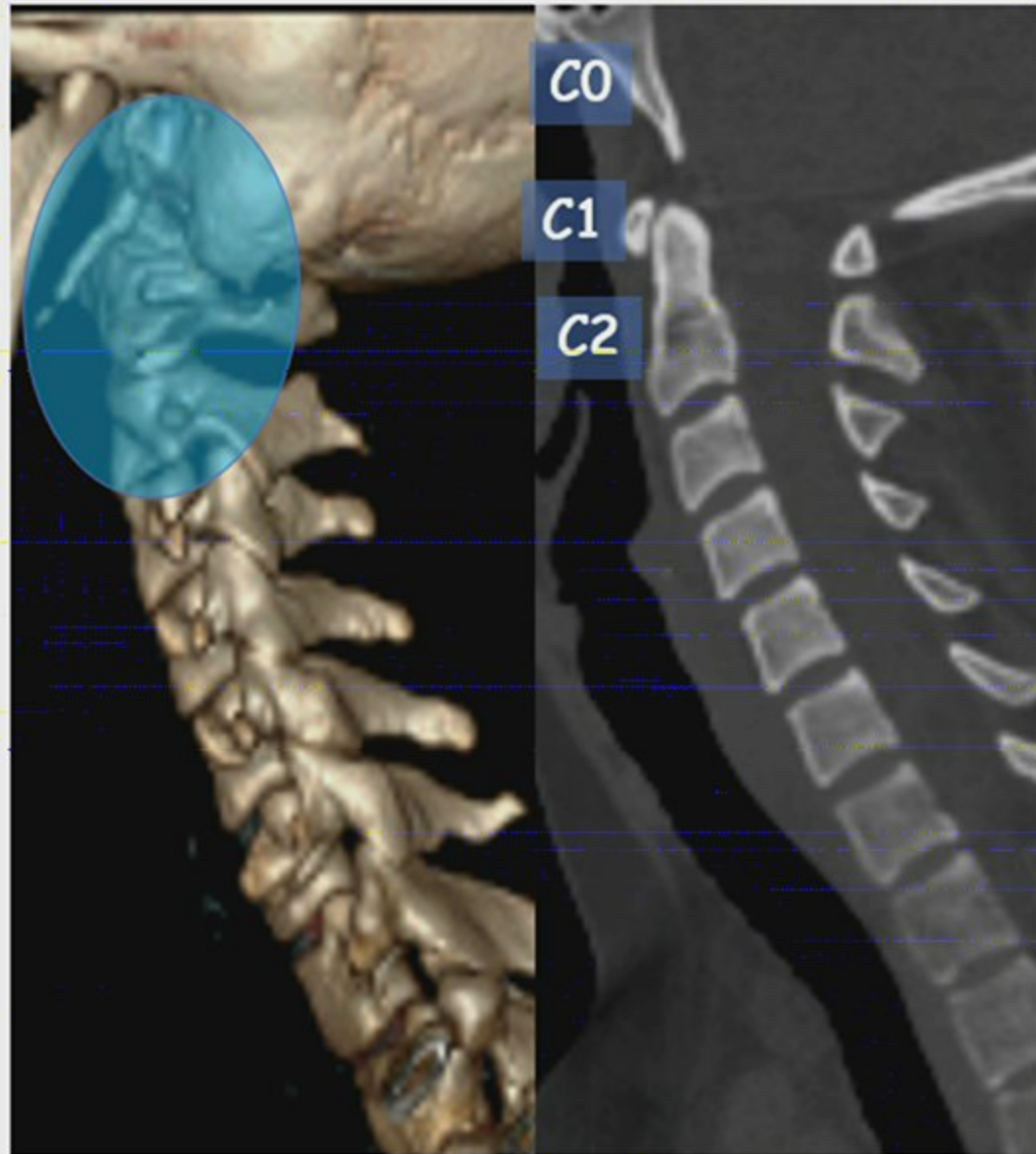
Servikal spinal travma

- Üst servikal
 - Oksipital kondiller (C0) & kranio-servikal bileşke
 - Atlas C1
 - Aksis C2
 - Atipik vertebralar
- Subaksiyal servikal
 - C3-C7
 - Tipik vertebralar



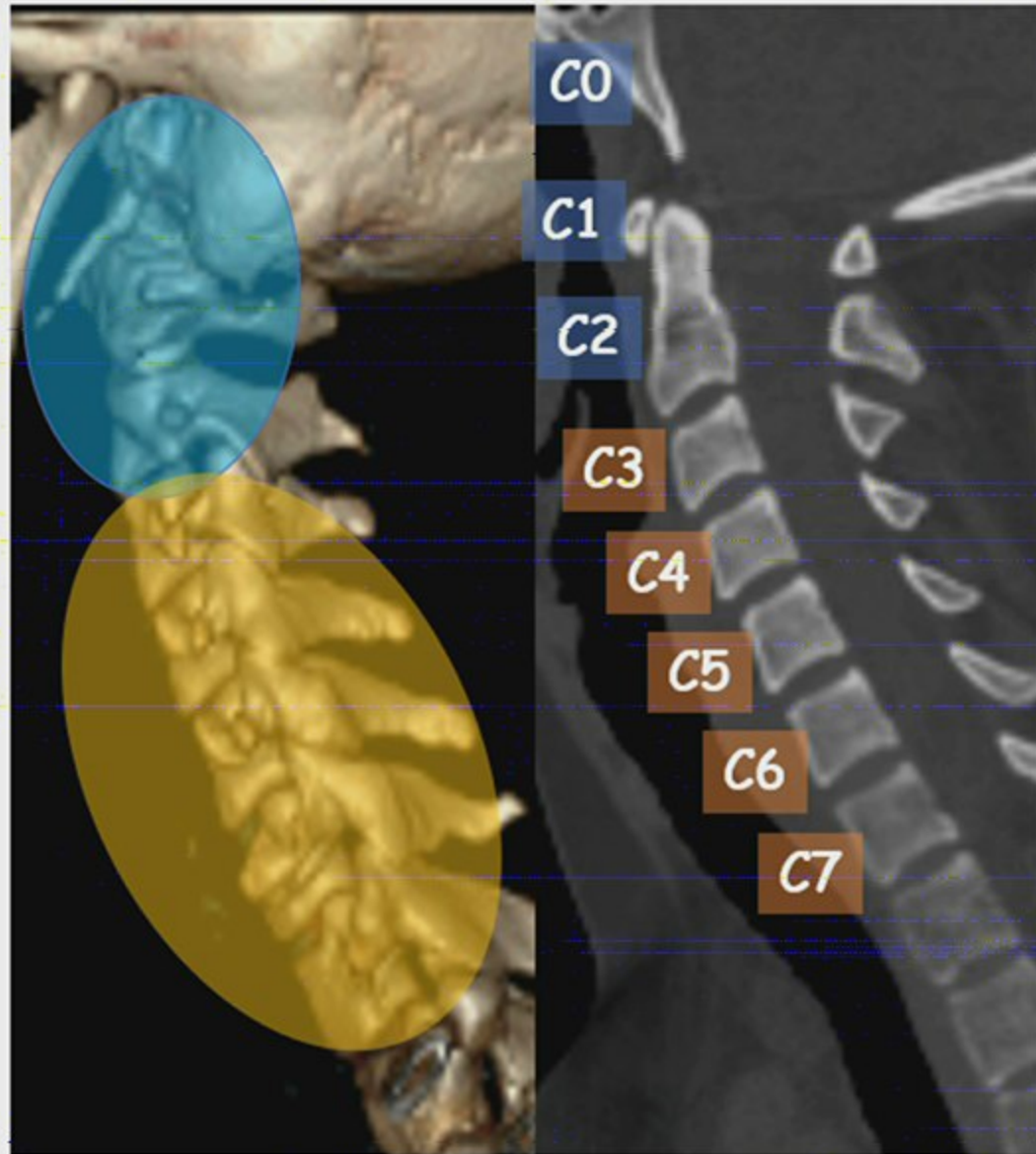
Servikal spinal travma

- Üst servikal
 - Oksipital kondiller (C0) & kranio-servikal bileşke
 - Atlas C1
 - Aksis C2
 - Atipik vertebralar
- Subaksiyal servikal
 - C3-C7
 - Tipik vertebralar



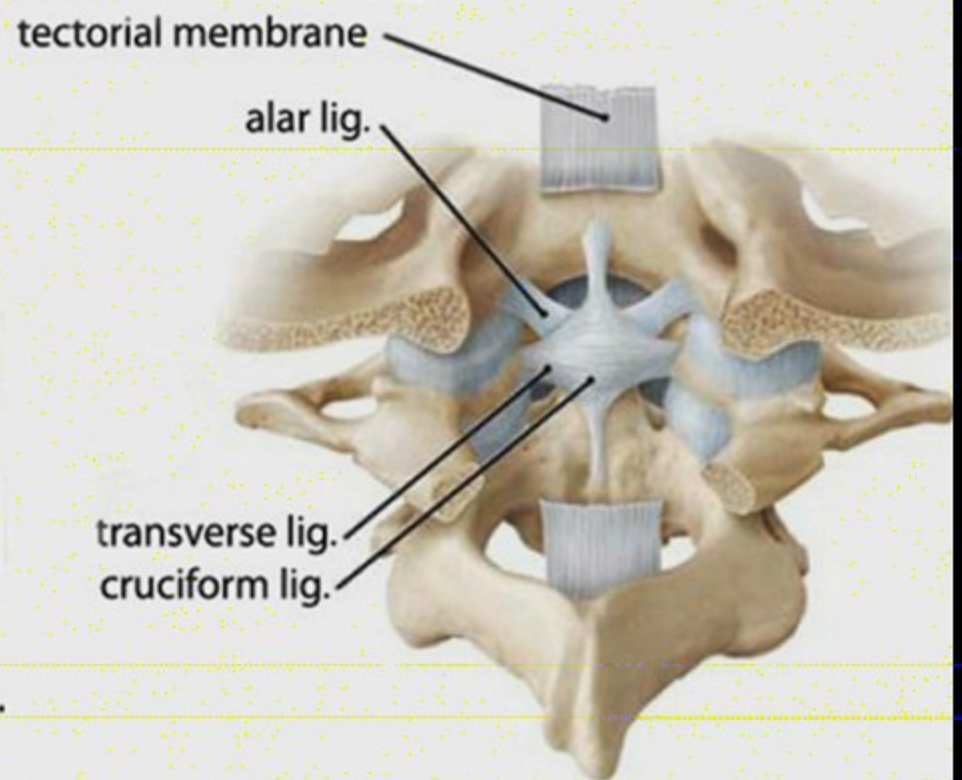
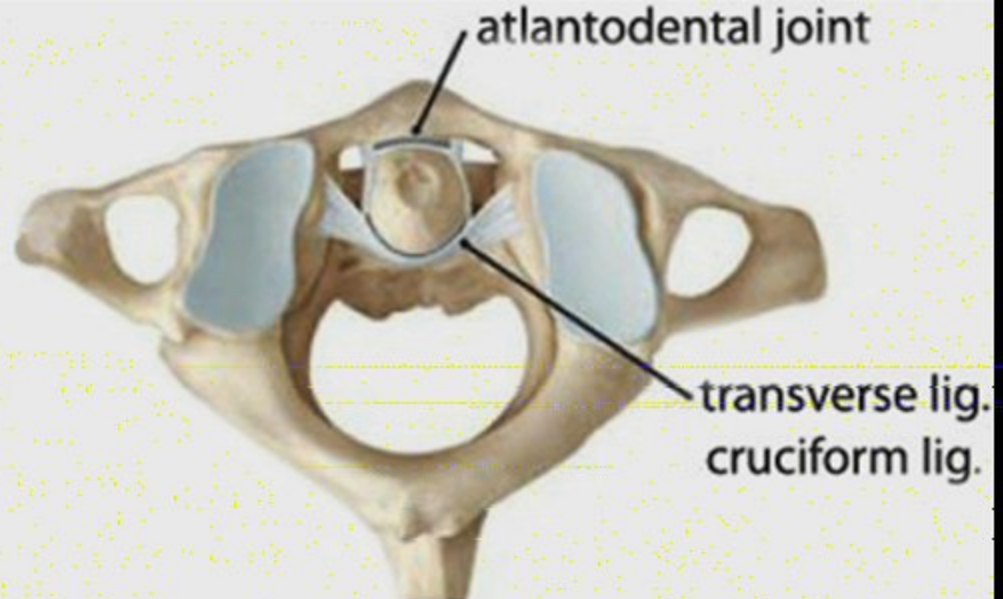
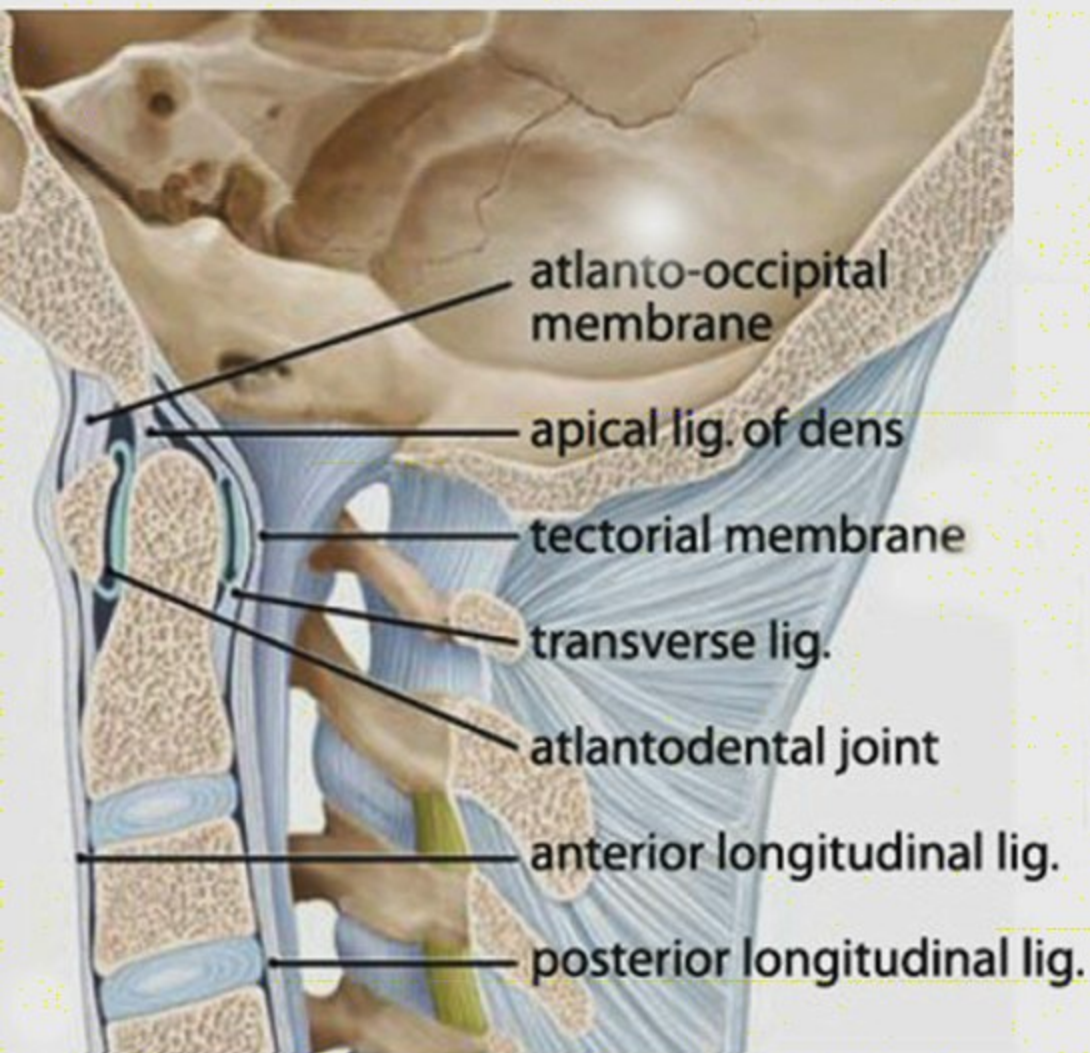
Servikal spinal travma

- Üst servikal
 - Oksipital kondiller (C0) & kranio-servikal bileşke
 - Atlas C1
 - Aksis C2
 - Atipik vertebralar
- Subaksiyal servikal
 - C3-C7
 - Tipik vertebralar





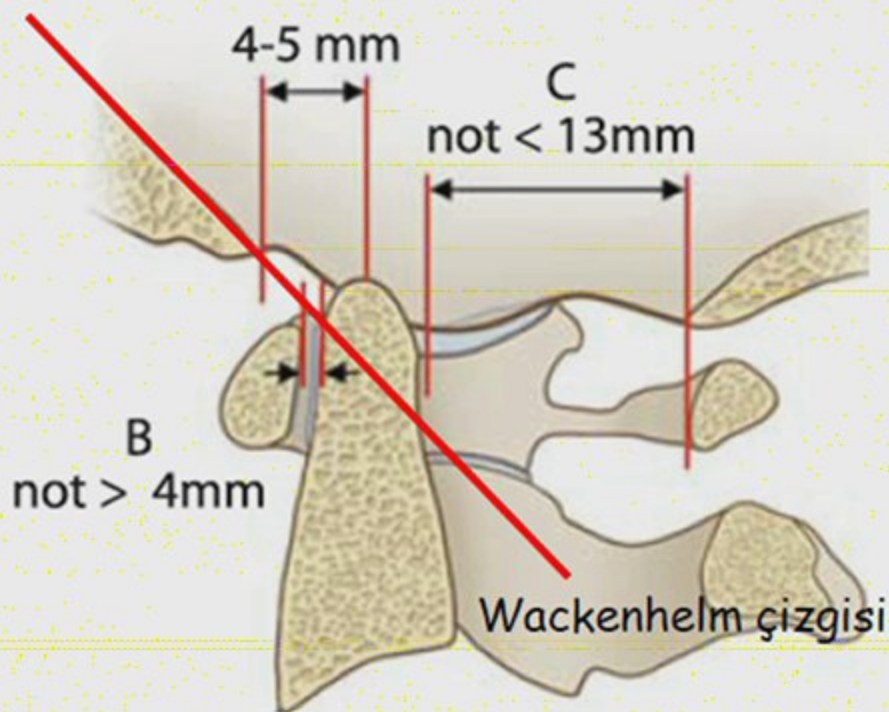
Anatomi





C0-C1-C2 stabilitesi

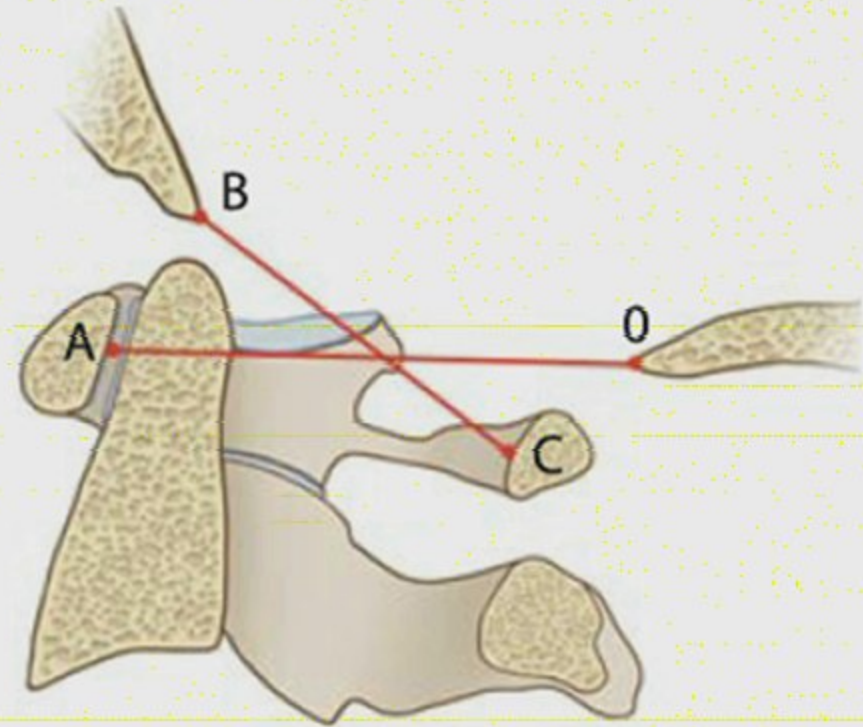
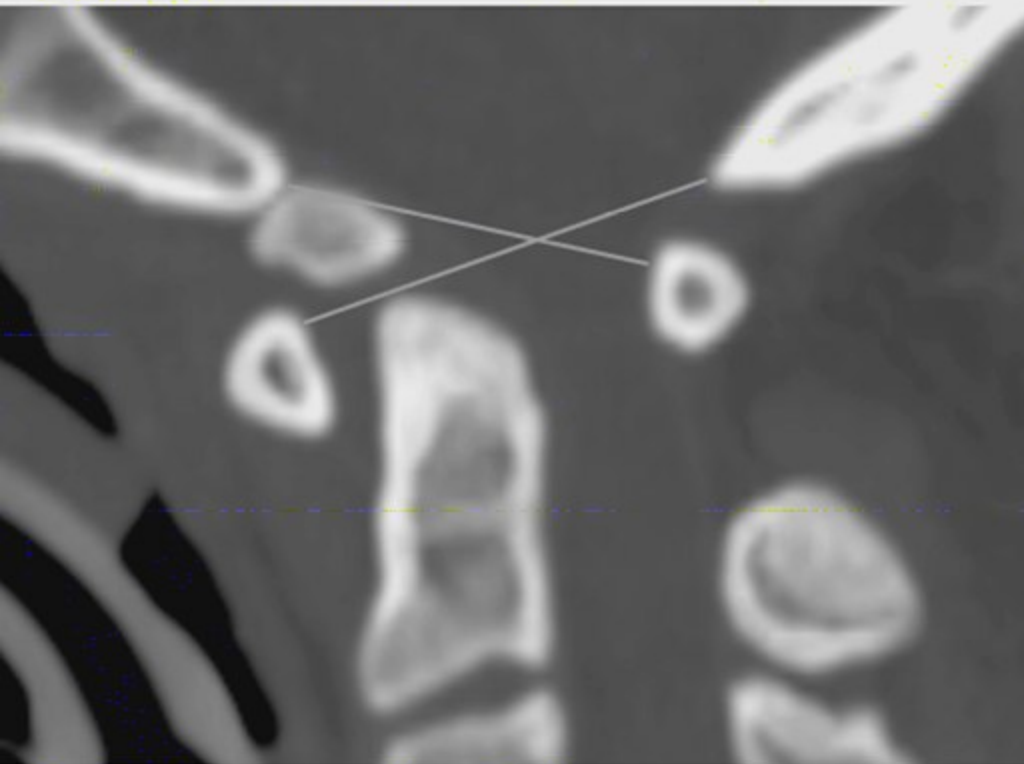
- Harris kriteri
 - < 12 mm bazion-dens aralığı
 - > 13 mm dens-C1 aralığı
- C1-C2 aralığı
 - > 4 mm erişkin
 - > 5 mm çocuk
- Wackenhelm çizgisi odontoidi kesmeli





C0-C1-C2 stabilitesi

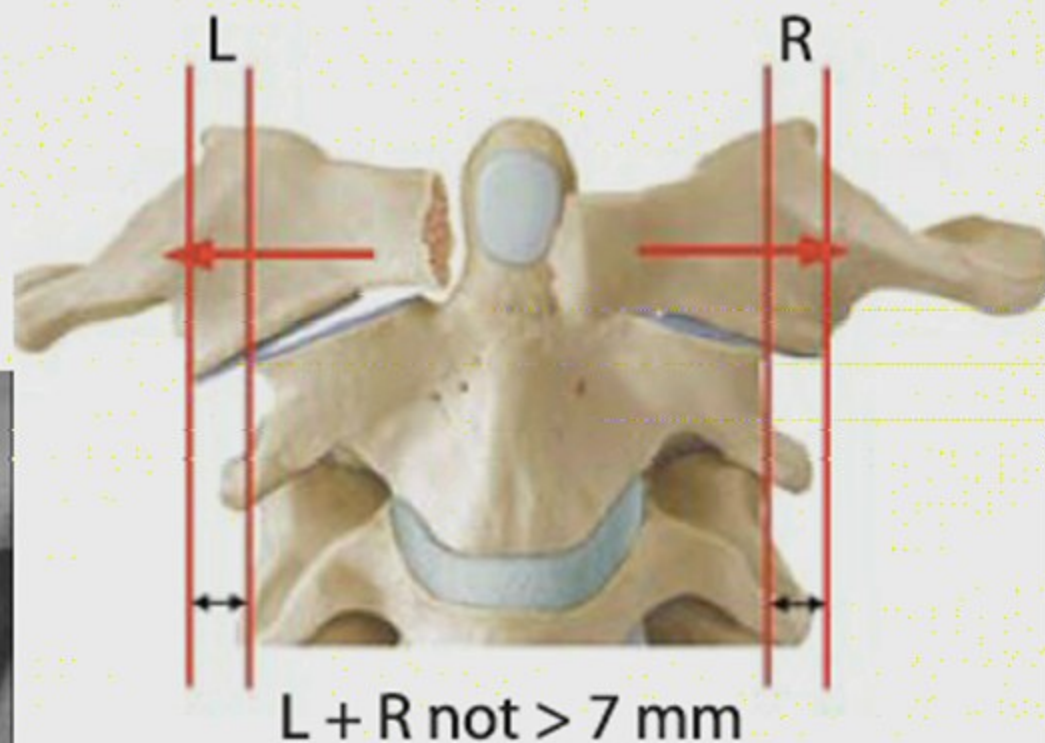
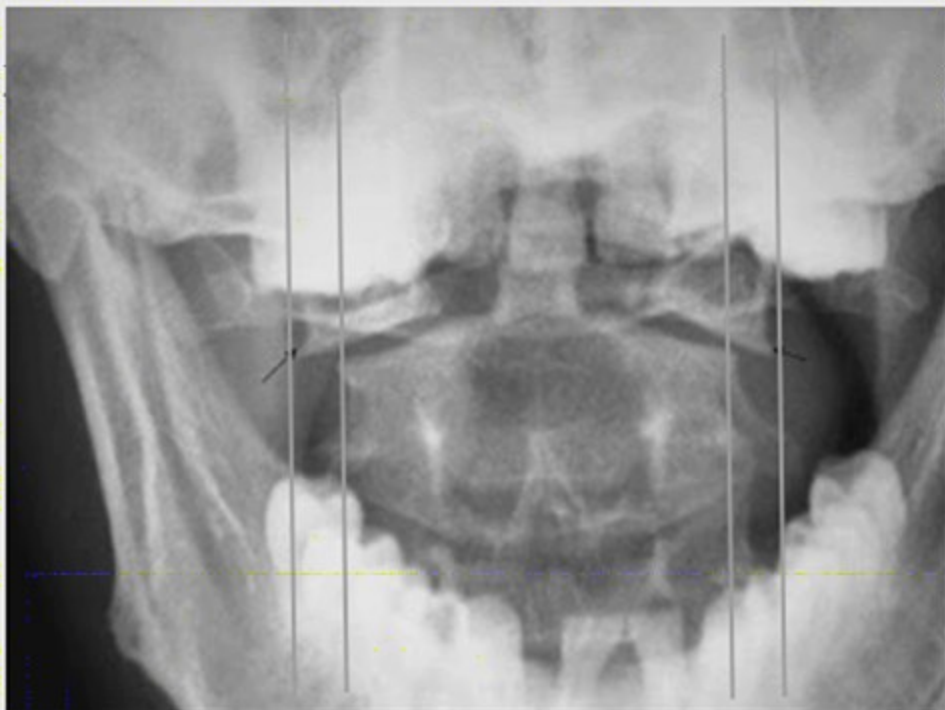
- Power oranı
 - < 1 BC/AO
 - > 1 atlanto-oksipital dislokasyon





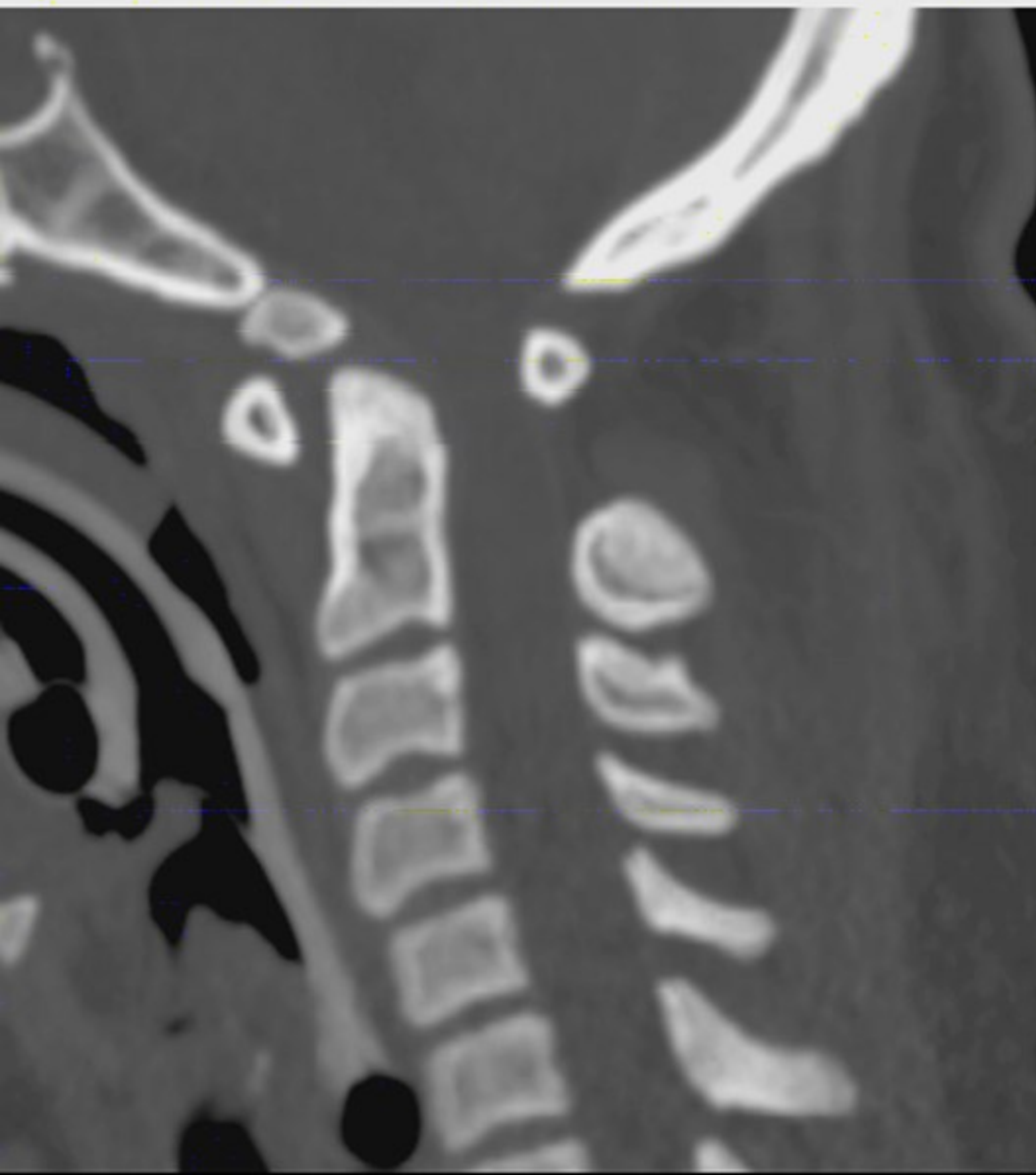
C0-C1-C2 instabilitesi

- > 7 mm L+R
- $> 8^\circ$ aksiyal C0-C1 rotasyon



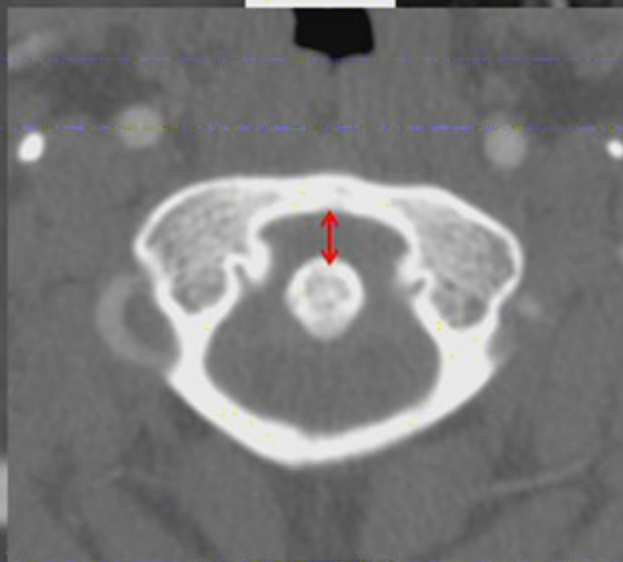
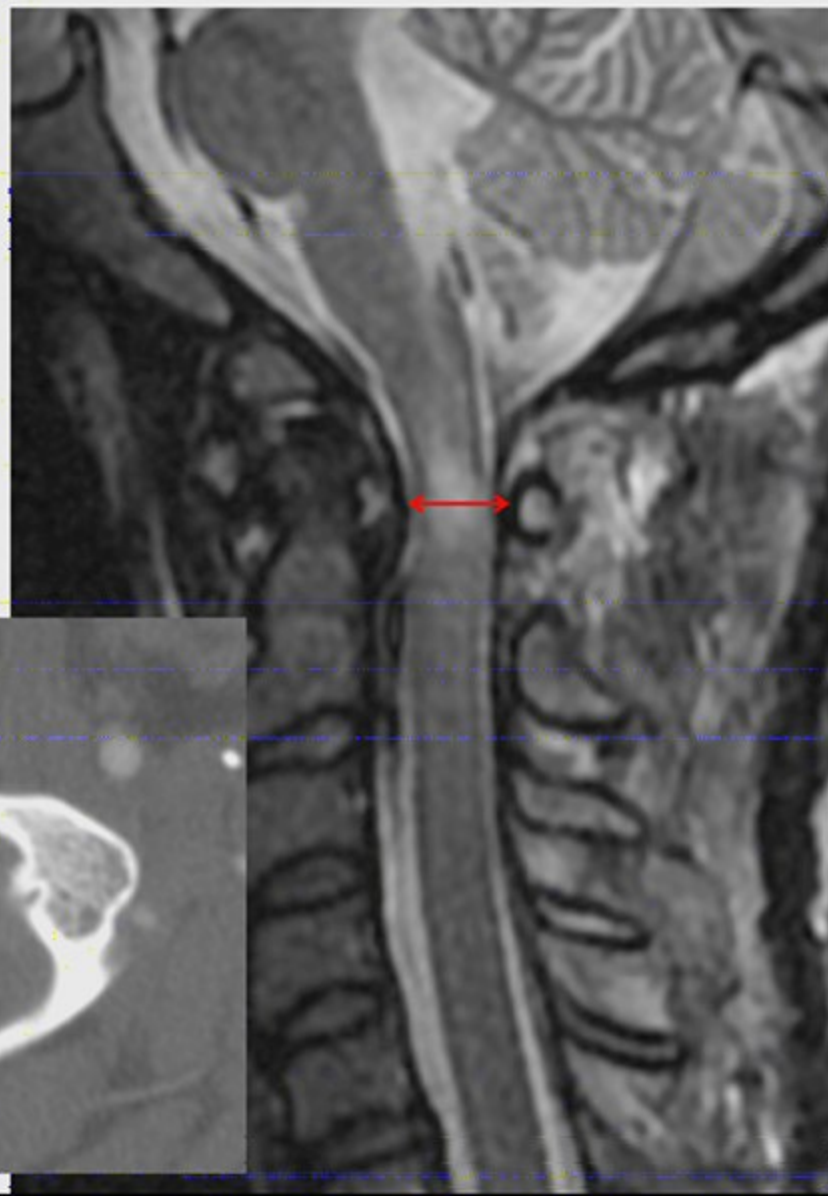
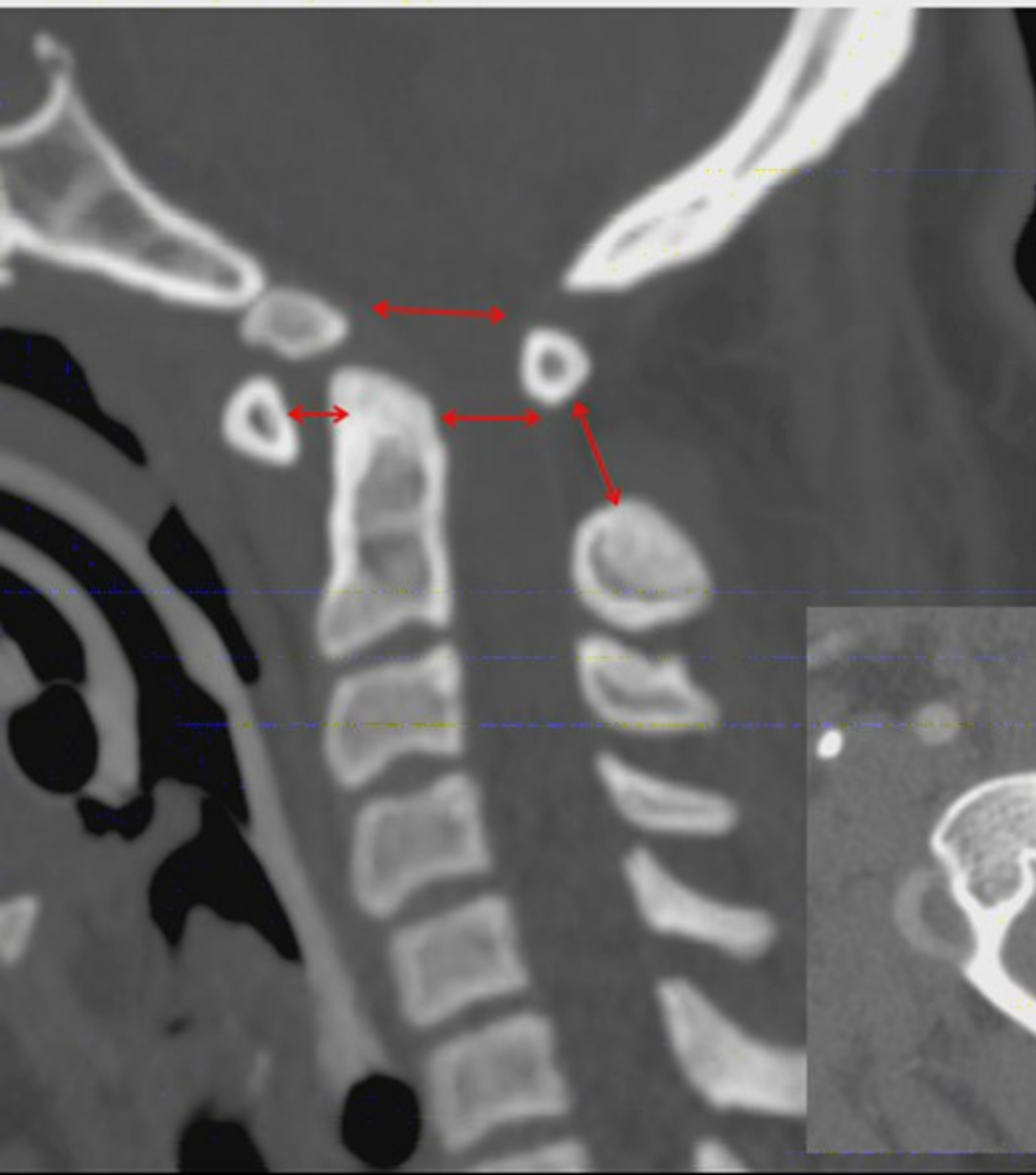


C1-C2 instabilite



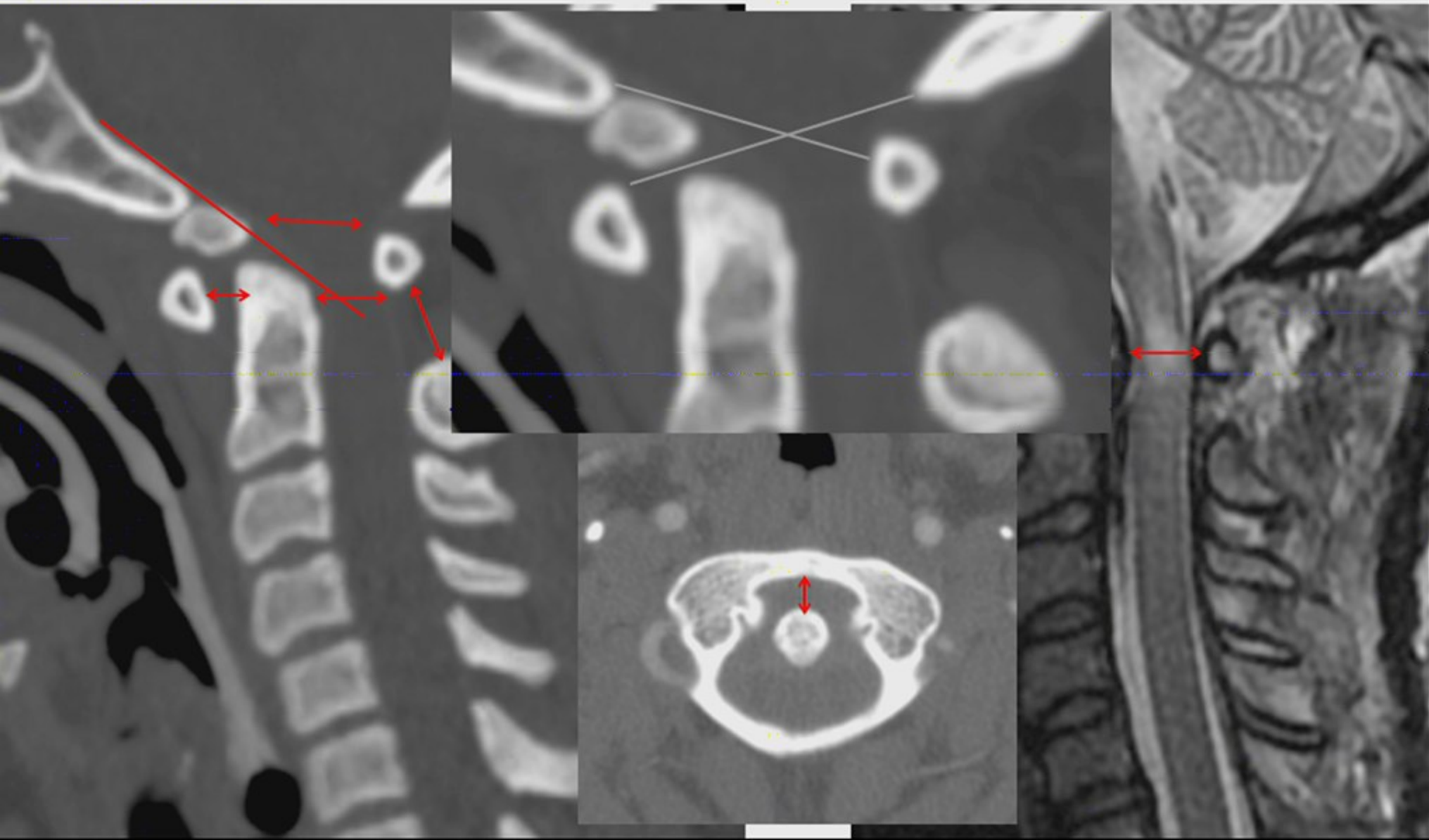


C1-C2 instabilite





C1-C2 instabilite





Sınıflamalar

- Oksipital kondil
 - Anderson & Montesano 1988
- KSB
 - Traynelis 1986
- C1 halka
 - Levine & Edwards 1991
- C1-C2 eklem
 - Fielding & Hawkins 1977,
 - modified Wang et al. 2013
- C2 odontoid
 - Anderson & D'Alonzo 2004
- C2-C3 eklem (Hangman fx)
 - Effendi et al. 1981
 - Levine & Edwards 1985



Üst servikal spinal travma

SEMIN SPINE SURG 29 (2017) 9–13

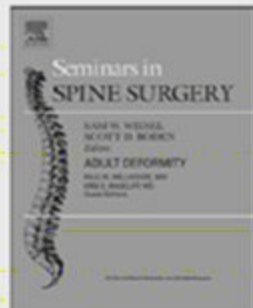


ELSEVIER

Available online at www.sciencedirect.com

ScienceDirect

www.elsevier.com/locate/semss



Update on upper cervical spine injury classifications

Jefferson R. Wilson, MD, PhD*, and James S. Harrop, MD

Departments of Neurological and Orthopedic Surgery, Thomas Jefferson University Hospital, 3rd Floor, 909 Walnut St, Philadelphia, PA



CrossMark

- I. Oksipital kondil & KSB hasarları
- II. C1 halka ve C1-C2 eklem hasarları
- III. C2 halka ve C2-C3 eklem hasarları

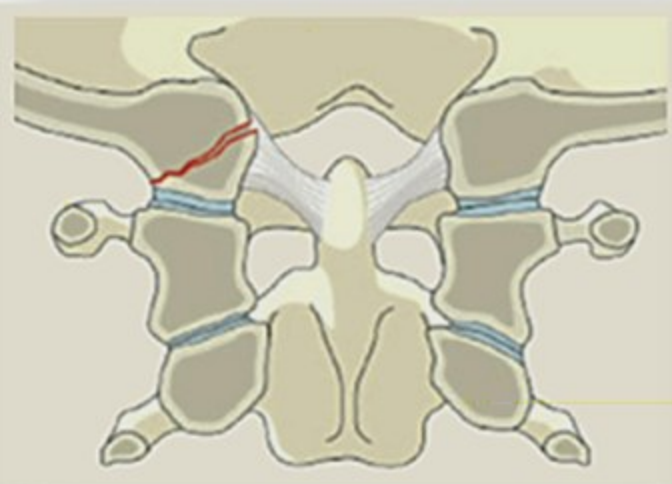


AOSpine

Üst servikal spinal travma

- Hedef
 - Tüm bu sınıflandırmaları basit ve kapsamlı tek bir sınıflandırma sisteminde birleştirmek
- Dayanak
- Yaralanma morfolojisi
 - Travmatik lezyonları hiyerarşik sınıflama sistemi içerisinde en stabilden en az stabile sınıflamak
- Nörolojik durum
- Düzenleyiciler

I. Oksipital kondil & KSB



Tip A.
İzole kemik
hasarı (kondil)

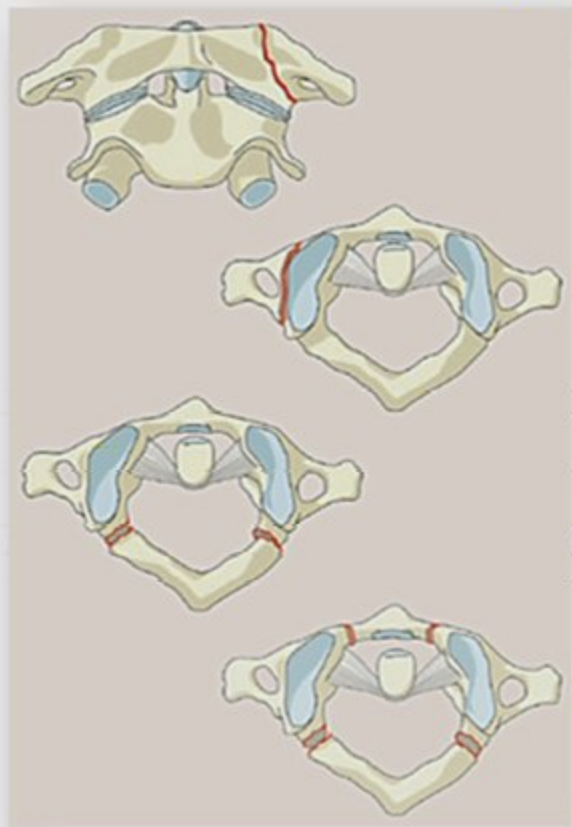


Tip B.
Non-deplase KSB
ligamentöz hasar

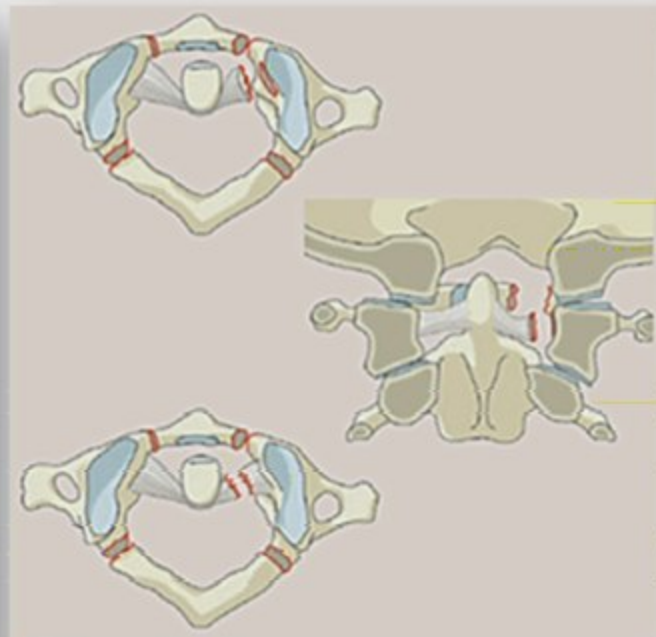


Tip C.
Deplasmaana yol
aan her trl
hasar

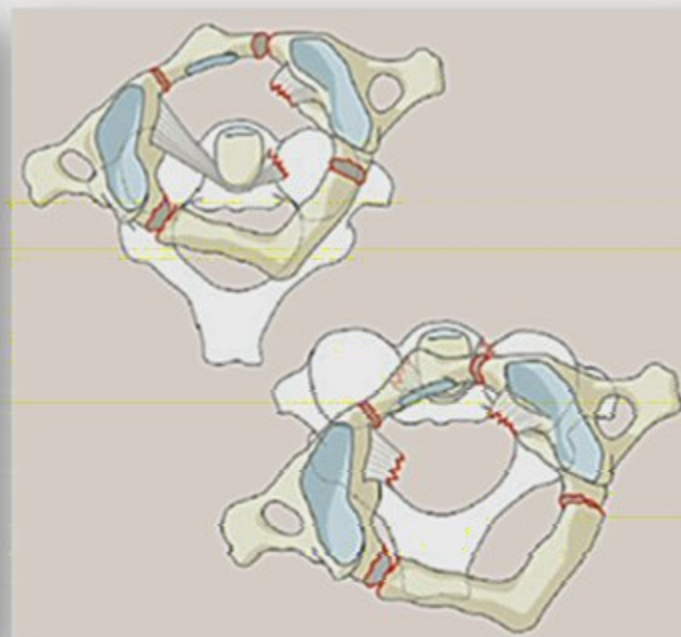
II. C1 halka ve C1-C2 eklem



Tip A.
Izole kemik
hasarı (ark)

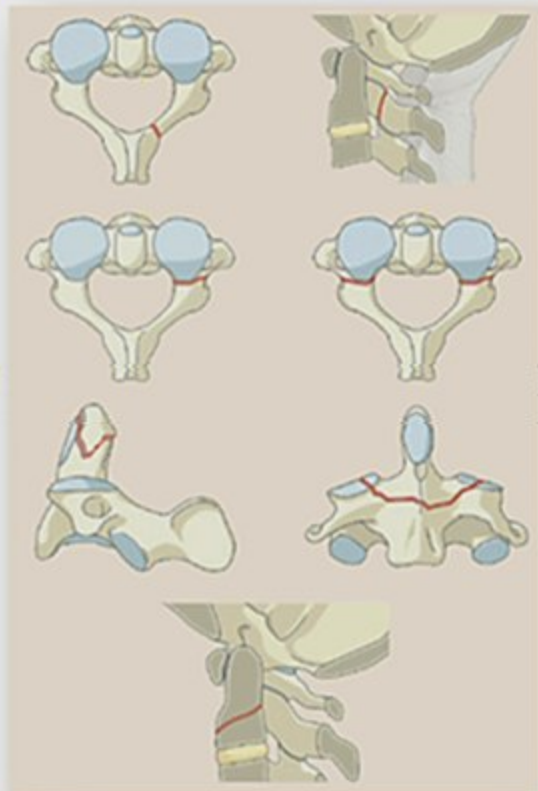


Tip B.
Ligamentöz hasar
(transvers lig.)

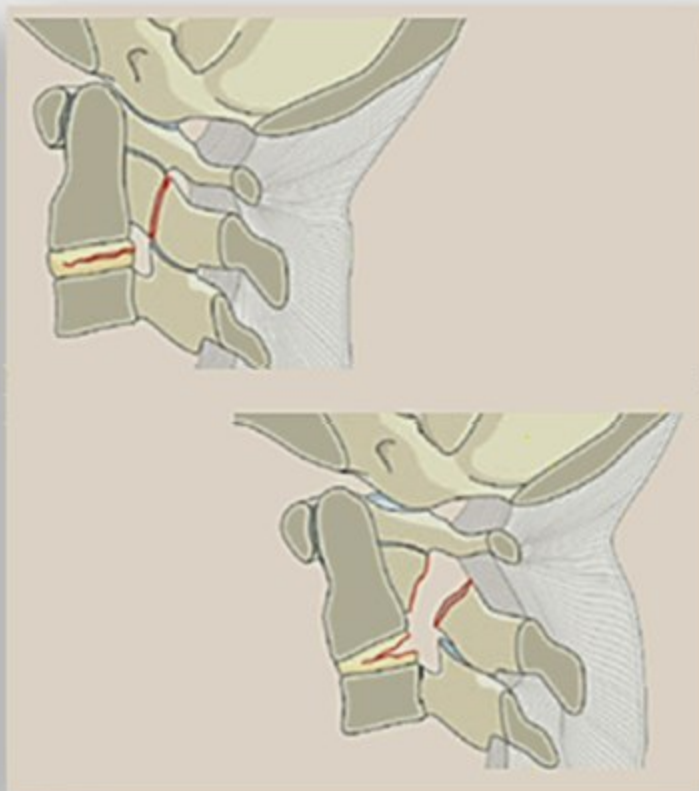


Tip C.
İnstabilite /
rotasyon

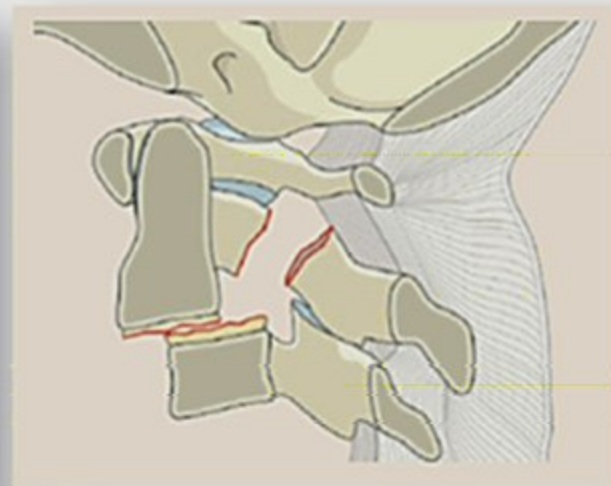
III. C2 halka ve C2-C3 eklem



Tip A.
Sadece kemik hasar.
Ligamentöz, tension
band, diskal hasar
yok



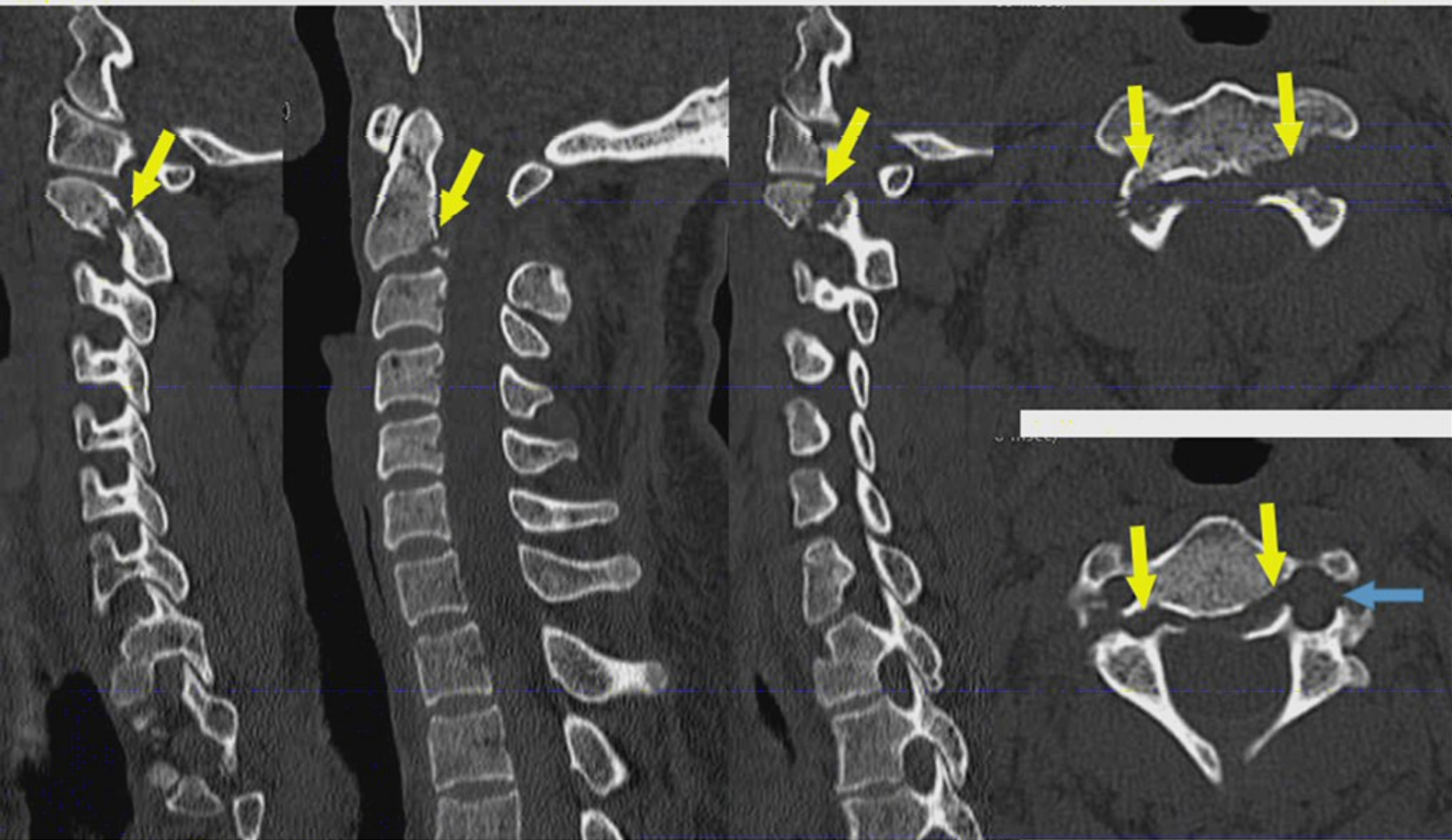
Tip B.
Ligamentöz, tension
band, diskal hasar $\pm$
kemik hasar



Type C.
Herhangi bir yön ve
düzlemde vertebral
kaymaya yol açan
herhangi bir yaralanma

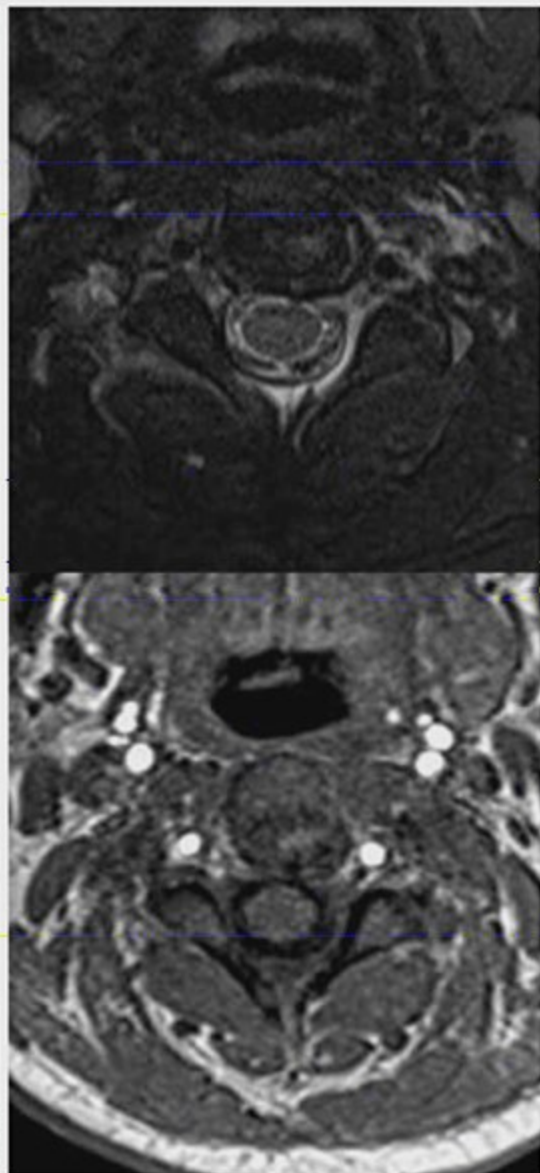


Tip A





Tip B





Tip C



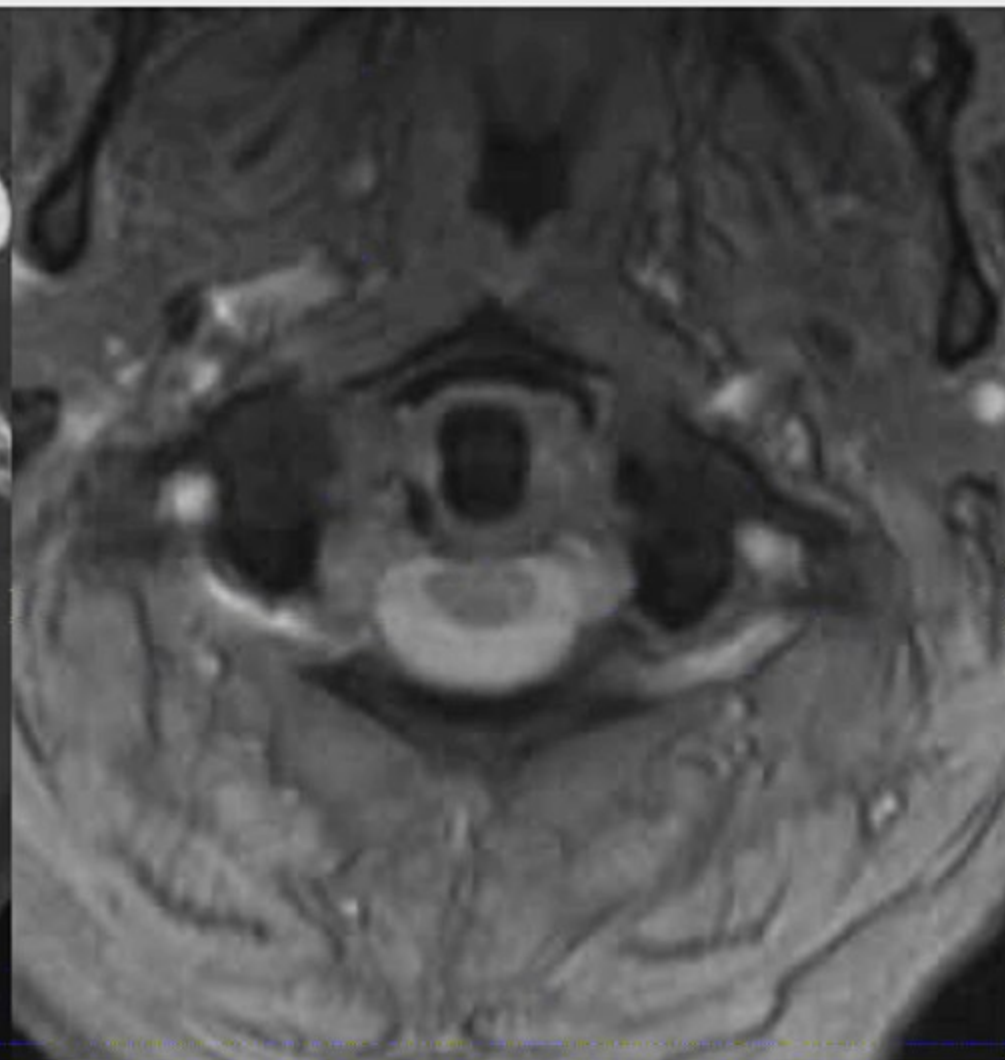
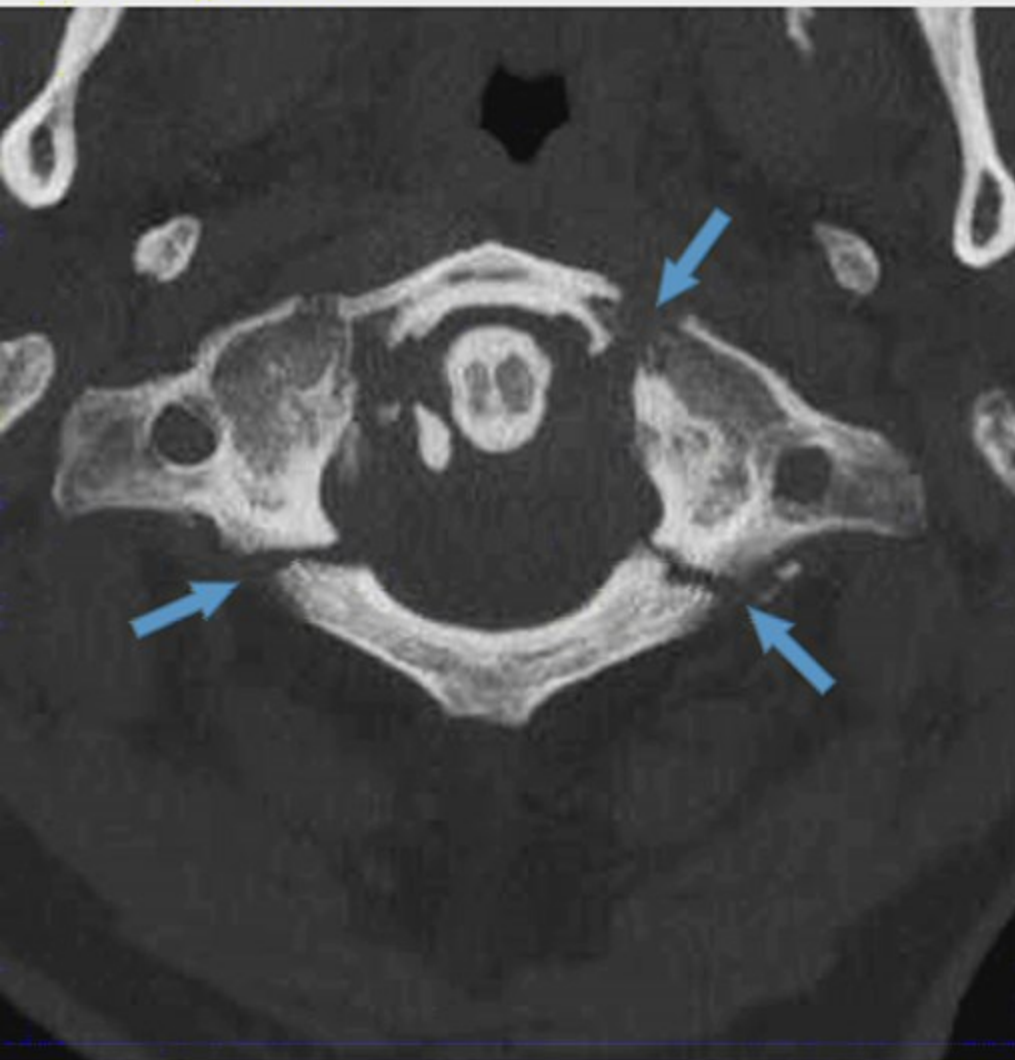


Tip C



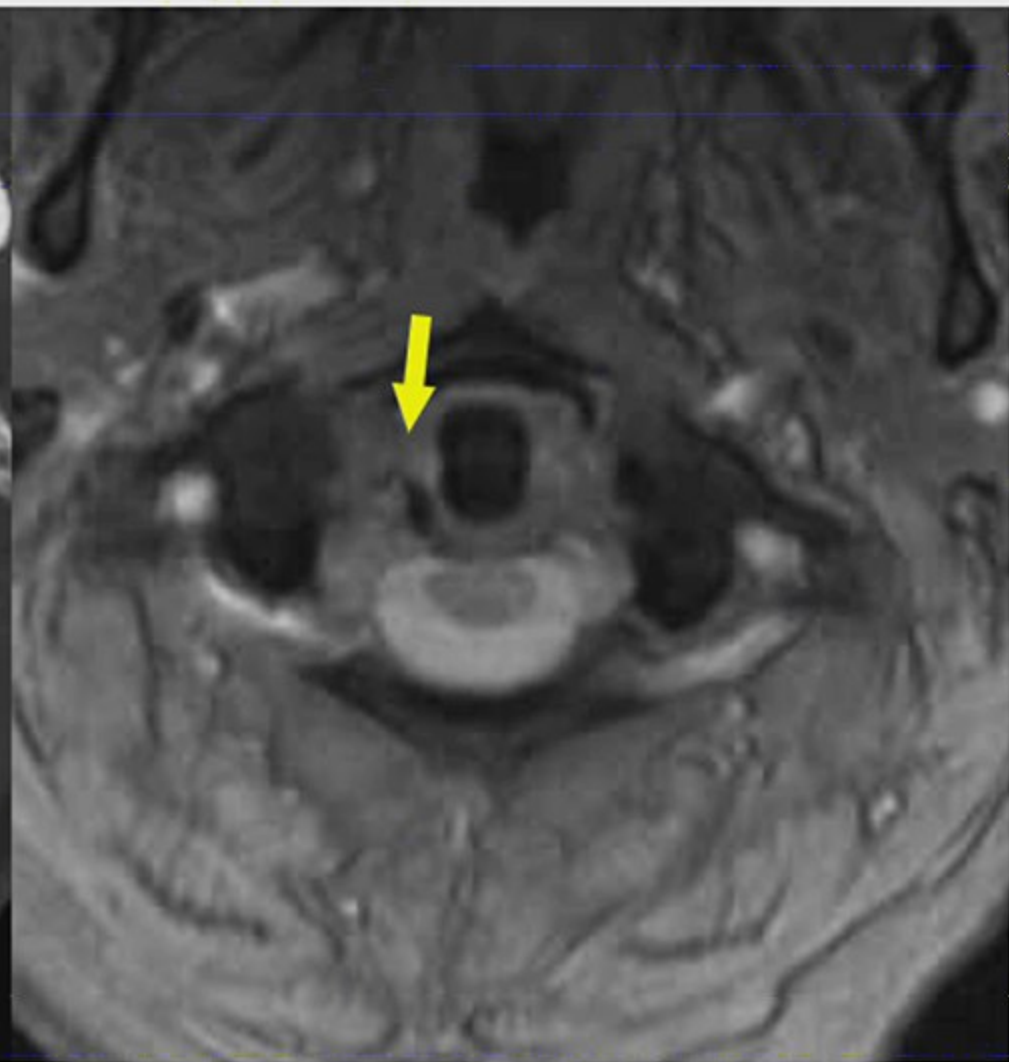
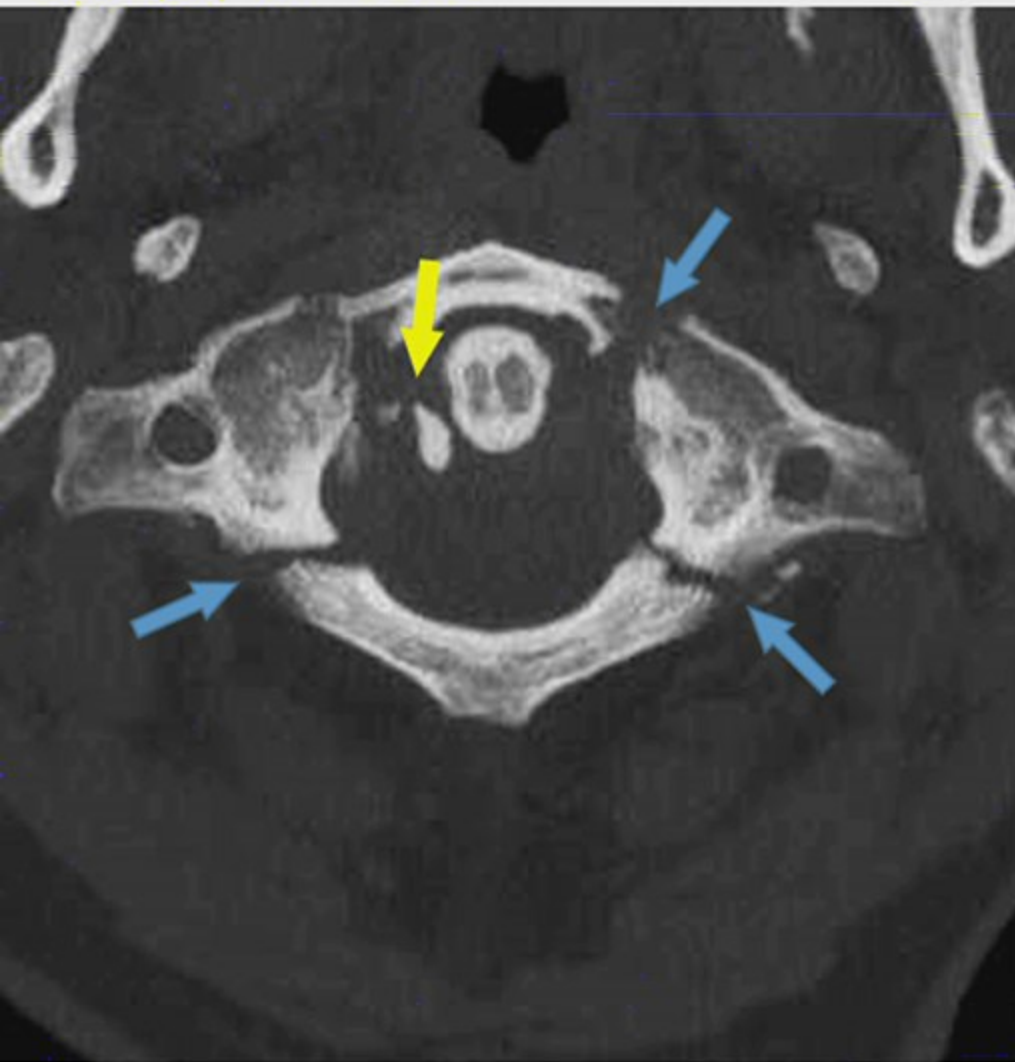


Tip C



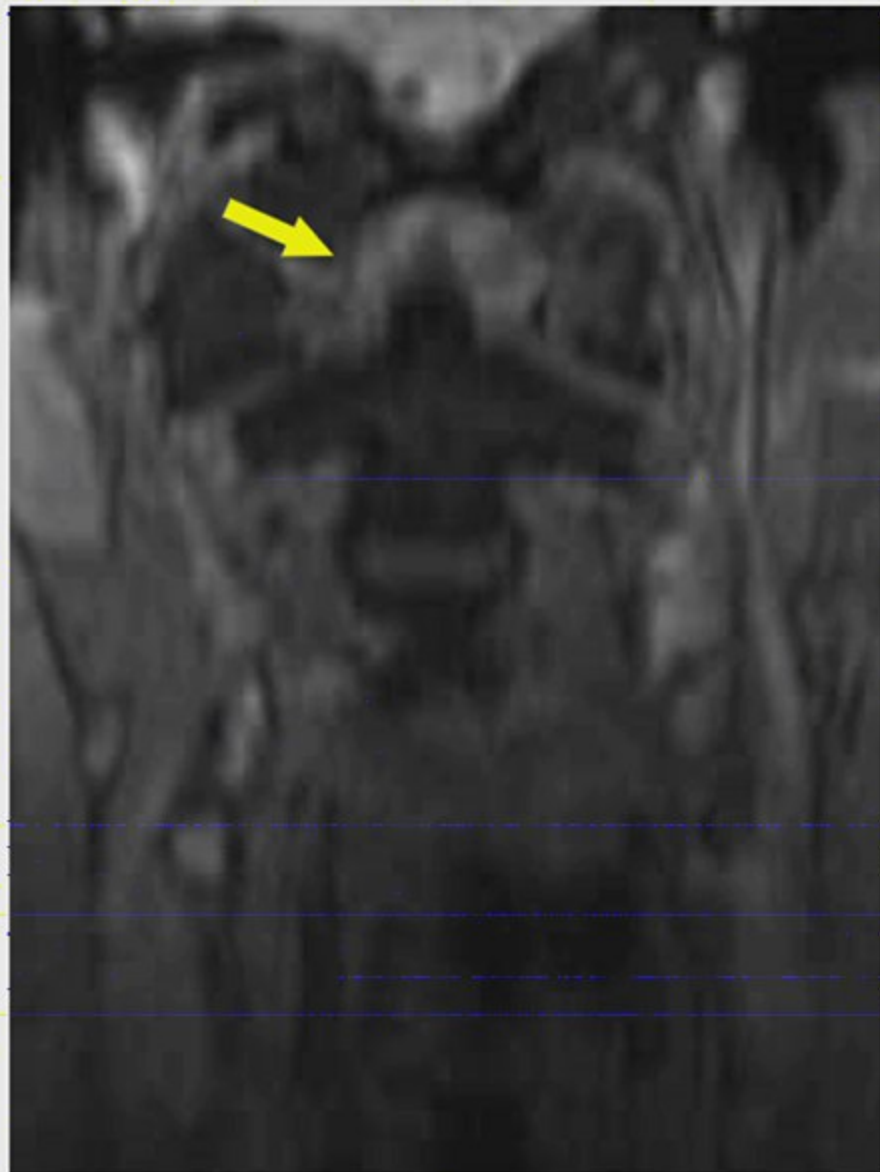
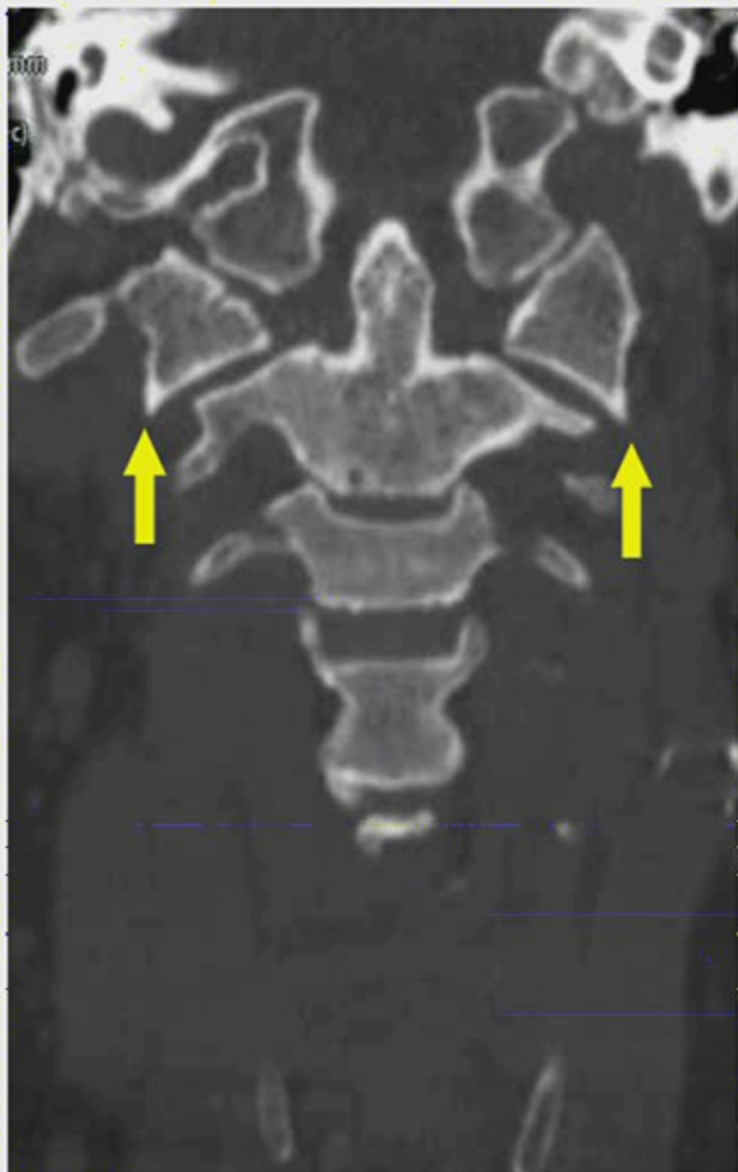


Tip C





Tip C





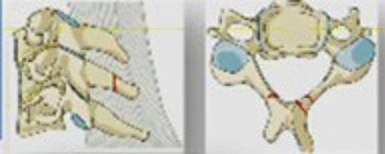
Subaksiyal servikal travma



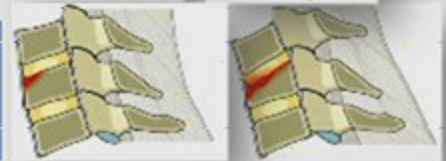
Hasar morfolojisi

A Kompresyon

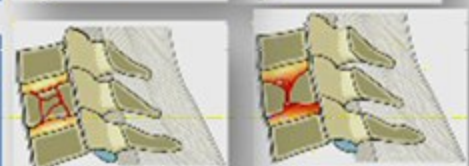
A0 Önemsiz hasar



A1 Wedge/Impaction



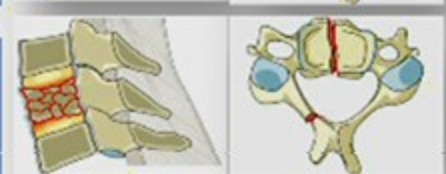
A2 Split/Pincer



A3 Tam olmayan burst



A4 Tam burst



B Tension band

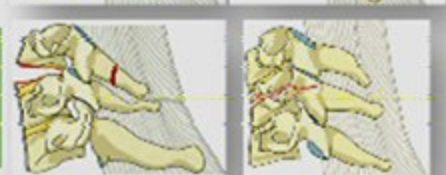
B1 Saf kemik ayrımı



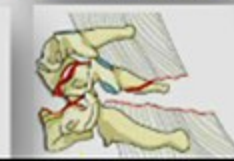
B2 Osseoligamentöz ayrım

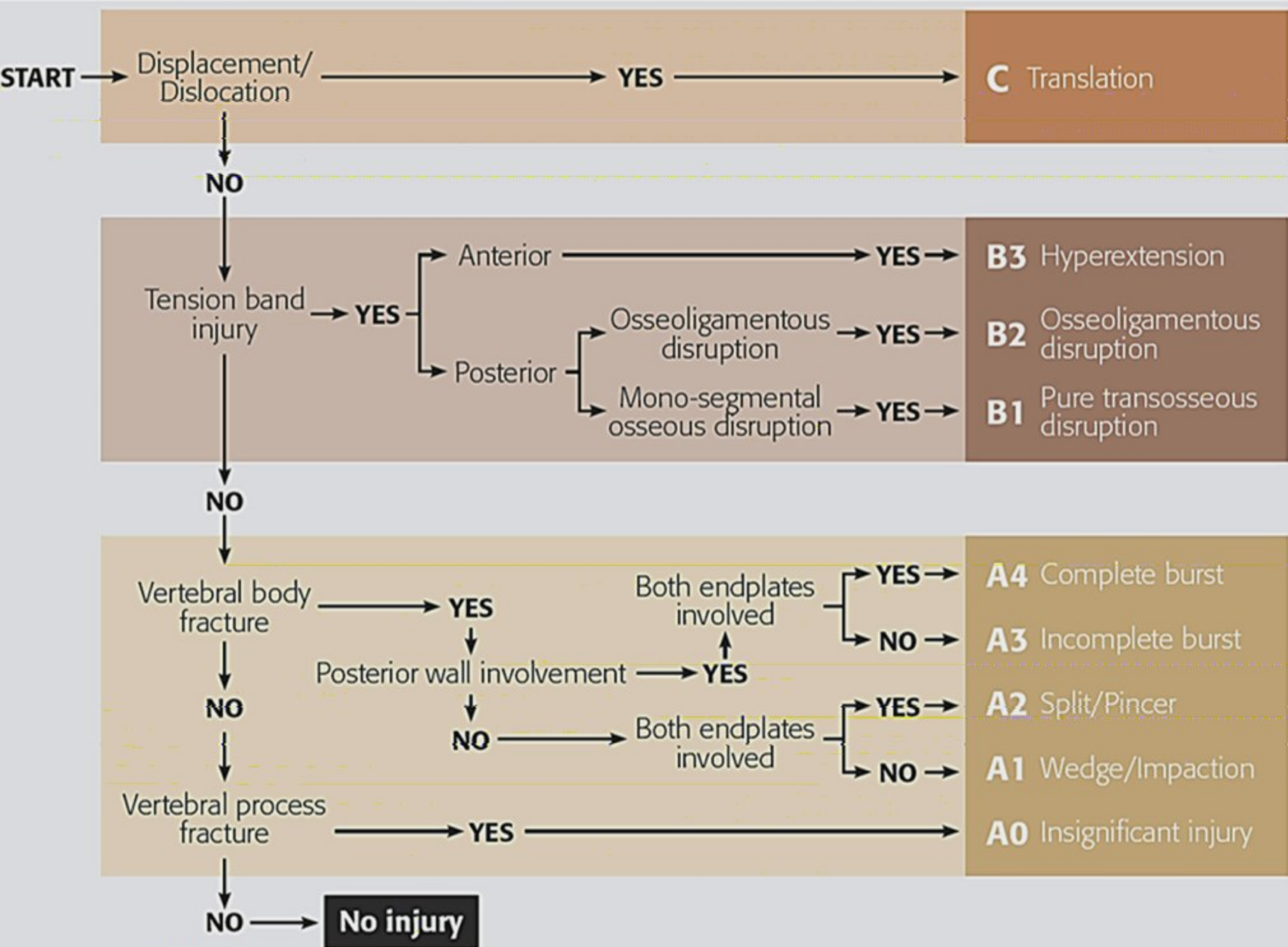


B3 Hiperekstansiyon



C Translasyon



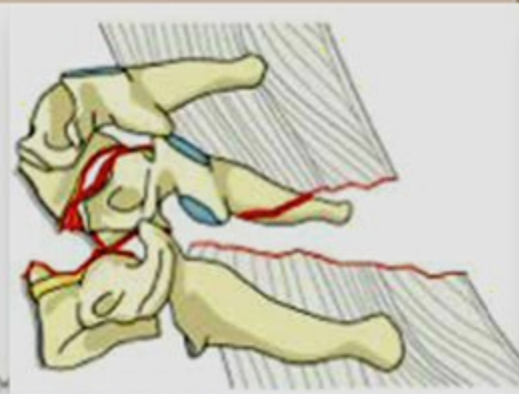
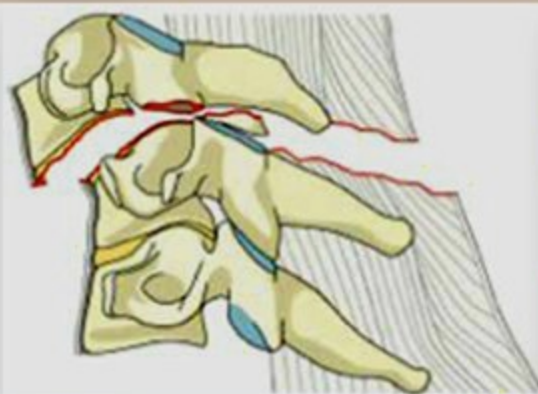


START

Displacement/
Dislocation

YES

C Translation



→ Mono-segmental
osseous disruption → **YES** →

B1 Pure transosseous
disruption

NO

Vertebral body
fracture

YES

Both endplates
involved

YES →

A4 Complete burst

NO →

A3 Incomplete burst

Posterior wall involvement

YES

NO

Both endplates
involved

YES →

A2 Split/Pincer

NO →

A1 Wedge/Impaction

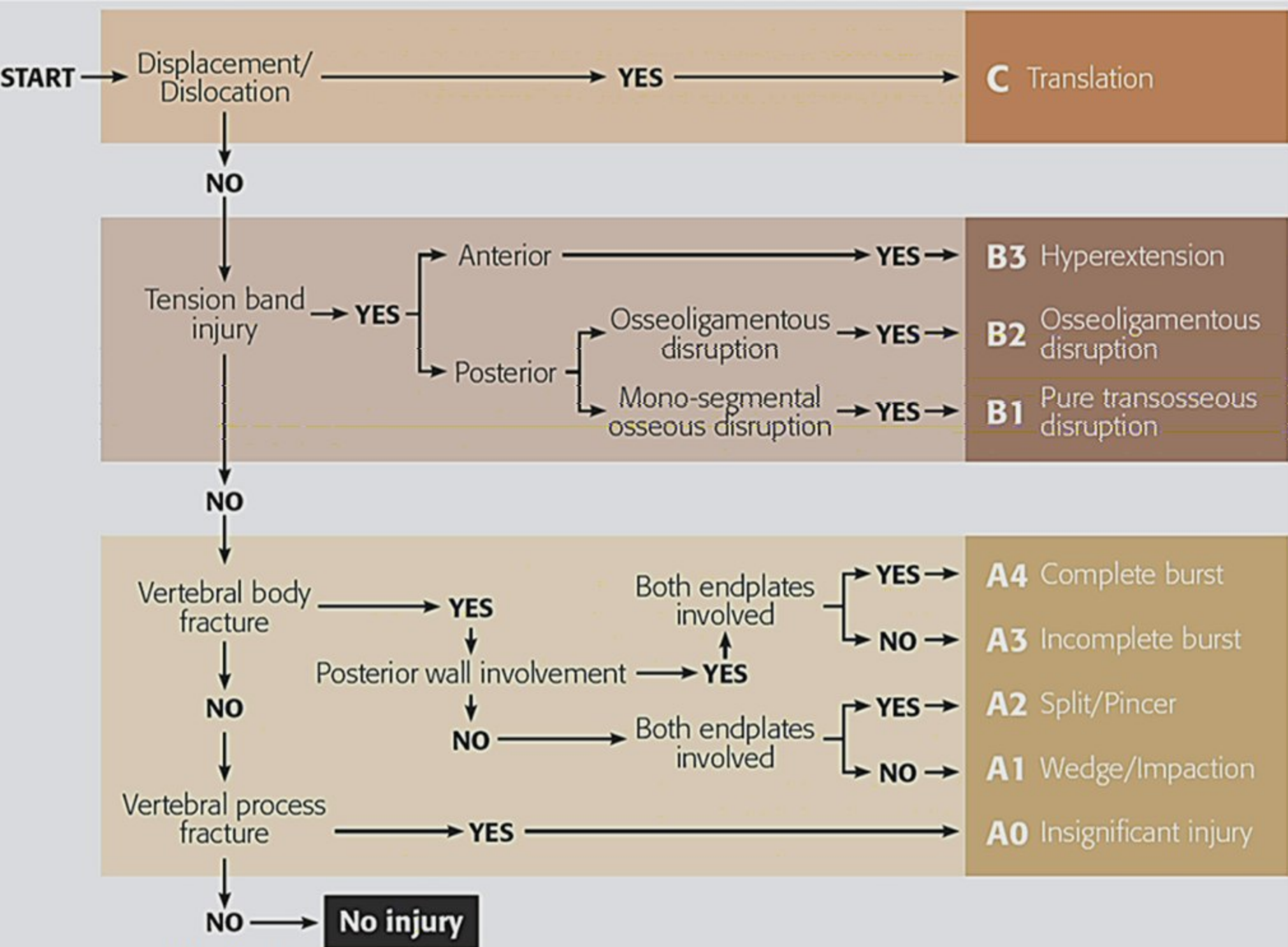
Vertebral process
fracture

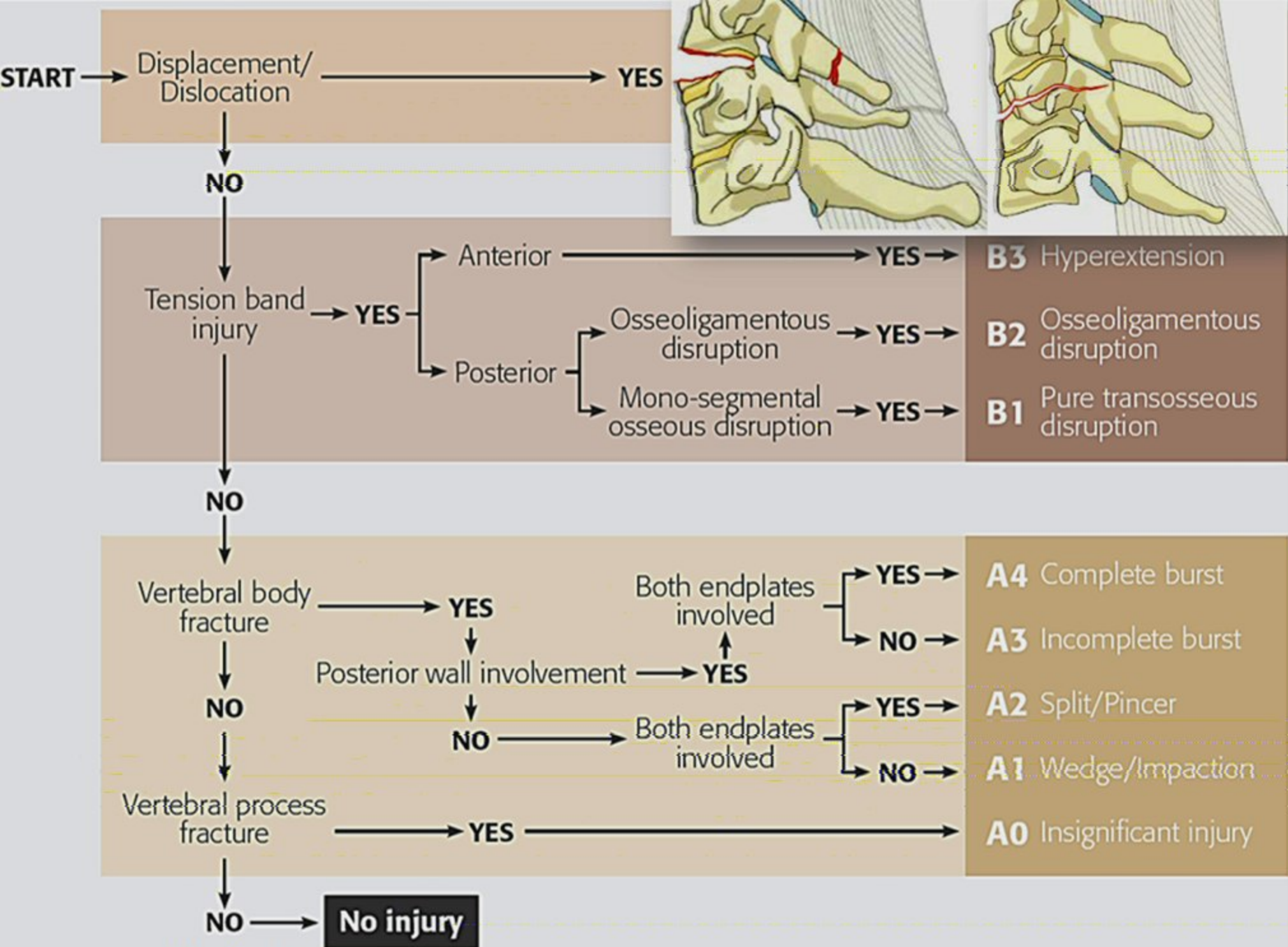
YES

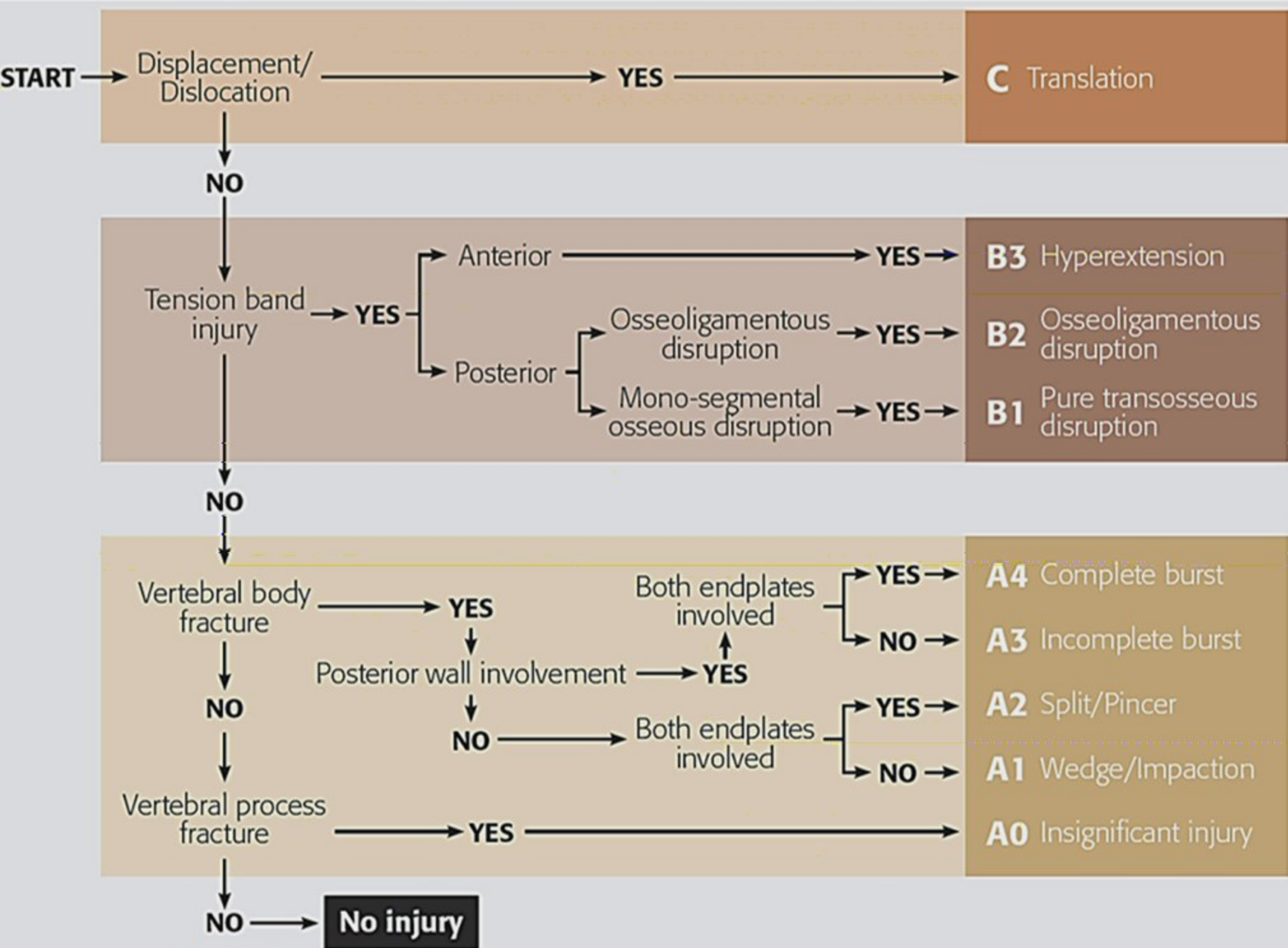
A0 Insignificant injury

NO

No injury



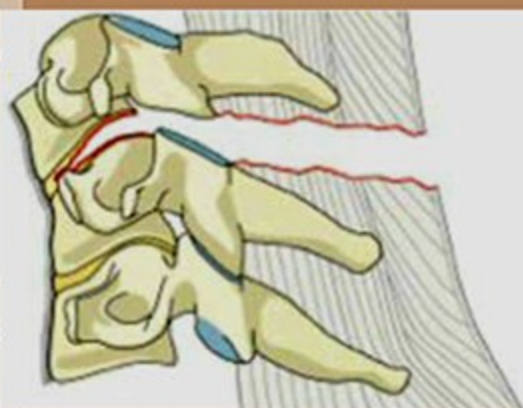




START

Displacement/
Dislocation

YES



NO

Tension band
injury

YES

Anterior

YES

Osseoligamentous
disruption

YES

B2 Osseoligamentous
disruption

Posterior

Mono-segmental
osseous disruption

YES

B1 Pure transosseous
disruption

NO

Vertebral body
fracture

YES

Both endplates
involved

YES

A4 Complete burst

NO

A3 Incomplete burst

Posterior wall involvement

YES

NO

Both endplates
involved

YES

A2 Split/Pincer

NO

A1 Wedge/Impaction

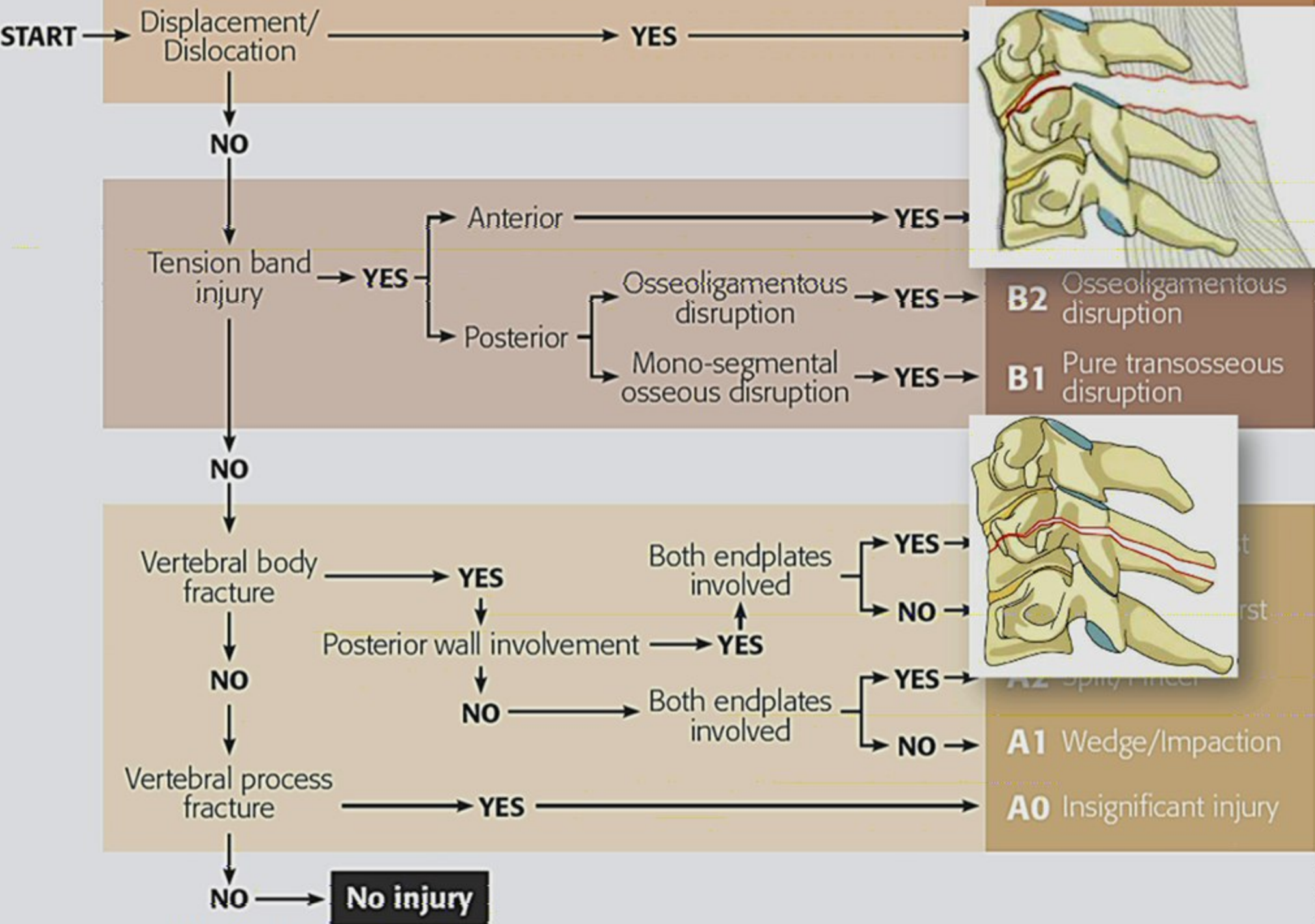
Vertebral process
fracture

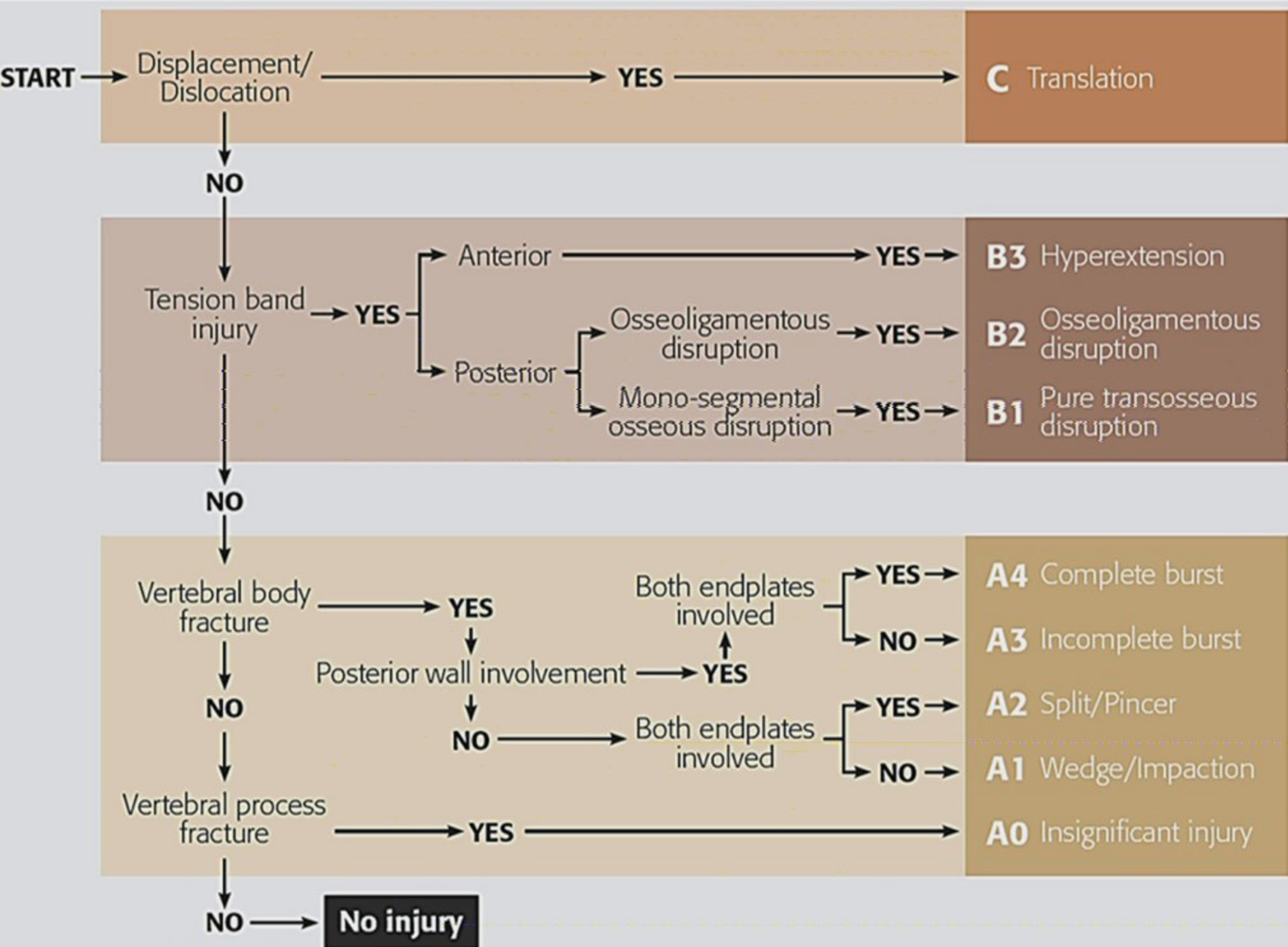
YES

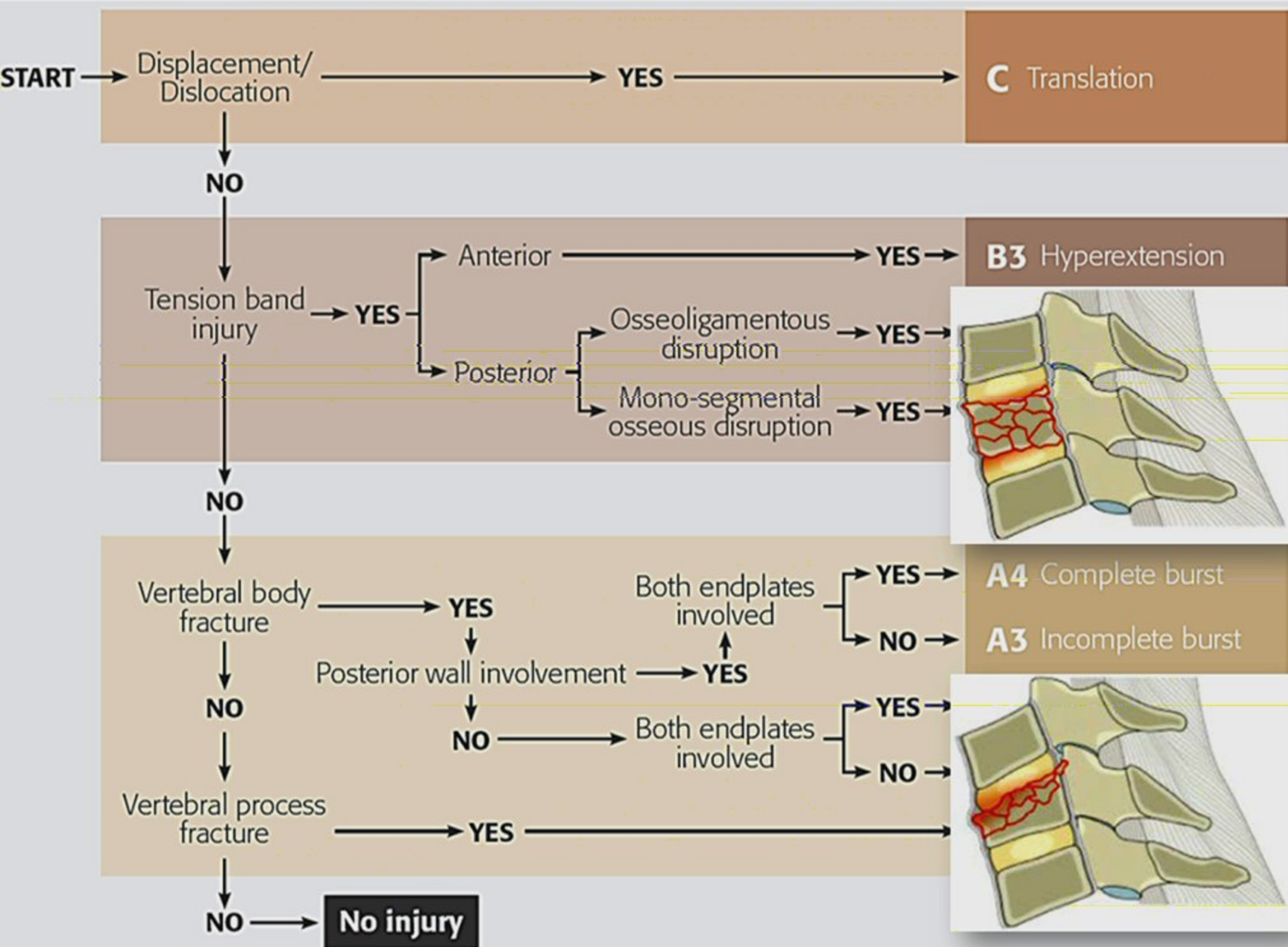
A0 Insignificant injury

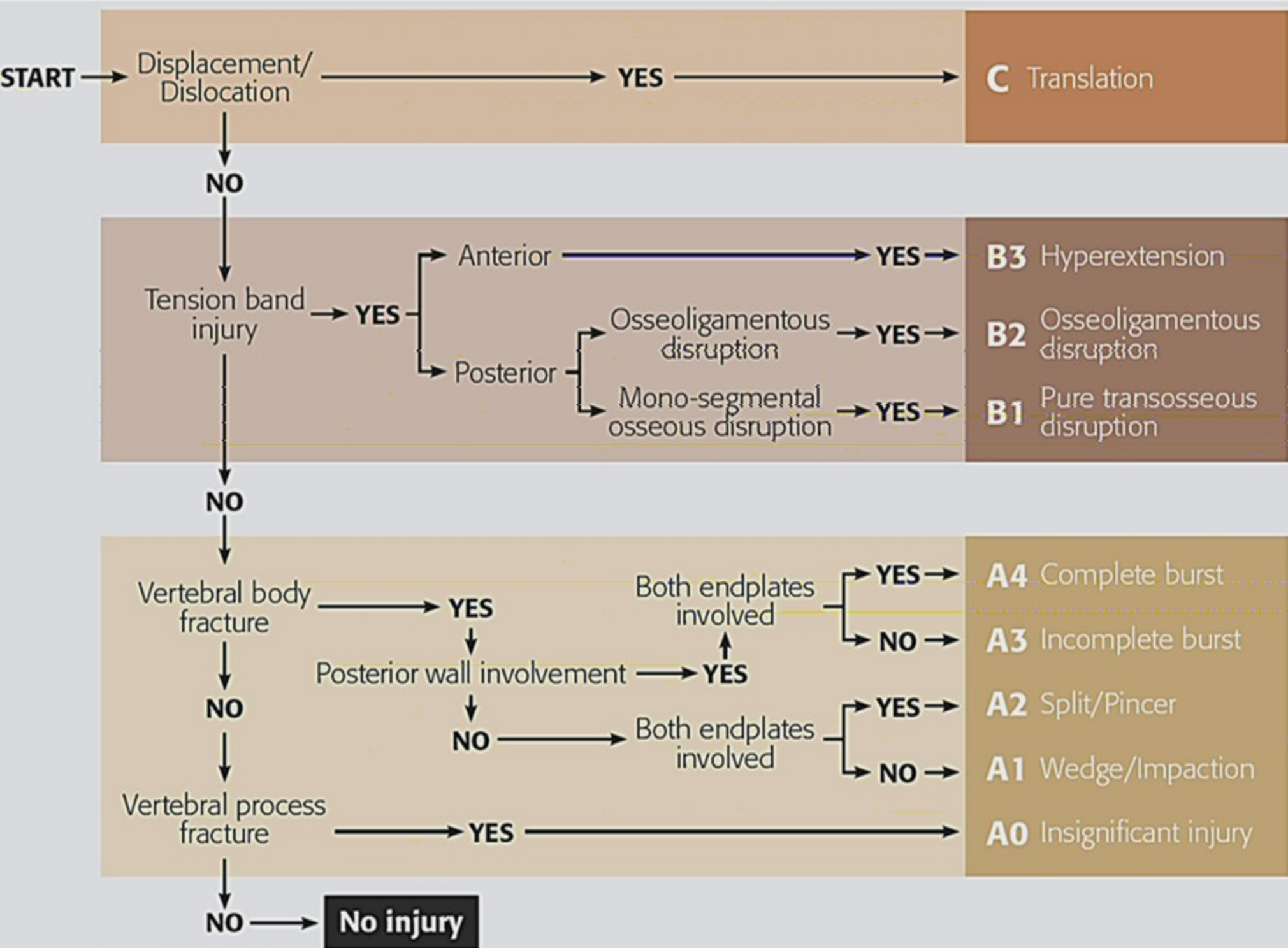
NO

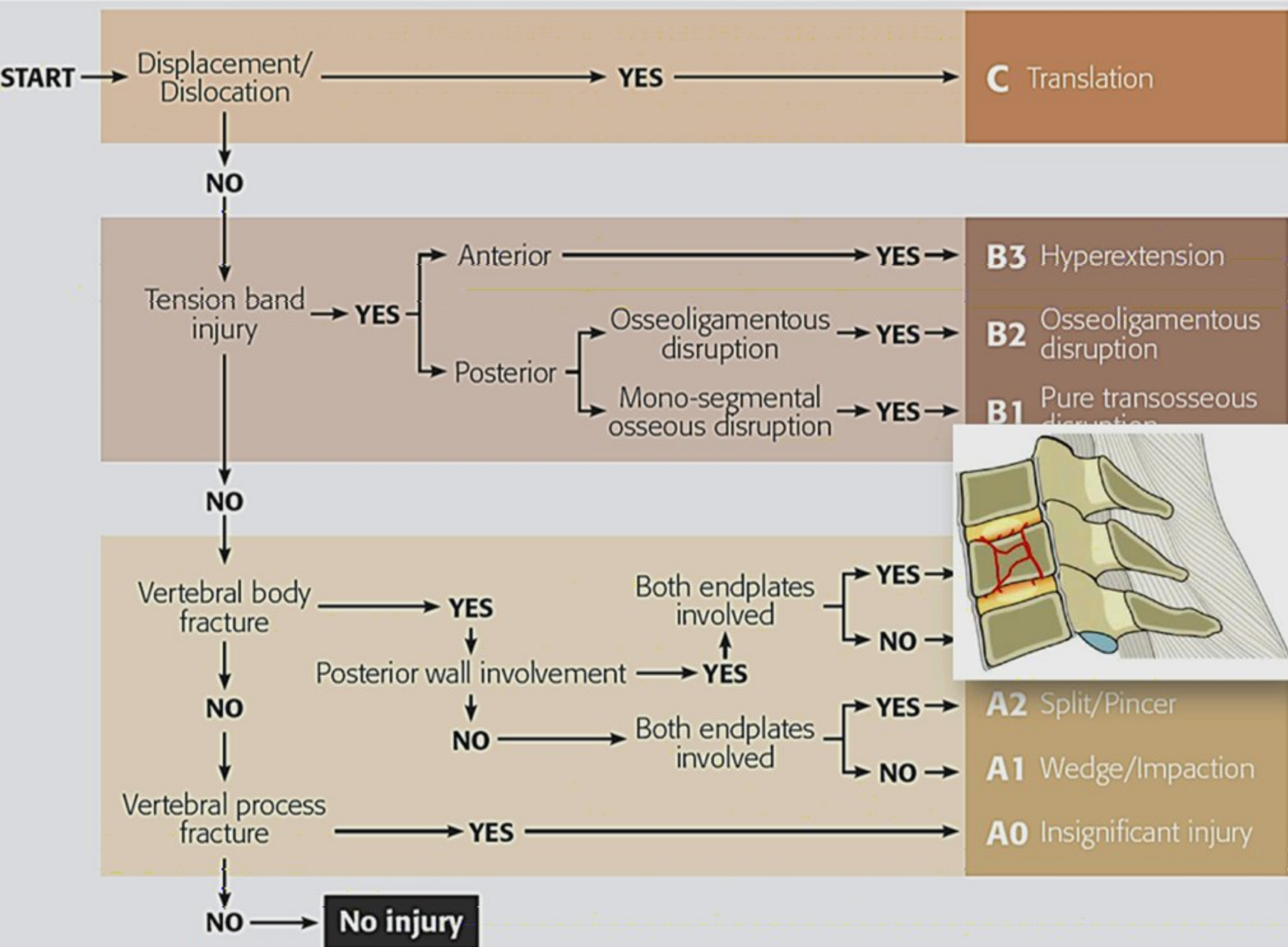
No injury

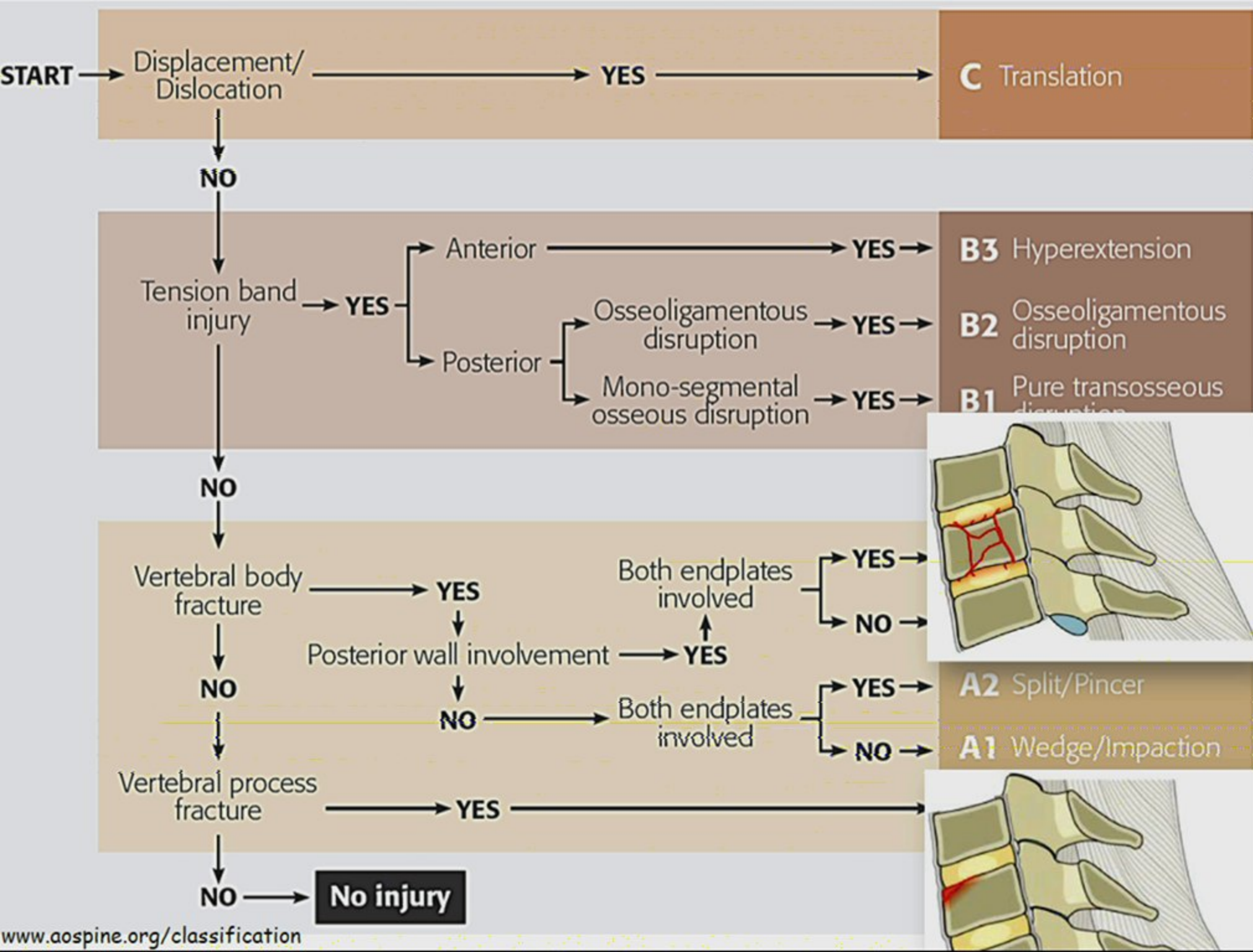


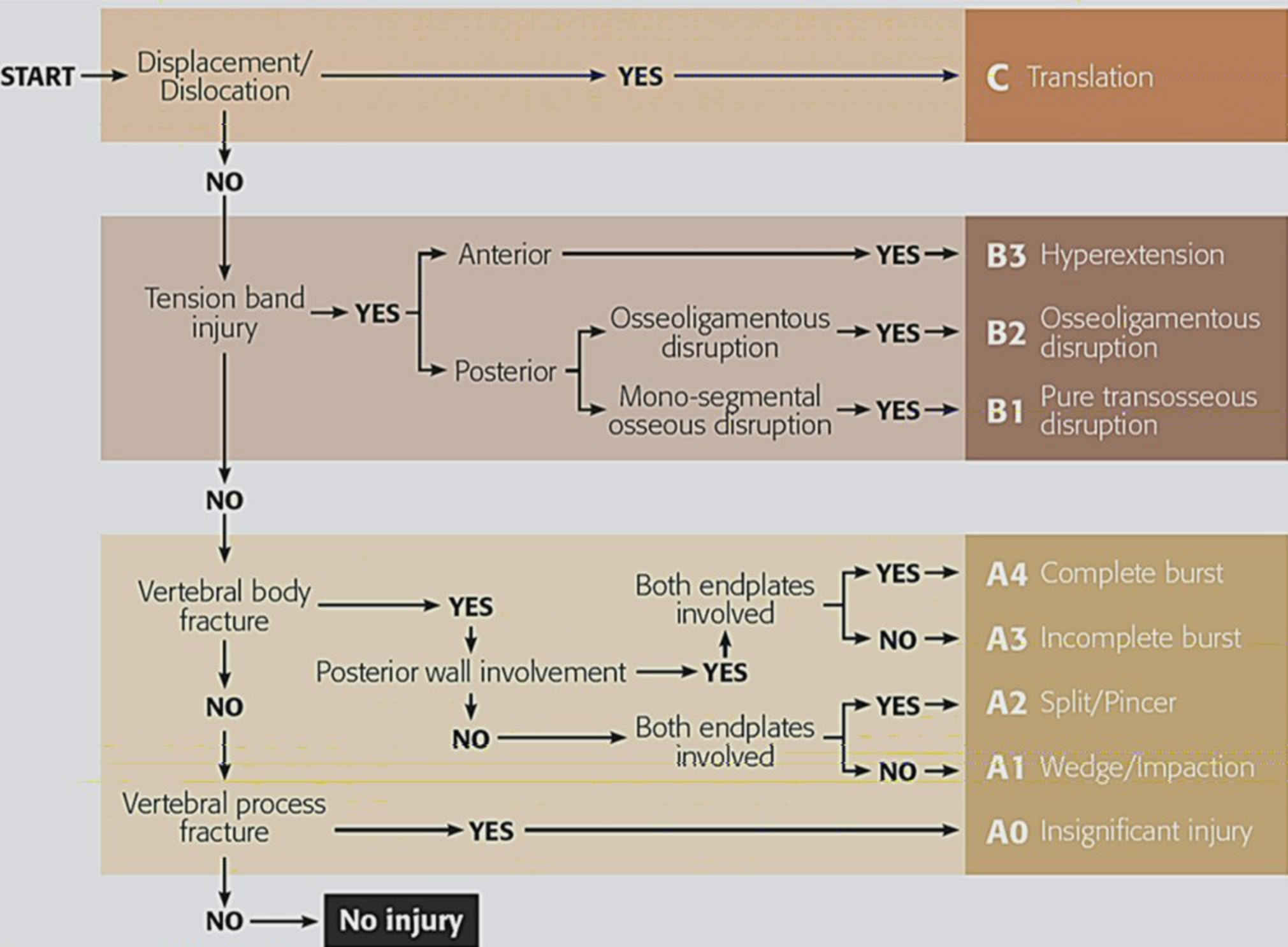












START

Displacement/
Dislocation

YES

C Translation

NO

Tension band
injury

YES

Anterior

YES

B3 Hyperextension

Posterior

Osseoligamentous
disruption

YES

B2 Osseoligamentous
disruption

Mono-segmental
osseous disruption

YES

B1 Pure transosseous
disruption

NO

Vertebral body
fracture

YES

Both endplates
involved

YES

NO

Posterior wall involvement

YES

NO

Both endplates
involved

YES

NO

NO

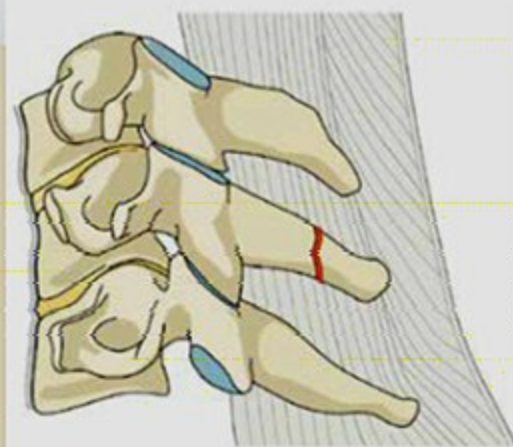
Vertebral process
fracture

YES

A0 Insignificant injury

NO

No injury



Faset hasarları

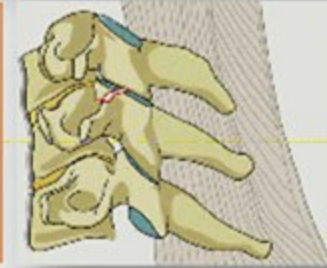
F1. Nondeplase
faset kırığı

<1cm kırık, <40%
lateral mass kırık



F2. Potansiyel
instabil faset kırığı

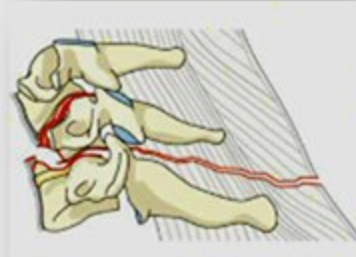
>1cm, veya >40%
lateral mass kırık ya
da deplasman



F3. Yüzen lateral
mass



F4. Patolojik
subluksasyon veya
disloke faset

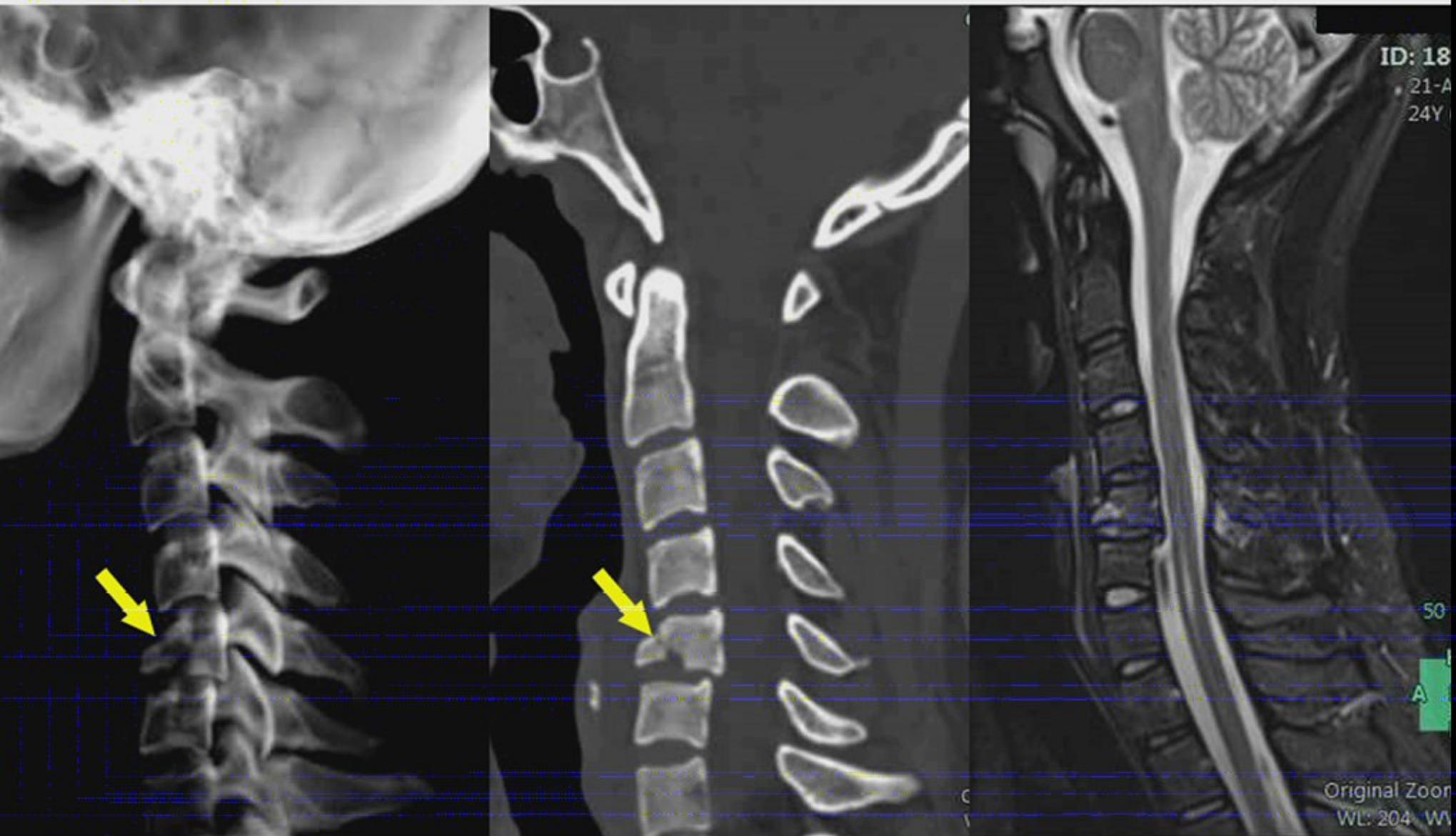


BL.
Bilateral hasar



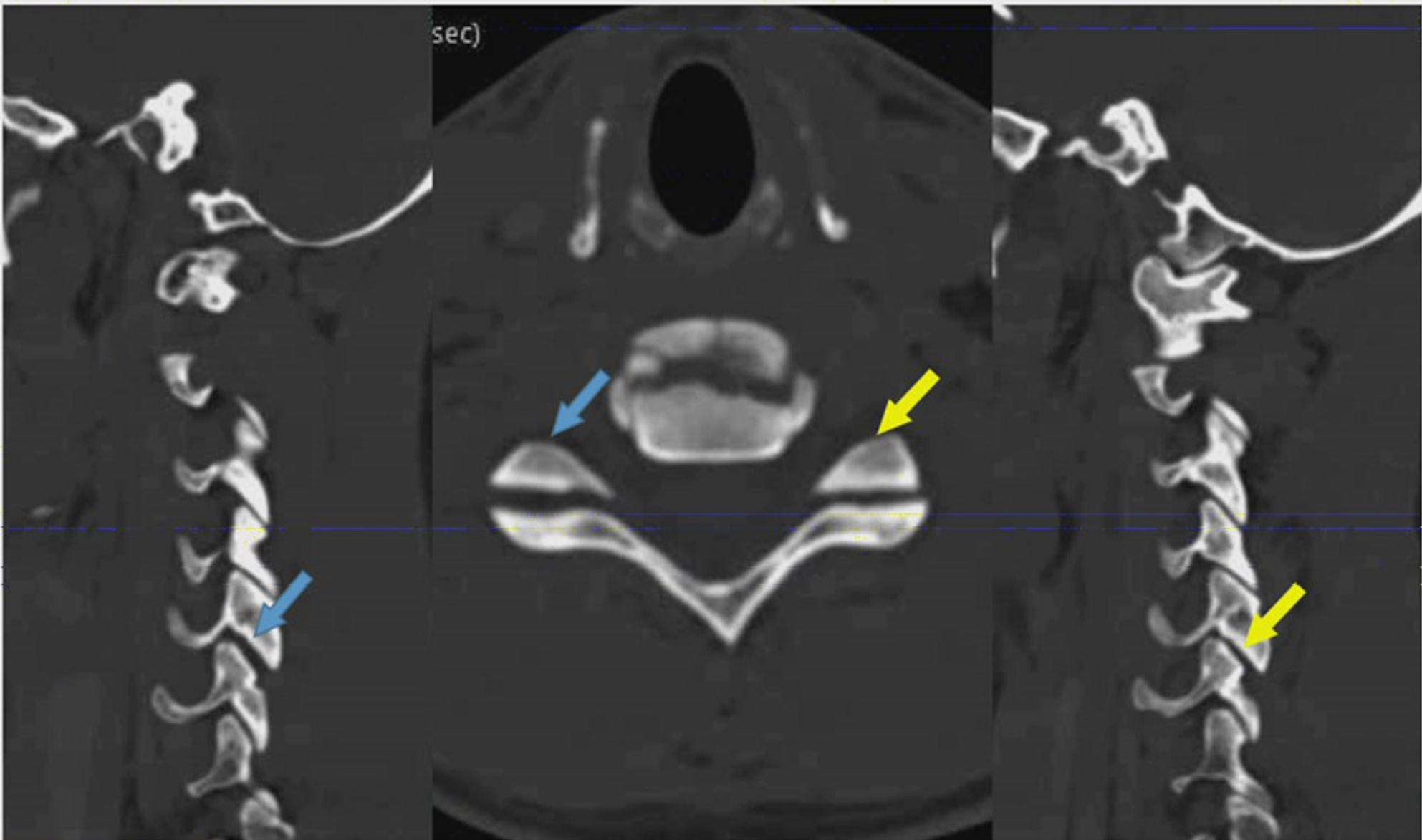


A1 Kama kompresyon



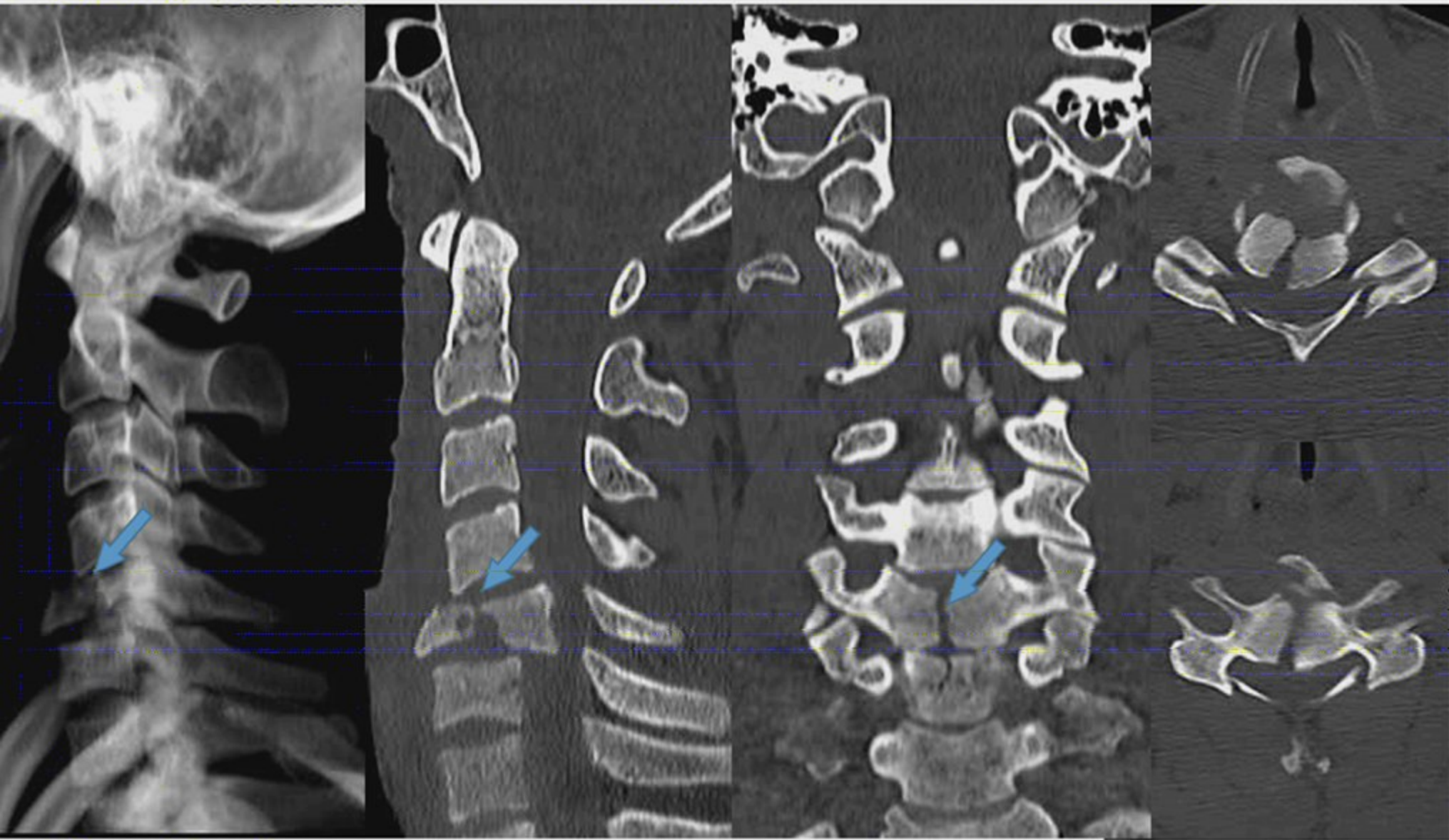


F1. Nondeplase faset hasarı



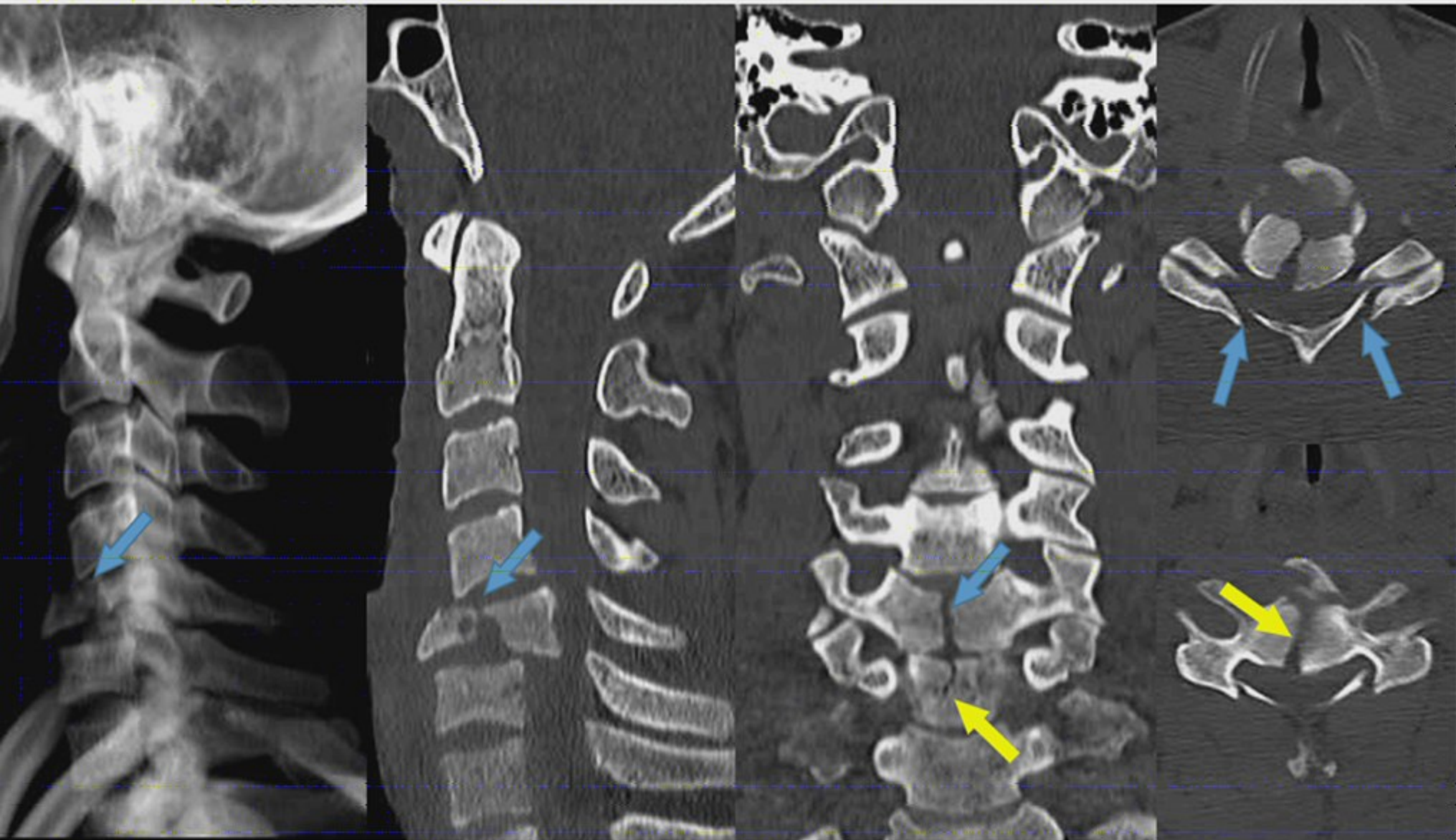


A4. Komplet burst



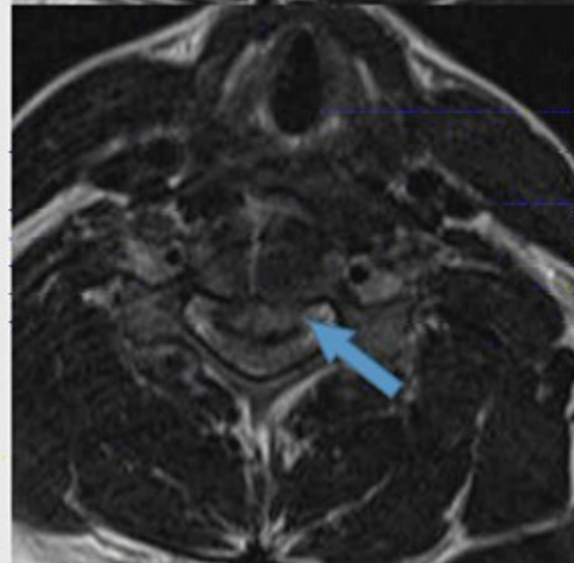
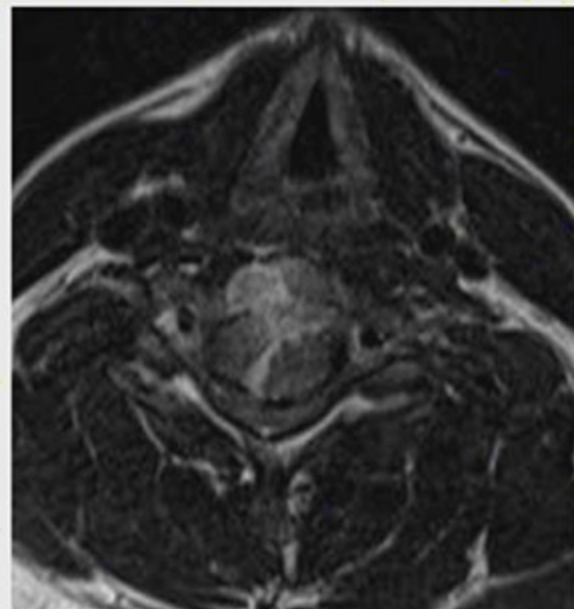


A4. Komplet burst



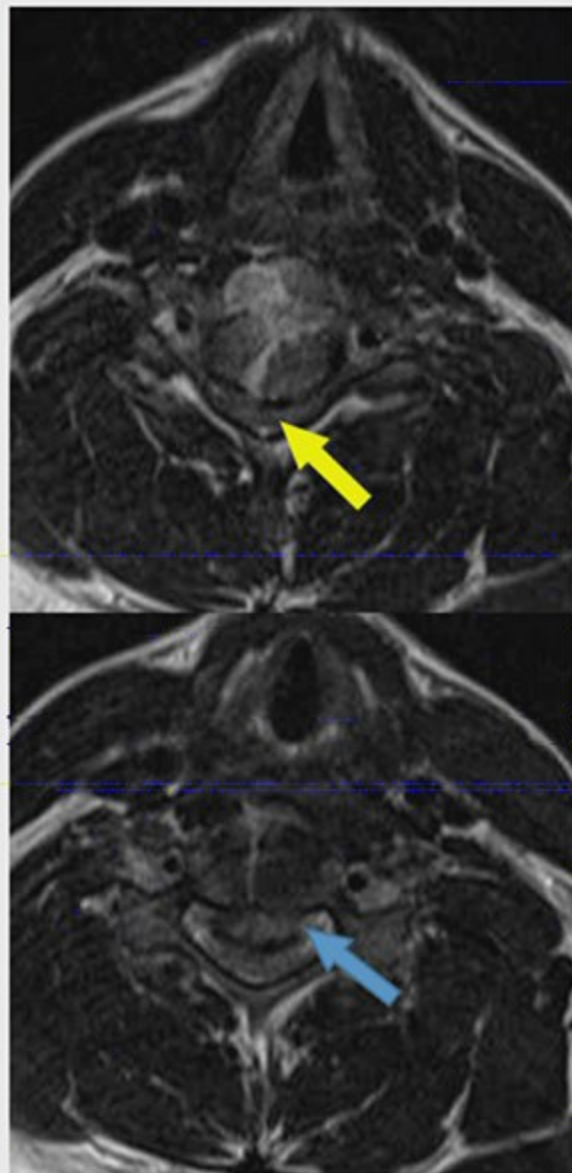
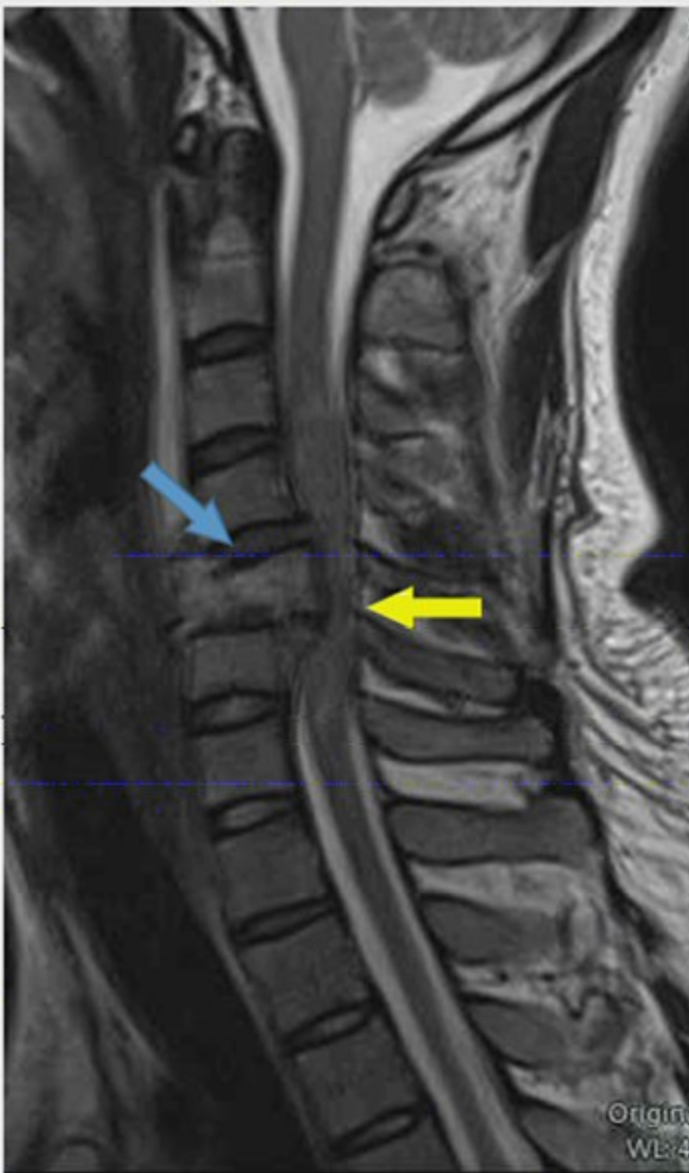


A4. Komplet burst



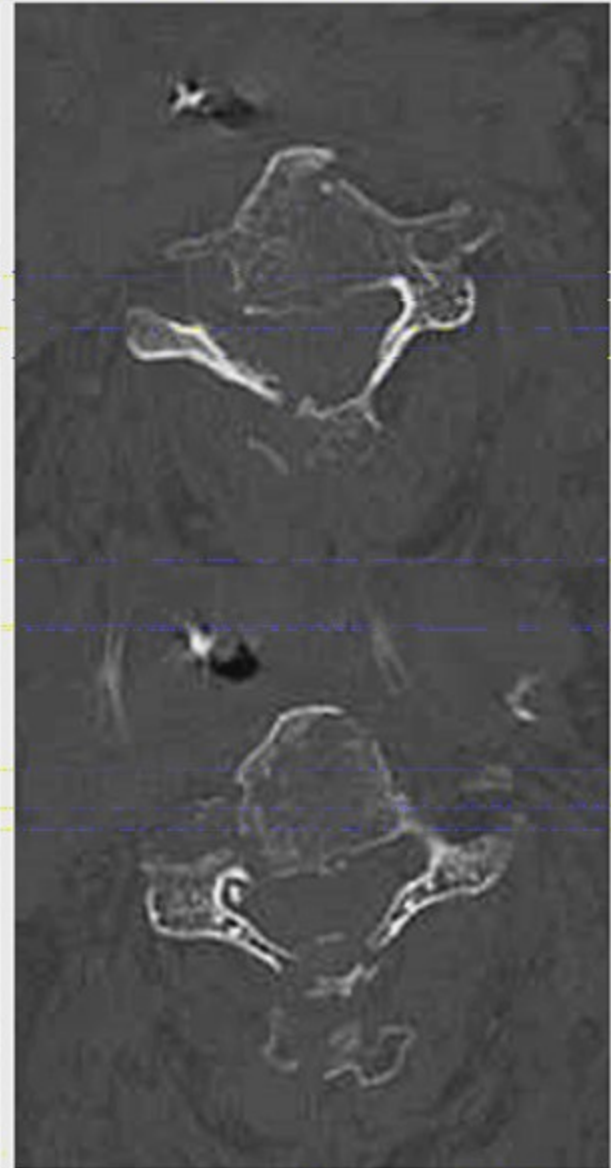
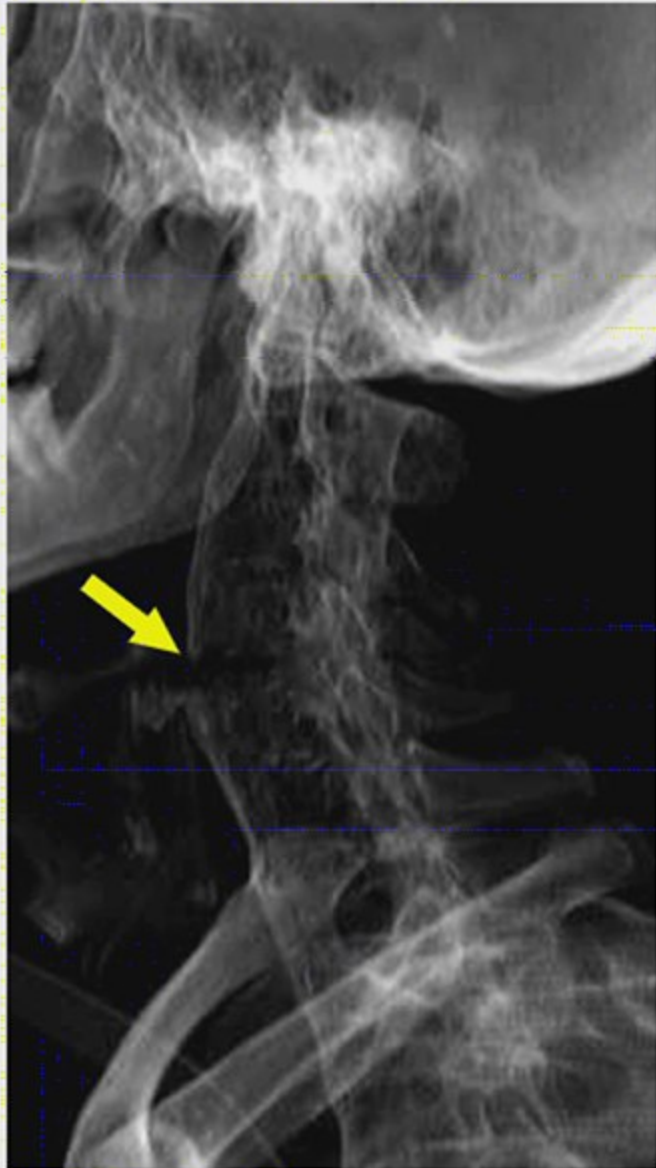


A4. Komplet burst



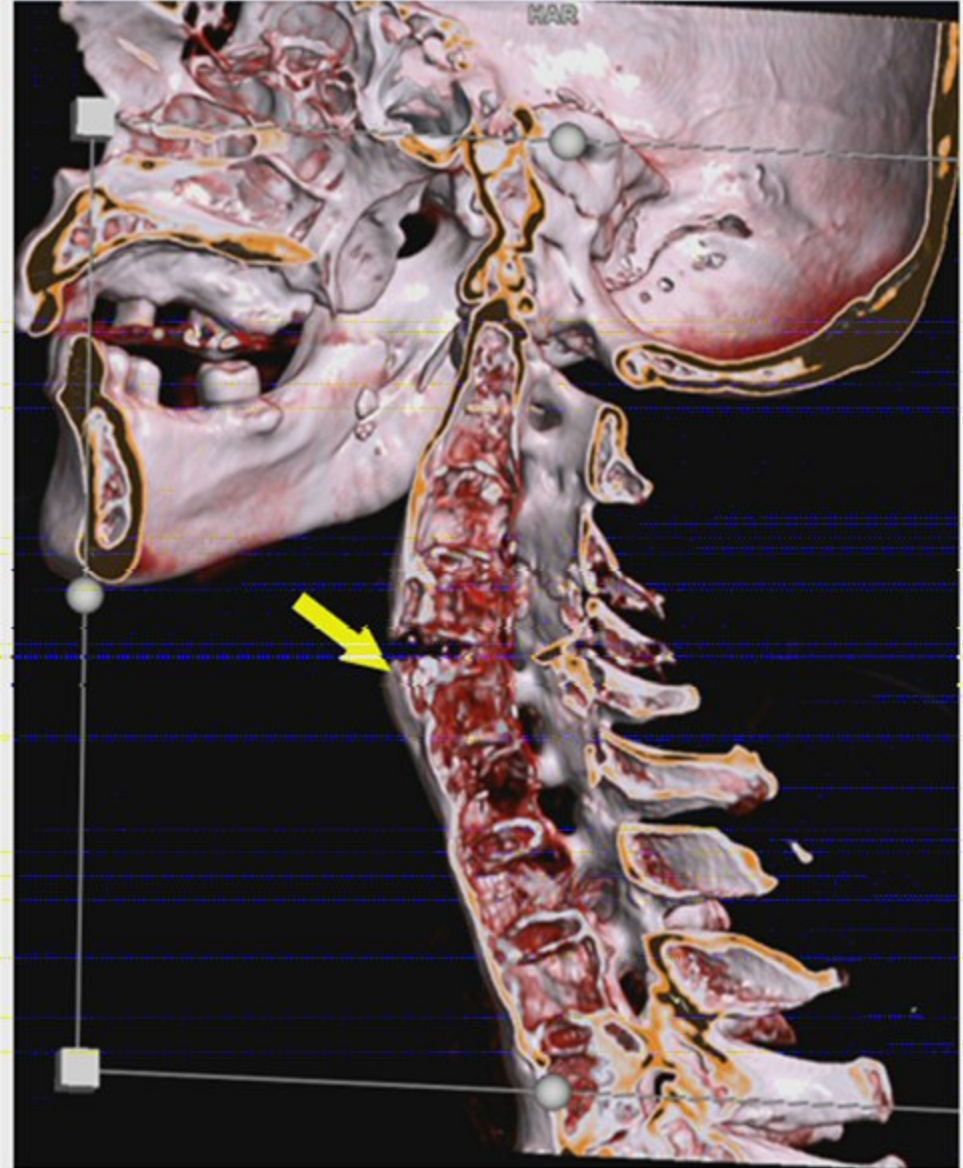
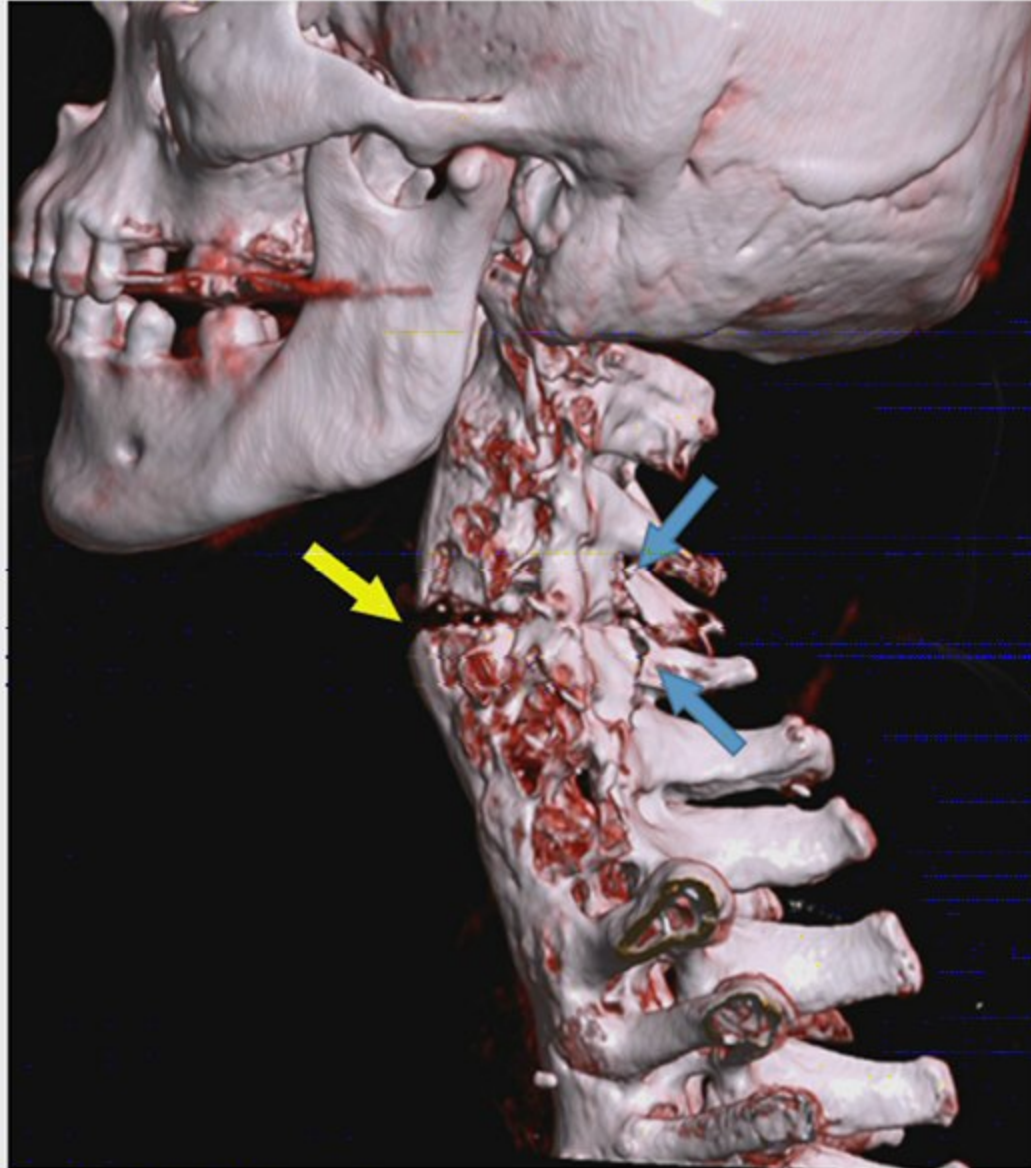


B3.Ön tension bant yaralanması



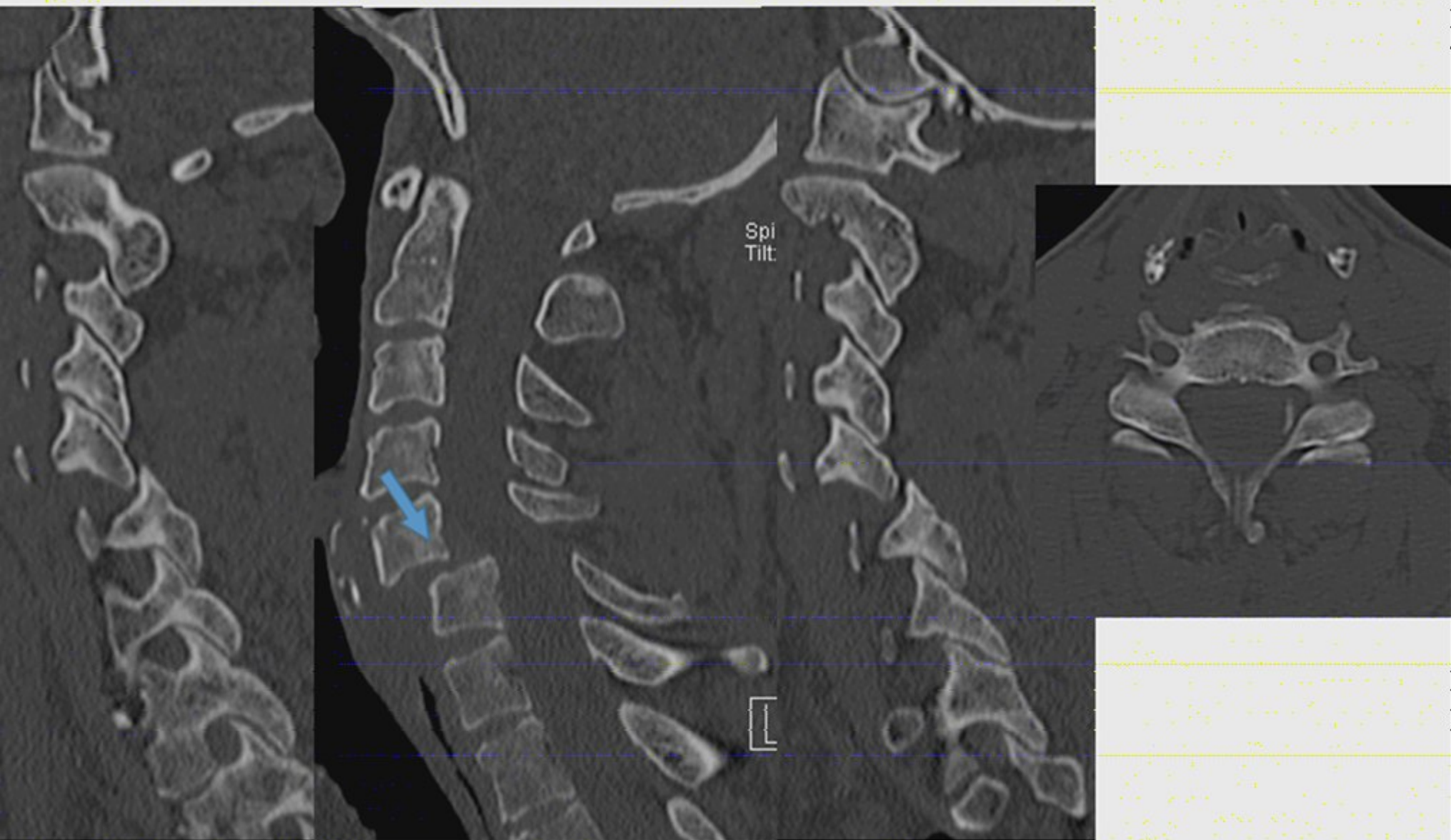


B3.Ön tension bandı yaralanması



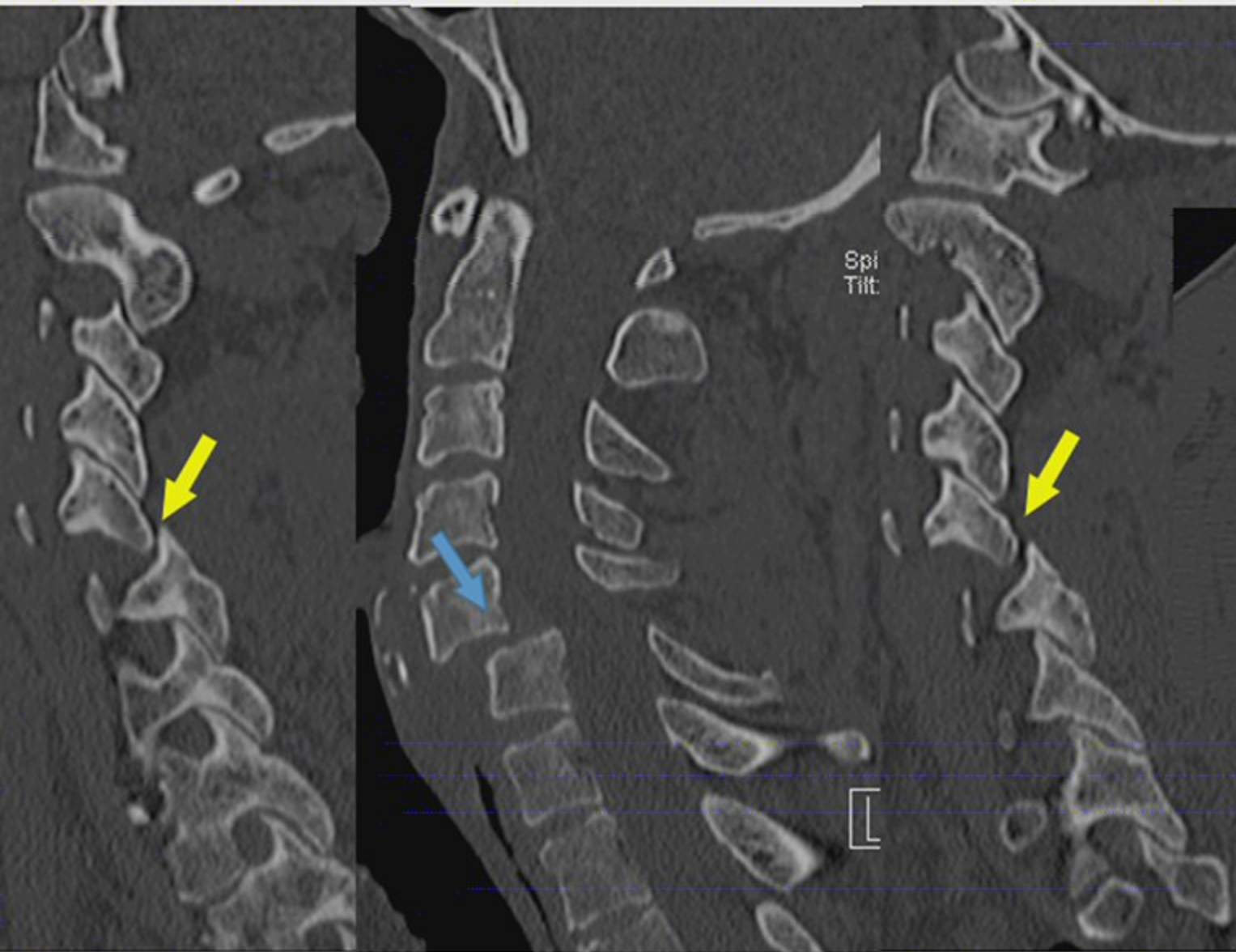


C. Translasyon/F4. Subluksasyon



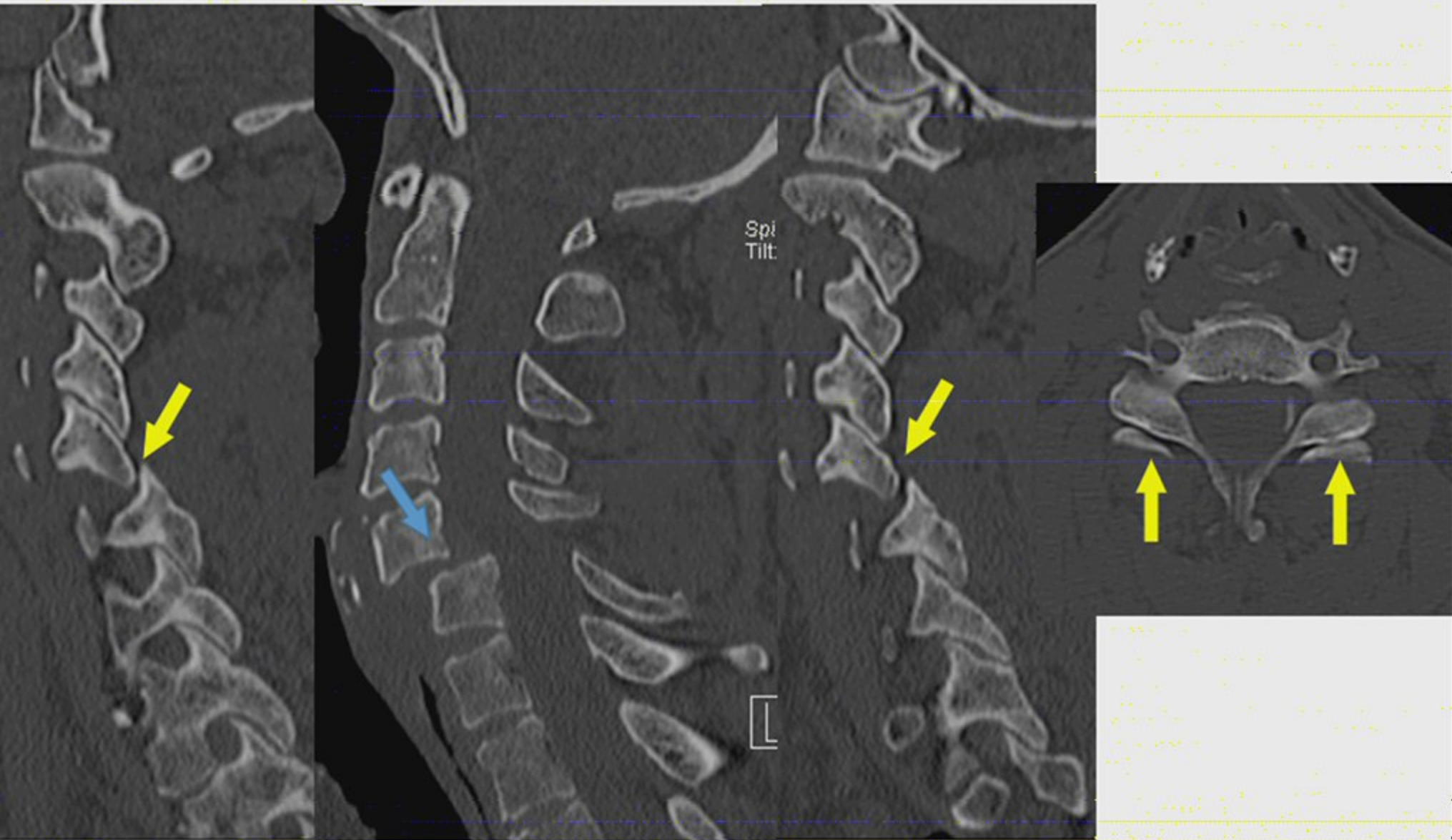


C. Translasyon/F4. Subluksasyon



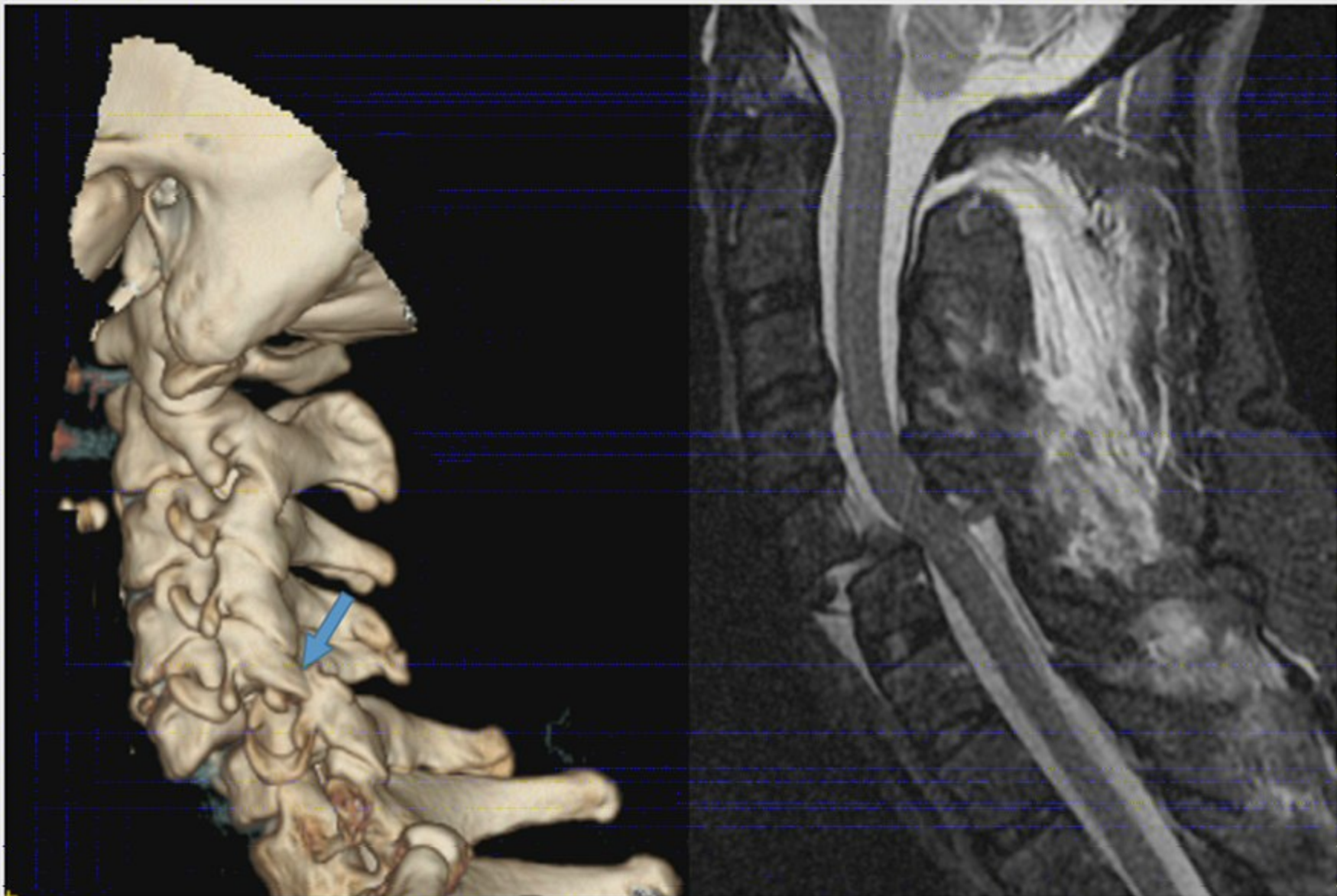


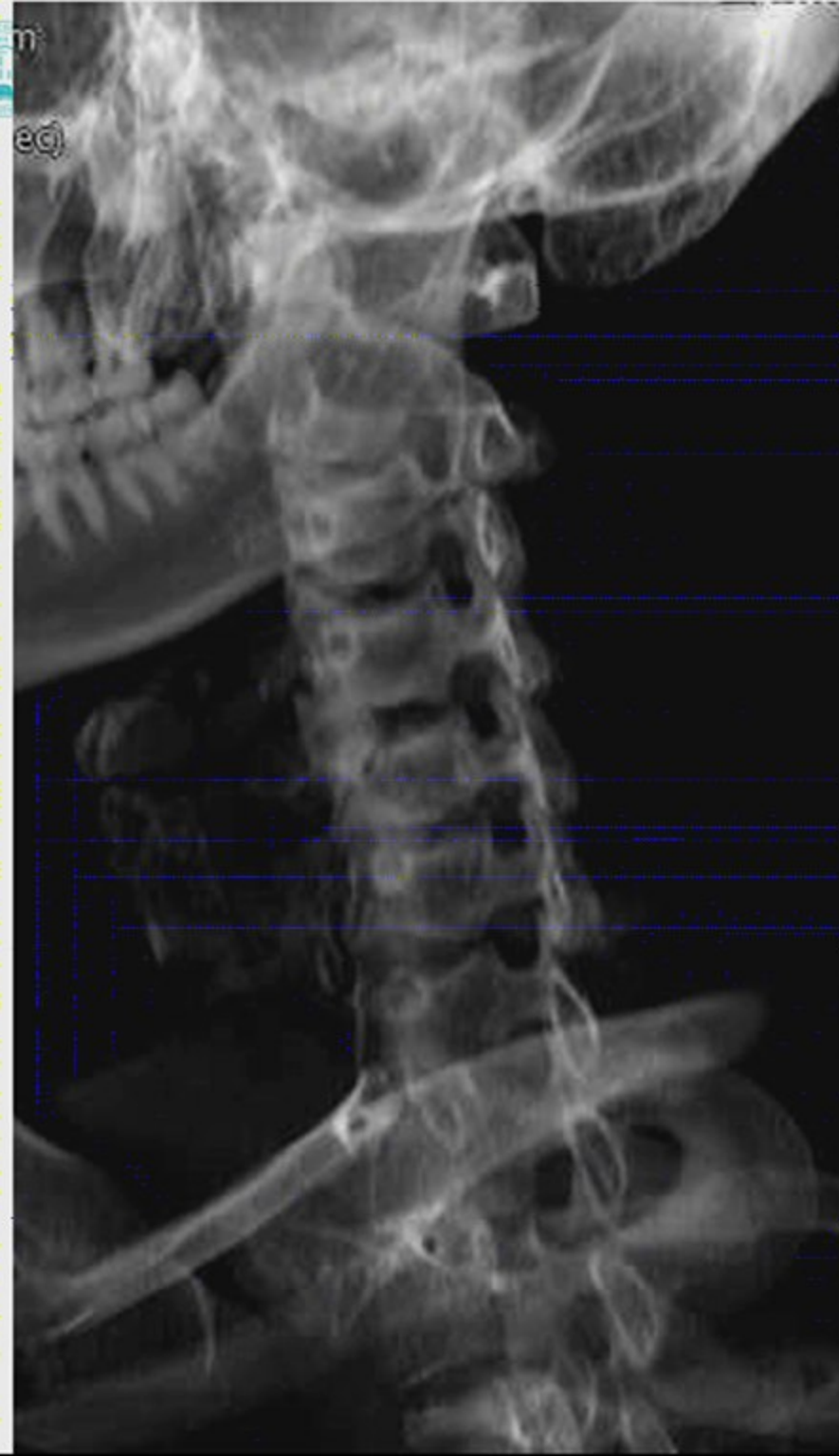
C. Translasyon/F4. Subluksasyon





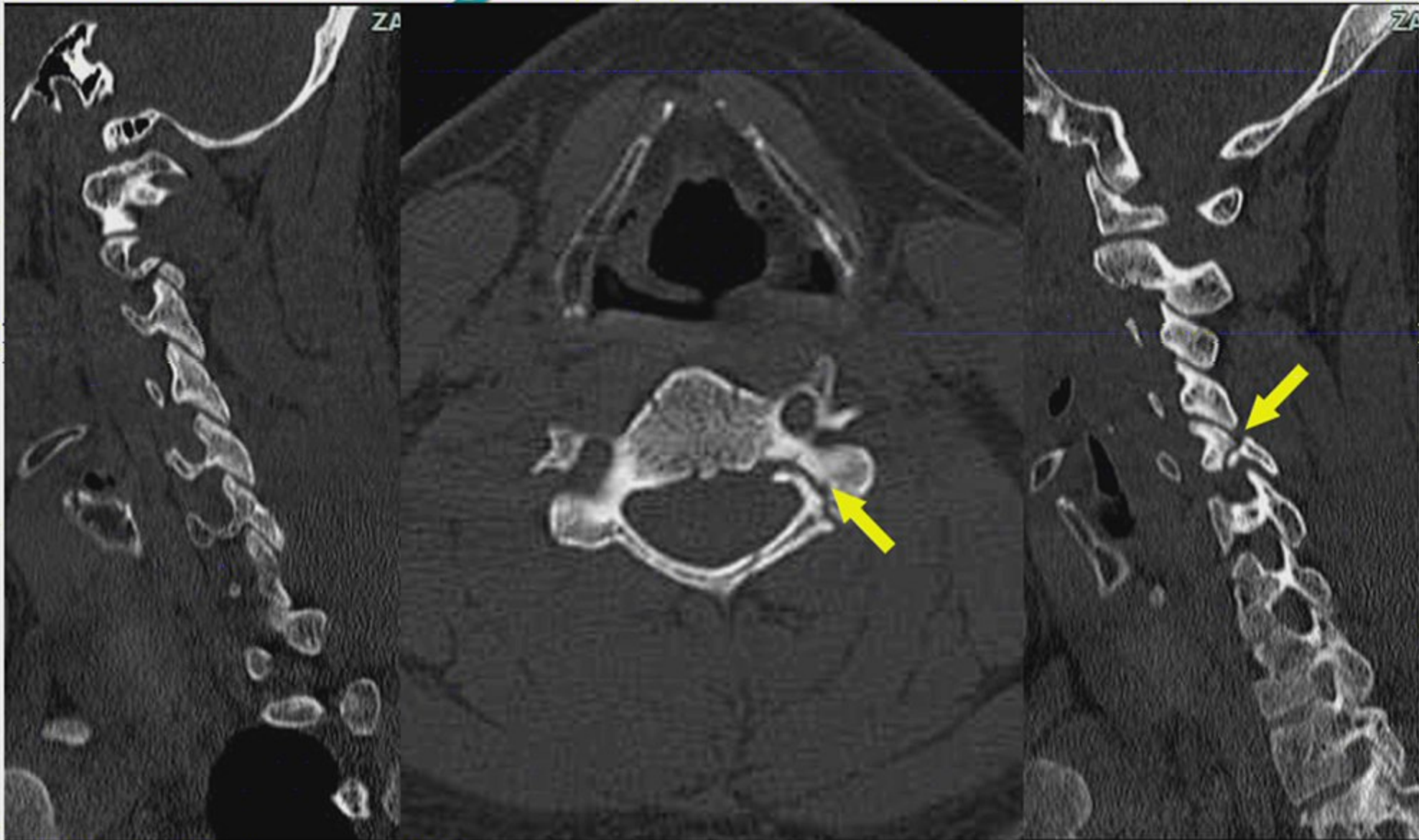
C. Translasyon/F4. Subluksasyon







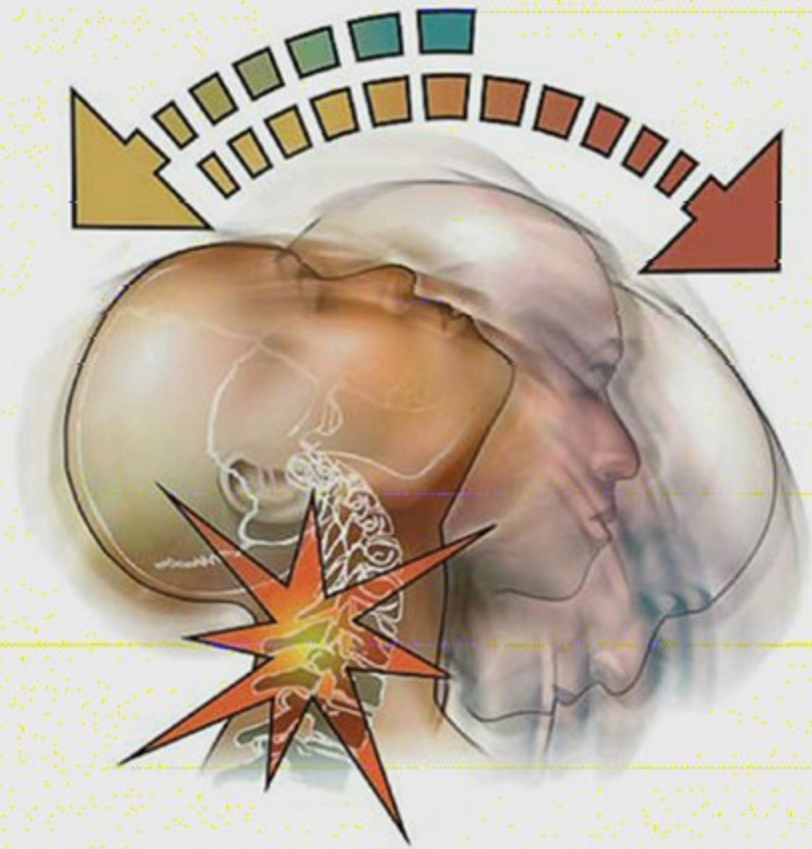
F2. Unstabil potansiyeli olan faset kırığı





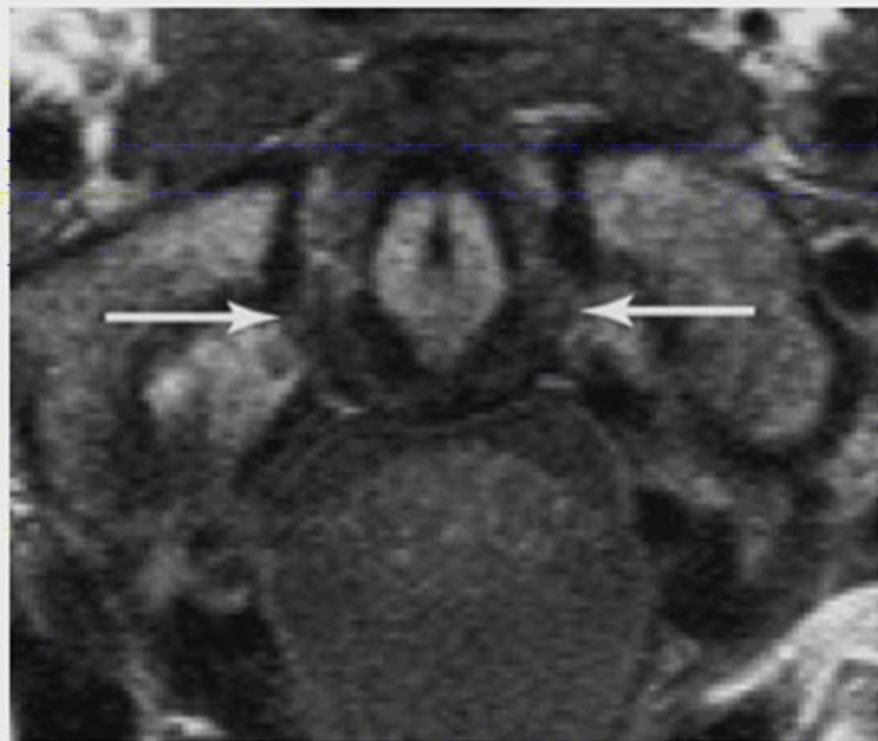
Whiplash yaralanma

- Akselasyon - deselasyon hasarı
- Arkadan > yandan > önden çarpma
- 1-4/1000
- Klinik tanı
 - Boyun ağrısı (24 saat)
 - Sertlik
 - Baş ağrısı
 - Denge ve görme boz
 - Dikkat ve bellek boz
 - Psikolojik problemler





Transvers ligament





Tektoryal membran





Atlanto-oksipital membran



Omurilik yaralanmaları

- Total omurilik yaralanması
- Subtotal omurilik yaralanması
- Anterior omurilik sendromu
- **Santral omurilik sendromu**
- Brown Sequard sendromu
- Posterior omurilik kontüzyonu
- Omurilik kommosyosu
- Kök lezyonu ve brakial monopleji
- İlerleyici ve gecikmiş omurilik lezyonları
 - Erken tipte
 - Geç tipte





SCIWORA

(Spinal Cord Injury Without Radiographic Abnormality)

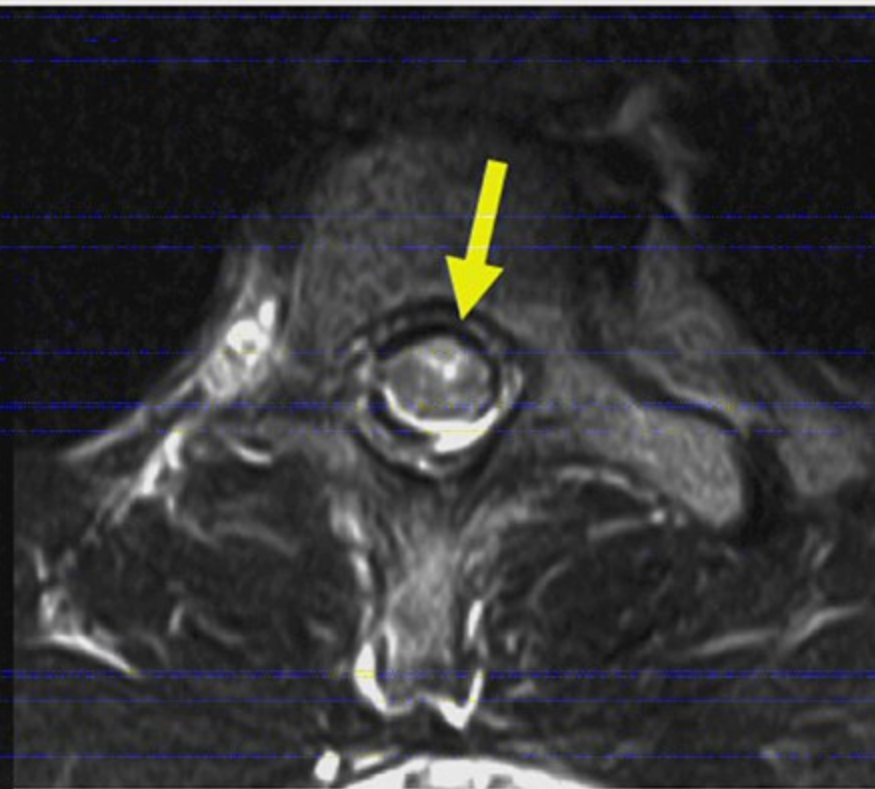
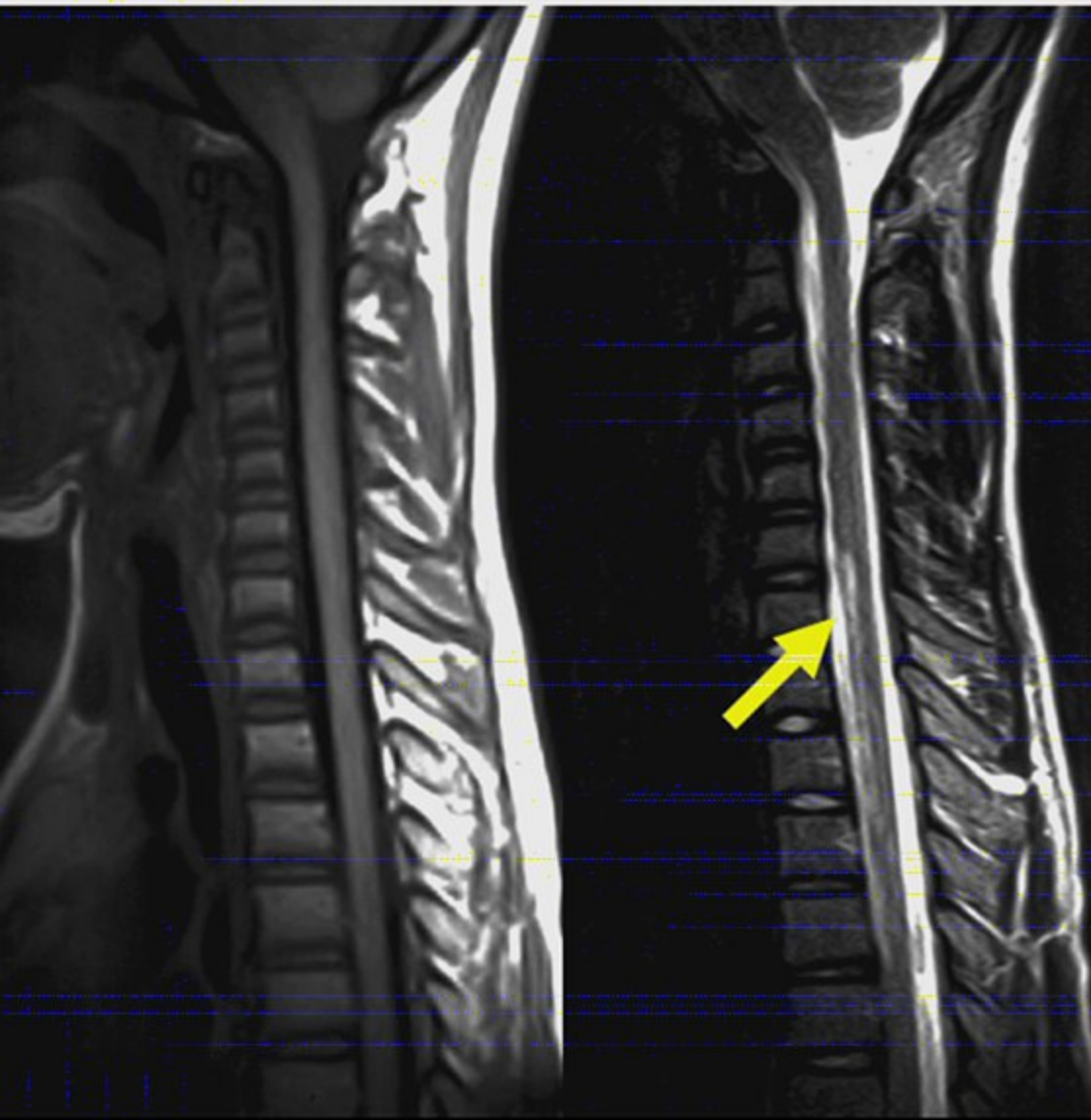
- BT ve direkt grafiler normal
- MRG normal/patolojik
 - MRG kullanıma girdikten sonra azaldı
- Spinal kordun bası veya gerilmesi
- Erişkinde çok nadir
- Çocuklarda sık
 - %19-34 tüm pediatrik spinal kord hasarları
 - <8 yaş daha sık
 - Klinik bulgular geç (4 gün) ortaya çıkar
 - Tekrarlayan SCIWORA %17



Travmatik spinal kord hasarı (Schaefer ve ark. 1992)

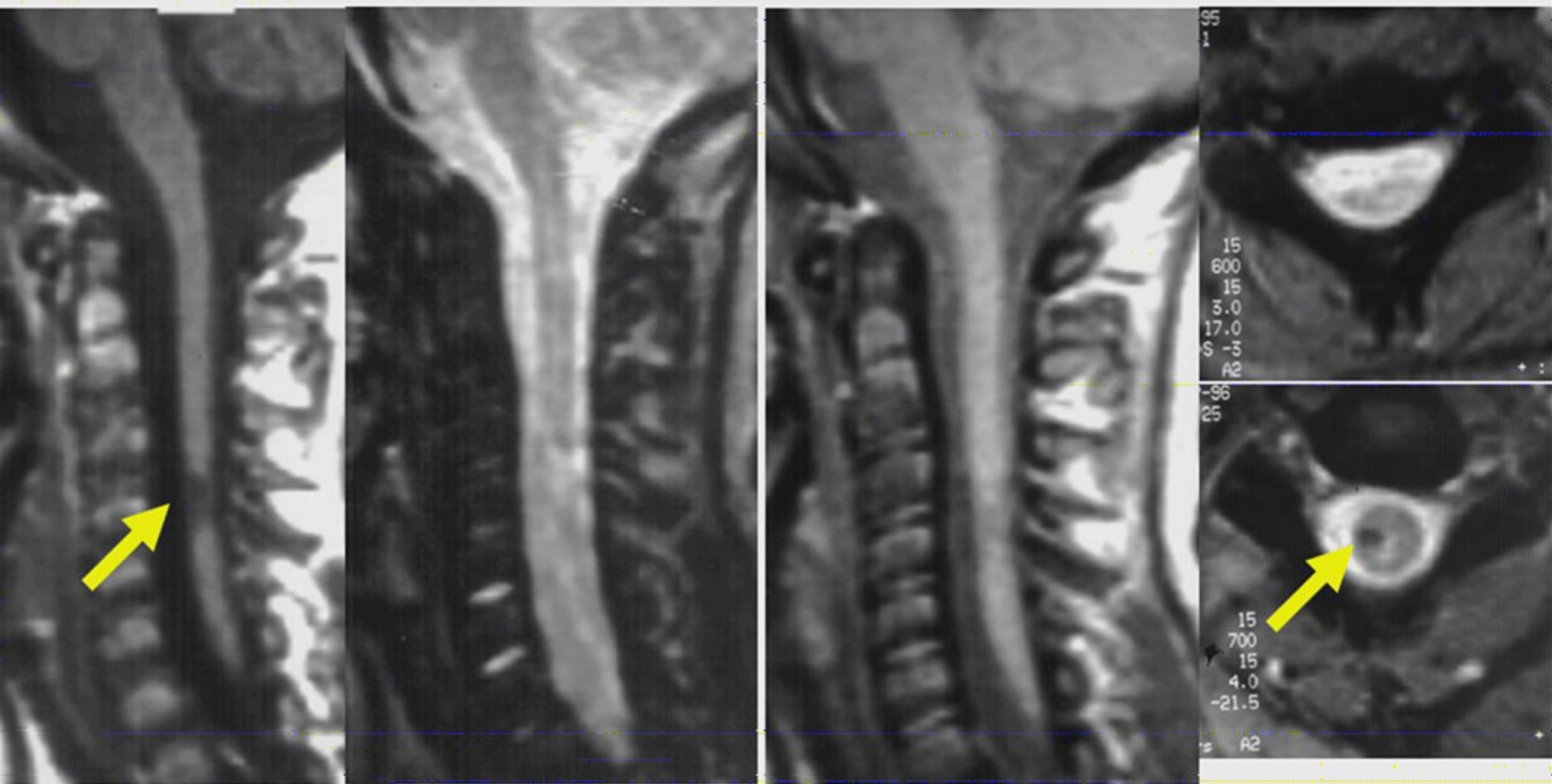
- Tip I: Ödem (nonhemorajik kontüzyon)
 - Yaygın sınırları belli olmayan T2 hiperintensitesi
 - Tersinir, en iyi prognoz
- Tip II: Kan (hemorajik kontüzyon)
 - Nöronal hasar (T2*/SWI kan)
 - Daha kötü prognoz
- Tip III: Ödem + Kanama
 - En kötü prognoz
- Kronik evre : Myelomalazi
 - Nonkistik
 - Kistik

Tip I (Ödem)





Tip II (Hemorojik kontüzyon)



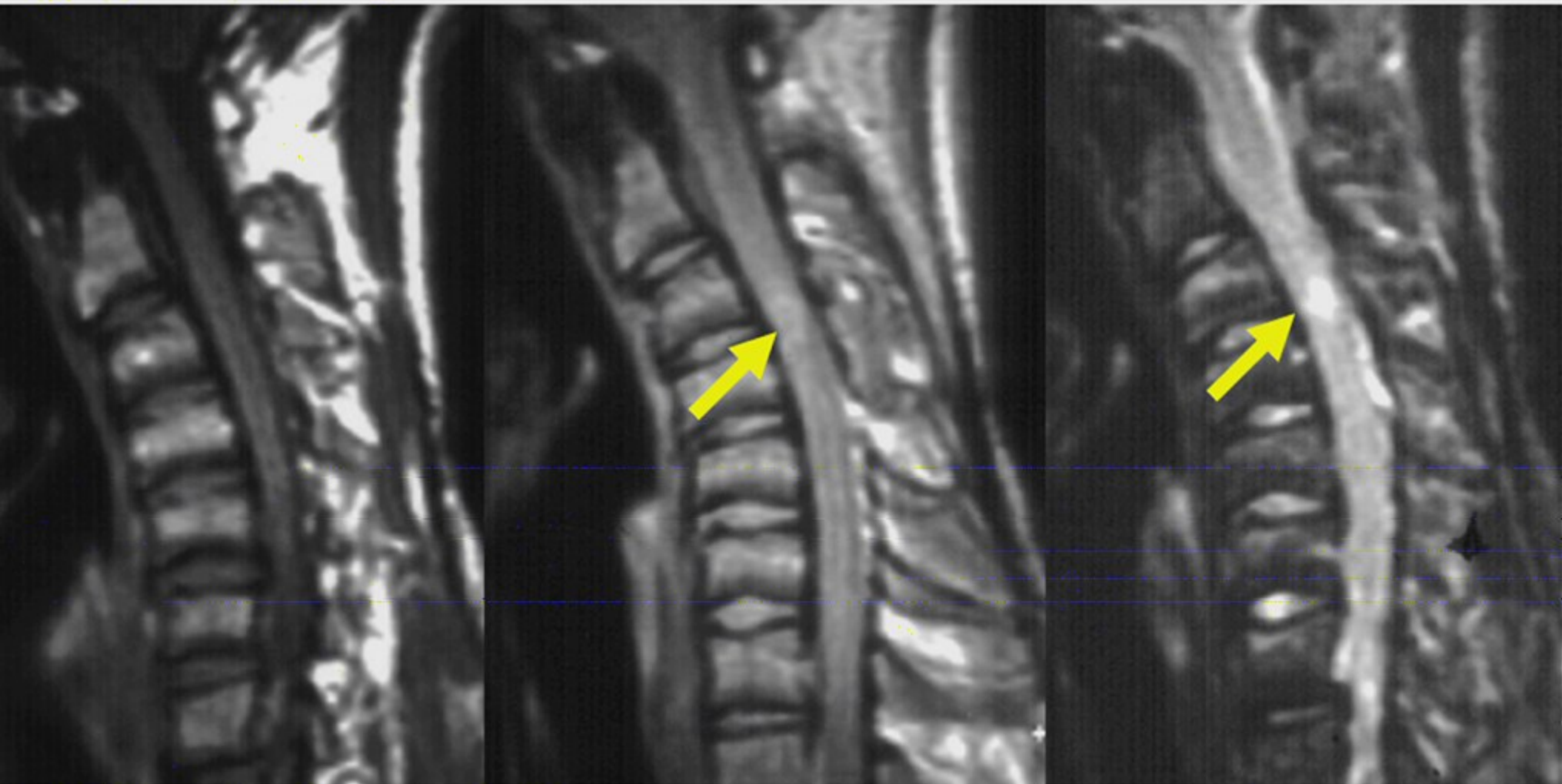


Tip III (Mikst kontüzyon)



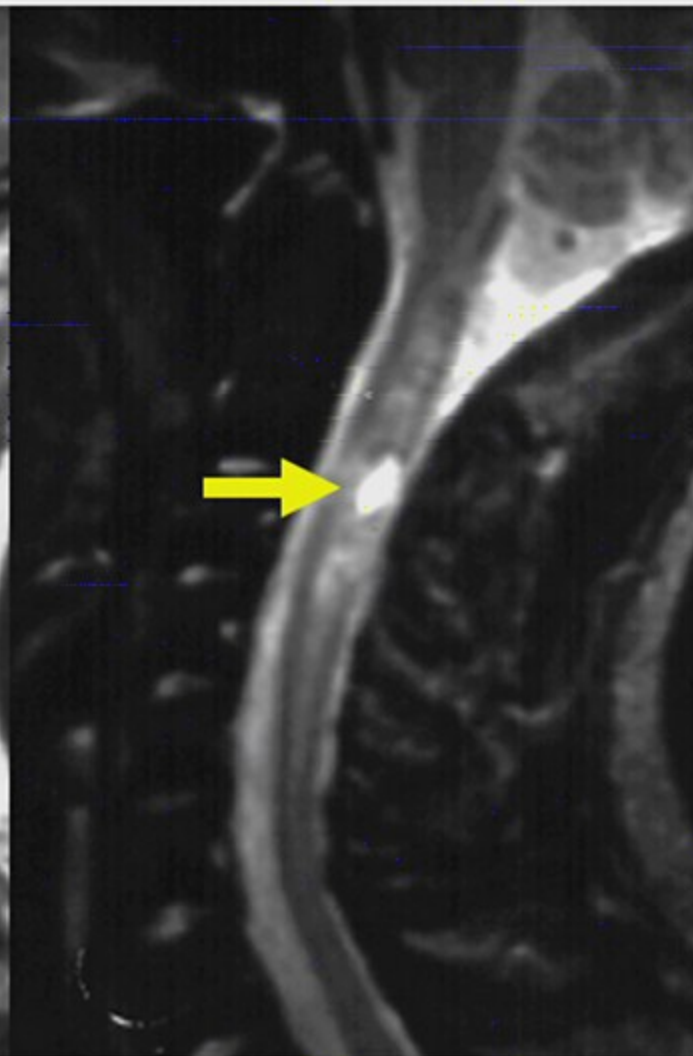
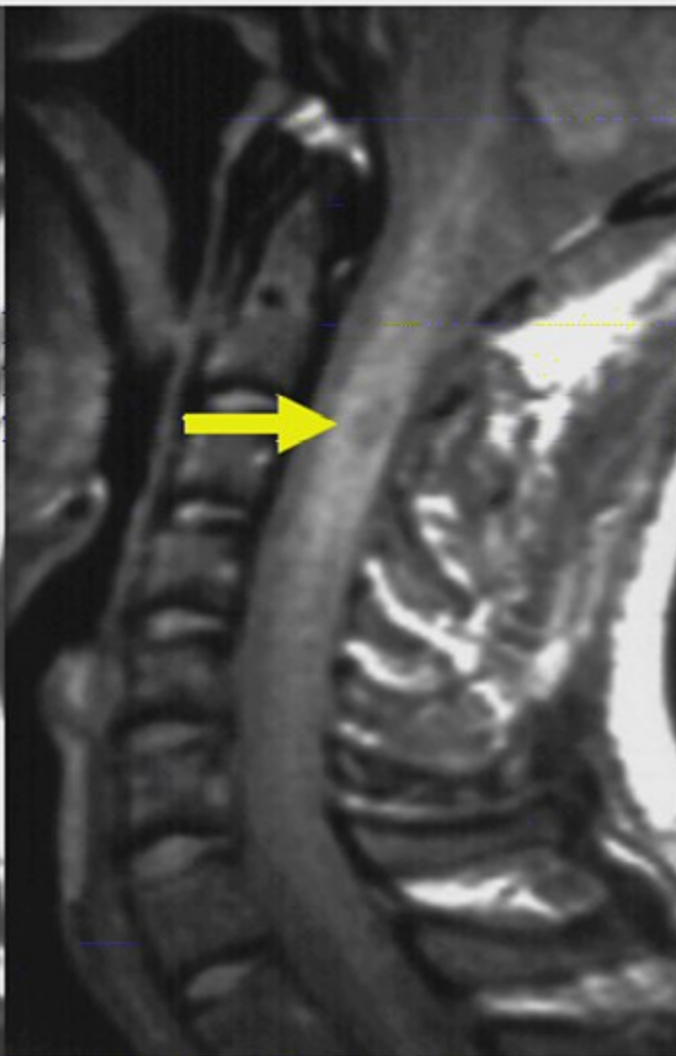
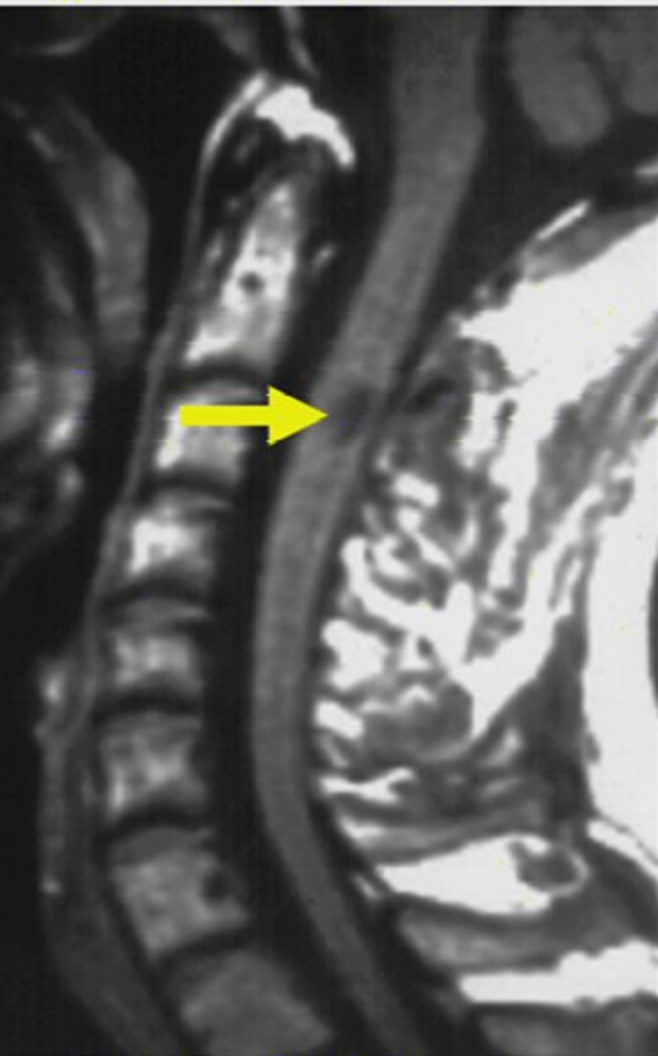


Non-kistik myelomalazi



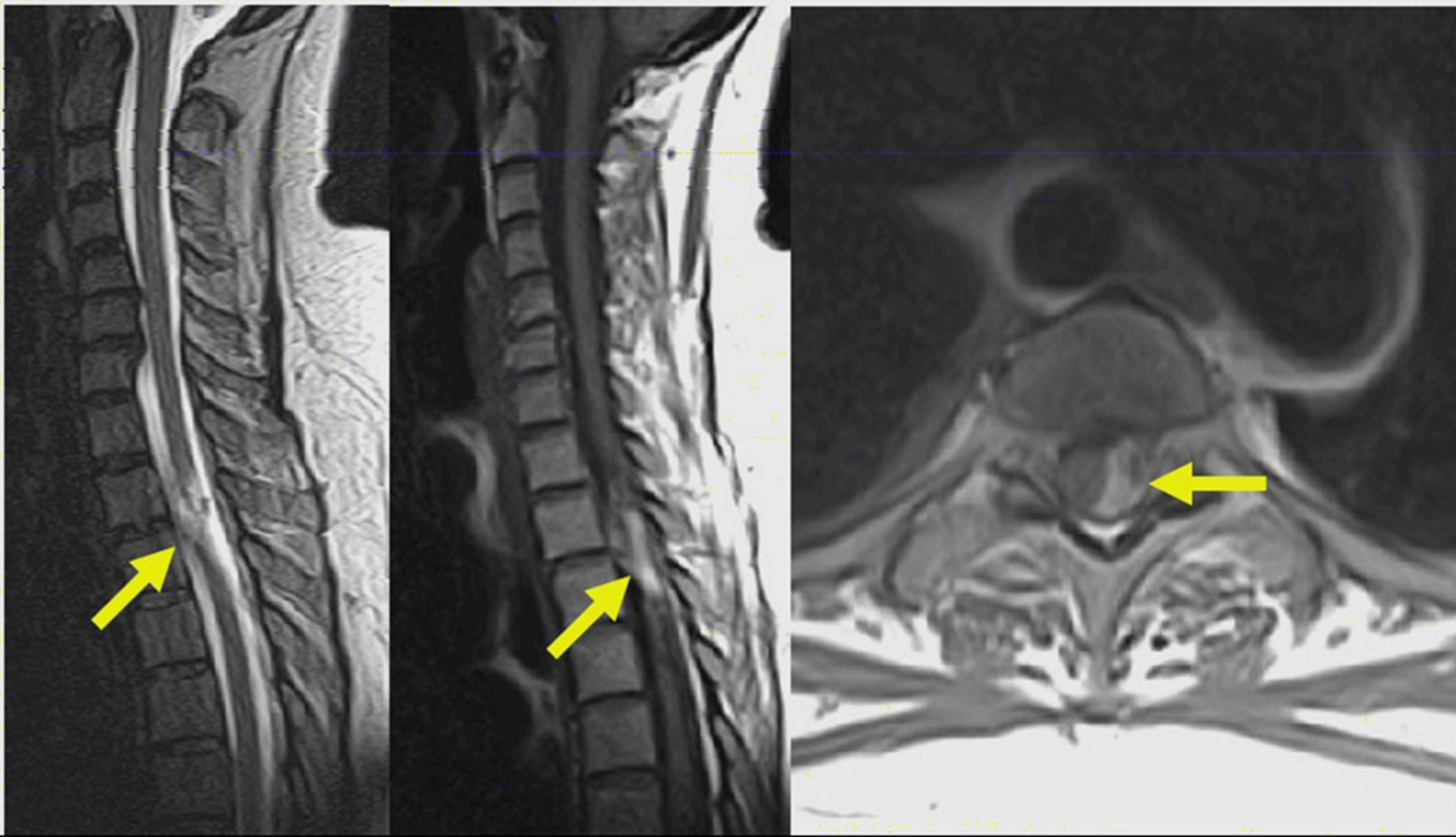


Kistik myelomalazi



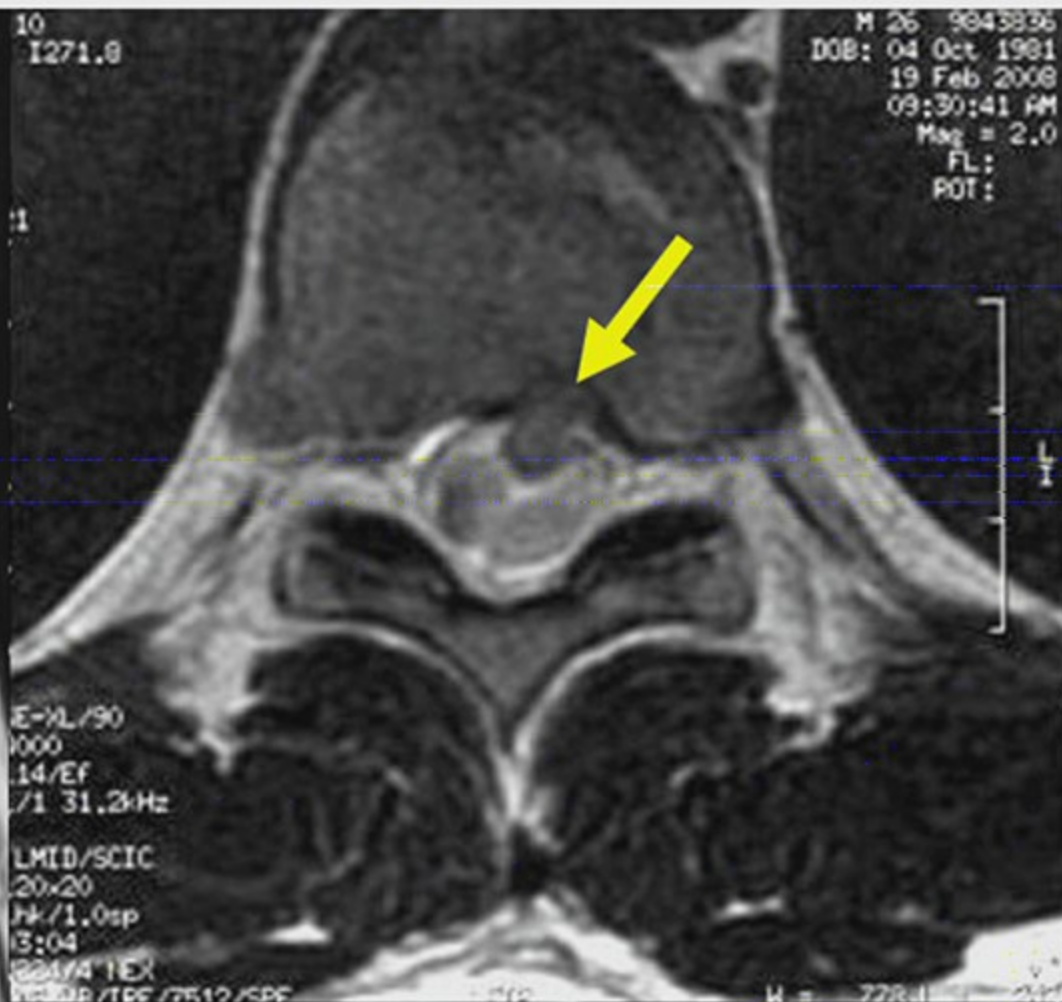
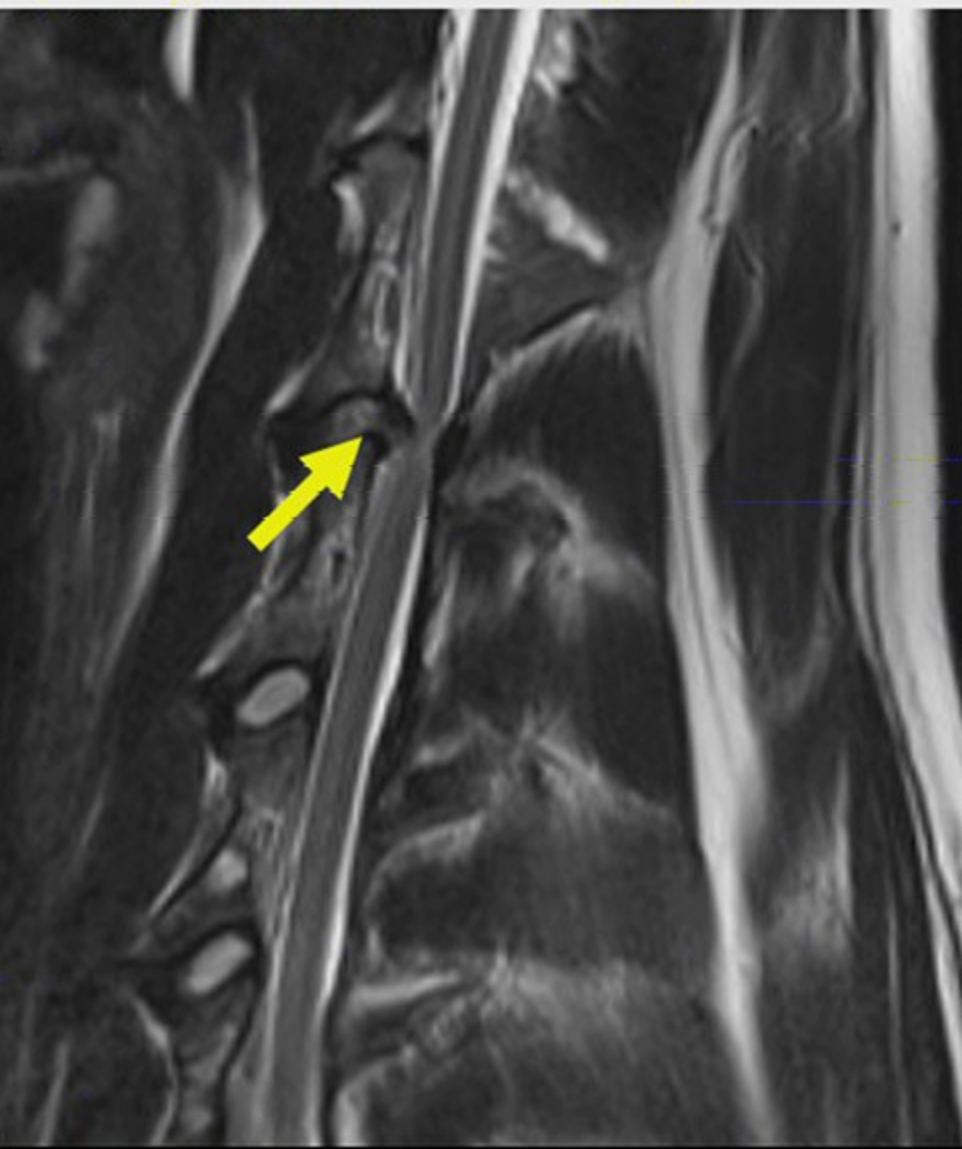


Travmatik epidural hematom



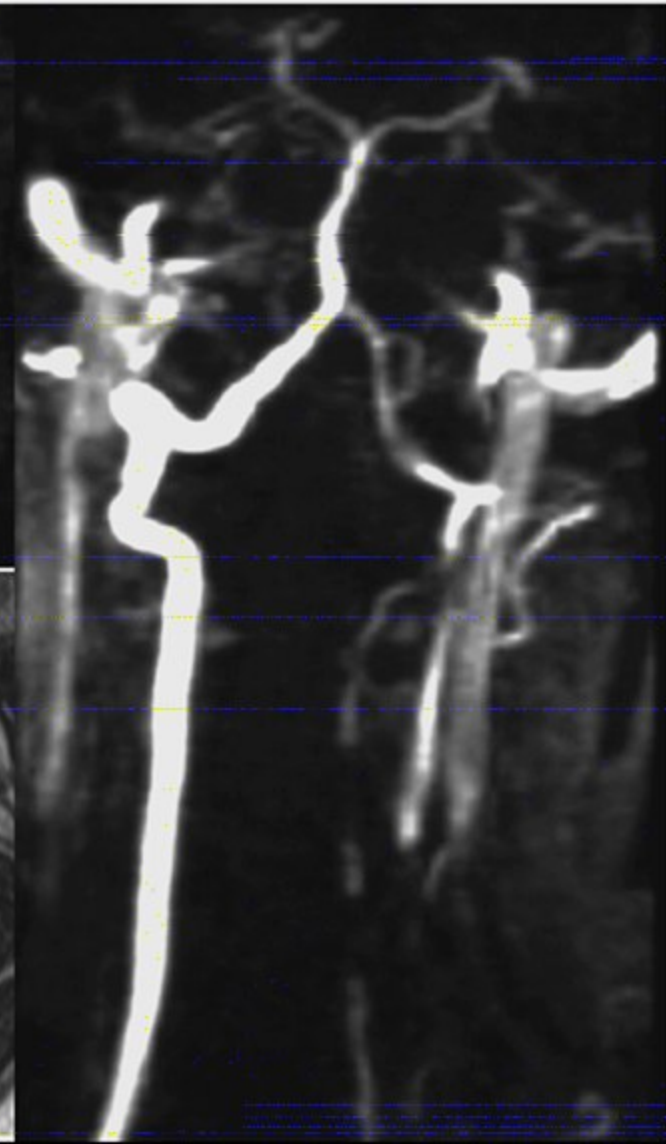
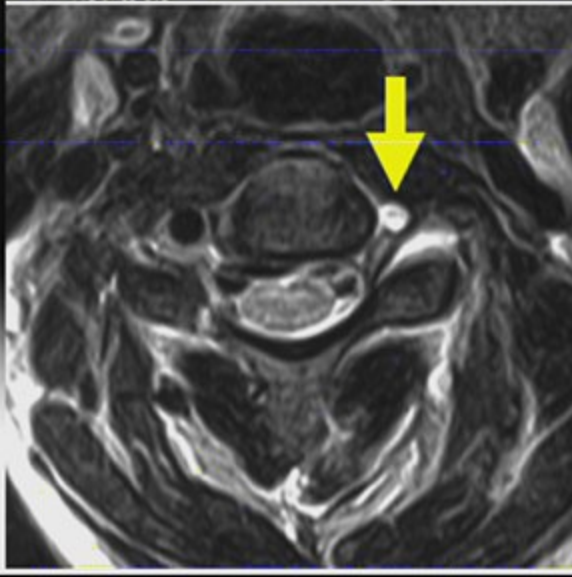
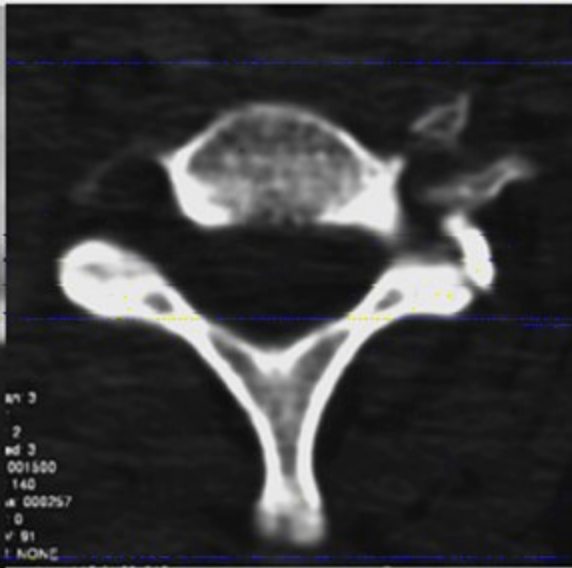


Travmatik disk herniasyonu



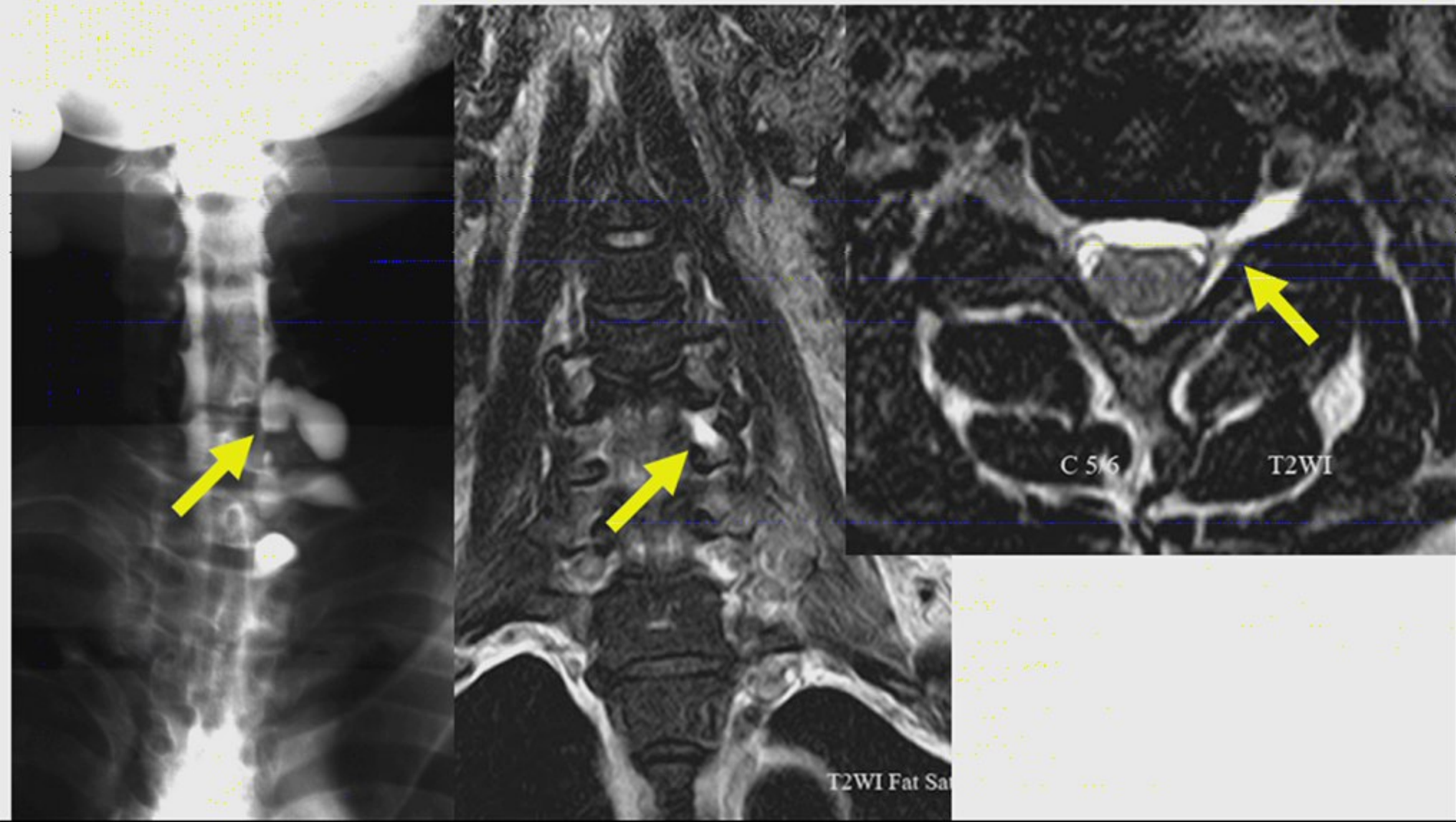


Vertebral arter diseksiyonu



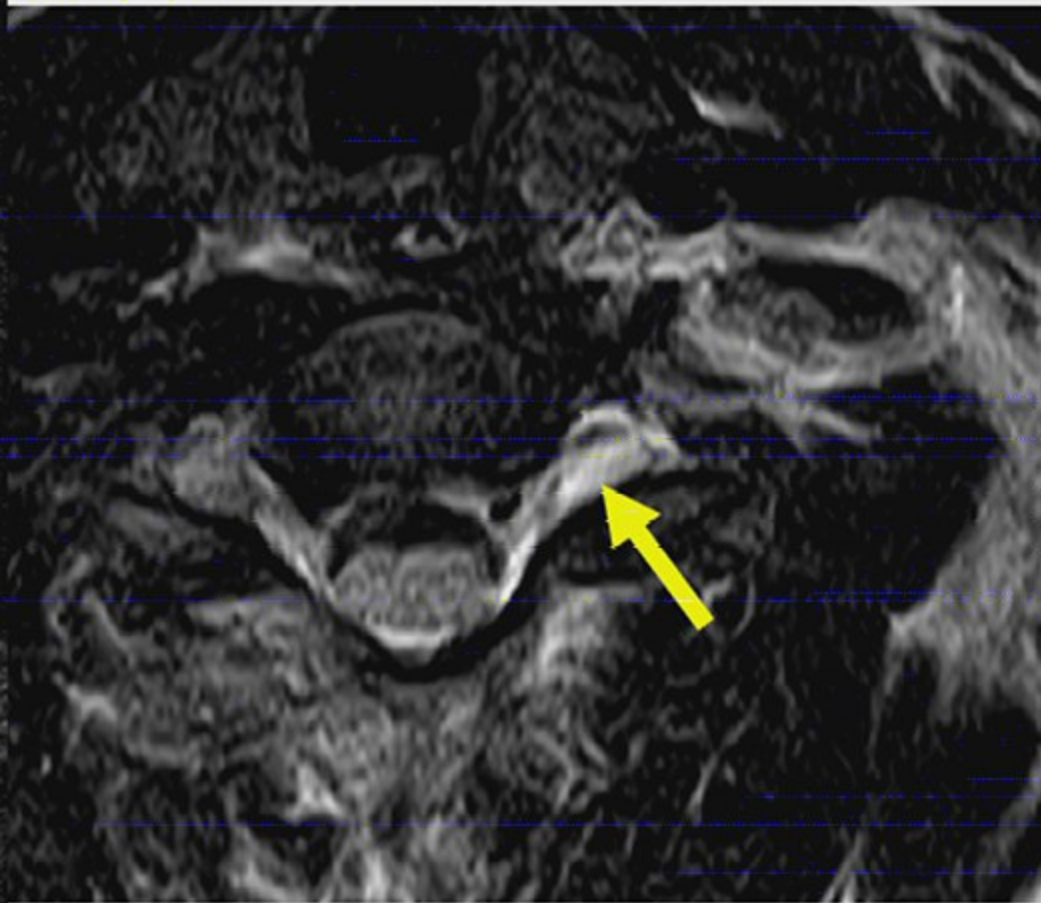
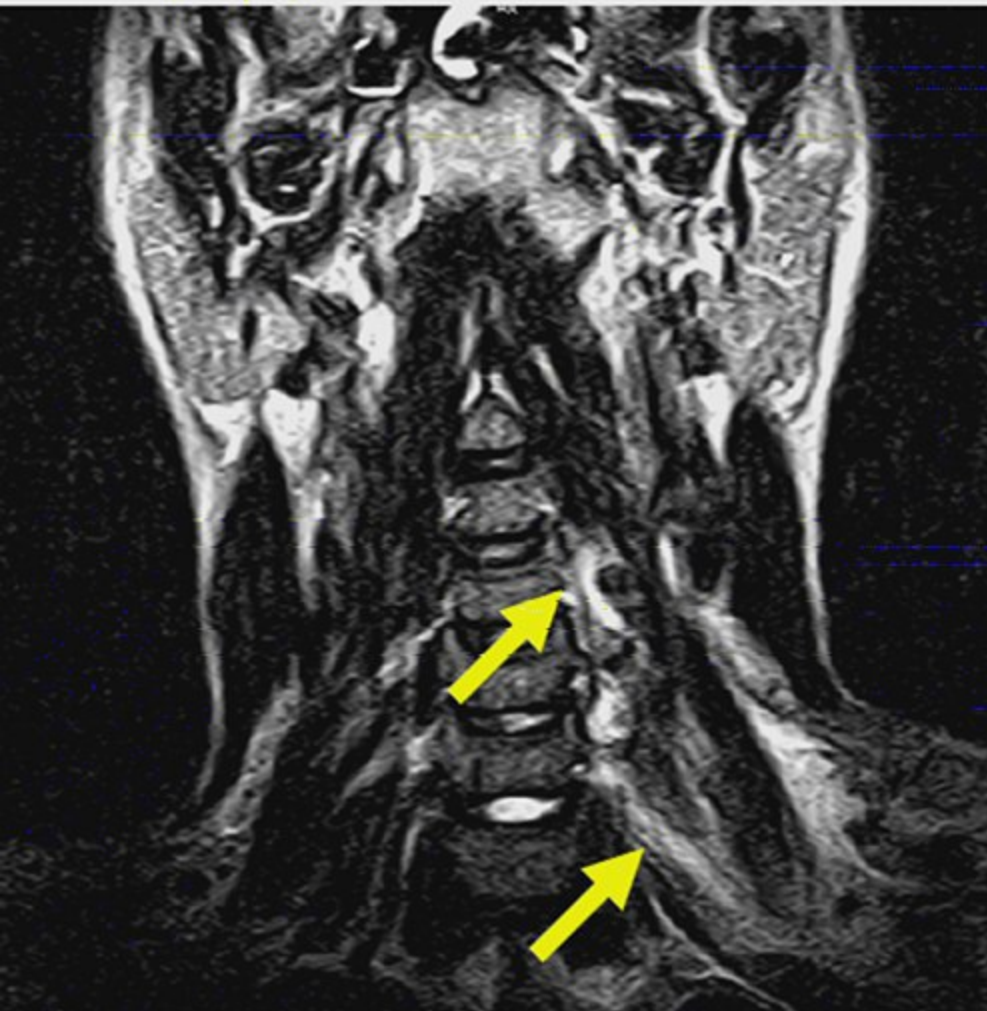


Travmatik kök hasarı





Brakial pleksus yaralanması





Torakolomber vertebra



Torakolomber yaralanmalar

- En sık T12-L2 arası
- Genç ve orta yaş (20-40)
- E:K = 4:1
- Etyoloji
 - AITK
 - Düşme
 - İş kazaları



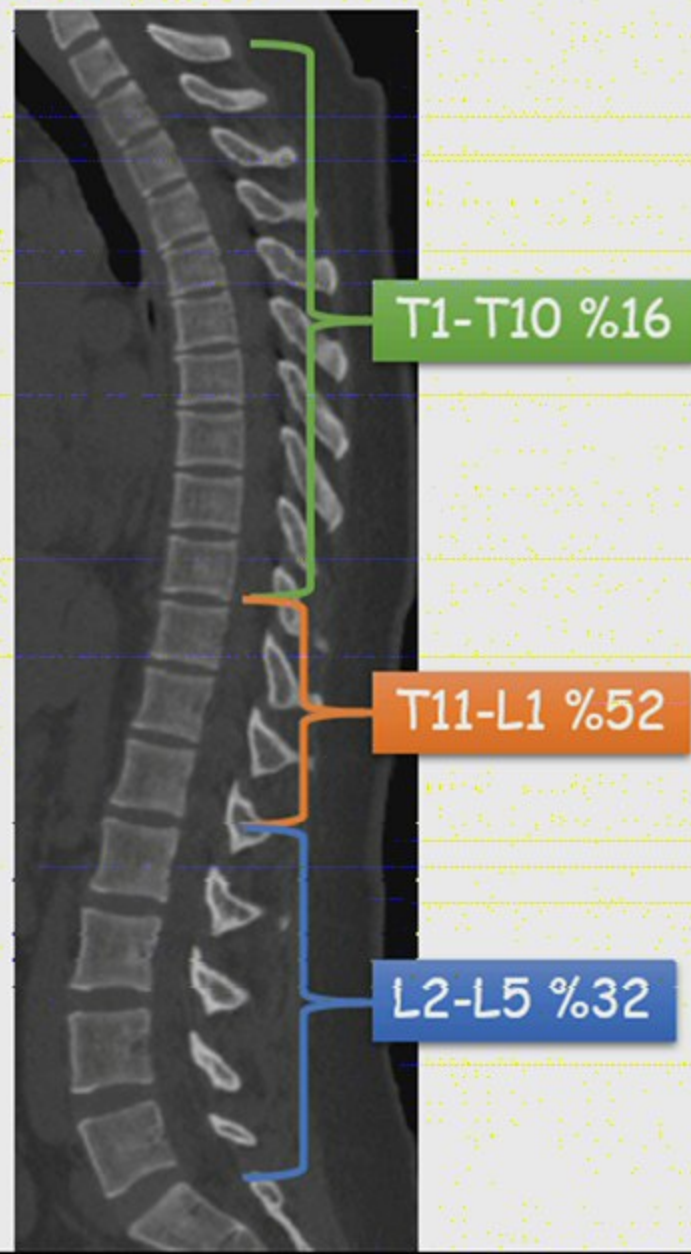
Torakolomber yaralanmalar

- En sık T12-L2 arası
- Genç ve orta yaş (20-40)
- E:K = 4:1
- Etyoloji
 - AİTK
 - Düşme
 - İş kazaları



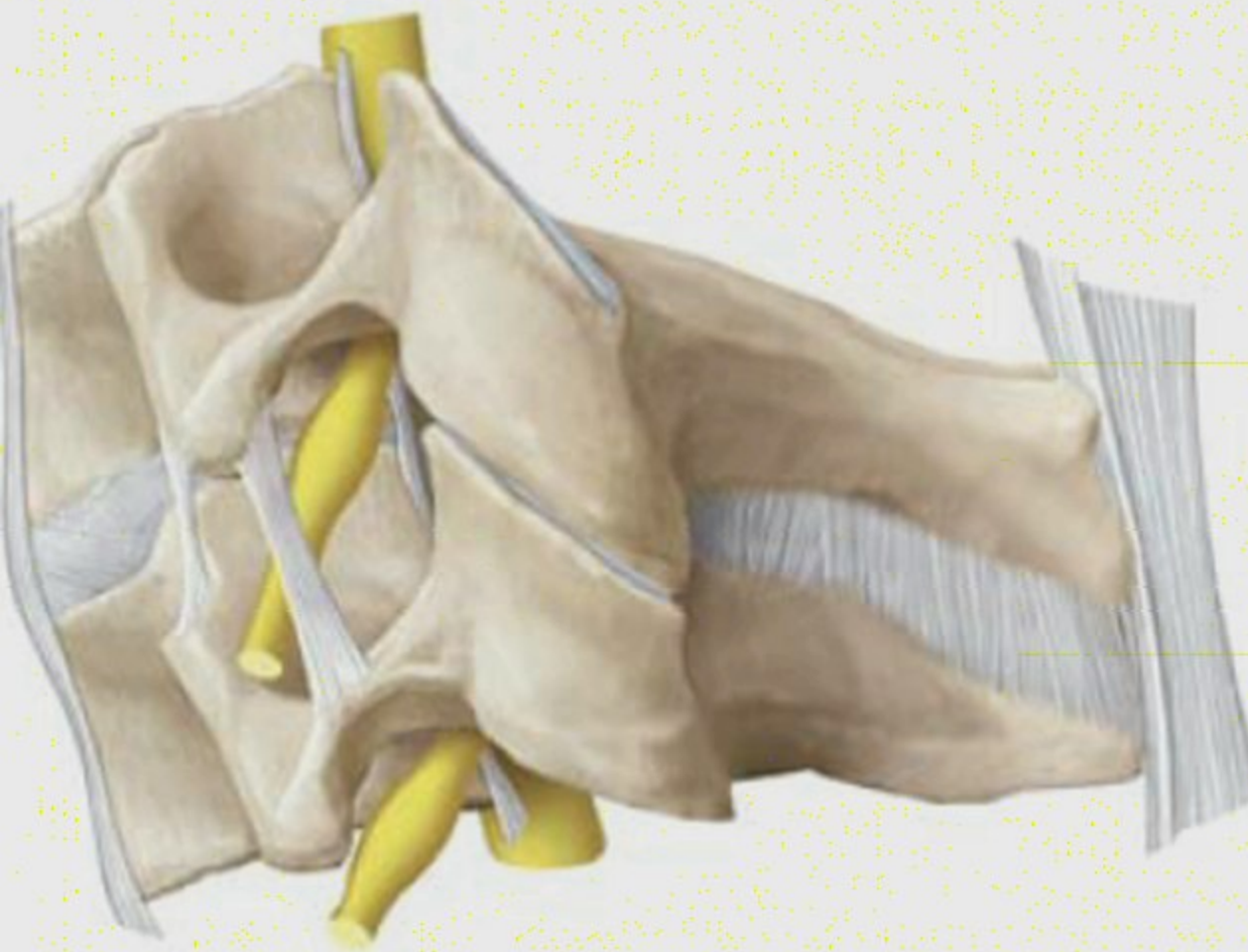
Torakolomber yaralanmalar

- En sık T12-L2 arası
- Genç ve orta yaş (20-40)
- E:K = 4:1
- Etiyoloji
 - AITK
 - Düşme
 - İş kazaları





Posterior ligamentöz kompleks (PLK)



- Supraspinöz lig.
- İnterspinöz lig.
- Faset eklem kapsülleri
- Lig. Flavum



TLICS



Kırık Mekanizması

Kompresyon

1

Burst

2

Rotasyonel

3

Distraksiyon

4

Nörolojik Tutulum

Sağlam

0

Sinir kökü

2

Tam kord / konus

2

Tam olmayan
kord / konus

3

Kauda ekina

3

Posterior Ligament Kompleksi

Sağlam

0

Belirlenemeyen

2

Hasarlı

3

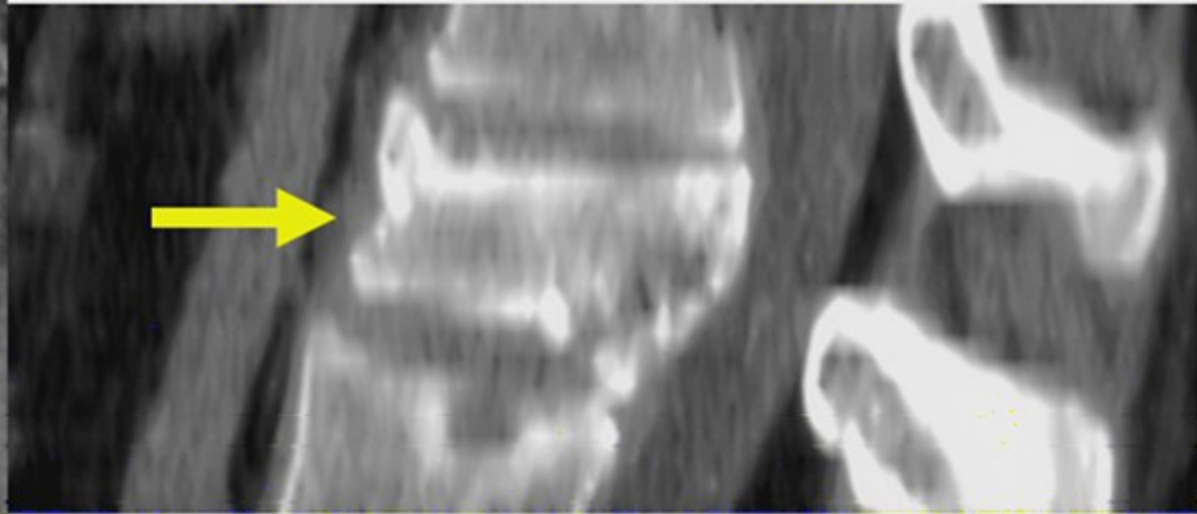


L4 Pincer



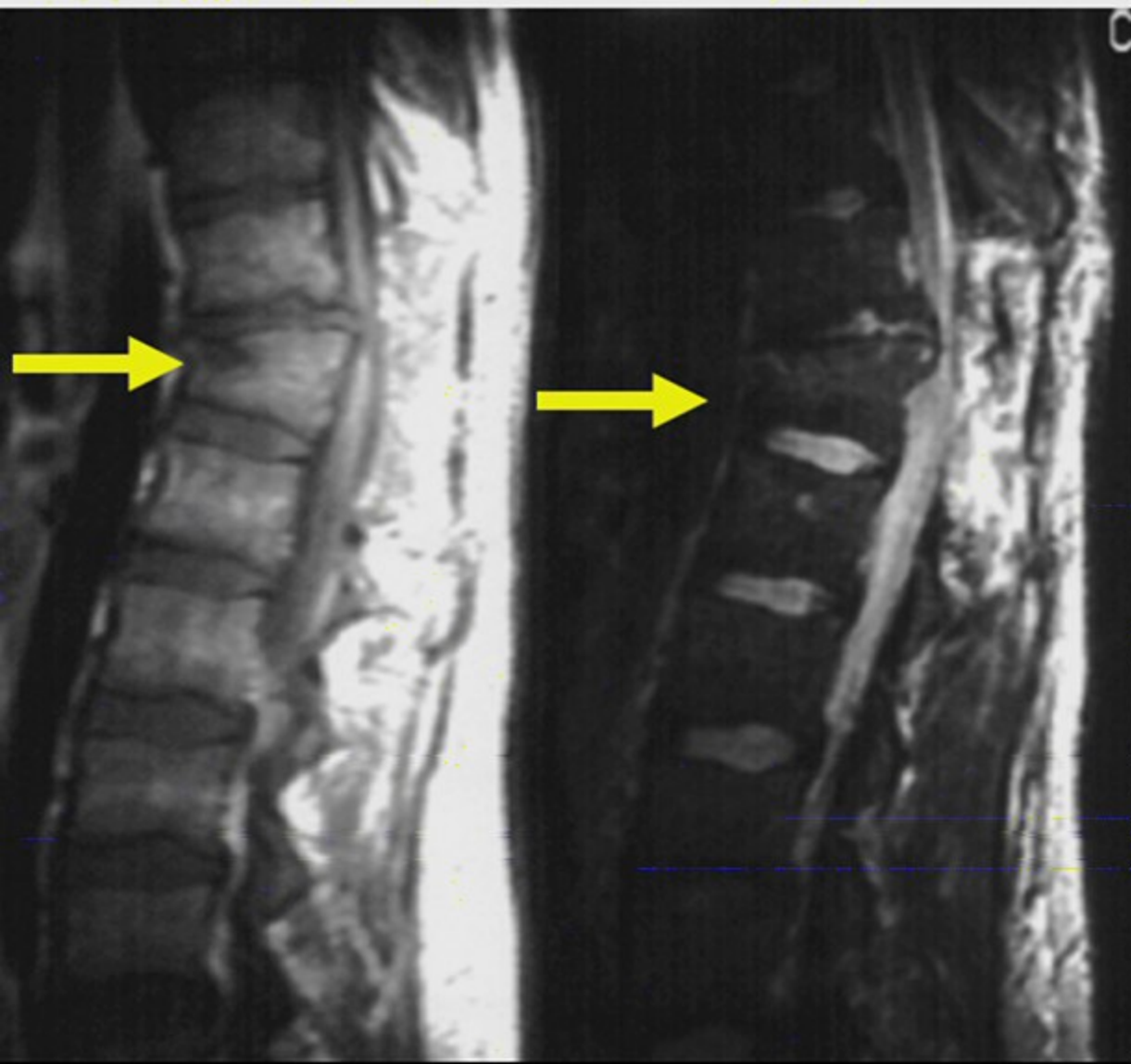


L2 wedge kompresyon



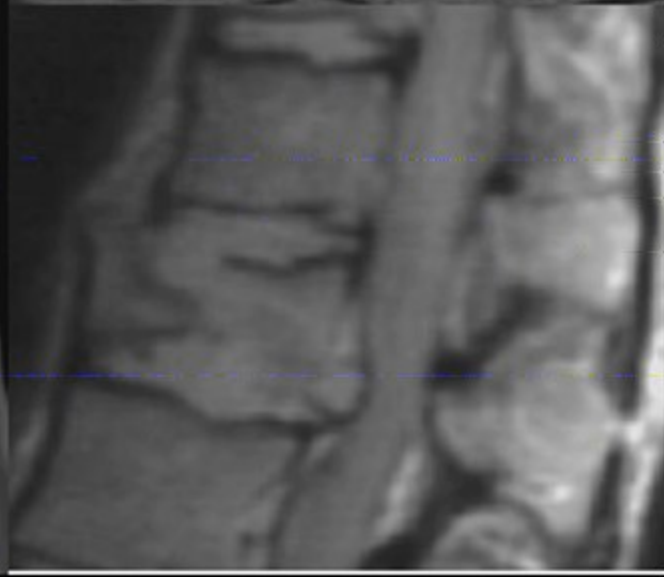
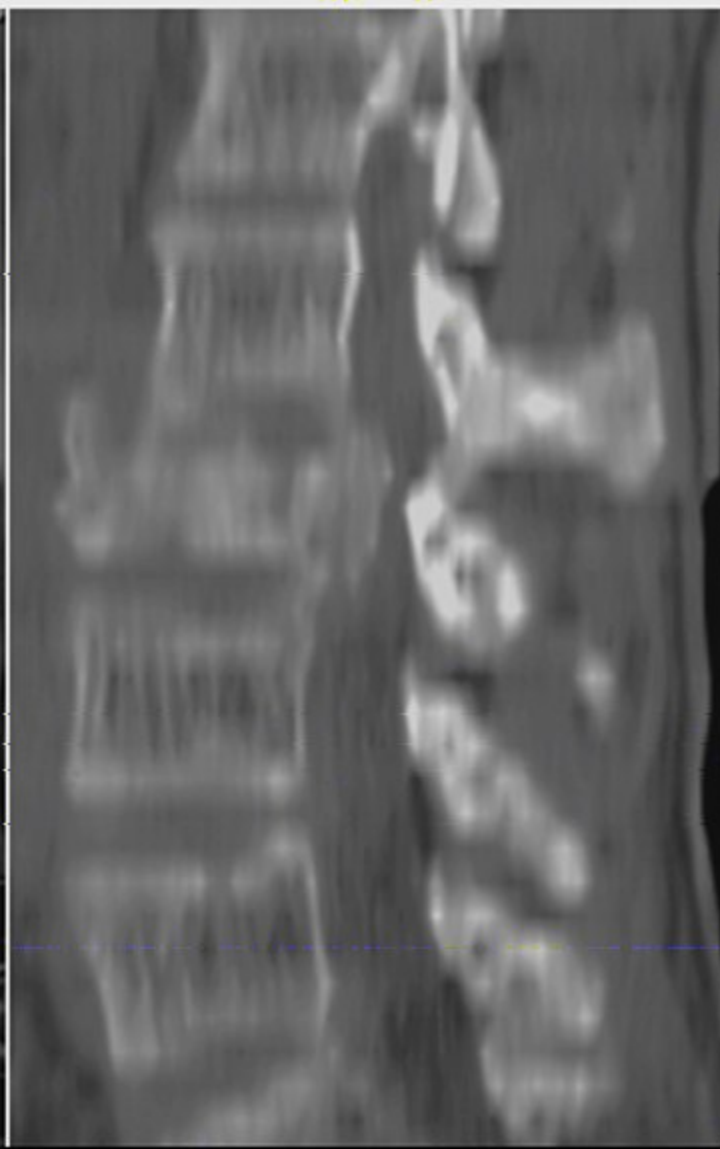
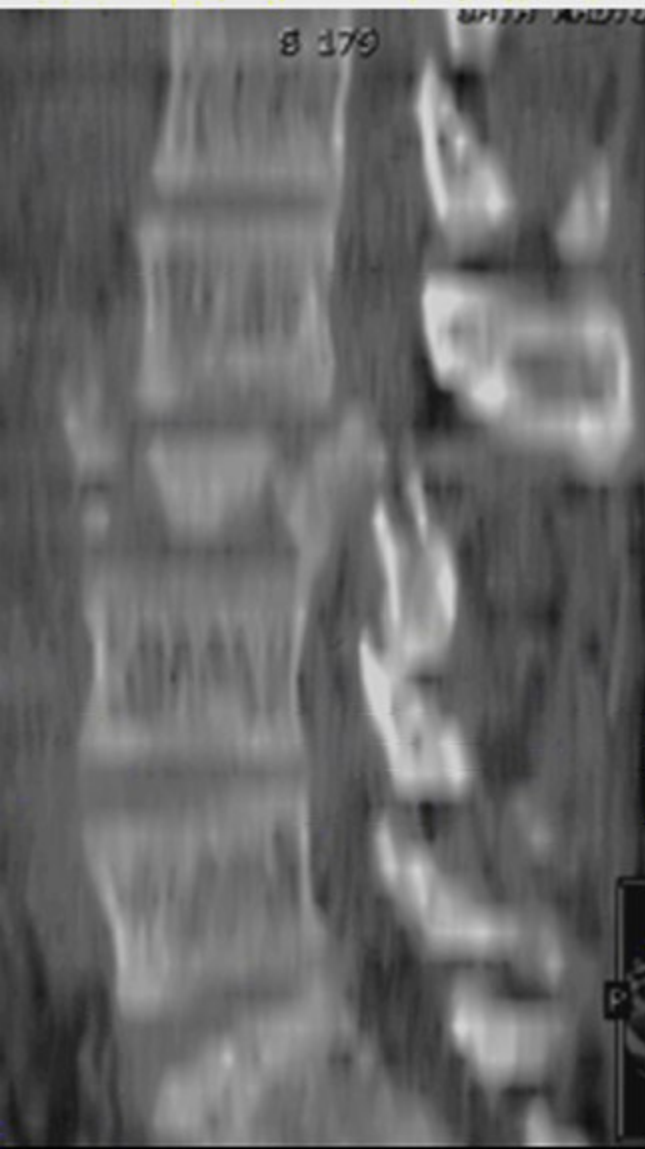


T10 wedge kompresyon



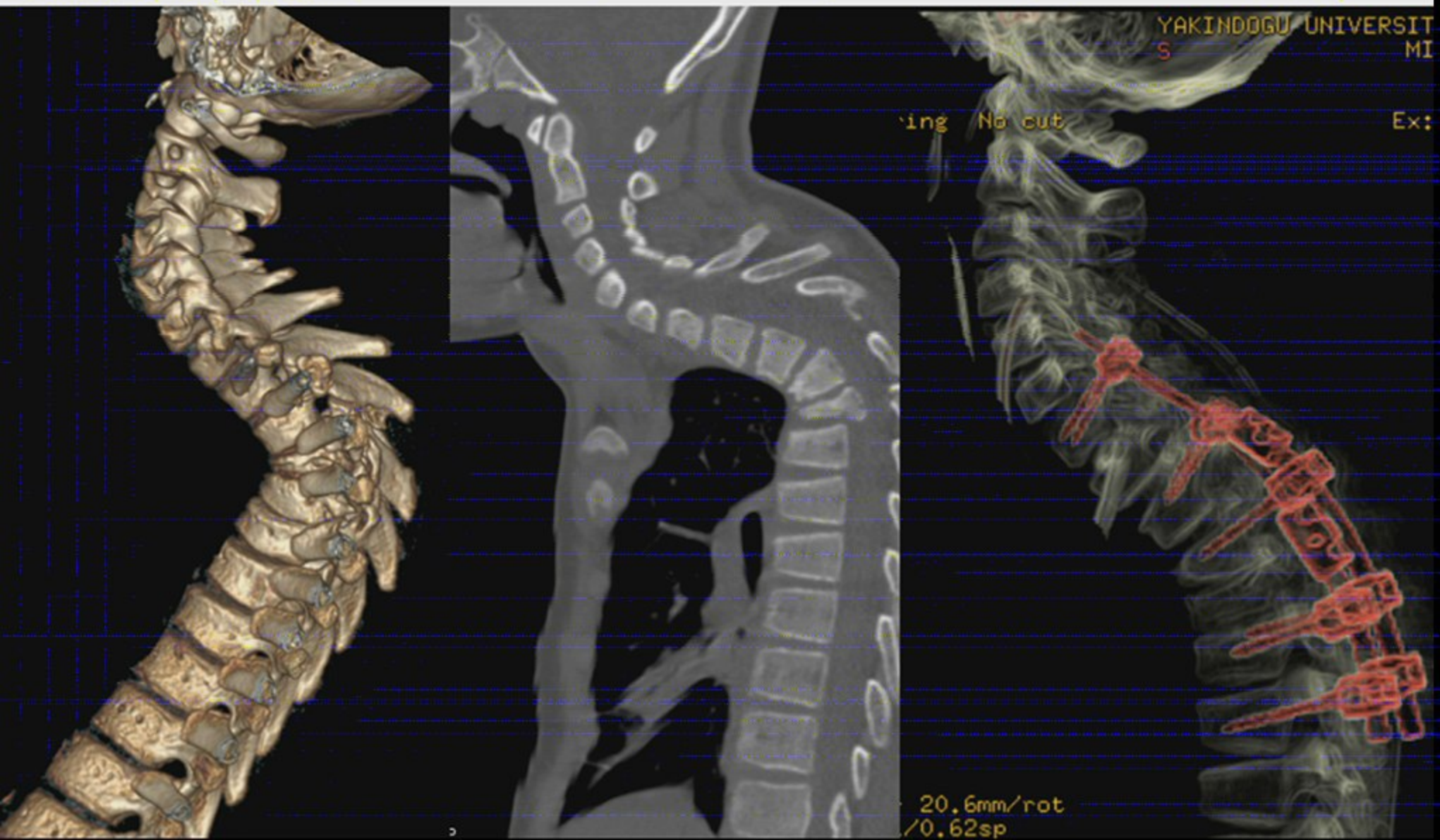


Burst kırık



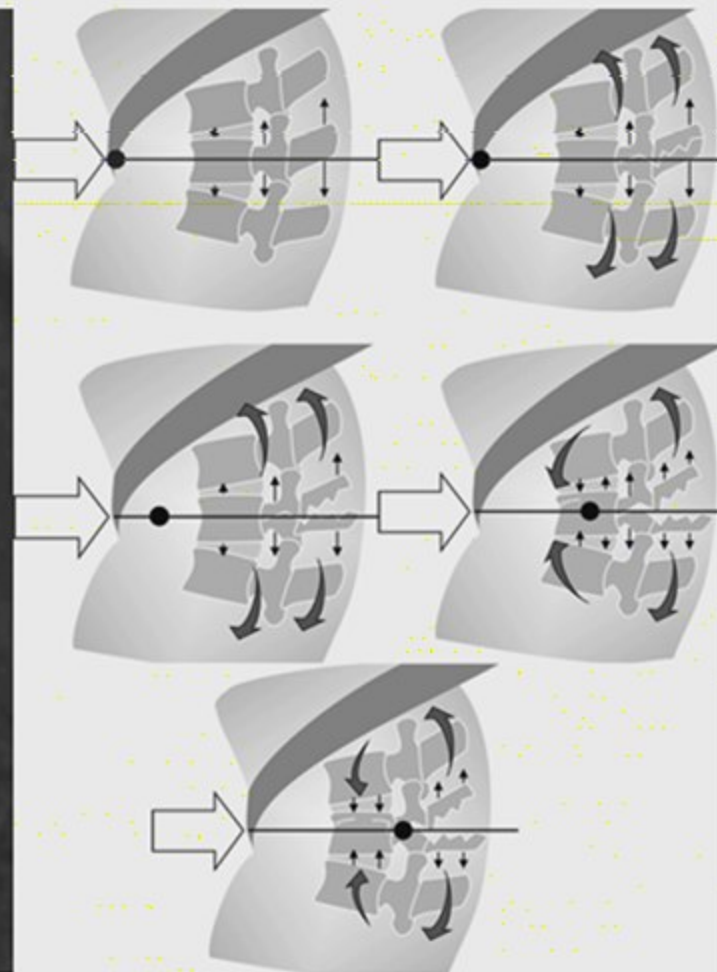
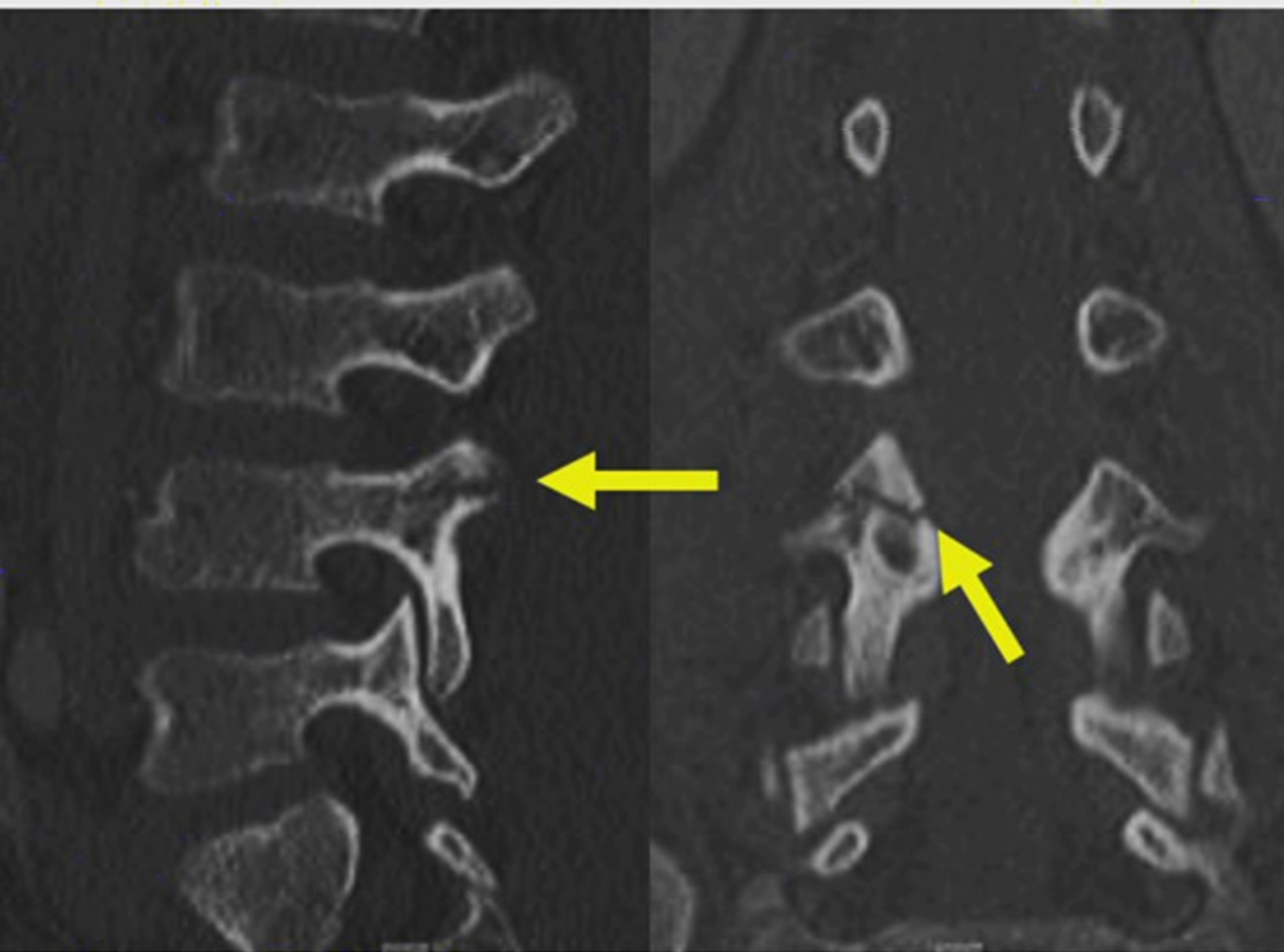


Burst kırık



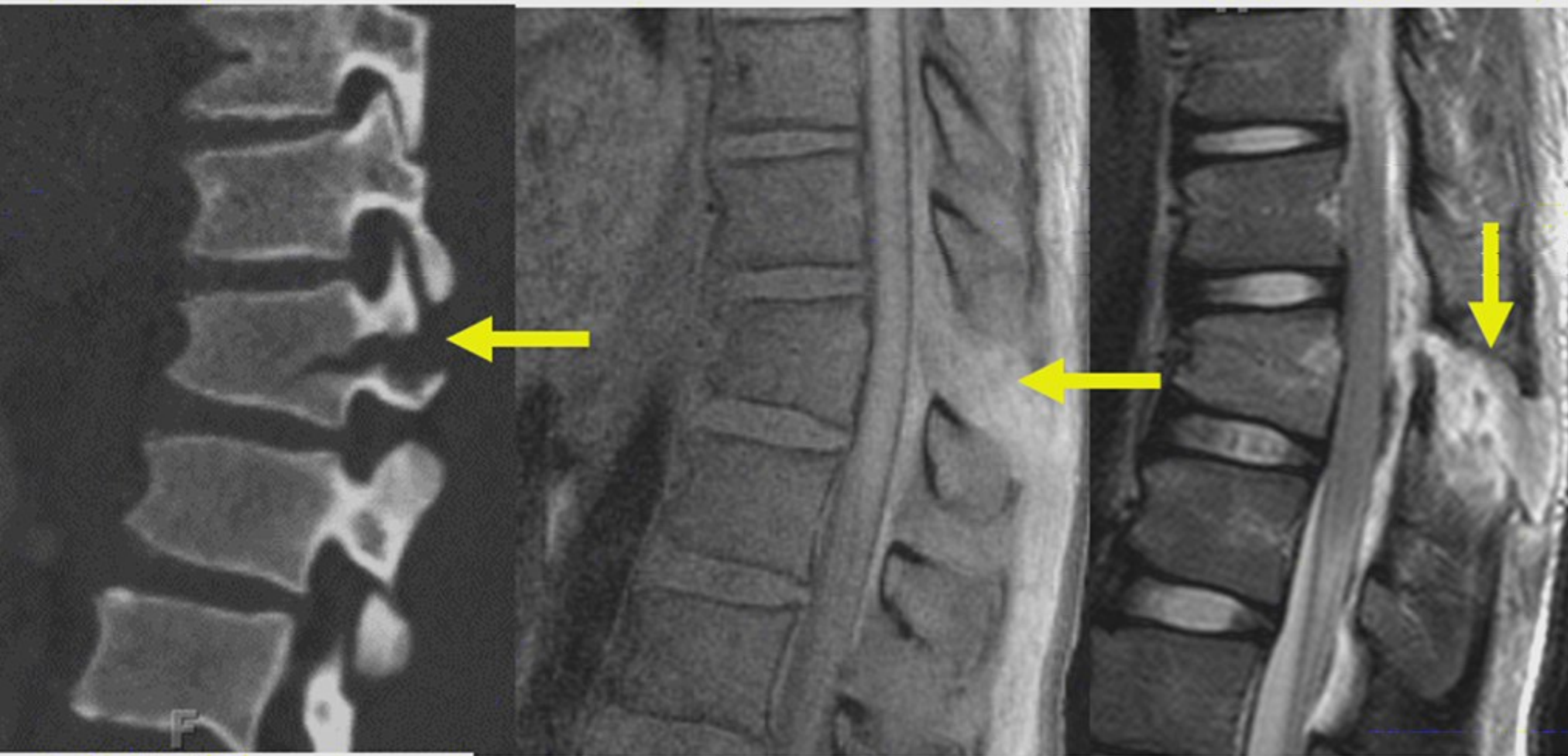


Fleksiyon distraksiyon (Chance kırığı)



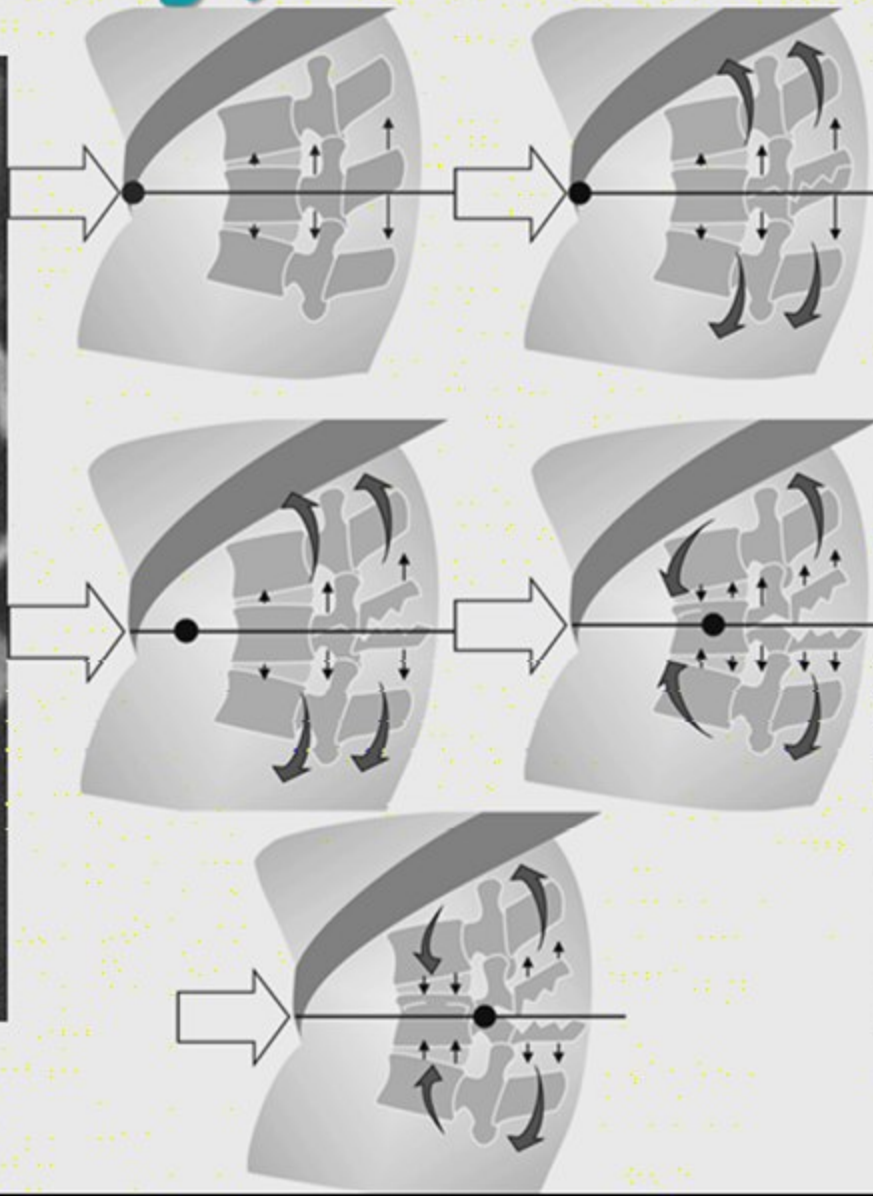


Fleksiyon distraksiyon (Chance kırığı)



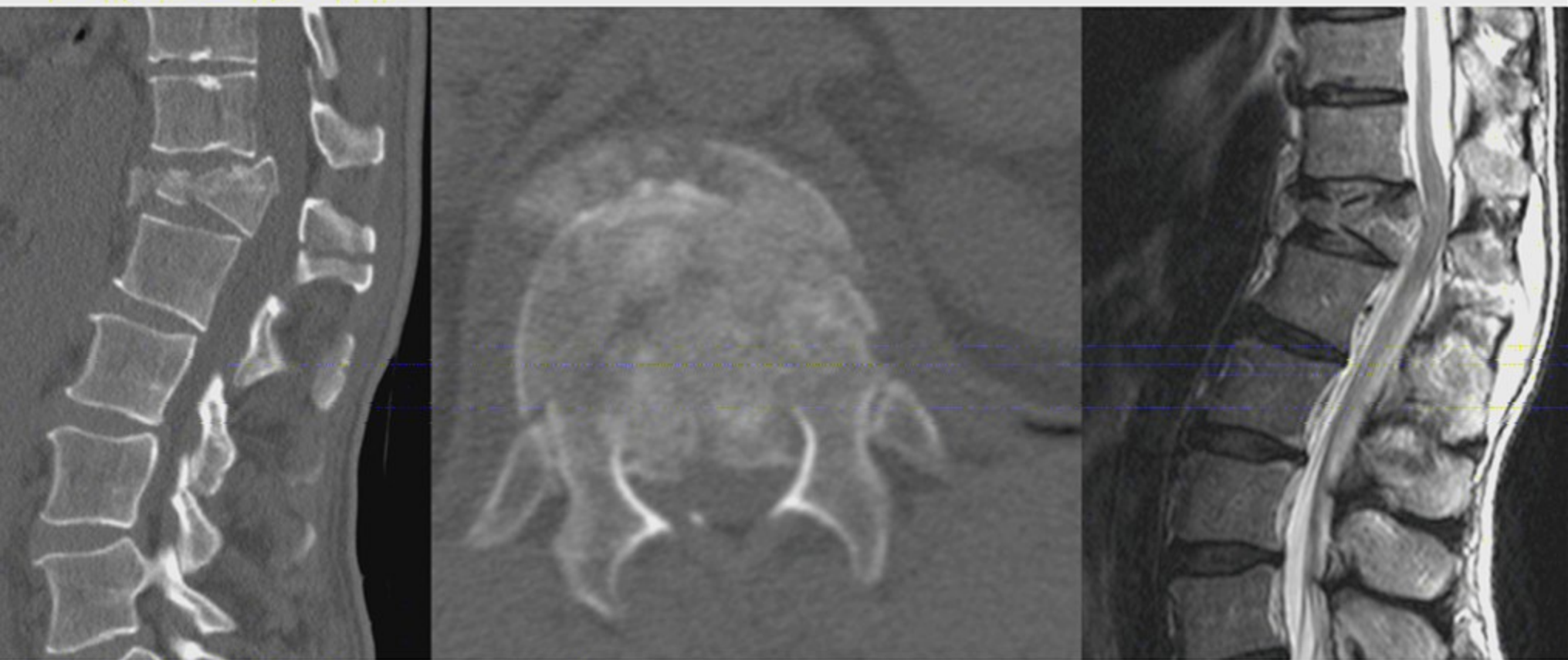


Fleksiyon distraksiyon (Chance kırığı)



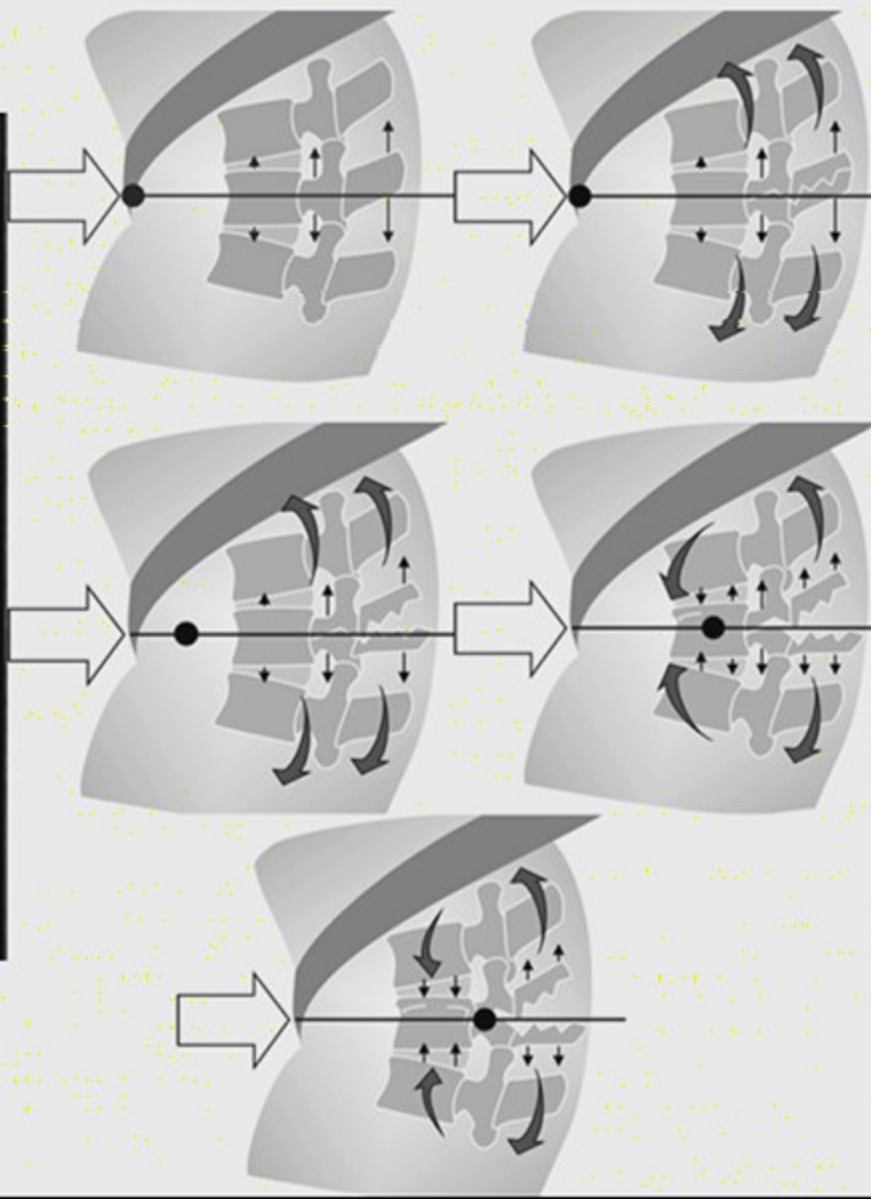


Burst distraksiyon kırığı



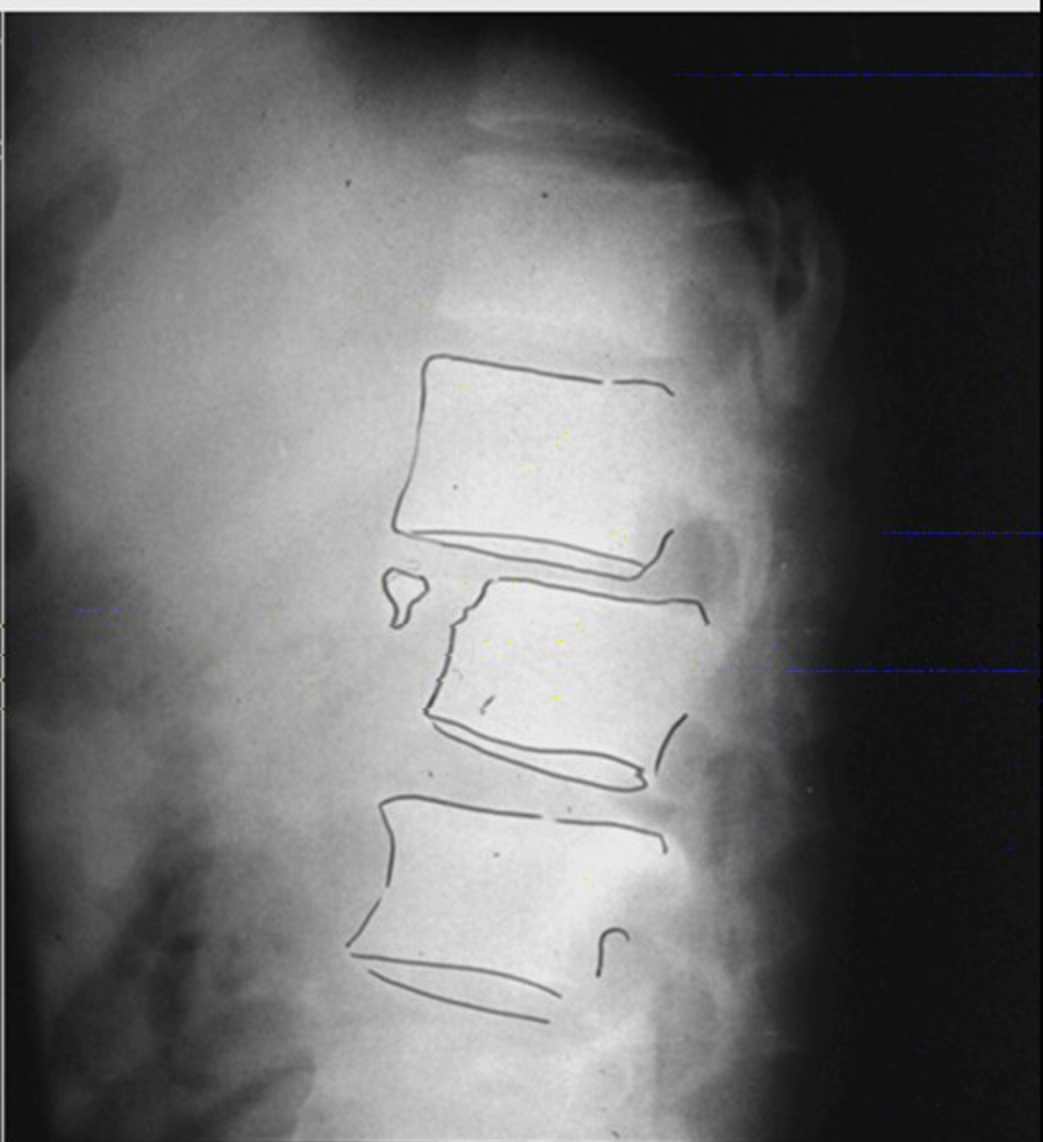


Burst distraksiyon kırığı



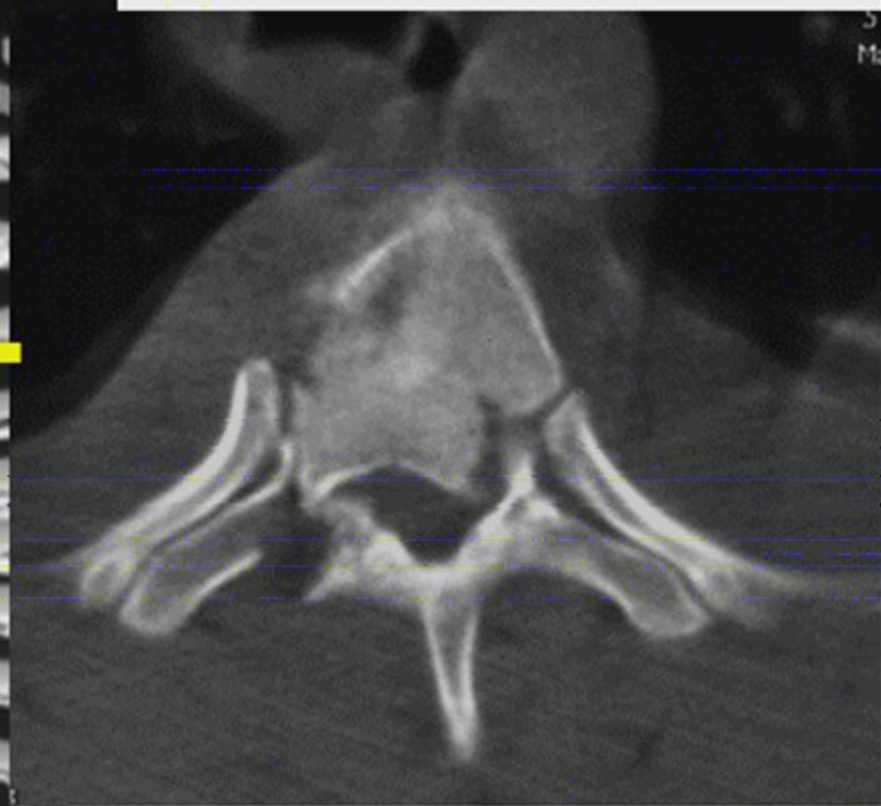
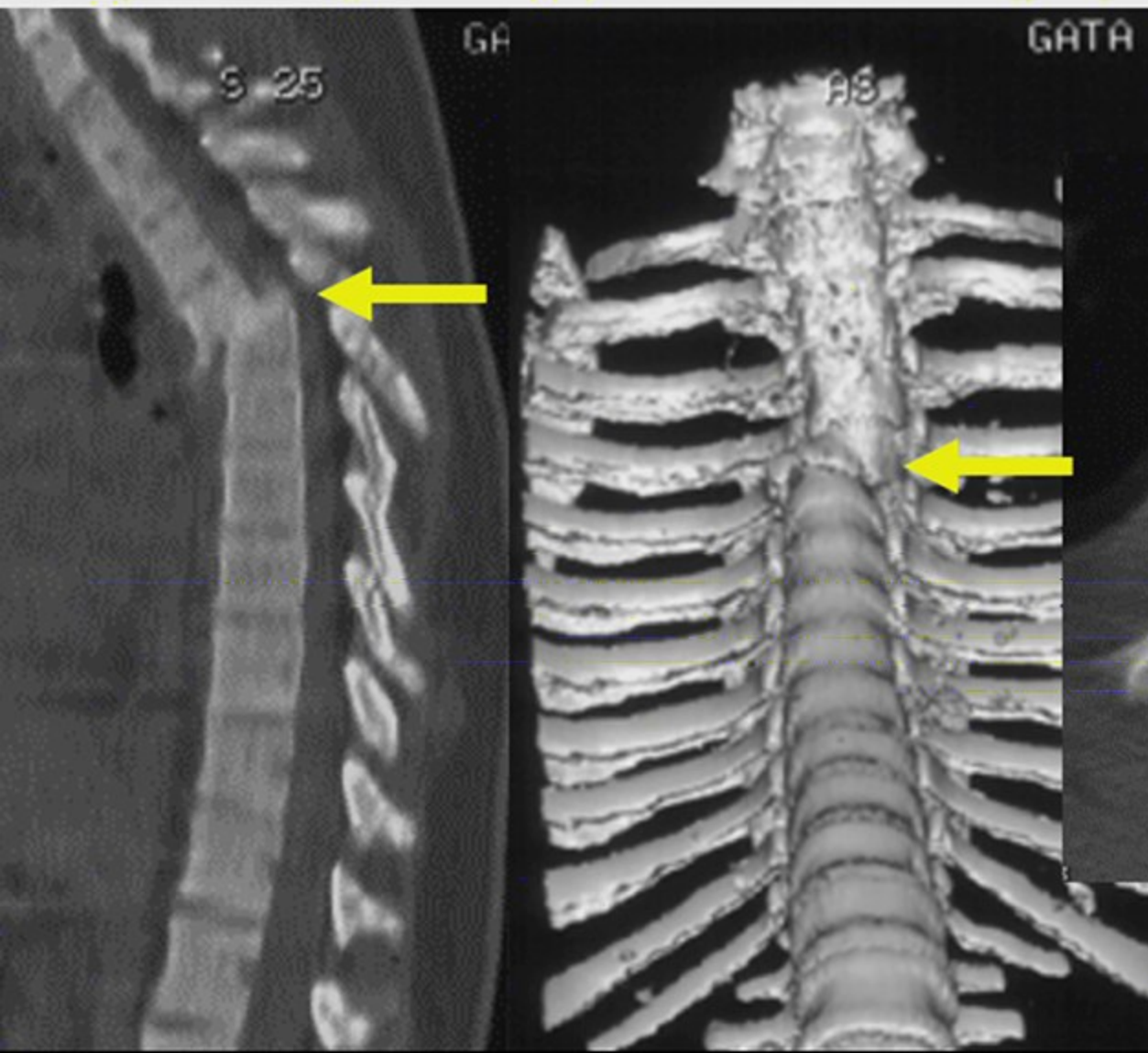


T12-L1 distraksiyon yaralaması





T5 Translasyon/Rotasyon





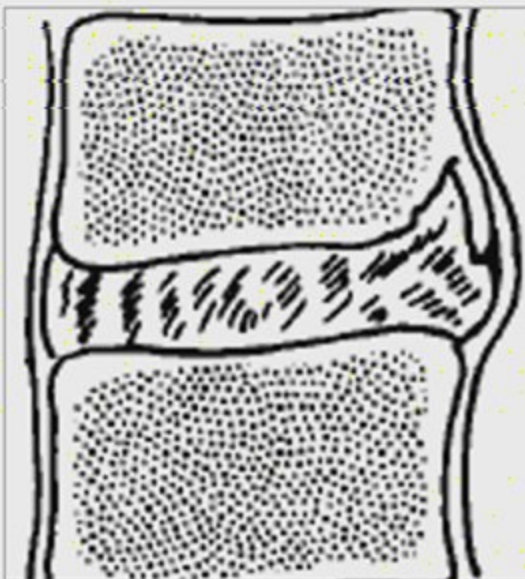
Translasyon/Rotasyon



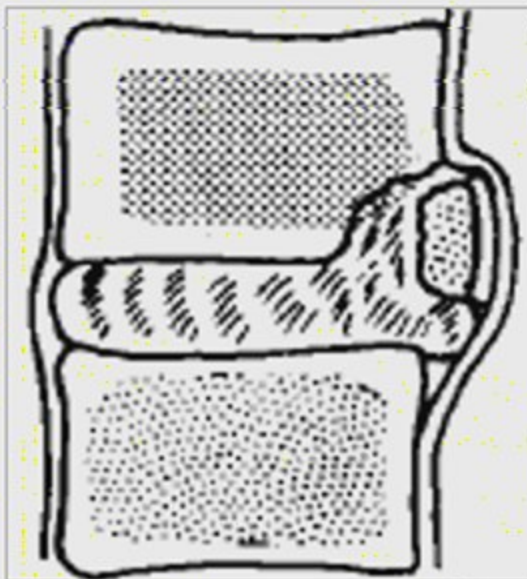


Limbus Fractures

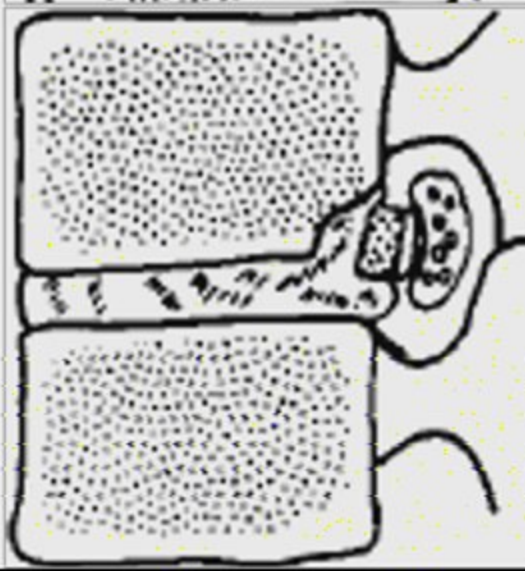
I



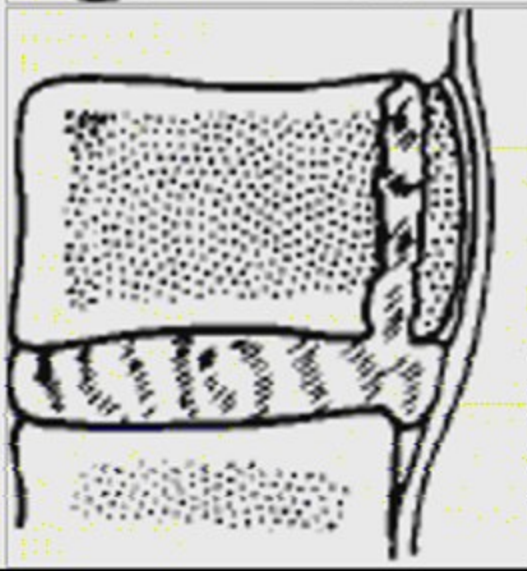
III



II



IV





Limbus





Cerrahi karar

Nörolojik durum	İntakt PLK	Hasarlı PLK
Sağlam / Kök hasarı	Posterior	Posterior
İnkomplet kord hasarı	Anterior	Kombine
Komplet kord hasarı	Anterior veya Posterior	Kombine veya Posterior



Cerrahi karar

Nörolojik durum	İntakt PLK	Hasarlı PLK
Sağlam / Kök hasarı	Posterior	Posterior
İnkomplet kord hasarı	Anterior	Kombine
Komplet kord hasarı	Anterior veya Posterior	Kombine veya Posterior

Redüksiyon ± Stabilizasyon ± Tamir



Neleri raporlamalıyız? (BT & MRG)

- Morfoloji
 - Kırık tipi
 - Kompresyon, Burst, Rotasyon, Distraksiyon
 - Parçalanmanın derecesi
 - Vertebra yükseklik kaybının oranı
 - Geriye kayma miktarı
 - Kanaldaki daralmanın oranı
 - Diğer eşlik eden hasarlar
 - Kifoz derecesi



Neleri raporlamalıyız? (BT)

- PLK bütünlüğü (Sağlam, Belirsiz, Hasarlı)
 - İnterspinöz mesafe artışı
 - Spinöz prosesde avulsiyon kırığı
 - Faset eklemlerde genişleme
 - Boş (çıplak) faset eklemler
 - Korpusda rotasyon veya yana kayma



Neleri raporlamalıyız? (MRG)

- Nörolojik hasar
 - Spinal kord, konus medüllaris, kauda ekina
 - Sinir kökleri
 - Epidural hematoma
- Disk hasarı
- Yumuşak doku ve vasküler hasar



Eve gidecekler

- Multipl travmalı olgularda spinal yaralanma araştırılmalı
- Hızlı ve kesin tanı (Vakit nakit !)
 - ÇKBT (hazır protokol) ilk yöntem
 - MRG
 - İnstabilite
 - Klinik/radyolojik uyumsuzluk
- Çok düzeyli / kombine hasara dikkat
- Aynı dili konuş (AO Spine ve TLICS)