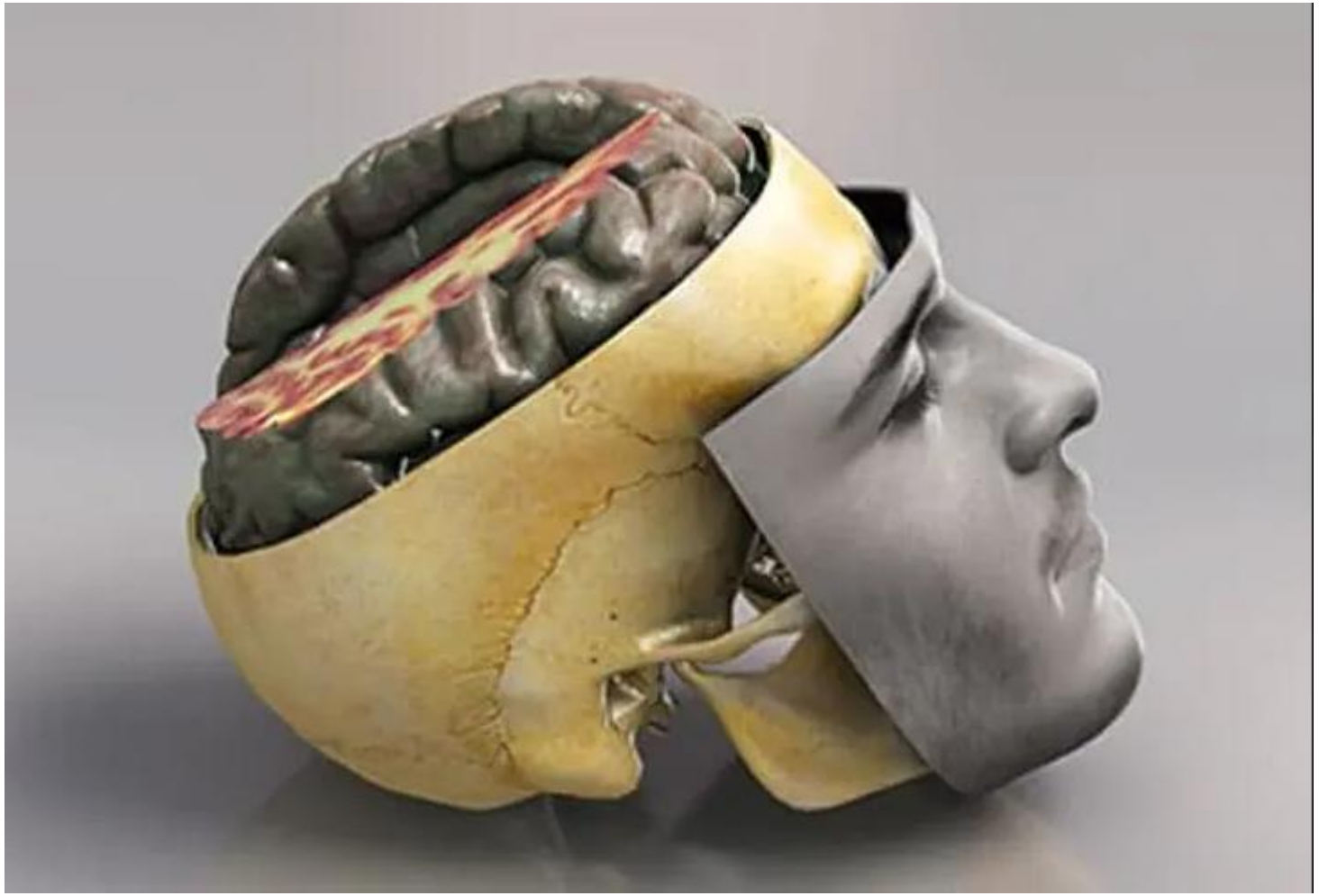
Manyetik Rezonans Görüntüleme'nin Travmada Yeri

Uzm. Dr. Ömer Özberk

Konya Şehir Hastanesi Radyoloji Kliniği

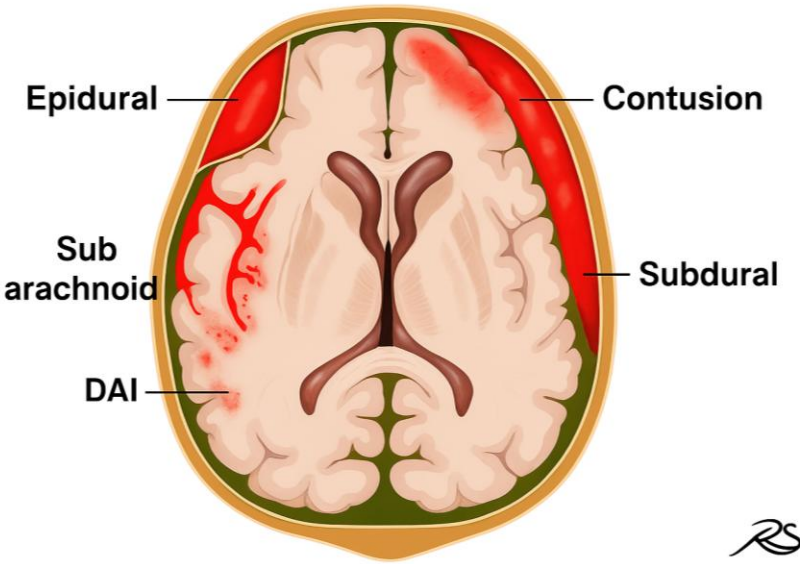
Kafa travmaları



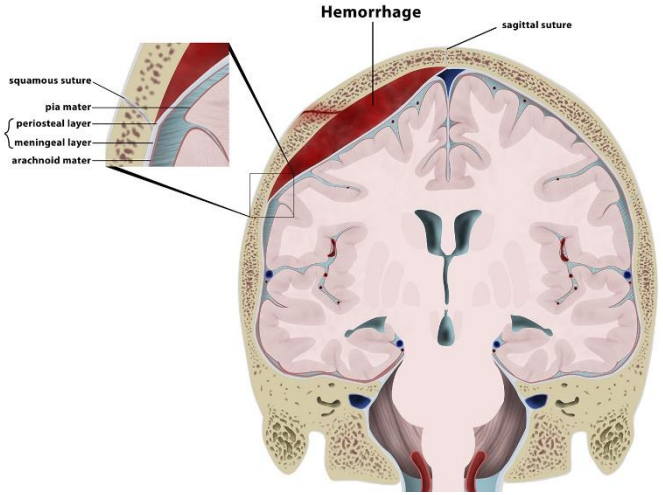
Manyetik Rezonans Görüntüleme (MRG)

- Diffüz aksonal zedelenmeyi (DAI)
- Vasküler hasarı
- Subdural hemoraji (özellikle izodens, kronik dönem)
- Subaraknoid kanama (FLAIR)

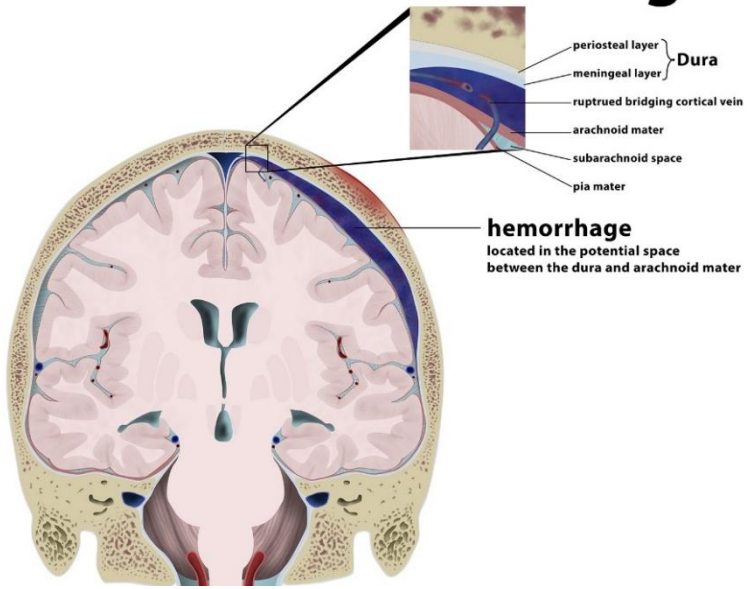
Tavmatik intrakranial hemorajiler



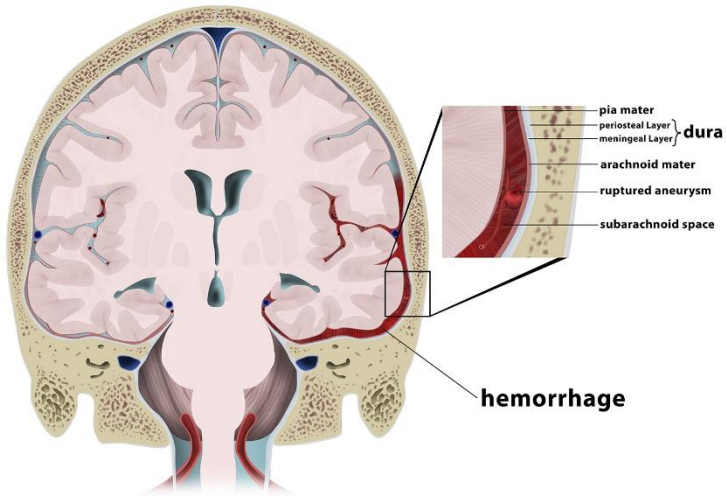
Extradural Hemorrhage



Subdural hemorrhage



Subarachnoid Hemorrhage

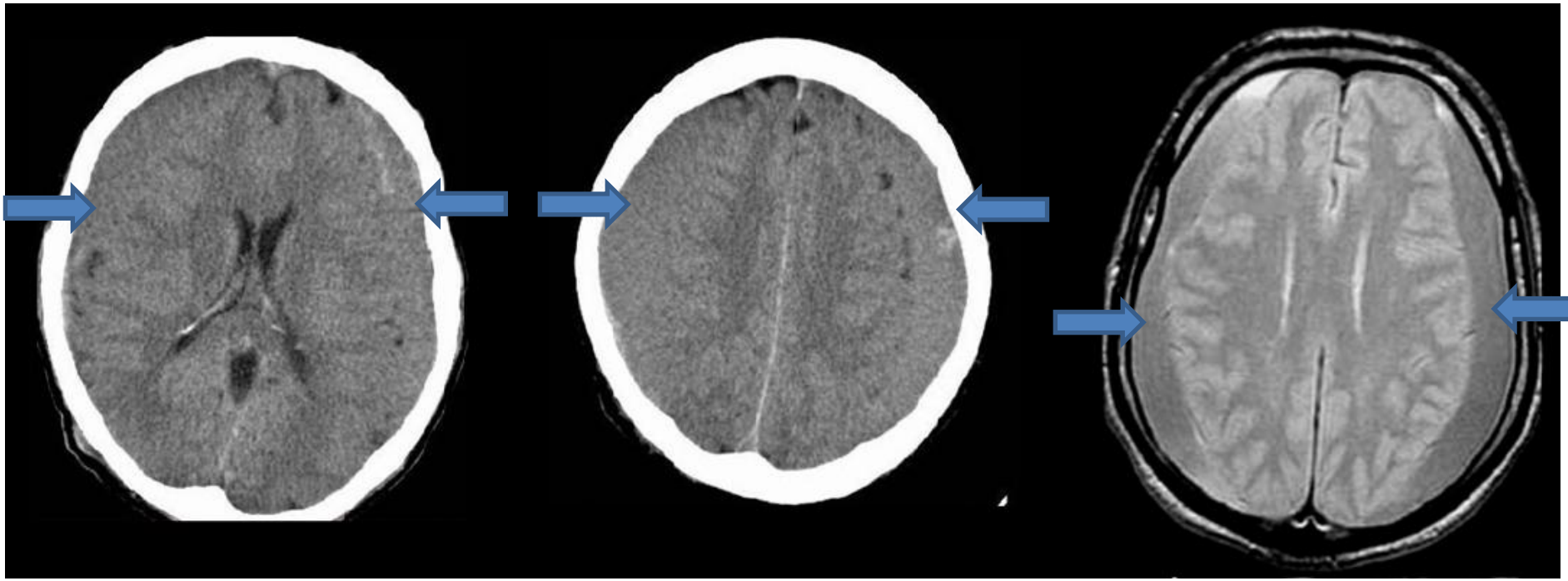


Epidural hematom

- İç tabula ile dura arası boşluğa kanama olur
- Kanama yavaş olur travma zamanı ile klinik kötüleşme arasında zaman vardır (lusid interval).
- Suturleri geçmez, konveks şekli tipik
- Temporal kemik kırıkları sonucu arteria menengia media yaralanması ile oluşur.
- Çocukta elastisite nedeniyle kırık olmadan da görülebilir.

Subdural hematom

- Pia/araknoid membran ile dura arasındaki boşluğa olan kanama
- Travma sonucu köprü venlerinin hasarı ile oluşur.
- Konkav, suturleri geçebilir



Kontrastsız BT izodens subdural hematom (ok)

FLAIR subdural hematom (ok)

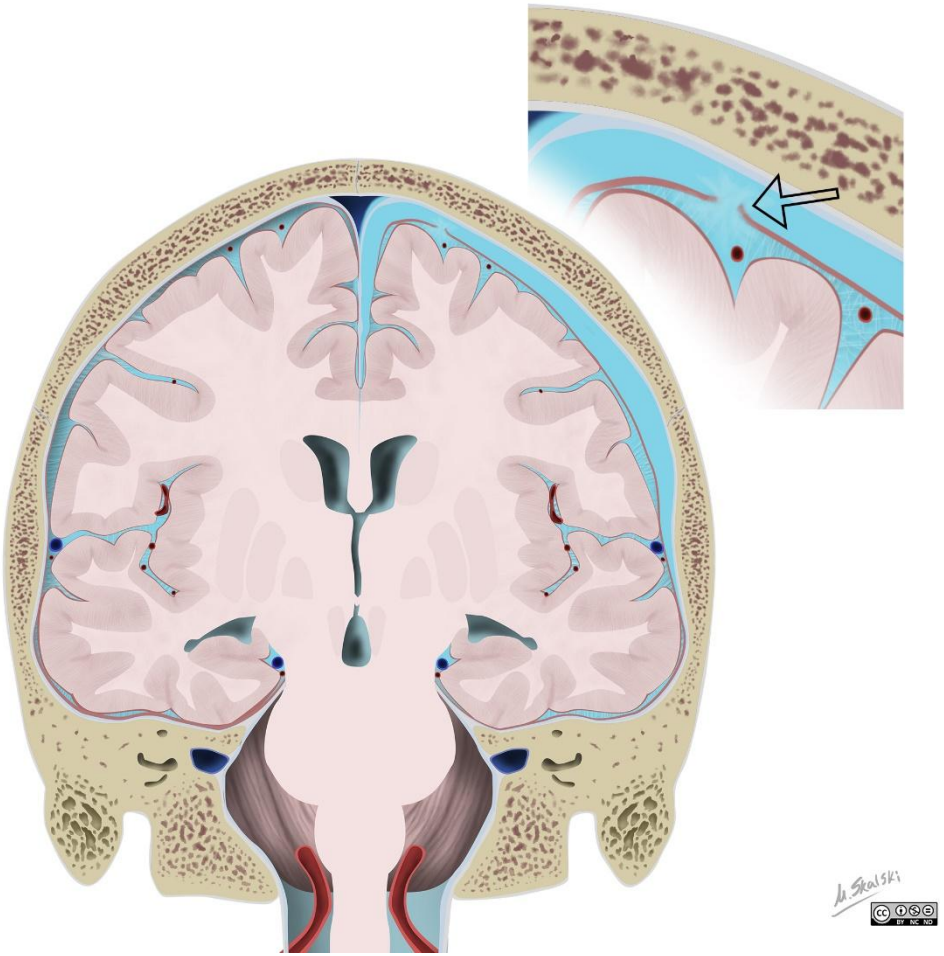


FLAIR farklı evrelerde subdural hematom (ok)

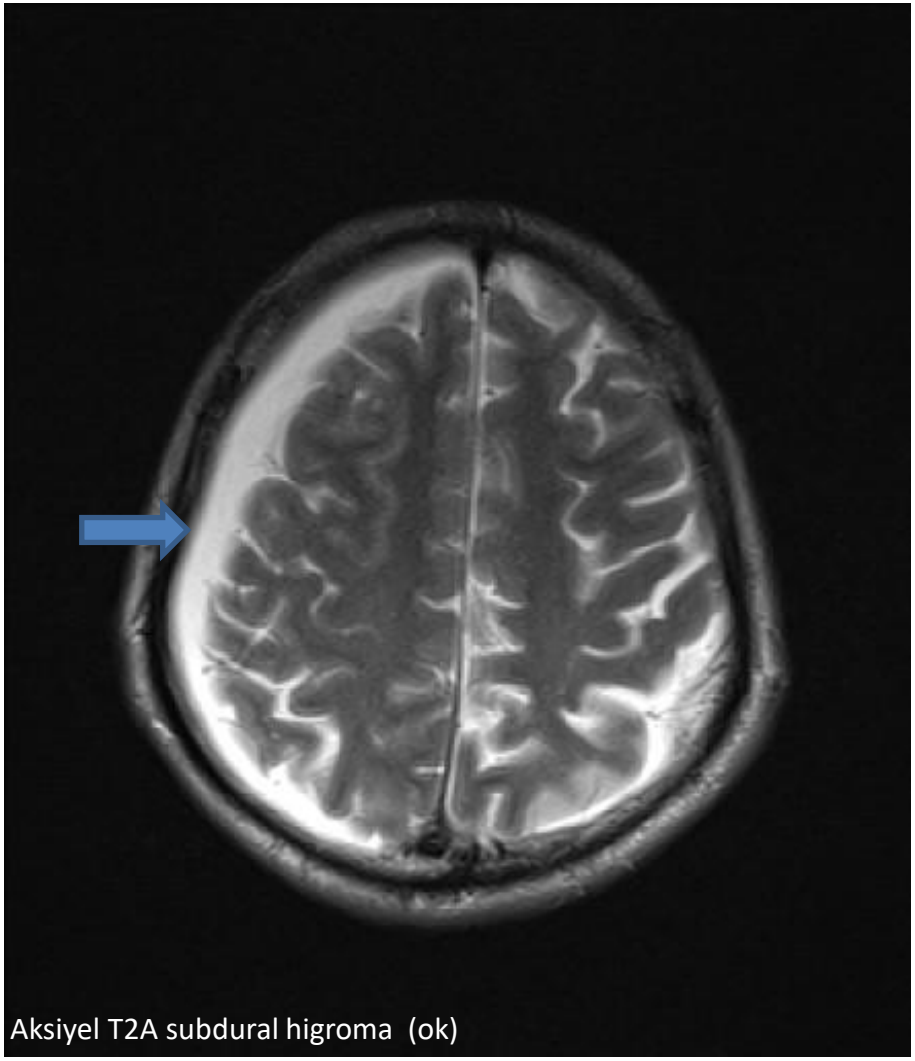
Bir bebek yada çocukta değişik evrelerde subdural hematom görüyorsak dövülmüş çocuk yada çocuk istismarının bulgusu olabilir.

Kanama Evresi	BT (CT)	T1 Ağırlıklı (T1WI)	T2 Ağırlıklı (T2WI)	GRE/SWI
Hiperakut (< 6 saat)	Hiperdens	İzointens – hafif hipointens	Hiperintens	Hipointens kenar
Akut (6–72 saat)	Hiperdens	İzointens	Hipointens	Hipointens kenar, merkeze doğru ilerleyen
Erken subakut (3 gün – 1 hafta)	Hiperdens	Hiperintens	Hipointens	Hipointens
Geç subakut (1 hafta – 1 ay)	İzodens	Hiperintens	Hiperintens	Hipointens
Kronik (> 1 ay)	Hipodens	Hipointens	Hipointens	Ensefalomalazi alanının izo–hiperintens merkezi ve hipointens kenarı

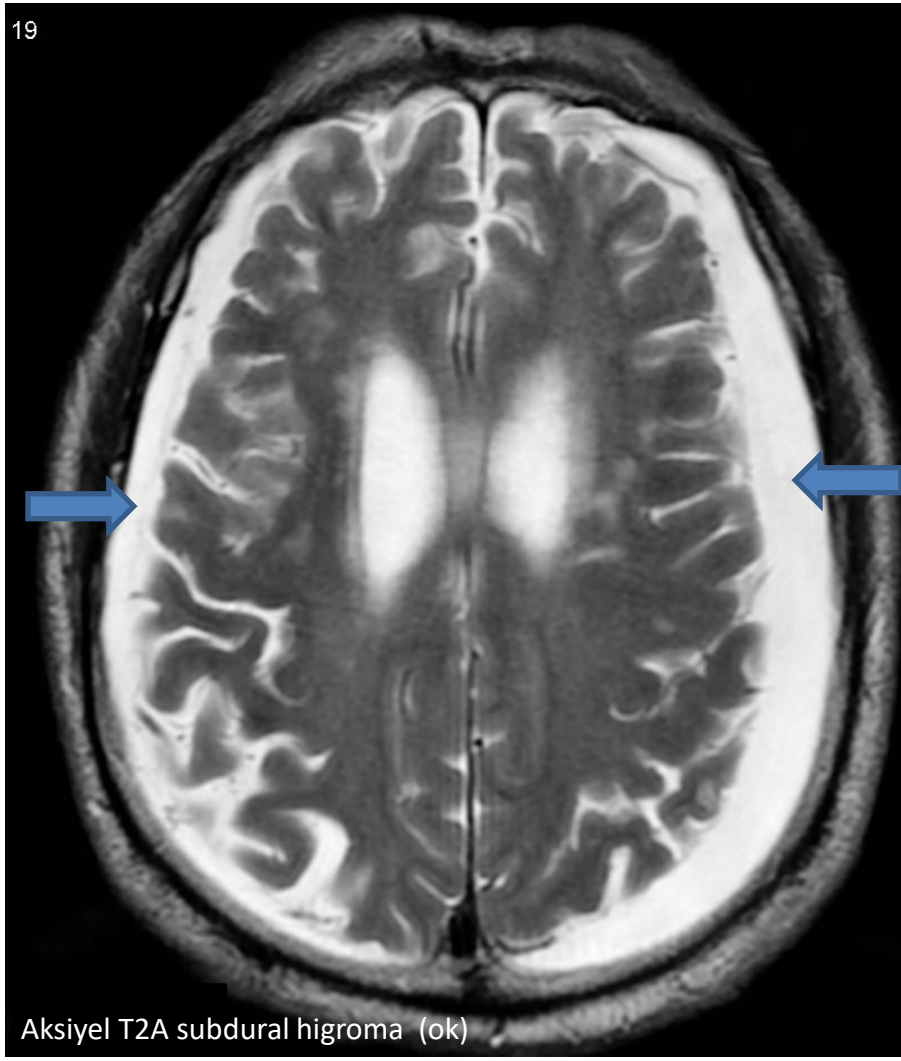
Subdural higroma



- Dura/araknoid membrandaki küçük bir yırtıktan uzanan subdural BOS dolu bir koleksiyon ile tasvir edilir
- Kitle etkisi göstermez
- Kronik subdural hematom
- Serebral arofi
- Araknoid kist
- Bebeklik döneminde subaraknoid boşluğun iyi huylu büyümesi ile karışabilir



Aksiyel T2A subdural higroma (ok)

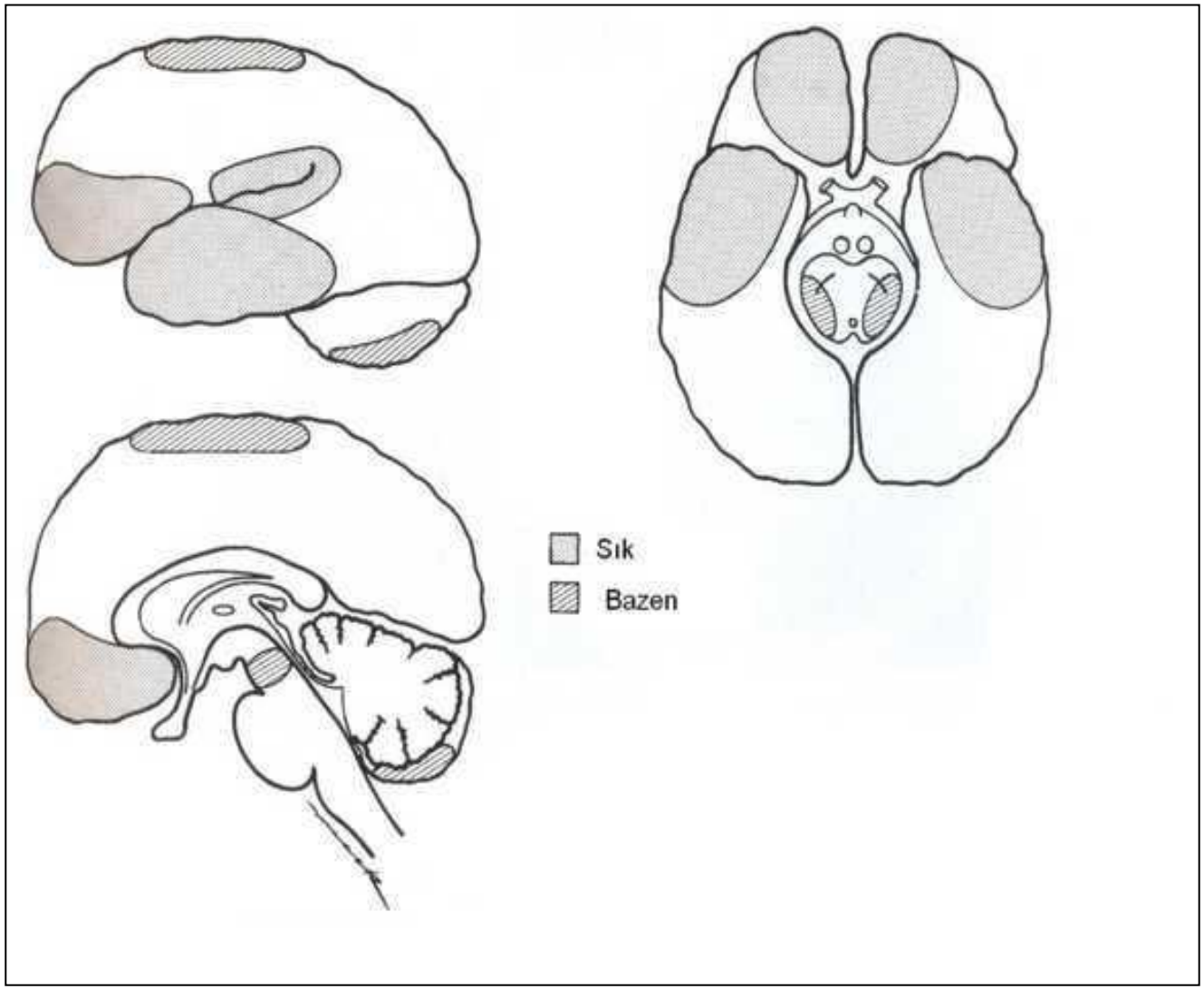


Aksiyel T2A subdural higroma (ok)

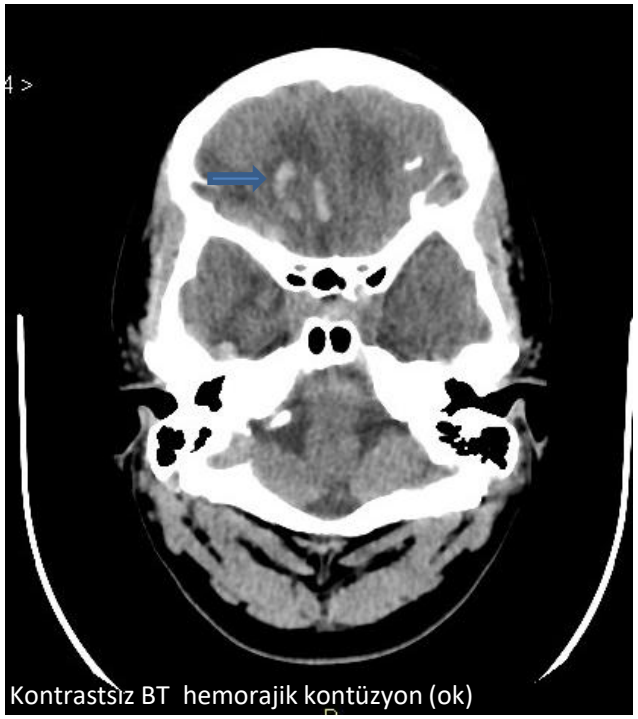
Subdural higroma kitle etkisi yok

Hemorajik kontüzyon

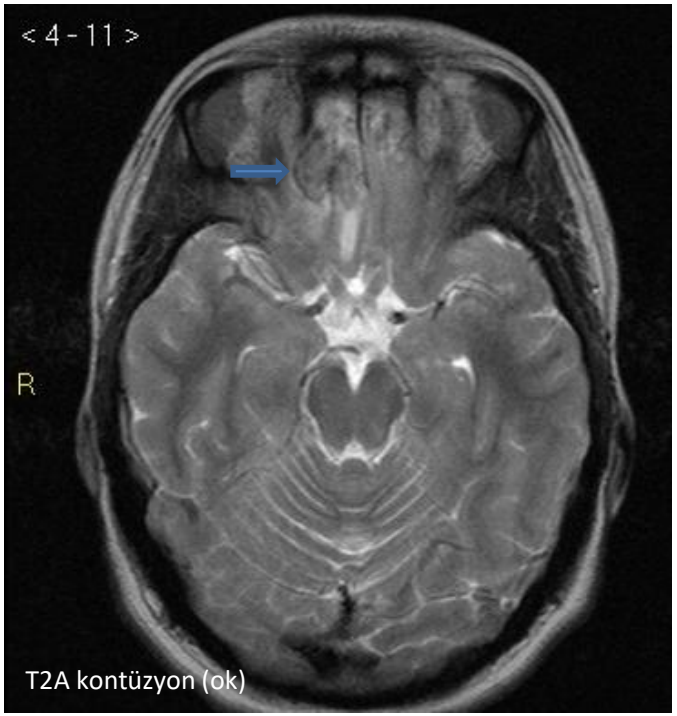
- Petişeyel kanamalara yol açan parankimal hasar
- Genelde korteks etkilenir, beyaz cevhere de uzanabilir
- Subdural, subaraknoid mesafeye açılabilir
- Frontal lobların anterior, inferior ve lateral yüzleri temporal loblarda daha sık



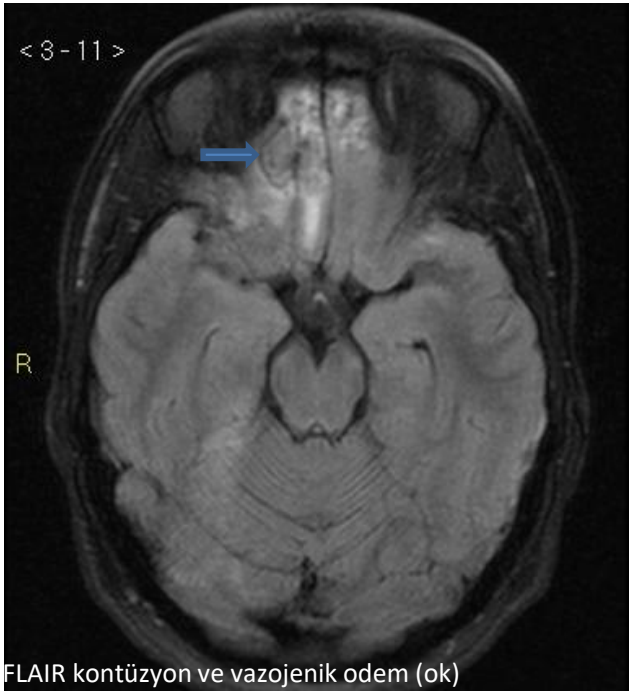
Kontüzyona bağlı beyin hasarlarının tipik lokalizasyonları



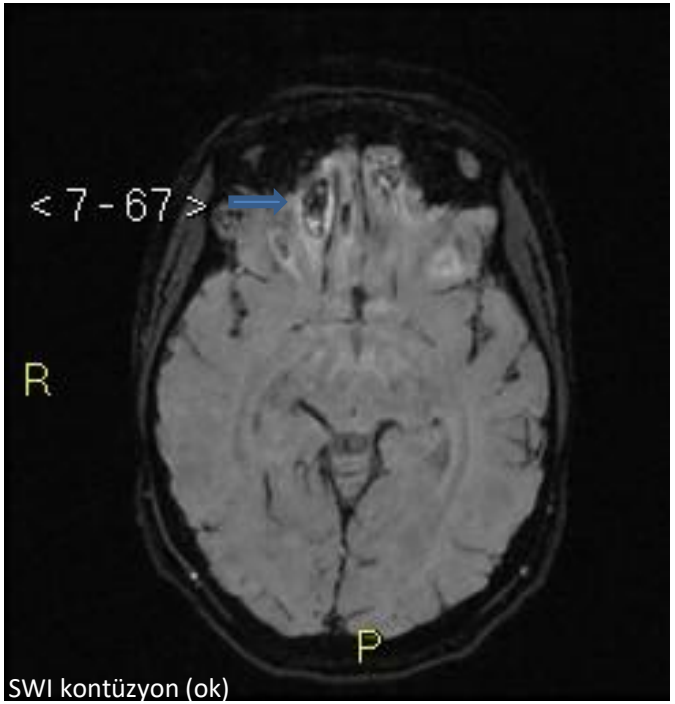
Kontrastsız BT hemorajik kontüzyon (ok)



T2A kontüzyon (ok)



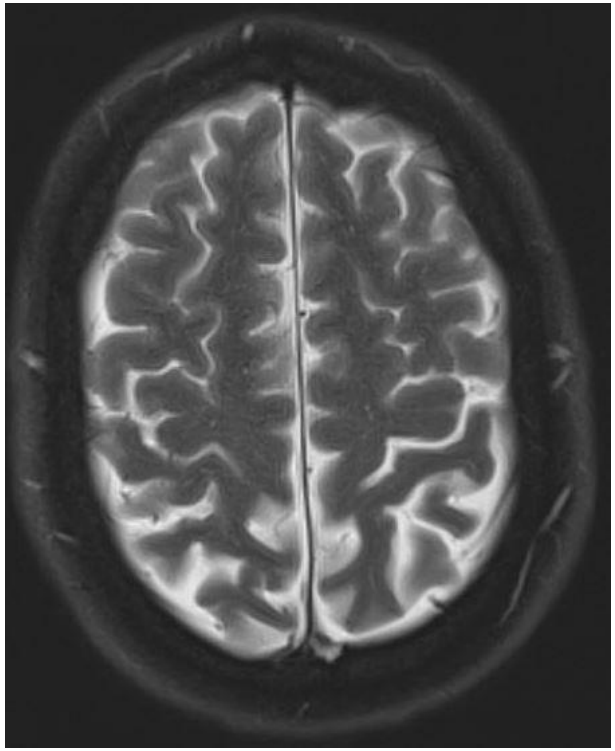
FLAIR kontüzyon ve vazojenik odem (ok)



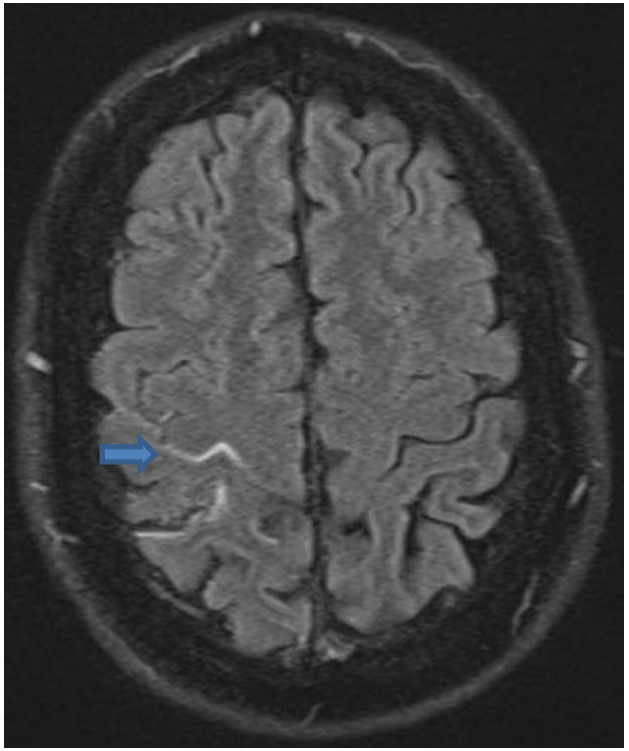
SWI kontüzyon (ok)

Subaraknoid kanama

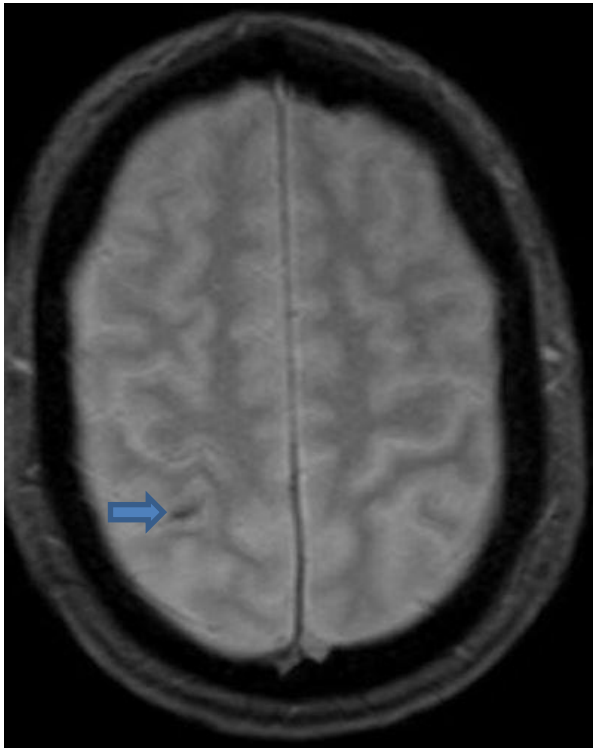
- Araknoid ve pia arası mesafaye kanama
- %50-70 anevrizma rüptürü sonucu olur
- Diğer nedenler
  - **Travma**
  - Hemorajik tümör
  - AVM
  - Kanama diyatezleri
- Fokal yada diffüz olabilir, epidural subdural kanama komşuluklarında görülebilir
- MRG de FLAIR sekans, Gradient, SWI sekans



T2A subaraknoid hemoraji bulgusu yok

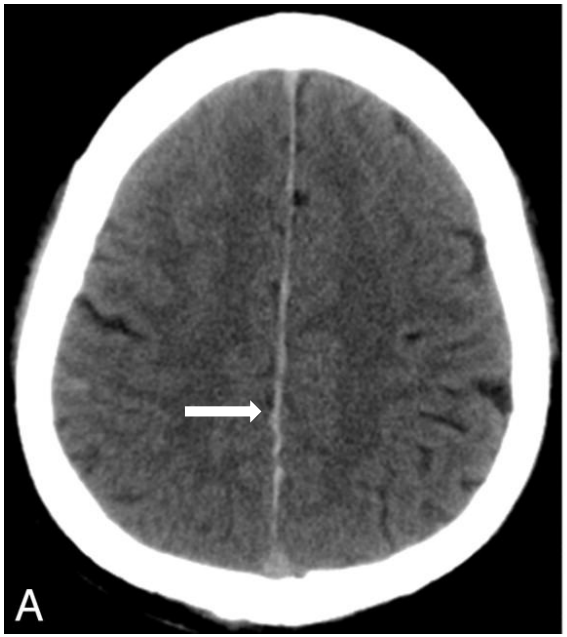


FLAIR subaraknoid hemoraji (ok)

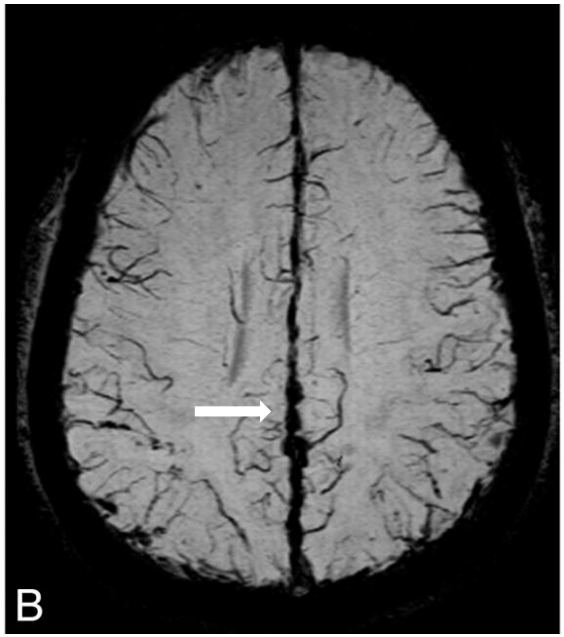


Gradienteko subaraknoid hemoraji (ok)

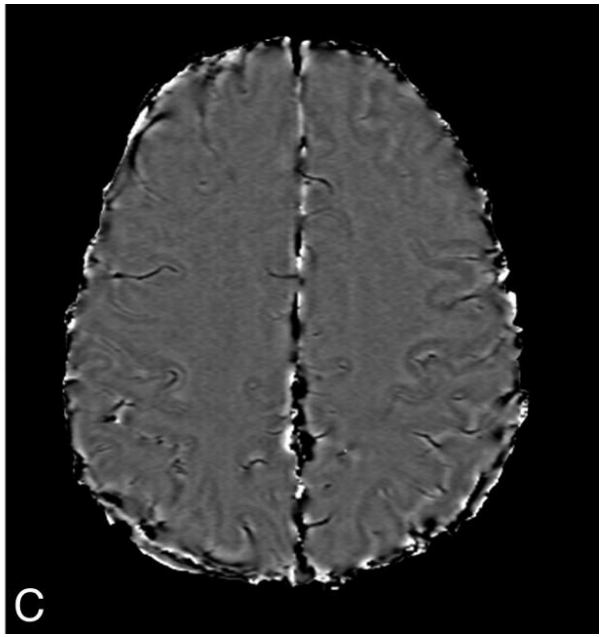
Subaraknoid kanama T2A negatif FLAIR ve Gradient eko sekanslar küçük veya şüpheli intrakranial hemorajileri gösterebilir.



BT falksta kalınlaşma (ok)



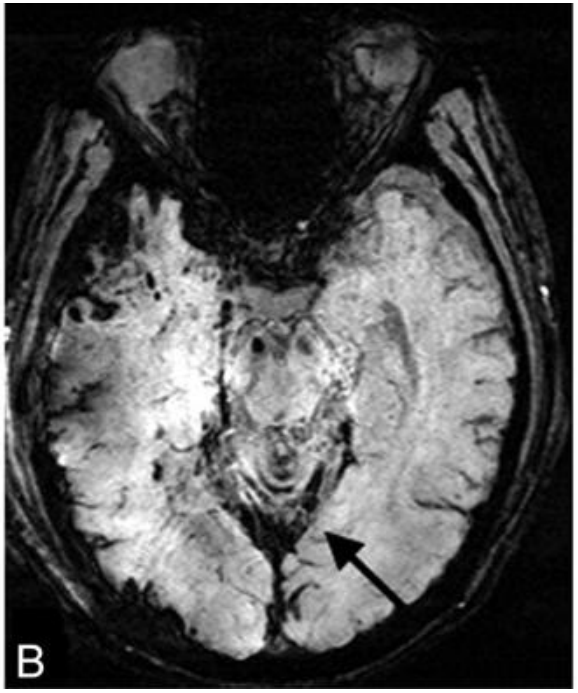
SWI da daha net (ok)



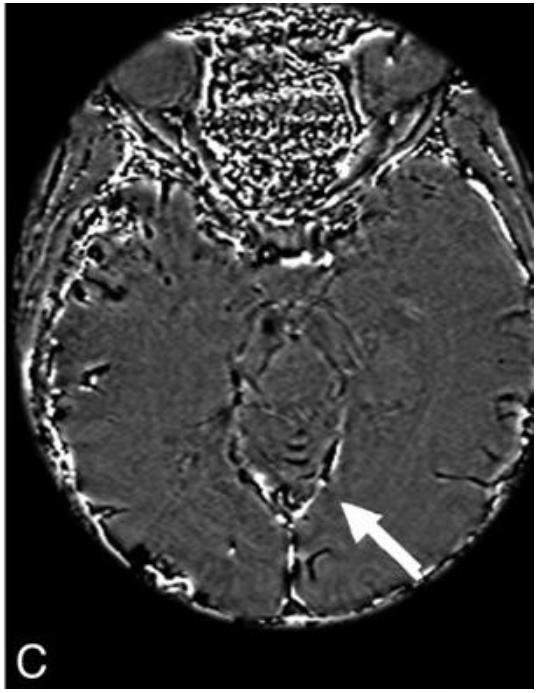
SWI faz görüntü



BT tentoriumda kalınlaşma (ok)



SWI da daha net (ok)



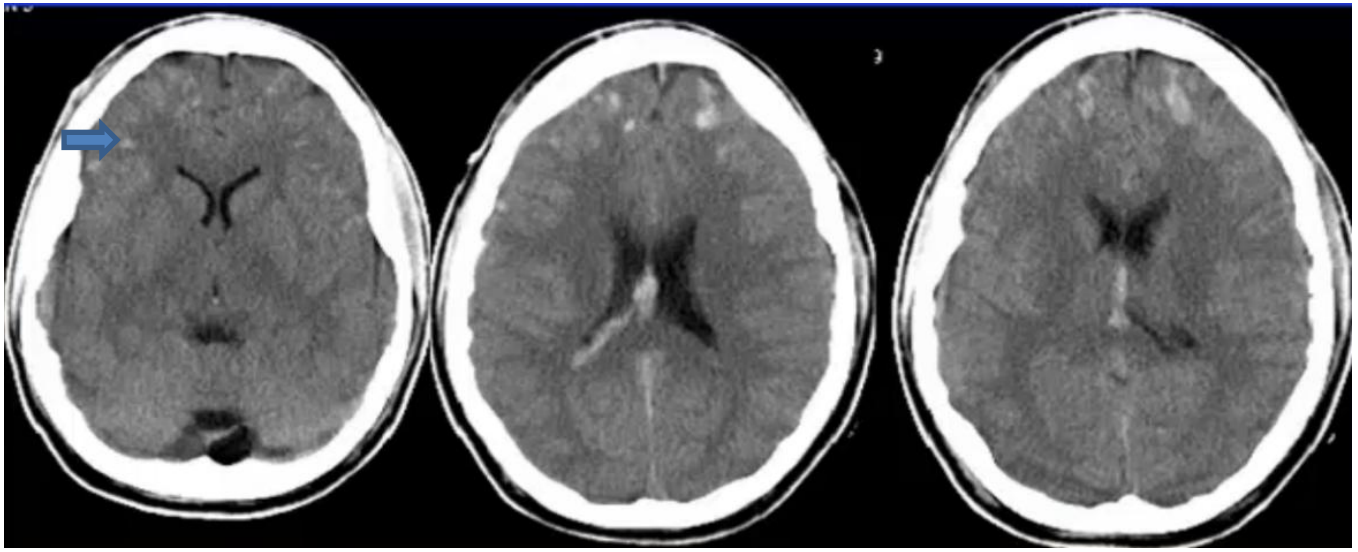
SWI faz görüntü

Diffüz aksonal zedelenme

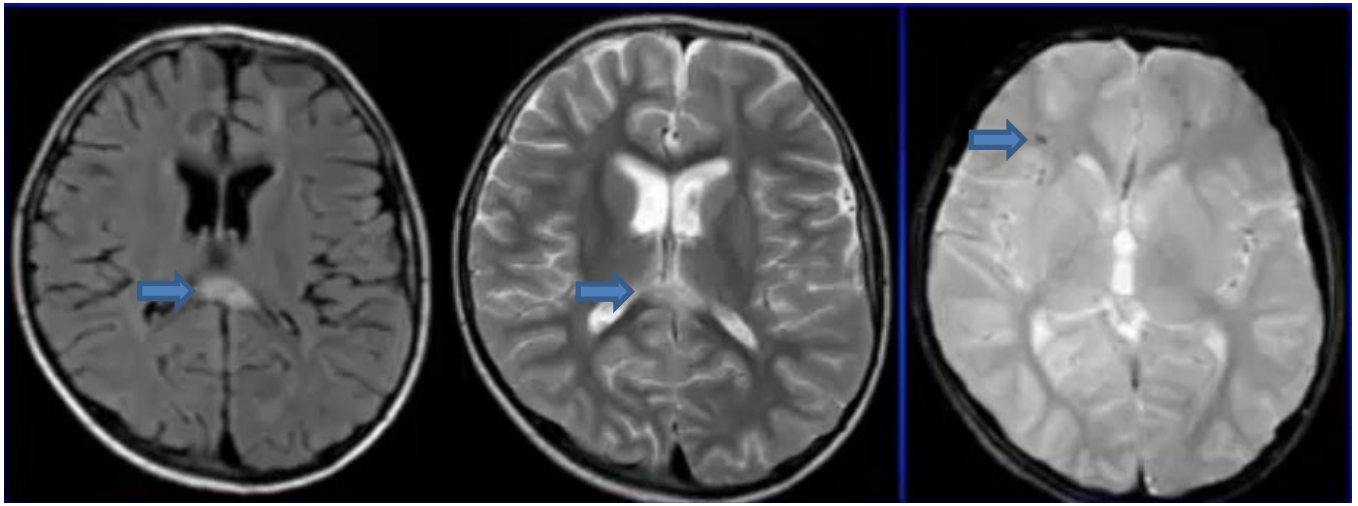
- Kafa travmalarında, özellikle araç içi trafik kazalarında koma ve ağır prognoz açısından en ödemli patolojilerden biri
- Rotasyon, akselerasyon/deselarasyona bağlı oluşur
- Klinik durum ilk görüntüleme ile uyumsuz

Diffüz aksonal zedelenme

- Gri ve beyaz cevher bileşkesi
- Korpus kollozum (en sık splenium)
- Beyin sapı (kötü prognoz)
- İnternal kapsül
- Superior serebellar pedinkül
- BT lezyonları göstermede yeterince duyarlı değil
- Lezyonları büyük kısmı hemorajik değildir.
- MRG özellikle gradient eko ve SWI en hassas yöntemlerdir



BT multiple kanama alanları (ok)



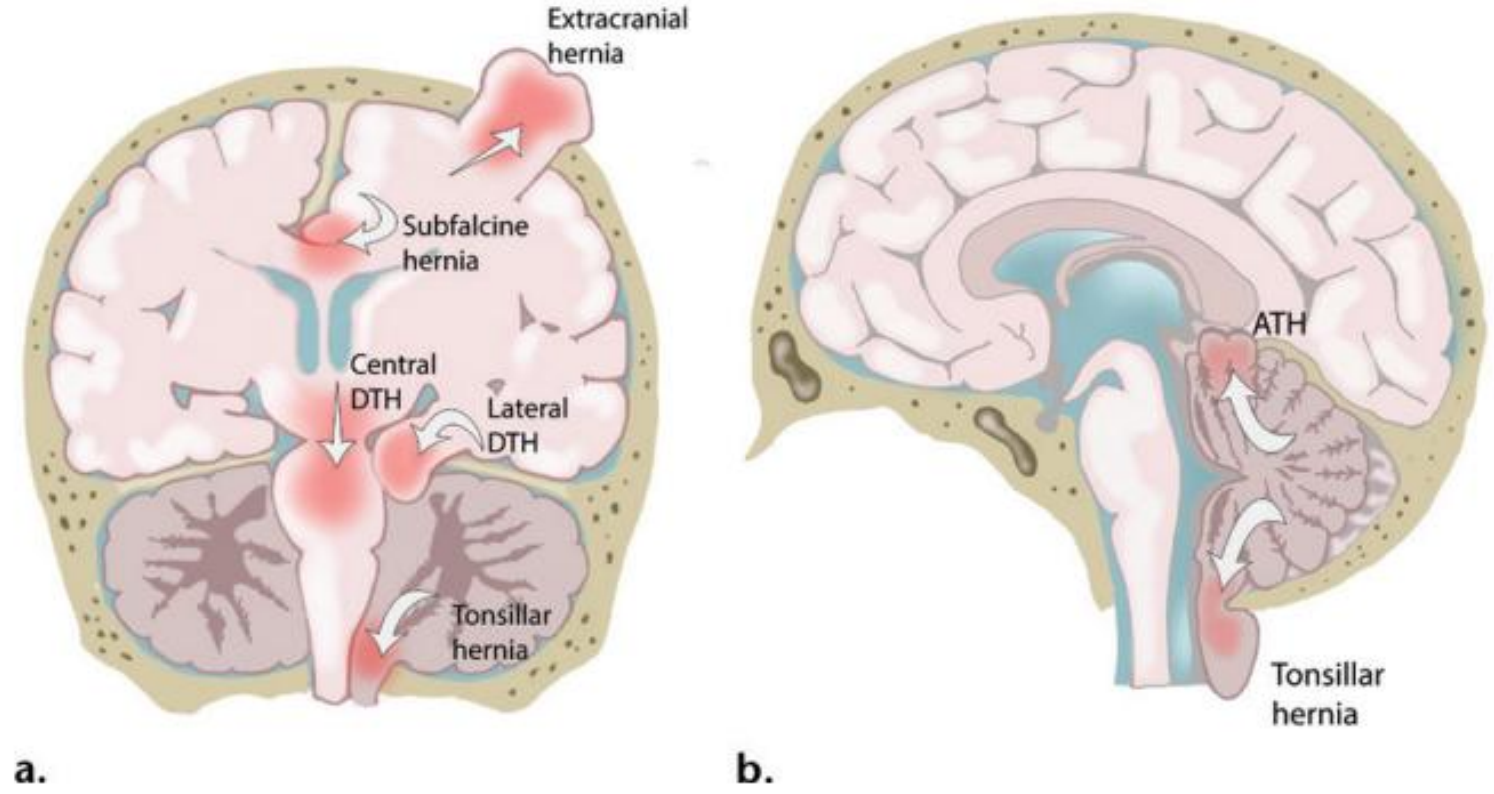
FLAIR ve T2A korpus kollozumda hiperintens alan (ok)

Gradientekoda milimetrik alanlar(ok)

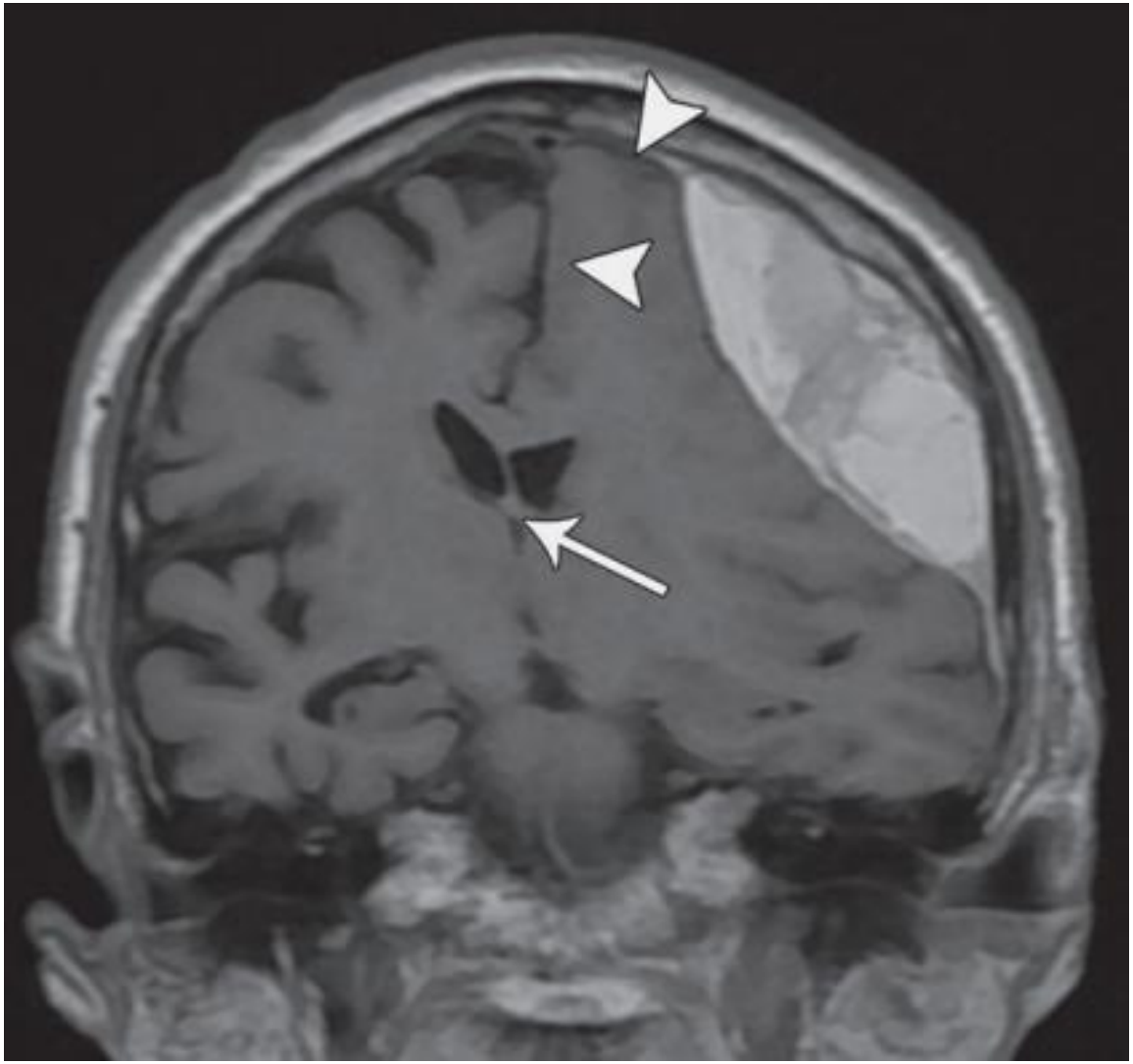
Kafa travmalarında sekonder hasar olabilir

- İntrakranial basınç artışı
- Enfeksiyon
- Hipoksi
- Enfarkt
- Herniasyon
- Arteriyel yapılarda diseksiyonlar

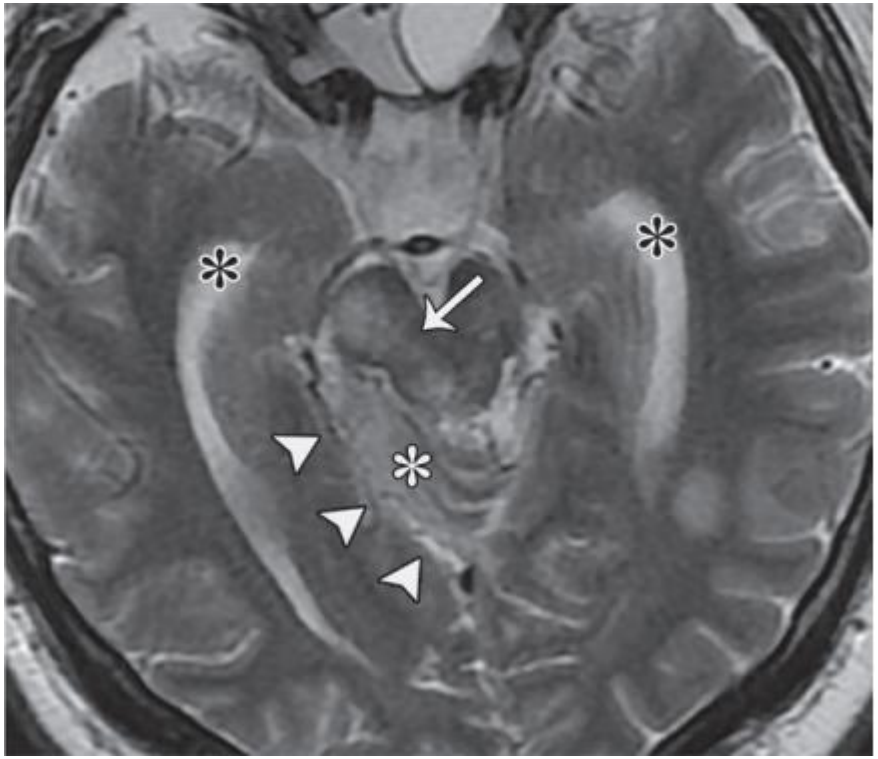
gelişebilir.



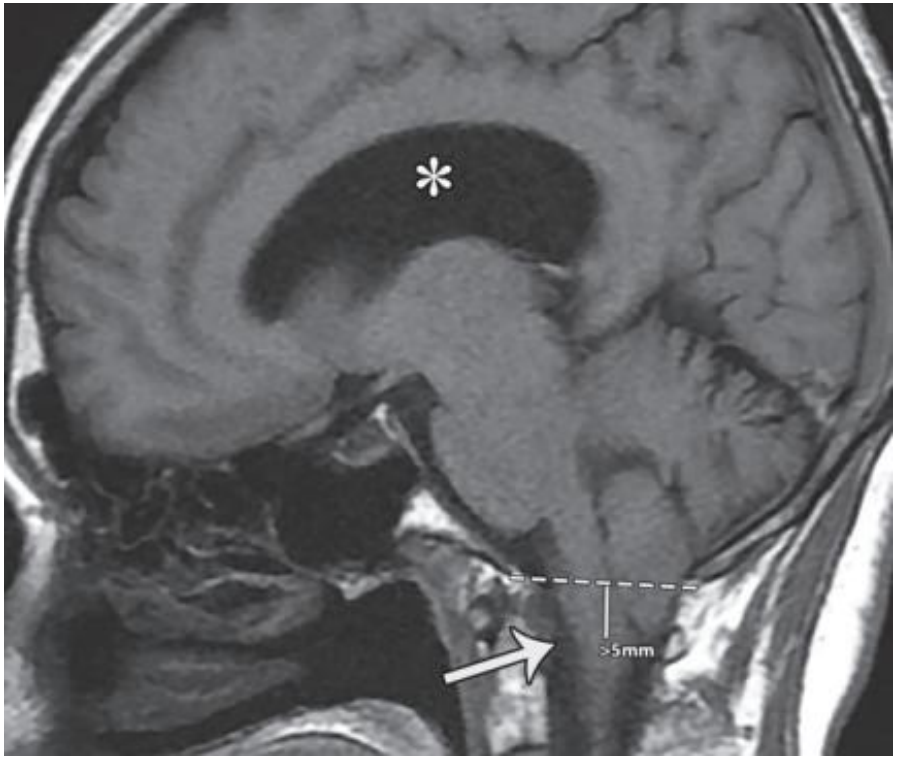
ATH ascending transtentorial herniation, DTH descending transtentorial herniation



Koronal T1A hematom, subfalsian herinasyon.
Formen monroya bası (ok)



Aksiyal T2A transtentorial herniasyon mezensefelona bası (ok), hidrosefali (yıldız)

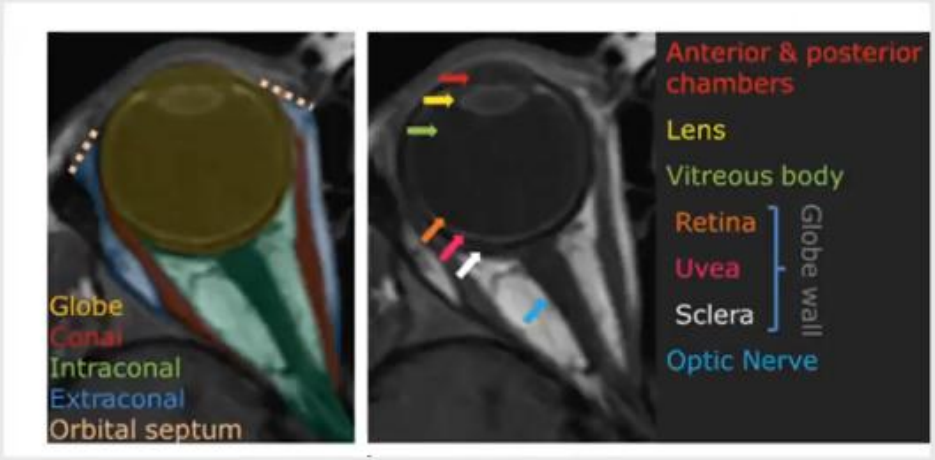


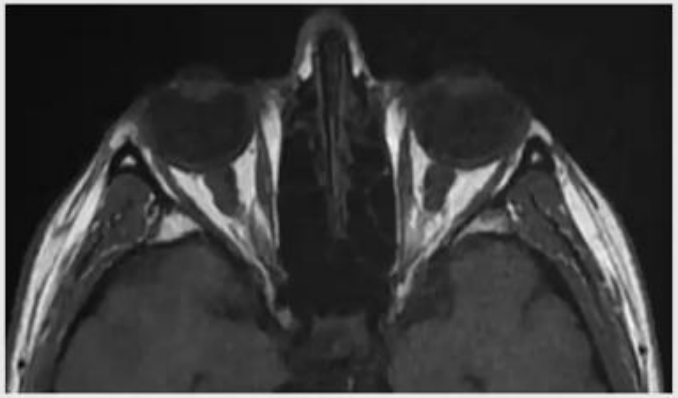
Sagital T1A tonsiler herniasyon (ok)

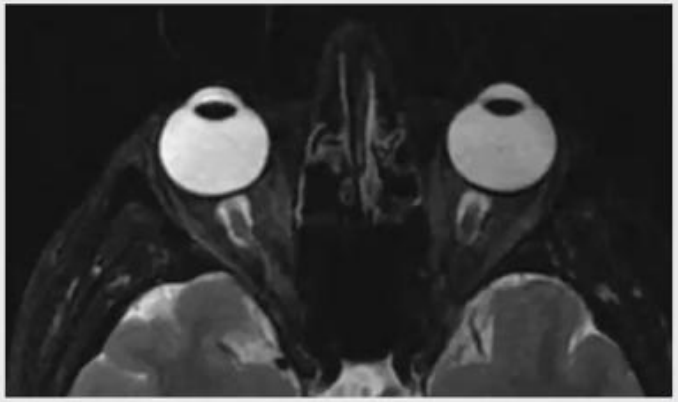
Orbital yaralanmalar

Yumuşak doku

- 4 kompartman
- Bulbus oküli
- Konal
- Ektrakonal
- İntrakonal

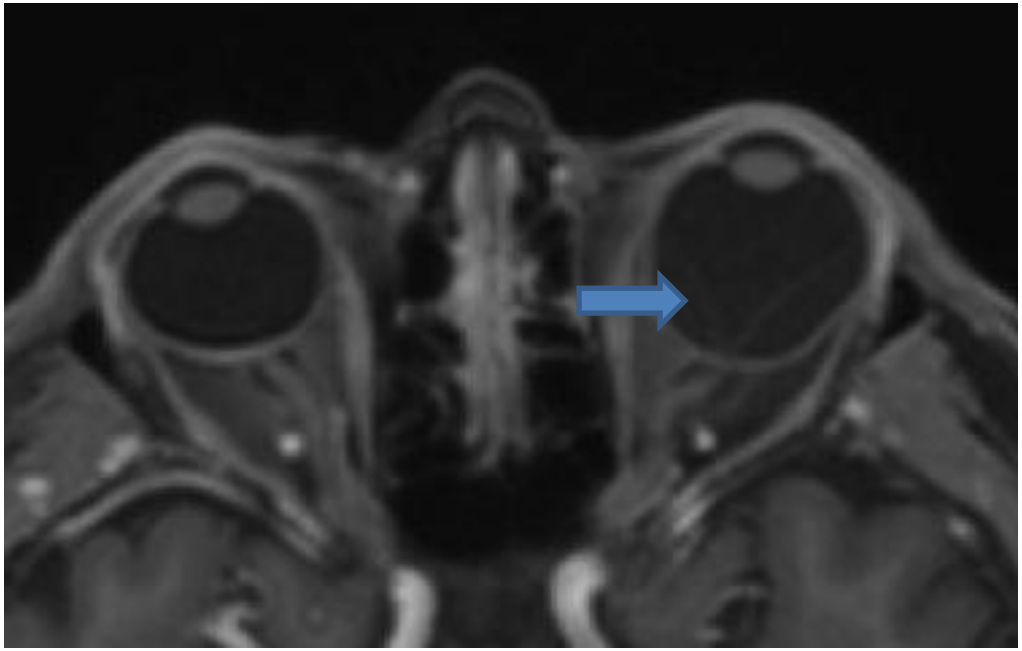




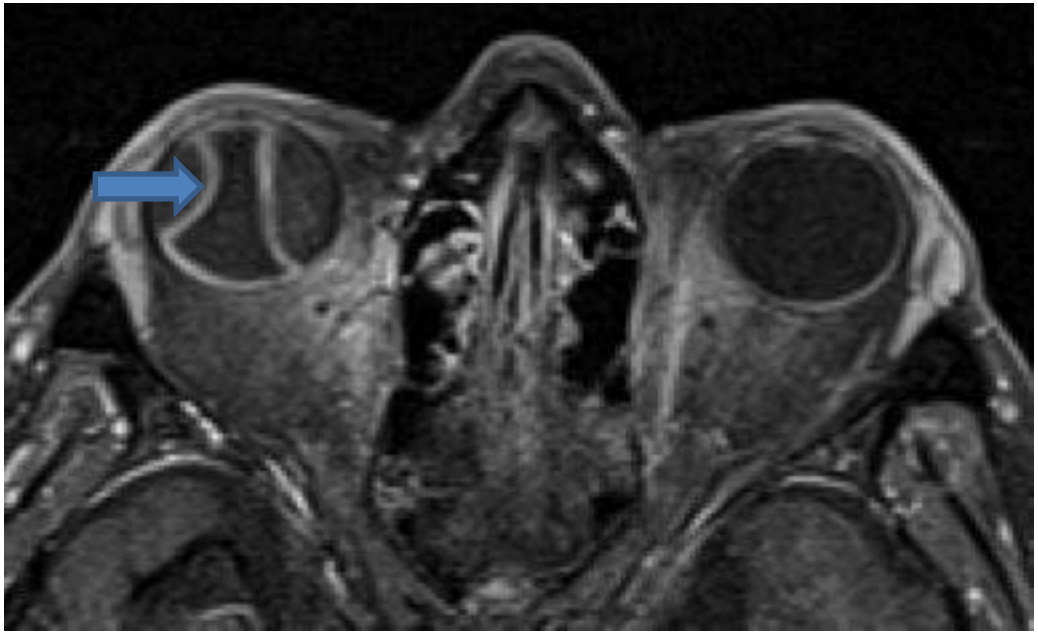




Yabancı cisim dışlanmalı

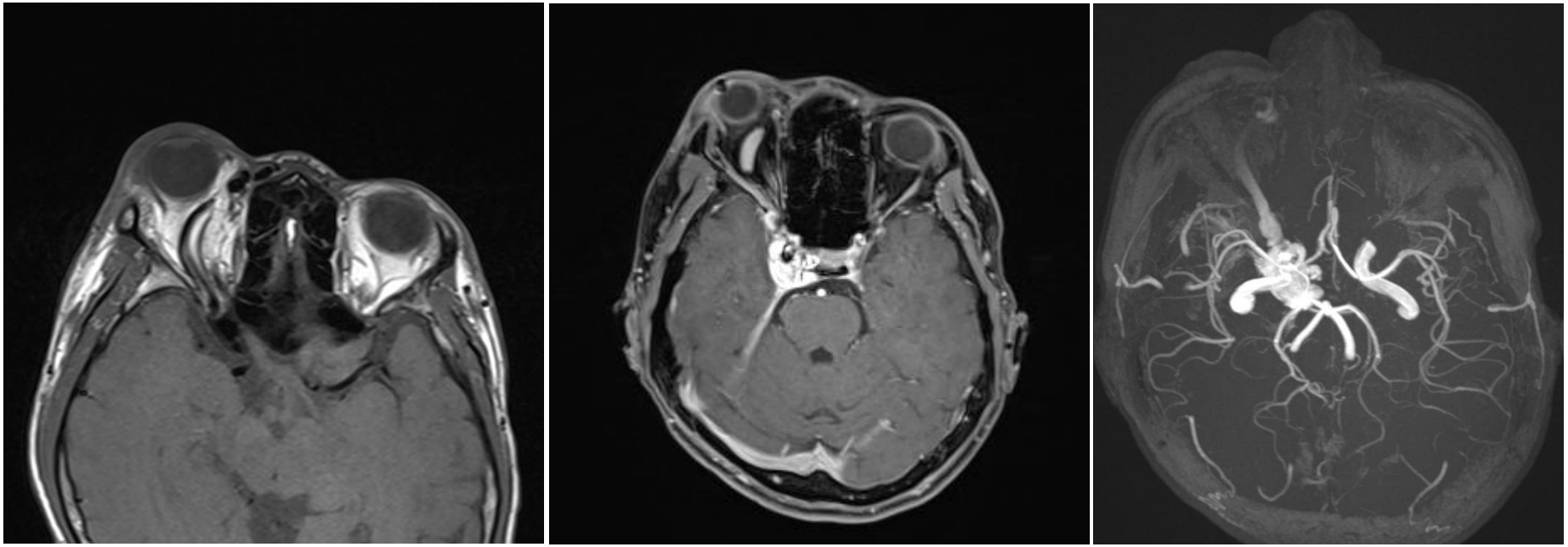


Aksiyel T1A kontrastlı retinal dekolman (ok)



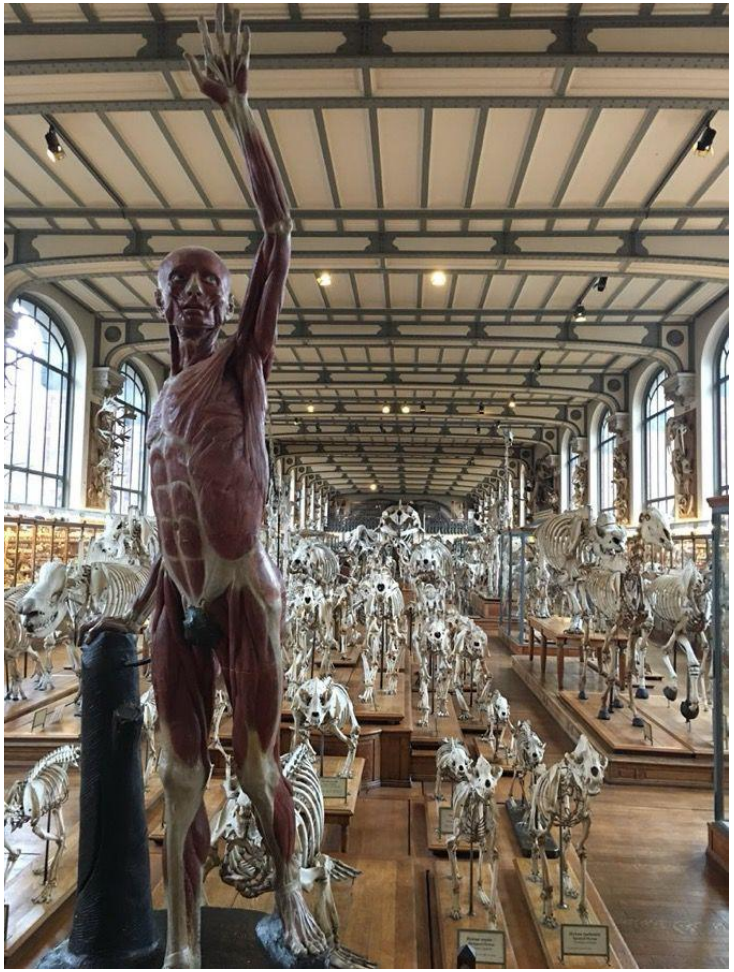
Aksiyel T1A kontrastlı koroidal dekolman (ok)

Karotikokavernöz fistül



Travma sonrası olgu: Proptozis, genişlemiş oftalmik ven, kavernoz sinüste genişleme

Kas iskelet sistemi travmaları



Skafoid

- Kırıklar direek grafide % 16 oranında görülmeyebilir
- Skafoid kırığı direkt grafide görülmezse 1 hafta sonra kontrol grafi, klinik varsa MRG
- Distalden beslenir özellikle proksimalde avasküler nekroz gelişebilir.

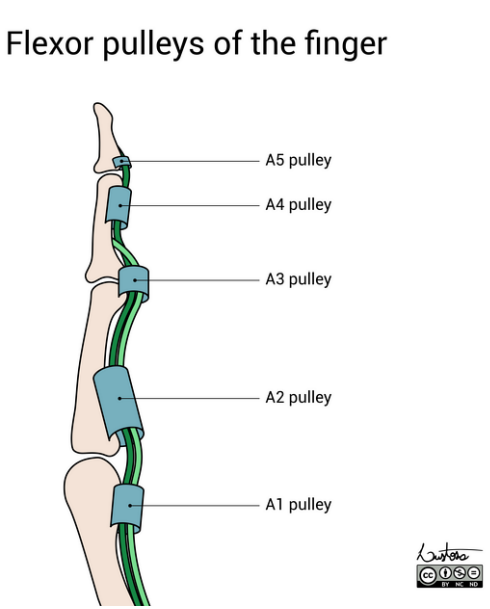


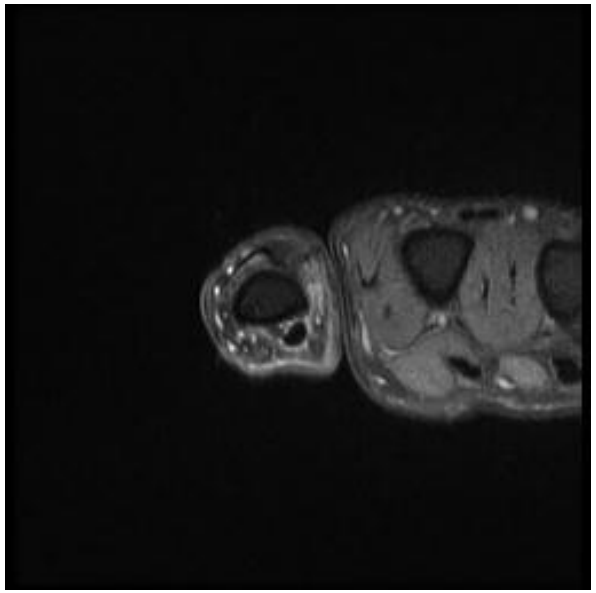
Direkt grafide belirsiz

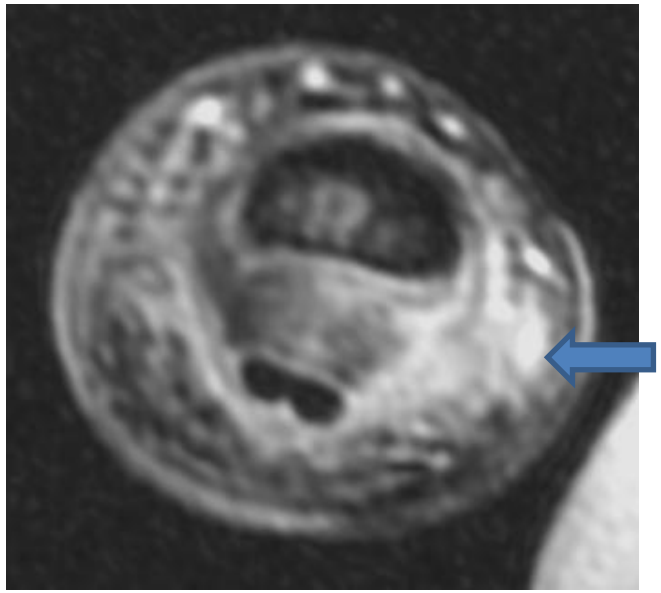


T2A yağ baskılı kemik iliği ödemş ve fraktür (ok)

El-El bileği ligament injurileri







T2A yağ baskılı 1. parmak pulley injury (ok)

El bileği Triangular fibrokartilaj injury

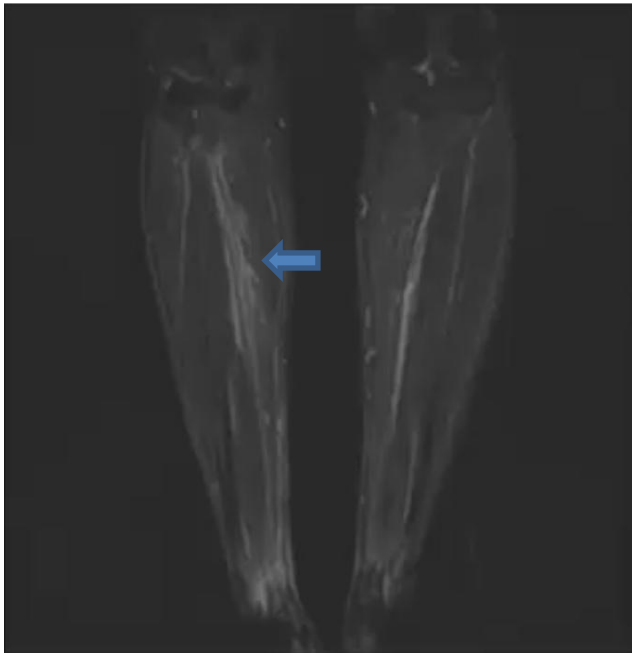




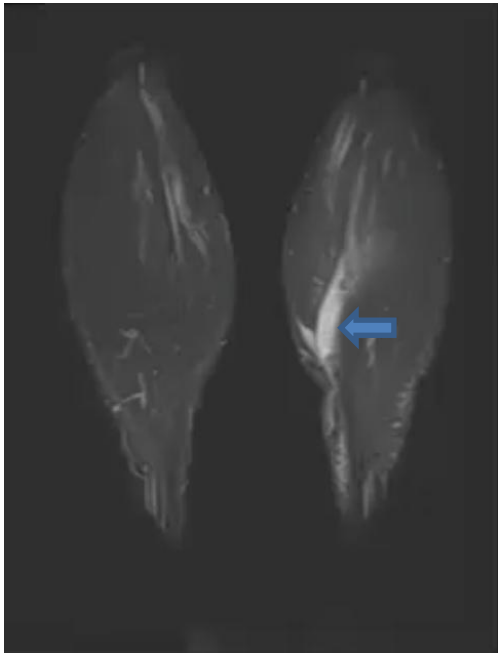
STIR TFCC yırtığı

Kas-Tendon yaralanmaları

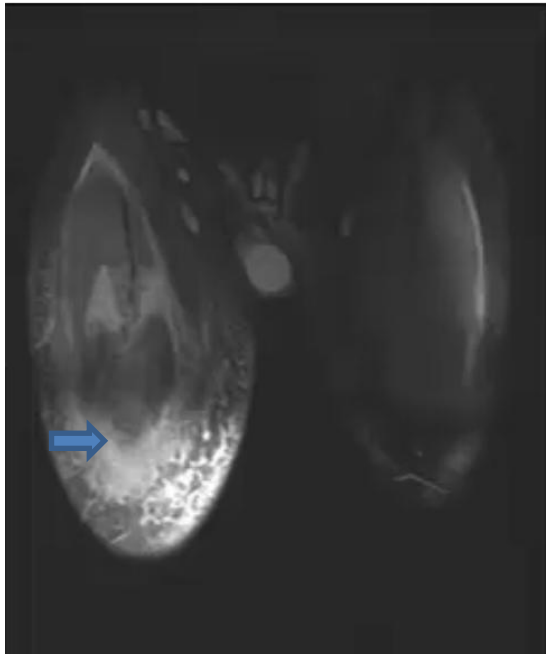
- Grade 1: Birkaç kas liflini etkiler
- Grade 2: Parsiyel yırtık
- Grade 3: Komplet yırtık



T2A yağ baskılı grade 1 injury tüy görünümü (ok)

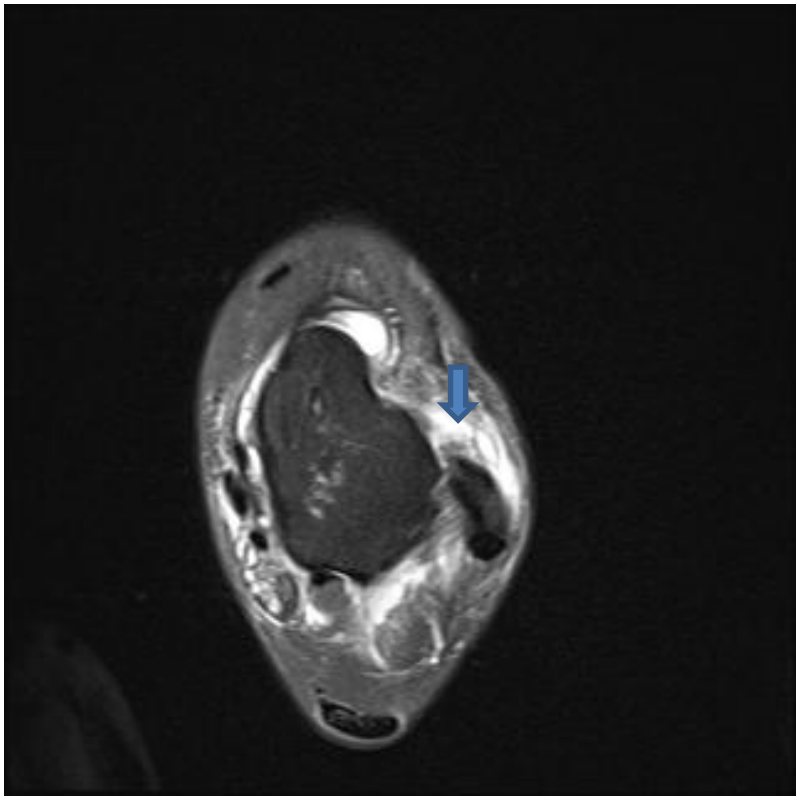


T2A yağ baskılı grade 2 injury (ok)

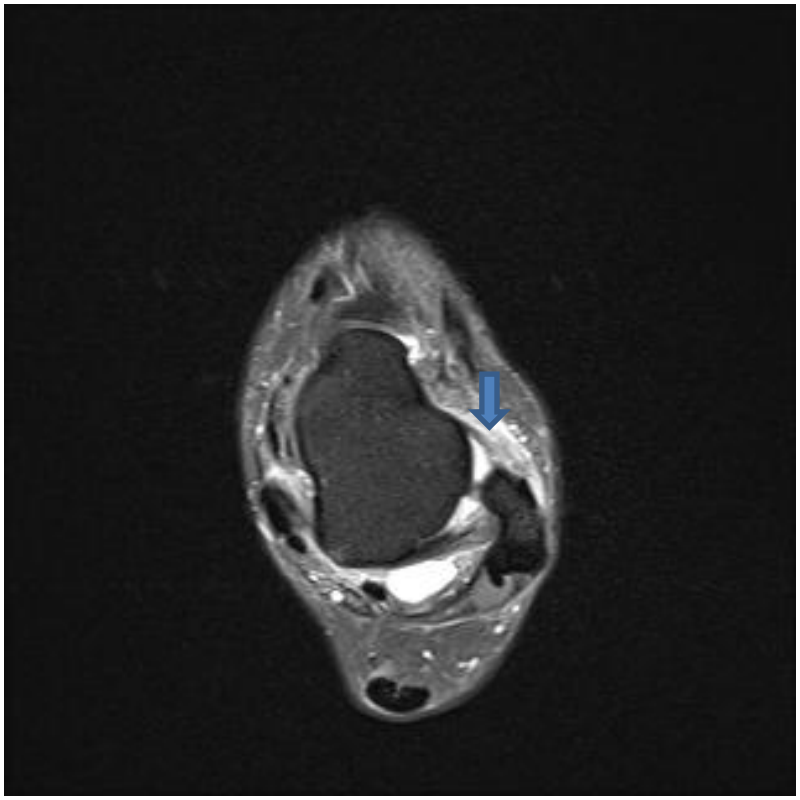


T2A yağ baskılı grade 3 injury (ok)

Anterior talofibular bağ yaralanması
Travmada en sık yaralanan bağ

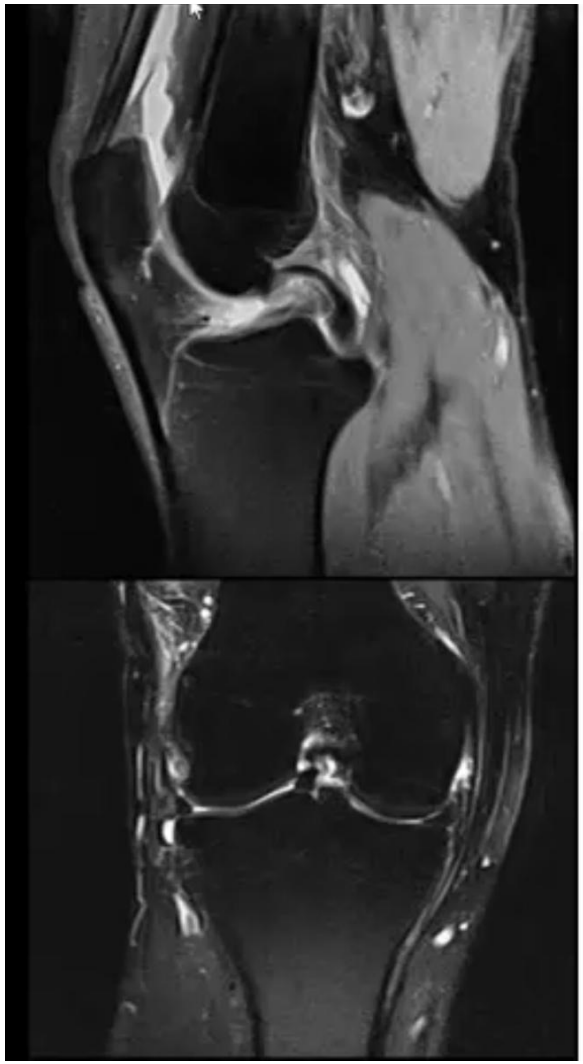


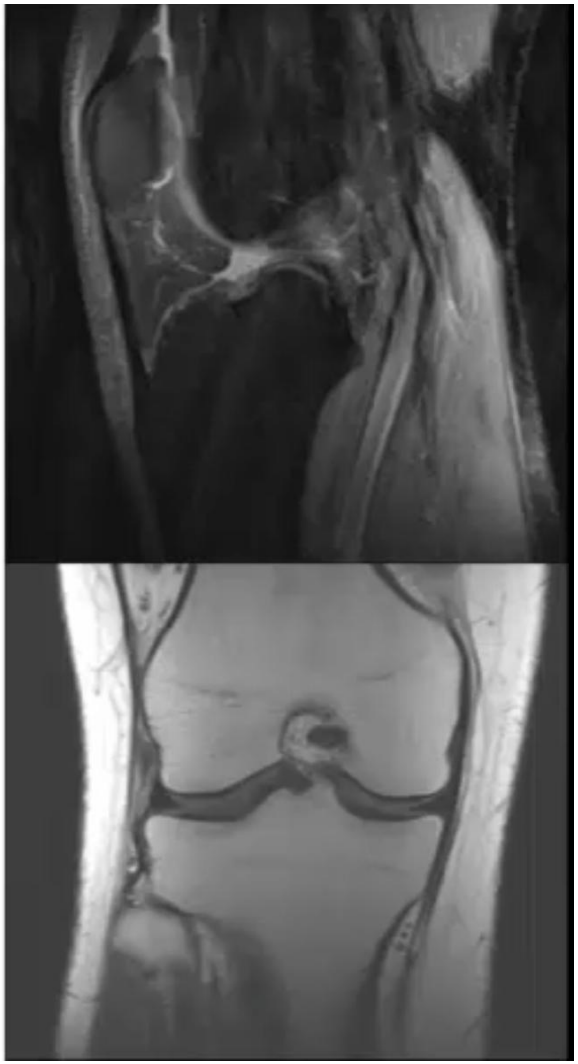
T2A yağ baskılı grade 3 komplet (ok)



T2A yağ baskılı grade 2 parsiyel yırtık (ok)

Ön çapraz bağ yırtığı





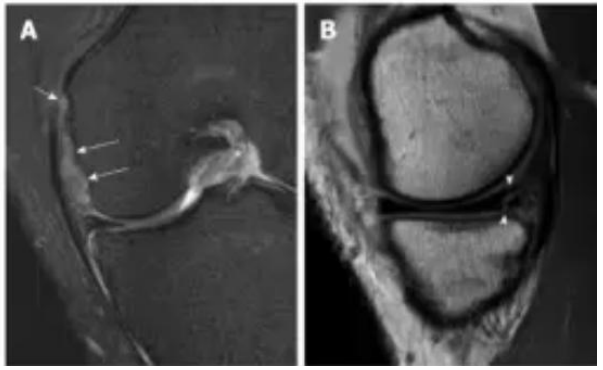
PD yağ baskılı ön çapraz bağ yırtığı (ok)

Ön çapraz bağ yırtığı indirekt bulgular





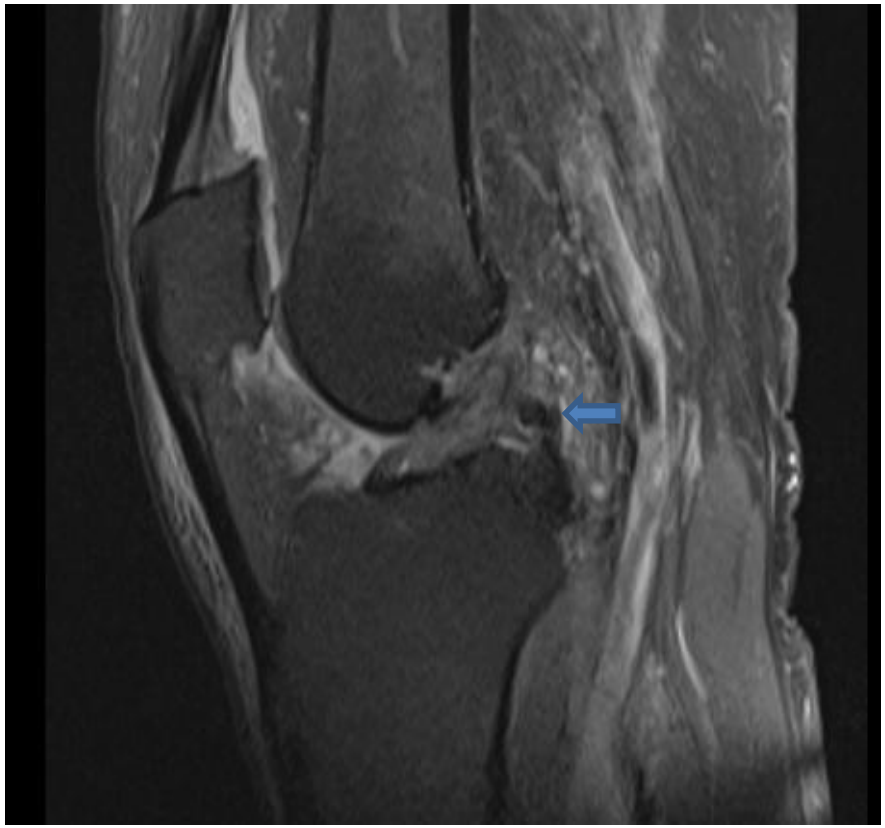




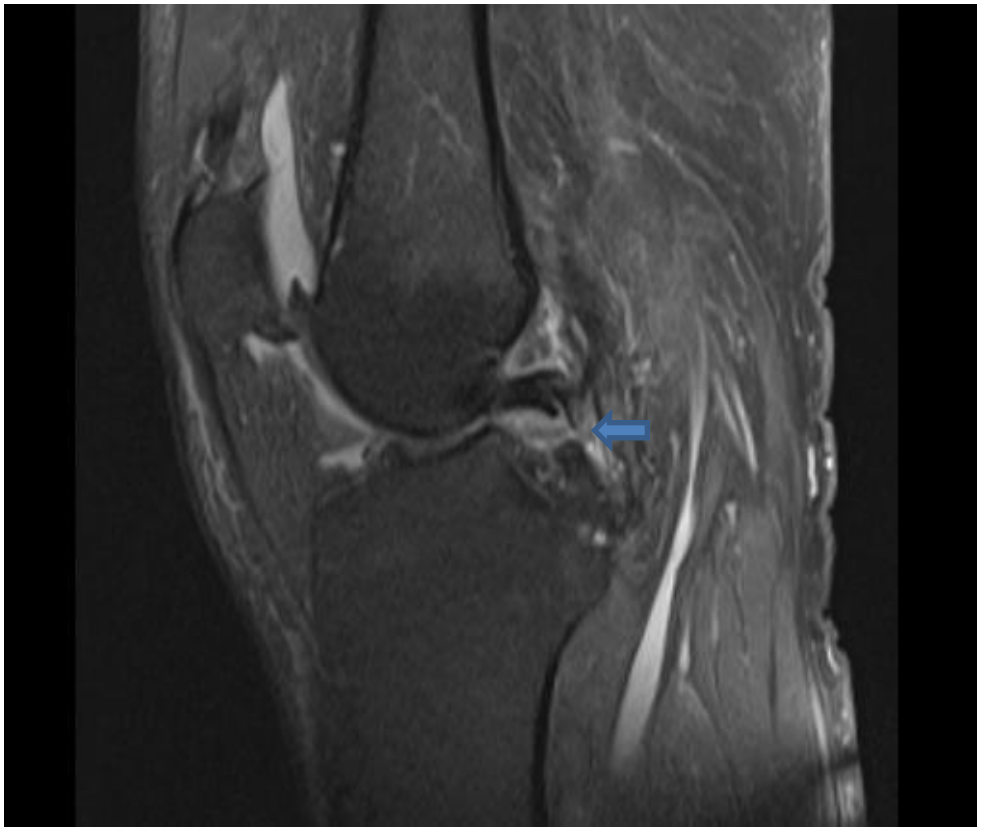
- Efüzyon
- Tibiada avulsiyon
- Lateral femoral kondilde impaksiyon

- Segond fraktürü
- LCL
- Menisküs yırtığı

PCL Rüptür



PD yağ baskılı arka çapraz bağ yırtığı (ok)



PD yağ baskılı arka çapraz bağ yırtığı (ok)

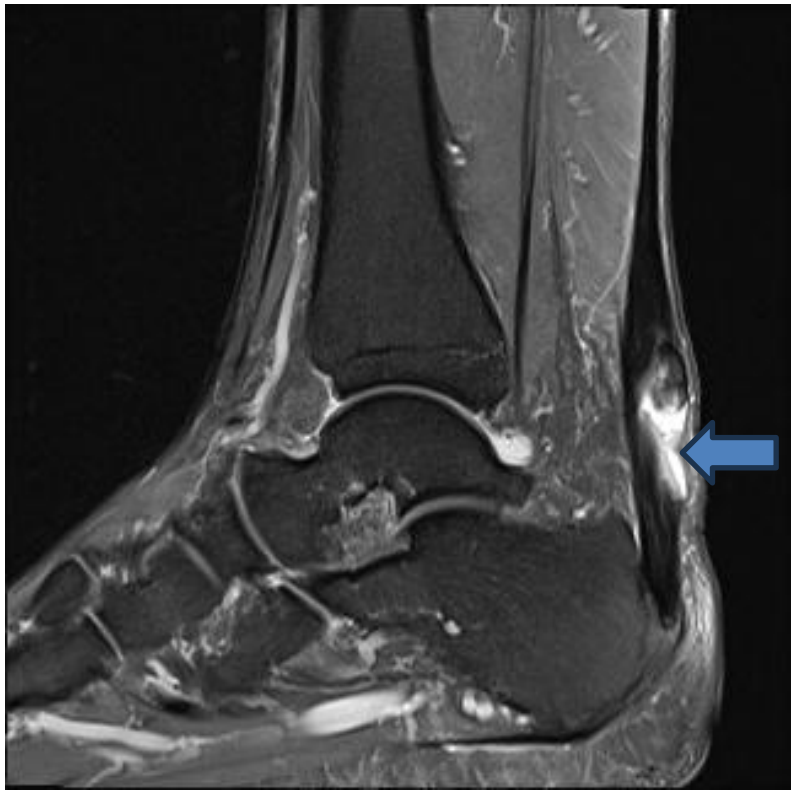


PD yağ baskılı LCL rüptürü (ok)

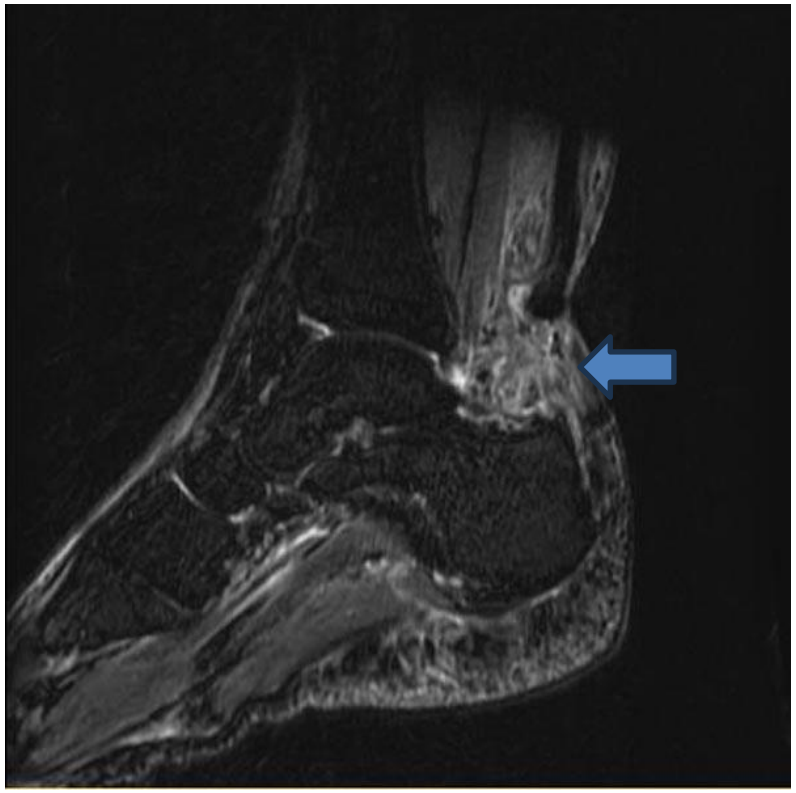


PD yağ baskılı MCL rüptürü (ok)

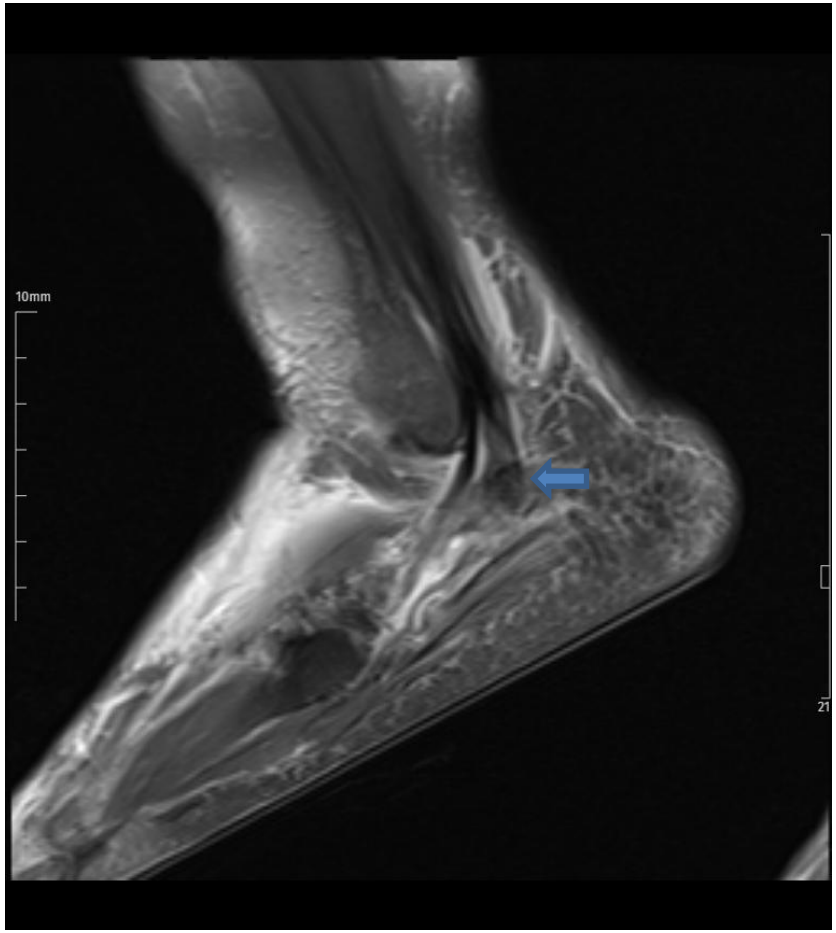
Aşil tendon yırtığı

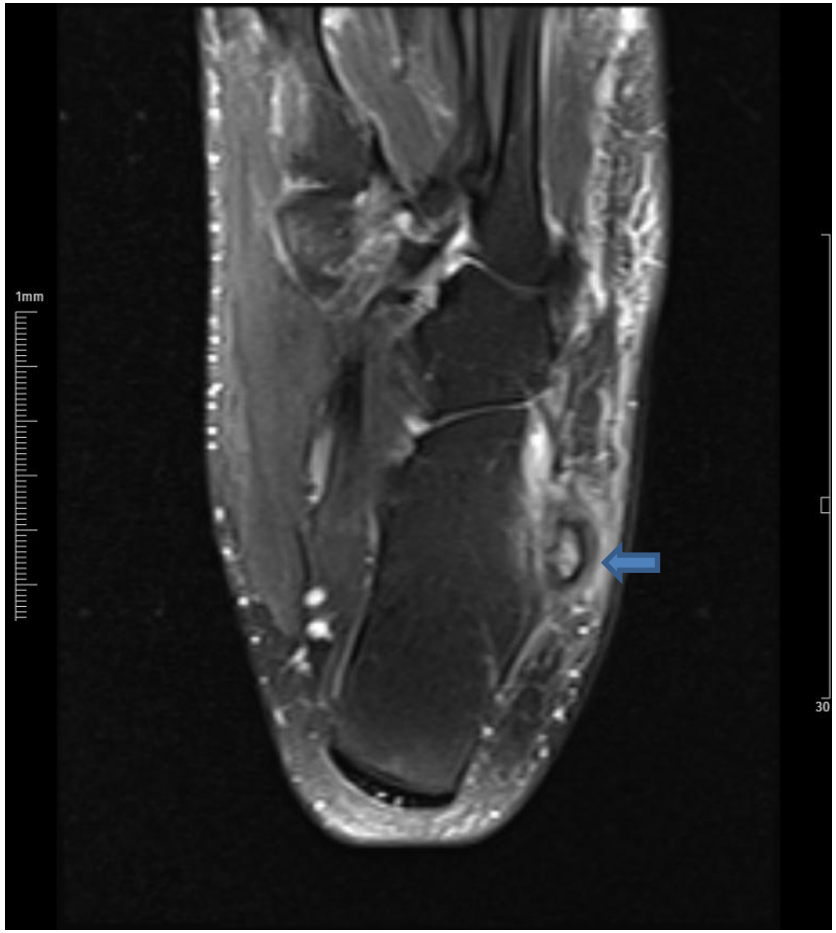


T2A yağ Parsiyel aşil yırtığı (ok)



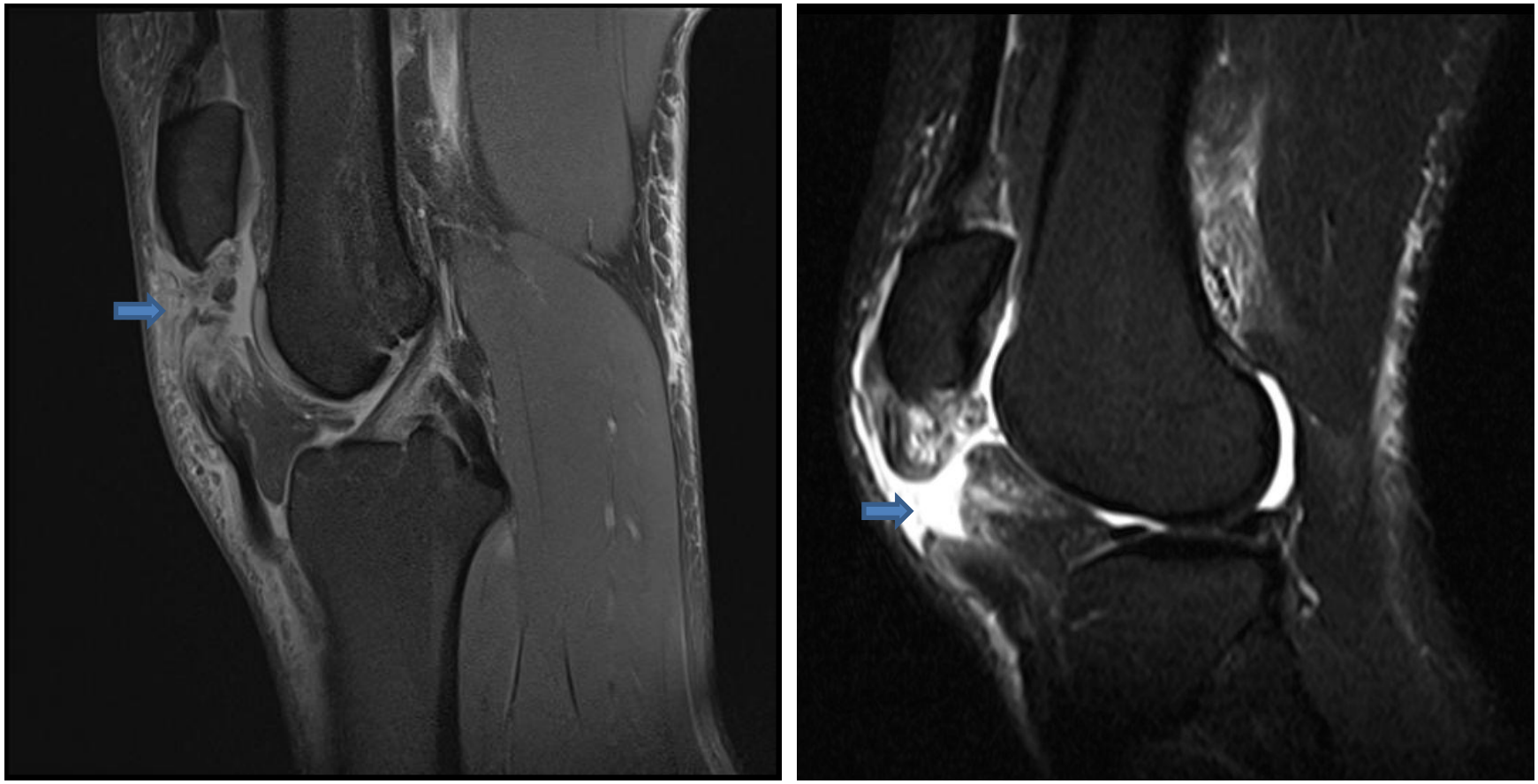
T2A yağ Total aşil yırtığı (ok)





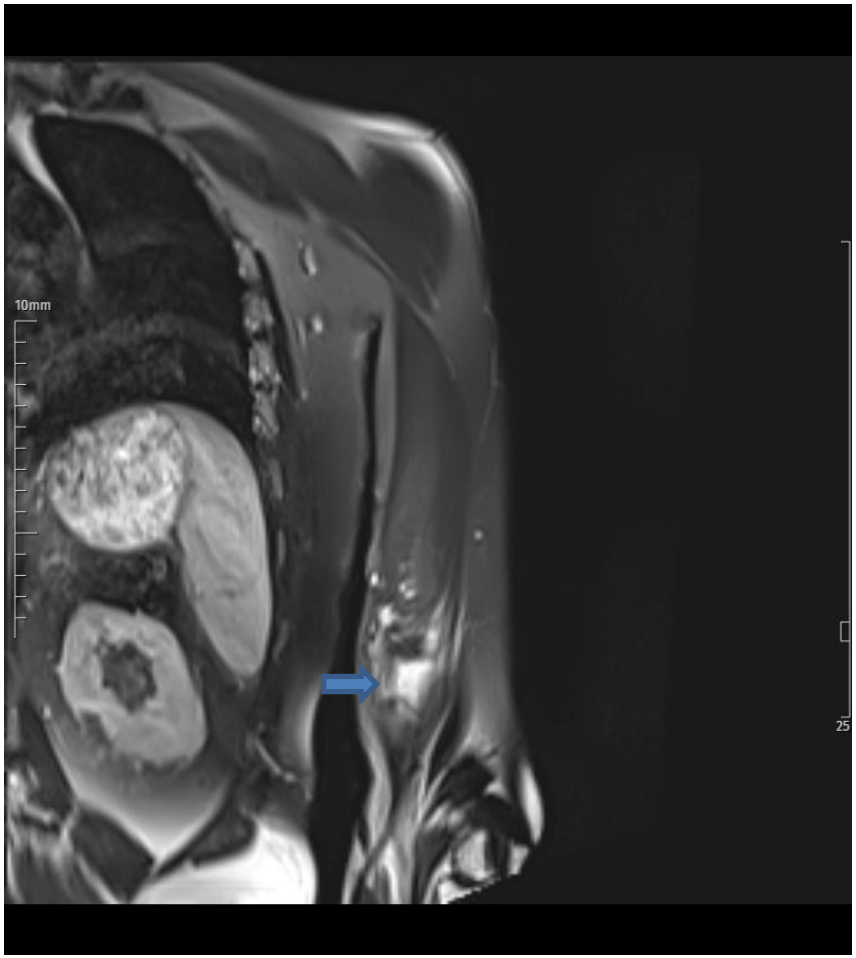
T2A yağ baskılı Preneus longus tendon rüptürü (ok)

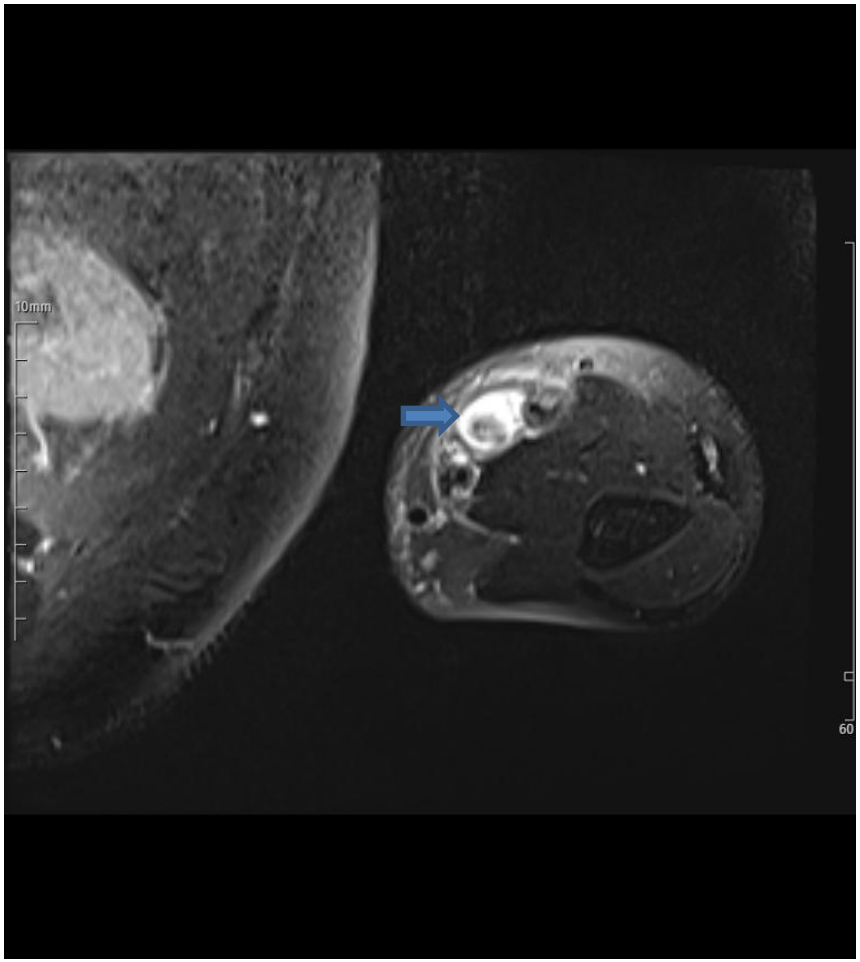
Patellar tendon rüptürü



PD yağ baskılı Patellar tendon rüptürü (ok)

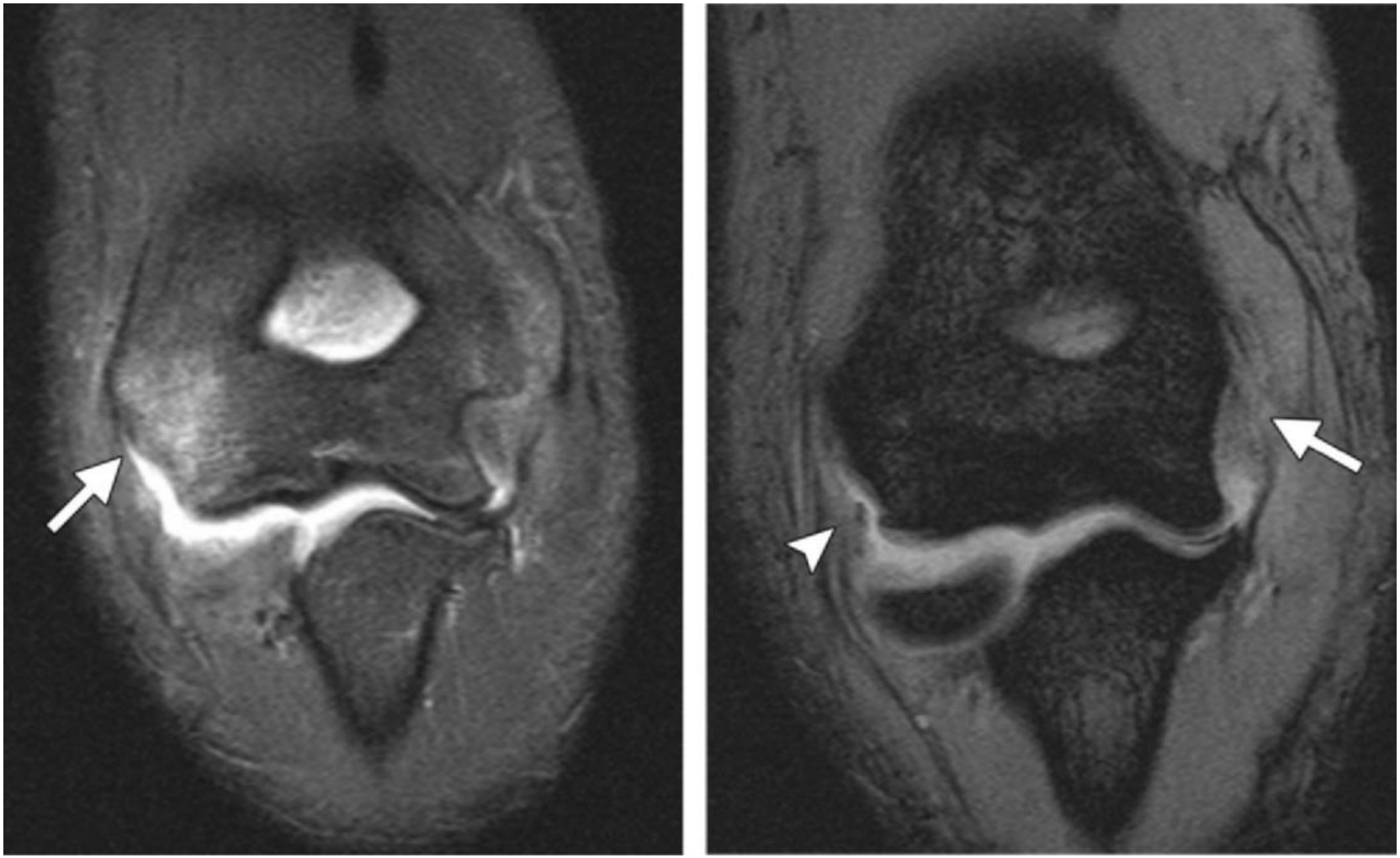
Biseps tendon rüptürü



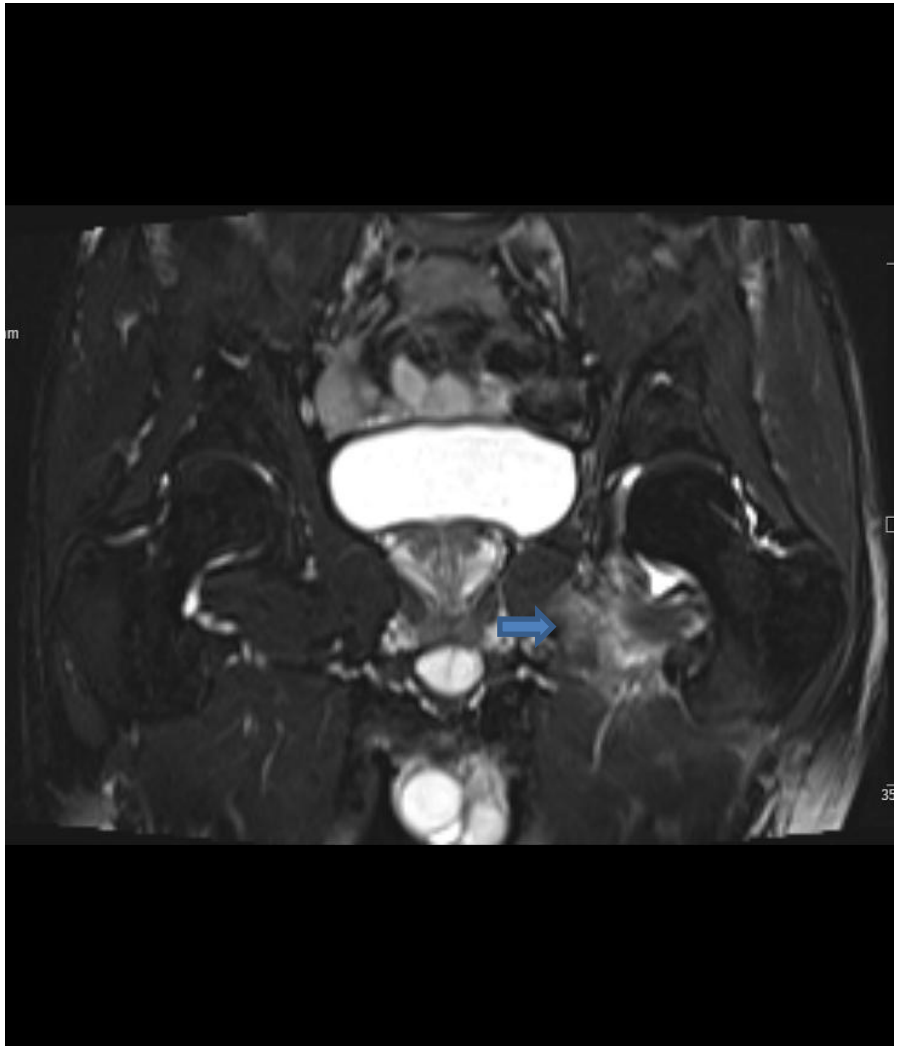


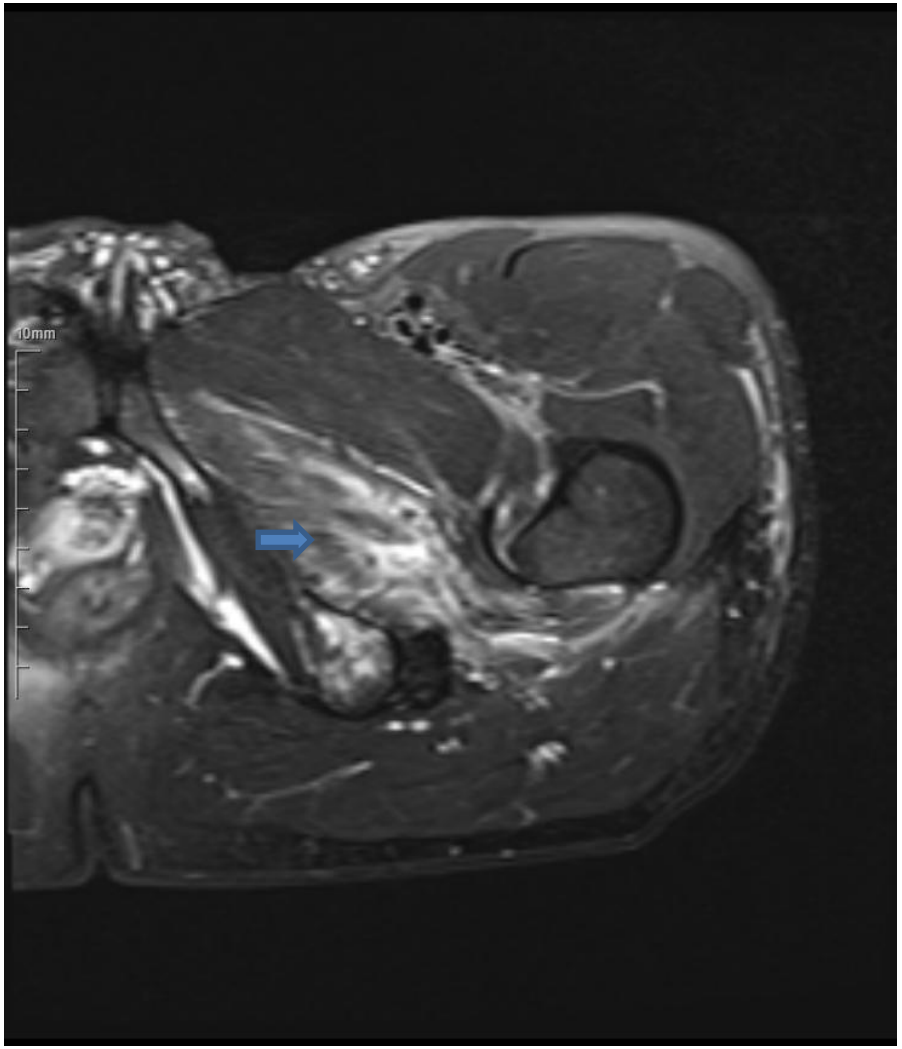
PD yağ baskılı Biseps tendon rüptürü (ok)

Dirsek ekleminde ligament injurileri



PD yağ baskılı Medial kolleteral ve lateral kolleteral ligamentlerde yırtıklar (ok ve ok başı)



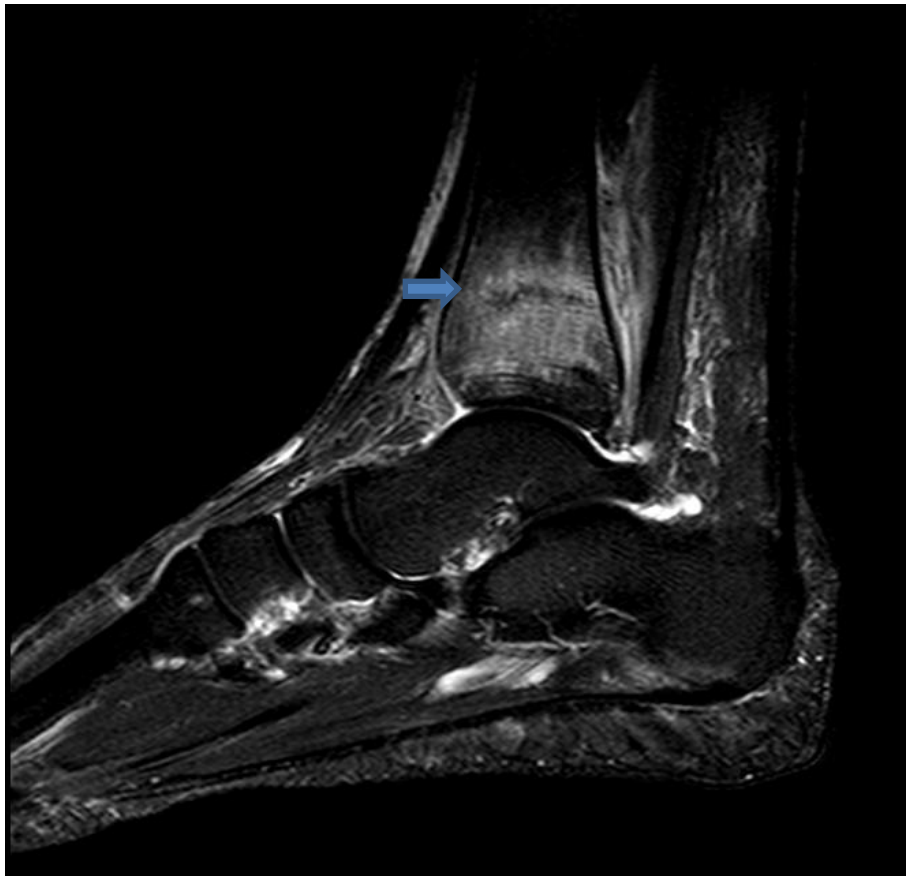


T2A yağ baskılı Adduktor magnus yırtığı (ok)

Stress fraktüleri

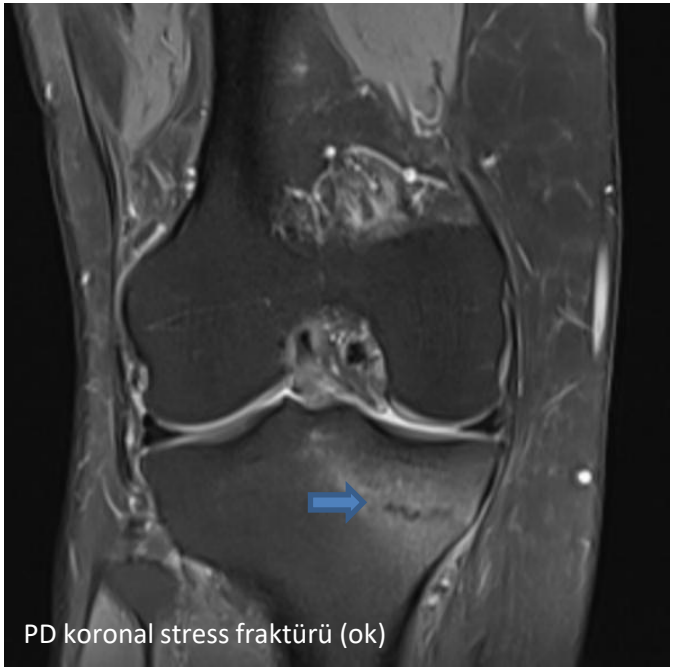


Direkt grafide distal tibial metafizde sınırları silik lineer skleroz alanı (ok).



T2A yağ basklı distal tibiada kemik iliği ödemi ve lineer uzanım gösteren inkomplet stress fraktürü (ok)

Stress fraktüleri



PD koronal stress fraktürü (ok)



PD koronal stress fraktürü (ok)

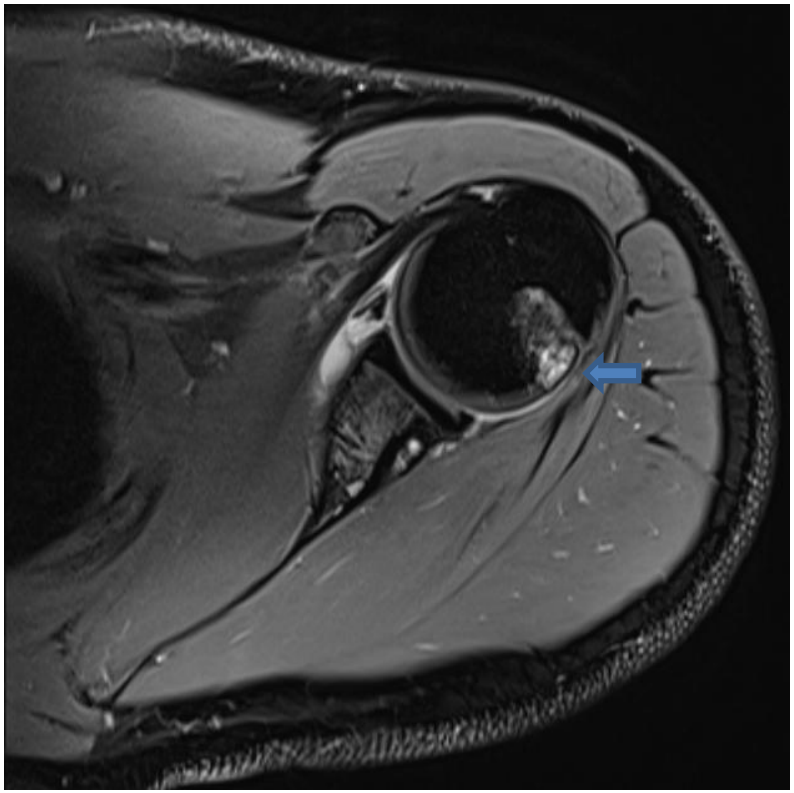


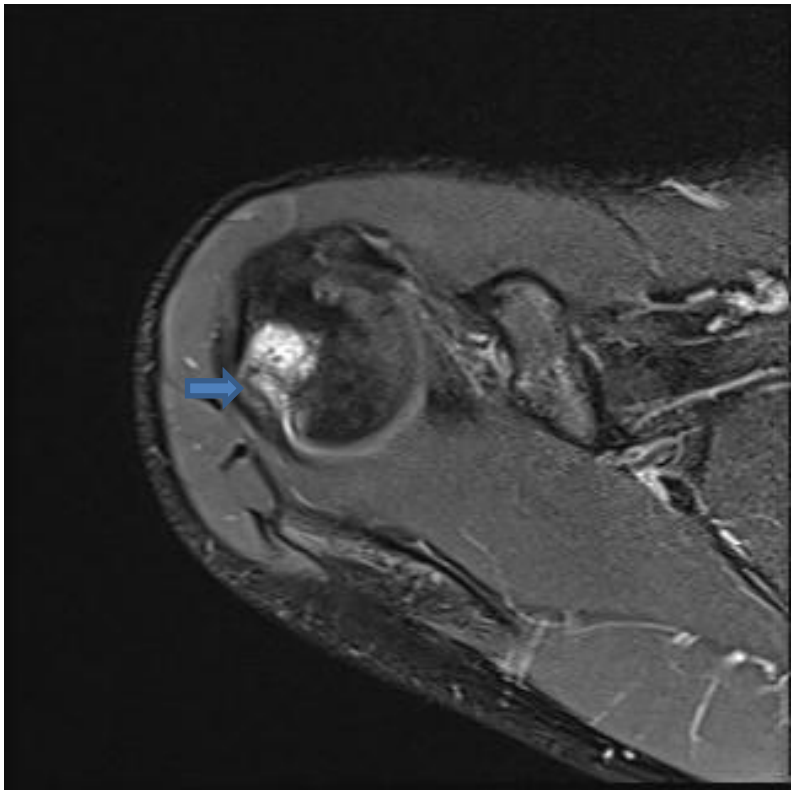
T2A FS Aksiyel stress fraktürü ve kallus



BT de kallus (ok)

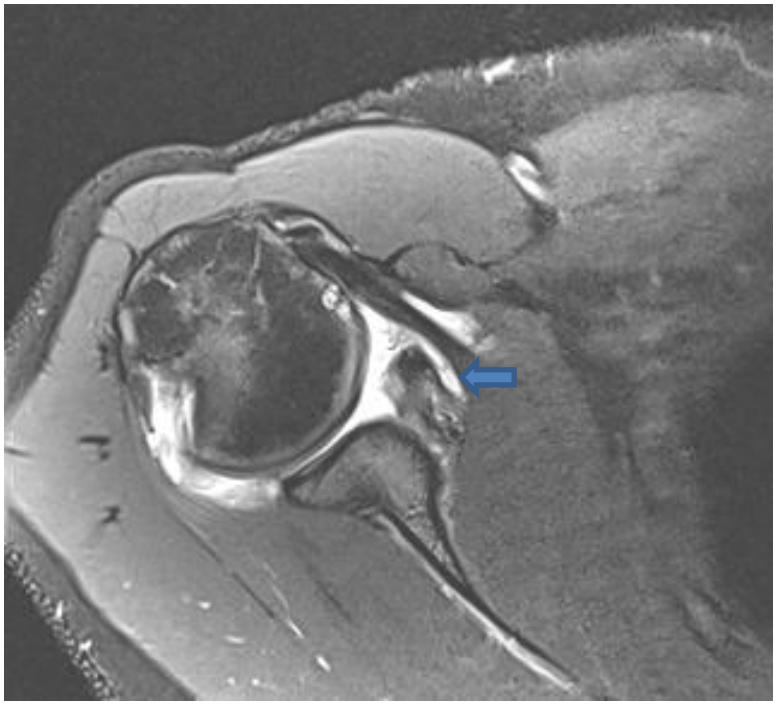
Omuz lezyonları

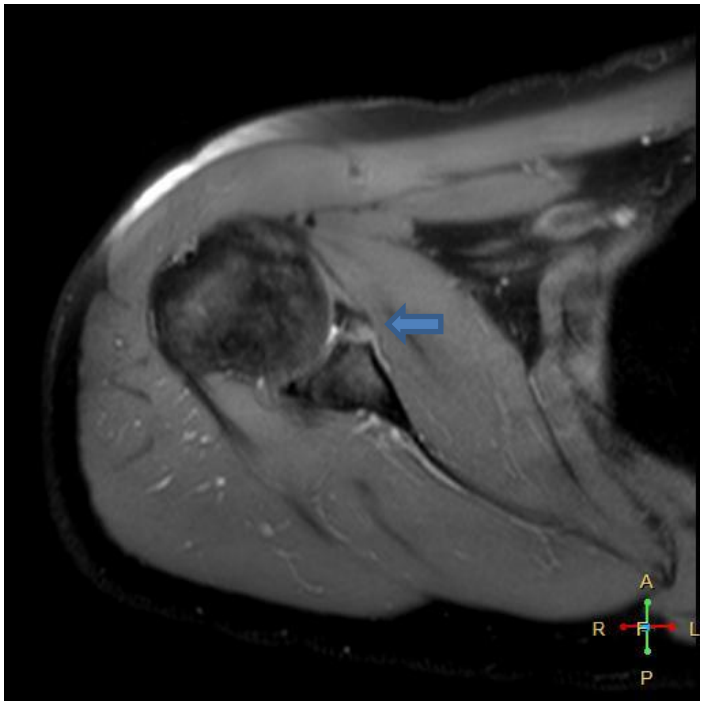




PD aksiyel yağ baskılı posterolateral humerus başı depresyon kırığı ve komşu kemik iliği ödemi (Hill-Sachs defekti) (ok)

Omuz lezyonları



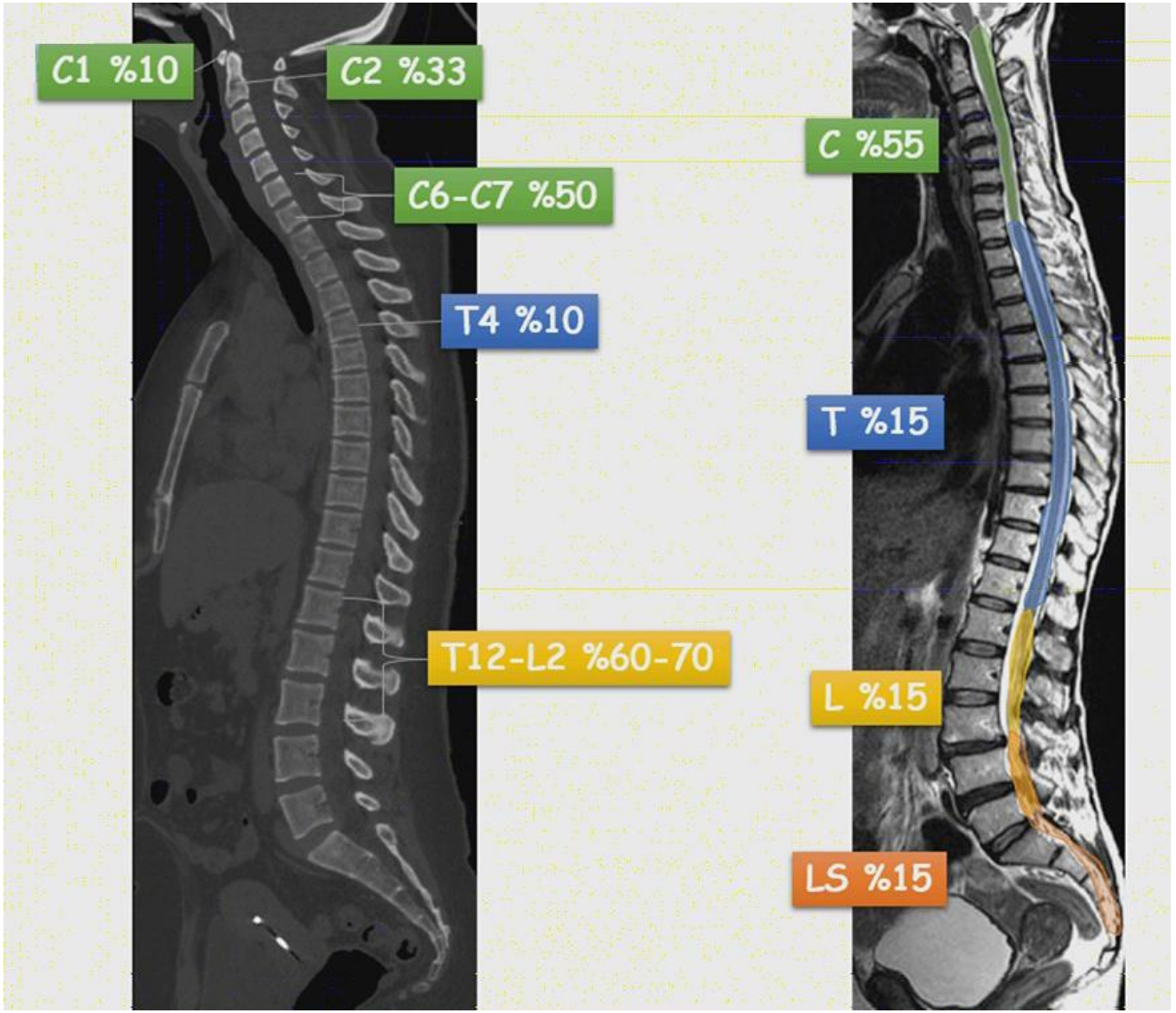


PD yağ baskılı anterior glenoid labrum defekti (Bankart) (ok)

Spinal travma

- Fleksiyon yaralanması
- Esktansiyon yaralanması
- Aksiyel yüklenme
- Rotasyon yaralanması

Spinal travma



Spinal travma

- Bilinçli ve asemptomatik hastada radyolojik değerlendirme gerekmez
- Bilinçli semptomatik veya bilinçsiz hastada
  - Yüksek çözünürlüklü BT ilk yöntem
  - BT çekilemiyorsa 3 plan radyografi, BT'nin çekilebildiği ilk durumda hasta BT ile tekrar değerlendirilmeli

Ryken TC, et al. Radiographic Assesment. Neurosurgergy 72:54-72,2013

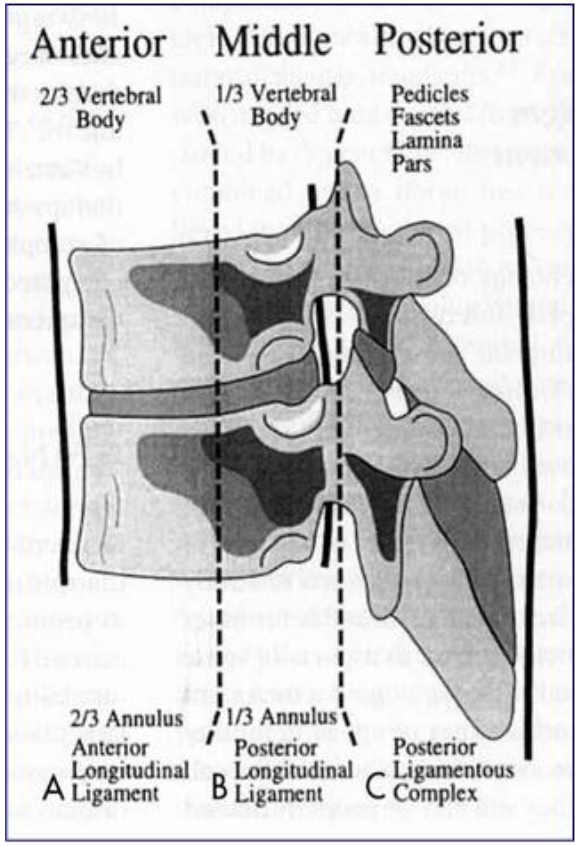
MRG Endikasyonları

- Klinik
  - Hasta stabilize edilmiş olmalı
  - 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
  - Vertebralarda genişleme kayma veya dönme

MRG bulguları

- Medulla spinalis (kord ödemi, hemoraji, kesi)
- İntervertebral disk (disk hernisi, epidural, subdural hematom)
- Ligamanlar (ligaman hasarı)
- Vasküler yapılar (vasküler lezyonlar MRA)
- Radiksler (kök avulsiyonu)
- Medüller kemik iliği (STIR sekansı)

Denisin üç kolon teorisi
İnstabilite

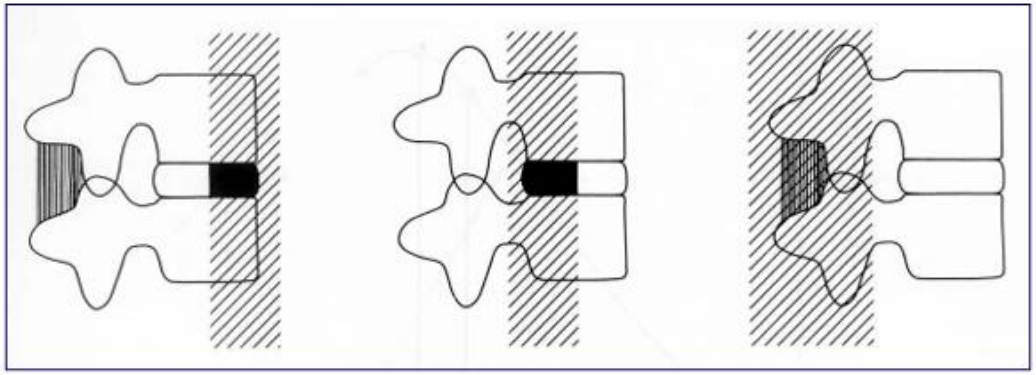


Ön Kolon

ALL
Disk ön kısmı
Vertebra korpusunun 2/3 ön kısmı

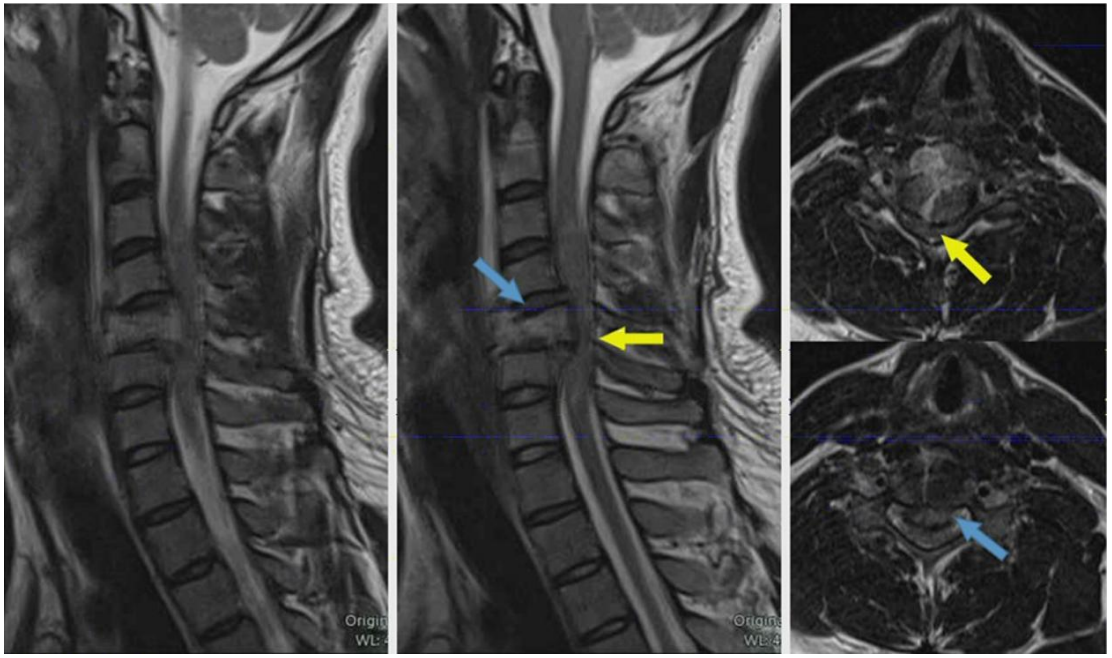
Orta Kolon

PLL
Disk arka kısmı
Vertebra korpusunun 1/3 arka kısmı

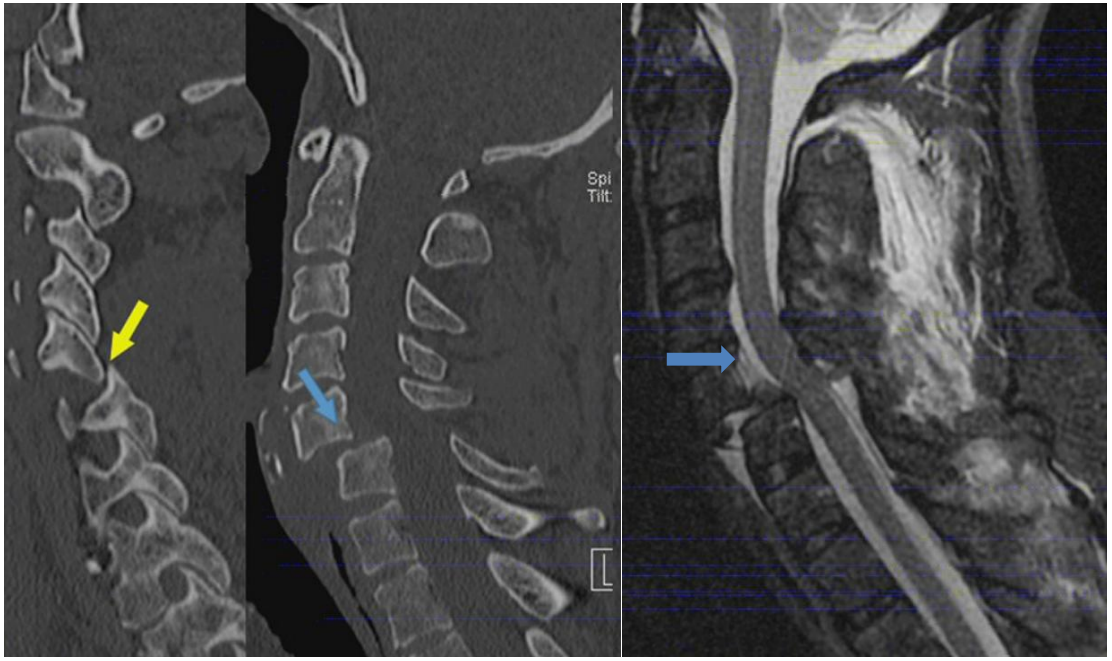


Arka Kolon

posterior kemik elemanlar
posterior lig.kompleks
supraspinöz, interspinöz lig,
lig. flavum
faset eklemler

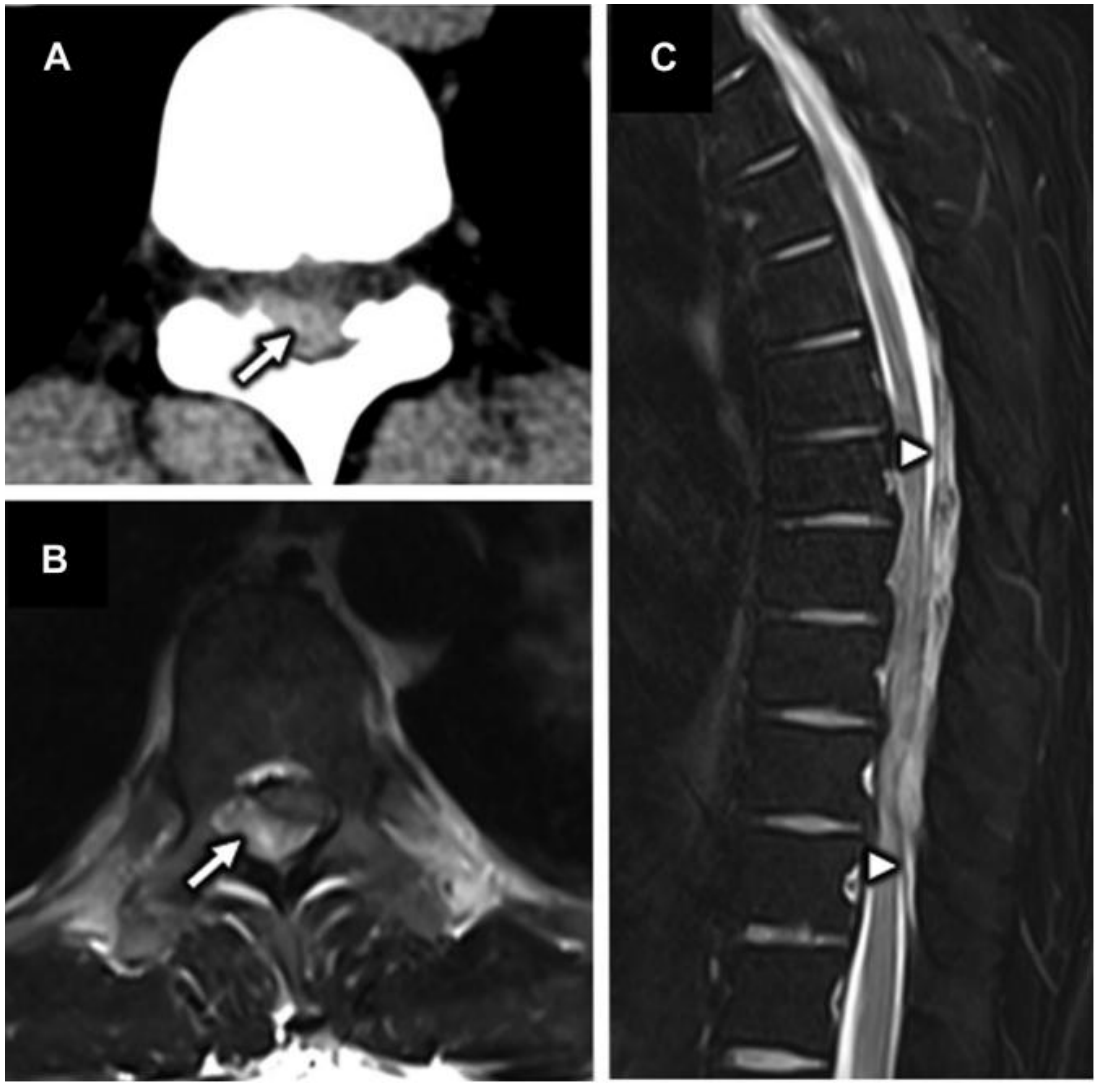


T2A sagital ve aksiyel Komplet burst (mavi ok), spinal kanal (sarı ok)



C5-6 translasyon, faset dislokasyonu BT (sarı ok), listezis (sarı ok)

Disk hasarı, PLL hasarı (mavi ok)



Toraksik vertebralar düzeyinde epidural hematom.

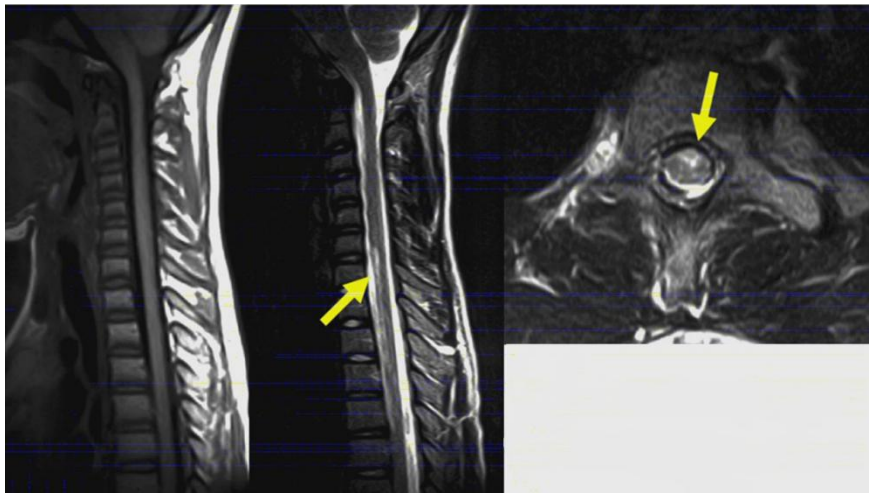
A) BT hiperdes hematom (ok) B) Aksiyel MR T2A epiural hematom, C) sagital epidural uzun segment hematom (ok başları)



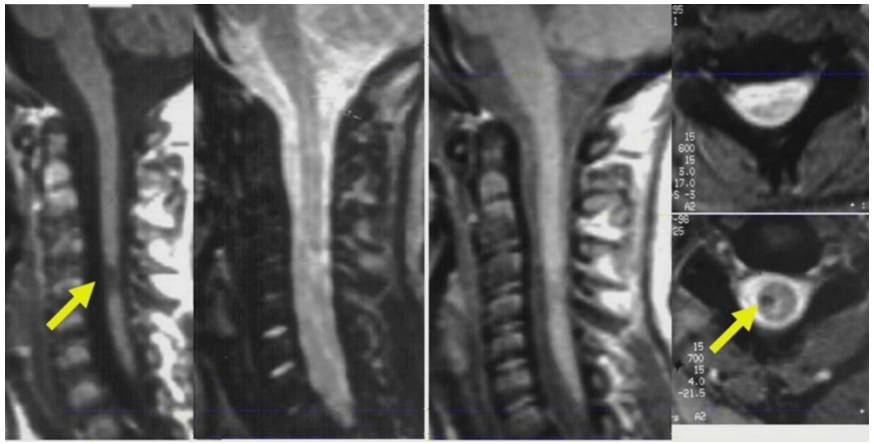
Toraksik vertebralar düzeyinde Btde yükseklik kaybı yada fraktür yok. STIR sekansta üst end plato düzeyinde kontüzyone kemik iliği ödemleri (oklar)

Travmatik spinal kord hasarı

- Tip 1 Ödem (non hemorajik kontüzyon)
  - Yaygın sınırları belli olmayan T2A hiperintensitesi
- Tip2 Kan (hemorajik kontüzyon)
  - Nöronal hasar (T2*/SWI)
- Tip 3 Ödem +Kanama
- Kronik evre: Myelomalazi



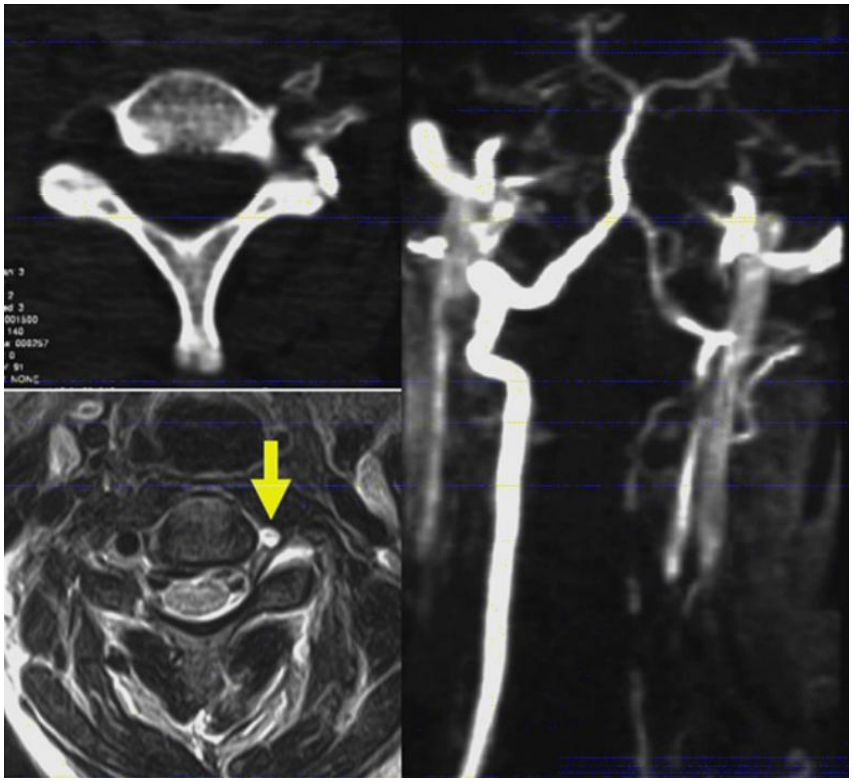
Tip1



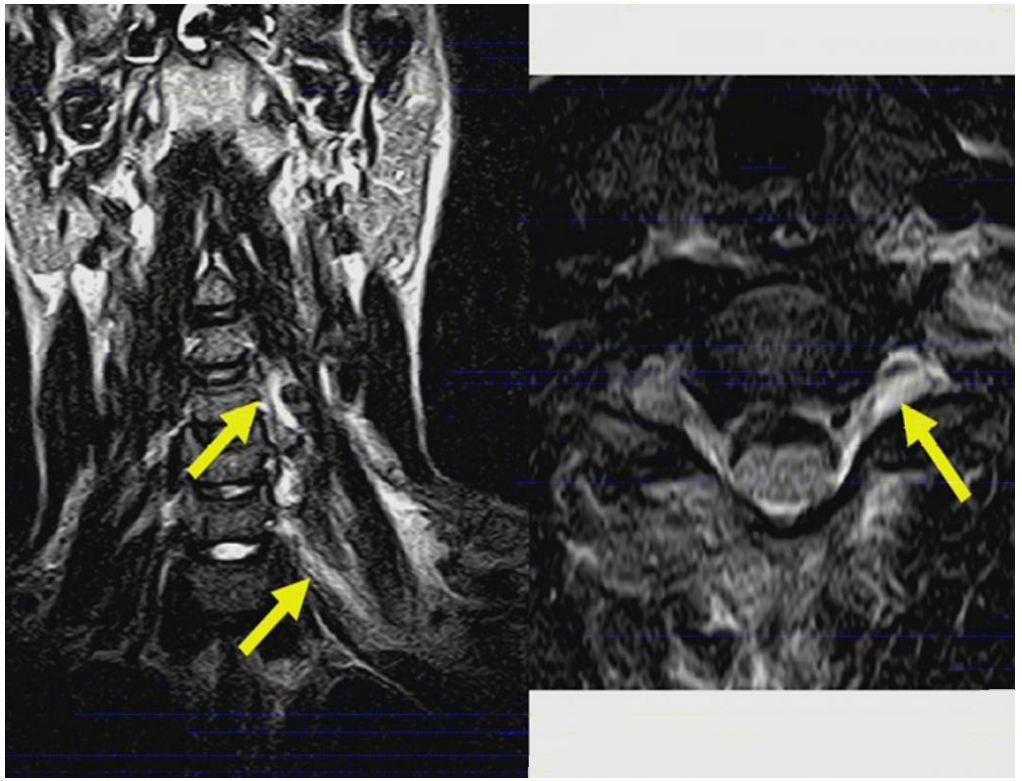
Tip2



Tip3



Aksiyel BT ve MR Vertebral arter diseksiyonu (sarı ok)

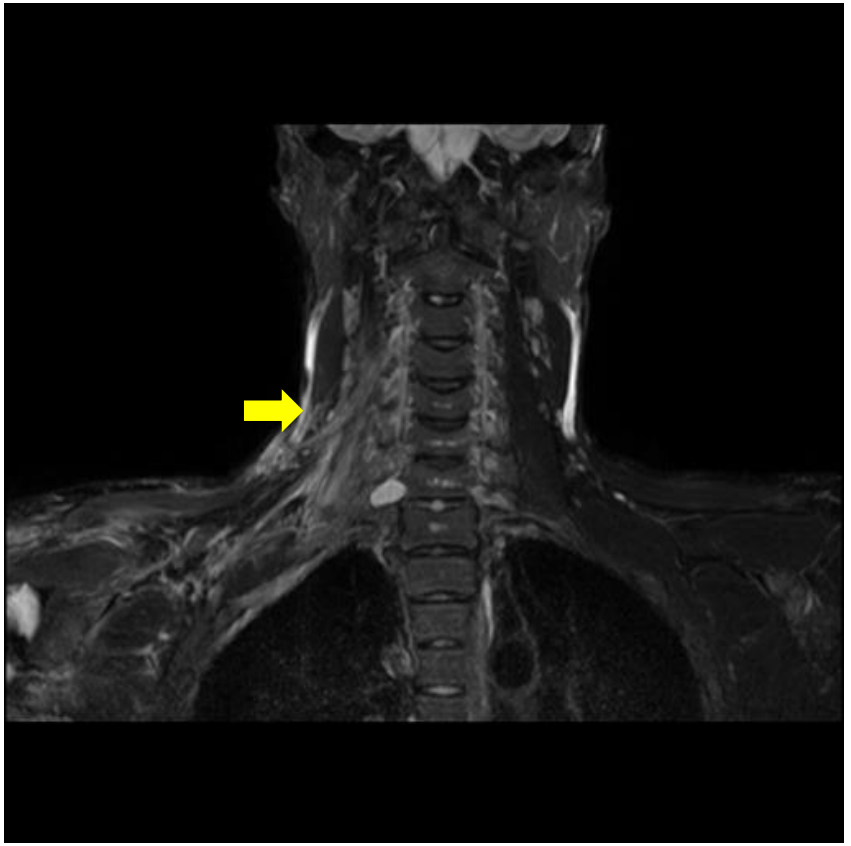


Koronal ve aksiyel T2A Brakial pleksus hasarı (sarı ok)

Brakial pleksus injury

- Genellikle motorlu taşıt kazalarından kaynaklanan travmalar, üst ekstremitede kısmi veya tam sinir yaralanmalarına yol açabilir
  - C5/C6 tutulumu omuz ve biseps kaslarında paraliziye yol açar
  - C7 tutulumu el bileği ve el kaslarına uzanan paralizeye yol açar
  - C8/T1 tutulumu ön kol fleksörlerinde ve el iç kaslarında paraliziye yol açar
  - Ayrıca, doğum (obstetrik) yaralanmaları, Erb paralizisine veya Klumpke paralizisizene yol açabilir.





Koronal T2A yağ baskılı brakial pleksus hasarı (sarı ok)

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Teşekkürler

Online Bilimsel Program: