

KRONİK KARACİĞER PARANKİM HASTALIĞI

Radyolog gözüyle

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GRUP

FLORENCE NIGHTINGALE
HASTANELERİ



Görüntüleme Yöntemleri

- US

- BT

Radyasyon (10 mSv)

CIN (%0,6-2.3; böbrek fonk bozuksa %3-21)

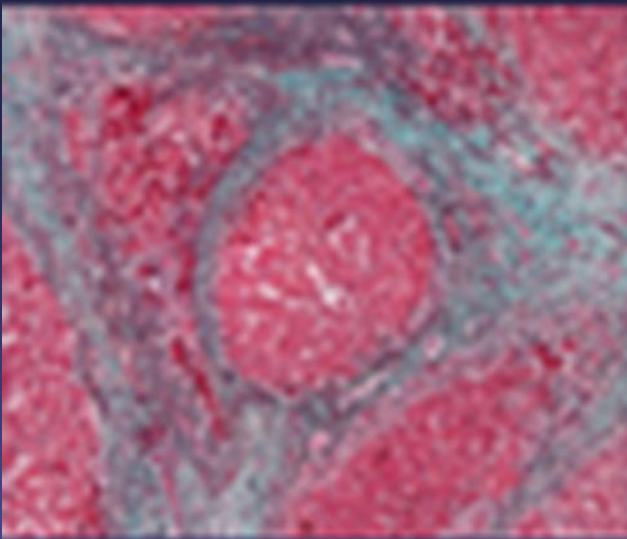
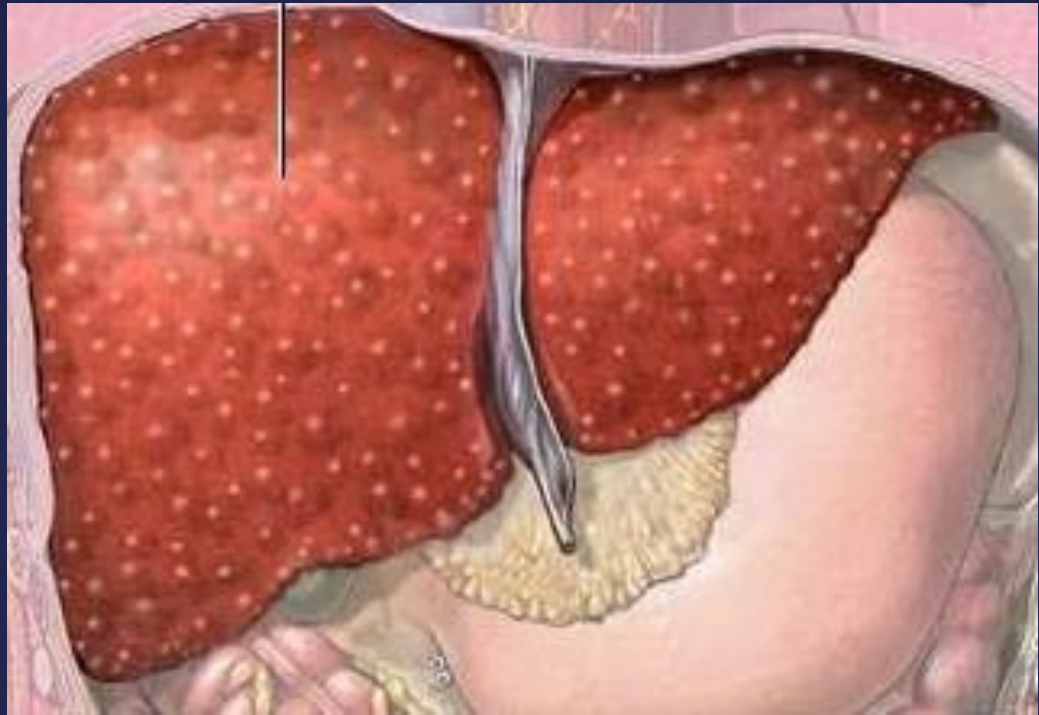
- MRG

NSF

ÖĞRENİM HEDEFLERİ:

- Kronik karaciğer parankim hastalıklarında radyolojik bulgular
- Radyolojik bulguların tanısal etkinliği
- Klinisyenlerin beklentileri
- Parankim hastalıklarında yeni teknikler

- Alkol
- Kronik hepatit C
- Kronik hepatit B



- Patolojik:
 - Fibrozis
 - Nodüler transformasyon
 - Hepatik parankimde distorsiyon

KC fibrozis tanısı

- Biyopsi
- Kan testi: Fibrotest
- Elastografi (Fibroscan)
- Radyolojik yöntemler

Neden görüntülüyoruz?

- Morfolojik değişikliklerin ortaya konması
- Hepatik ve ekstrahepatik vasküler yapıların değerlendirilmesi
- Portal hipertansiyon etkilerinin değerlendirilmesi
- HCC değerlendirilmesi

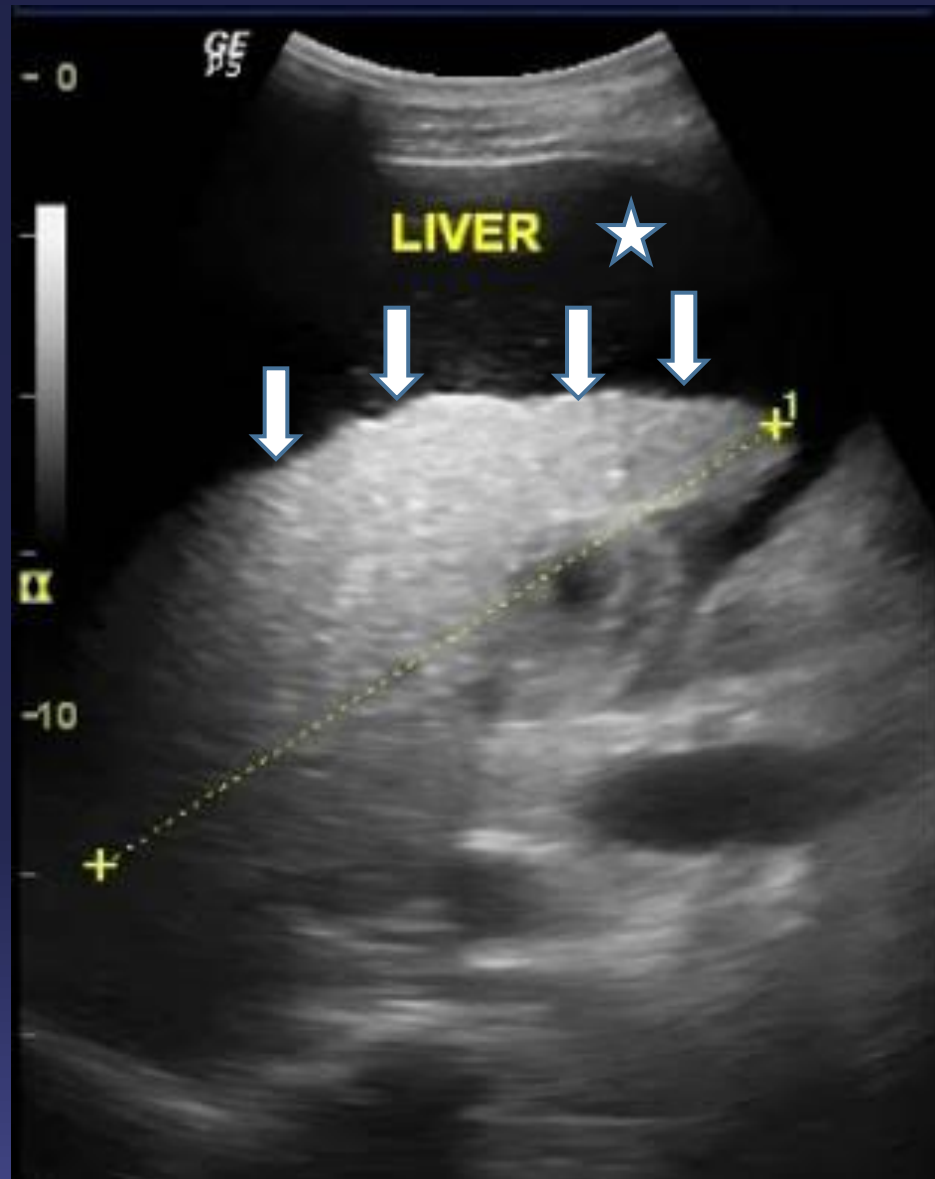
Radyolojik bulgular

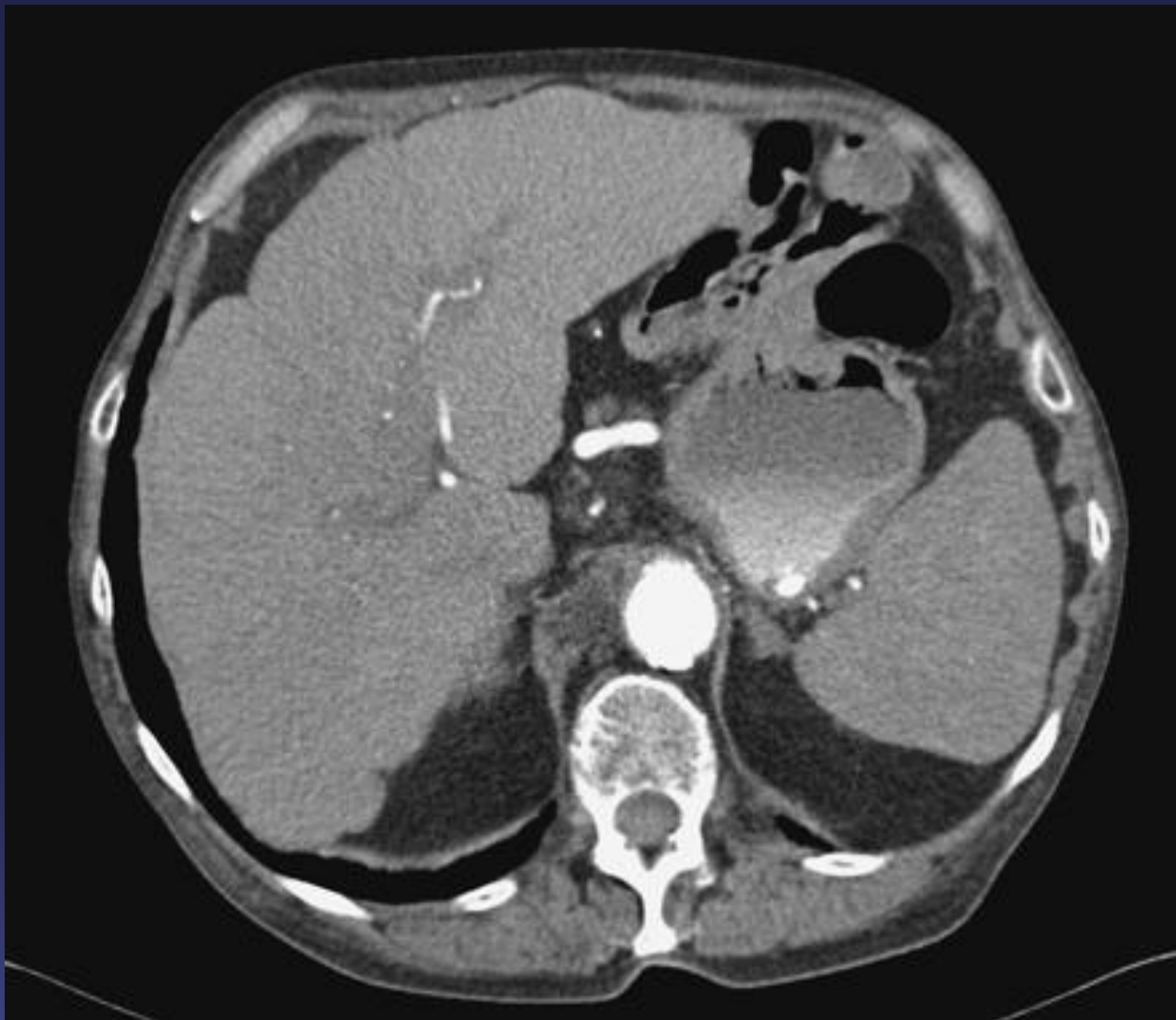
- KC yüzeyinde nodularite
- KC parankimal heterojenite
- KC morfolojisindeki değişiklikler
- Vasküler değişiklikler
- Portal hipertensiyon-mezenterik ödem

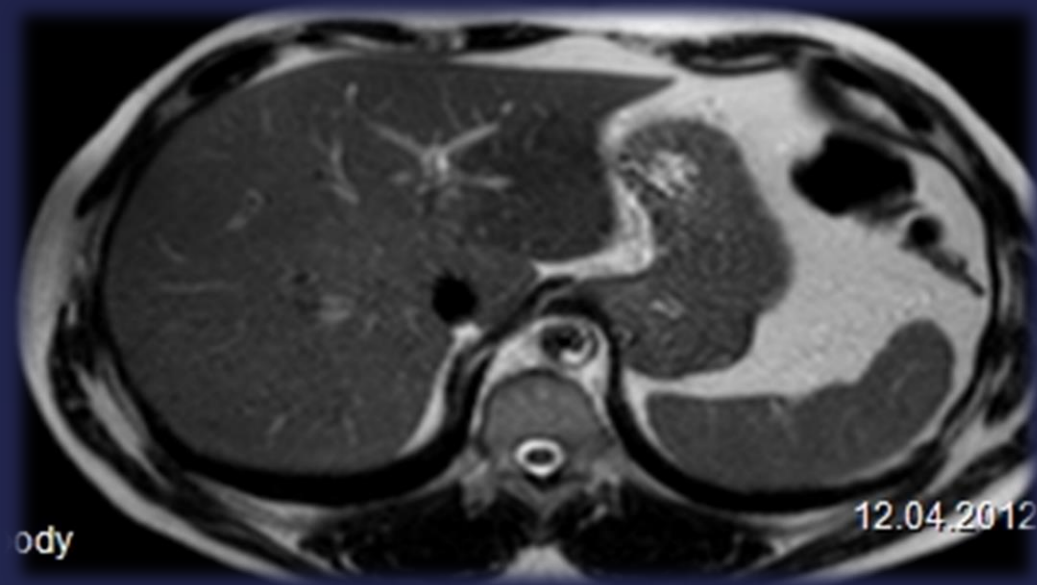
KC yüzeyinde nodularite

KC parankiminde heterojenite

- . Başlangıçta yüksek frekanslı transducer
- . US, CT ve MR

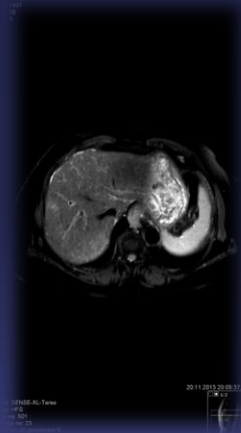


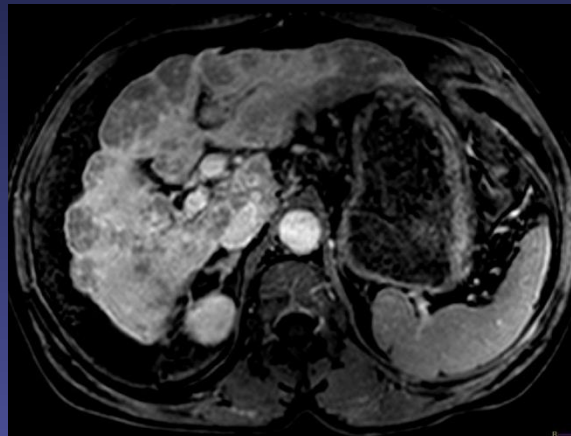
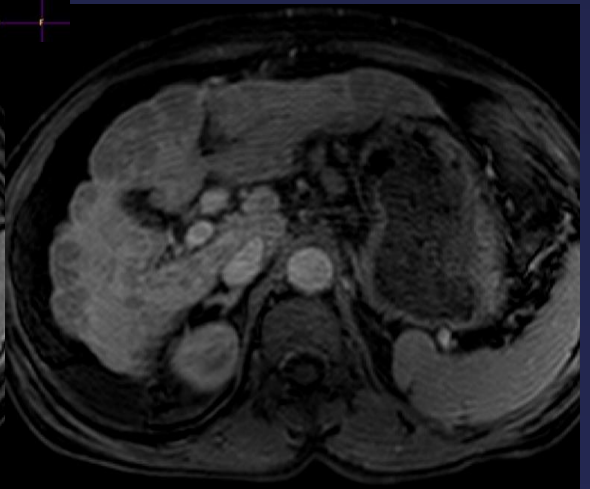
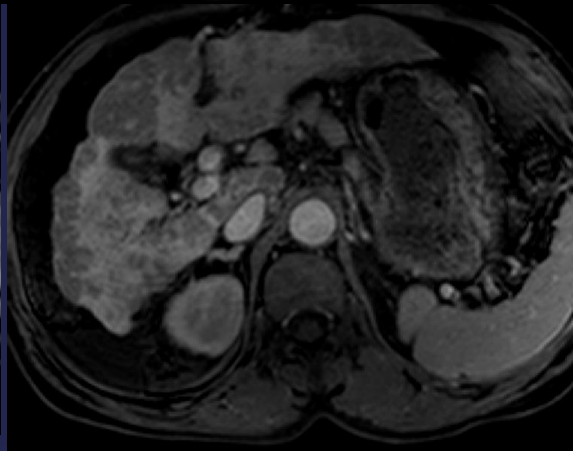
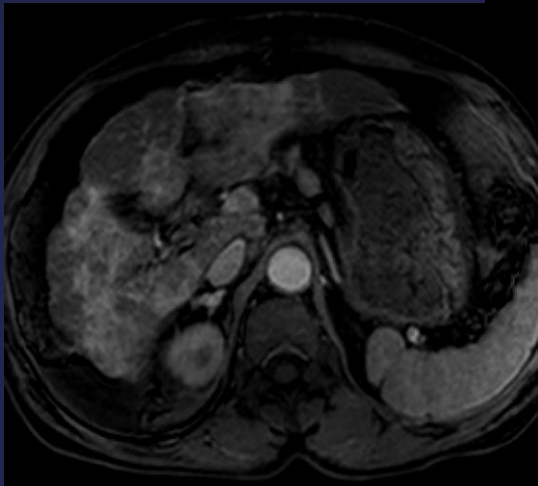
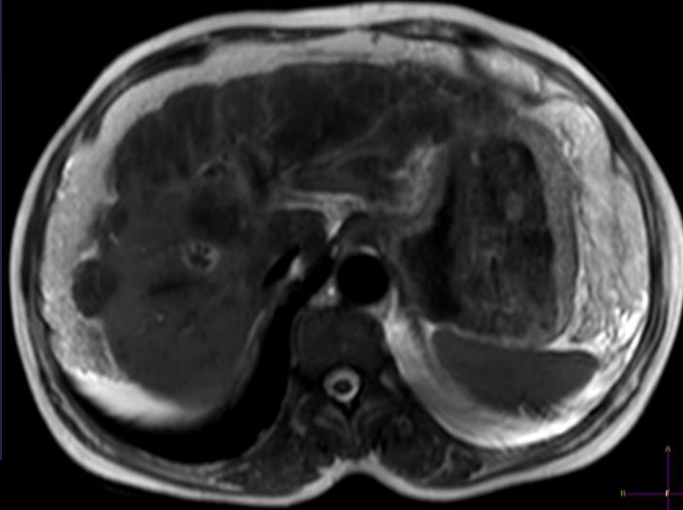




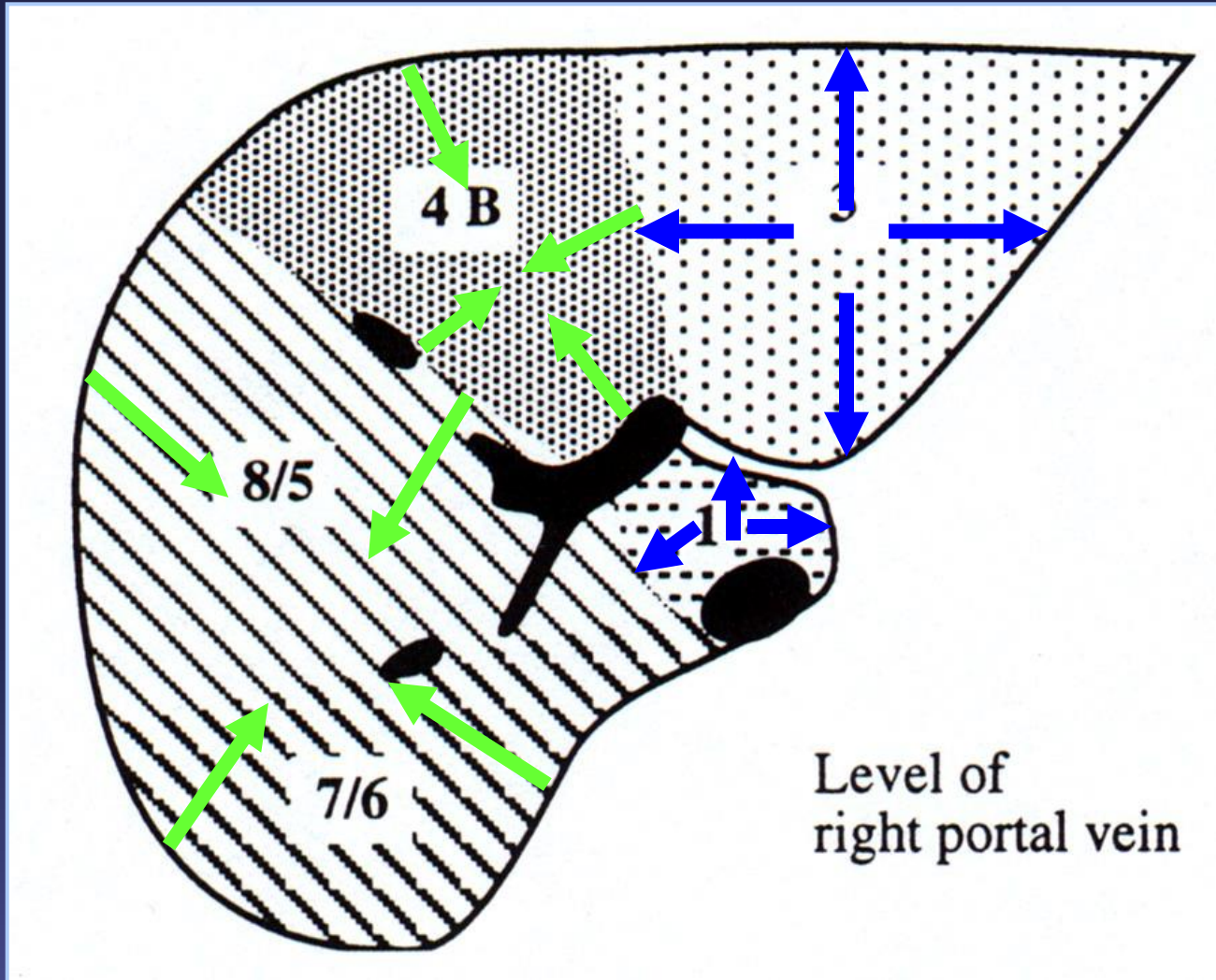
Normal KC

Sirotik KC



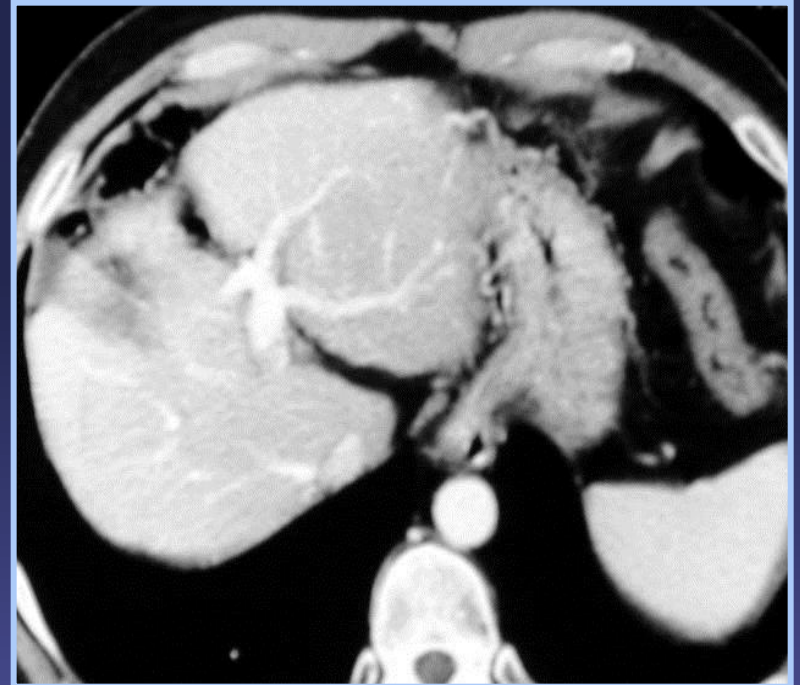
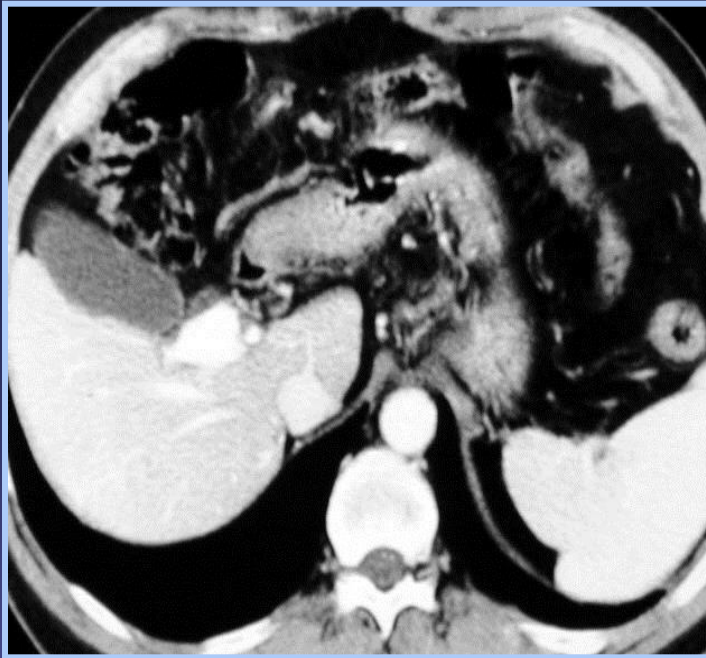


KC'de morfolojik deęişiklikler



KC'de morfolojik deęişiklikler

- Kaudat lob-saę lob oranı (> 0.65)
- Segment 4
Kontrol grubu 43 ± 8 mm
Siroz 28 ± 9 mm



KC'de morfolojik deęişiklikler

- Safrakesesi yataęının genişlemesi

Spesifisite ve PPV %98

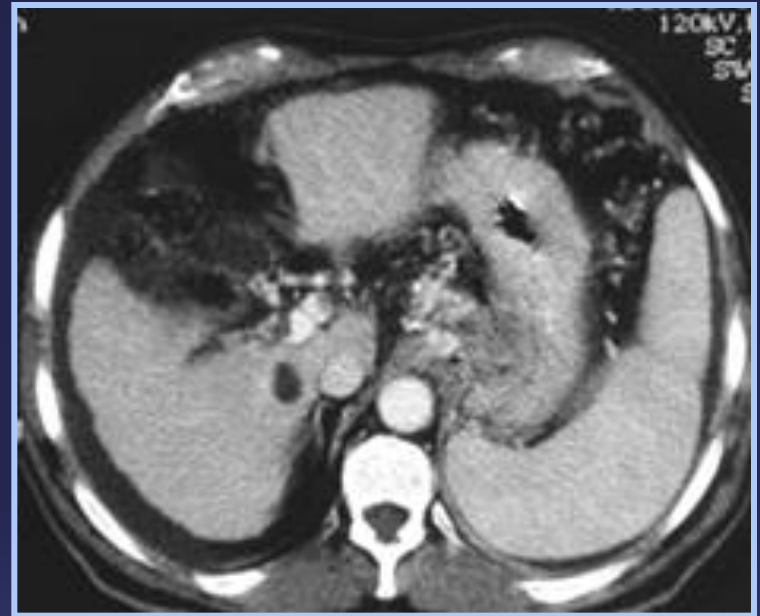
Segment 4 atrofisi ile ilişkili

- Periportal alanda genişleme

Erken sirozda %98

Kontrol group: 5.3 mm

Siroz: 15.5 mm



Vasküler deęişiklikler

Hepatik venler

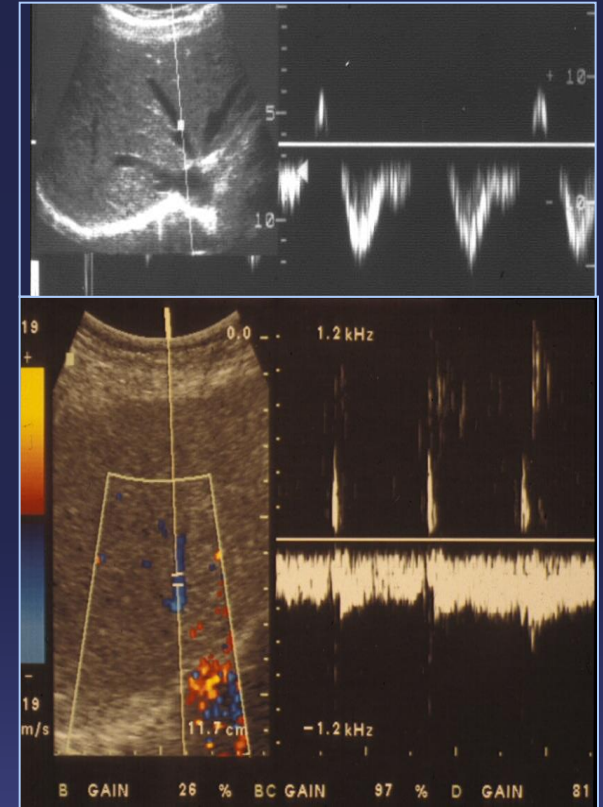
Normalde trifazik

Sirozda

aplarında azalma

akım dalga formunda bozulma (50%)

(dalga formunda portalizasyon)



Vasküler deęişiklikler

Hepatik arter



HA apında artıř

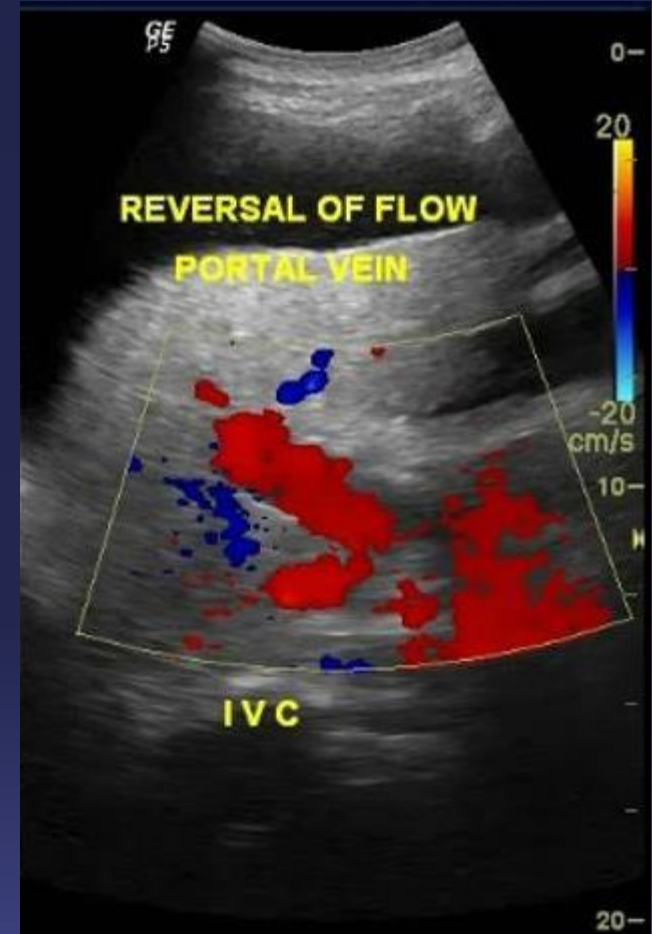
RI ve PI artıř

Portal hipertansiyon (PHT)

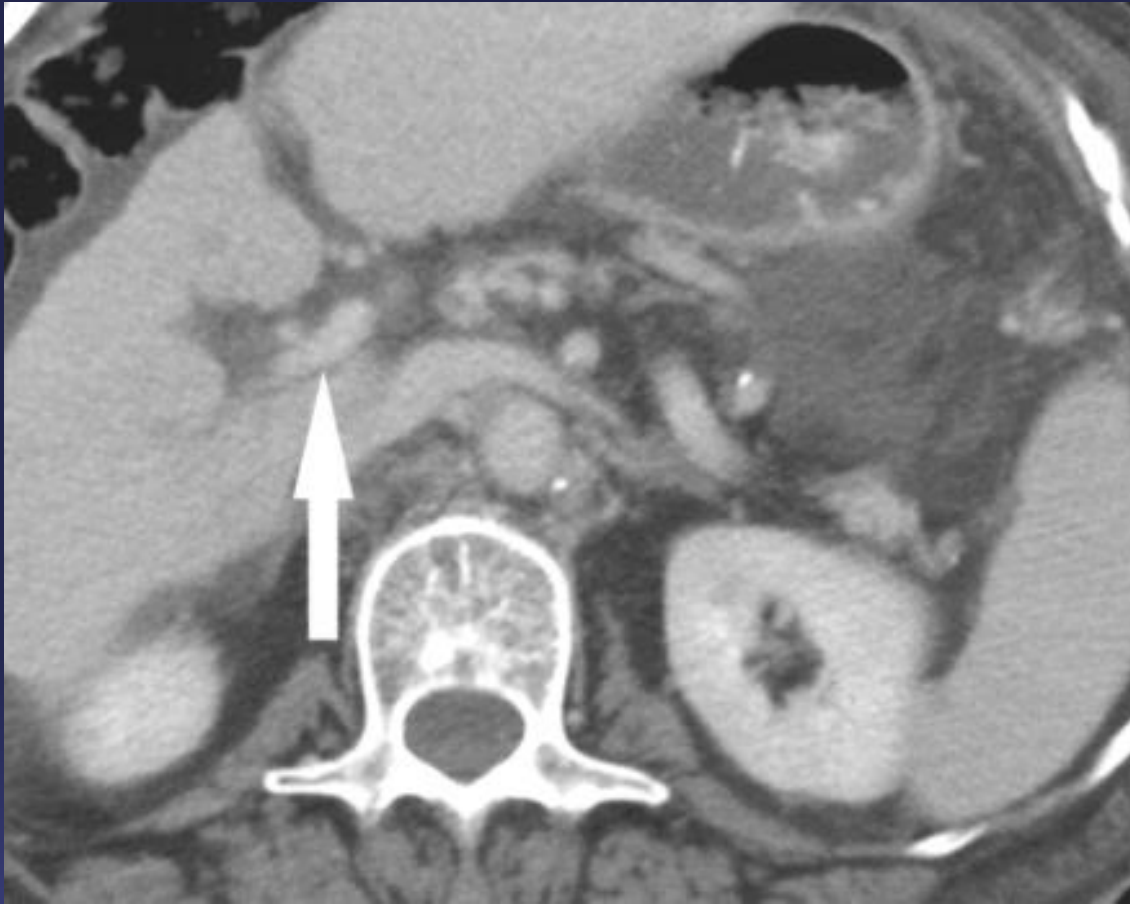
- Basınç > 15 mm Hg
 - Portokaval gradyent > 5 mm Hg
-
- Kollateraller
 - Asit
 - Splenomegali

PHT tanısı

- Portal ven çapı > 13 mm
(% 42 sensitiv, % 95-100 spesifik)
- Portal venöz akım hızında azalma
 < 15 cm/sn
- Portal akımın bozulması
arteryalize akım
çiftyönlü akım
ters akım (hepatofugal)
- Portal ven trombozu +/- kavernöz transformasyon



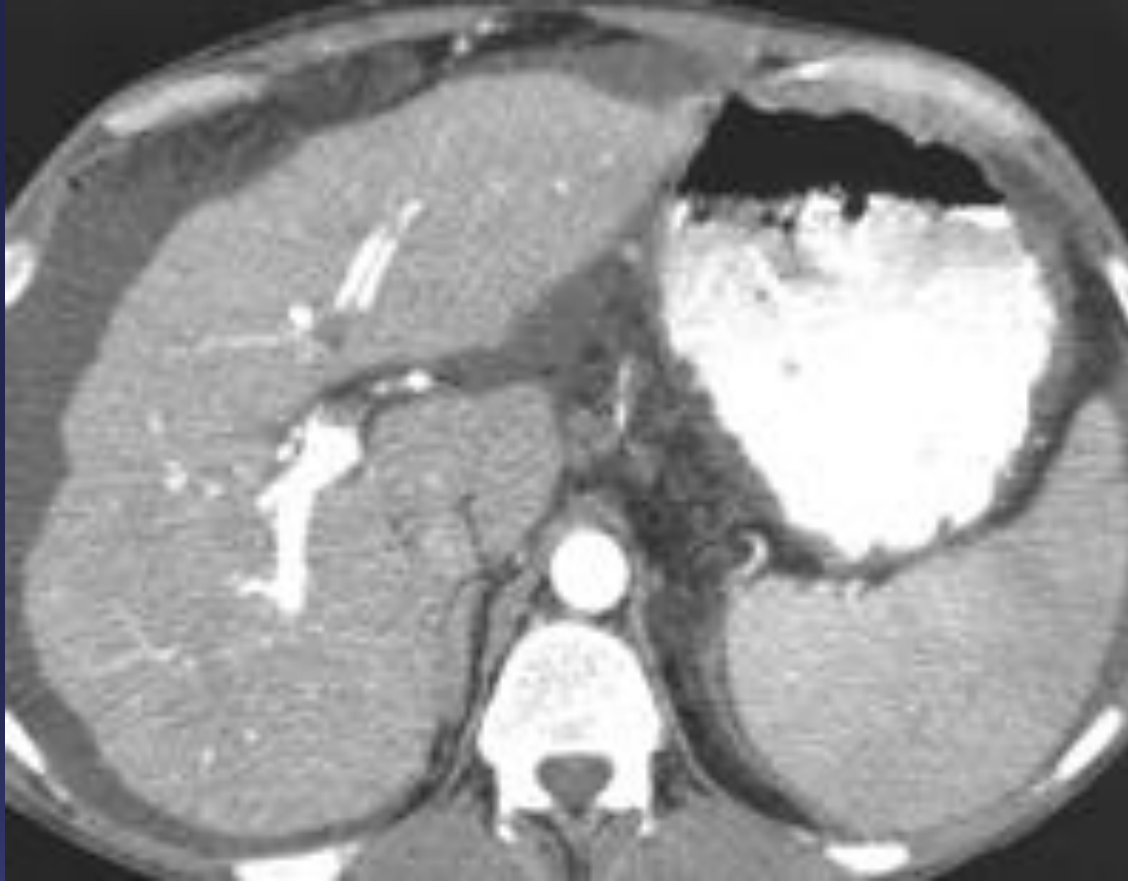
Hepatofugal Akım



79 y, F

Küçük ana portal ven —————> hepatofugal akım

Hepatofugal Akım

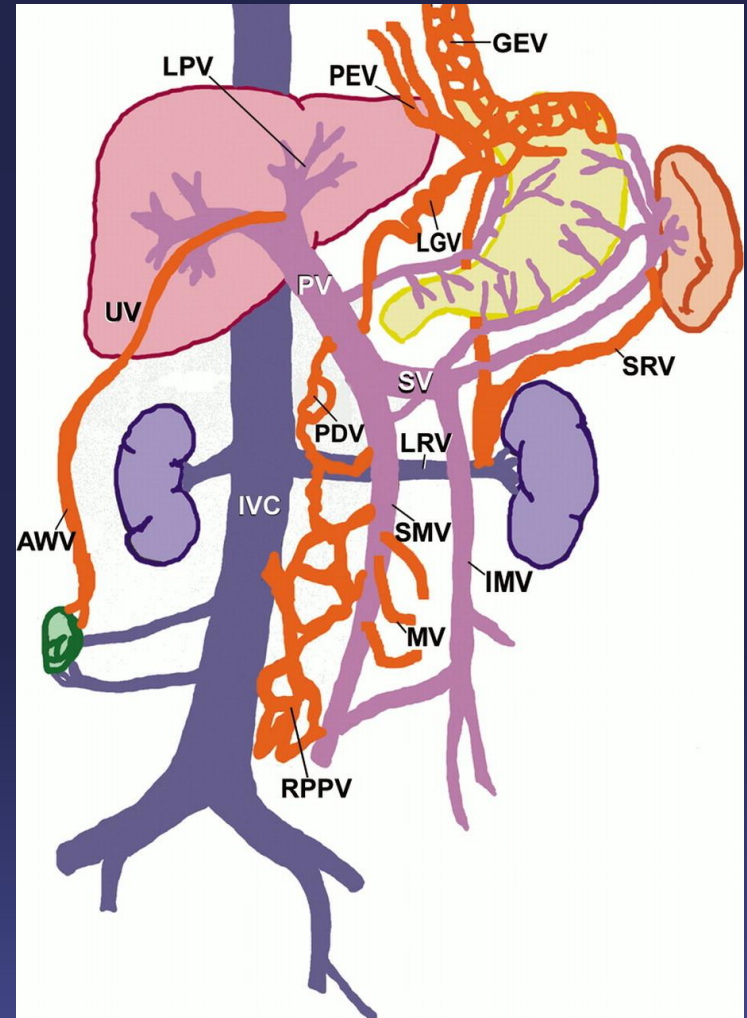


49, M Hep C siroz

Arteriyel fazda portal vende kontrastlanma —————>
hepatofugal portal akım

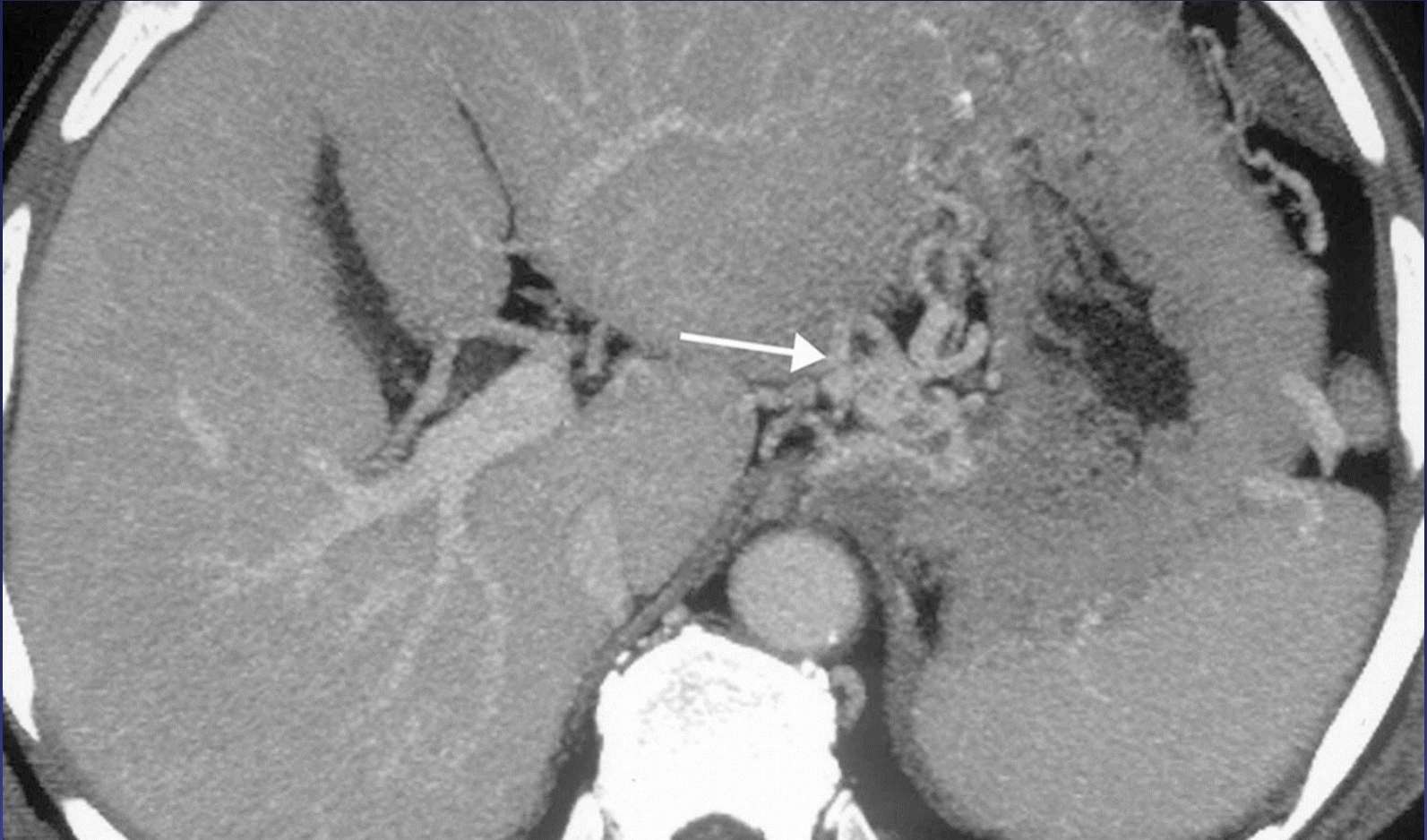
PHT-Portosistemic Vasküler Kollateraller

- Varislere bağı kanama
% 25-40 komplikasyon
- Gastroözefageal
- Superfisyel
- Splenorenal
- Retroperitoneal ve mezenterik
- Transhepatic Portosistemik
 - Rekanalize paraumbilikal ven
 - KC yüzeyinde kollateraller

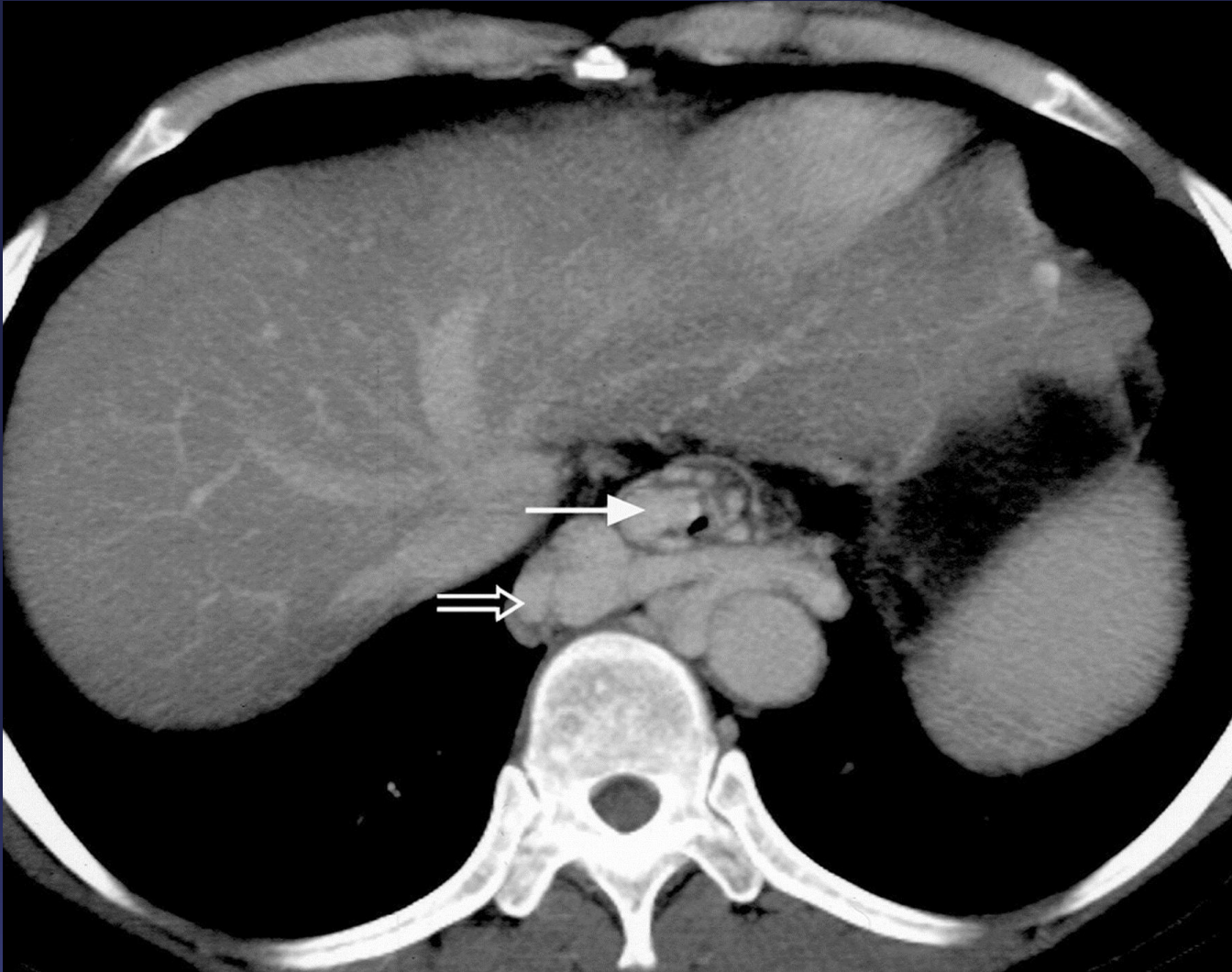


PHT tanısı

Sol gastrik ven



Aksiyel BT: dilate sol gastrik ven (6 mm)



BT: tortuoz, genişlemiş paraözefageal varisler (oklar).

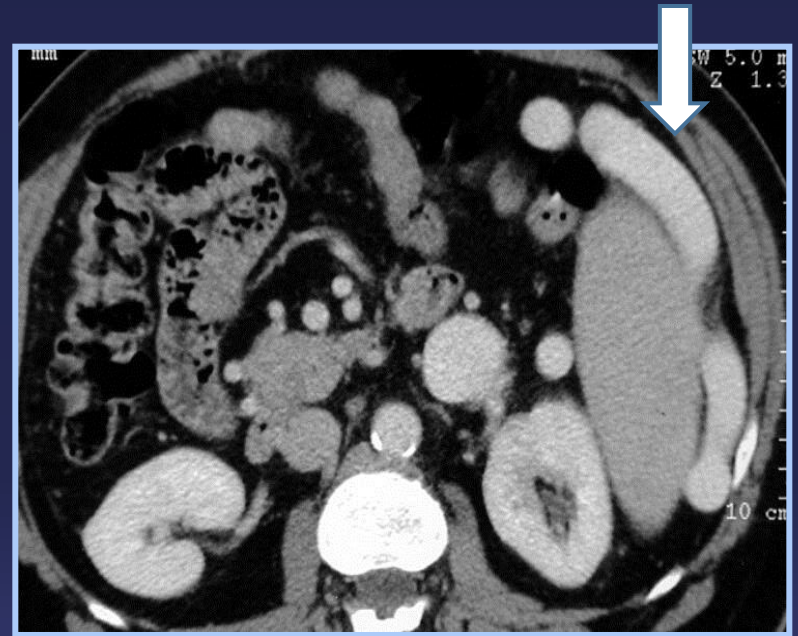
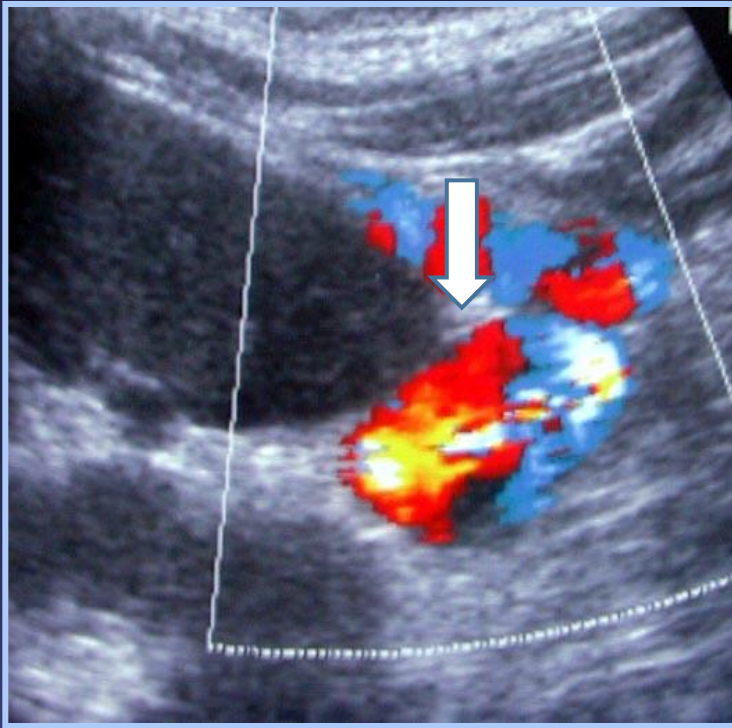
PHT tanısı

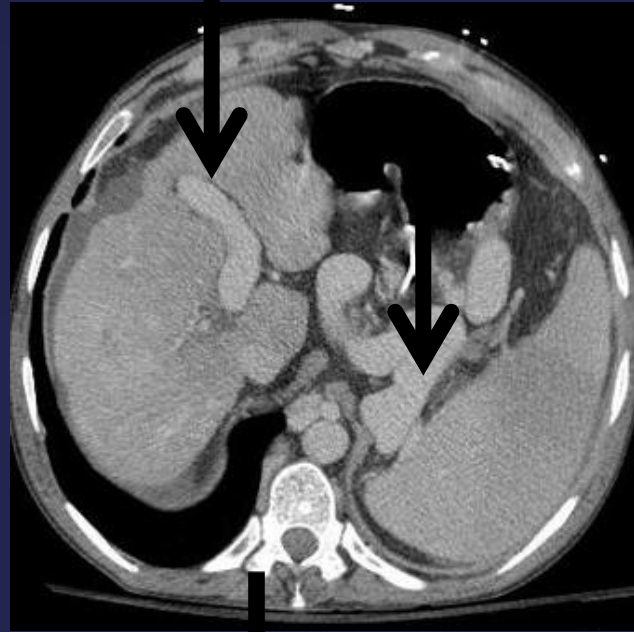
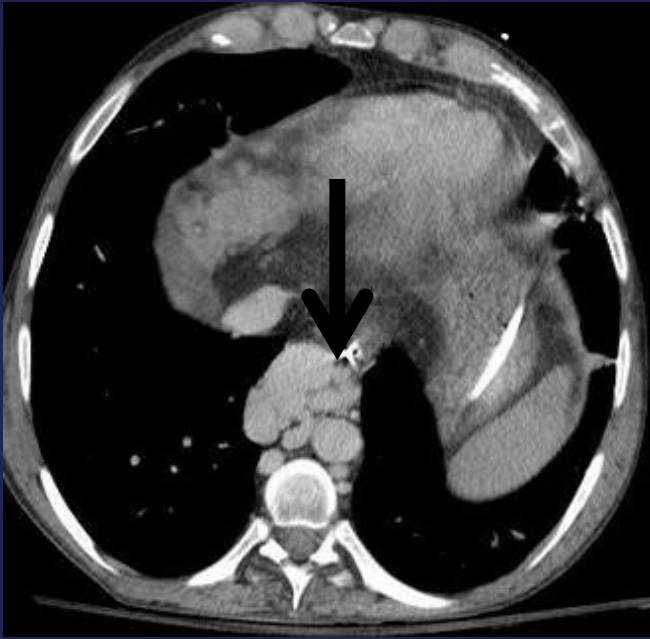
Paraumblikal ven



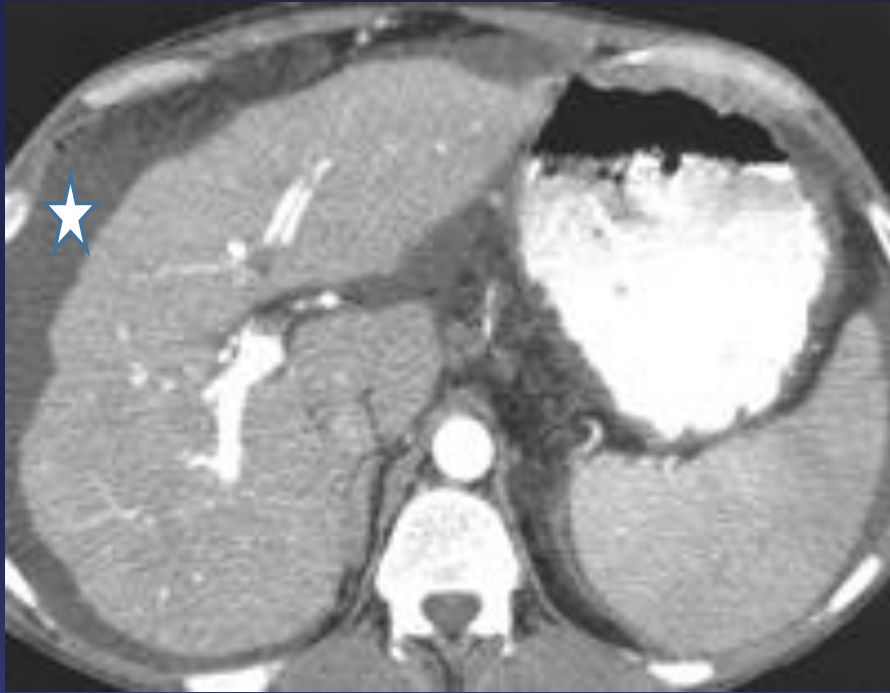
PHT tanısı

Splenorenal venler

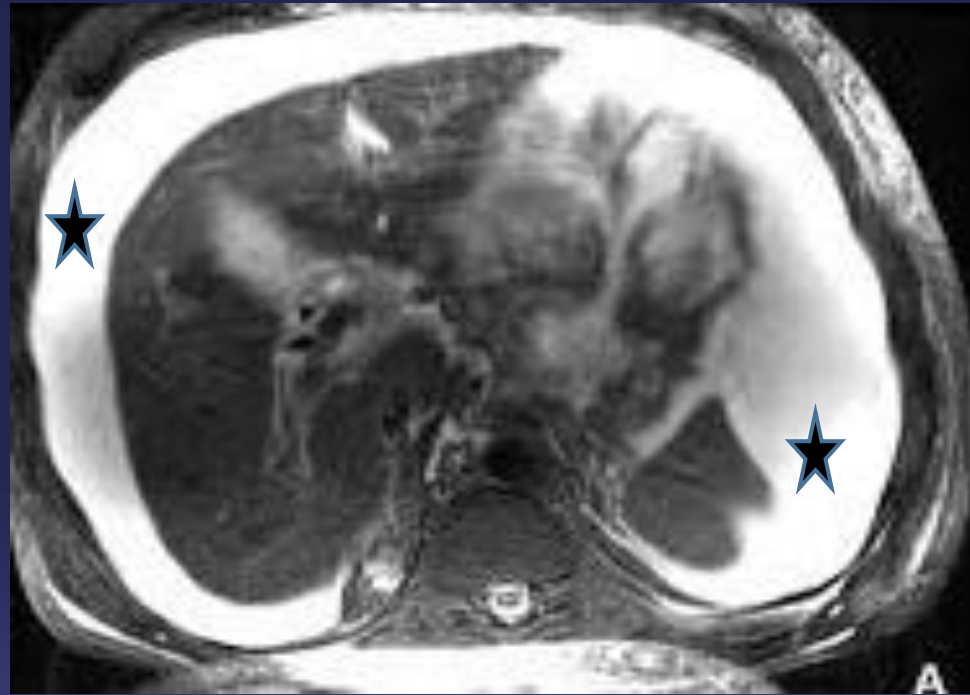




PHT-Asit



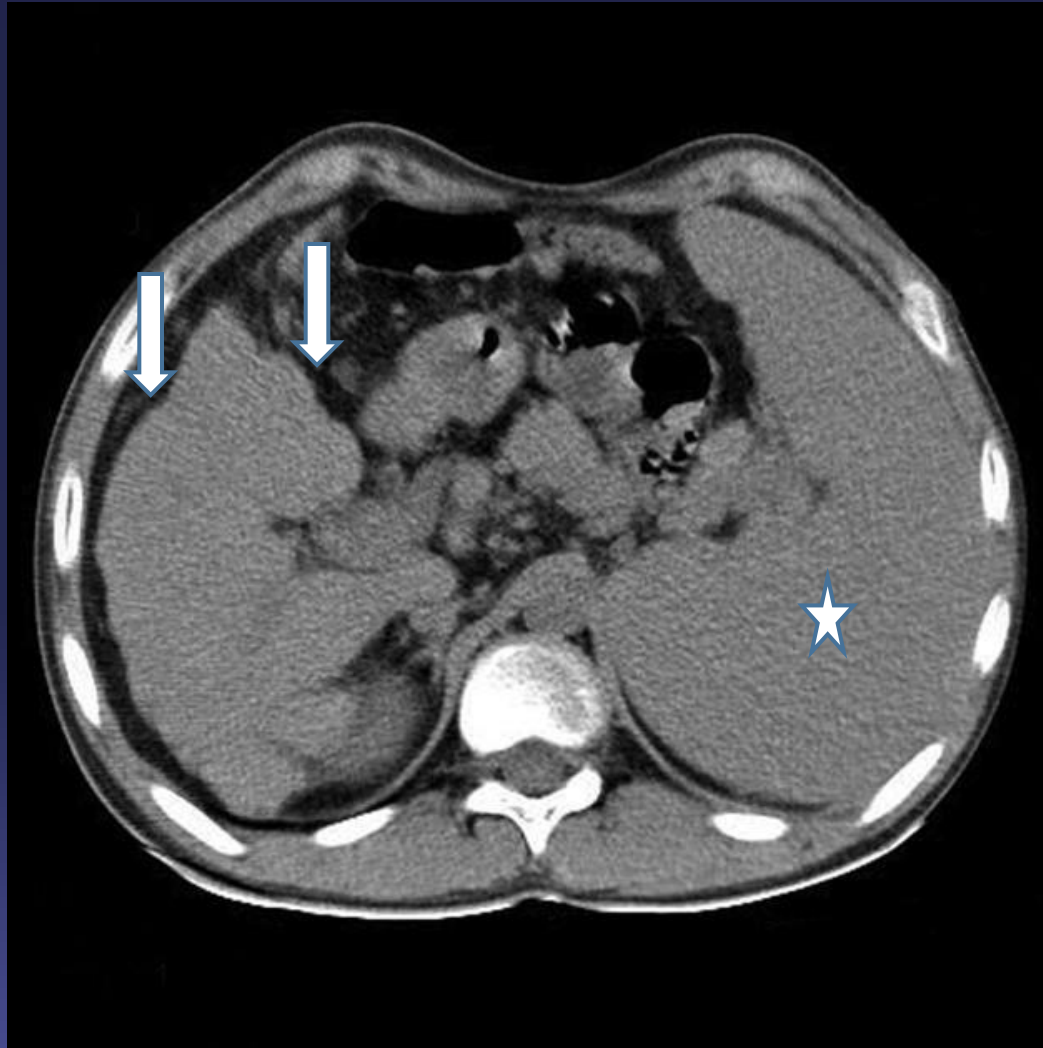
BT



T2A



PHT-Splenomegali



Sirozda HCC tanisi

- HCC riski

Hepatit CX100

Alkolik siroz.....X 2-3

KC parankimi nasıl?



Normal



Anormal



Kist



Hemanjiom



Fibronodüler hiperplazi (FNH)



Adenom

(OKS, anabolik steroid)



Fibrolamaller HCC



Periferik kolanjiyokarsinom



Metastaz (*primer malignite*)



Rejenerasyon nodülü



Displastik nodül

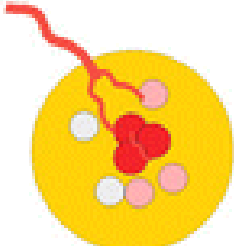
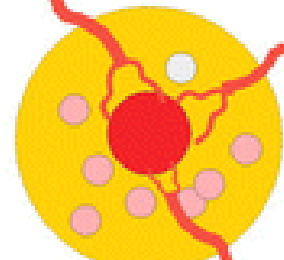
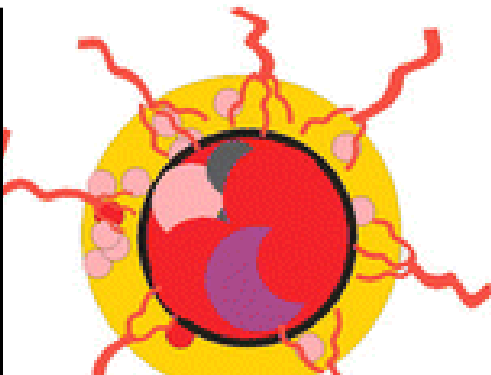


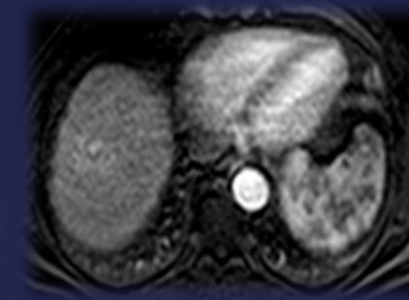
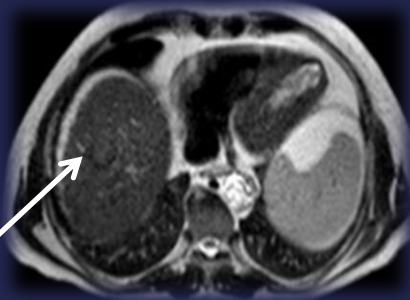
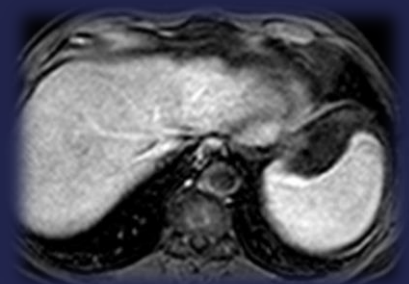
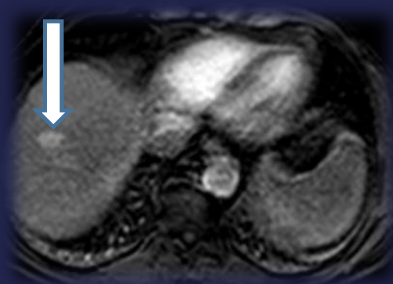
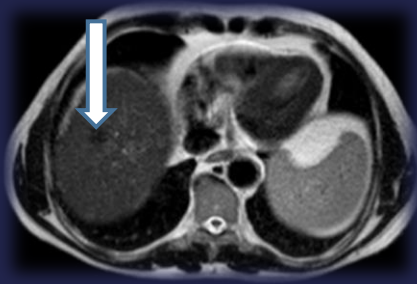
HCC



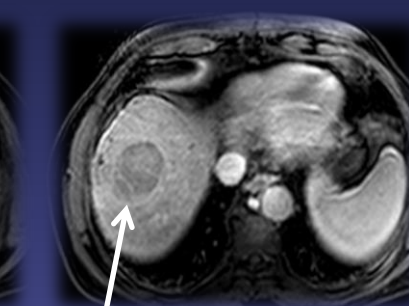
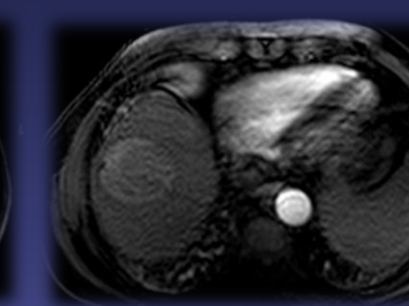
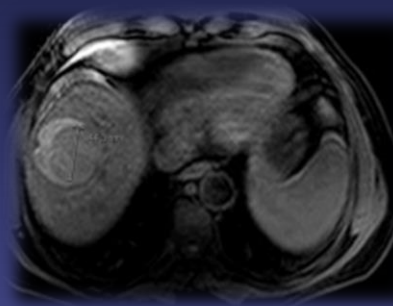
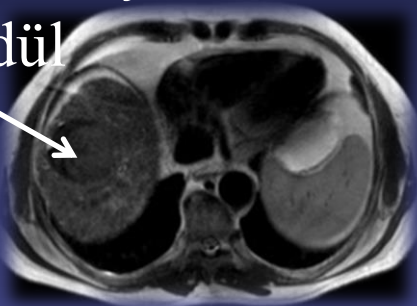
Nodüler rejeneratif hiperplazi
NRH (*venookluziv hast.*)

Hastalıklı karaciğer parenkiminde gelişen fokal hepatik lezyonlar

	 RN	 DN	 HCC focus	 Small HCC	 Large HCC (> 2cm)
T1A	İzo	izo	hiper	Hipo	hipo
T2A	İzo	izo	İzo	Hiper	hiper
AF	izo	izo	Hipervasküler ±	Hipervasküler	Hipervasküler (mozaik patern)
PVF	izo	izo	hipovasküler	Wash out	Wash out Kapsüler
Primovist (20.dk)	+	+	+	±	-

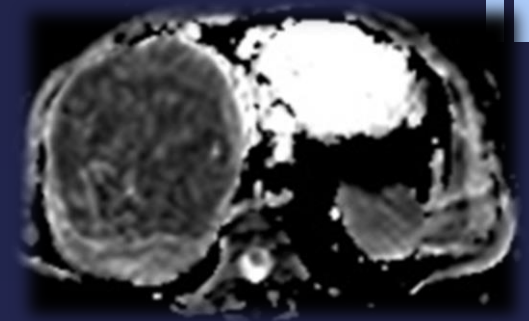
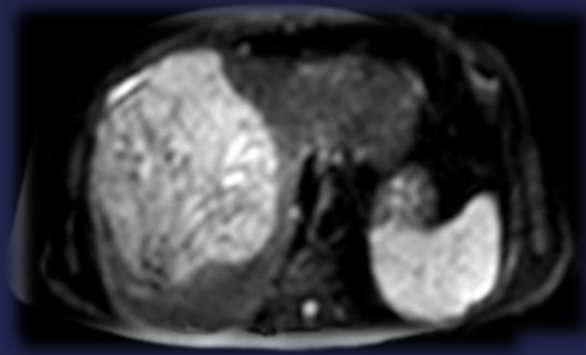


Nodül içi
nodül



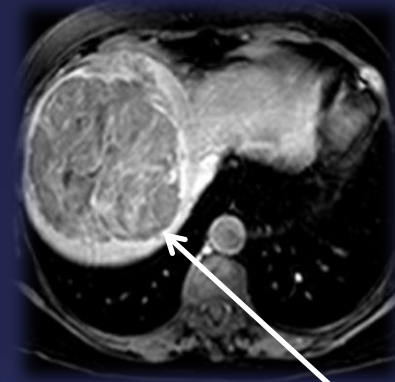
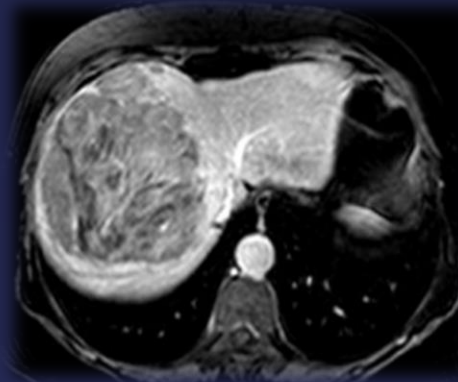
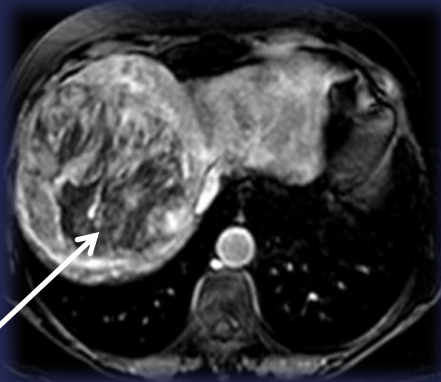
Kapsül

Mozaik patern-HCC



b1000

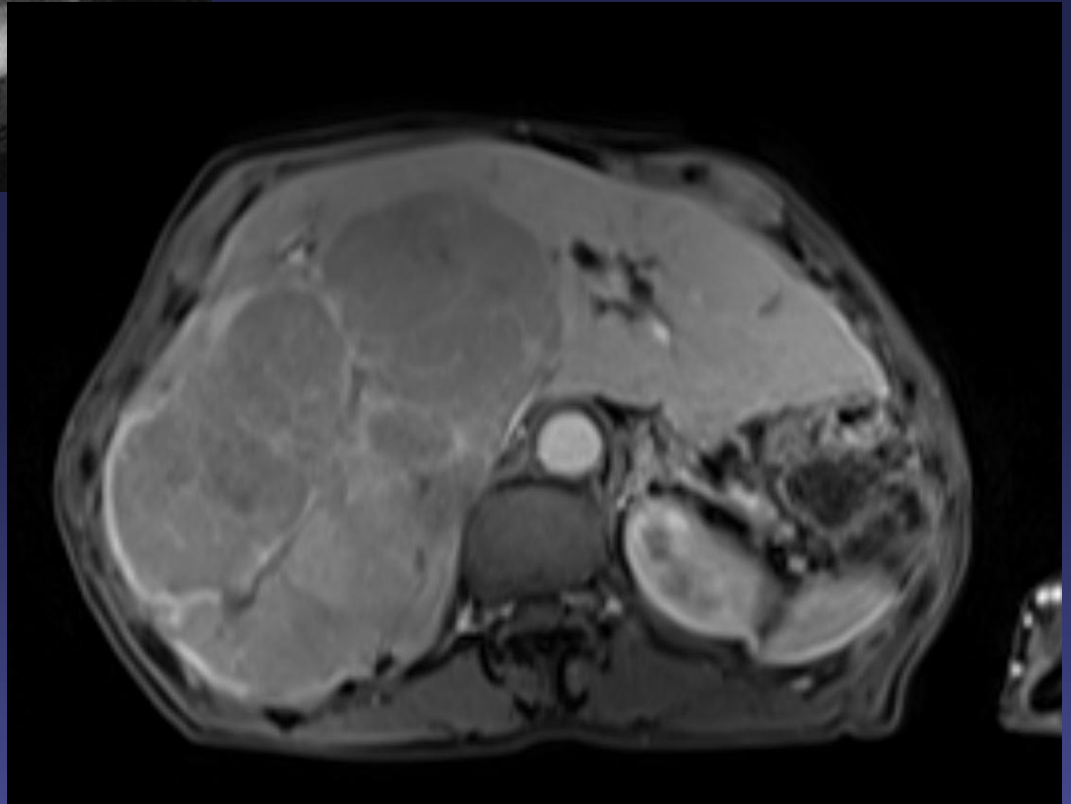
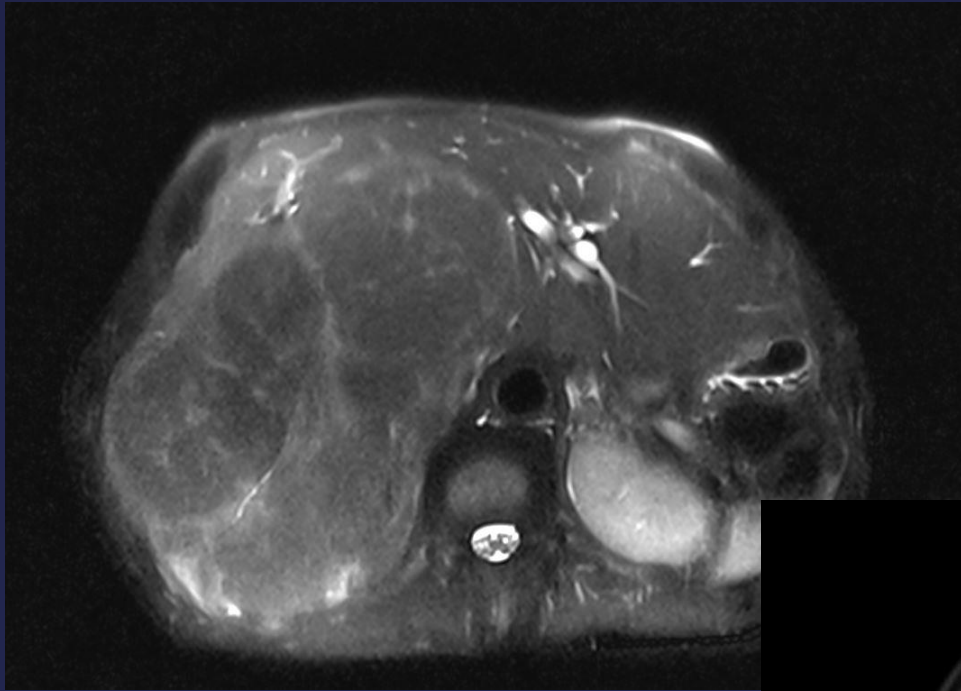
ADC

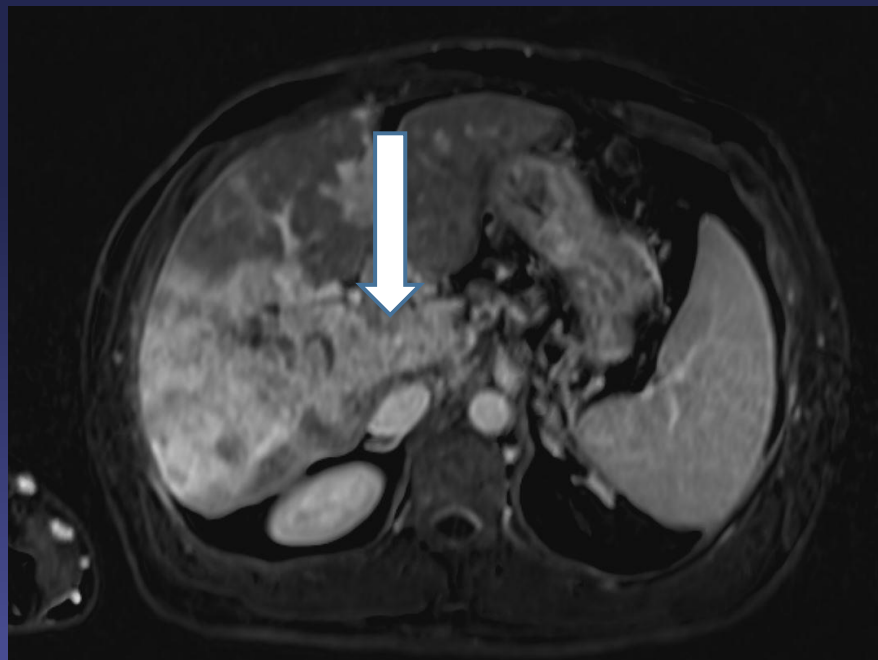
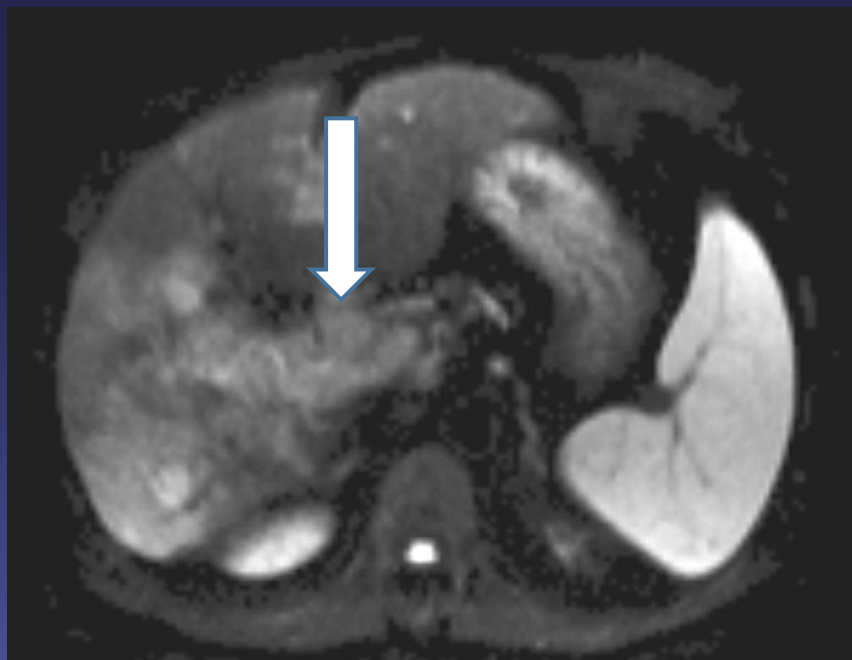
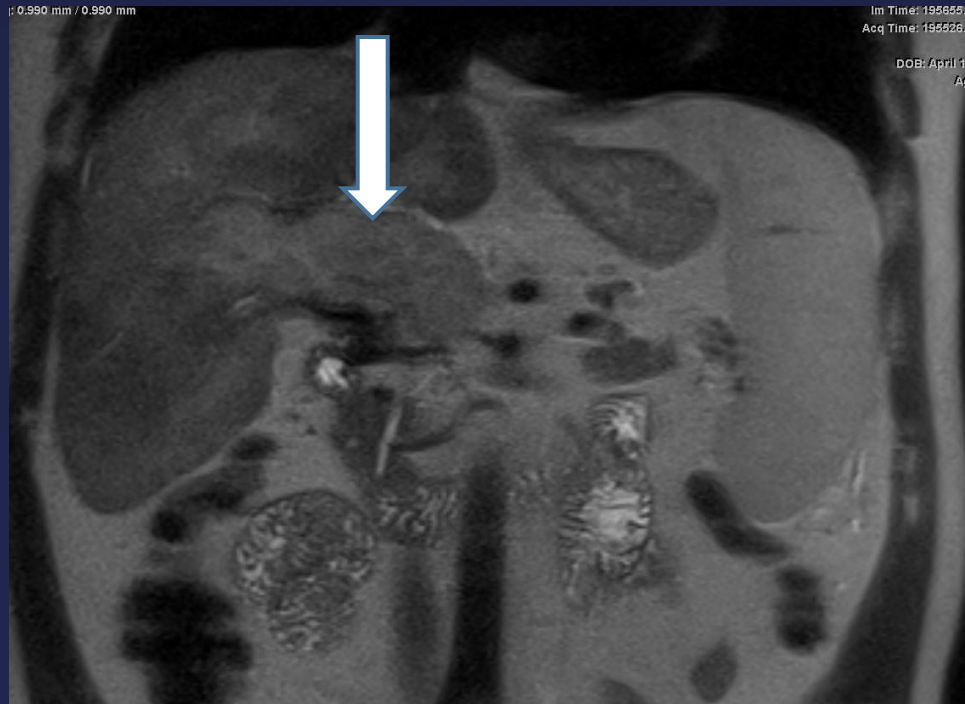
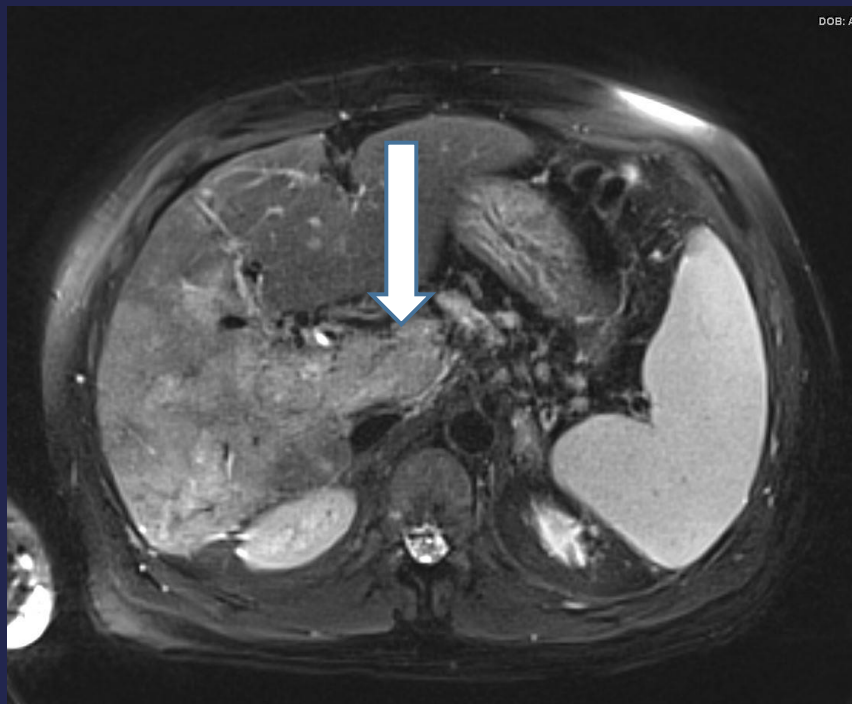


Mozaik
patern



Kapsüler
boyanma

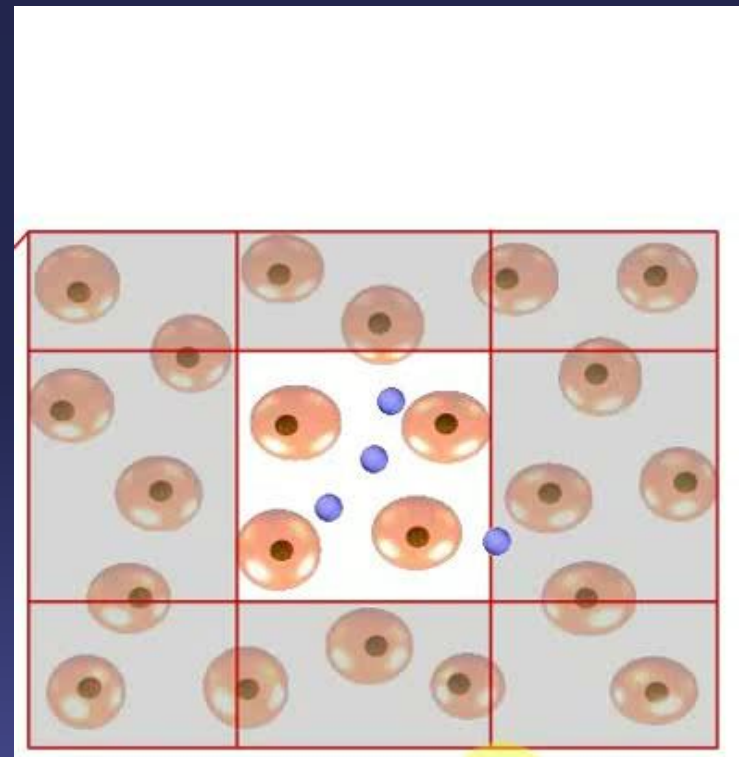
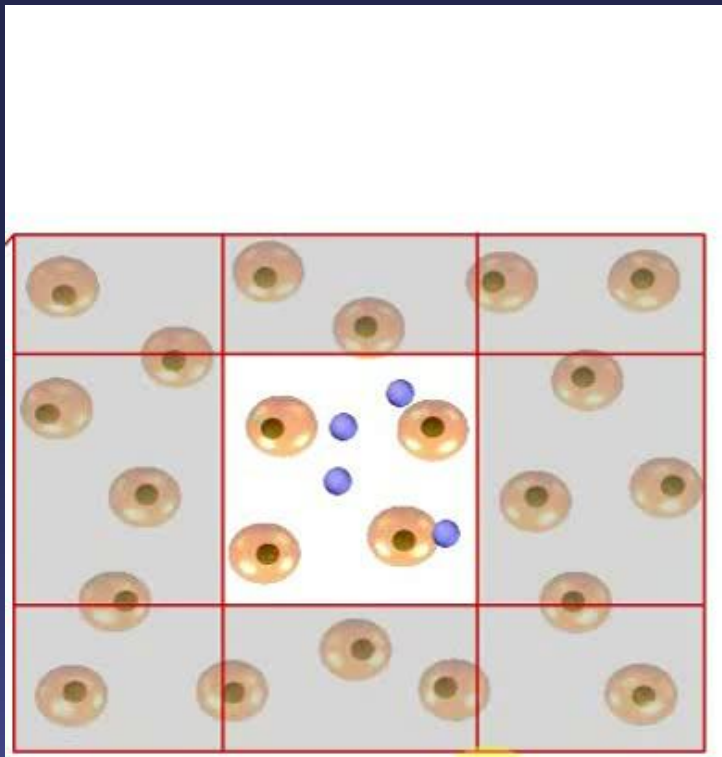




Fonksiyonel görüntüleme:

- DAG (Diffusion- weighted imaging)
- PWI (Perfusion-weighted imaging)
- MRE (MR Elastography)
- PET-MRG

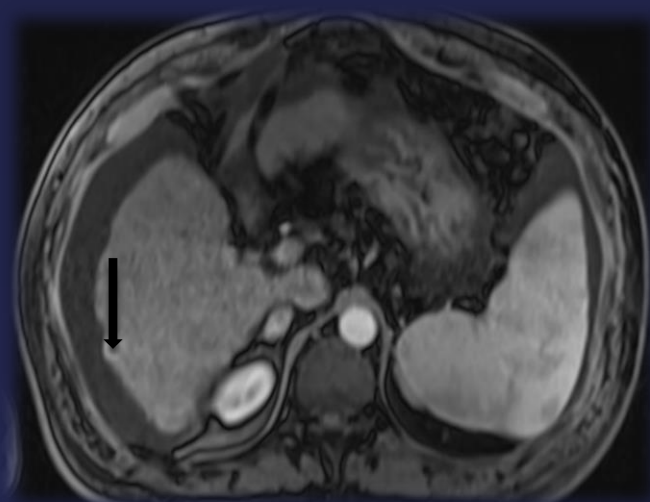
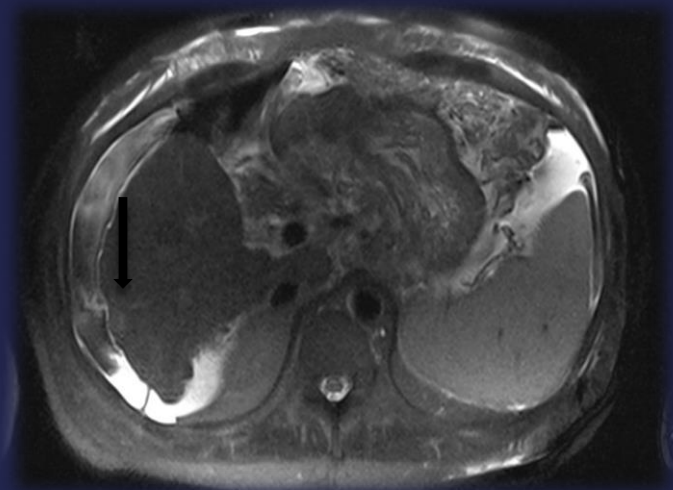
DAG-Konzept



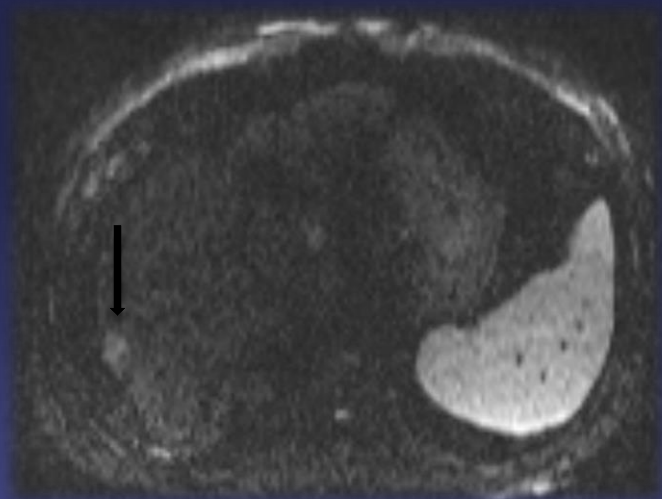
Niye DAG?

- *Tanısal performansı arttırmak*
HCC saptanması ve karakterizasyonu
- *Diffüz parankim değerlendirme*

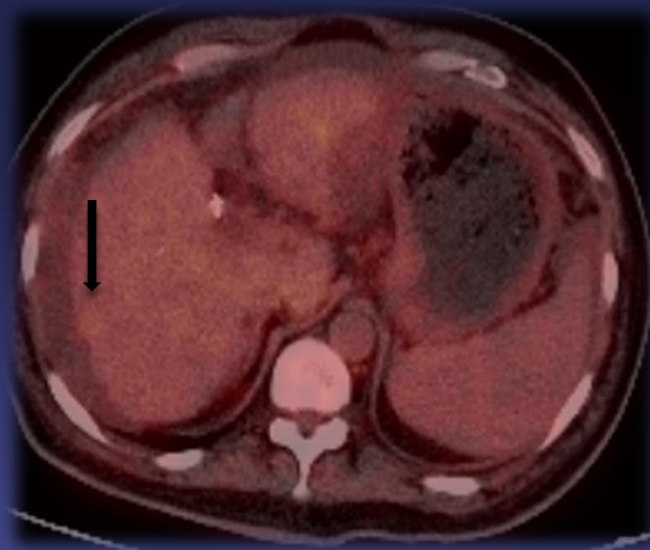
52y, E, HBV, AFP: 31

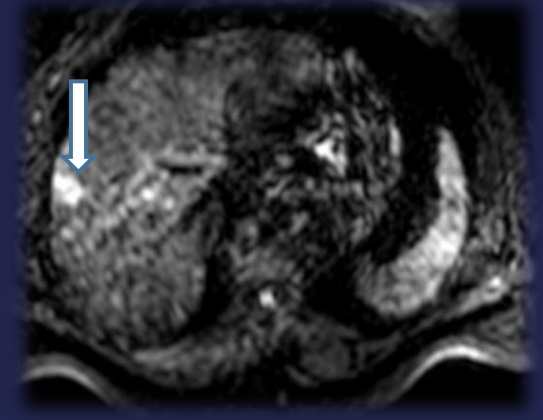
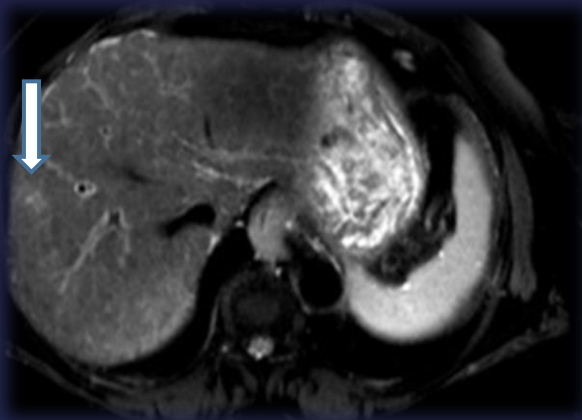


Arteryel

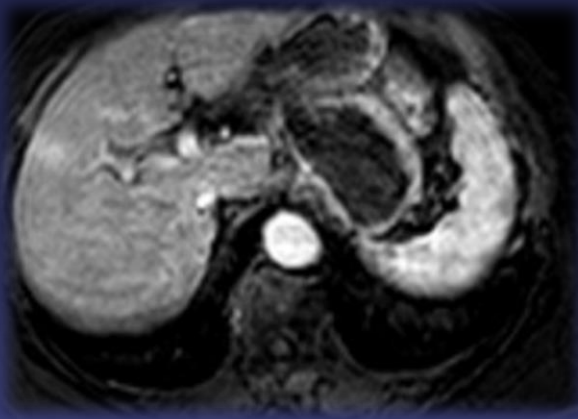


b 800 sn/mm²

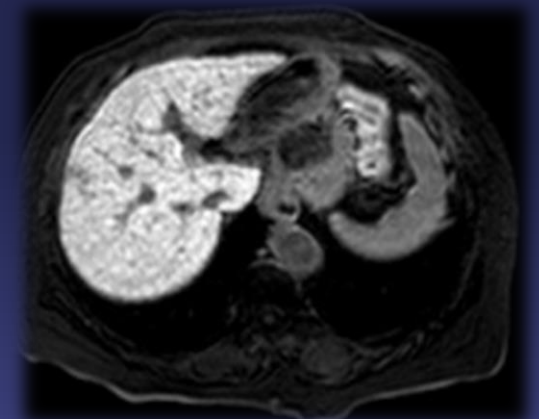
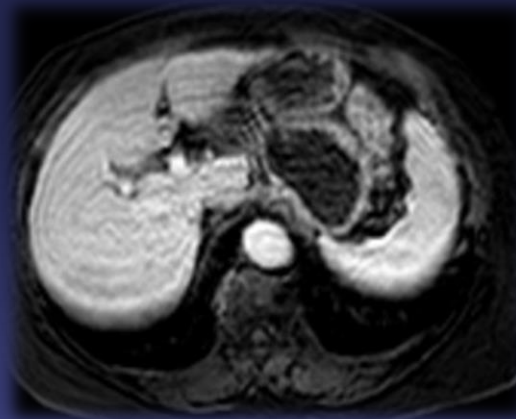




b1000



Arterysel

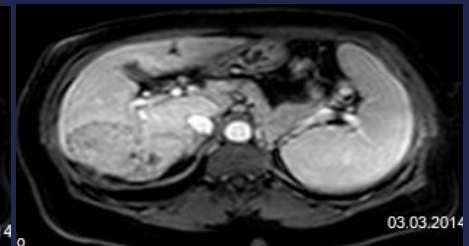
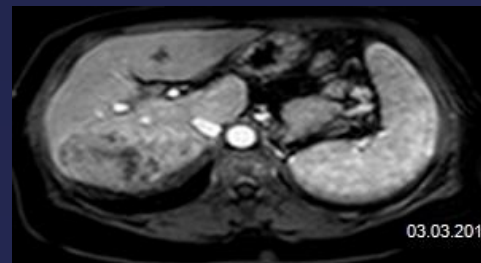
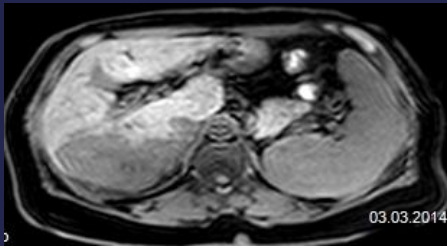
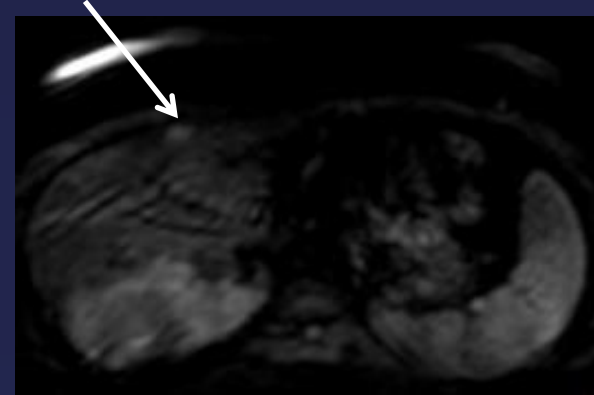
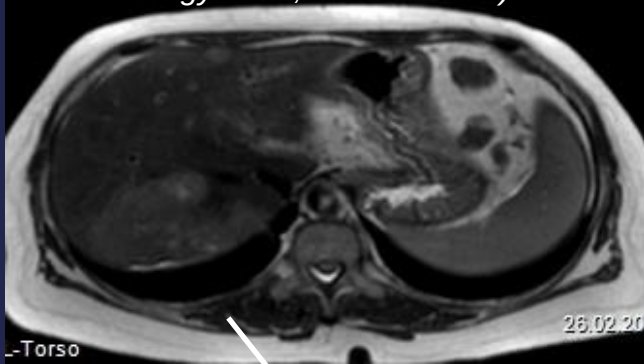


Primovist
(20 dk)

Primovist + DAG

<2 cm HCC'lerdeki saptama oranını arttırmaktadır

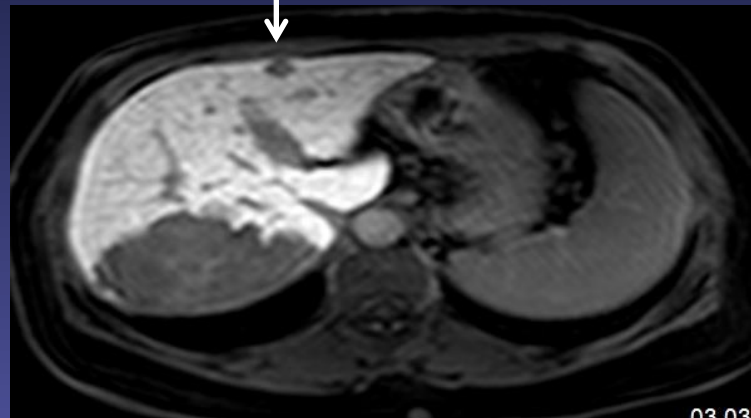
(Park MJ et al. Radiology 2012; 264: 761-770)



Arteryel

Portovenöz

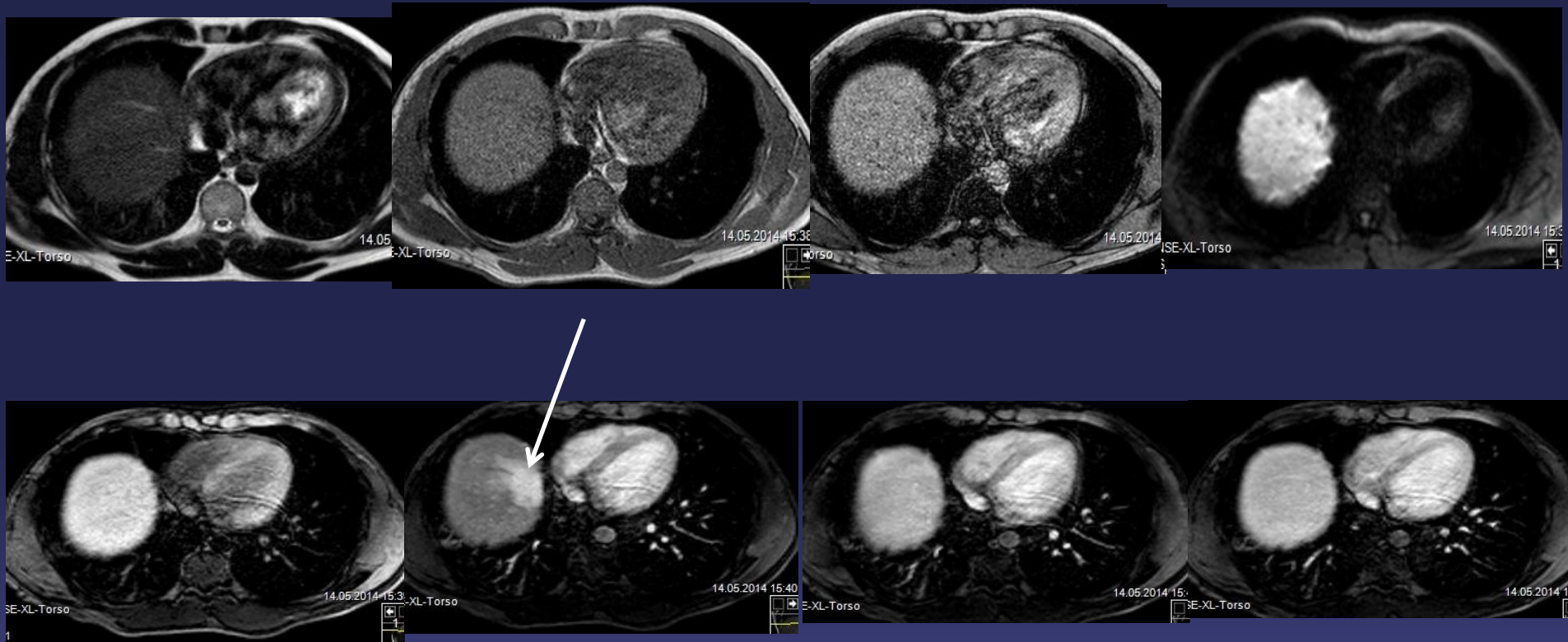
Denge



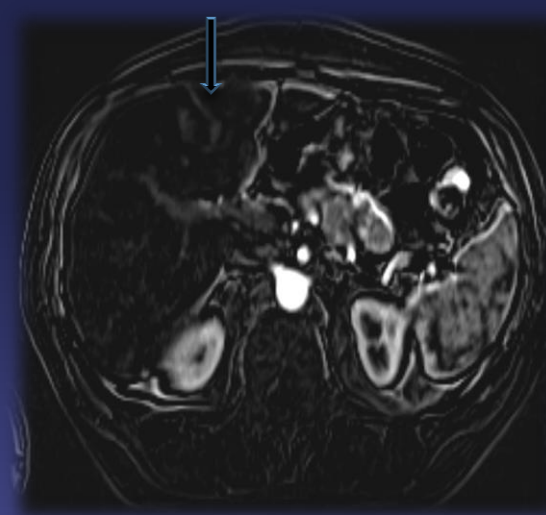
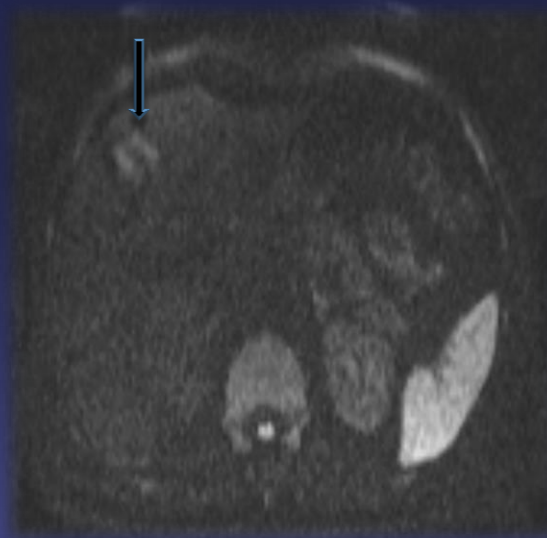
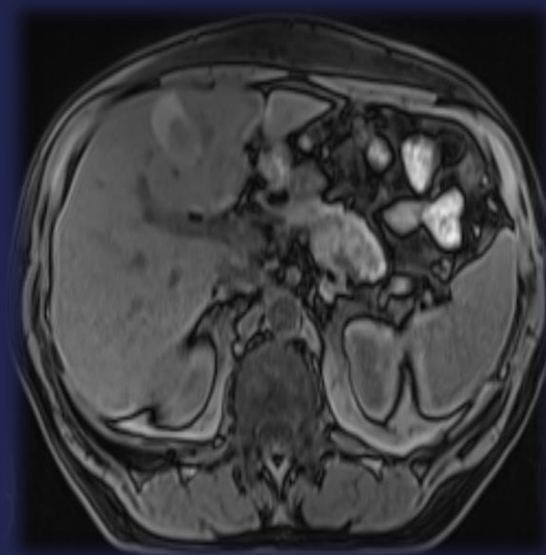
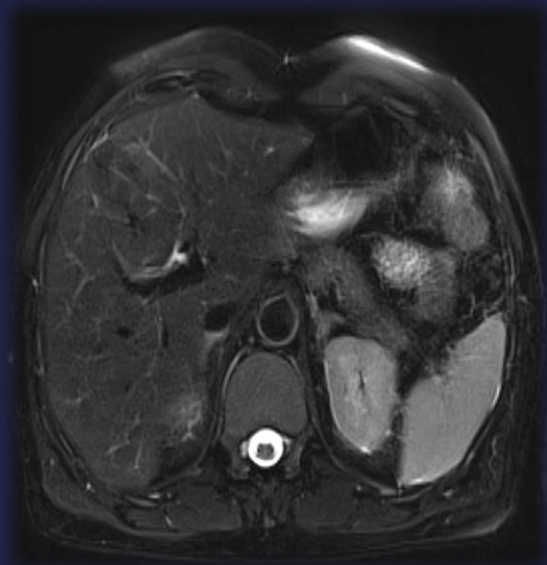
Primovist
20.dk

Geçici hepatik intesite farklılığı

A-P shunt



HCC, RFA



Sub AF

SİROZ

- ADC değerinde azalma

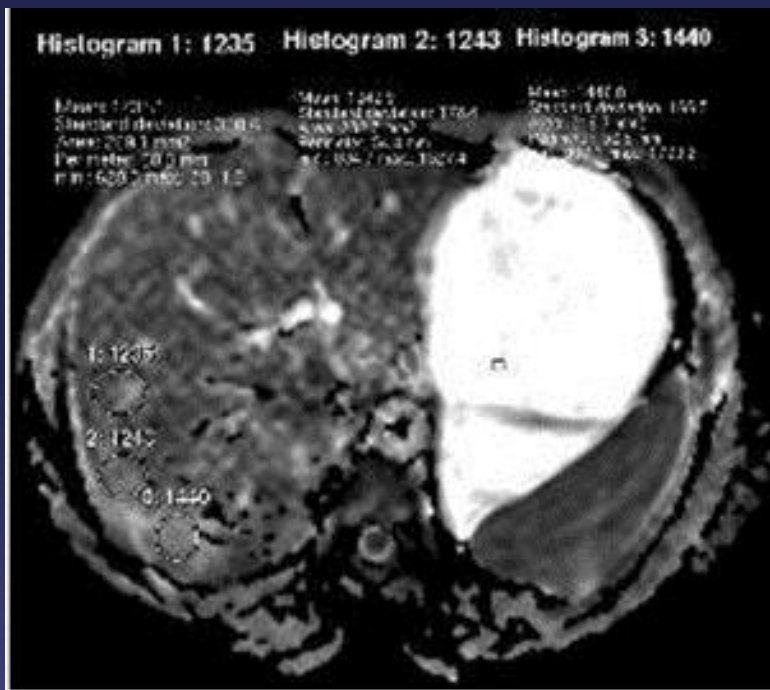
- 37 Kr. viral hepatitli hasta ve 34 normal gönüllü
- 3 T MRG; DAG SSh-EPI-TSE (single-shot echo-planar spin echo)
- b faktor 0 ve 1000 s/mm²
- ADCs haritaları
- Histopatolojik olarak (METAVIR); fibrosis 5li skalada (0–4)
inflamasyon 4lü skalada (0–3)

- ADCs

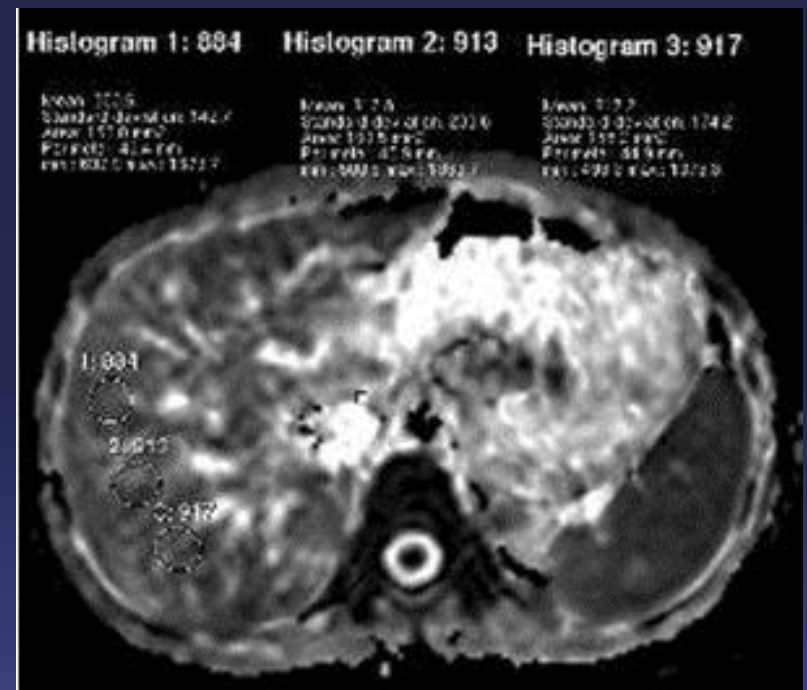
hasta < normal

ADC (mm ² /s)	$0.91 \pm 0.20 \times 10^{-3}$	$1.08 \pm 0.18 \times 10^{-3}$	$p = 0.000$
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ADC-fibrosis arasında ters korelasyon



normal

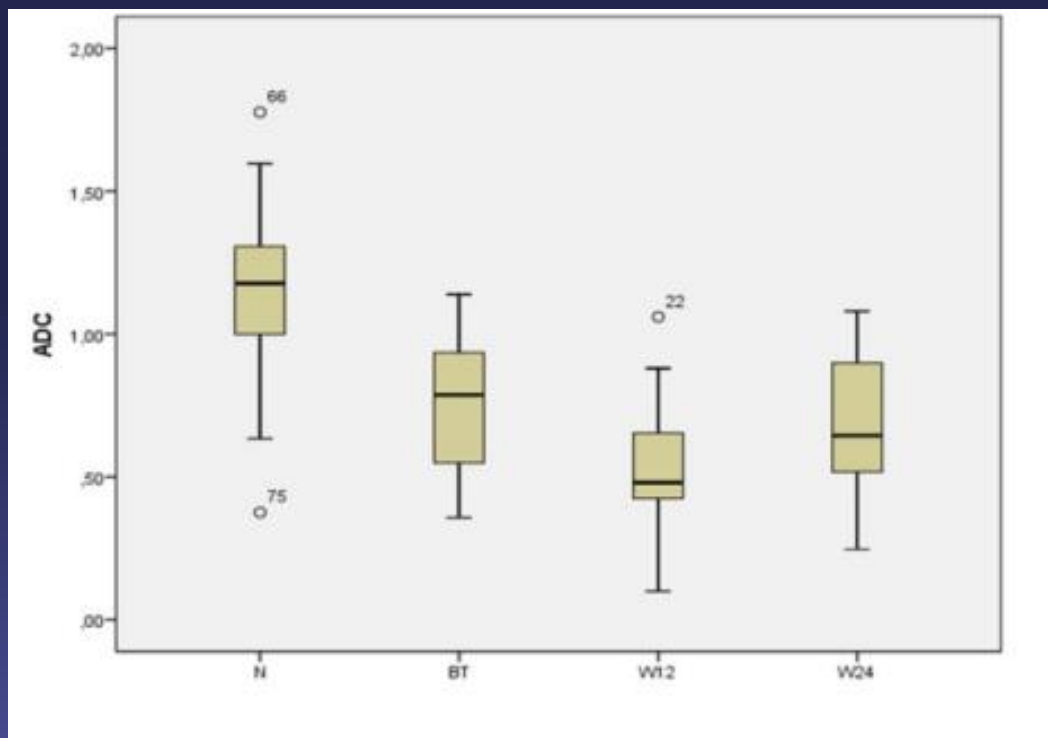


hasta



- **Telaprevir-bazlı üçlü tedavi ile KC parankimindeki ADCs değişiklikleri**
- **17 Kr. Hepatit C hasta ve 25 normal gönüllü**
- **24 hf (12 hf telaprevir-bazlı üçlü tdv+12 hf PEG-INF-RBV)**
- **Before treatment (BT), 12th (W12) ve 24th (W24)**
- **3 T MRG (DAG SSh-EPI-TSE (single-shot echo-planar spin echo))**
- **b faktor 0 ve 1000 s/mm²**
- **ADCs haritaları**

		Patients (n=17)	Healthy volunteers (n=25)
ADC ($\times 10^{-3} \text{ mm}^2 / \text{sec}$)	Before treatment	0.74 ± 0.23	1.14 ± 0.28
	12 th week	0.54 ± 0.25	-
	24 th week	0.68 ± 0.24	-



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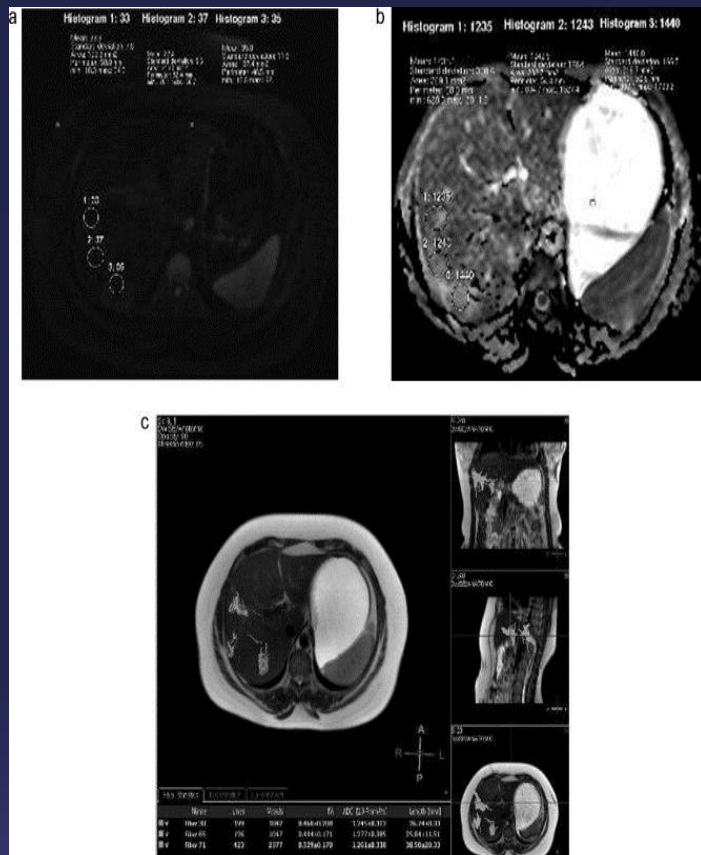


Table 1

Results of the quantitative analysis of the CDI and DTI.

	Patients (<i>n</i> = 37)	Healthy volunteers (<i>n</i> = 34)	<i>p</i>
SI on trace images	96.82 ± 37.79	80.35 ± 23.47	<i>p</i> = 0.033
ADC (mm ² /s)	0.91 ± 0.20 × 10 ⁻³	1.08 ± 0.18 × 10 ⁻³	<i>p</i> = 0.000
<i>D</i> (mm ² /s)	1.25 ± 0.13 × 10 ⁻³	1.38 ± 0.16 × 10 ⁻³	<i>p</i> = 0.001
FA	0.48 ± 0.06 × 10 ⁻³	0.46 ± 0.06 × 10 ⁻³	<i>p</i> = 0.323

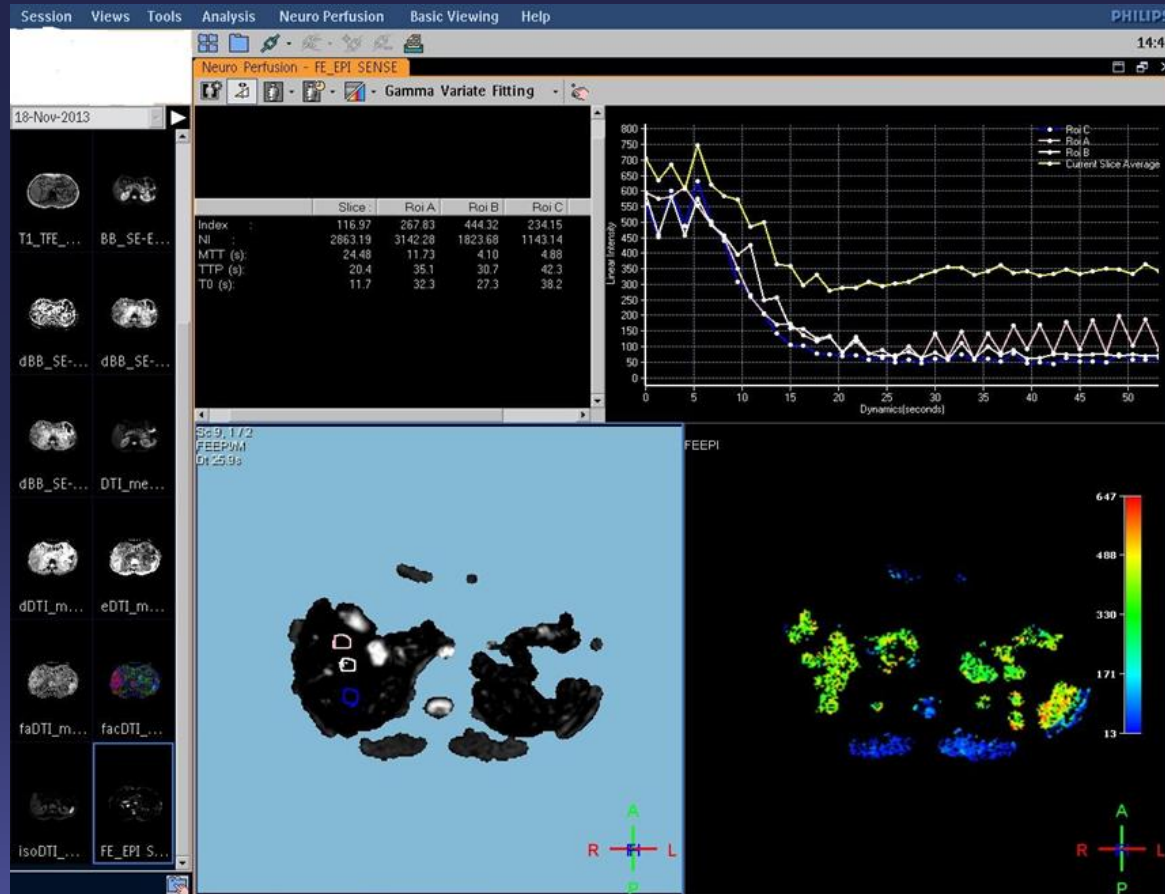
Table 2

Results of the quantitative analysis of the CDI and DTI in according to the fibrotic stage.

	Stage 1	Stage 2	Stage 3	Stage 4
ADC	$0.90 \pm 0.11 \times 10^{-3}$	$0.89 \pm 0.02 \times 10^{-3}$	$0.87 \pm 0.02 \times 10^{-3}$	$0.86 \pm 0.01 \times 10^{-3}$
<i>D</i>	$1.27 \pm 0.13 \times 10^{-3}$	$1.26 \pm 0.16 \times 10^{-3}$	$1.25 \pm 0.12 \times 10^{-3}$	$1.15 \pm 0.03 \times 10^{-3}$
FA	$0.46 \pm 0.05 \times 10^{-3}$	$0.49 \pm 0.06 \times 10^{-3}$	$0.50 \pm 0.08 \times 10^{-3}$	$0.40 \pm 0.01 \times 10^{-3}$

KC MR perfüzyon

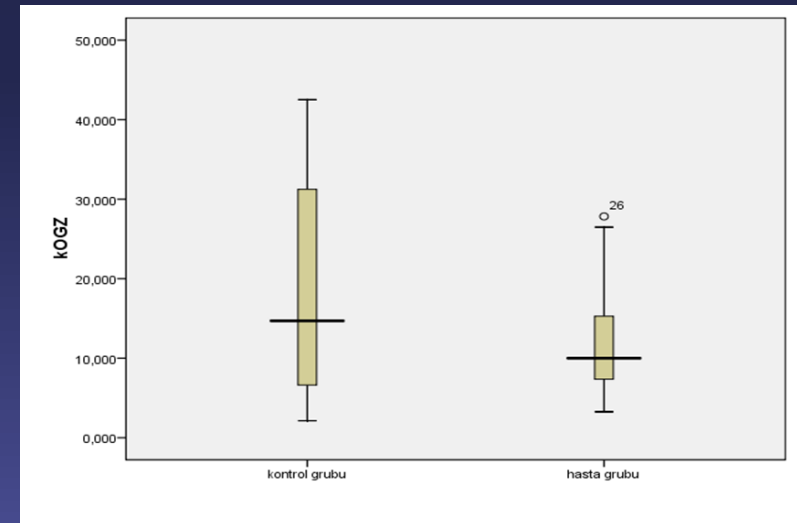
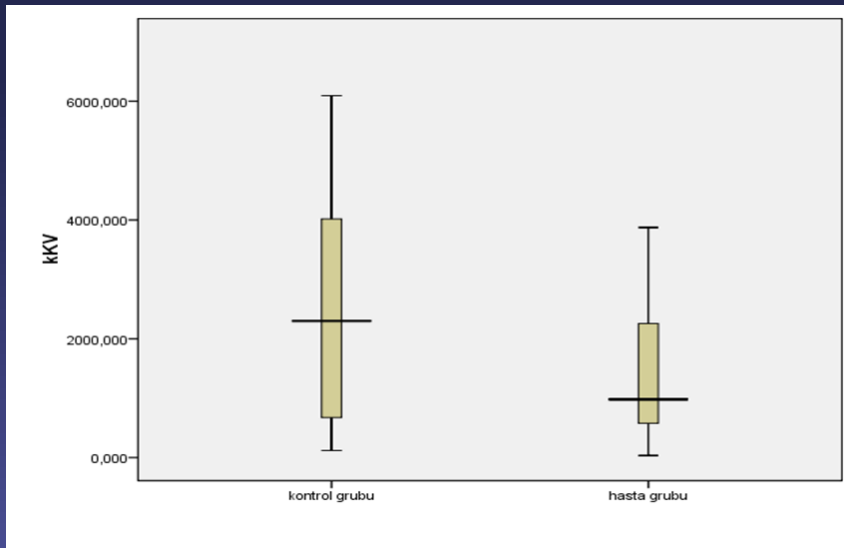
- Dinamik Suseptibilite Kontrast Manyetik Rezonans Perfüzyon Görüntüleme (DSK-MRPG) yöntemi ile paramanyetik kontrast maddeler kullanılarak dokudaki kan akımı ve incelenen dokunun vaskülarizasyonu belirlenebilmektedir.



KC MR perfüzyon

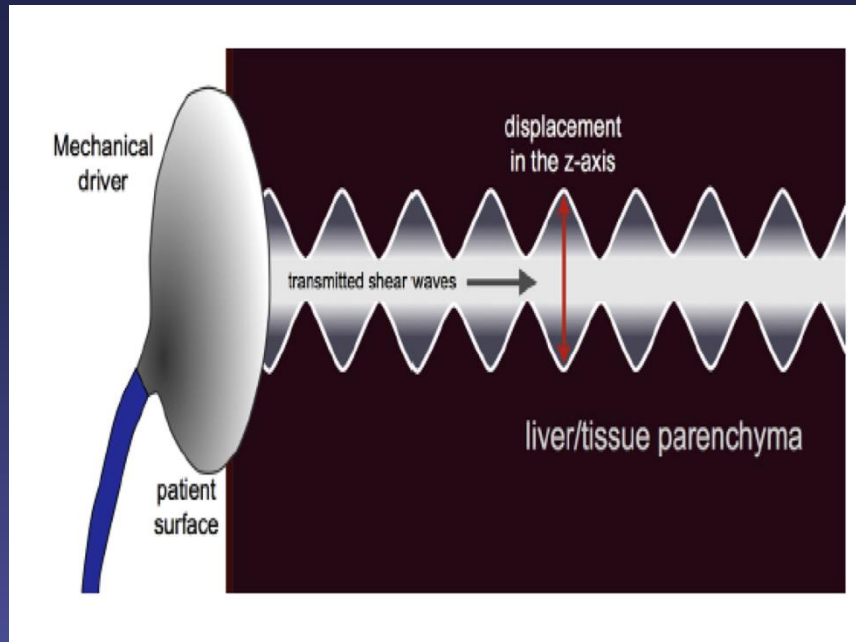
	Hasta grubu (n=27)	Kontrol grubu (n=24)	p
kKA (ml/100g/dk)	104.35± 60.26	126.69± 58.20	p=0.185
kKV (ml/100g)	1360.62 ± 1075.12	2460.39 ± 1873.37	p=0.016
kPZ (sn)	37.90±11.386	39.19 ± 8.361	p=0.643
kT0 (sn)	33.75± 11.450	33.72± 9.864	p=0.990
kOGZ (sn)	12.06 ± 6.798	18.56 ± 12.693	p=0.032

NOT: kKA: Karaciğer kan akımı; kKV: Karaciğer kan volümü; kPZ: Karaciğer pik zamanı; kOGZ: Karaciğer ortalama geçiş zamanı

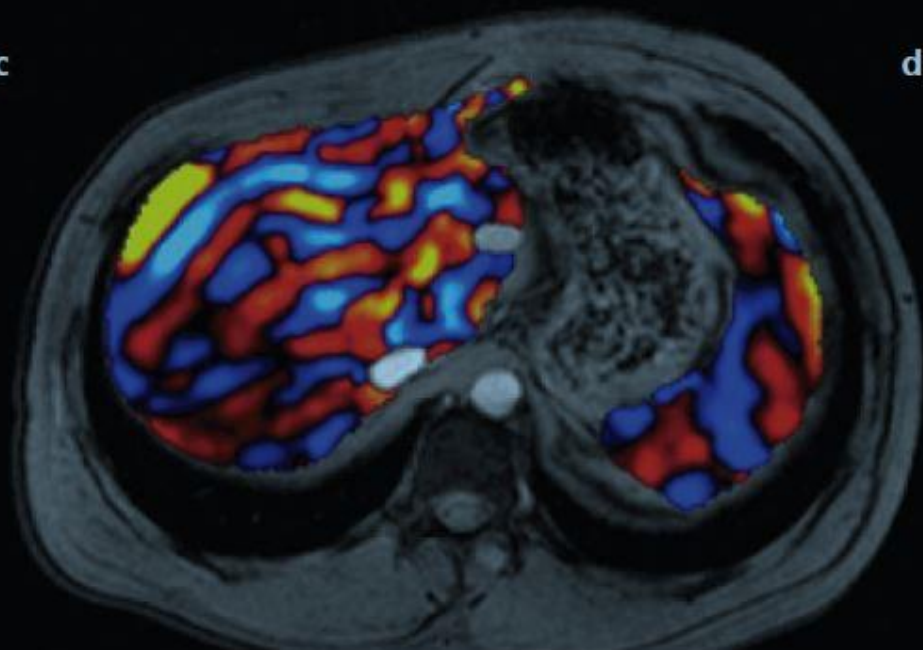


MR ELASTOGRAFI

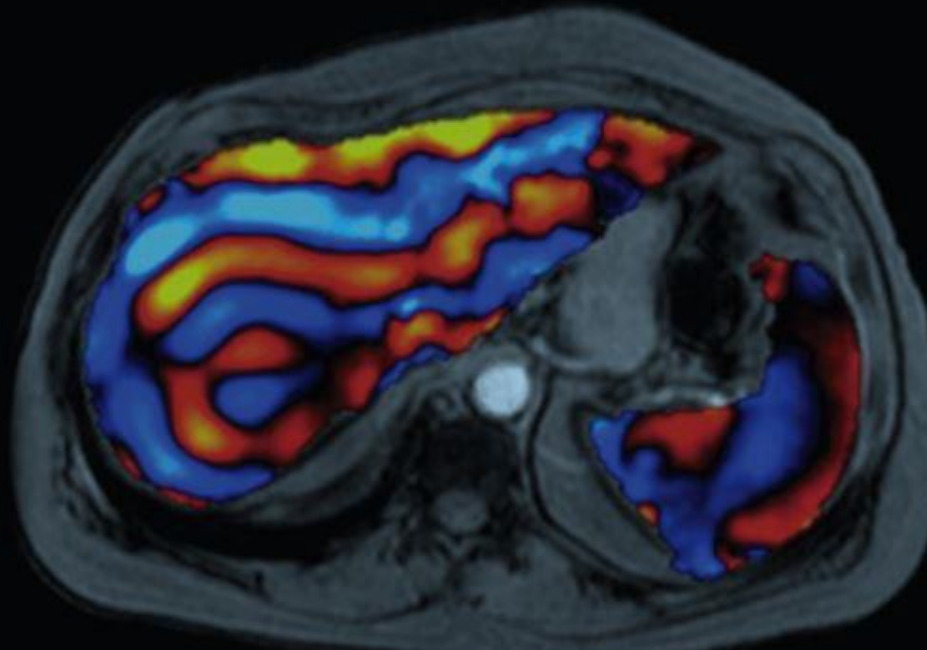
- Dalgalar dokunun elastikiyetine göre doku boyunca yayılım gösterir.
- Eksternal kompresyon uygulanır (öz. Sağ lob) ve dalgalar transvers düzlemde ilerlerken ve Z aksında (sup-inf) dokudaki yer değiştirme hesaplanır.
- Genelde GRE ve T2* ve TE 20 ms...Demir birikimi ciddi limitasyon...
- Hareket kodlama gradyentleriyle dokudaki yer değiştirme ölçülebilir.
- Sertlik haritaları/ elastogramlar oluşturulur.



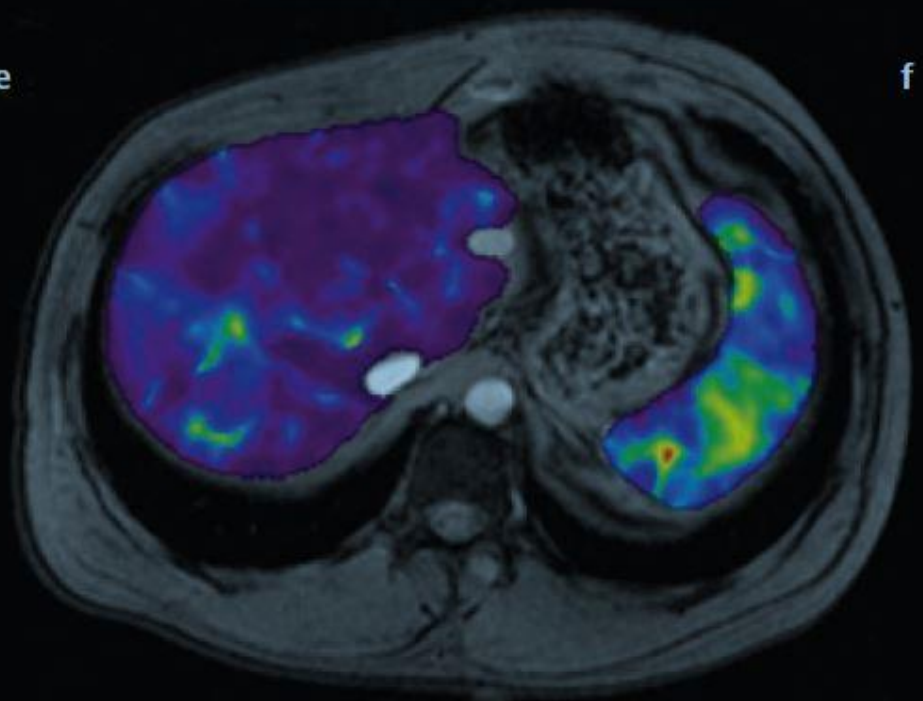
c



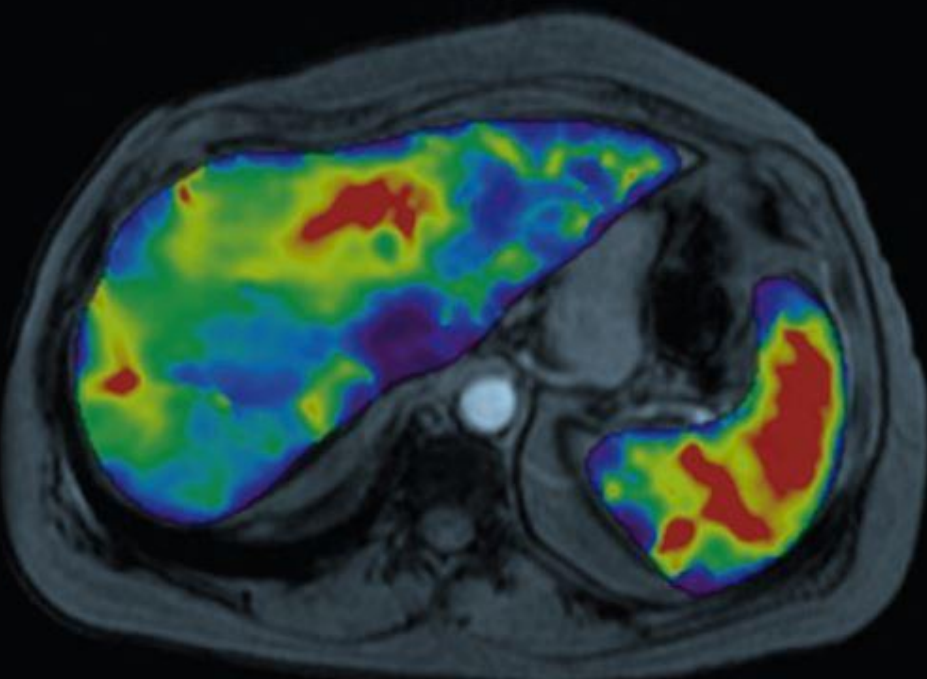
d



e



f



GELECEK

- IVIM (Intravoxel Incoherent Motion)
- Difüzyon-PET

IVIM (Intravoxel Incoherent Motion)

- Gerçek kısıtlanmış difüzyon - mikropiller perfüzyo

D: true diffusion coefficient

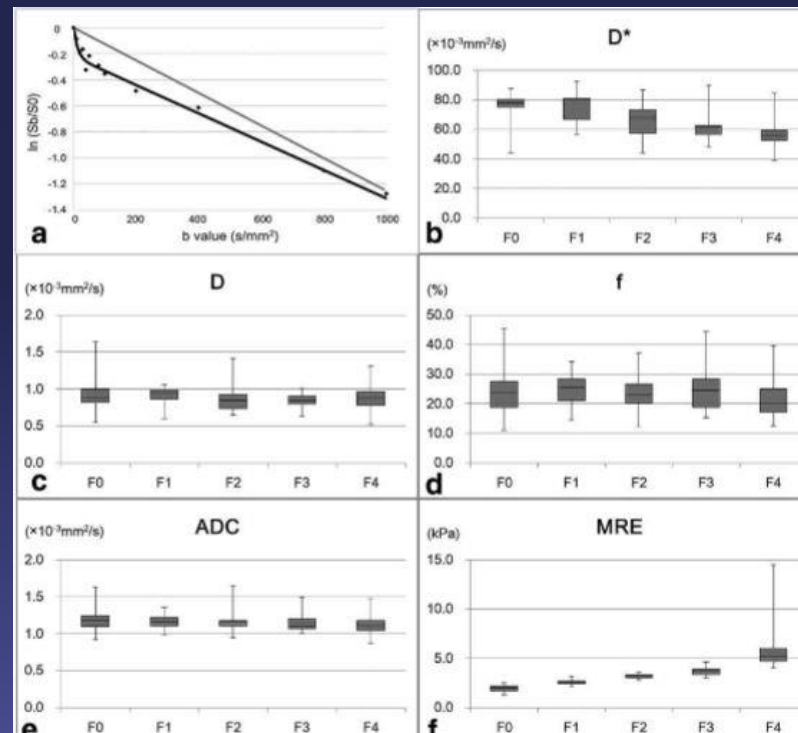
PF: Perfusion fraction

D: pseudodiffusion coefficient*

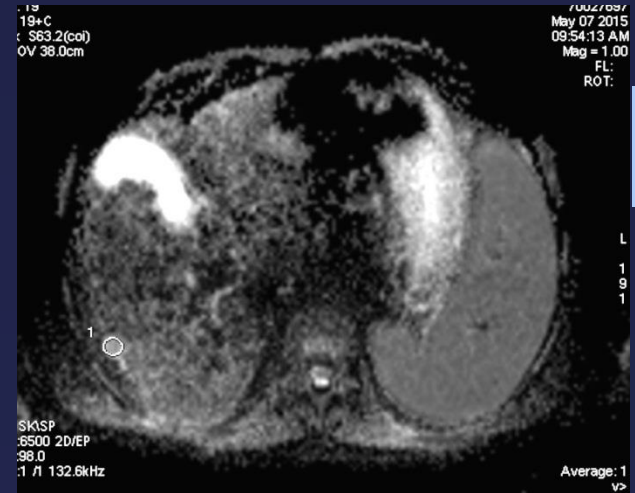
Original Research

MRI-Based Staging of Hepatic Fibrosis: Comparison of Intravoxel Incoherent Motion Diffusion-Weighted Imaging With Magnetic Resonance Elastography

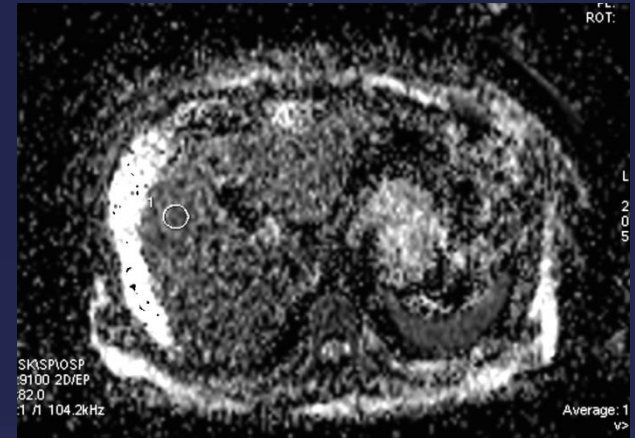
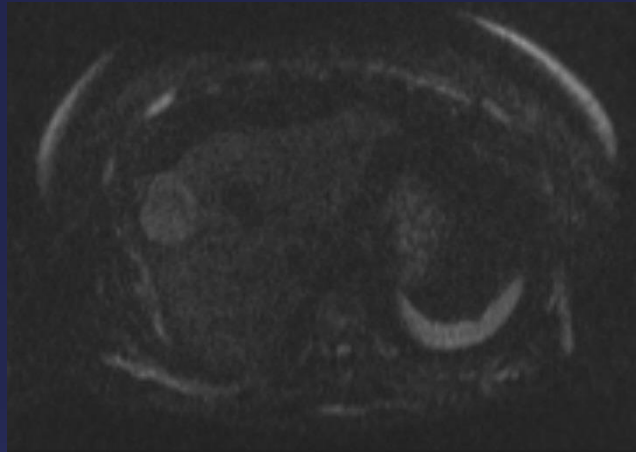
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Katsuhiro Sano, MD, PhD,¹ Tomoaki Ichikawa, MD, PhD,¹
Nobuyuki Enomoto, MD, PhD,² Masanori Matsuda, MD, PhD,³
Hideki Fujii, MD, PhD,³ and Hiroshi Onishi, MD, PhD¹



Düşük
gradeli

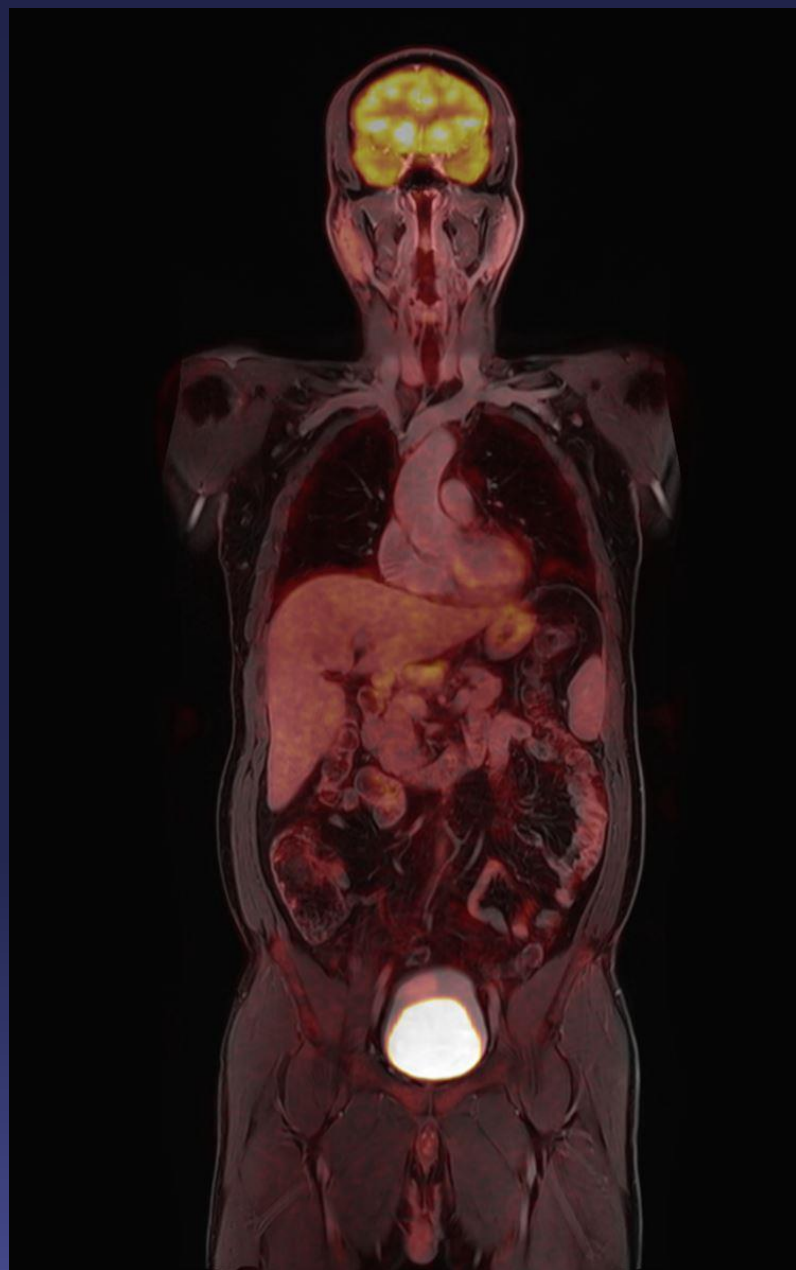
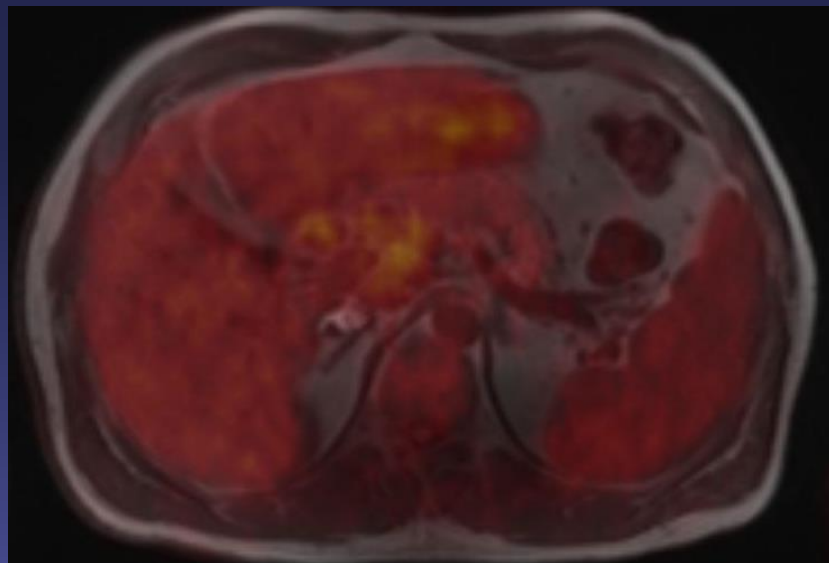
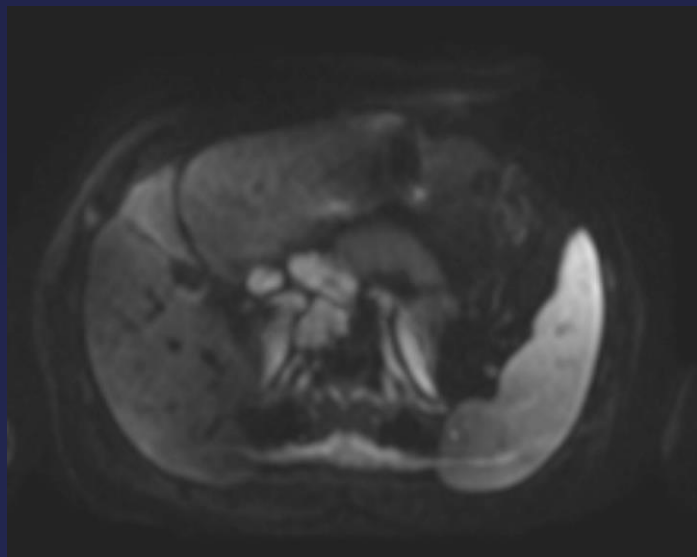


Yüksek
gradeli



	MonoExp Parameters	IVIM Parameters	
		f	D ($10^{-6}\text{mm}^2/\text{s}$)
Düşük gradeli	ADC ($10^{-6}\text{mm}^2/\text{s}$) 1,28	0,26,	1.14
Yüksek gradeli	0,99	0,39	1.03

PET MRG



SONUÇ

- Günümüzde Kr. Kc hastalıklarının ve komplikasyonlarının tanısında non invaziv görüntüleme yöntemleri kritik rol oynamaktadır.
- Önümüzdeki yıllarda erken evre fibrozisin ve tedavi cevabının değerlendirmesinde DAG, MRPG gibi ileri MRG teknikleri

TEŞEKKÜRLER