



KRONİK KARACİĞER HASTALARINDA RADYOLOJİK GÖRÜNTÜLEME

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Görüntüleme Yöntemleri

- US

- BT

Radyasyon (10 mSv)

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

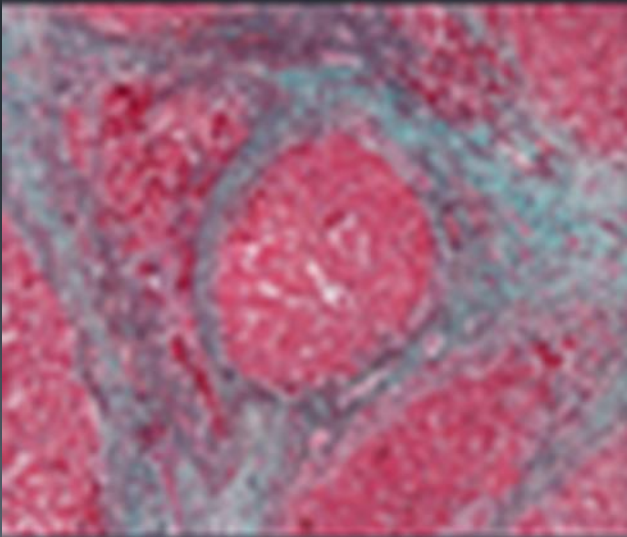
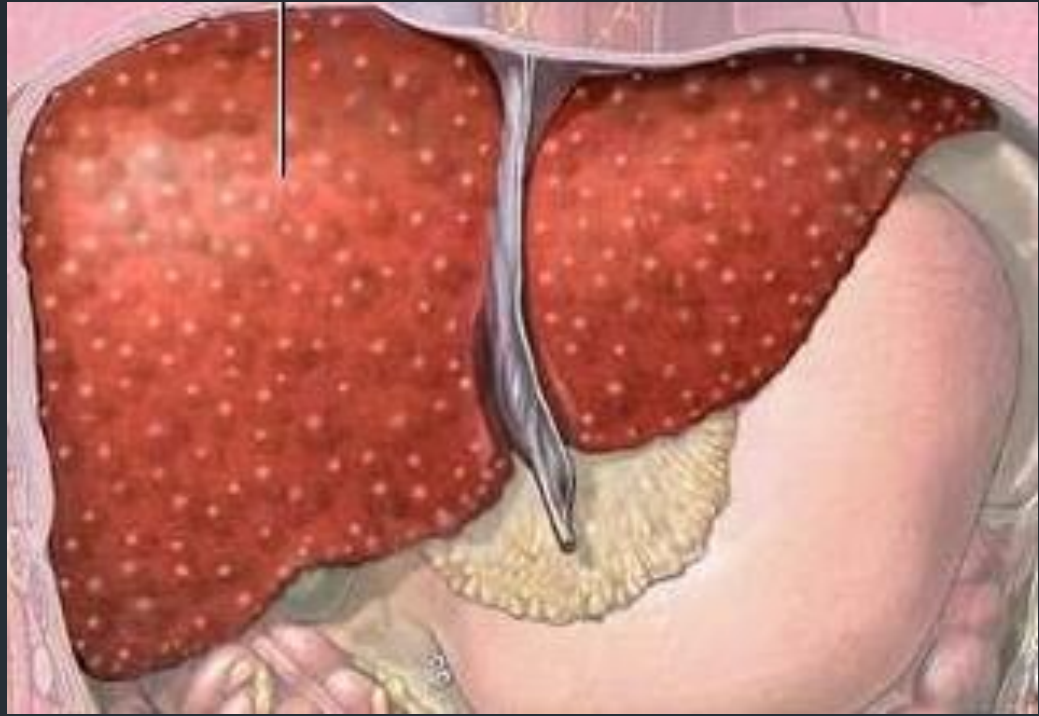
- MRG

NSF

ÖĞRENİM HEDEFLERİ:

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

- Alkol
- Kronik hepatit C
- Kronik hepatitis B
- Hemokomatozis
- Wilson Hastalığı



- 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



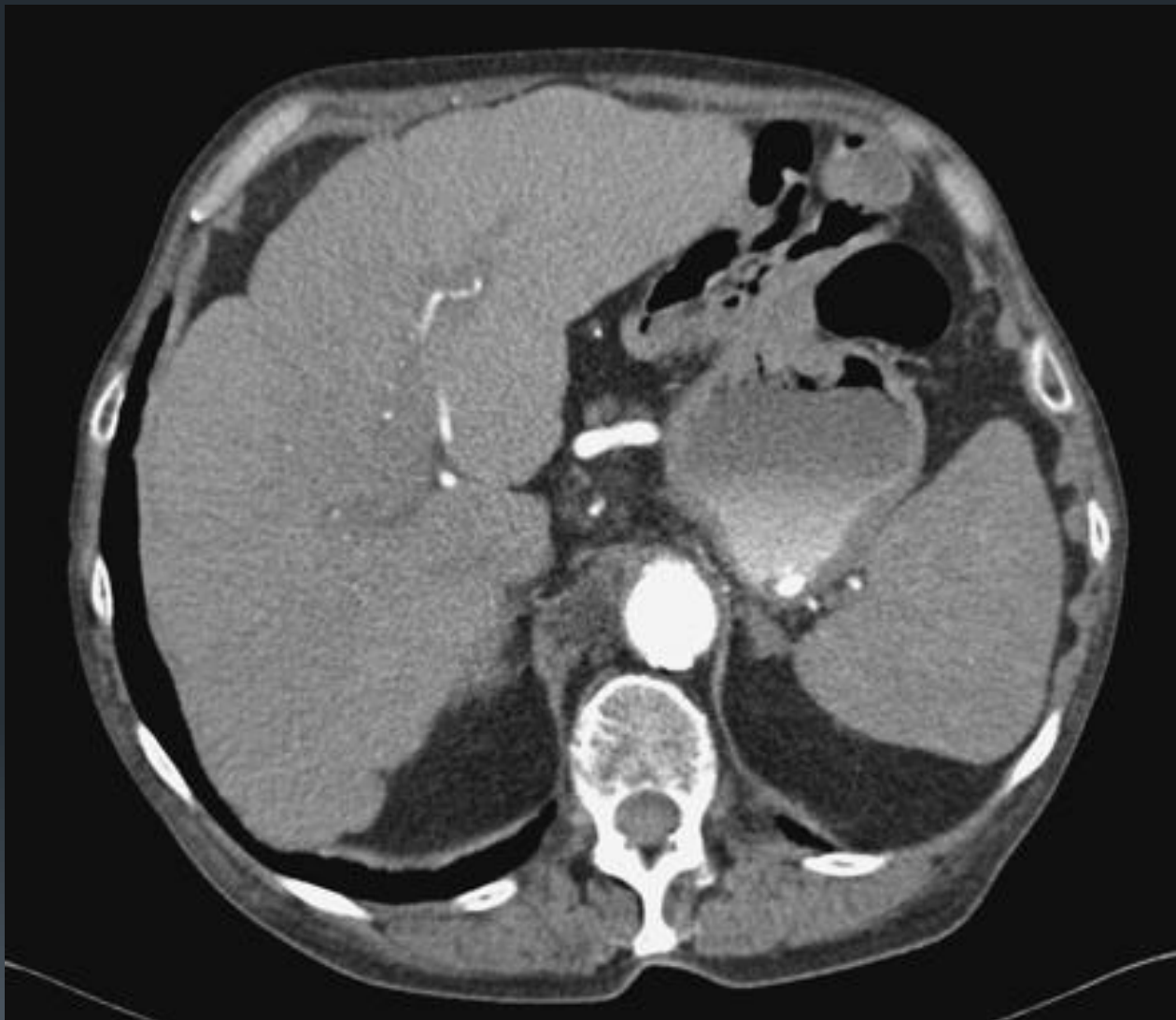
- KC yüzeyinde nodularite
- KC parankimal heterojenite
- KC morfolojisindeki değişiklikler
- Vasküler değişiklikler
- Portal hipertensiyon-mezenterik ödem

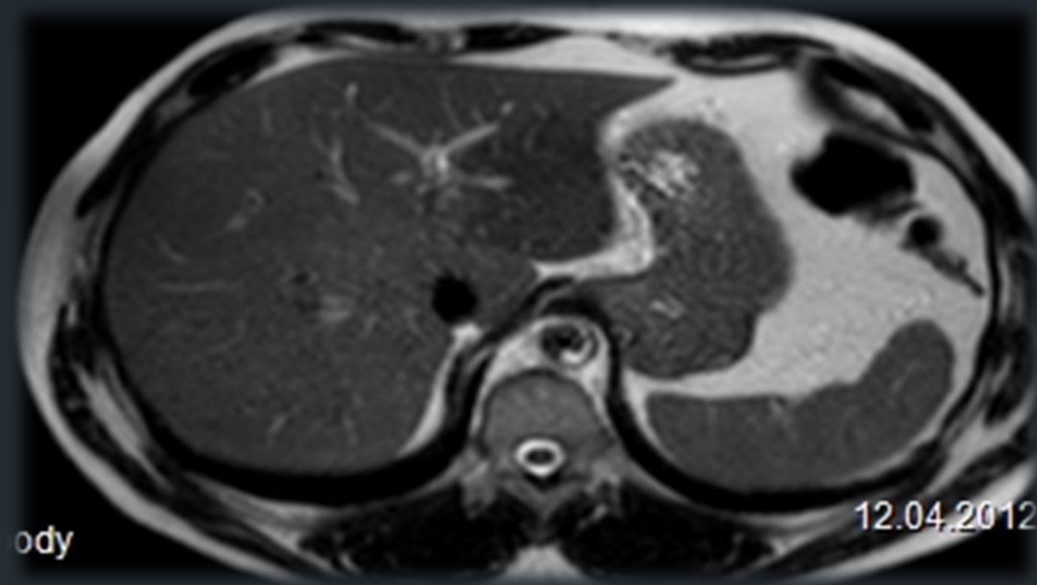
KC yüzeyinde nodularite

KC parankiminde heterojenite

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

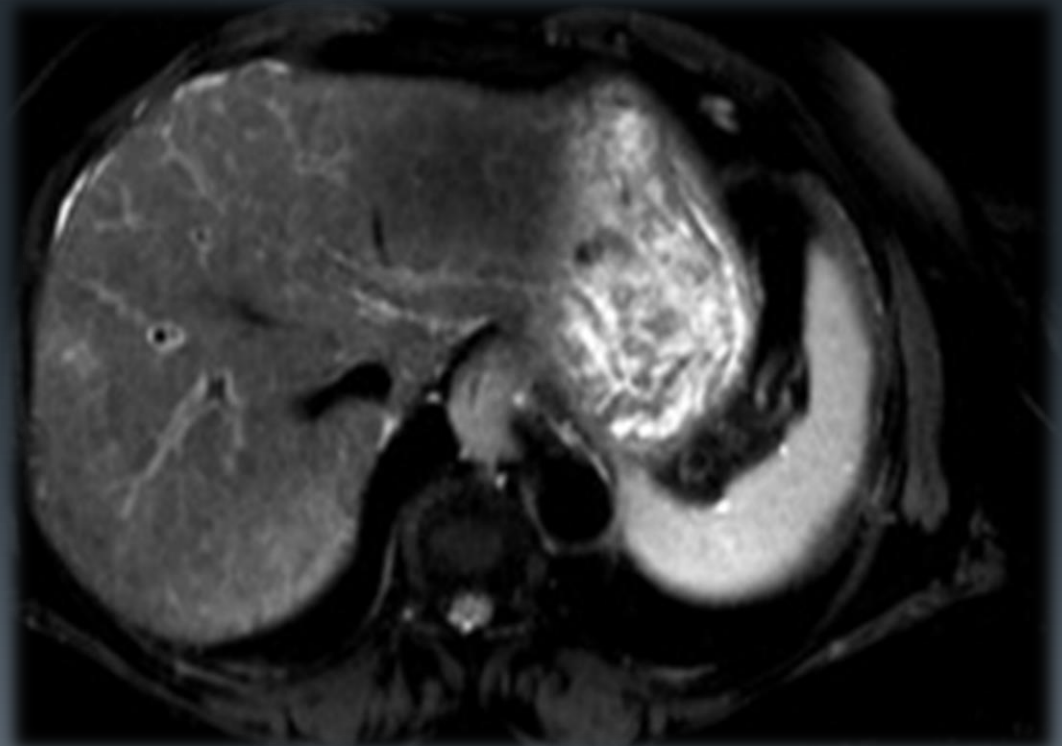


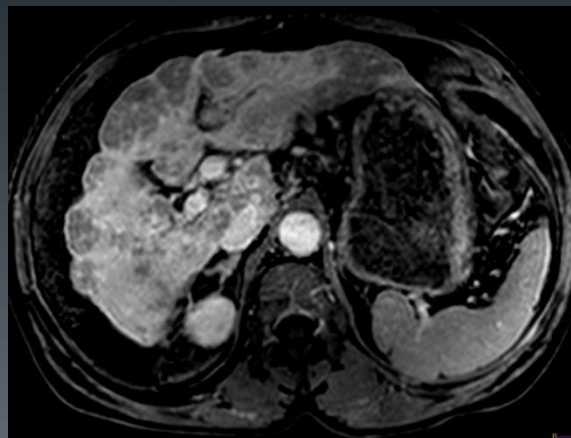
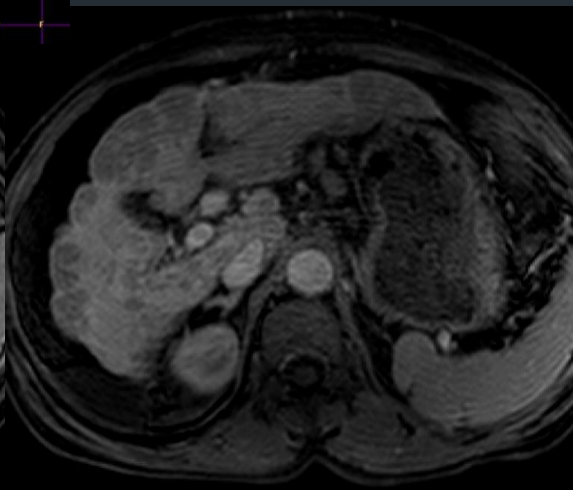
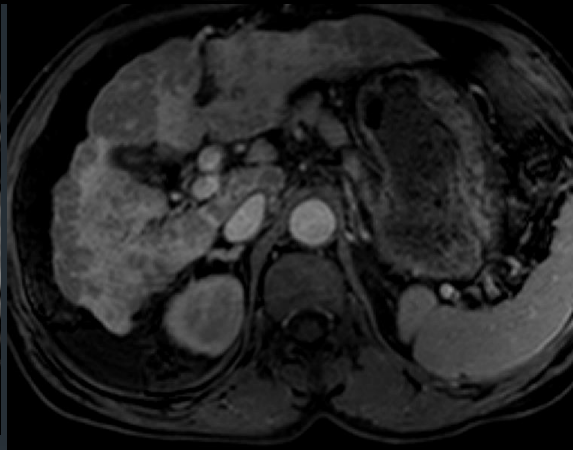
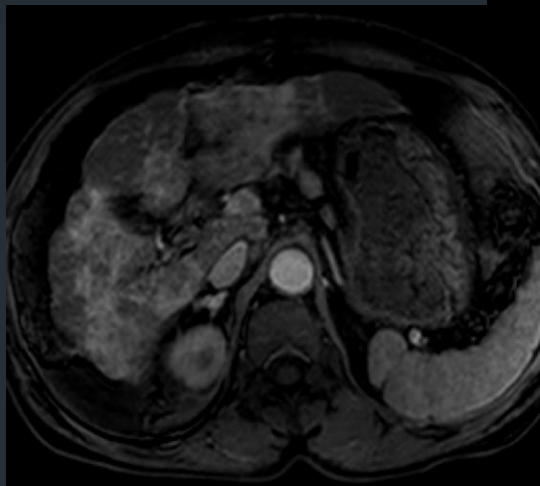
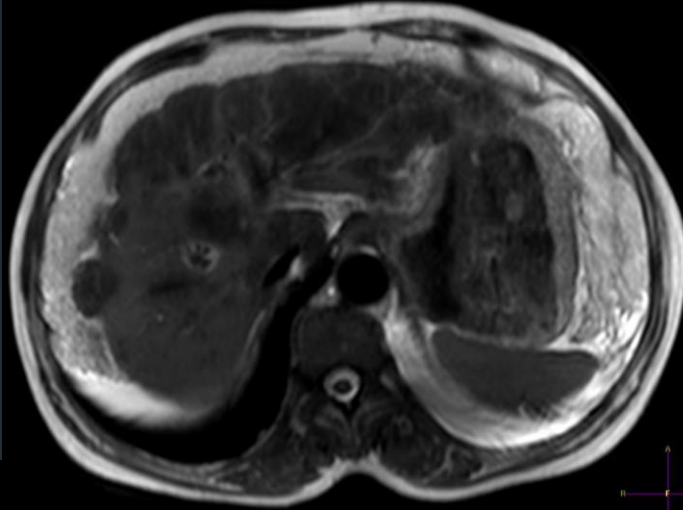




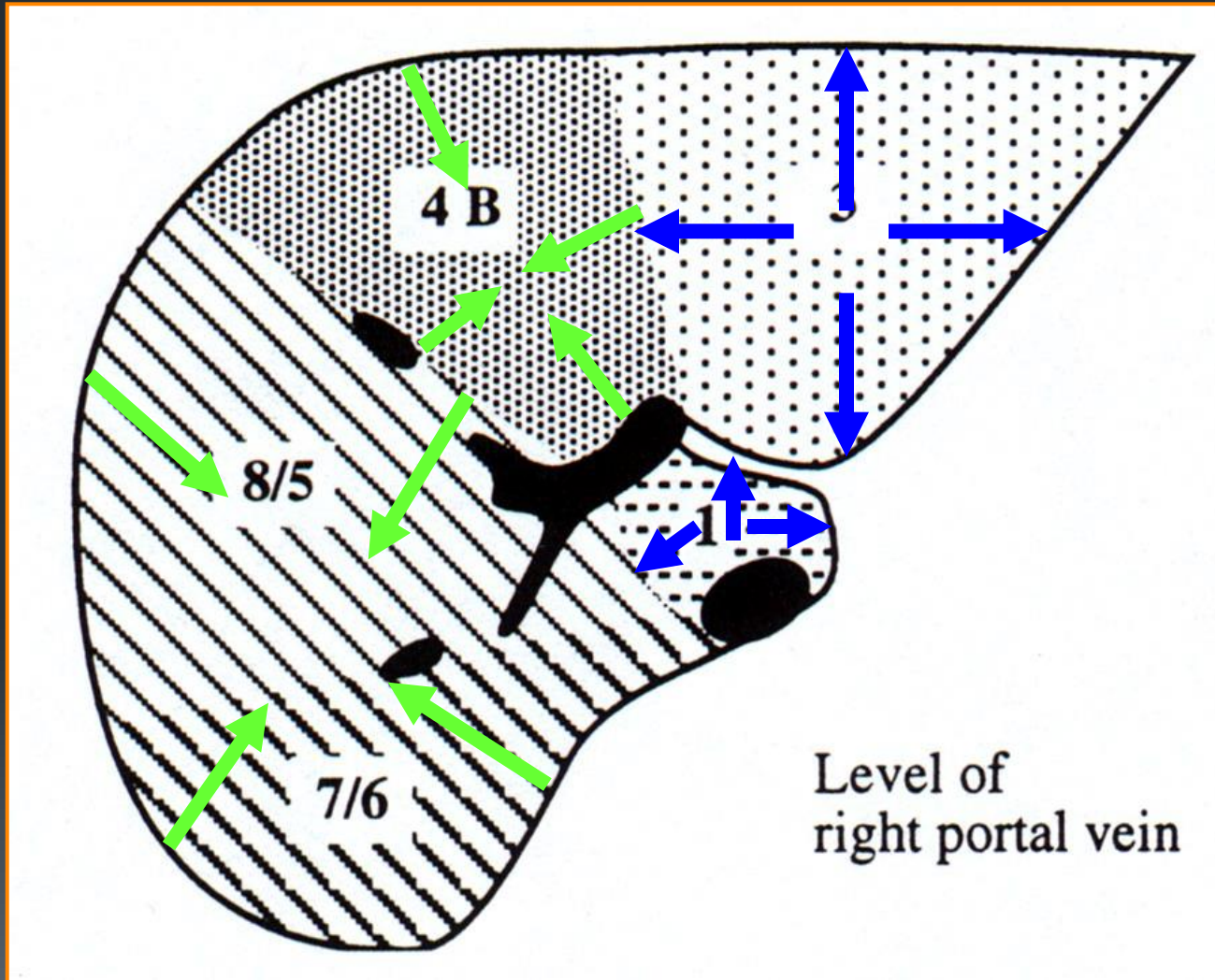
Normal KC

Sirotik KC



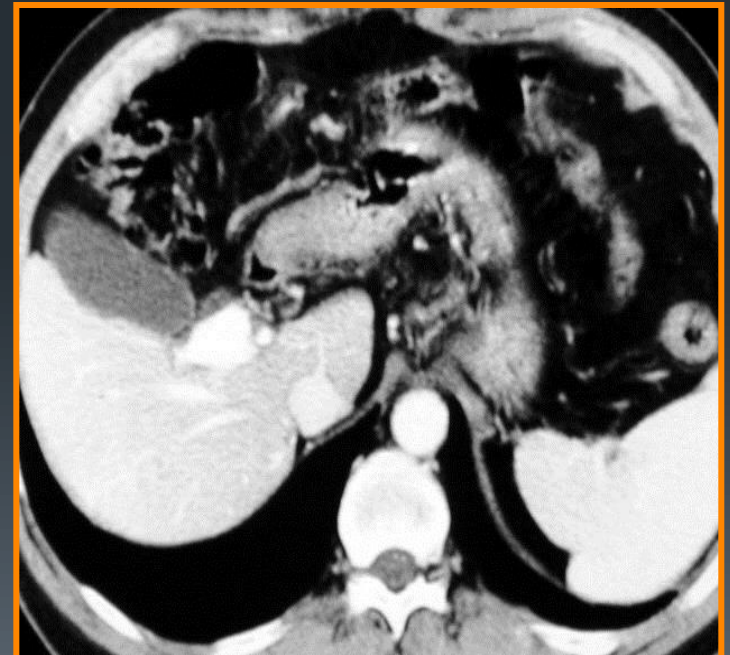
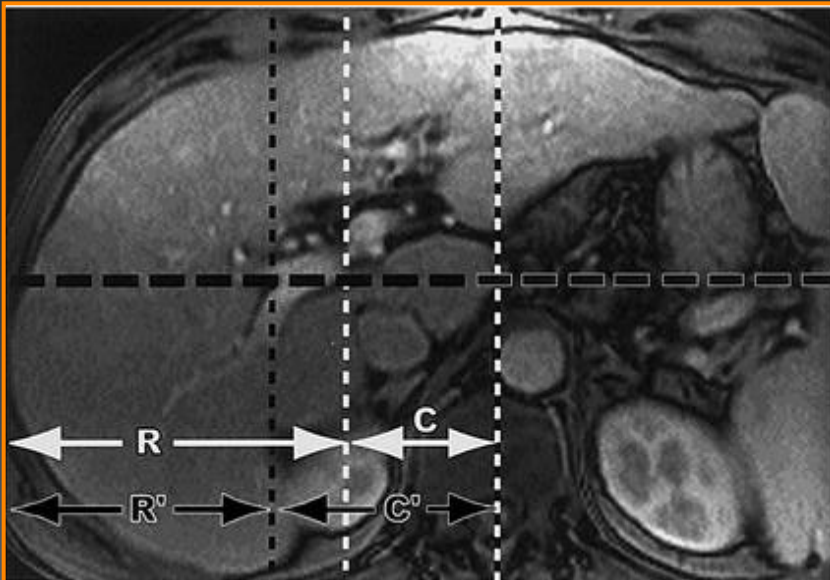


KC'de morfolojik deęişiklikler



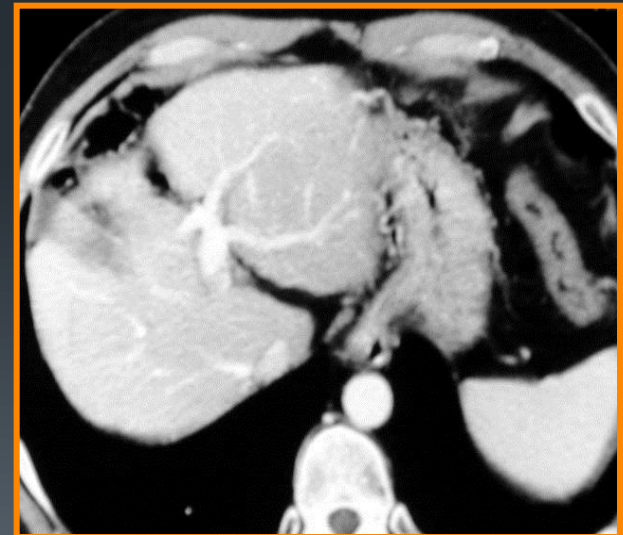
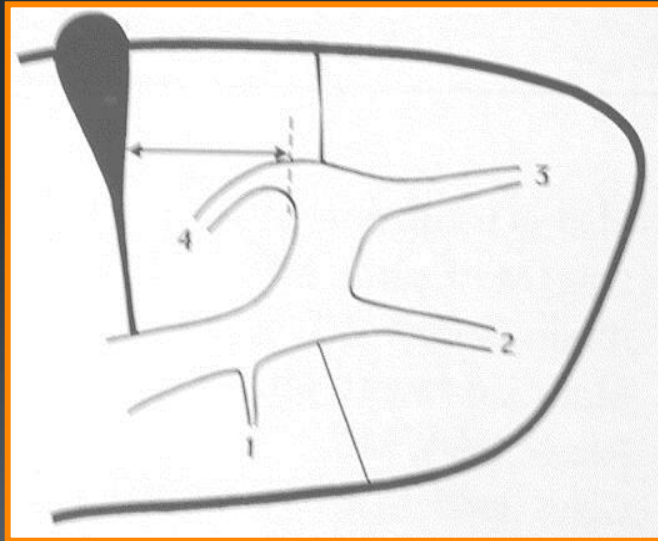
KC'de morfolojik değişiklikler

- Kaudat lob-sağ lob oranı (> 0.65)
- Modifiye Kaudat lob-sağ lob oranı (> 0.90)



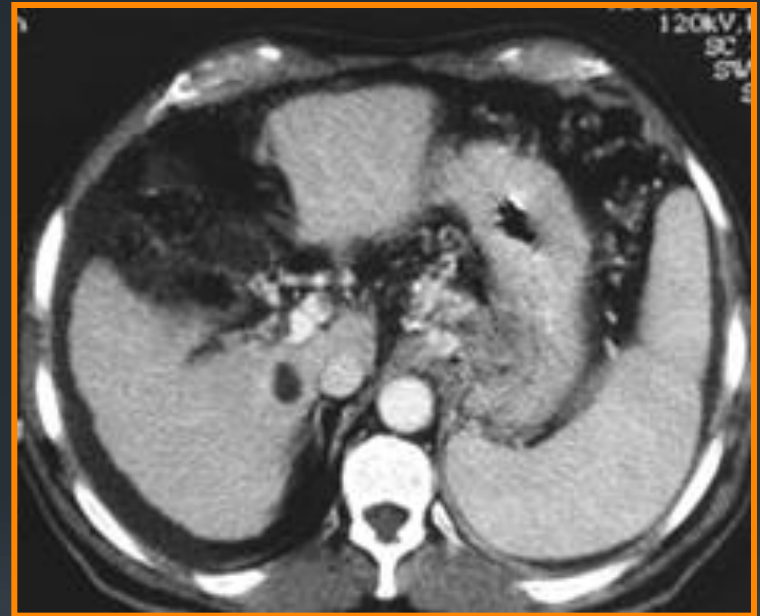
KC'de morfolojik deęişiklikler

- Segment 4
- Kontrol grubu 43 ± 8 mm
- Siroz 28 ± 9 mm



KC'de morfolojik deęişiklikler

- Safra kesesi 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 arter



HA apında artıř

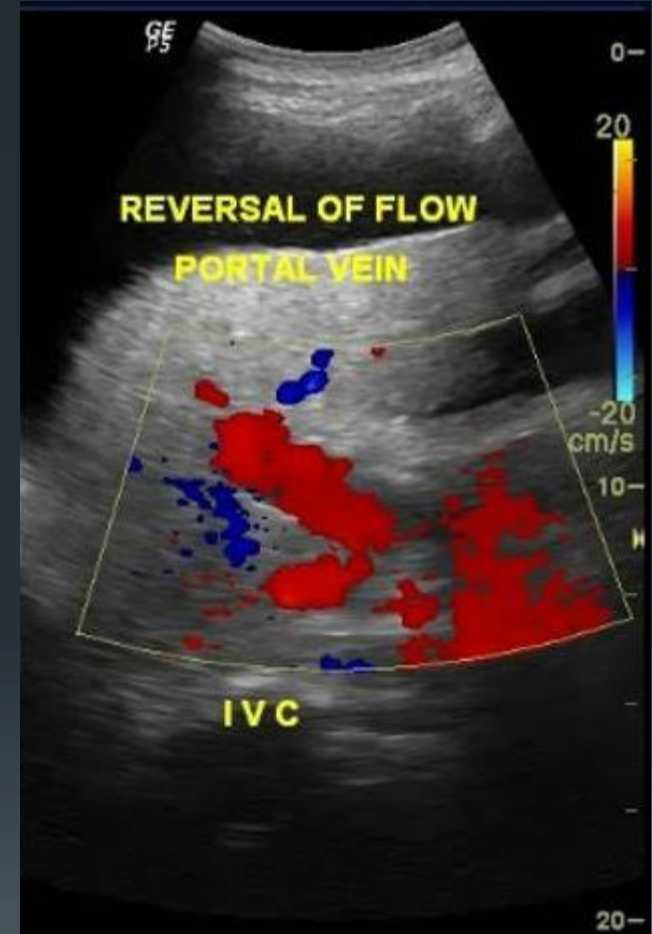
RI ve PI artıř

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



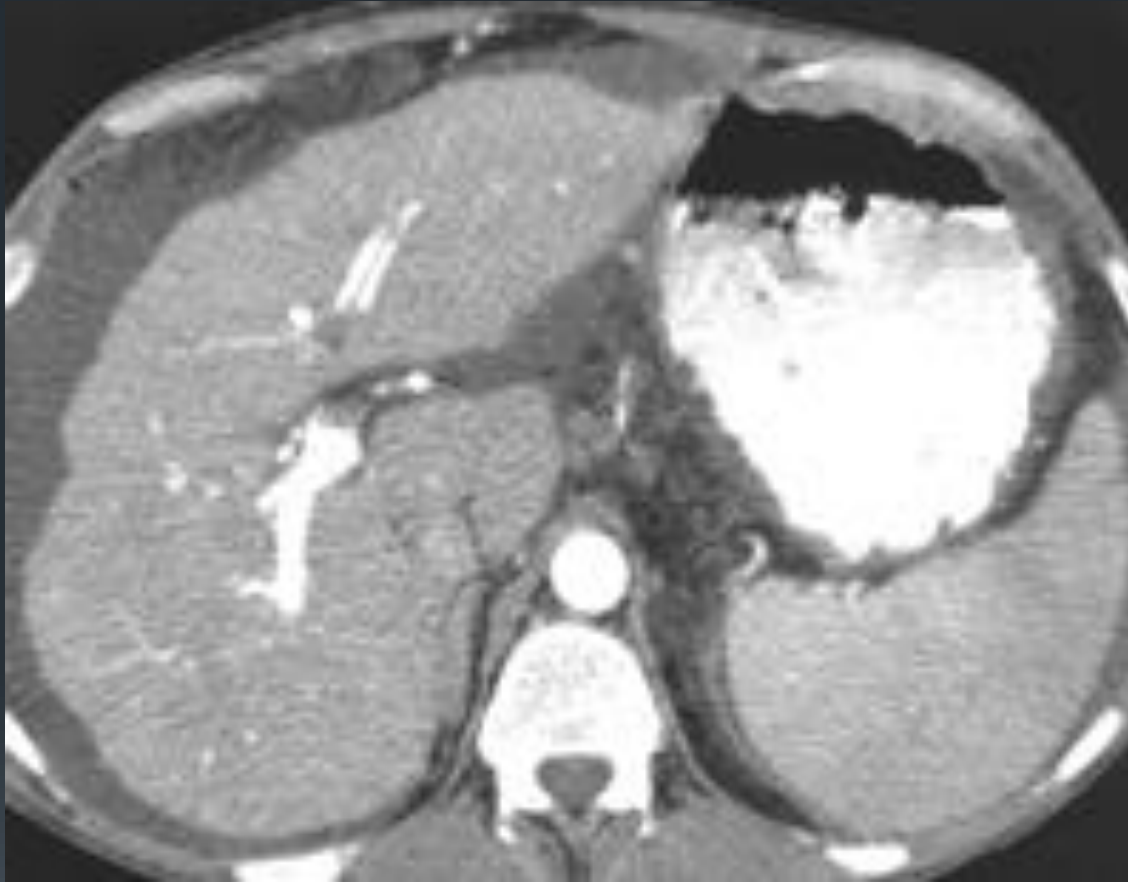
Hepatofugal Akım



79 y, F

Küçük ana portal ven → hepatofugal akım

Hepatofugal Akım

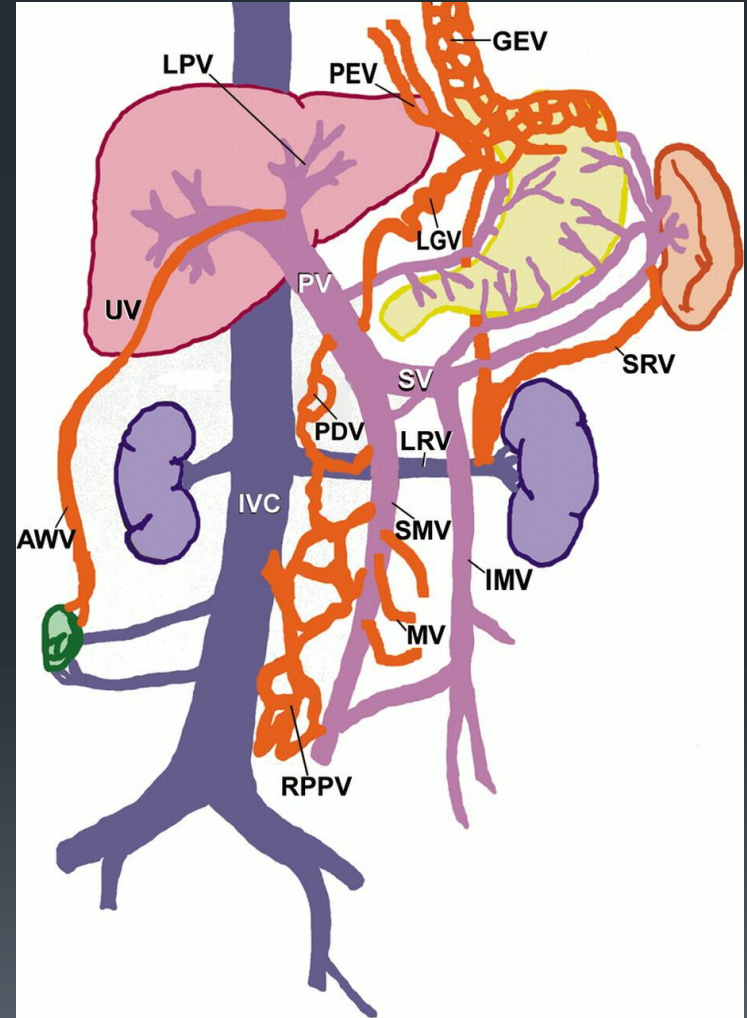


49, M Hep C siroz

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

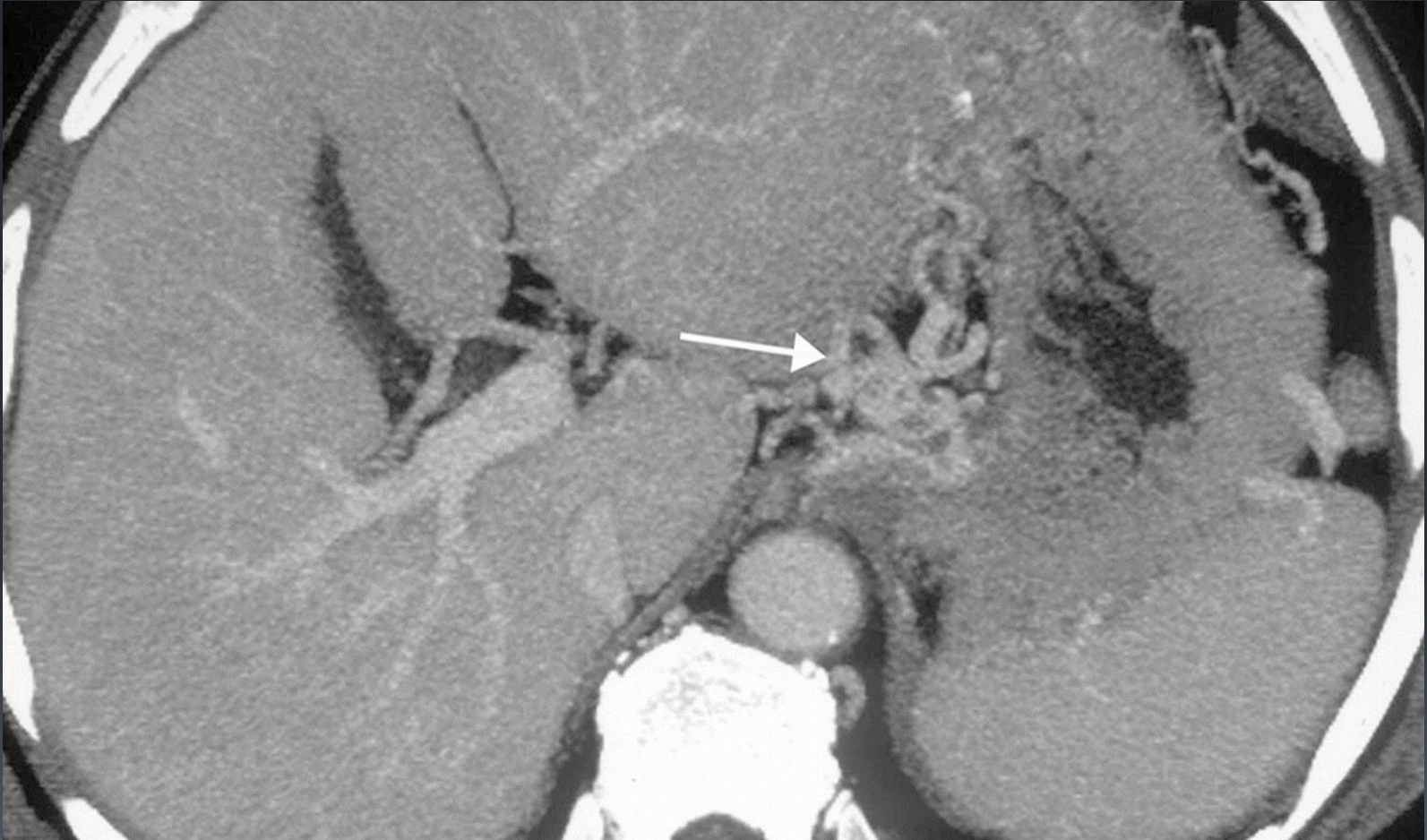
PHT-Portosistemic Vasküler Kollateraller

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

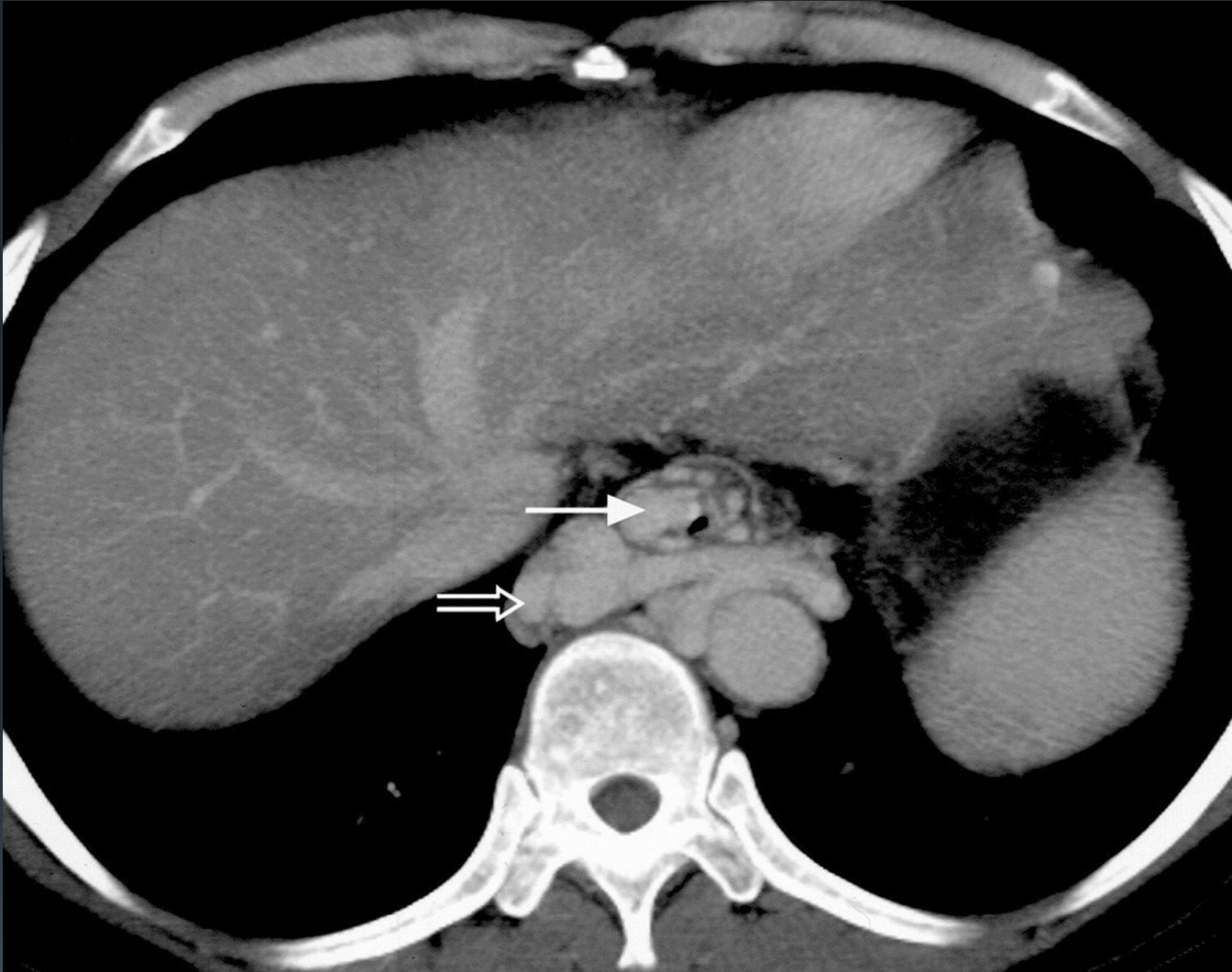


PHT tanısı

Sol gastrik ven



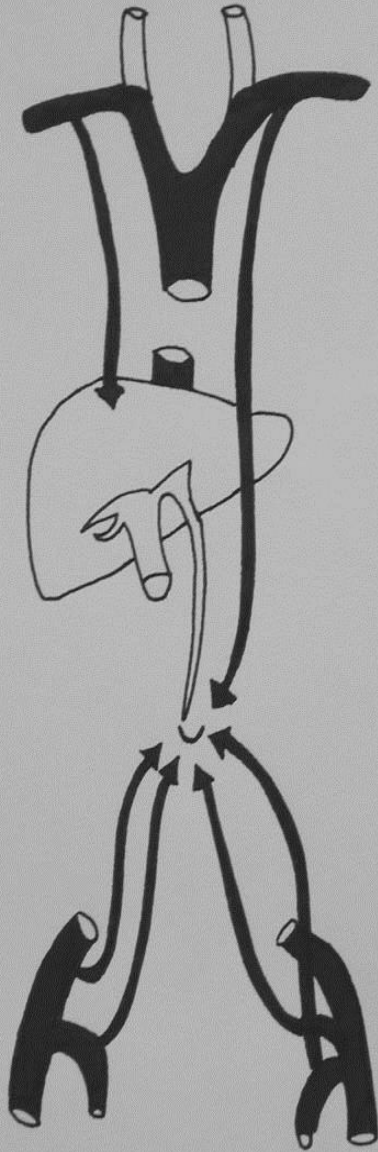
Aksiyel BT: dilate sol gastrik ven (6 mm)



BT: tortuoz, genişlemiş paraözefageal varisler (arrows).

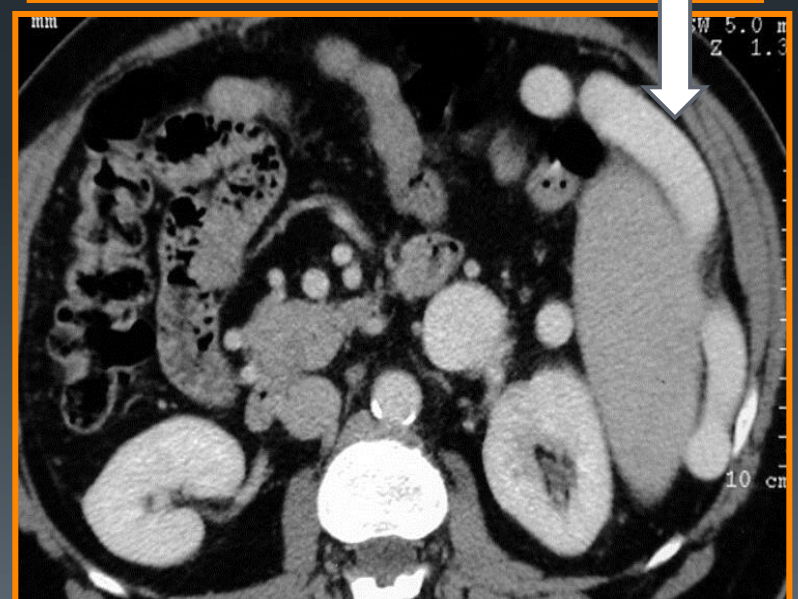
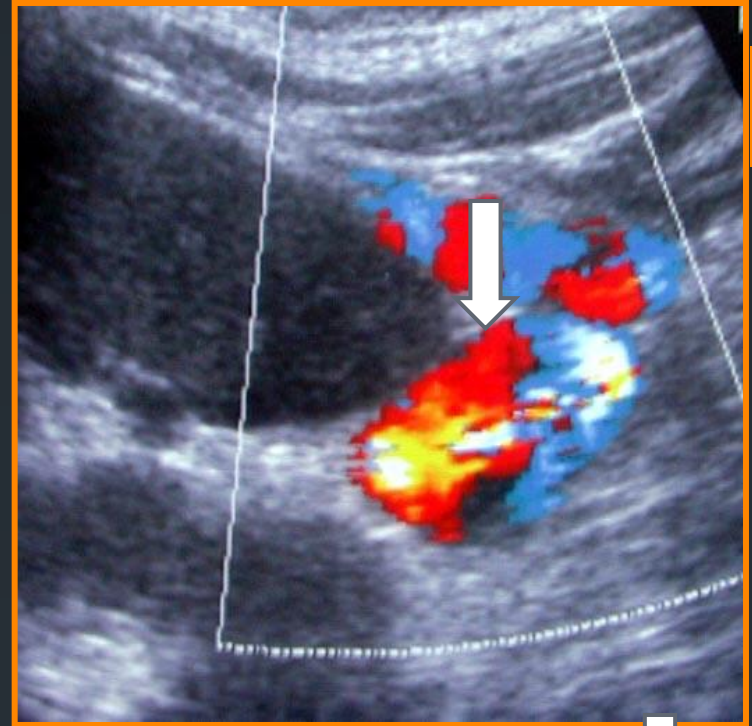
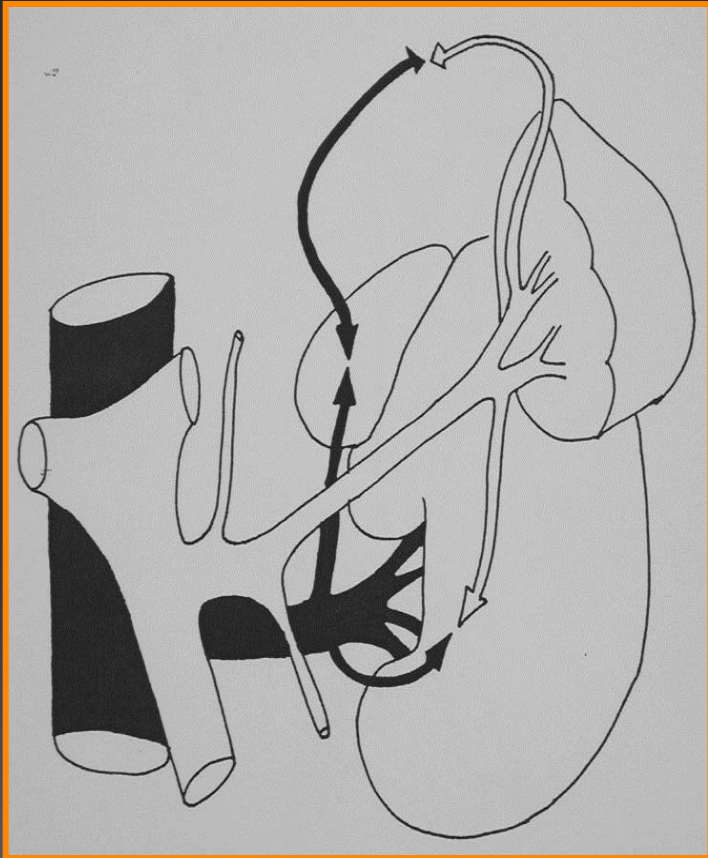
PHT tanısı

Paraumblikal ven



PHT tanısı

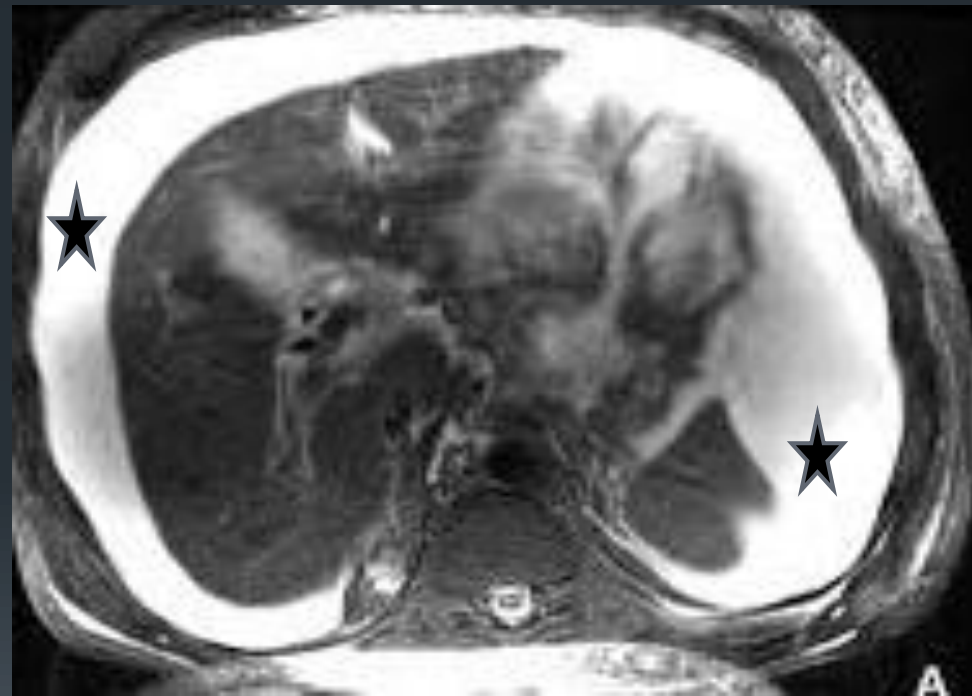
Splenorenal venler



PHT-Asit

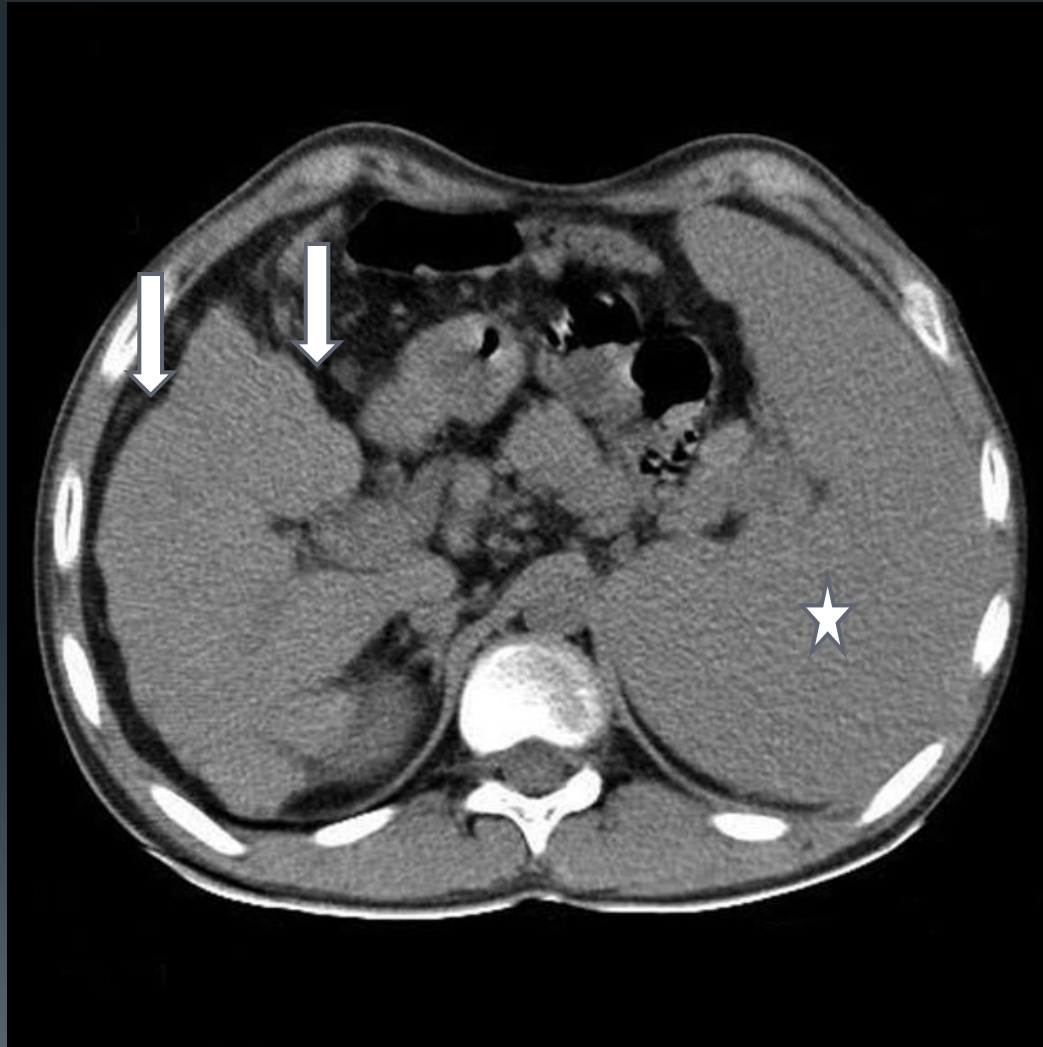


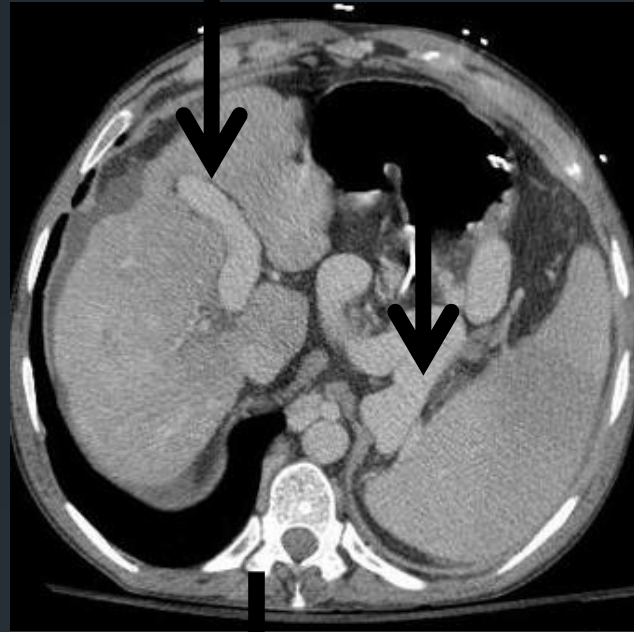
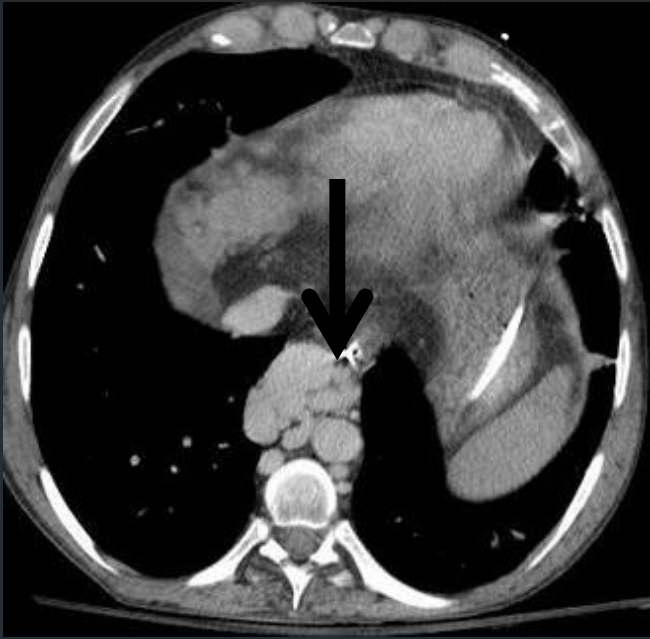
BT



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

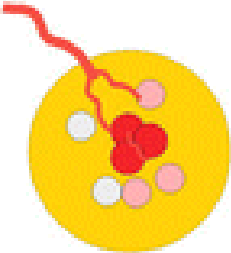
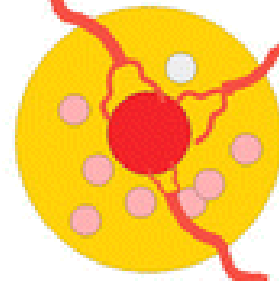
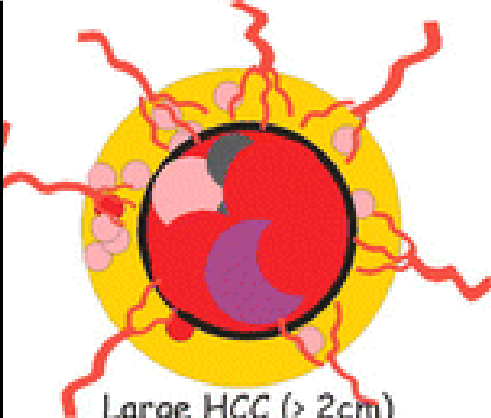


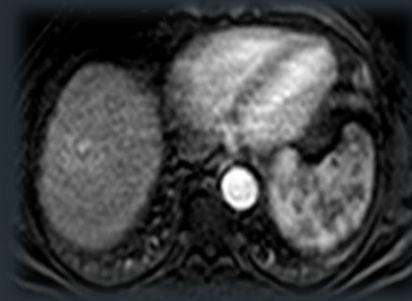
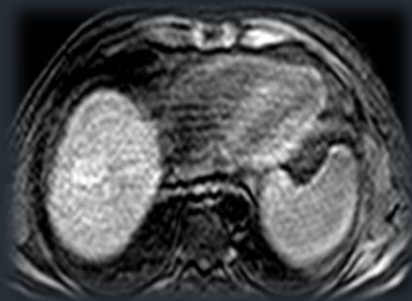
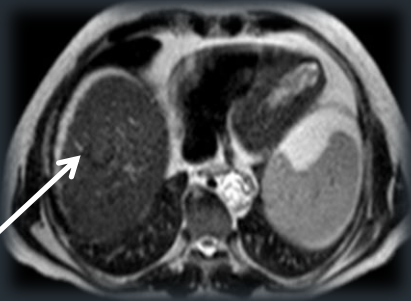
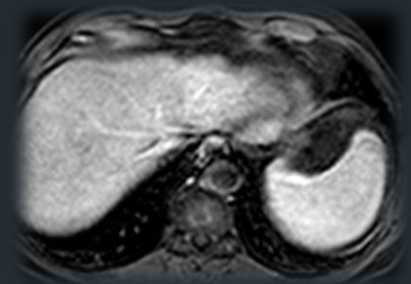
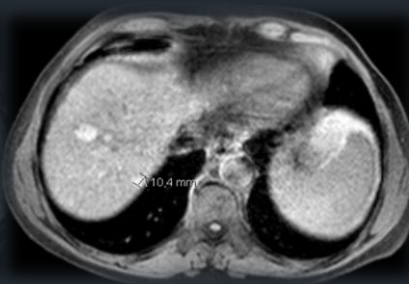
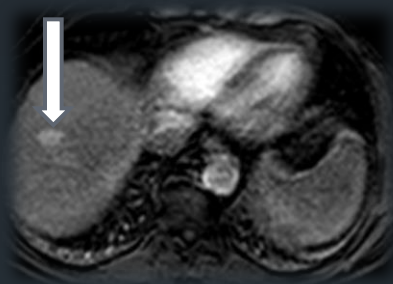
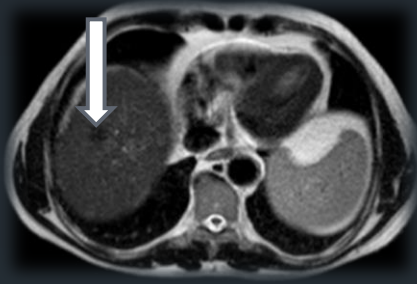
HCC



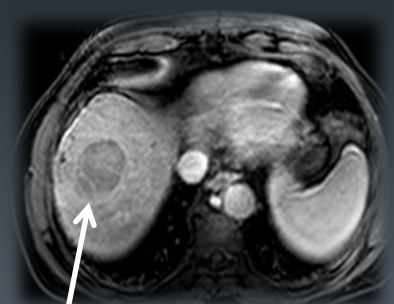
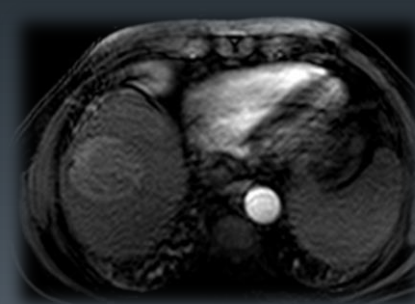
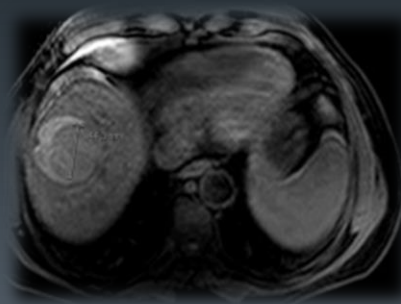
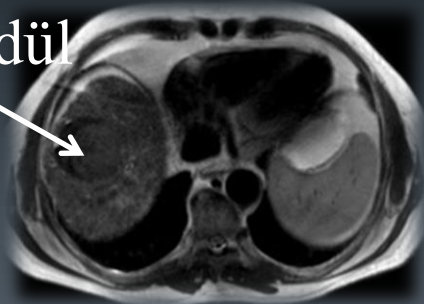
Nodüler rejeneratif hiperplazi
NRH (*venookluziv hast.*)

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)	+	+	+	±	-

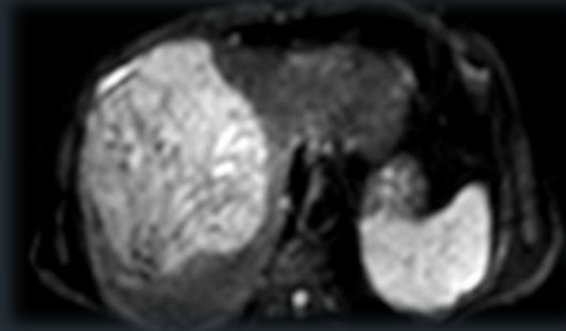
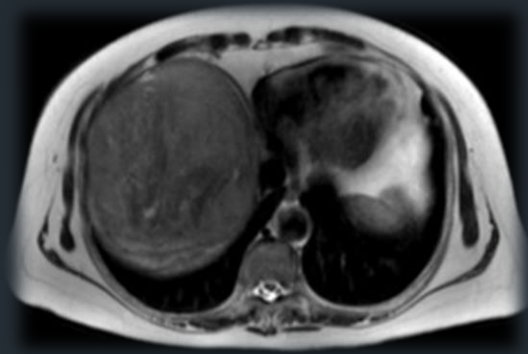


Nodül içi
nodül

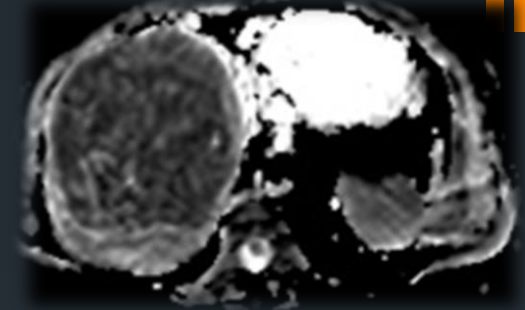


Kapsül

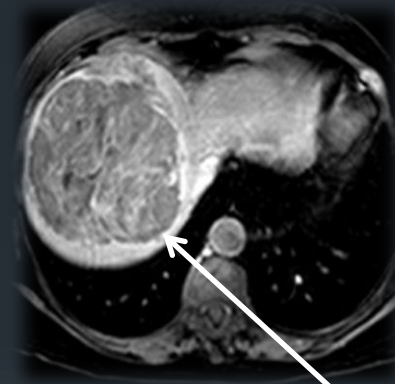
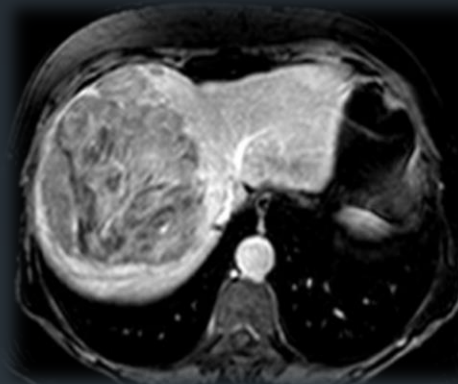
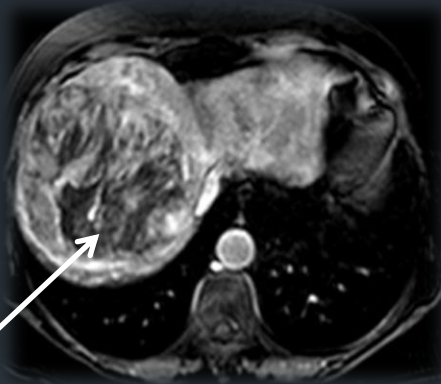
Mozaik patern-HCC



b1000



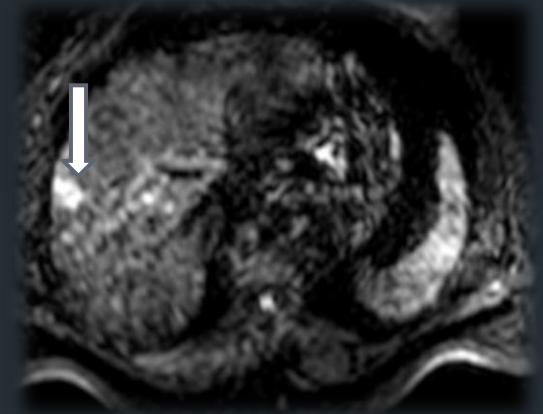
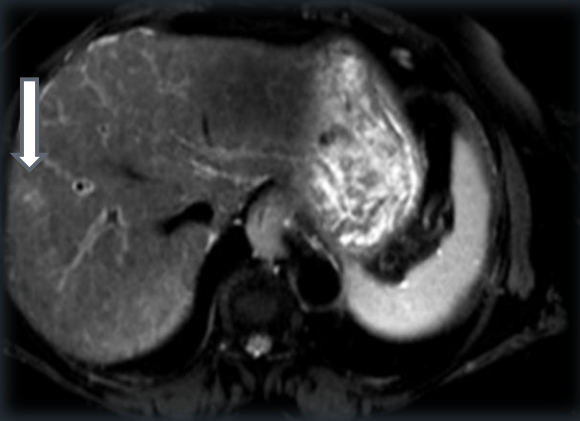
ADC



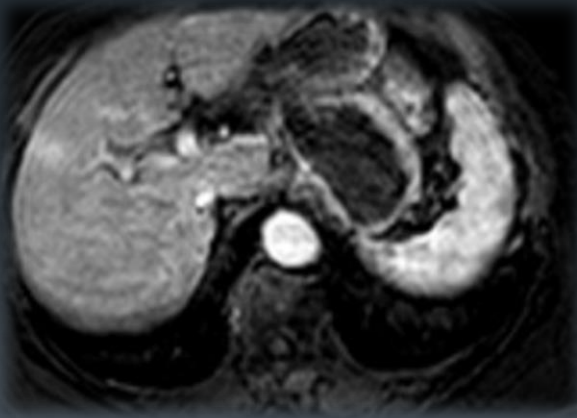
Mozaik
patern



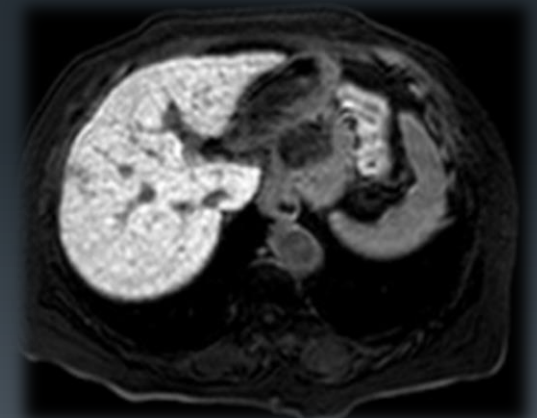
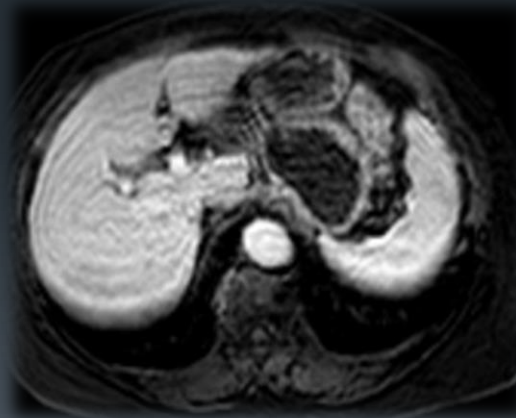
Kapsüler
boyanma



b1000



Arterysel

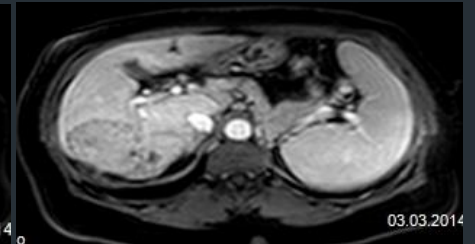
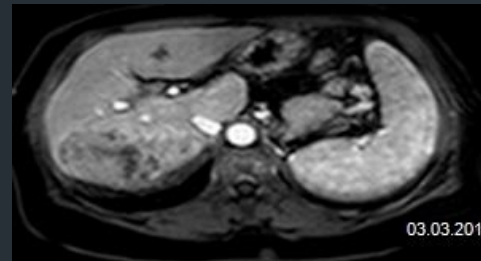
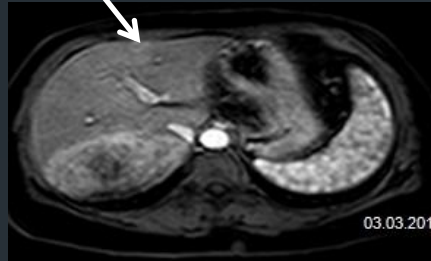
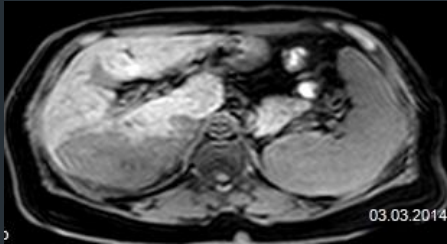
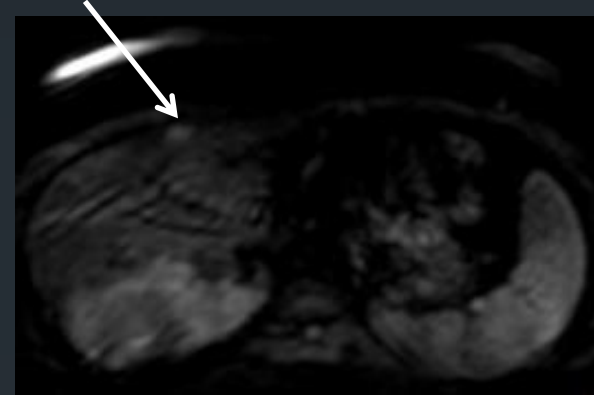
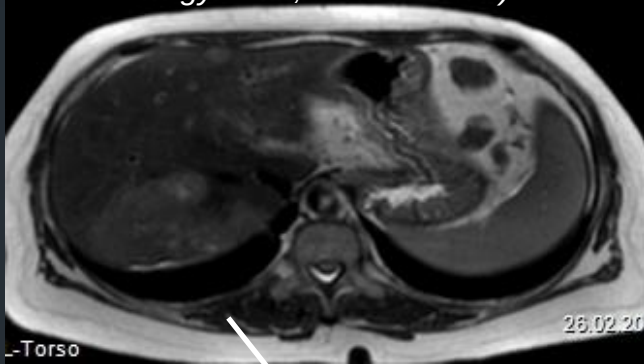


Primovist
(20 dk)

Primovist + DAG

<2 cm HCC'lerdeki saptama oranını arttırmaktadır

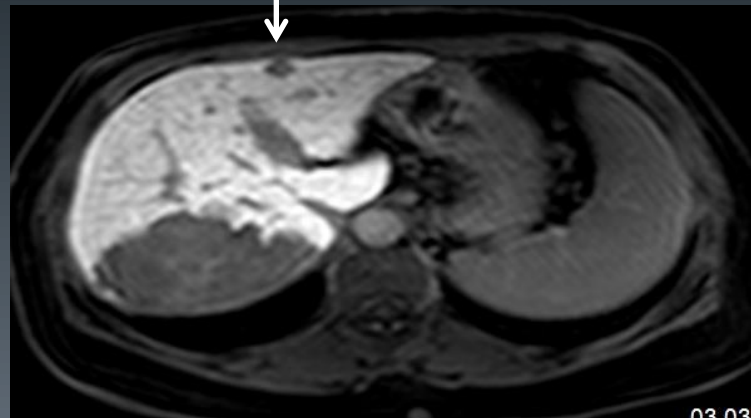
(Park MJ et al. Radiology 2012; 264: 761-770)



Arteriyel

Portovenöz

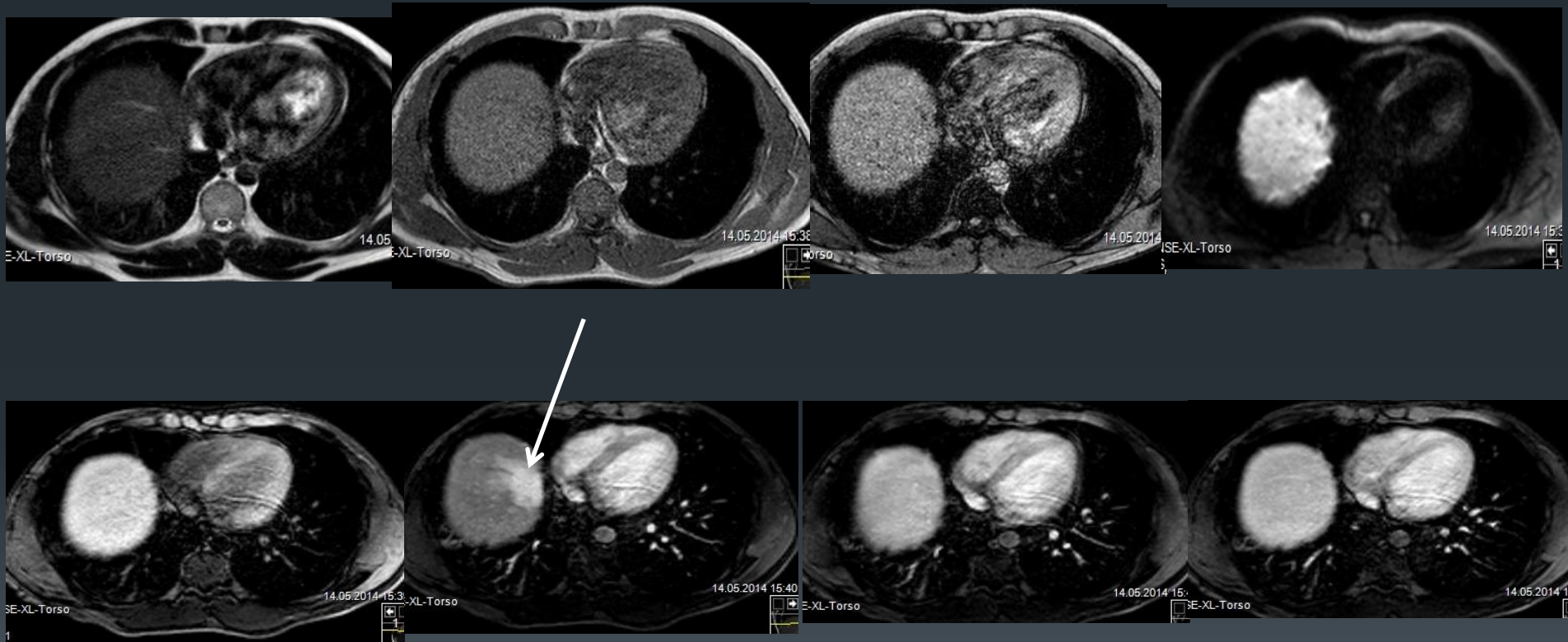
Denge



Primovist
20.dk

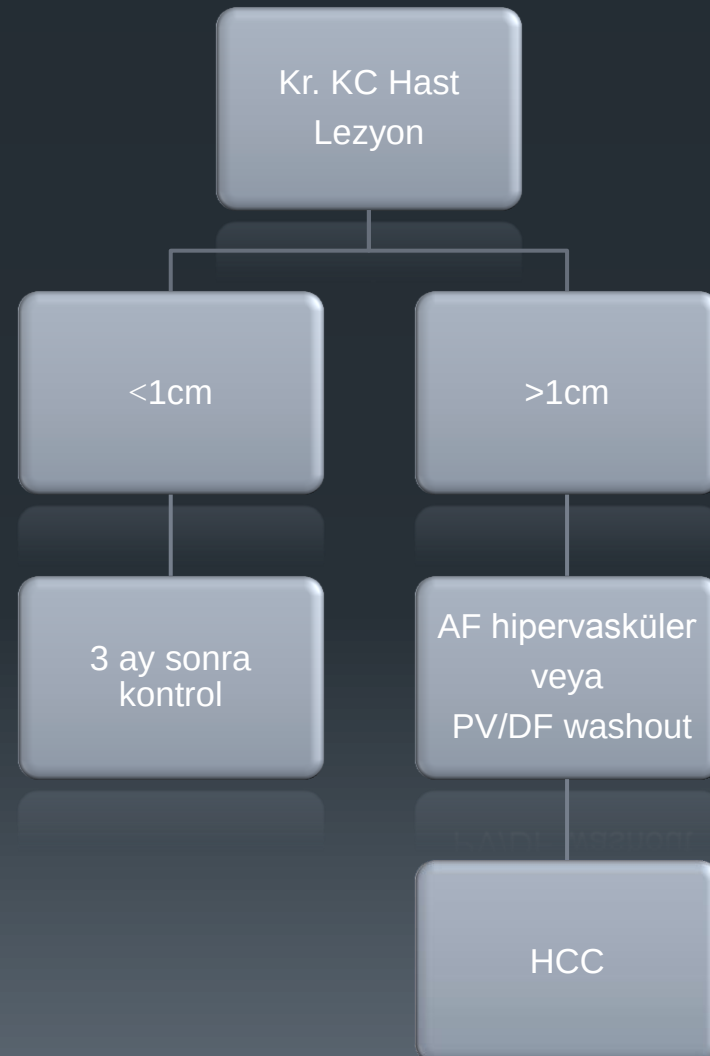
Geçici hepatik intesite farklılığı

A-P shunt



HCC: AASLD Kriterleri

American Association for the Study of Liver Diseases (AASLD) Practice Guideline 2010



İleri MR Teknikleri:

- DWI (Diffusion- weighted imaging)
- PWI (Perfusion-weighted imaging)
- MRE (MR Elastography)

MR difüzyon

- ADC değerinde azalma

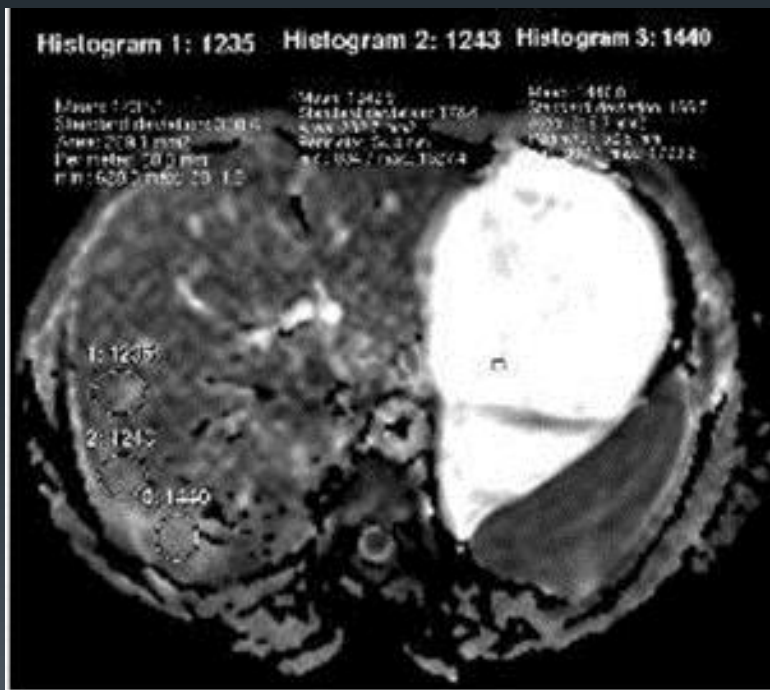
- 37 Kr. viral hepatitli hasta ve 34 normal gönüllü
- 3 T MRG; DAG SSh-EPI-TSE (single-shot echo-planar spin echo)
- b faktor 0 ve 1000 s/mm²
- ADCs haritaları
- Histopatolojik olarak (METAVIR); fibrosis 5li skalada (0–4)
inflamasyon 4lü skalada (0–3)

- ADCs

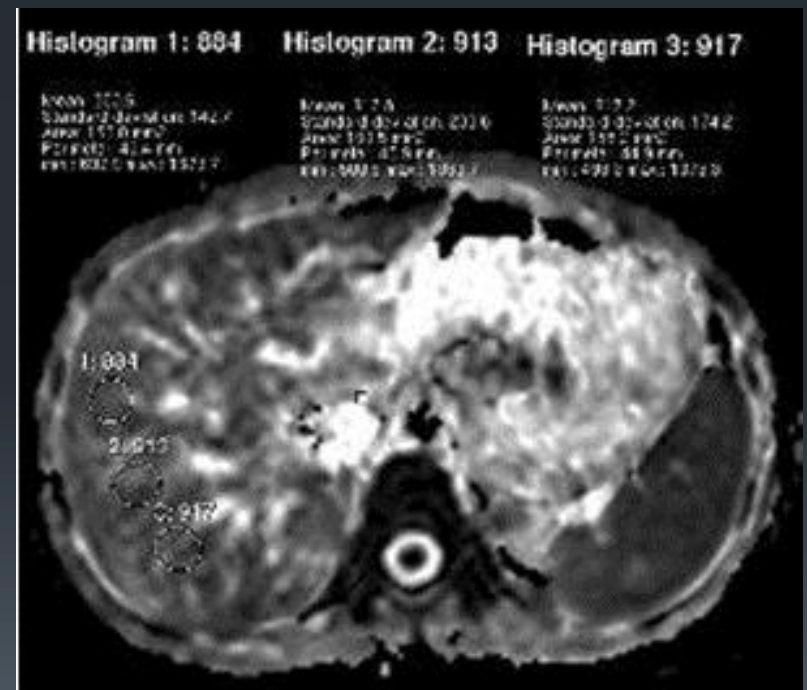
hasta < normal

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-fibrozis arasında ters korelasyon



normal

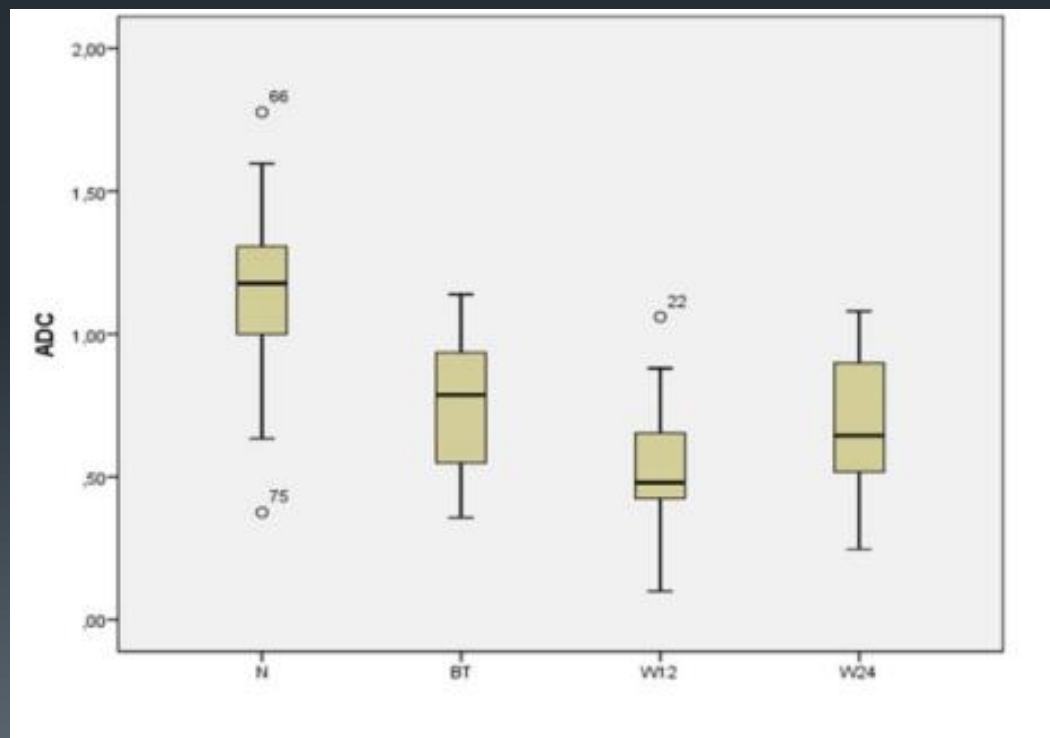


hasta



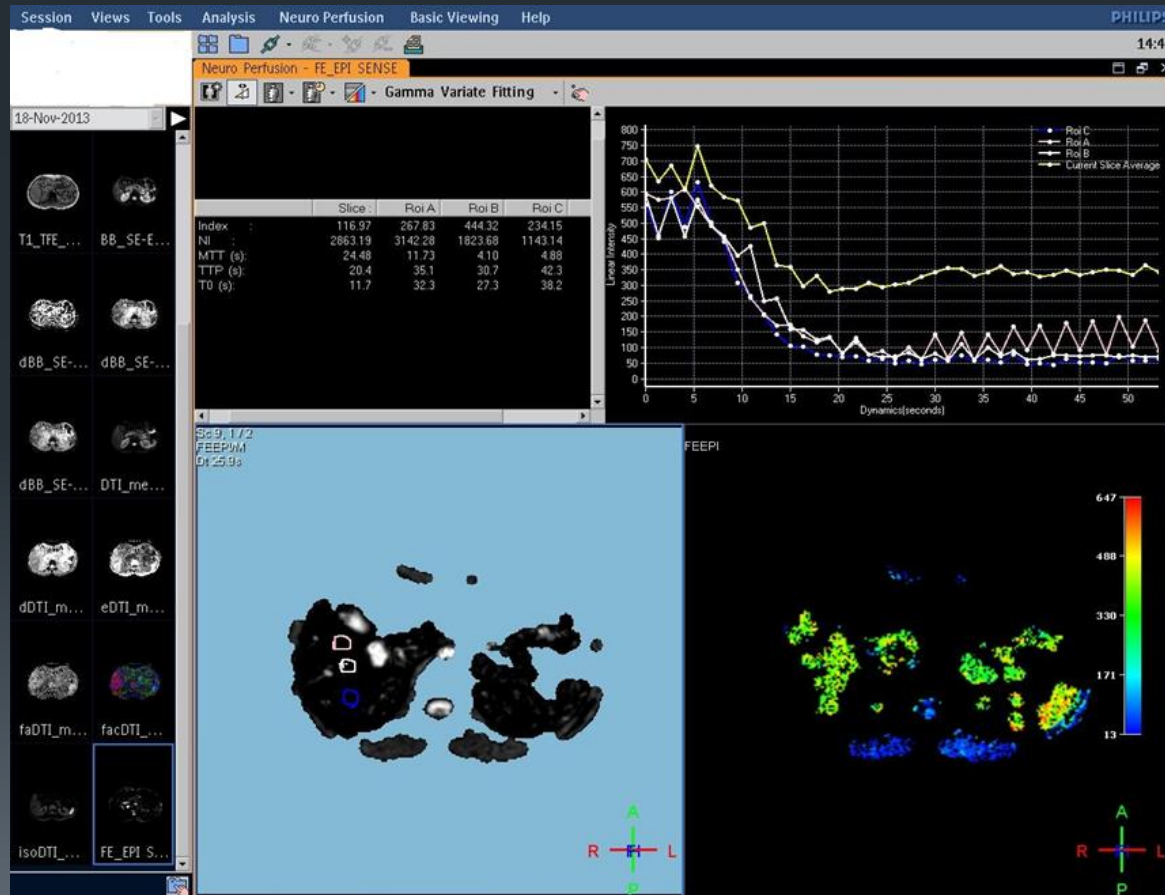
- **Telaprevir-bazlı üçlü tedavi ile KC parankimindeki ADCs değişiklikleri**
- **17 Kr. Hepatit C hasta ve 25 normal gönüllü**
- **24 hf (12 hf telaprevir-bazlı üçlü tdv+12 hf PEG-INF-RBV)**
- **Before treatment (BT), 12th (W12) ve 24th (W24)**
- **3 T MRG (DAG SSh-EPI-TSE (single-shot echo-planar spin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



KC MR perfüzyon

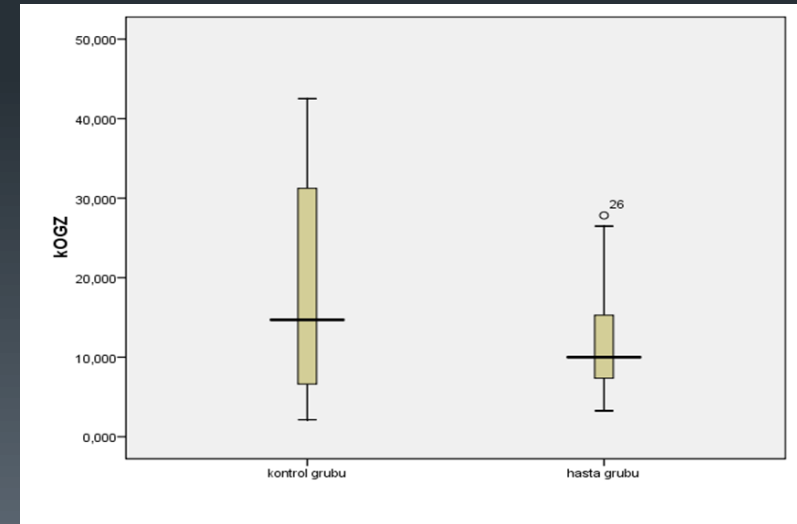
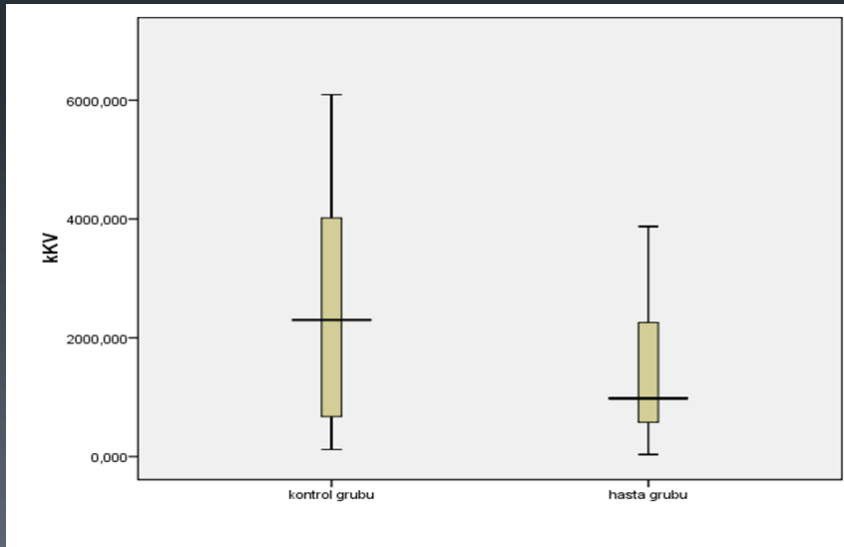
- Dinamik Suseptibilite Kontrast Manyetik Rezonans Perfüzyon Görüntüleme (DSK-MRPG) yöntemi ile paramanyetik kontrast maddeler kullanılarak dokudaki kan akımı ve incelenen dokunun vaskülarizasyonu belirlenebilmektedir.



KC MR perfüzyon

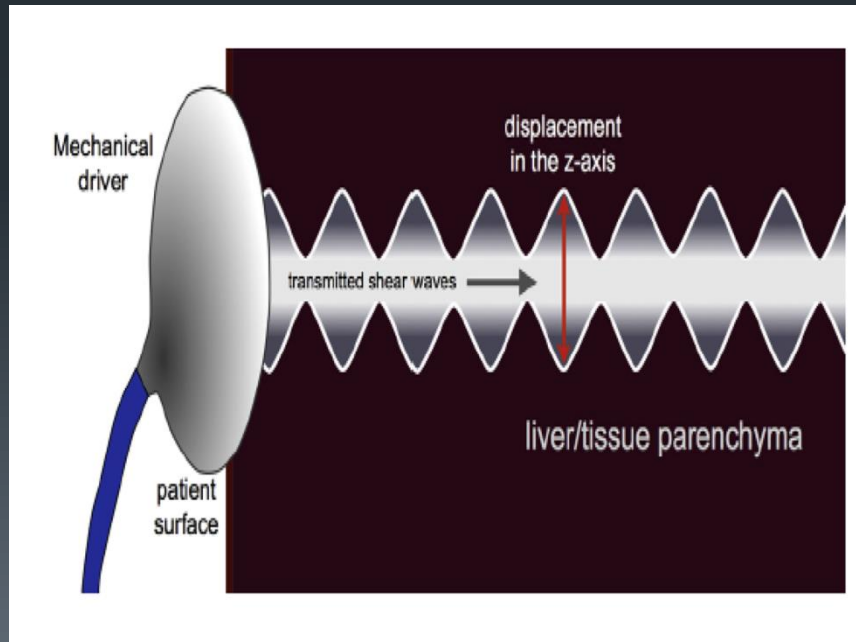
	Hasta grubu (n=27)	Kontrol grubu (n=24)	p
kKA (ml/100g/dk)	104.35± 60.26	126.69± 58.20	p=0.185
kKV (ml/100g)	1360.62 ± 1075.12	2460.39 ± 1873.37	p=0.016
kPZ (sn)	37.90±11.386	39.19 ± 8.361	p=0.643
kT0 (sn)	33.75± 11.450	33.72± 9.864	p=0.990
kOGZ (sn)	12.06 ± 6.798	18.56 ± 12.693	p=0.032

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

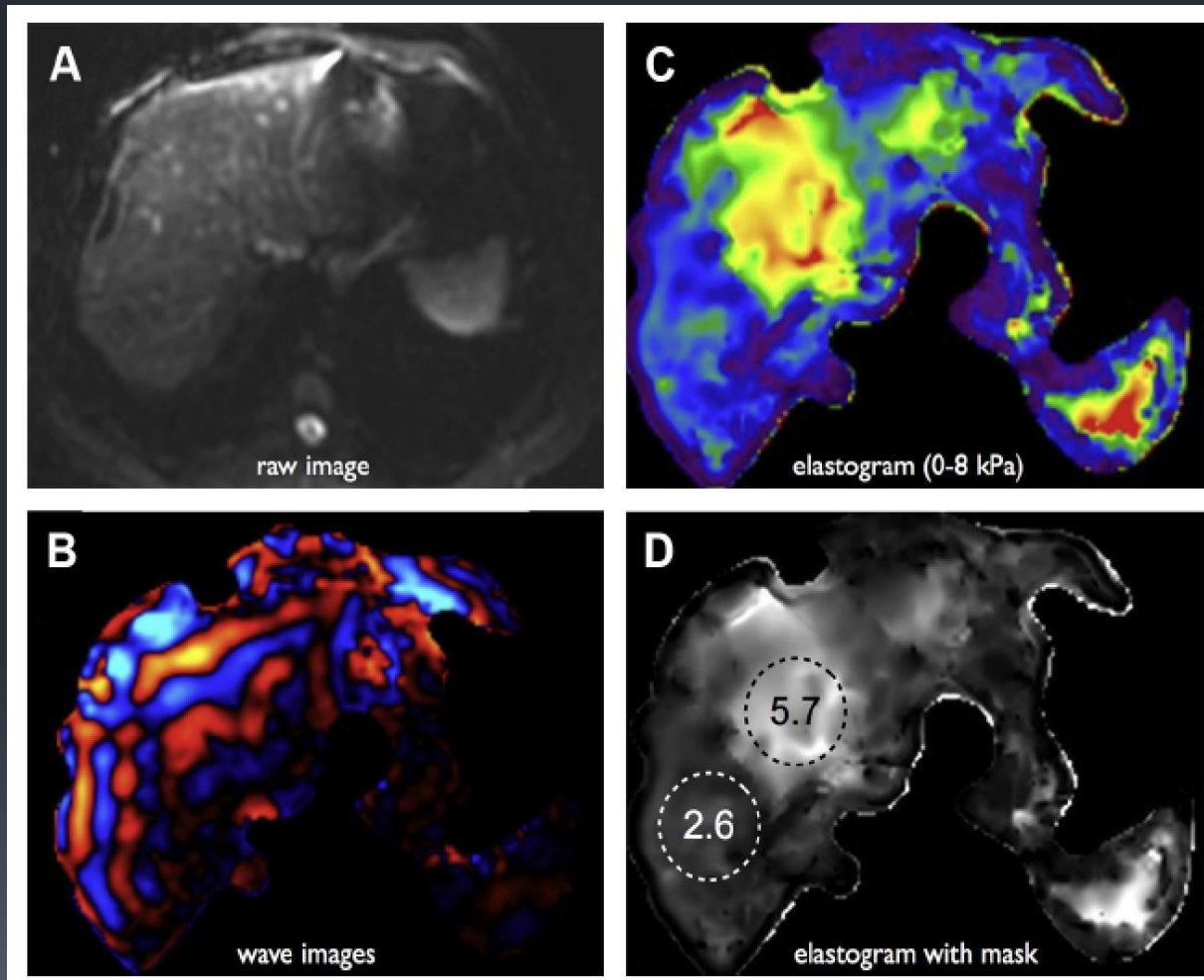


MR ELASTOGRAFI

- 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.



MRE:

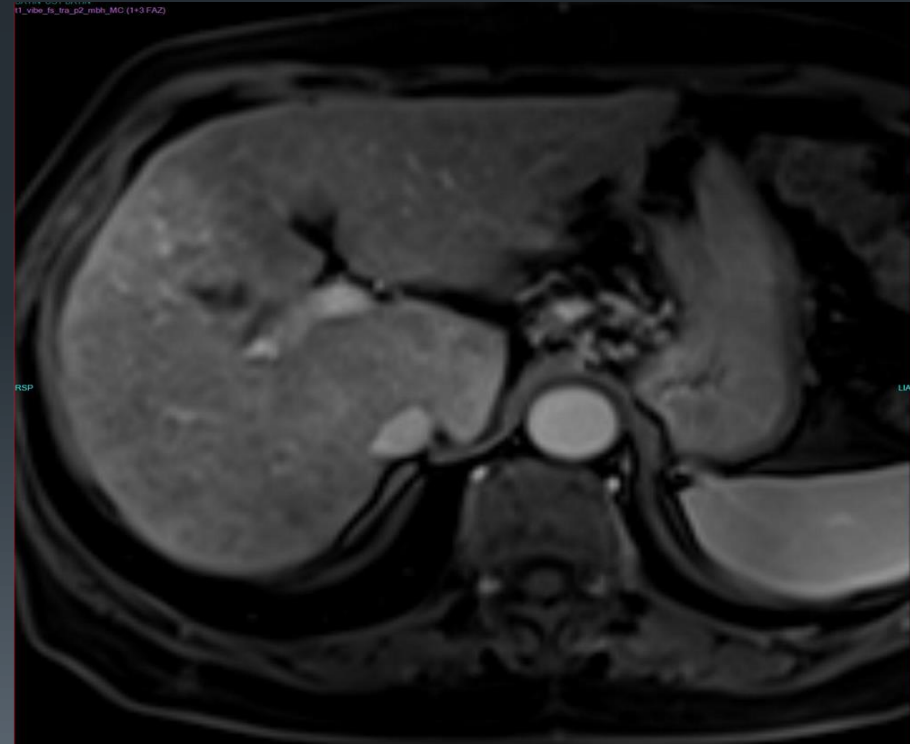
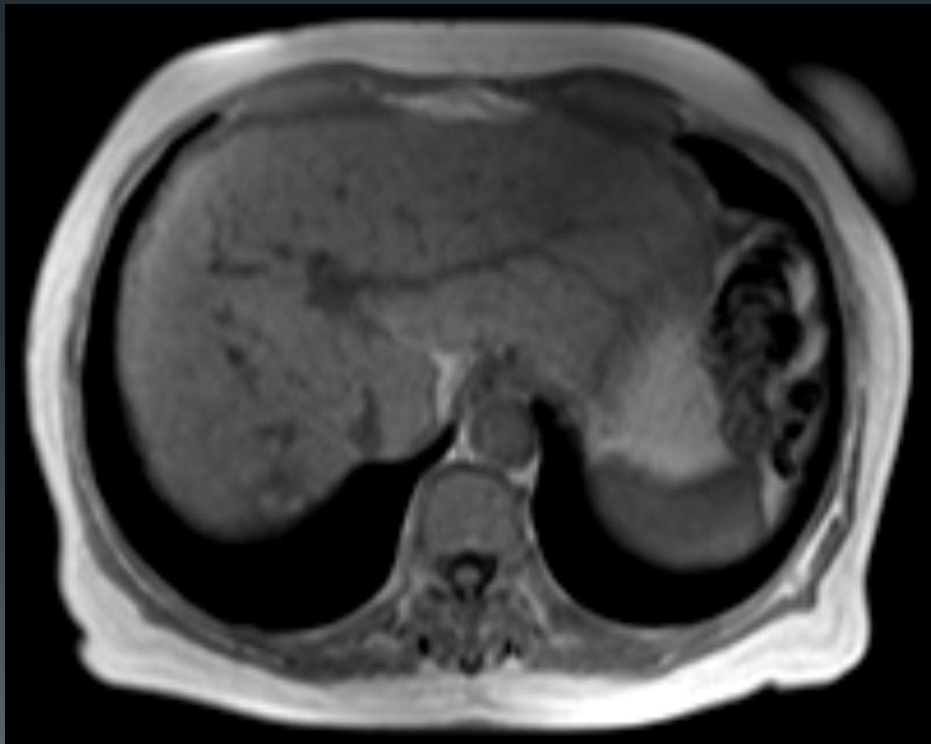
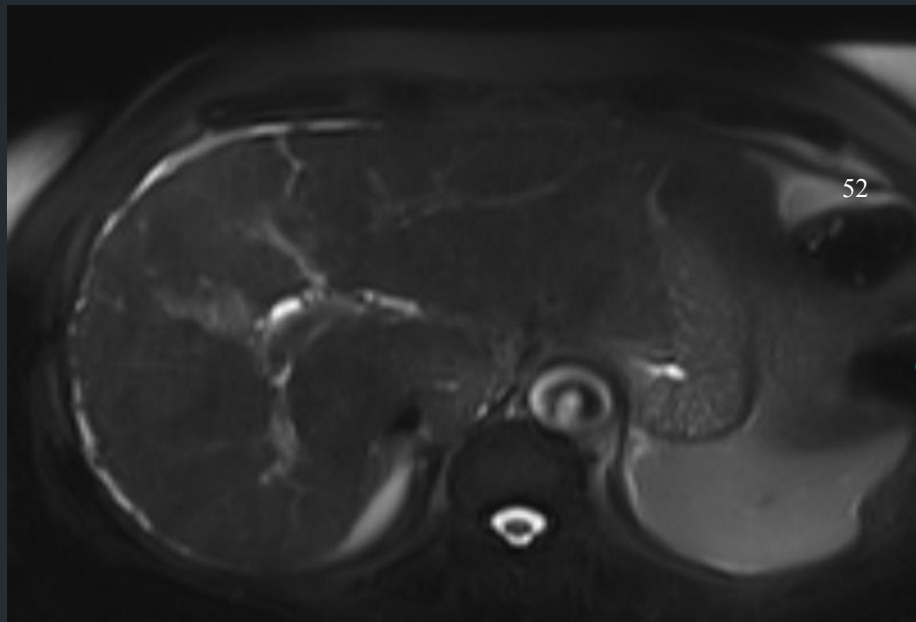


SONUÇ

- 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





Diagnosis of PHT

flow	Mean portal velocity		Mean portal blood	
	cm/sec		ml/min	
	controls	cirrhosis	controls	
■ Gaiani et al	19 ± 2.1	11.4 ± 3.7	919 ± 285	1197 ± 625
■ Moriyasu et al	15.3 ± 4	9.7 ± 2.6	899 ± 284	870 ± 289
■ Zoli et al	16 ± 0.5	10.5 ± 0.6	694 ± 23	736 ± 46
■ Ohnishi et al	17 ± 3.9	12 ± 3	648 ± 186	690 ± 1085

Gaiani, Hepatology 1989

Moriyasu, AJR 1986

Zoli, J Ultrasound Med

Prognozda görüntülemenin rolü

- Comparison between compensated and uncompensated cirrhosis
- Serial imaging
- Stability and functional reserve
 - . Hypertrophy and increasing of the caudate lobe ^{1, 2, 3}
 - . High caudate to right lobe ratio ¹
 - . Increasing lateral segment ²
- Clinical progression
 - . Progressive atrophy of the right lobe and medial segment ²
 - . Spleen enlargement ³
 - . Varices ³

1. Watanabe, Dig Dis Sci 1

2. Ito, Radiology 1998

3. Ito, AJR 1997

KC PARANKİMİ

Normal?

KONTRAST ÖNCESİ SEKANSLAR

T2A da belirgin hiperintensite
T2A da hipointensite
Kimyasal şift: Mikroskobik-makroskobik yağ
T1A: Kanama
Santral skar
Kapsüler çekinti

KONTRAST SONRASI SEKANSLAR

Geç arteriyel faz: Kontrastlanma paterni
(Homojen, mozaik, halkasal)
Portal venöz/geç faz: Wash-out
Progresif dolum
Persistan tutulum
Solma
Periferik wash out
Kapsüler boyanma
Geçici hepatik intensite farklılığı

KC MR difüzyon



Tissue or Lesion Type	First Sequence*	Second Sequence†	P Value‡
Normal liver ($n = 14$)	1.83 ± 0.36	1.51 ± 0.49	.06
Cirrhotic liver ($n = 9$)	1.37 ± 0.52	1.09 ± 0.46	.10

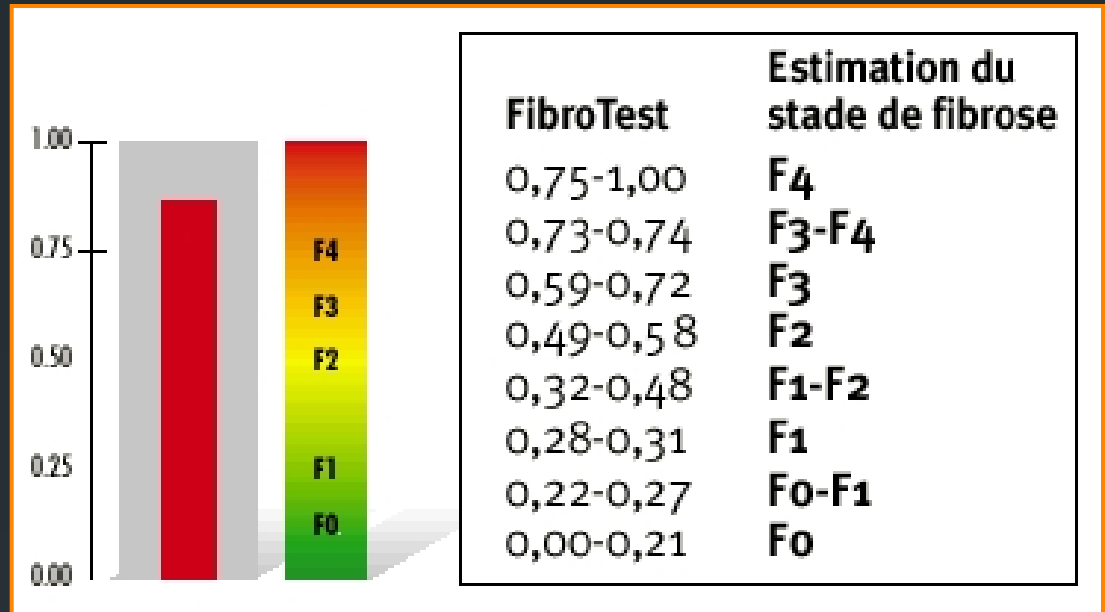


- Liver ADCs in patients were significantly lower than those of the normal volunteers ($p < 0.001$).
- Compared to those before treatment; the liver ADCs after telaprevir based triple therapy were significantly decreased at W12 ($p = 0.045$). A significant increase of liver ADCs was also observed after cessation of telaprevir at W24 with a return to initial values (significant difference between W12 and W24 at $p = 0.018$; BT and W24 at $p = 0.517$).

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

Fibrotest

- Alpha 2 makroglobulin
- Haptoglobin
- Apolipoprotein 1
- Total billurbin
- GGT
- ALT

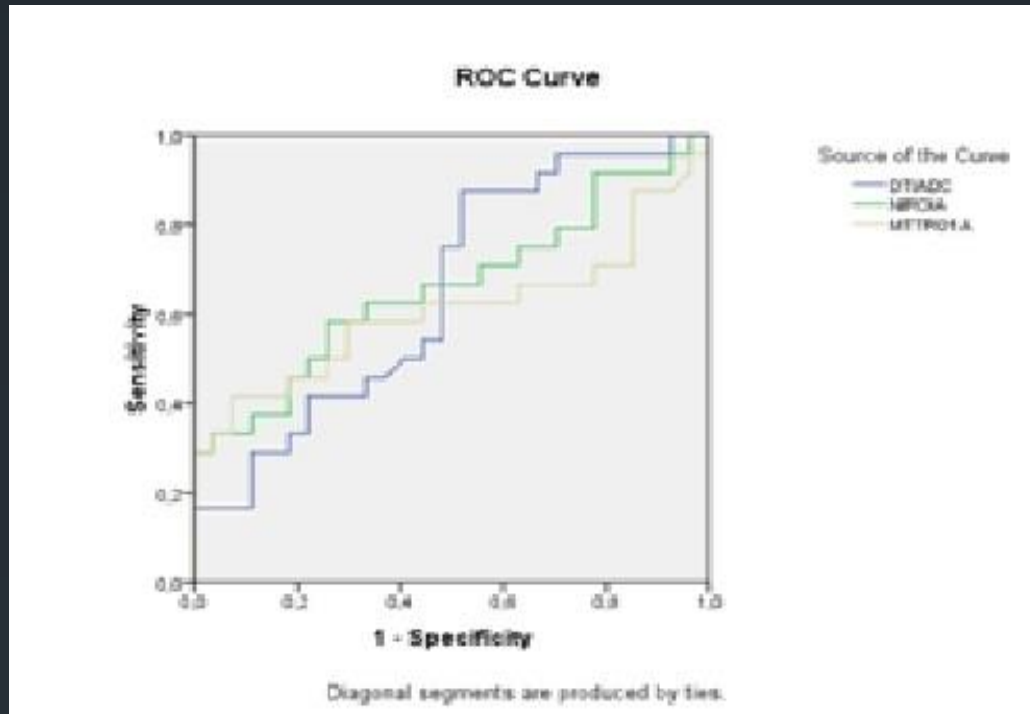


- 0 - 0.10 fibrosis olasılığı < 10%
- 0.10 - 0.60 KC biyopsi önerilir
- 0.60 - 1.00 fibrosis olasılığı > 90%

Elastografi (Fibroscan)

- Düşük frekanslı Ultrason (5MHz) and
- (50 Hz) elastik dalgalar





	Area	Std. Error ^a	p	Eşik değeri	Duyarlılık	Özgüllük
D	0.650	0.077	0.066	$1.27 \times 10^{-3} \text{ mm}^2/\text{sn}$	%62	%52
kKV	0.660	0.079	0.050	1586.95 ml/100g	%63	%67
kOGZ	0.609	0.085	0.183	10.1 sn	%62	%56

PHT tanısı

Splanknik venler

- Splanknik venlerde genişleme
 - SMV kalibrasyonundaki fizyolojik değişikliğin kaybı
 - Ters akım
 -
- SMV % 2.1
splenik ven %3.1



PHT tanısı

Diğer kollateraller

- Retroperitoneal venler
- Omental venler
- Rektal varisler
- Safrakesesi varisleri

Siroz

US-Skoru



	Tanısal doğruluk (%)
KC kontur lobulasyonu + ortalama portal hız	82
Splenomegali + ortalama portal hız	84
Splenomegali+ort portal hız+hepatik venöz spektrum	89

Siroz

US-Skoru



	Tanısal doğruluk (%)
KC kontur lobulasyonu + ortalama portal hız	82
Splenomegali + ortalama portal hız	84
Splenomegali+ort portal hız+hepatik venöz spektrum	89