

Applications de l'échographie de contraste

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DIU d'échographie

Introduction

- Imagerie diagnostique : détection et caractérisation lésionnelle (lésion solide/lésion liquide ; lésion maligne/lésion bénigne)
- Imagerie de suivi thérapeutique : avant biopsie ou chirurgie, peropératoire, post-thérapeutique
- Imagerie fonctionnelle : quantification du signal ultrasonore//perfusion tumorale et modifications précoces sous traitement.
- Congrès Euroson de Copenhague 2003 : Idée de produire un document descriptif avec :
 - Requis technique, conditions de réalisation,
 - Qualification des investigateurs,
 - Étapes de la procédure,
 - Guide pour interprétation des images,
 - Indications
 - Consensus en 01/2004 à Rotterdam publié en 08/04 dans Ultraschall,

Introduction

- *Guidelines and good clinical practice recommendations for contrast enhanced ultrasound (CEUS) **in the liver** - update 2012 : a WFUMB – EFSUMB initiative in cooperation with representatives of AFSUMB, AIUM, ASUM, FLAUS and ICUS*

Claudon et al. *Ultrasound in Med. And Biol.*, Vol. 39, No. 2, pp. 187-210, february **2013**.

- *The EFSUMB Guidelines and Recommendations on the Clinical Practice of Contrast Enhanced Ultrasound (CEUS) : Uptade 2011 **on non-hepatic applications***

Piscaglia et al. *Ultraschall in Med* **2011** ;32 : 1-27

- *An EFSUMB Inroduction into Dynamic Contrast-Enhanced Ultrasound(DCE-US) for **Quantification of Tumor Perfusion***

C.F.Dietrich et al. *Ultraschall in Med* **2012** ;33 : 344-351

CEUS LI-RADS® 2017

Apply in patients at high risk for HCC, namely those with:

- Cirrhosis OR
- Chronic hepatitis B viral infection OR
- Current or prior HCC



Including adult liver transplant candidates and recipients posttransplant

Do not apply in patients:

- Without the above risk factors
- < 18 years old
- With cirrhosis due to congenital hepatic fibrosis
- With cirrhosis due to a vascular disorder such as hereditary hemorrhagic telangiectasia, Budd-Chiari syndrome, chronic portal vein occlusion, cardiac congestion, or diffuse nodular regenerative hyperplasia



Apply to observations:

- Visible at precontrast ultrasound



Do not assign CEUS LI-RADS categories for observations:

- That are path-proven malignancies OR
- That are path-proven benign lesions of non-hepatocellular origin such as hemangiomas



Apply for CEUS exams performed with:

- Pure blood-pool agents such as Lumason® (in USA)/SonoVue® (outside USA) and Definity® (in USA, Canada)/Luminity® (outside USA, Canada)



Do not apply for CEUS exams performed with:

- Combined blood-pool and Kupffer-cell agents such as Sonazoid®
The current version of CEUS LI-RADS does not address use of Sonazoid®. Use of Sonazoid® will be addressed in the next version of CEUS LI-RADS.



CEUS LI-RADS® 2017 Categories

Diagnostic Categories

CEUS LR-NC
Not categorizable (due to image degradation or omission)

CEUS LR-1
Definitely benign

CEUS LR-2
Probably benign

CEUS LR-3
Intermediate probability of malignancy

CEUS LR-4
Probably HCC

CEUS LR-5
Definitely HCC

Probably or definitely malignant, not necessarily HCC

CEUS LR-TIV
Tumor in vein

(Treatment response categories in development)

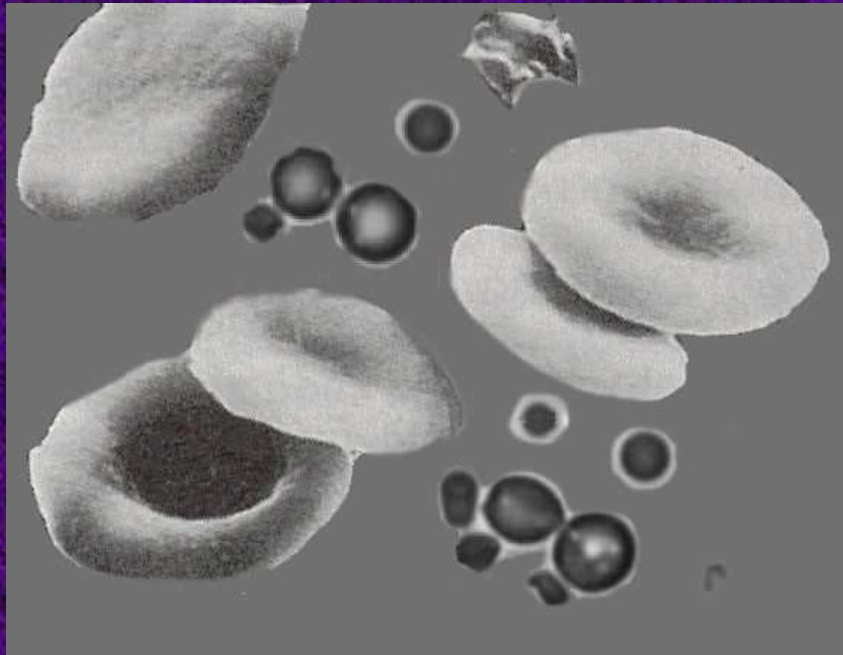
Agents de contraste ultrasonores

- Approche de la microvascularisation : augmentation de la valeur diagnostique de l'échographie,
 - Echo B : dynamique de gris, Sensibilité limitée de l'échographie : 57-92% en relation avec la taille des lésions, l'échogénicité, l'accès...Autres méthodes : CT-scan, 65-87% ; MRI, 85-90% ; US peropératoire, 90-95%
 - Doppler couleur et énergie : macrovascularisation
- Approche vasculaire permettant à l'instar du CEMRI et du CECT la caractérisation lésionnelle
- Agent marqueur sélectif du secteur vasculaire sans diffusion au secteur interstitiel : imagerie perfusionnelle, particularités sémiologiques /autres modalités ; outil de quantification de la perfusion tumorale.



Agent de contraste
CT ou IRM

Sortie du capillaire



MICROBULLES DE GAZ
PASSANT LA BARRIÈRE CAPILLAIRE PULMONAIRE ET
RESTANT STRICTEMENT ***INTRAVASCULAIRES***

- Agent de contraste ultrasonore : marqueur de la microvascularisation
- Importante rétrodiffusion liée aux bulles // augmentation du contraste lésion/ parenchyme : augmentation de la *détection* lésionnelle.
- Visualisation dynamique du réhaussement vasculaire des lésions : *caractérisation* lésionnelle,
- Stabilité des agents de contraste de 2^{ième} génération : augmentation de la *résolution temporelle* (supérieure aux autres modalités) par une imagerie en temps réel.

Les agents de contraste

SONOVUE® (BRACCO): AMM Europe 2001, France 2003

- microbulles d'hexafluorure de soufre sous forme lyophilisée avec reconstitution d'un flacon de 5ml (4.8 ml effectifs) diamètre moyen de 3 microns,
- injection de 1,2 à 2,4 ml suivi de 10 ml de sérum physiologique
- balayage des organes possible pendant 4 min, à moduler en fonction du type de vascularisation de l'organe exploré (terminale ou non)
- Hépto et spléno-spécificité d'étiologie imparfaitement connue (SRE?) : remanence tardive au niveau du foie et de la rate.

Les agents de contraste

SONOVUE® (BRACCO): AMM Europe 2001, France 2003, USA 2014 (Lumison®)

INDICATIONS :

Echocardiographie
examen doppler des gros vaisseaux
examen doppler des microvaisseaux (foie et sein)

CONTRE-INDICATIONS :

shunt droit-gauche
HTAP >90mmHg
HTA non contrôlée
SDRA
Grossesse/allaitement/enfant < 18ans

MISE EN GARDE :

coronaropathie instable/IC aiguë, III ou IV/Troubles du rythme sévère.

ESI :

Céphalées, paresthésies, douleur au point de ponction, réaction allergique < 0.002%

Les autres agents de contraste

- **DEFINITY®** (Lanthéus) : octofluoropropane, Canada et Australie,
- **SONAZOID®** (DaichiSankyo) : perfluorobutane, Japon et Corée du Sud,
- **LEVOVIST®** (Bayer Schering) : air, production arrêtée

Un mode d'imagerie spécifique

- Utilisation IV le plus souvent, intracavitaire possible (urosonographie)
- Nécessite un logiciel adapté constructeur dépendant,
- Échographe de dernière génération.
- Possible adaptation des modalités 3D

COMMISSION DE LA TRANSPARENCE

Avis
13 juin 2018

Date d'examen par la Commission : 30 mai 2018

hexafluorure de soufre (microbulles)**SONOVUE 8 µl/ml, poudre et solvant pour dispersion injectable**

Boîte de 1 flacon, 1 seringue pré-remplie et 1 système de transfert MimiSpike (CIP : 34009 357 564-6 6)

Laboratoire BRACCO IMAGING France

Code ATC	V08DA05 (produit de contraste)
Motif de l'examen	Extension d'indication
Listes concernées	Sécurité Sociale (CSS L.162-17) Collectivités (CSP L.5123-2)
Indications concernées	« Echographie des voies excrétrices urinaires SONOVUE est indiqué dans l'échographie des voies excrétrices urinaires chez l'enfant de la naissance à 18 ans afin de détecter un reflux vésico-urétéral.»

Avis favorable à la prise en charge dans l'indication concernée

Applications : le foie

- Rq : fréquence de résonance des bulles dans le domaine fréquentiel d'exploration de la cavité abdominale

➤ Sémiologie adaptée :

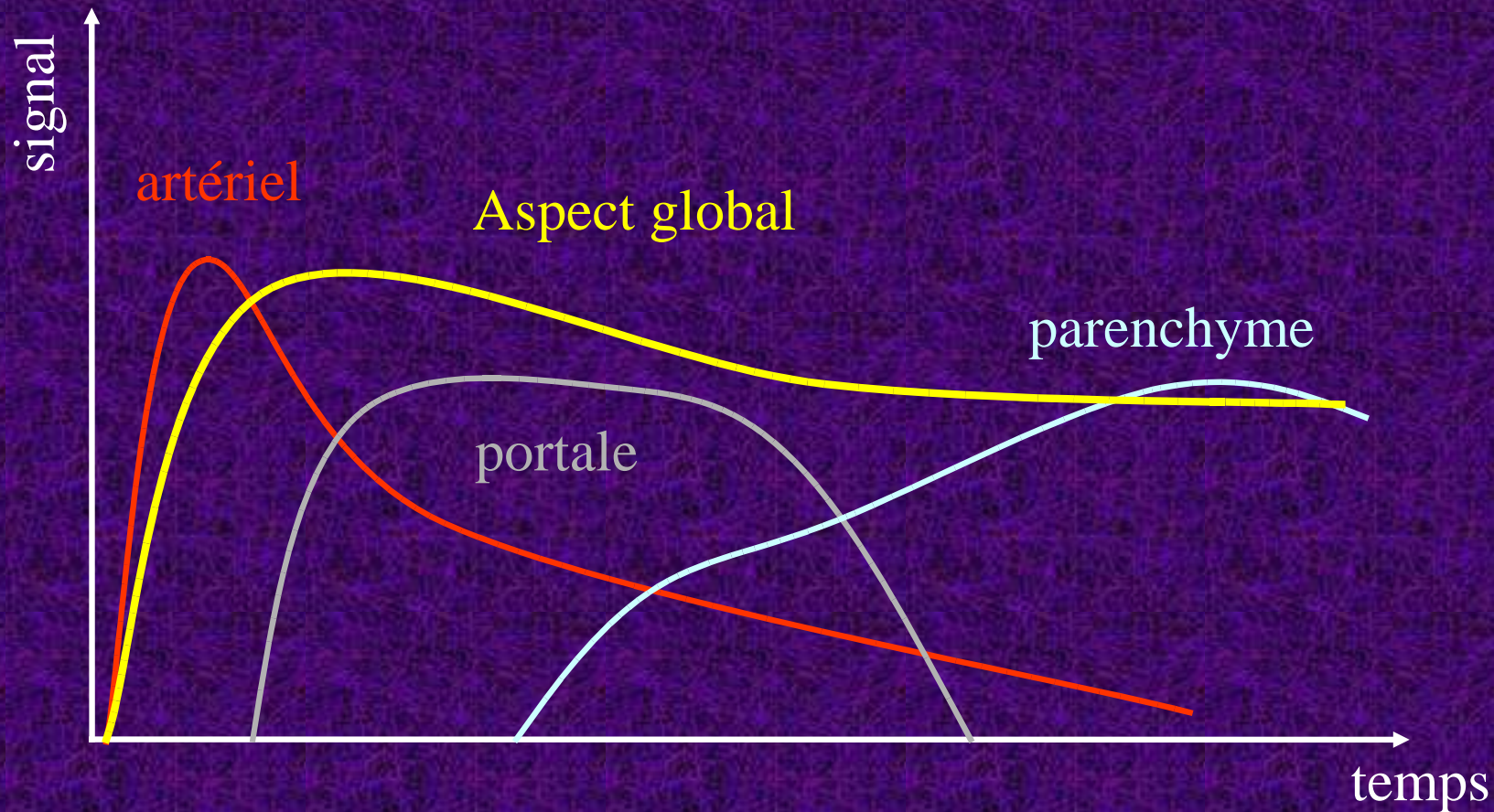
Notion de phases de rehaussement:

- ❖ artérielle (< 30 sec),
- ❖ portale (<1.30 min),
- ❖ (parenchymateuse ou) tardive (> 1.30 min, 2 min)

Table 1. Vascular phases in CEUS of the liver
(visualization postinjection time)

Phase	Start (s)	End (s)
Arterial	10–20	30–45
Portal venous (PV)	30–45	120
Late	>120	Bubble disappearance (approx. 4–6 min)

Applications : le foie



- ❖ **Définition du signal:**
 - hyposignal (signal plus faible que celui du parenchyme)
 - isosignal (identique) et
 - hypersignal (signal plus important que celui du parenchyme)

➤ Procédure d'exploration:

❖ *Recherche de lésions:*

- Injection de 2.4 ml puis balayage continu du foie dans sa globalité
- Puis

❖ *Caractérisation de lésions:*

- Acquisition continue sur une ou plusieurs lésions lors de réinjection de 2.4 ml

Table 2. Enhancement patterns of benign focal liver lesions in the non cirrhotic and cirrhotic liver

Lesion	Arterial phase	Portal venous phase	Late phase
A. Noncirrhotic liver			
Hemangioma			
Typical features	Peripheral nodular enhancement	Partial/complete centripetal fill in	Complete enhancement
Additional features	Small lesion: complete, rapid centripetal enhancement		Nonenhancing regions
FNH			
Typical features	Hyperenhancing from the center, complete, early	Hyperenhancing	Iso/hyperenhancing
Additional features	Spoke-wheel arteries Feeding artery	Unenhanced central scar	Unenhanced central scar
Hepatocellular adenoma			
Typical features	Hyperenhancing, complete	Isoenhancing	Isoenhancing
Additional features	Nonenhancing regions	Hyperenhancing Nonenhancing regions	Slightly hypoenhancing Nonenhancing regions
Focal fatty infiltration			
Typical features	Isoenhancing	Isoenhancing	Isoenhancing
Focal fatty sparing			
Typical features	Isoenhancing	Isoenhancing	Isoenhancing
Abscess			
Typical features	Peripheral enhancement, no central enhancement	Hyper-/isoenhancing rim, no central enhancement	Hypoenhancing rim, no central enhancement
Additional features	Enhanced septa Hyperenhanced liver segment	Hypoenhancing rim Enhanced septa Hyperenhanced liver segment	
Simple cyst			
Typical features	Nonenhancing	Nonenhancing	Nonenhancing
B. Cirrhotic liver			
Regenerative nodule (\pm dysplastic)			
Typical features (not diagnostic)	Isoenhancing	Isoenhancing	Isoenhancing
Additional features	Hypoenhancing		

Table 3. Enhancement patterns of malignant focal liver lesions in the noncirrhotic and cirrhotic liver

Lesion	Arterial phase	Portal venous phase	Late phase
A. Noncirrhotic liver			
Metastasis			
Typical features	Rim-enhancement	Hypoenhancing	Hypo/nonenhancing
Additional features	Complete enhancement Hyperenhancement Nonenhancing regions	Nonenhancing regions	Nonenhancing regions
HCC			
Typical features	Hyperenhancing	Isoenhancing	Hypo/nonenhancing
Additional features	Nonenhancing regions	Nonenhancing regions	Nonenhancing regions
Cholangiocarcinoma			
Typical features	Rim-like hyperenhancement, central hypoenhancement	Hypoenhancing	Nonenhancing
Additional features	Nonenhancing regions Inhomogeneous Hyperenhancement	Nonenhancing regions	Nonenhancing regions
B. Cirrhotic liver			
HCC			
Typical features	Hyperenhancing, complete Nonenhancing areas (if large)	Isoenhancing Nonenhancing regions	Hypoenhancing (slightly or moderately)
Additional features	Basket pattern, chaotic vessels Enhancing tumor thrombus Hypo/nonenhancing	Nonenhancing	Isoenhancing Nonenhancing

Caractérisation et détection

● Hemangioma

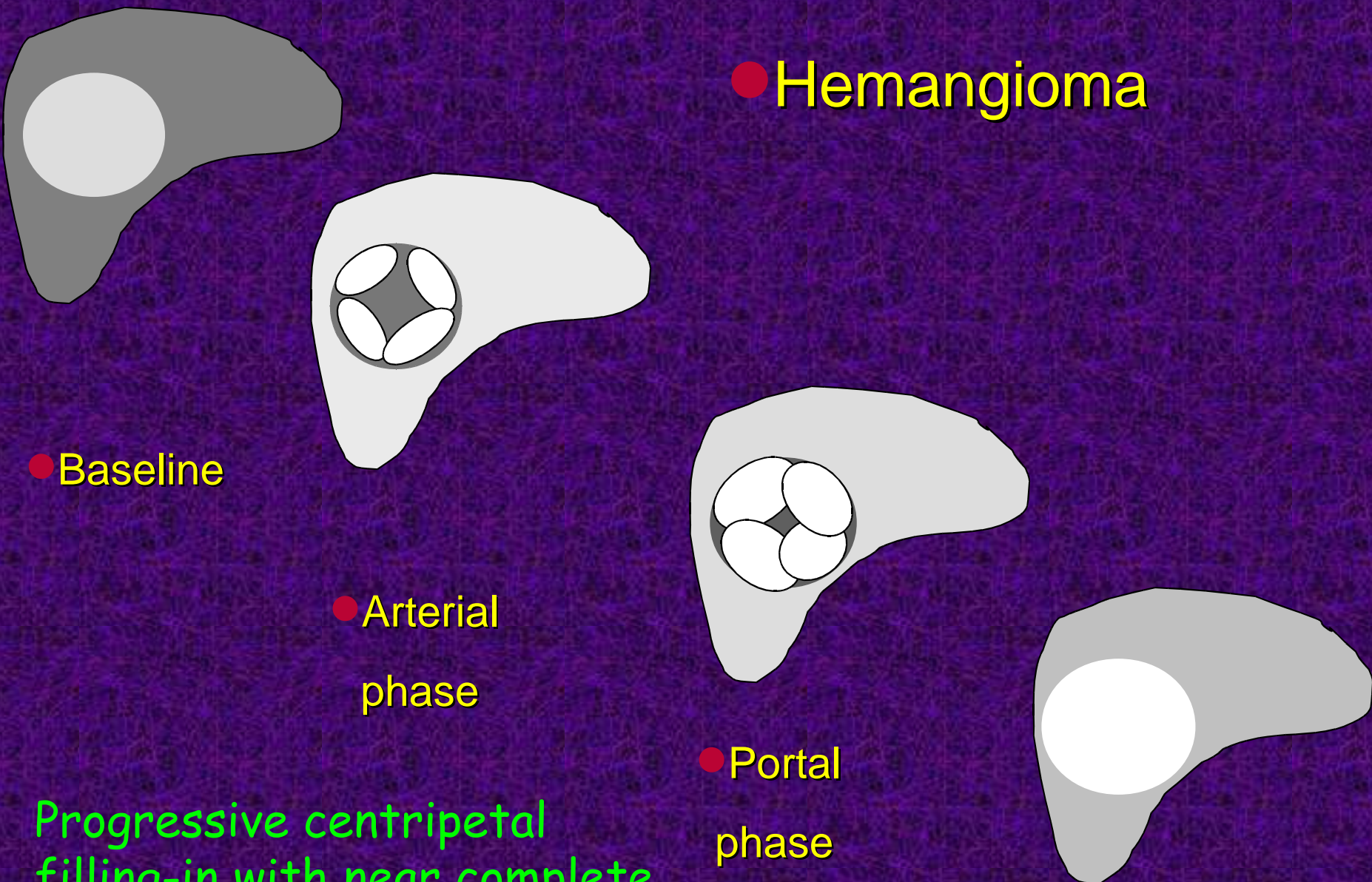
● Baseline

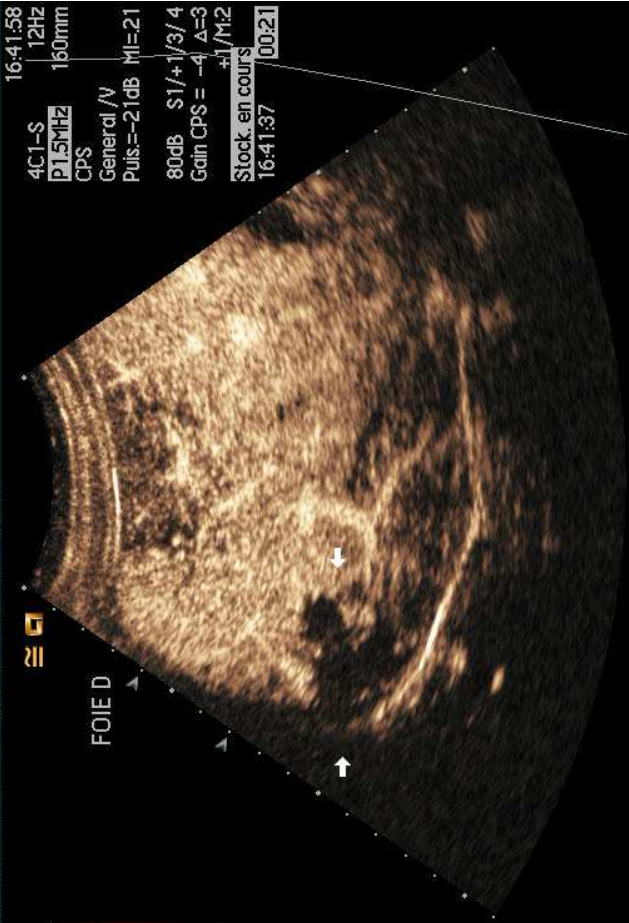
● Arterial
phase

● Portal
phase

● Late
phase

Progressive centripetal
filling-in with near complete
enhancement on late phase





Désactiver Horloge

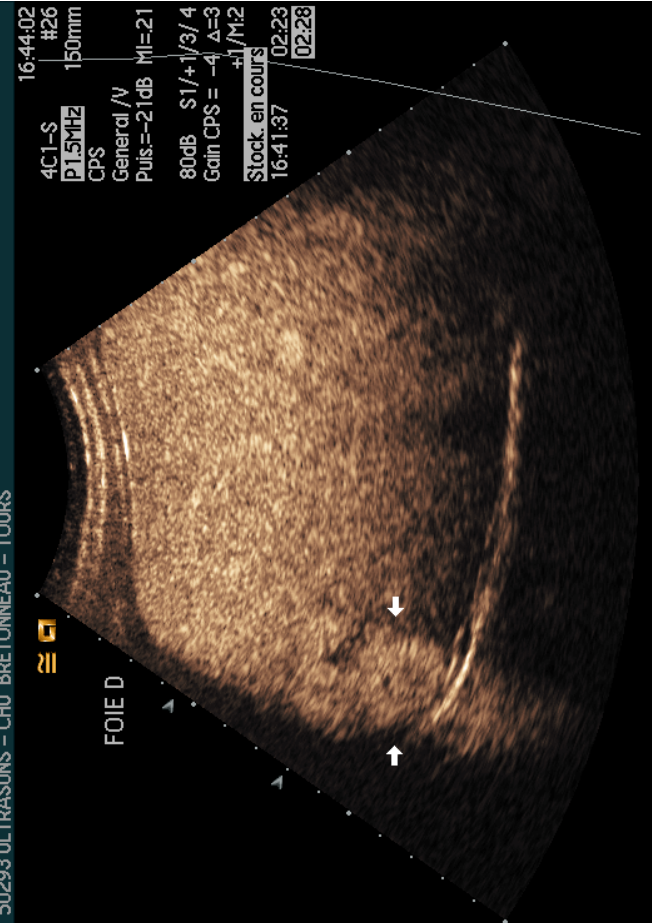
Sortir

Sélect. grp.

Verrous

Suppr. grp

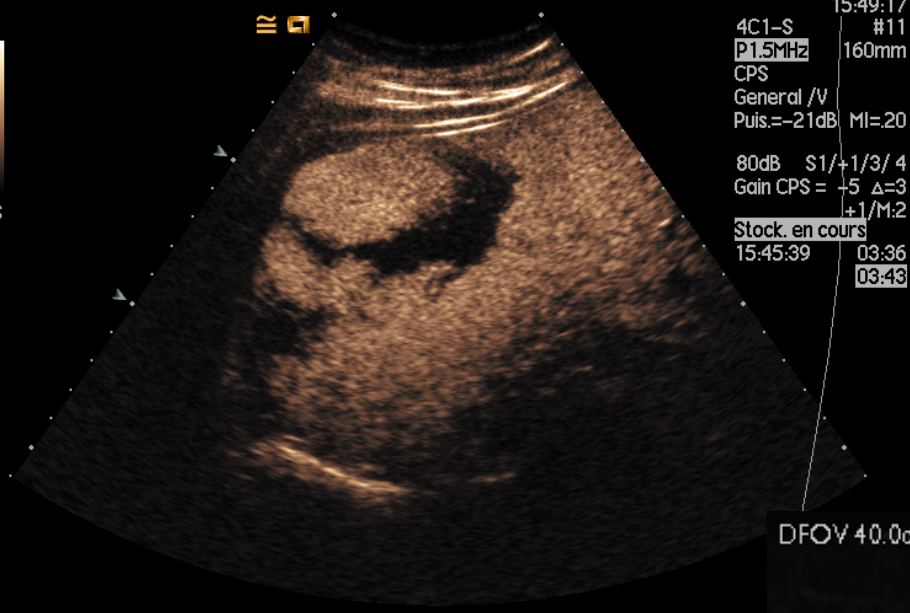
Sortir



Désactiver Horloge

Sortir

Sortir



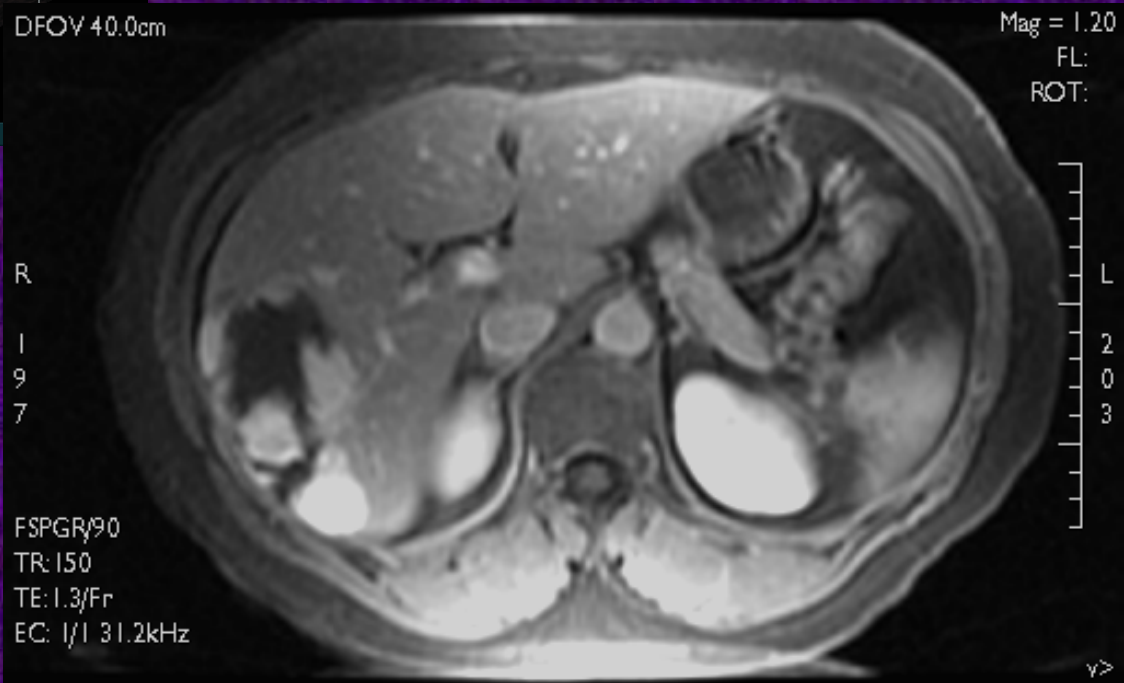
DFOV 40.0cm

Mag = 1.20

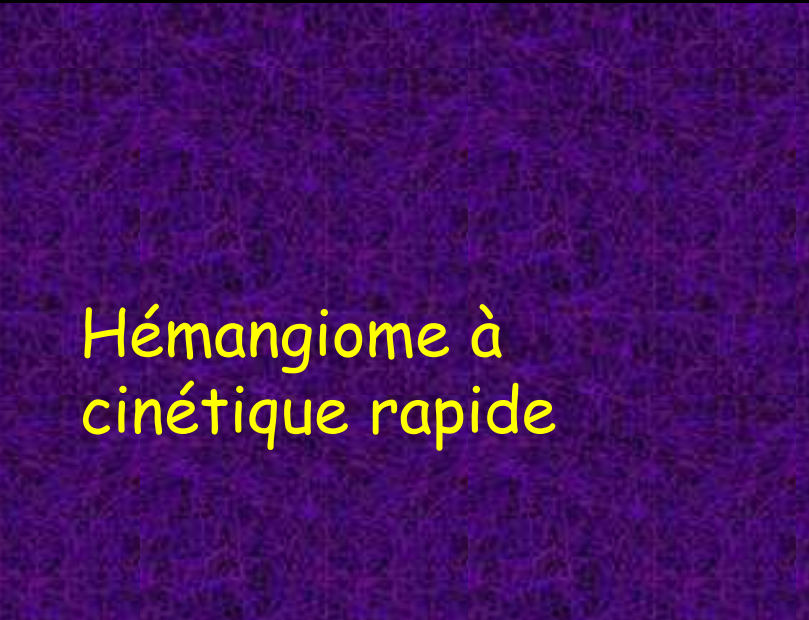
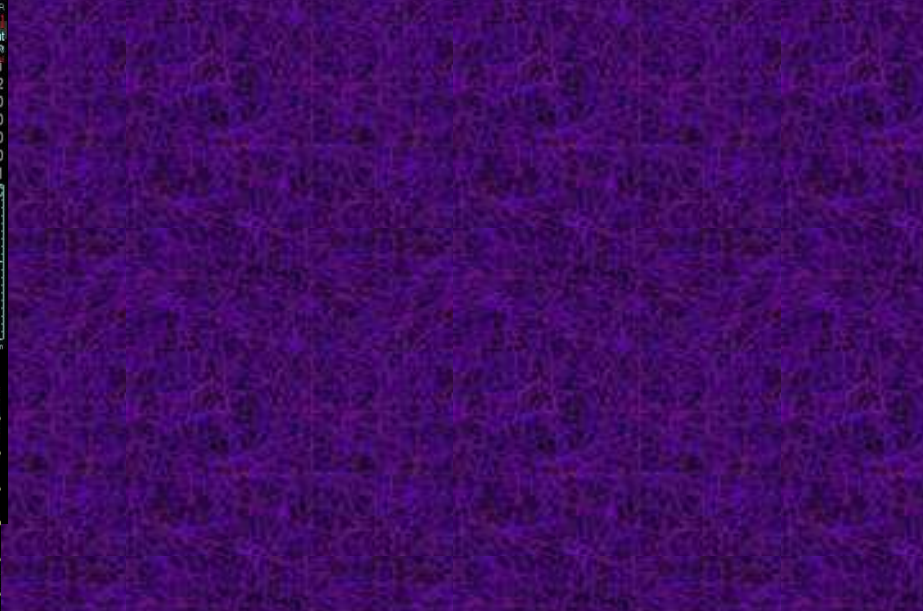
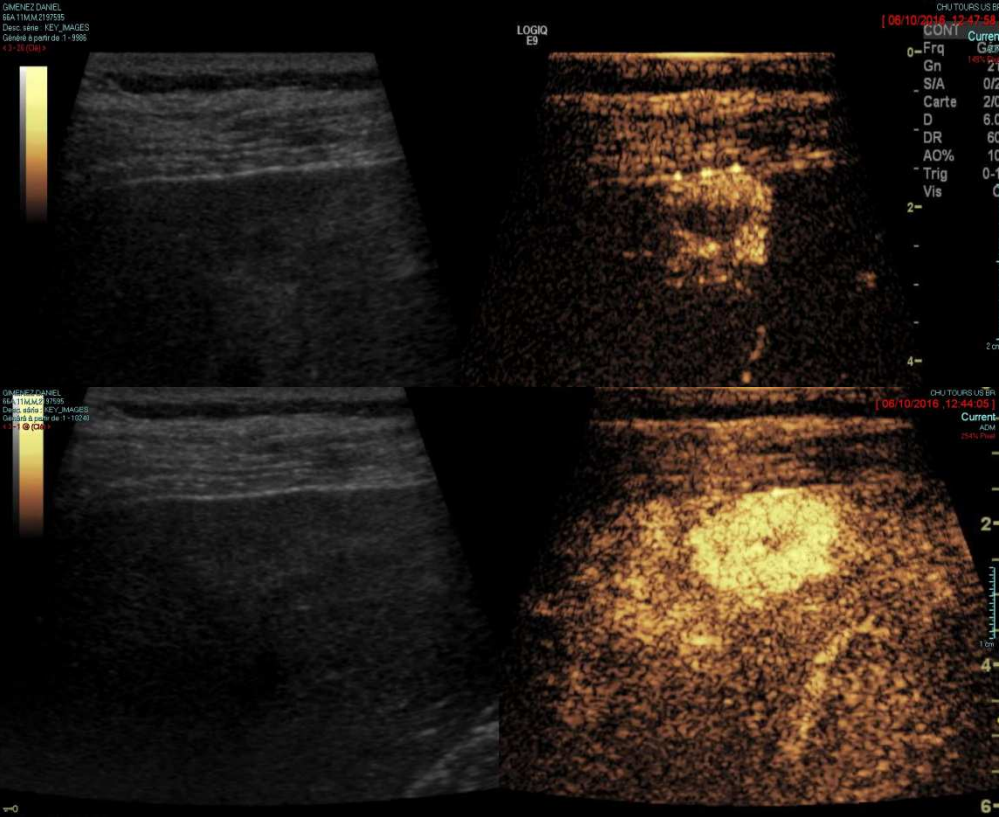
R
1
9
7

L
2
0
3

FSPGR/90
TR: 150
TE: 1.3/Fr
EC: 1/1 31.2kHz



Portal and late phases

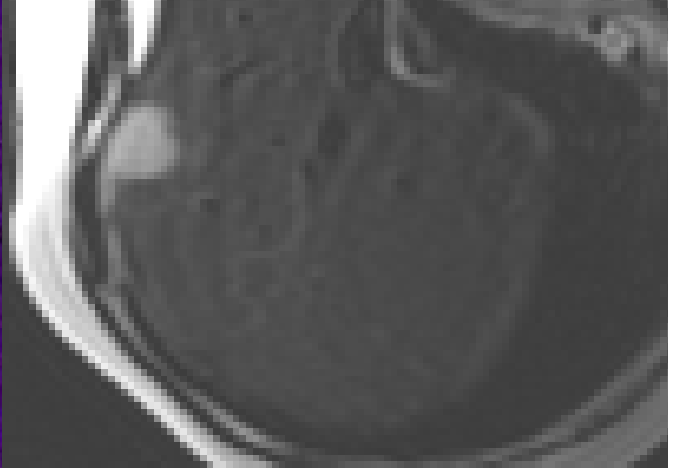
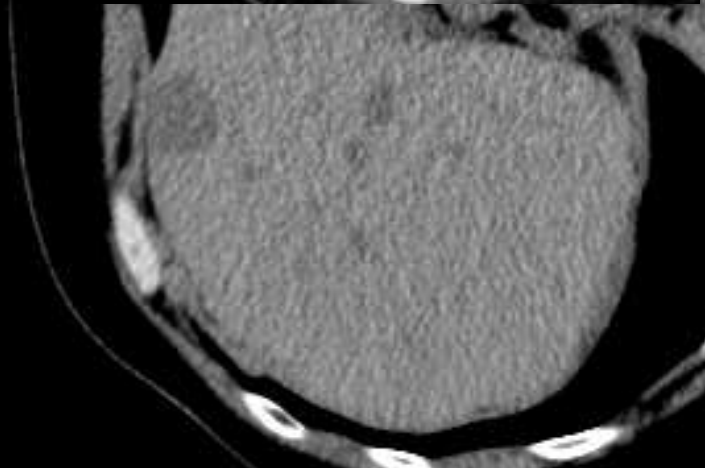
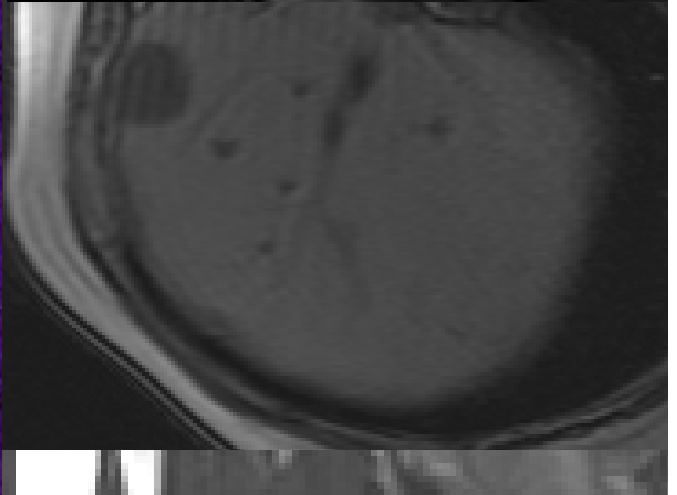
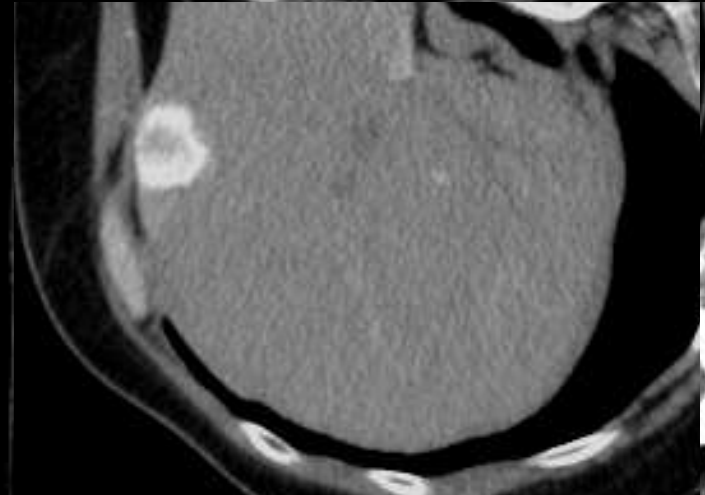
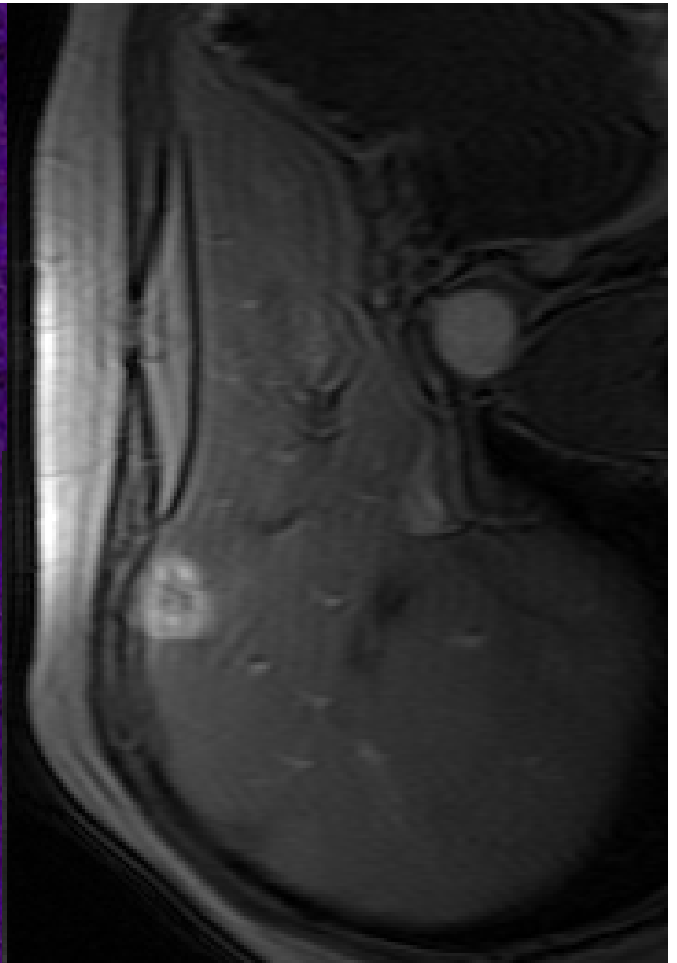
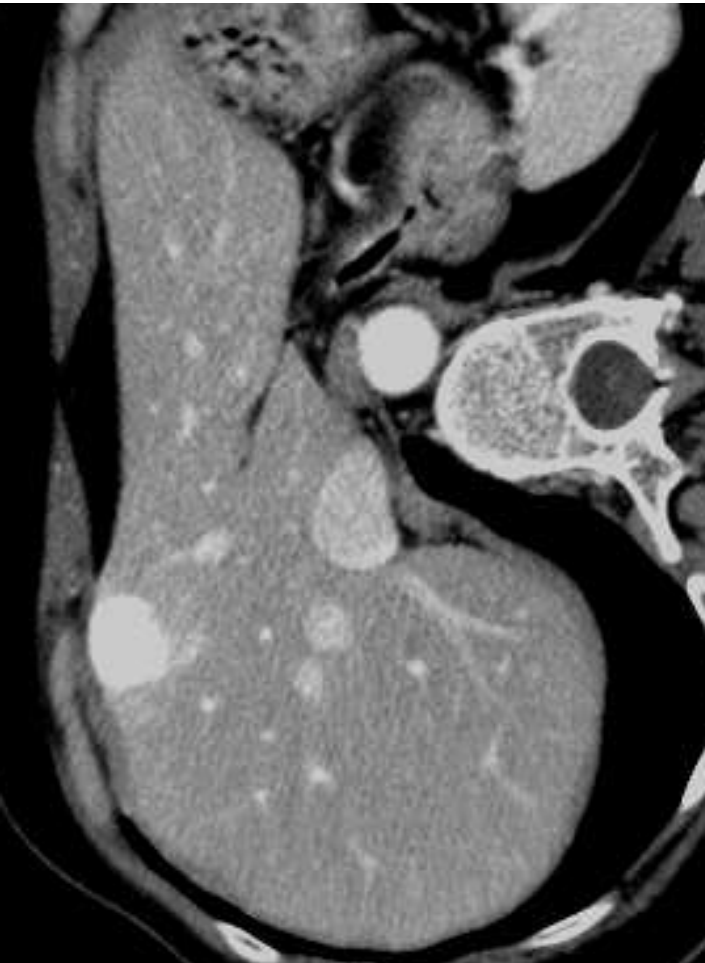


15 Oct 04

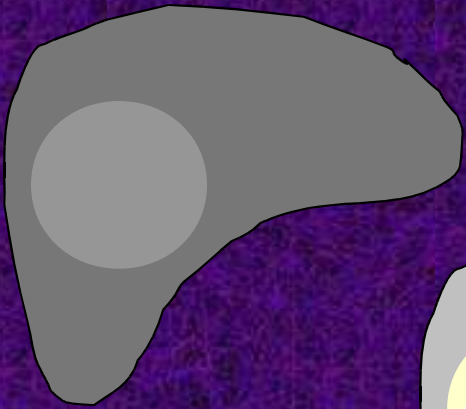
ASONS - CHU BRETONNEAU - TOURS

16:15:58 #34
4C1-S 120mm
P1.5MHz
CPS
General /V
Puis.=-21dB MI=21
80dB S1/+1/3/4
Gain CPS = -8 Δ=3
+1/M:2
Stock. en cours
16:12:33 03:25
03:27

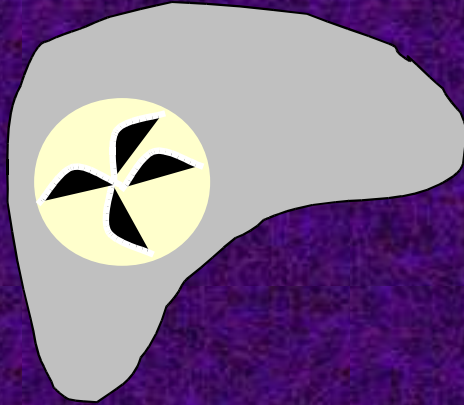
Hémangiome à cinétique rapide



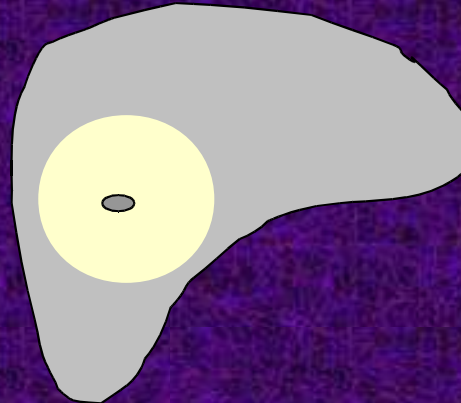
● Focal nodular hyperplasia



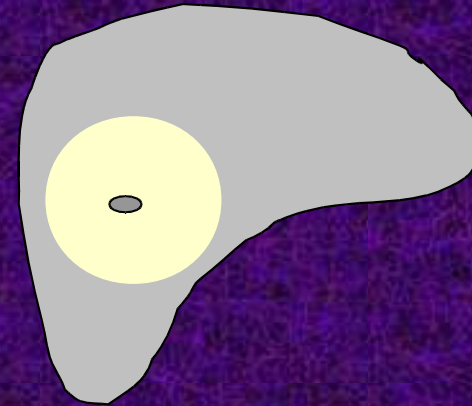
● Baseline



● Arterial phase

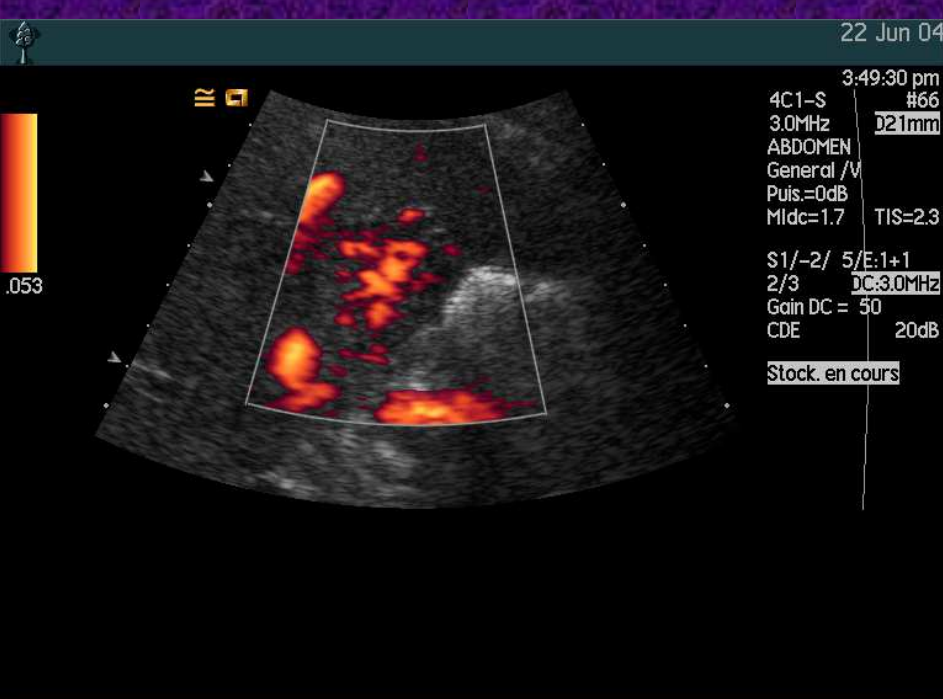
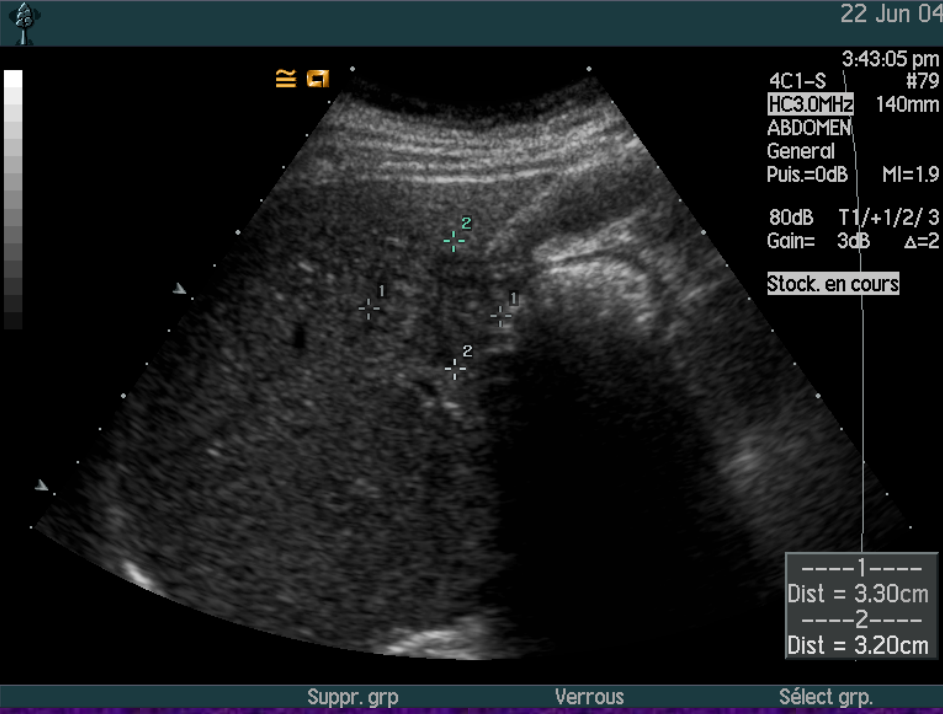


● Portal phase

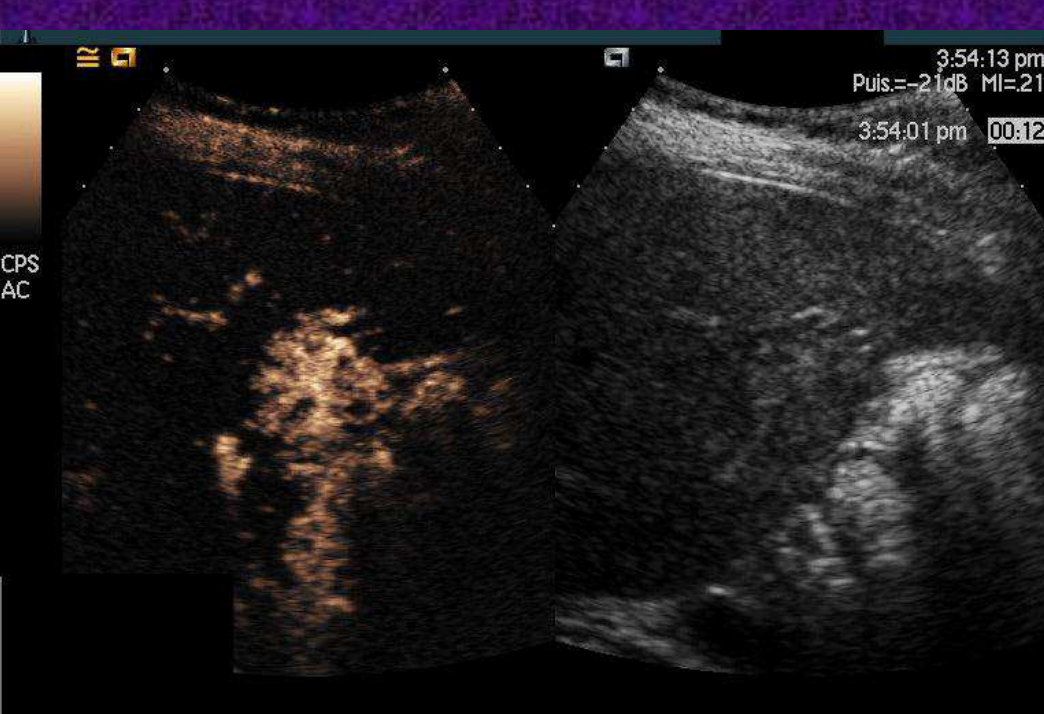


● Late phase

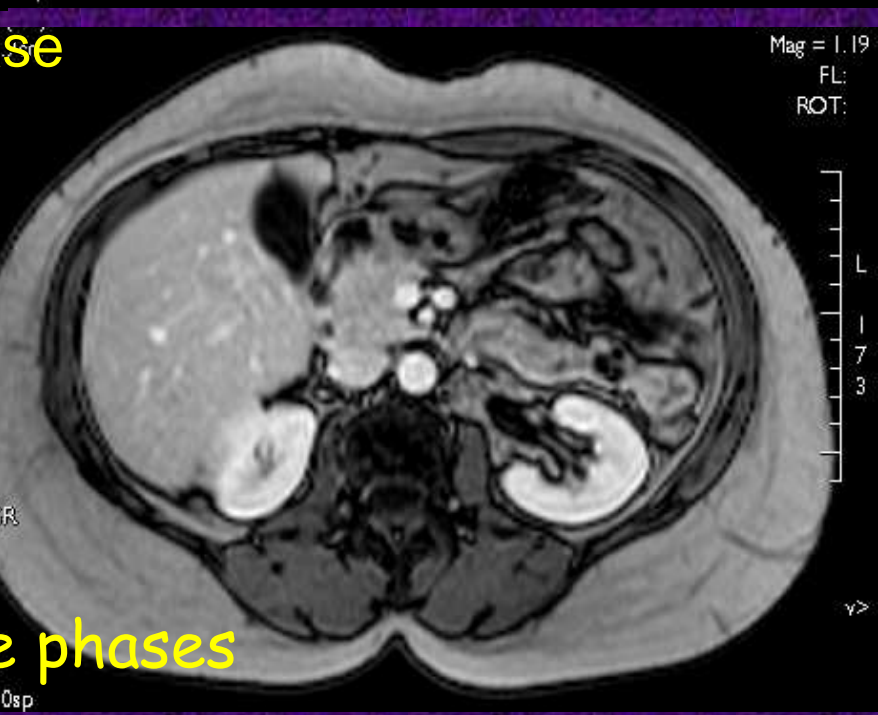
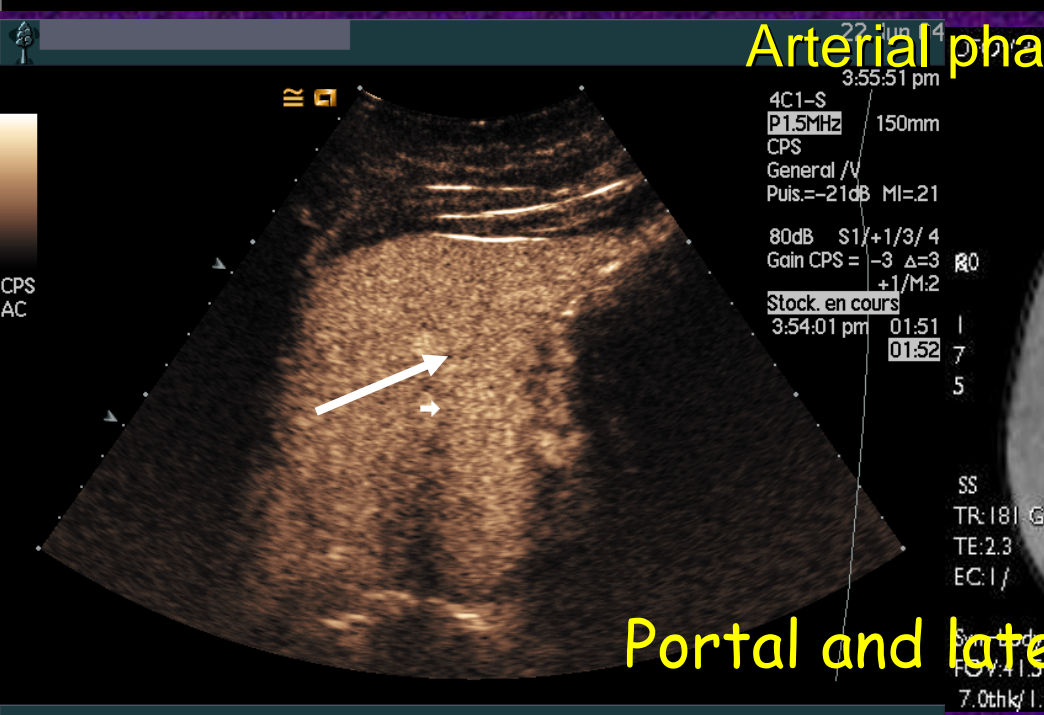
Depiction of central artery followed by a centrifugal stellar enhancement.
Iso- or hyper-enhancement on late phase.
Inconstant central scar.



Baseline

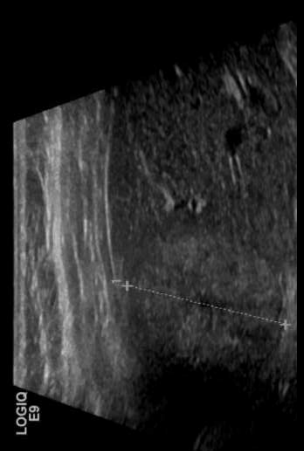


Arterial phase



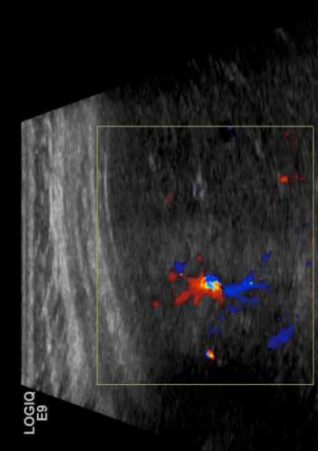
Portal and late phases

FR 25
 - CHI 8.4
 - Frq 41
 - Gn 1/1
 - S/A Carte
 - D 8.0
 - DR 69
 2-AD% 100



4-

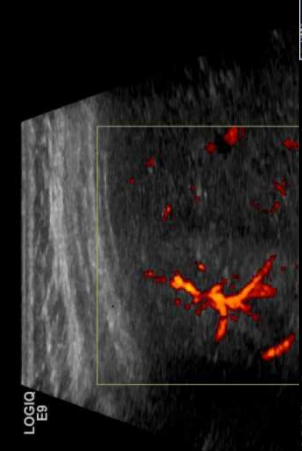
FR 6
 - CHI 8.4
 - Frq 41
 - Gn 8.0
 - AD% 100



2- Frq 4.2
 - Gn 28.0
 - L/A 4/5
 - PRF 1.1
 - FO 1/44
 - SIP 2/16
 - MAC% 100

4-

FR 6
 - CHI 8.4
 - Frq 41
 - Gn 8.0
 - AD% 100

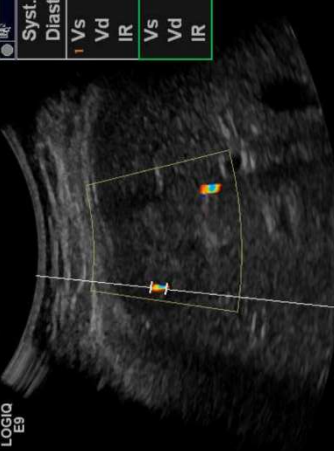


2- Frq 4.2
 - Gn 21.5
 - L/A 4/7
 - PRF 1.1
 - FO 1/44
 - SIP 2/16
 - MAC% 100

4-

MR	Syst.	81.9 cm/s
	Diasto.	39.1 cm/s
1	Vs	81.9 cm/s
	Vd	33.9 cm/s
	IR	0.59
	Vs	0.0 cm/s
	Vd	0.0 cm/s
	IR	0.00

FR 12
 - CHI 4.0
 - Frq 54
 - Gn 8.0
 - AD% 100



100 50 0 -50 cm/s

2- Frq 3.6
 - Gn 22.5
 - PRF 1.5
 - FO 2/70
 - AD% 100

4-

FR 6
 - DP 2.1
 - Frq 36
 - Gn 4.4
 - FO 54
 - Taille 4
 - 8-SVD 3.2
 - AD% 100

● Hepatocellular adenoma

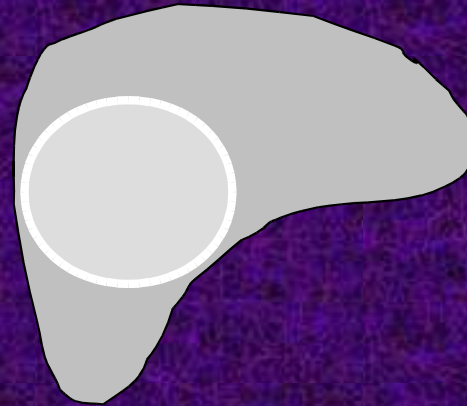
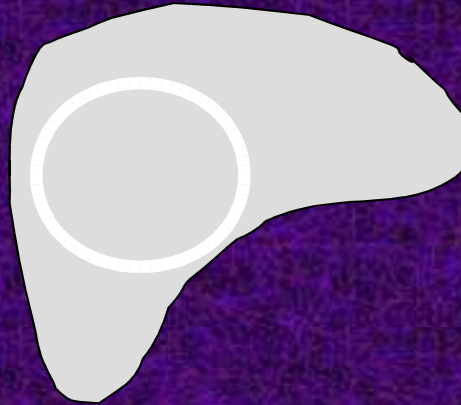
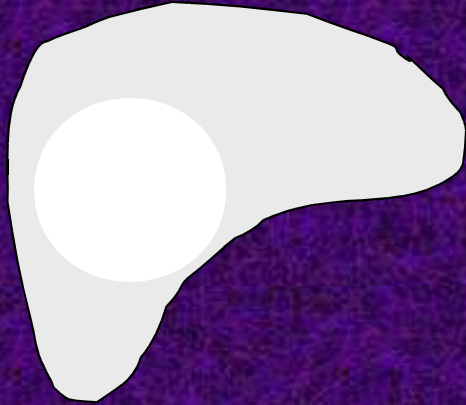
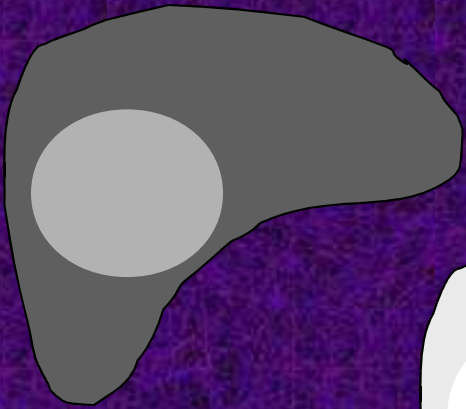
● Baseline

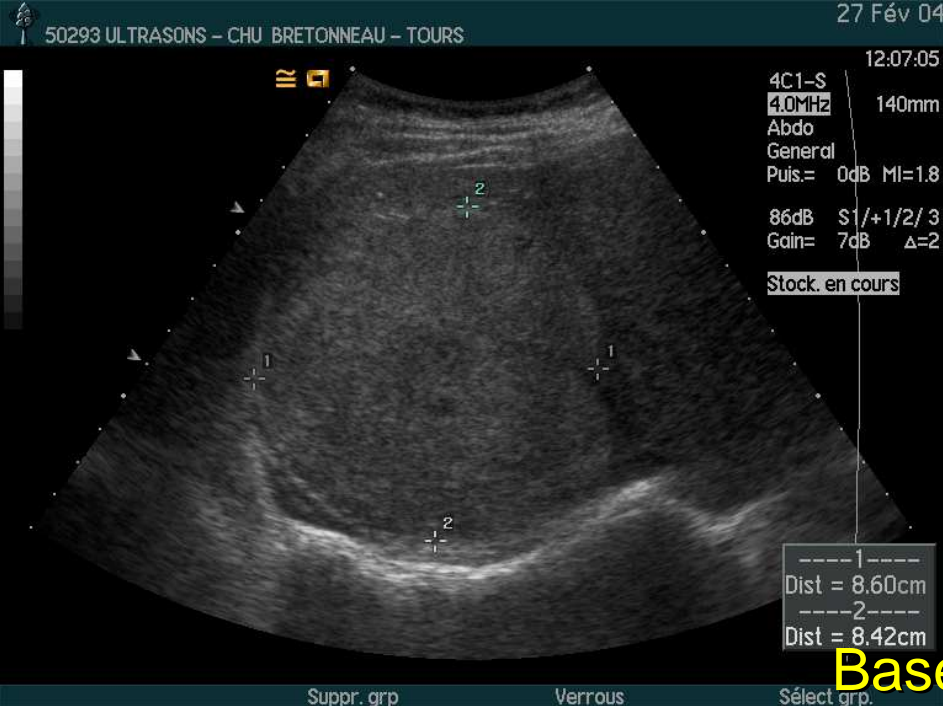
● Arterial
phase

● Portal
phase

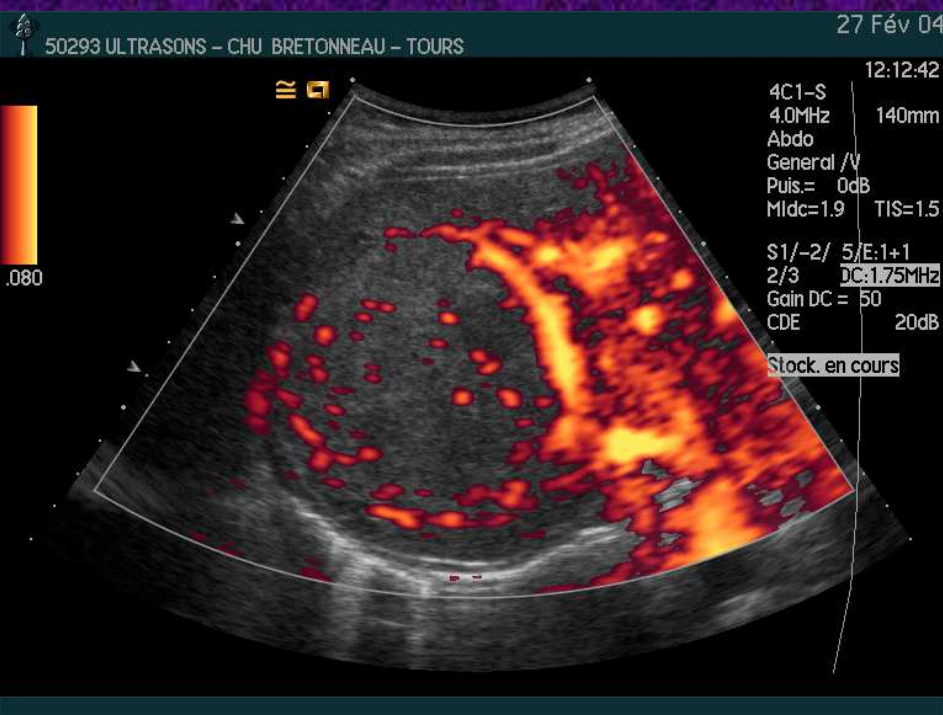
● Late
phase

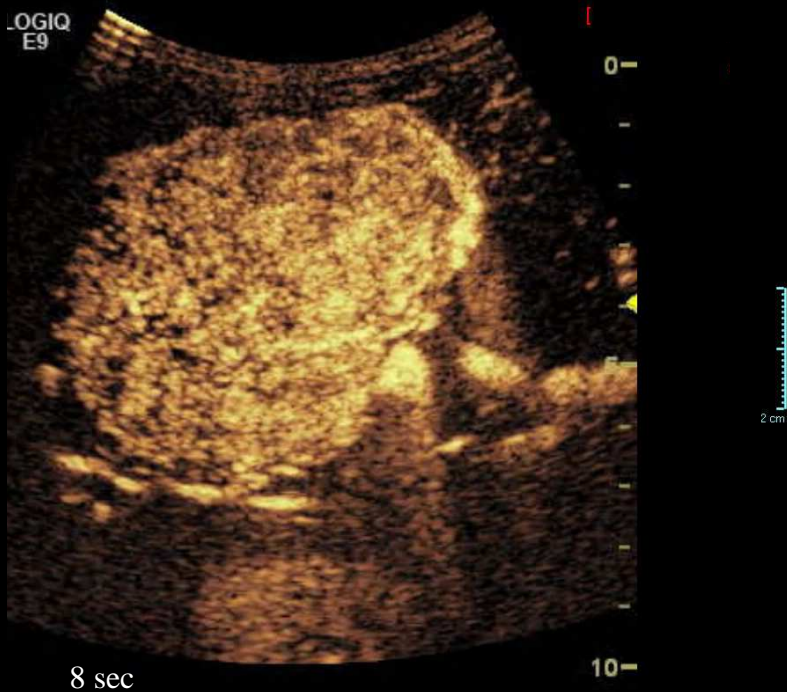
Centripetal arterial
enhancement with persistent
hyper-enhancement
and hypervascular rim.





Baseline





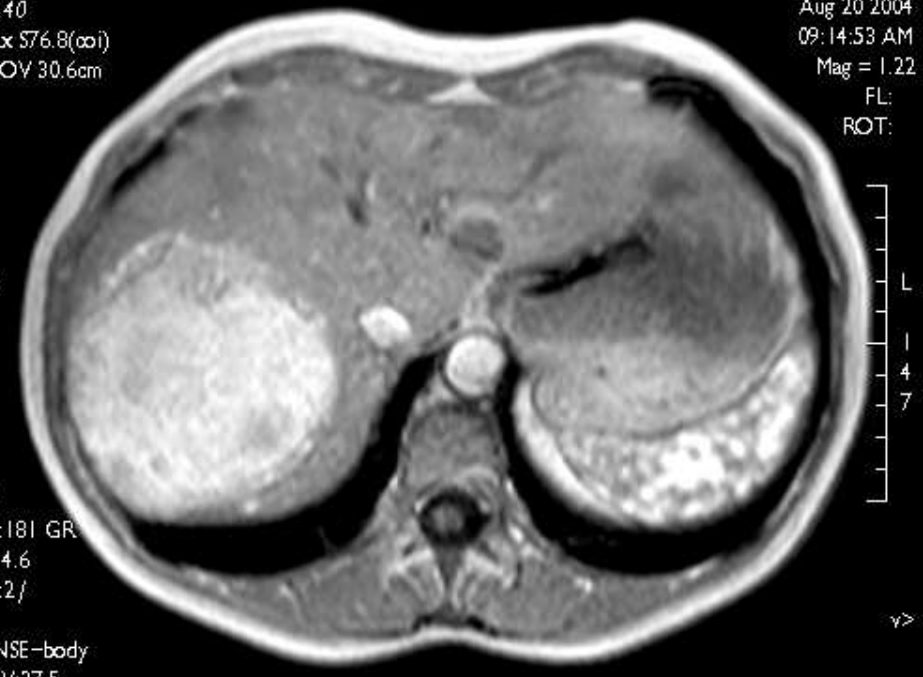
Im: 40
Ax 576.8 (po1)
DFOV 30.6cm

R0
1
6
0

SS
TR: 181 GR
TE: 4.6
EC: 2/

SENSE-body
FOV: 37.5

Aug 20 2004
09: 14: 53 AM
Mag = 1.22
FL:
ROT:



50293 ULTRASONS - CHU BRETONNEAU - TOURS

Arterial phase

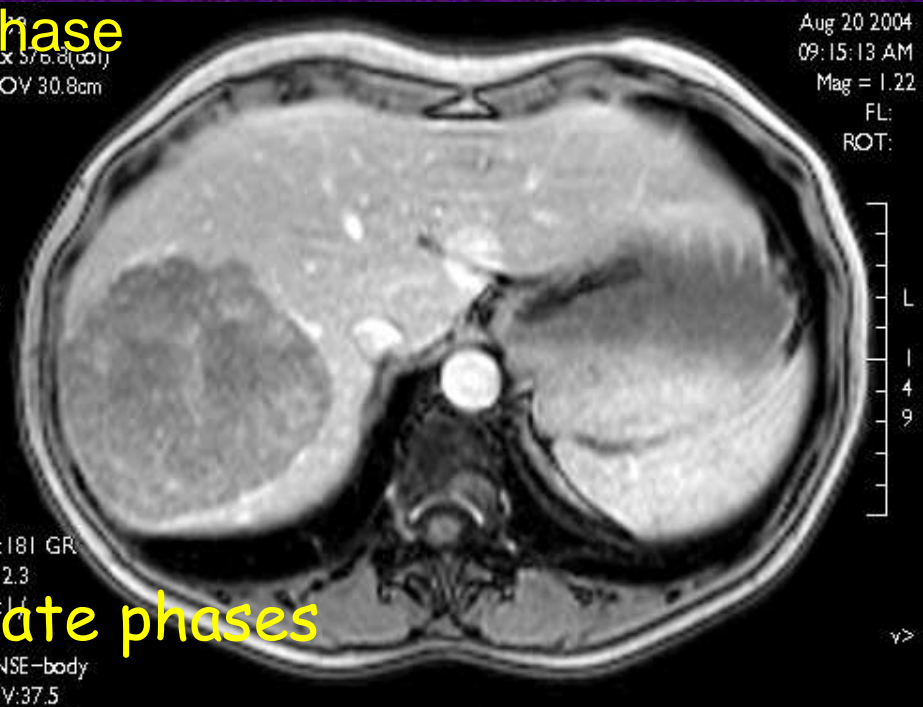
4C1-S
P1.5MHz 140mm
CPS
General /V
Puis. = -21dB MI = 21
80dB S1/+1/3/4
Gain CPS = -4 Δ=3
+1/M.2
Stock. en cours
12:17:29 01:45
01:52

Aug 20 2004
09: 15: 13 AM
Mag = 1.22
FL:
ROT:

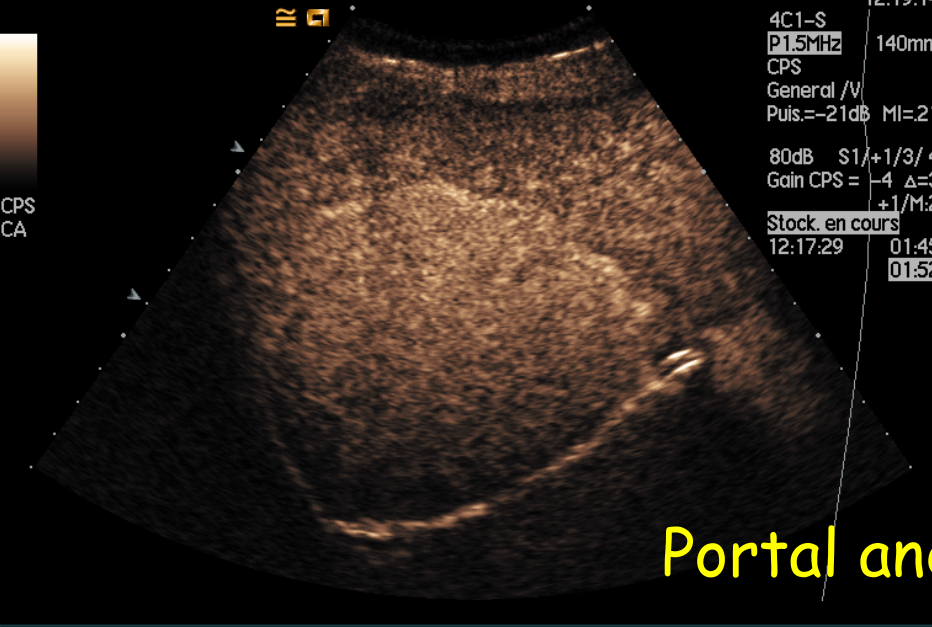
R0
1
5
9

SS
TR: 181 GR
TE: 2.3
EC: 1/

SENSE-body
FOV: 37.5



Portal and late phases



● Hepatocellular carcinoma

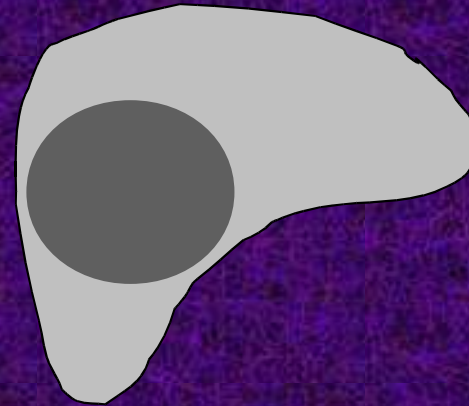
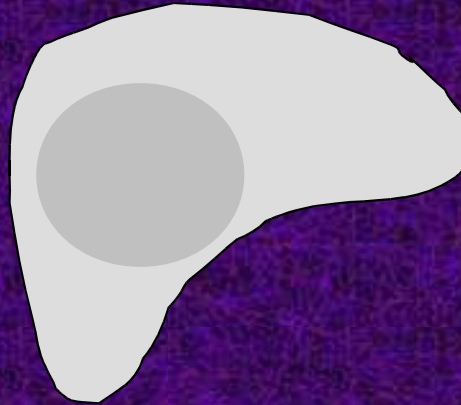
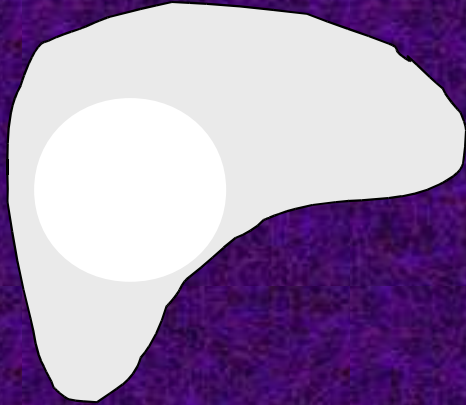
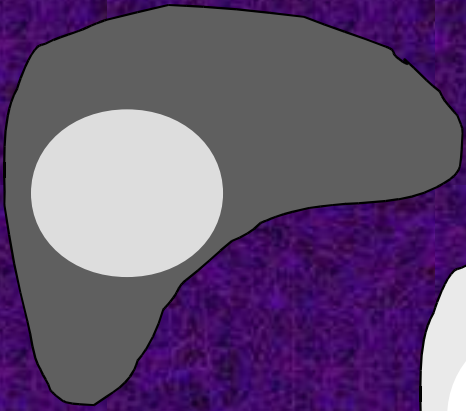
● Baseline

● Arterial
phase

● Portal
phase

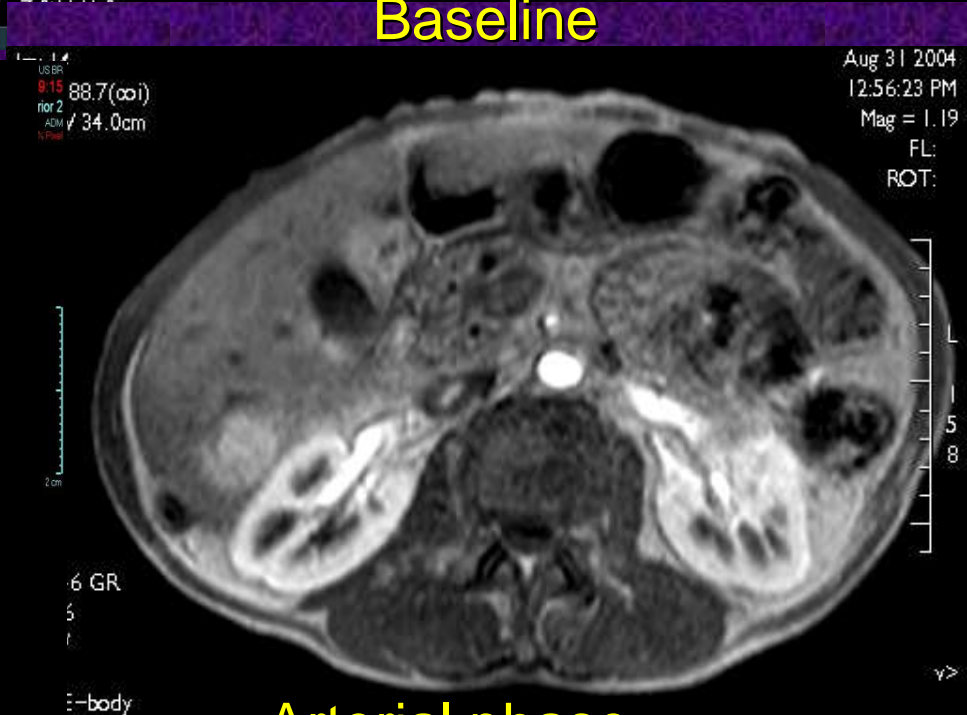
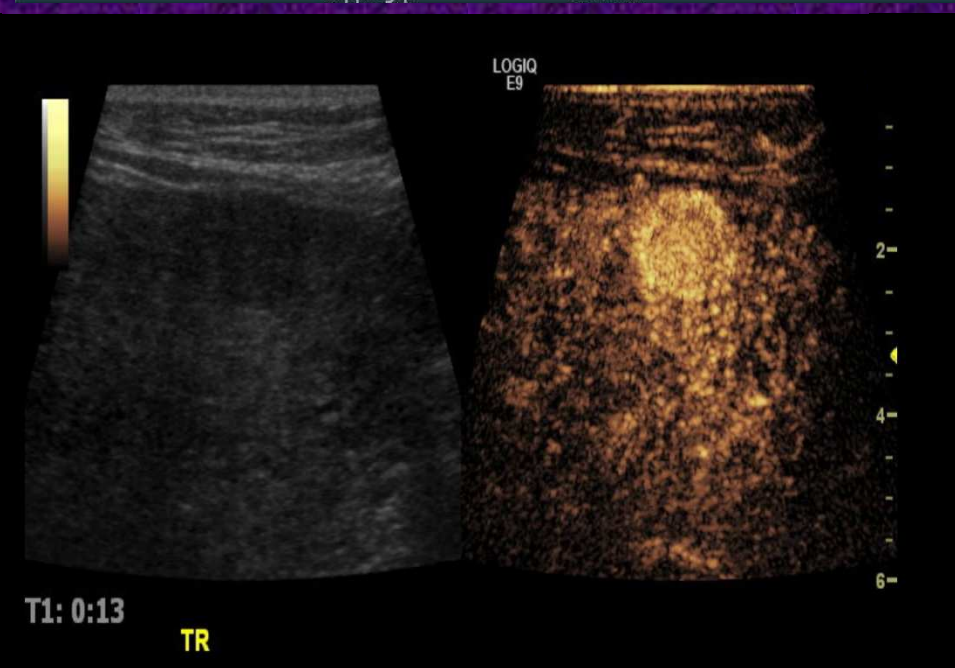
● Late
phase

Centripetal arterial
enhancement followed by
a progressive washout during
portal and late phases.

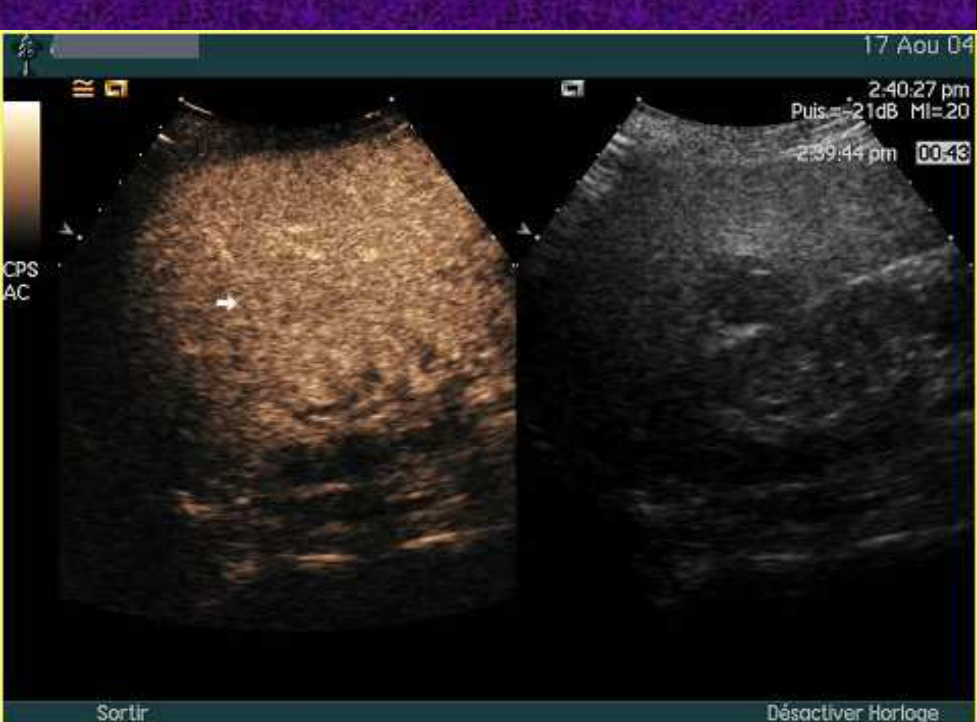




Baseline



Arterial phase



Im: 13
 Ax 188.7(∞i)
 DFOV 34.0cm

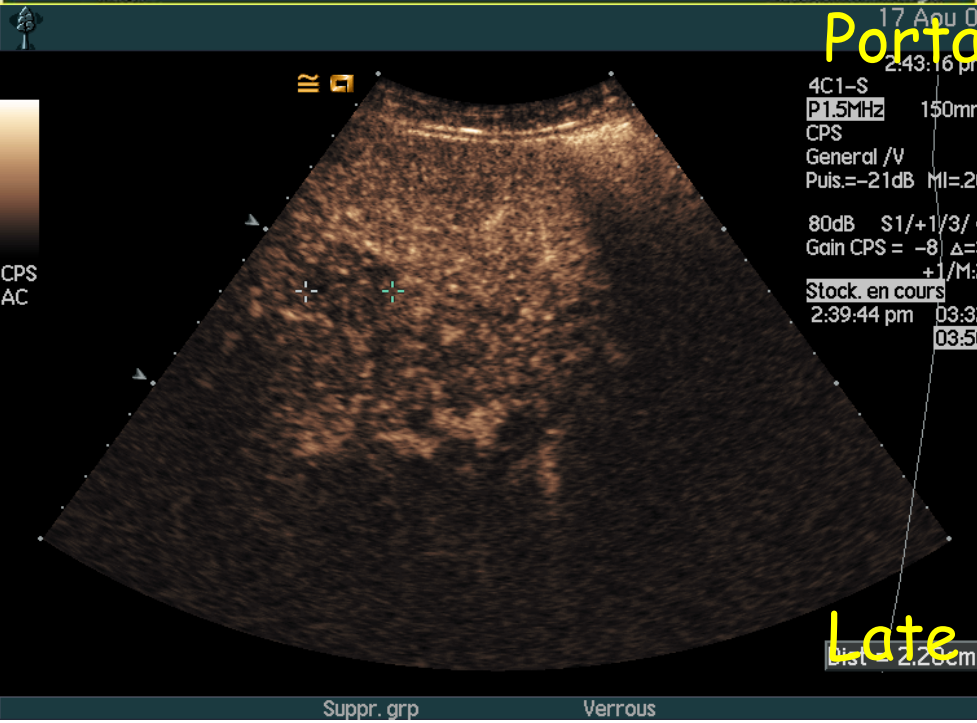
80
 1
 8
 3

SS
 TR: 146 GR
 TE: 2.3
 EC: 1/

SENSE-body
 FOV: 40.5
 7.0thk/1.0cm



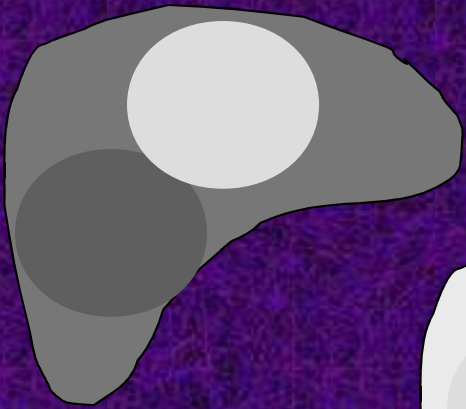
Portal phase



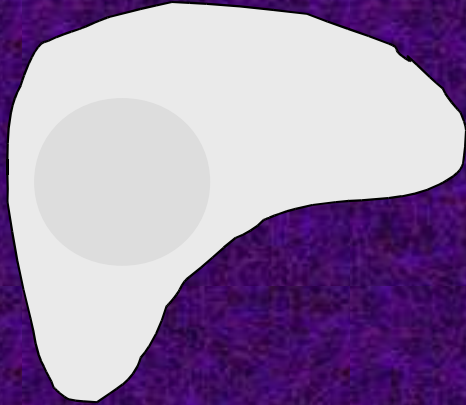
Late phase



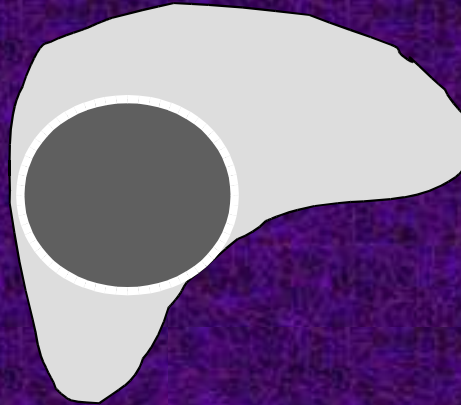
● Hypovascular metastasis



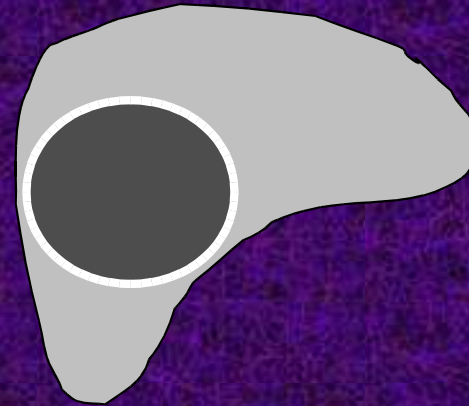
● Baseline



● Arterial
phase

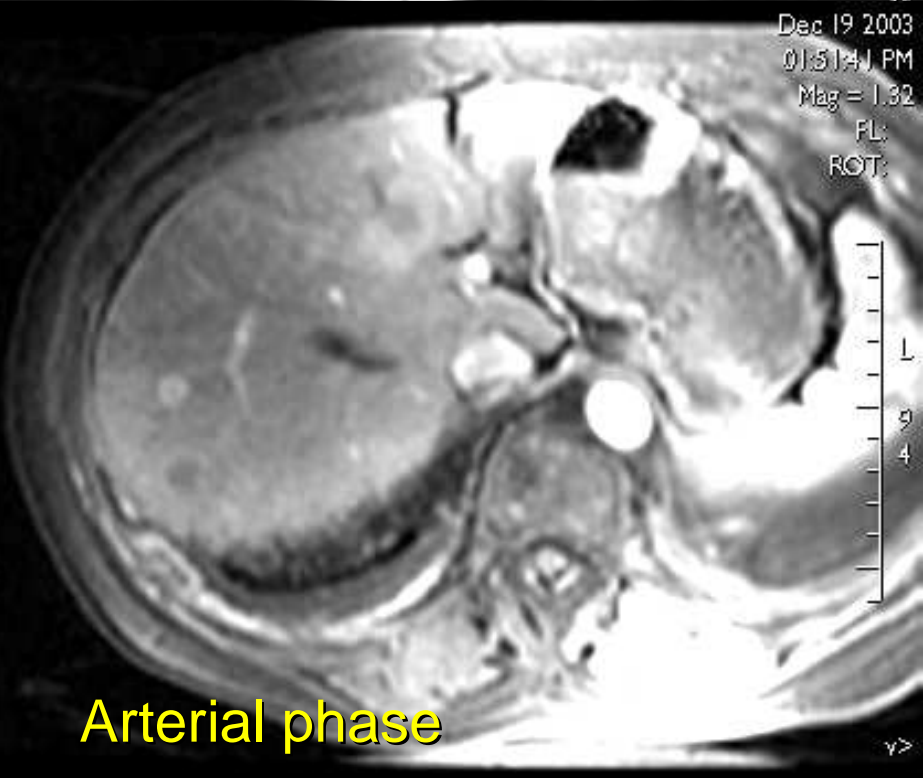
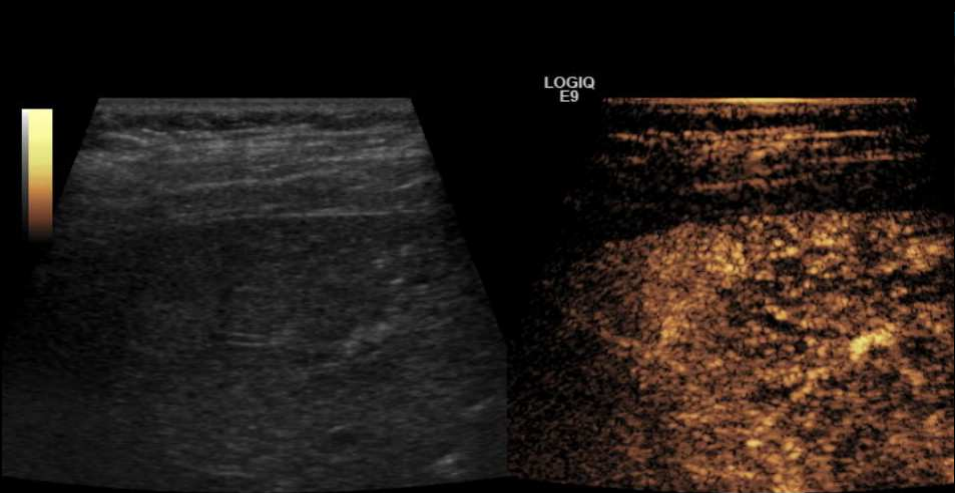
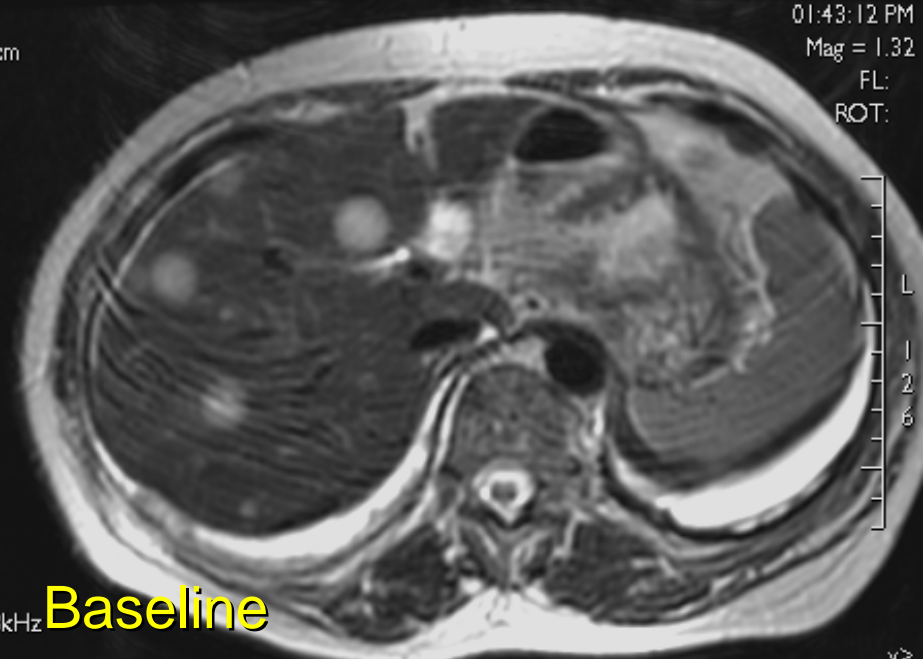
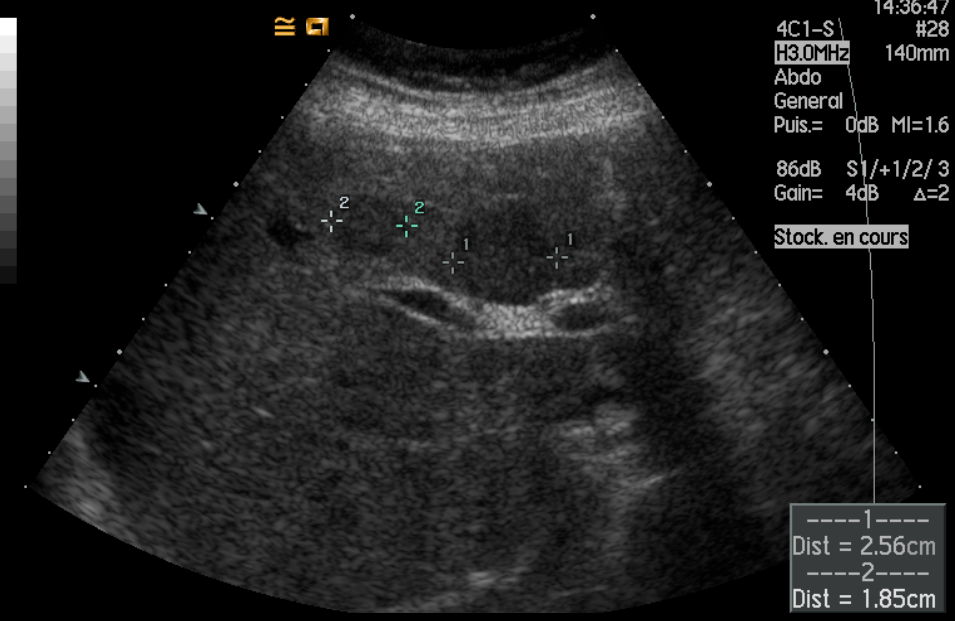


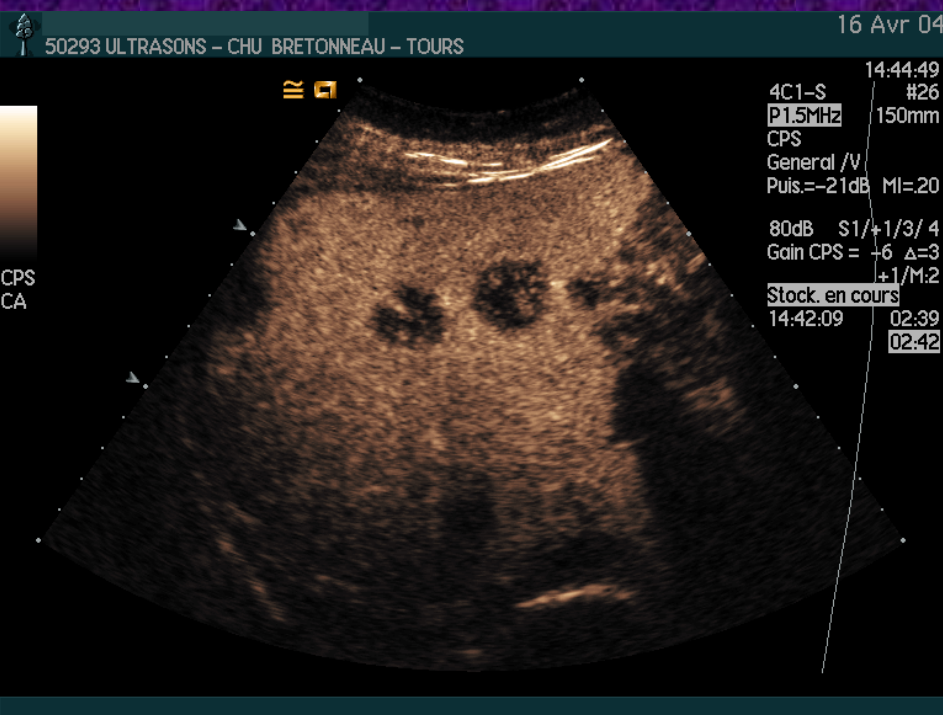
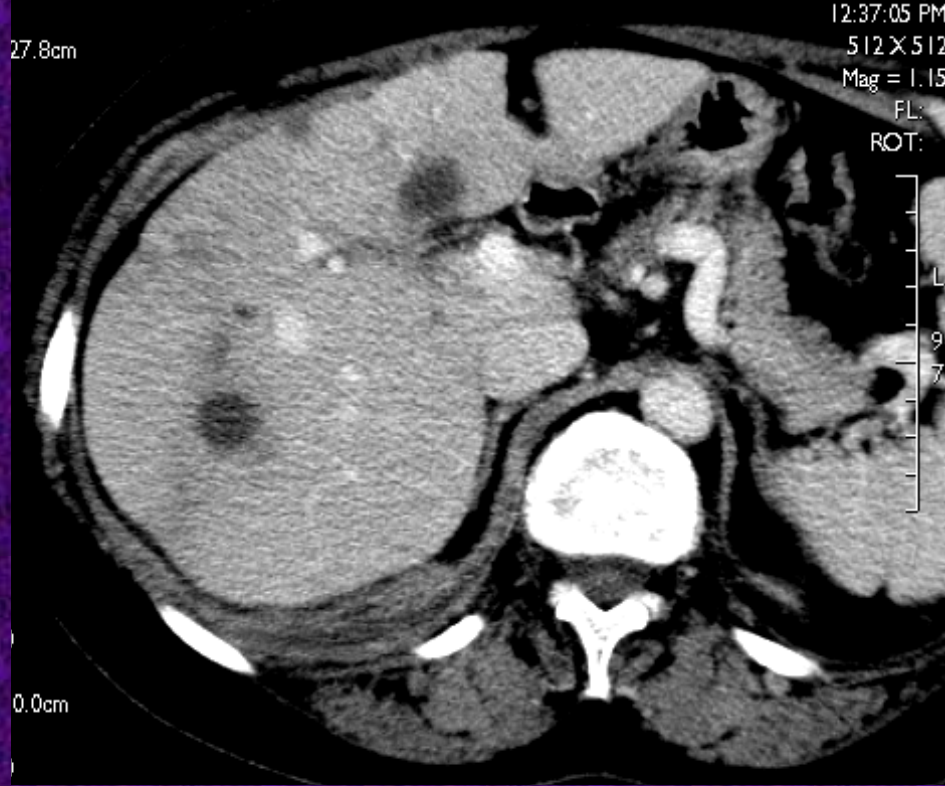
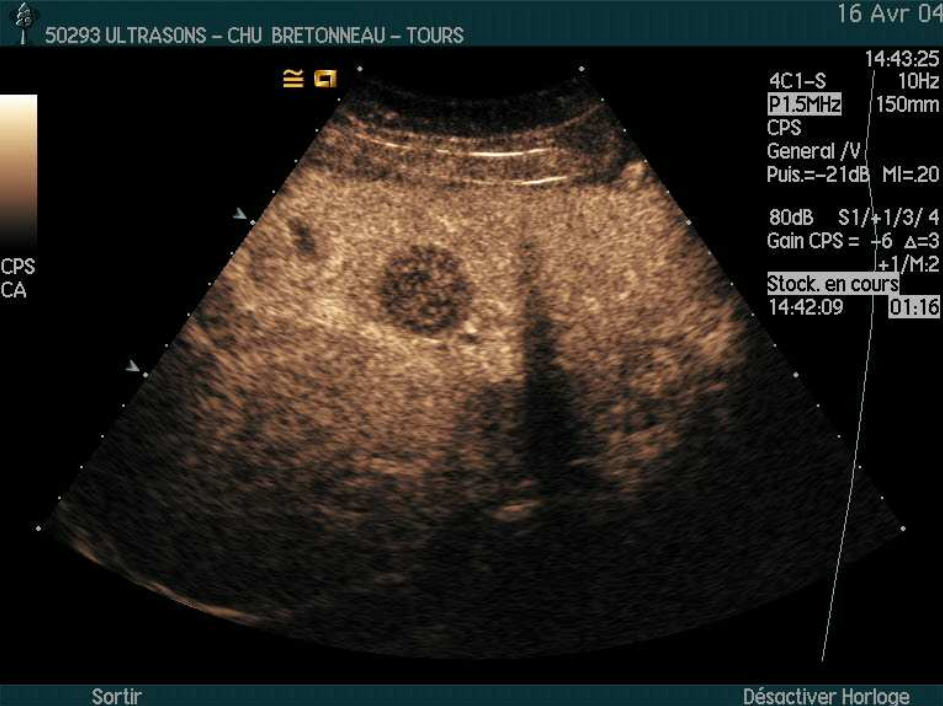
● Portal
phase



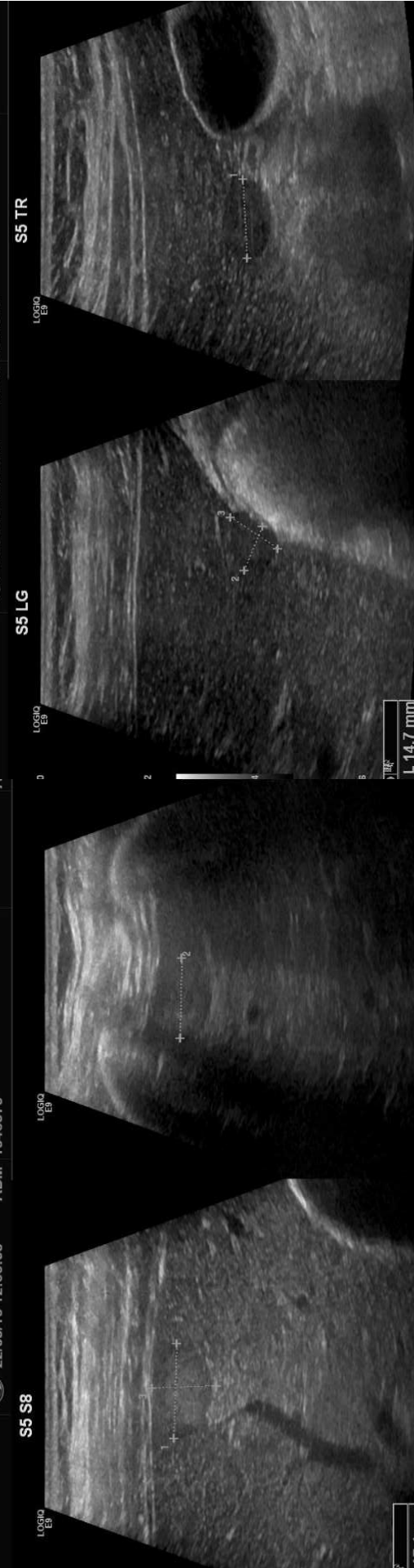
● Late
phase

Limited arterial enhancement
followed by contrast washout.
Contrast lacuna on late phase





Portal and late phases

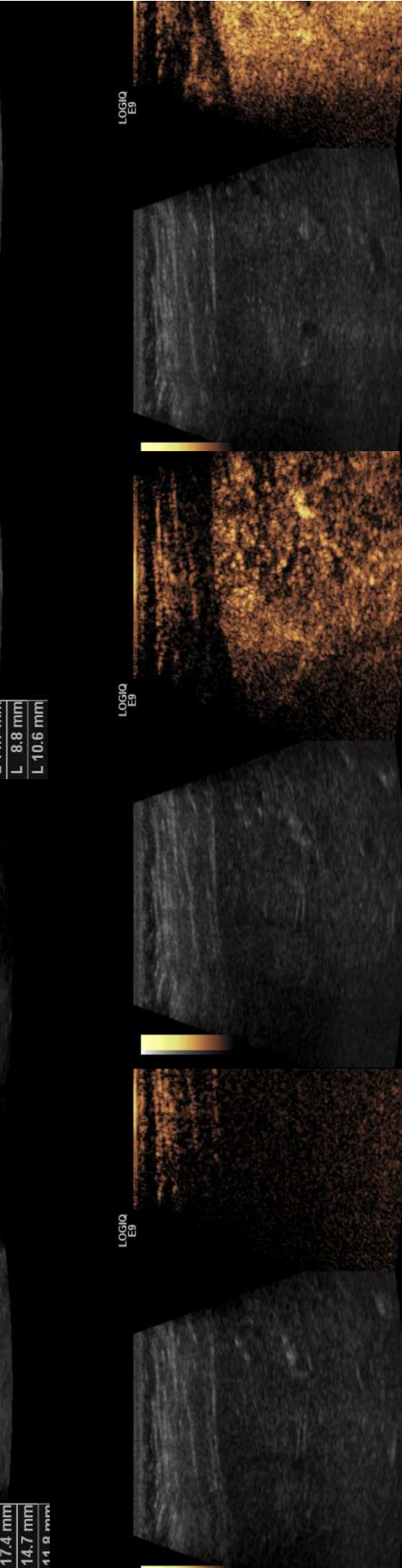


LOGIQ
E9

L	17.4 mm
L	14.7 mm
L	14.3 mm

LOGIQ
E9

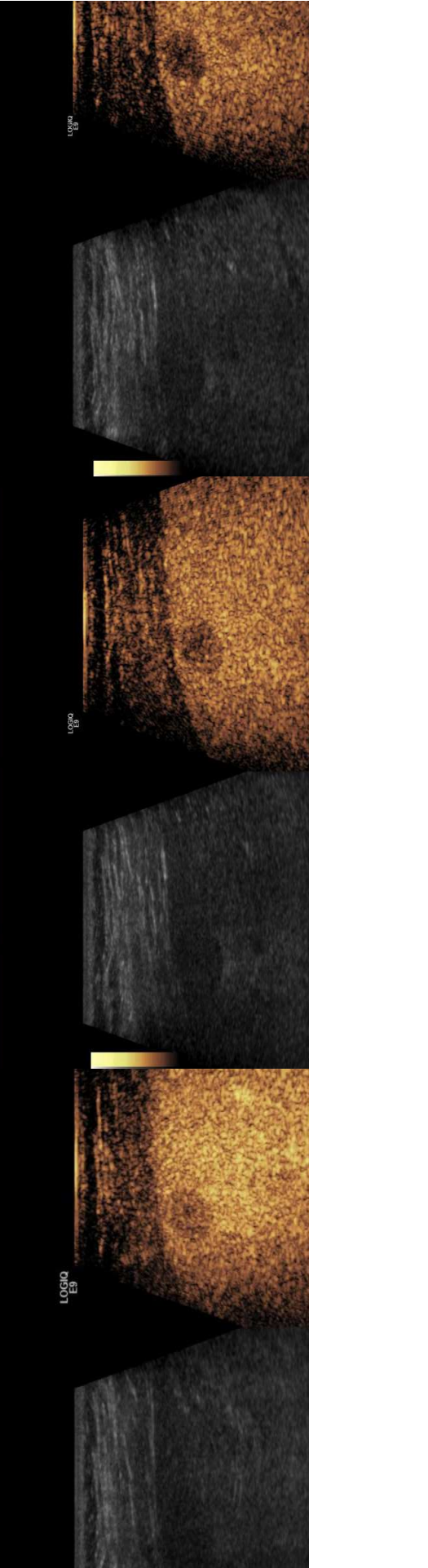
L	14.7 mm
L	8.8 mm
L	10.6 mm



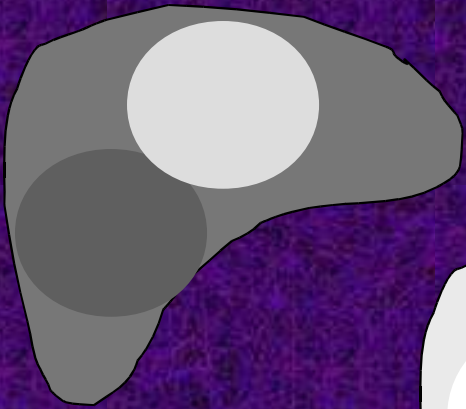
0:09

T1: 0:13

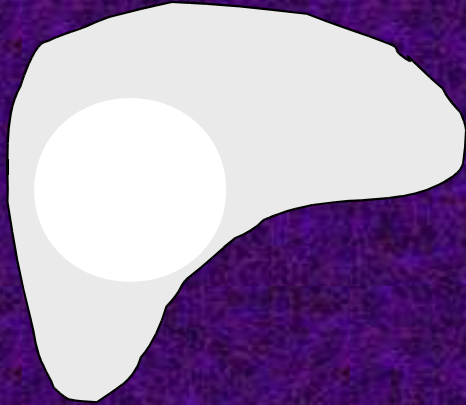
: 0:16



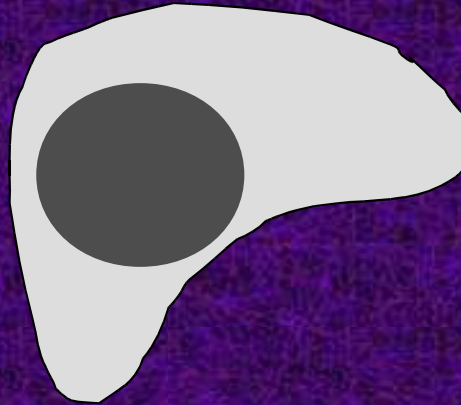
• Hypervascular metastasis



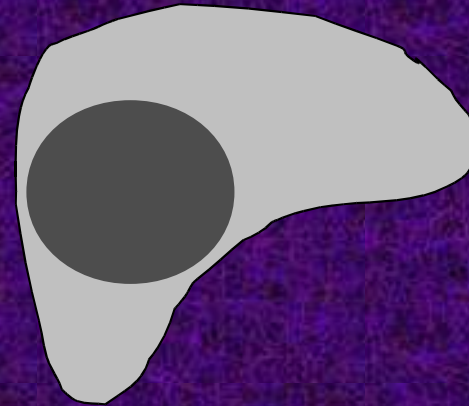
• Baseline



• Arterial
phase

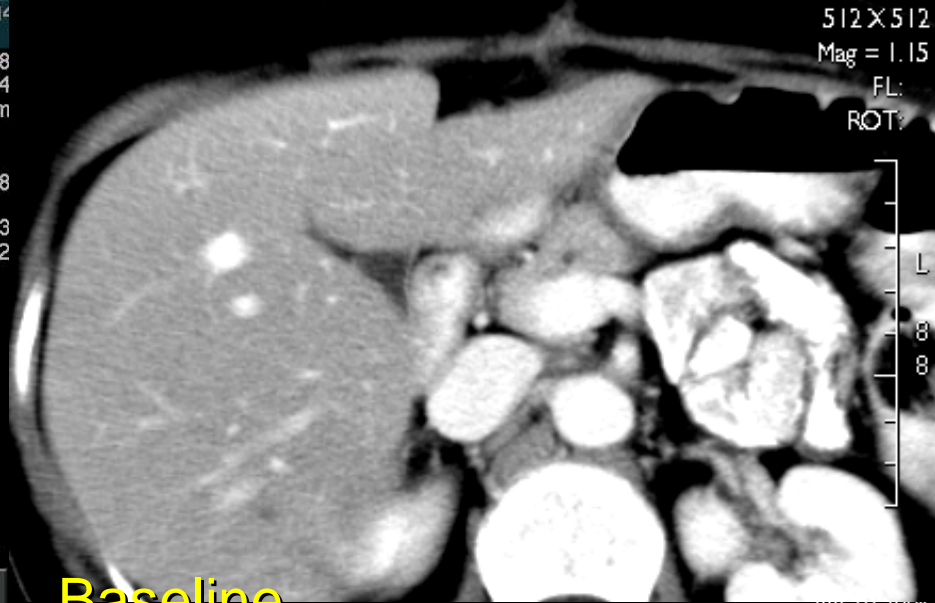


• Portal
phase

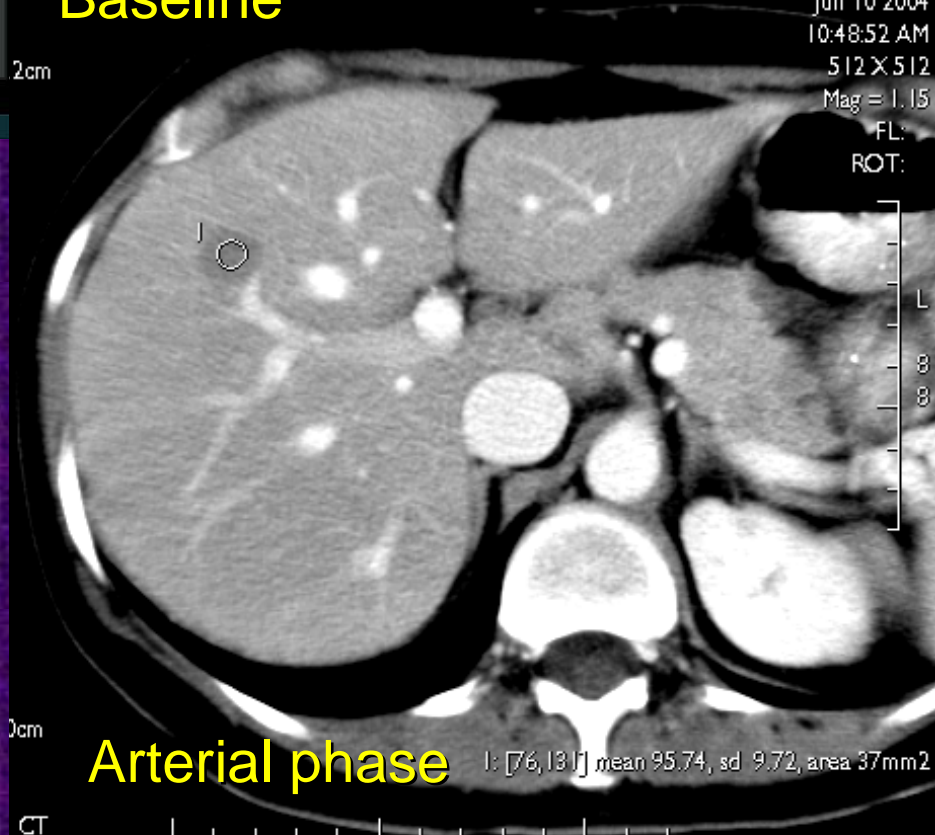


• Late
phase

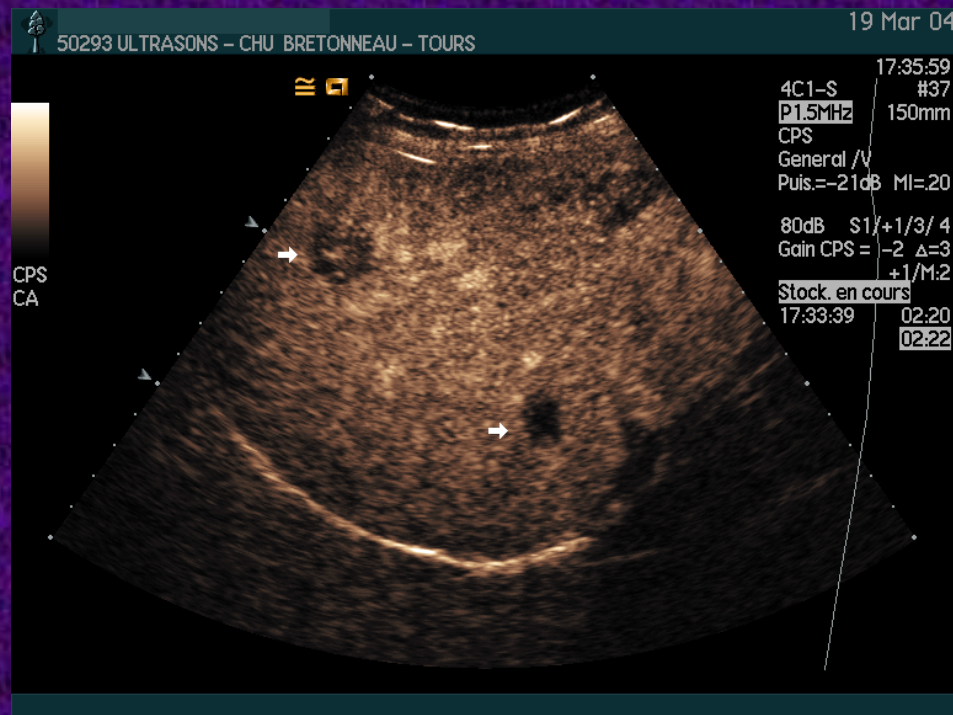
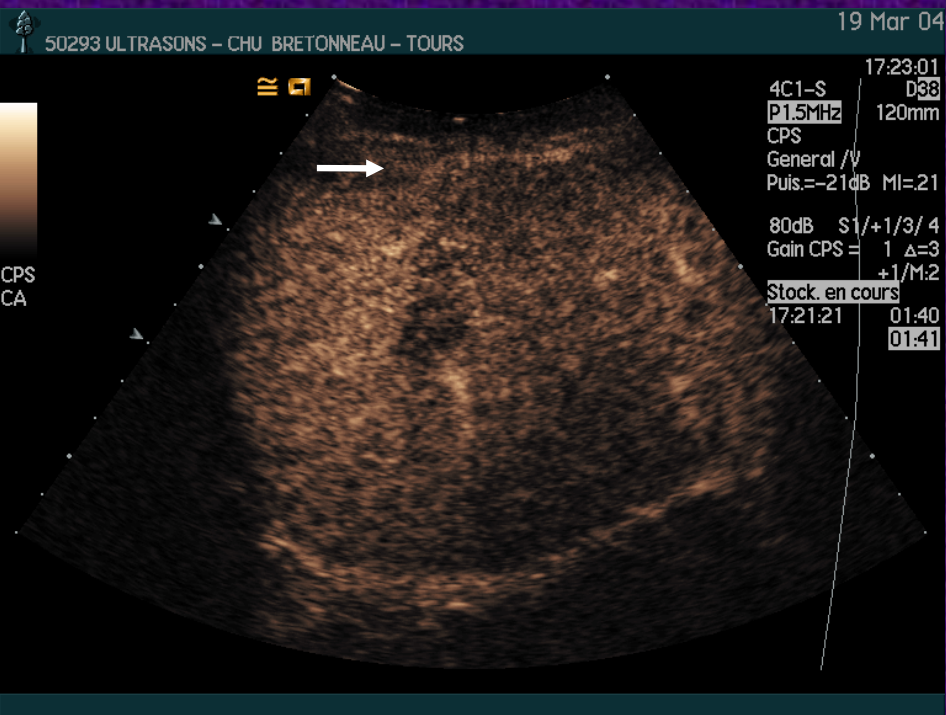
Strong arterial enhancement
followed by a prompt washout.
Contrast lacuna on late phase



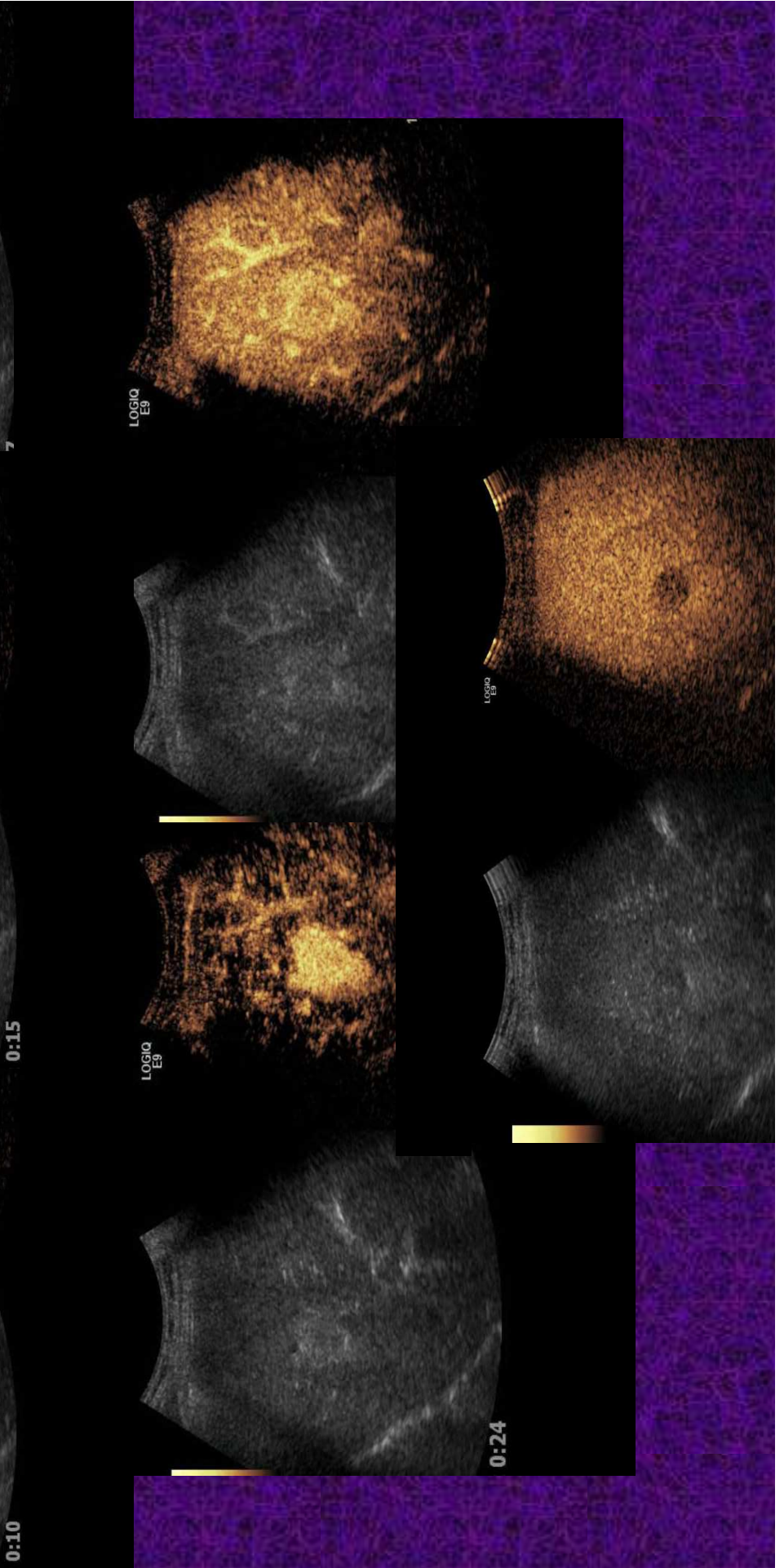
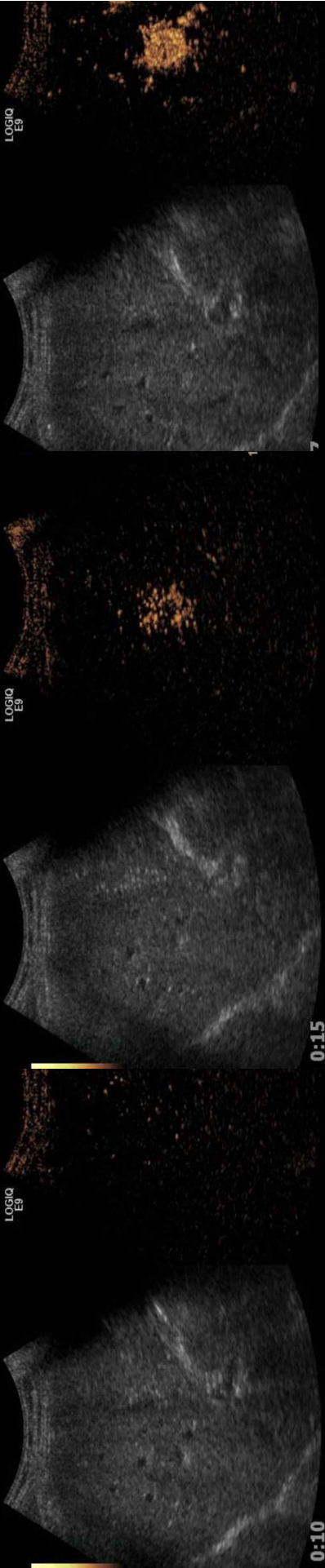
Baseline



Arterial phase



Portal and late phases



● Hepatic abscess

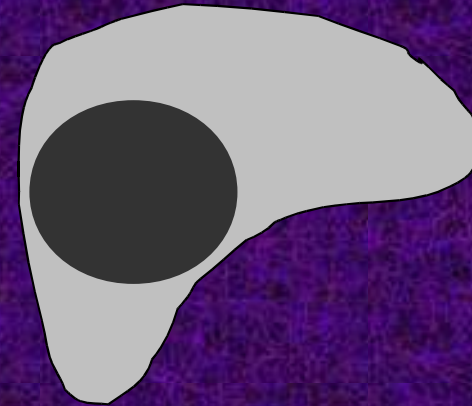
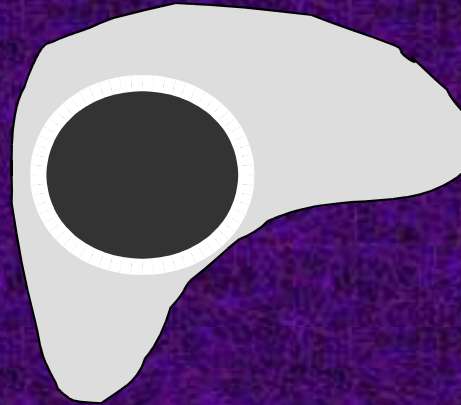
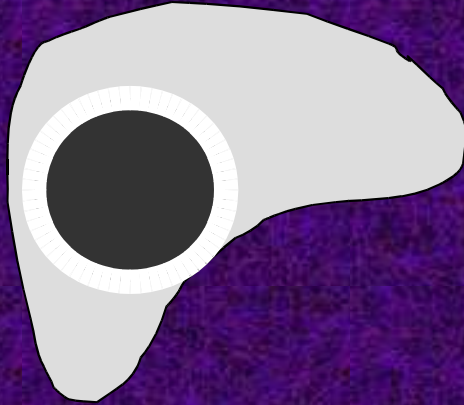
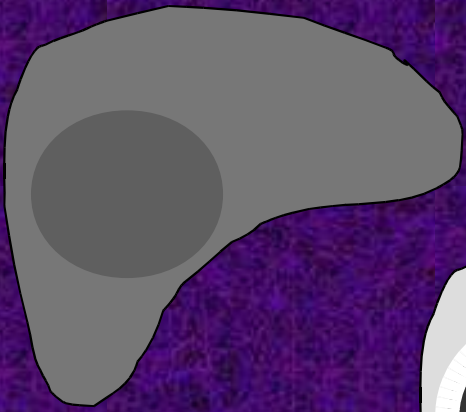
● Baseline

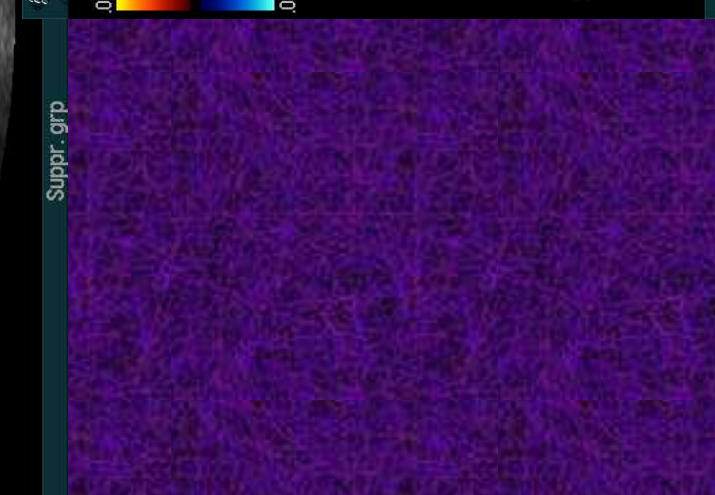
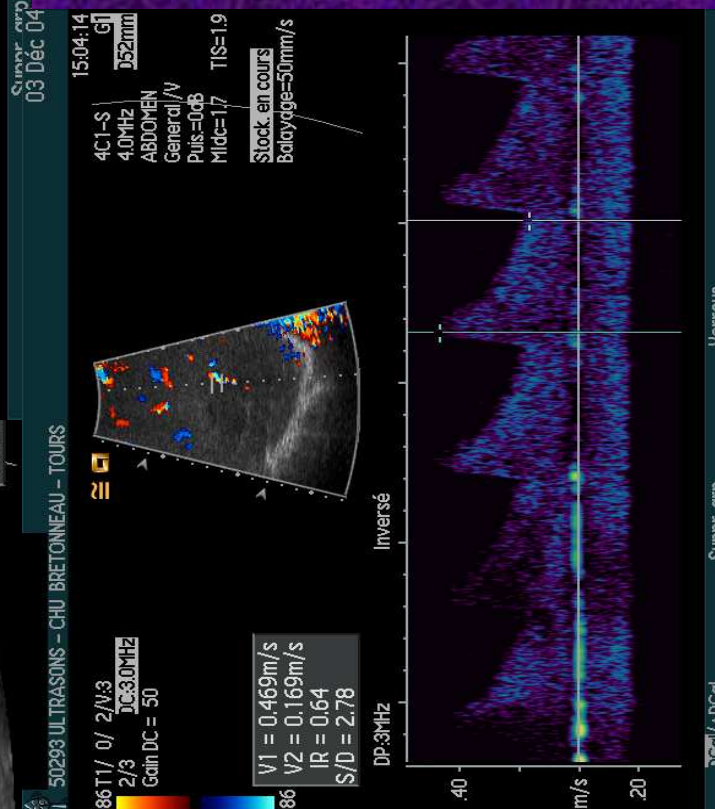
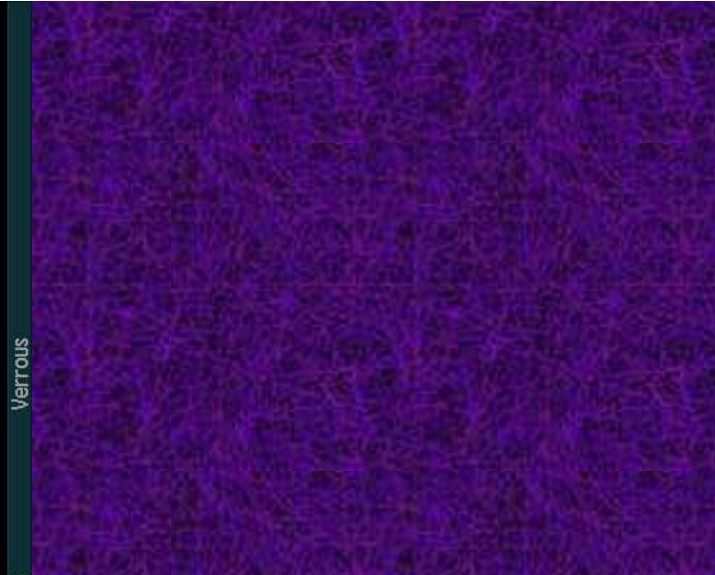
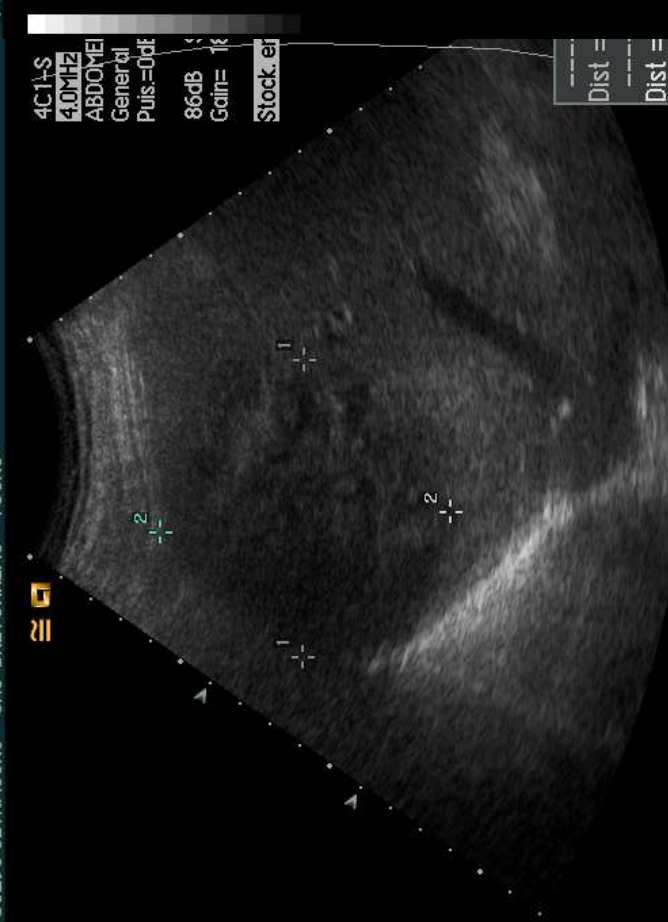
● Arterial
phase

● Portal
phase

● Late
phase

Absence of bubbles within
the lesion with enhanced rim
throughout all phases





Suppr. grp

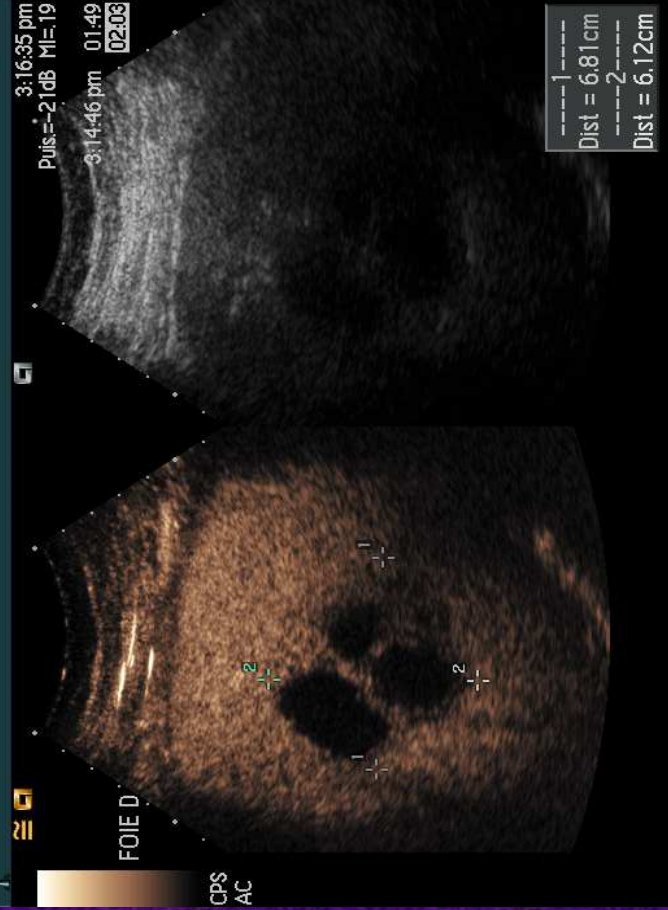
50293 ULTRASONS - CHU BRETONNEAU - TOURS

Suppr. grp

DCal/ΔDCal

Suppr. grp

Verrous



C. H. U. BRETONNEAU

A 163

TOSHIBA
Aquisition 000000000001
Ex 3873
Se: 4

M65Y/Aug 20 1939
ABDO-PELVIS

Dec 07 2004
02:41:32 PM
512 X 512
Mag = 1.00

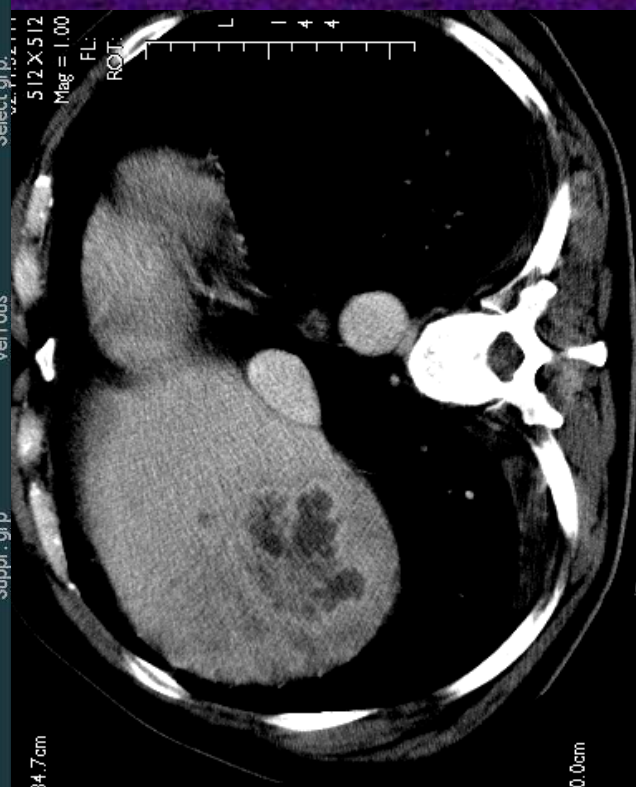
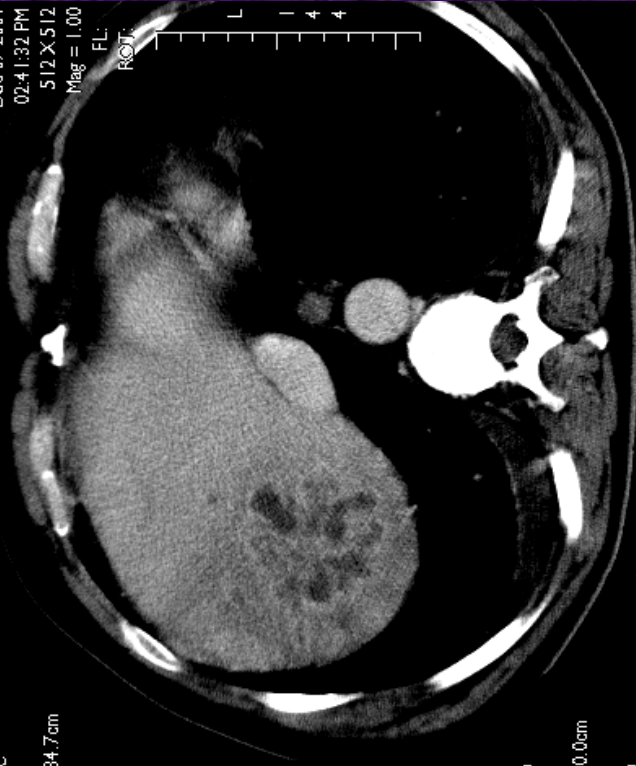
Im: 16+C
S425.5
DFOV 34.7cm
FC14

Sélect. grp.
512 X 512
Mag = 1.00

Verrrous

Suppr. grp

DFOV 34.7cm
FC14



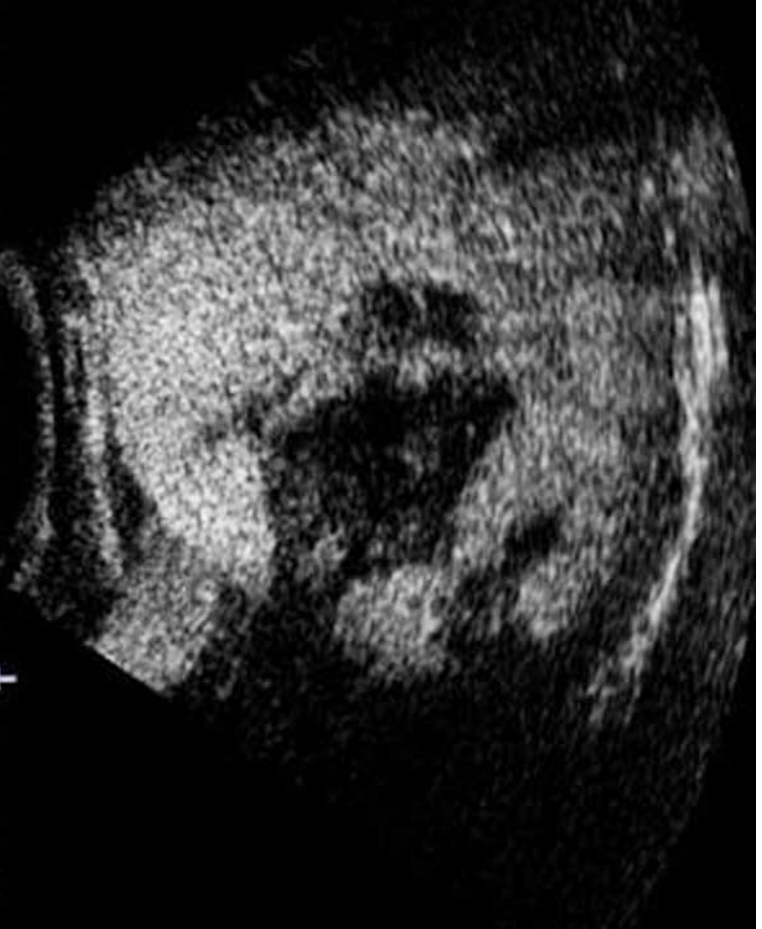
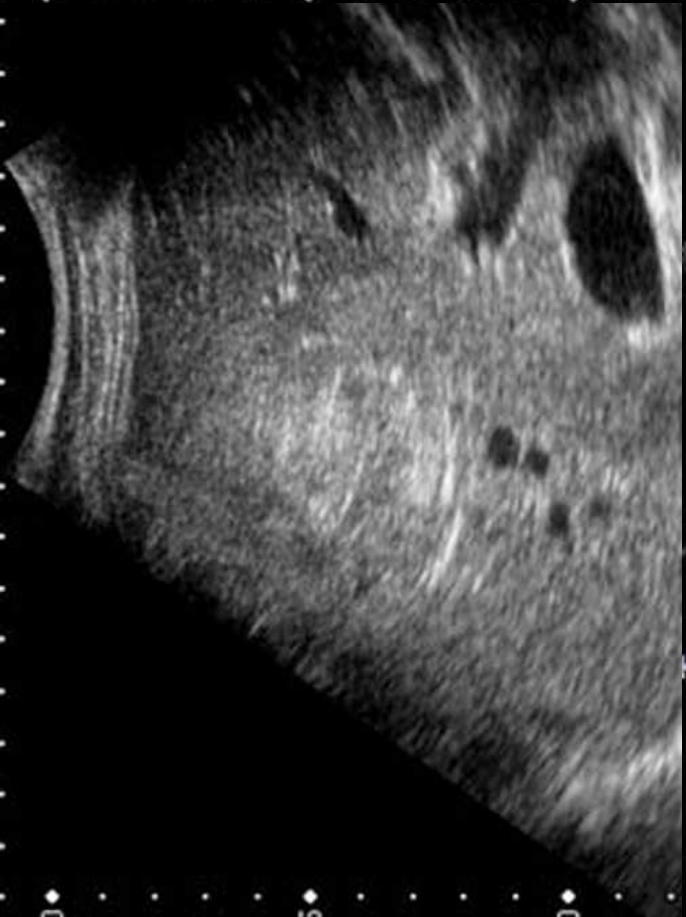
P 182

P 182

ECUS : stabilité de l'agent de contraste permettant une imagerie en temps réel // suivi des lésions aux différentes phases vasculaires

Limites = celles de l'échographie, concernent plus la détection que la caractérisation (foie stéatosique, sous-costal, lésions postérieures hautes et sous capsulaires inférieures à 10 mm)

Applications non hépatiques : les traumatismes



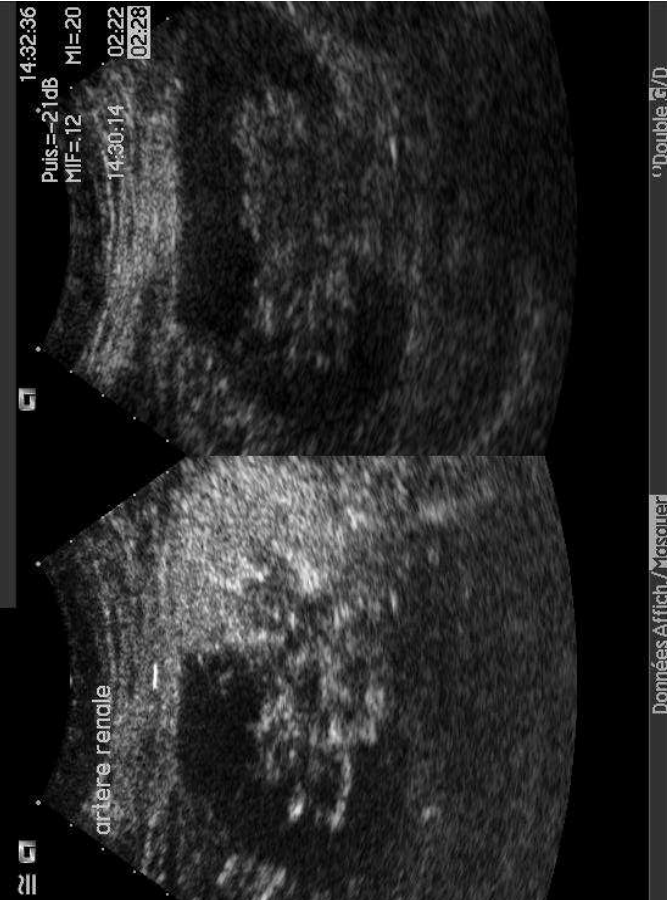
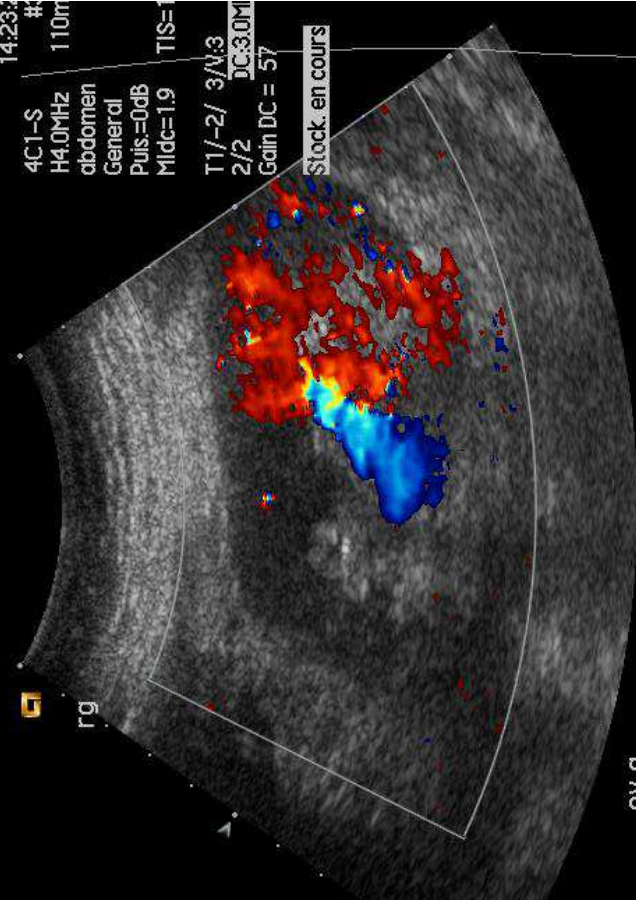
Applications non hépatiques: le rein

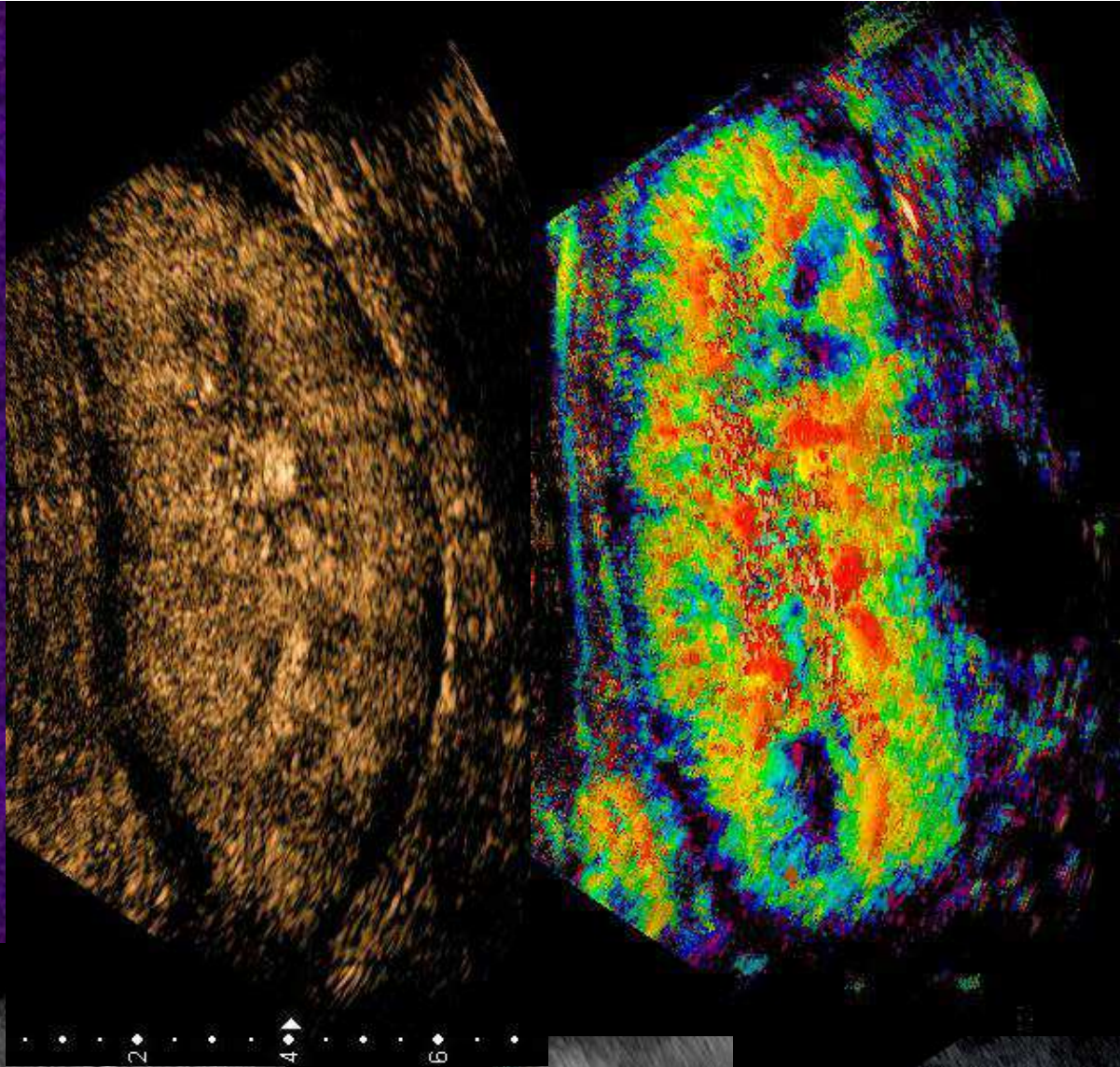
➤ Pré-requis :

- 25% du débit cardiaque (10% pour le foie)
- Vascularisation monophasique terminale, à 90% pour le cortex et à 10% pour la médullaire.
- Sémiologie de rehaussement normale :
 - Phase de rehaussement corticale puis
 - Phase de rehaussement cortico-médullaire
 - Phase d'élimination de l'agent de contraste (wash out phase)

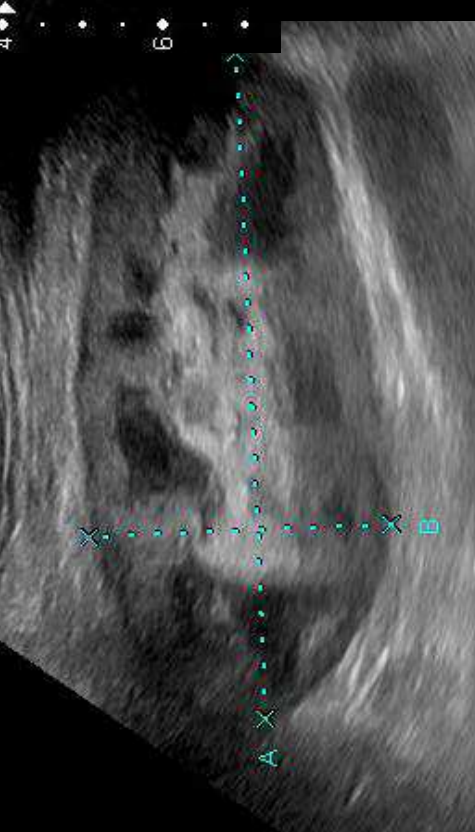
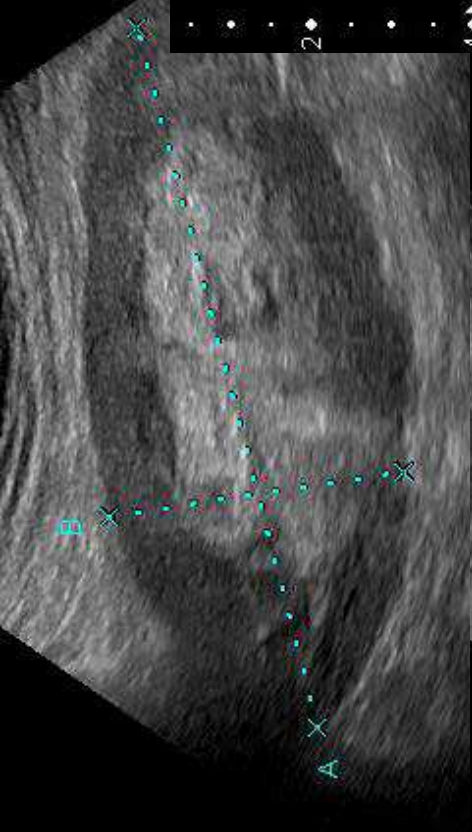
➤ Indications :

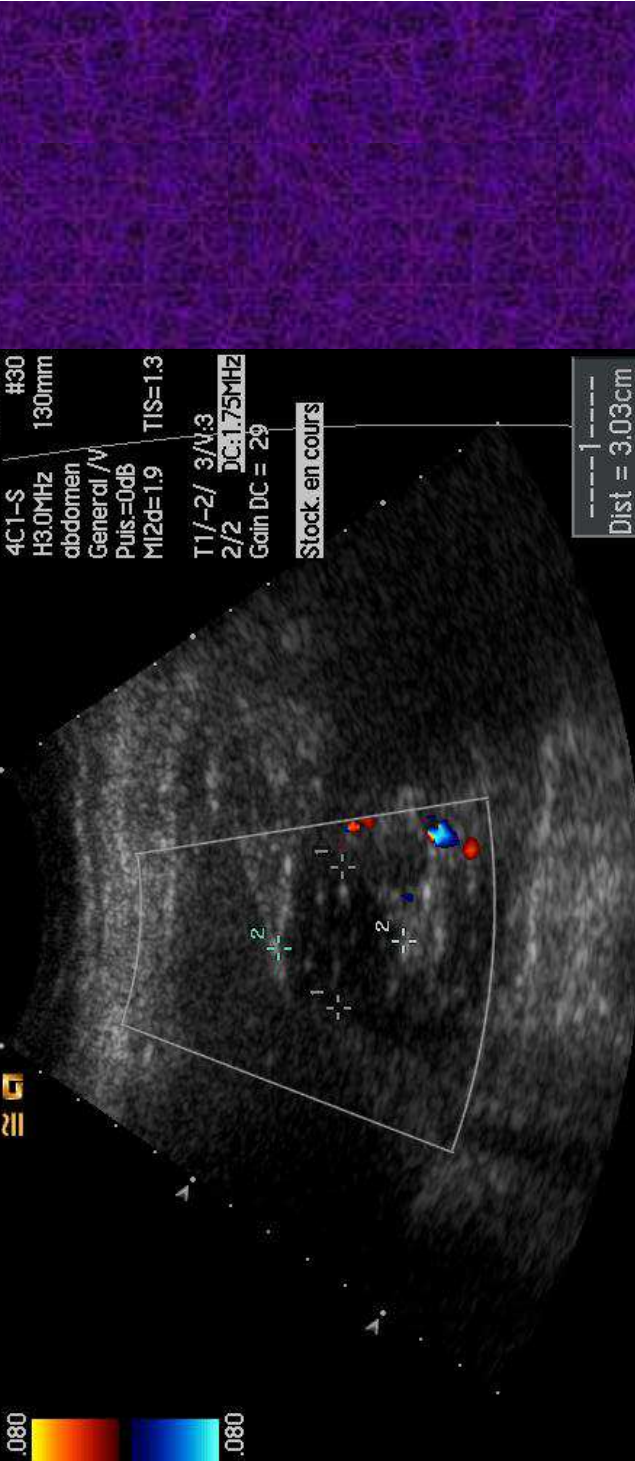
- ❖ Désordres vasculaires (sur rein natif ou sur rein transplanté): occlusion de l'artère rénale, infarctus, nécrose corticale...
- ❖ Diagnostic différentiel entre tumeurs solides et lésions kystiques avec un aspect équivoque en échographie ou en scanner,
- ❖ Caractérisation des masses kystiques complexes avant stratégie thérapeutique : approche de la classification de Bosniak.
- ❖ Diagnostic différentiel entre une tumeur rénale et une pseudo-tumeur (hypertrophie lobaire)
- ❖ Suivi après traitement par RF





2 4 6





26.10.2010
13.38.21

Abdomen

TOSHIBA
4A0040CAACTINIFAI1A1PFT 07 M

2 TOSHIBA

Abdomen

TOSHIBA
4A0040CAACTINIFAI1A1PFT 07 M

2 TOSHIBA



26.10.2010
14.02.26

ABDO CHI

4A0040CAACTINIFAI1A1PFT 07 M

2 TOSHIBA

Abdomen

TOSHIBA
4A0040CAACTINIFAI1A1PFT 07 M

2 TOSHIBA

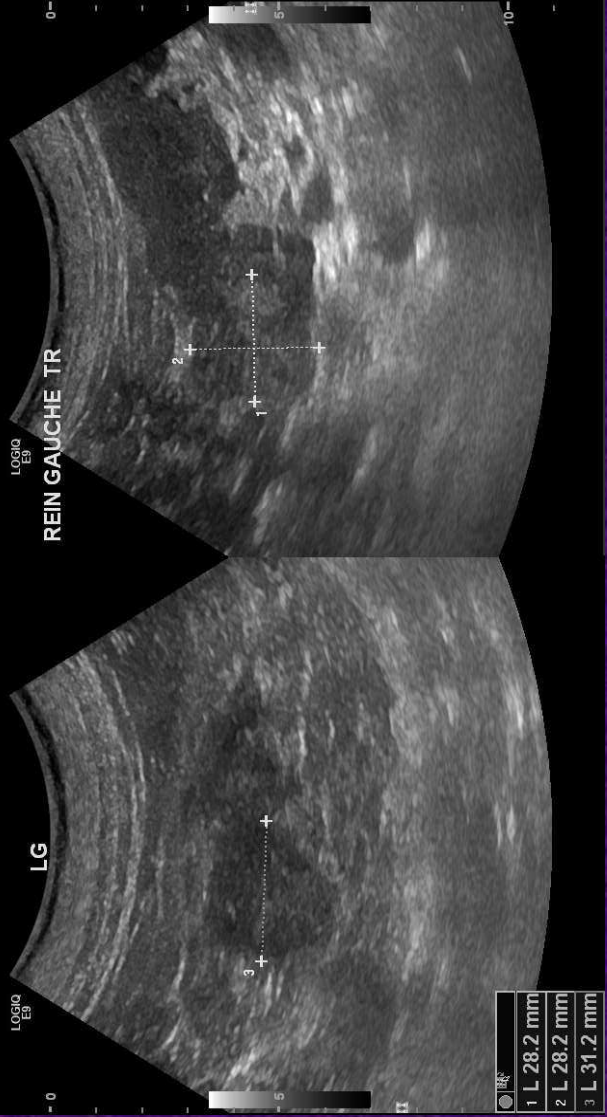


LOGIQ
E9

CHI	4.0
Frq	61
Gn	2/1
S/A	A0
- Carte	11.0
D	72
DR	100
- AO%	100

LG

REIN GAUCHE TR

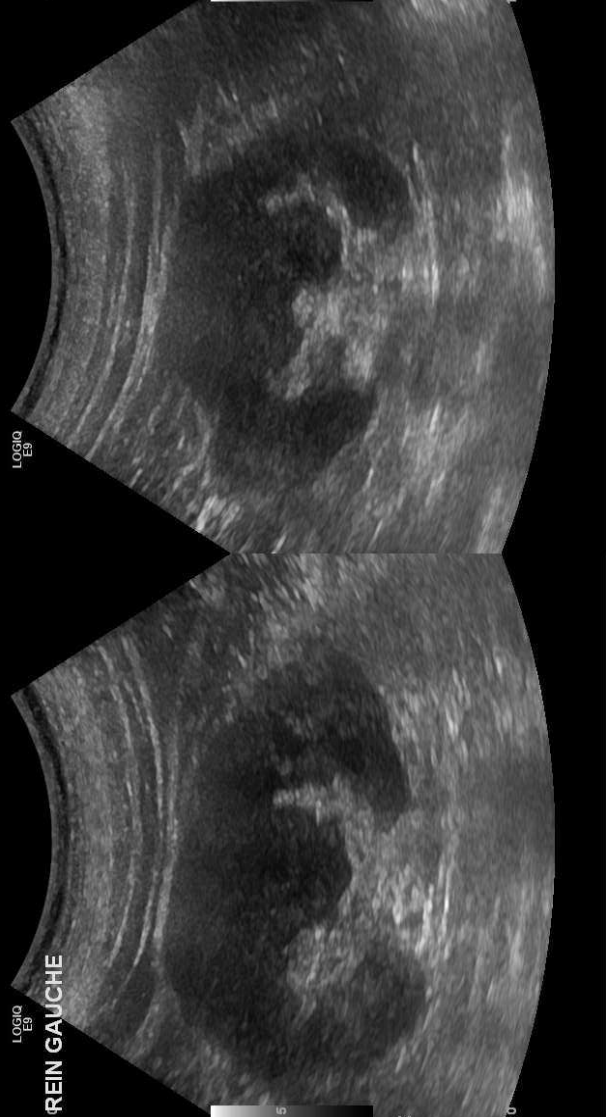


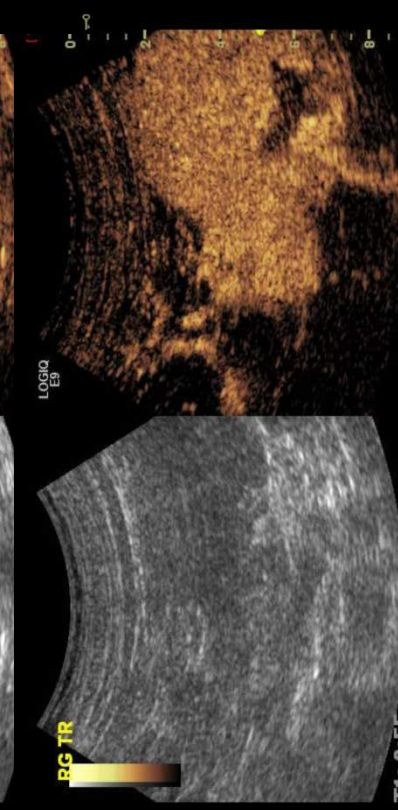
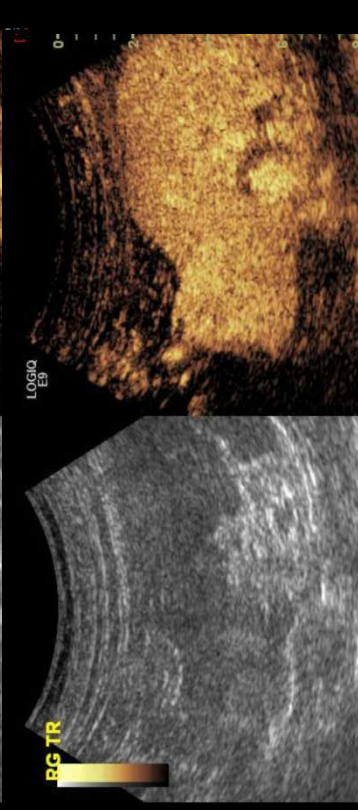
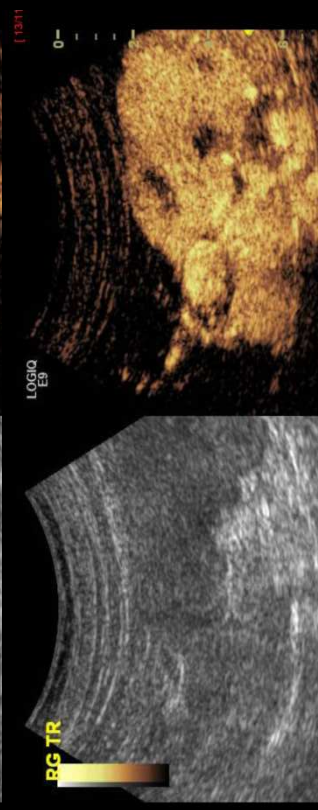
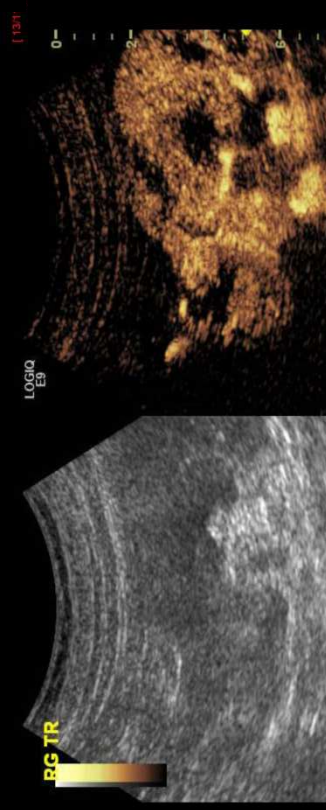
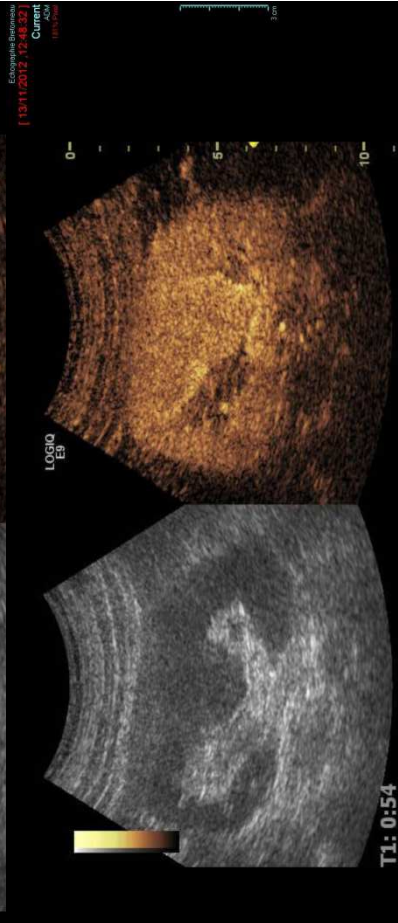
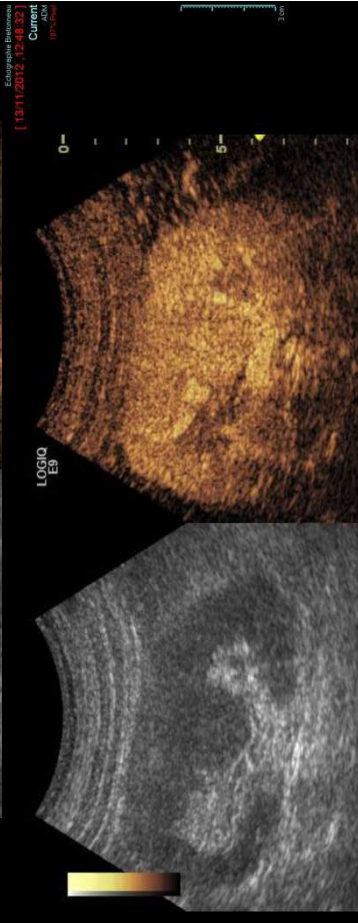
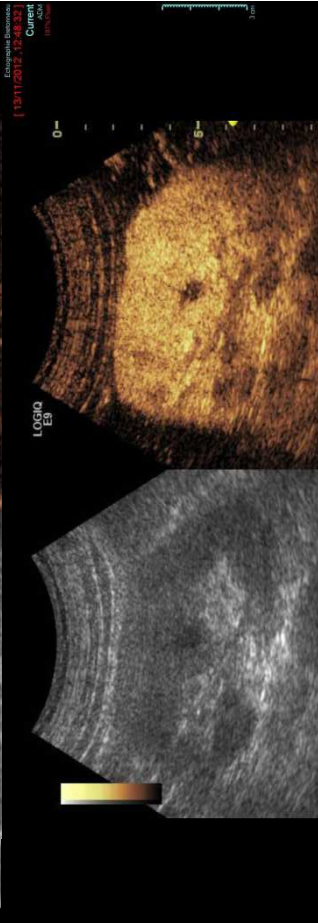
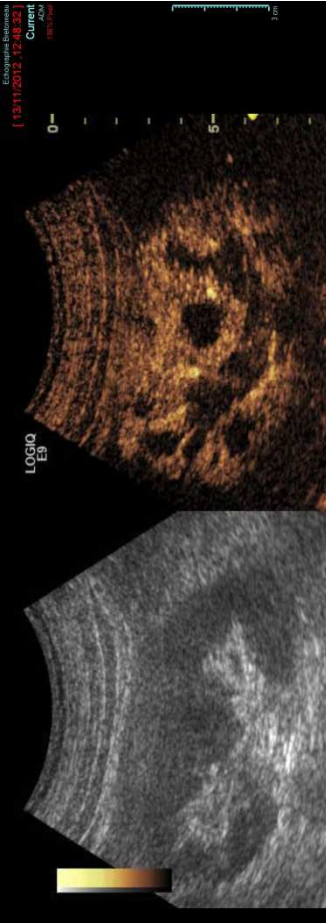
- 1 L 28.2 mm
- 2 L 28.2 mm
- 3 L 31.2 mm

LOGIQ
E9

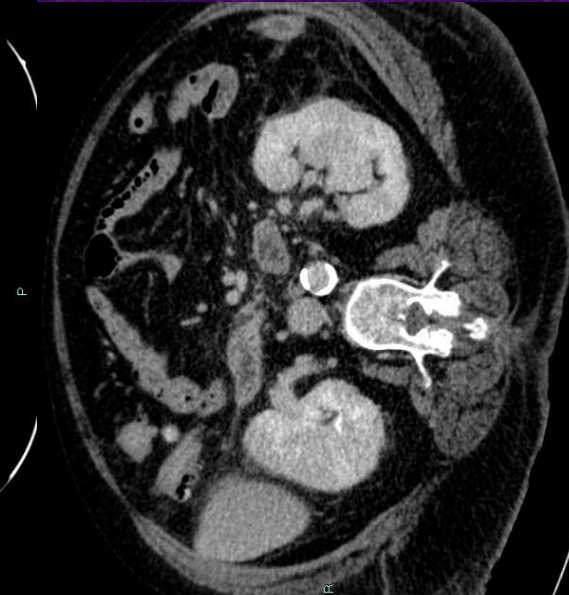
CHI	4.0
Frq	61
Gn	2/1
S/A	A0
- Carte	11.0
D	72
DR	100
- AO%	100

- REIN GAUCHE

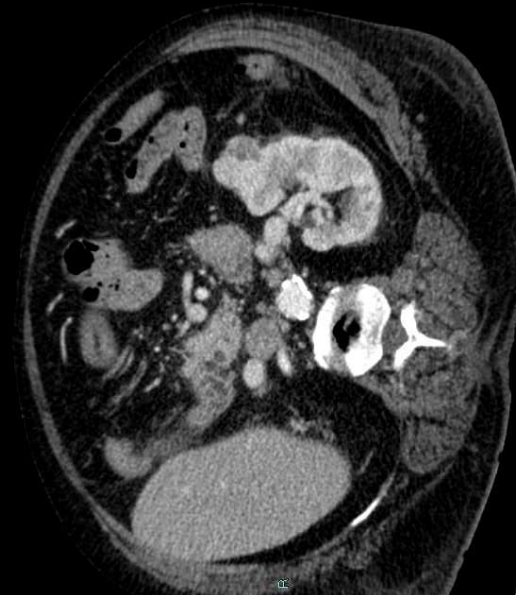




< 5 - 150 ABDO 3MIN >

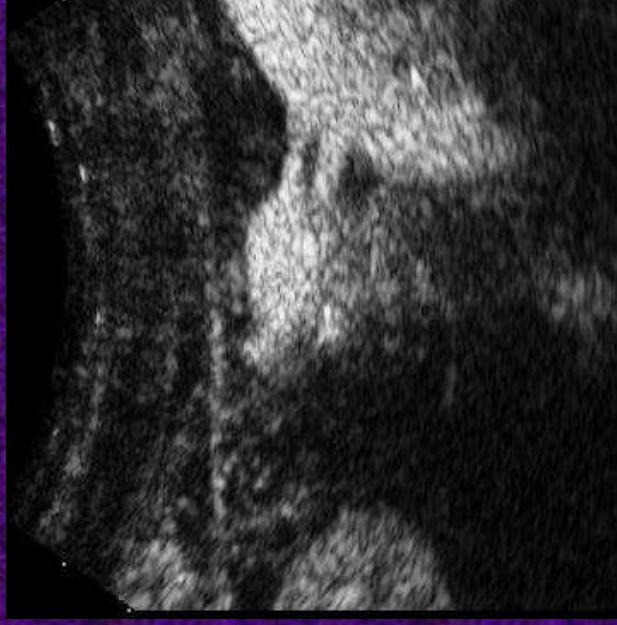
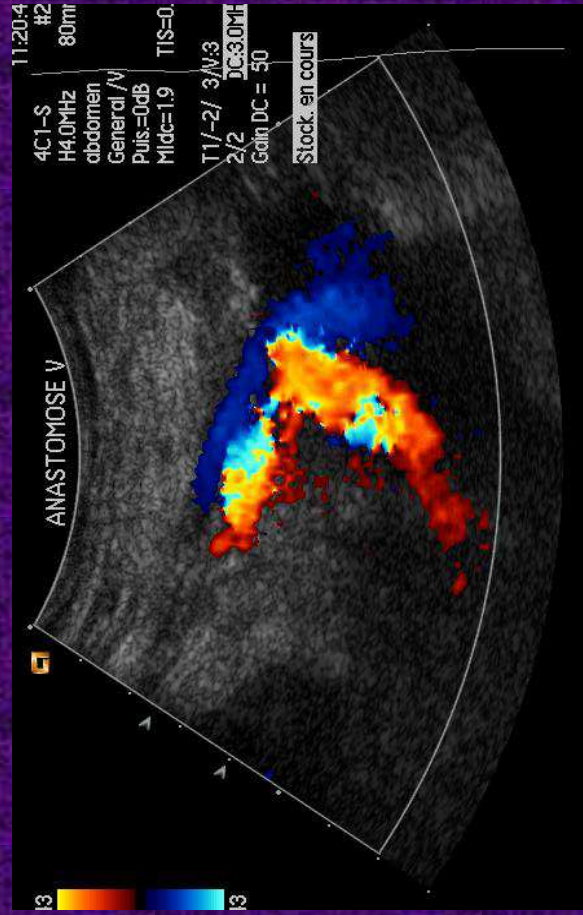
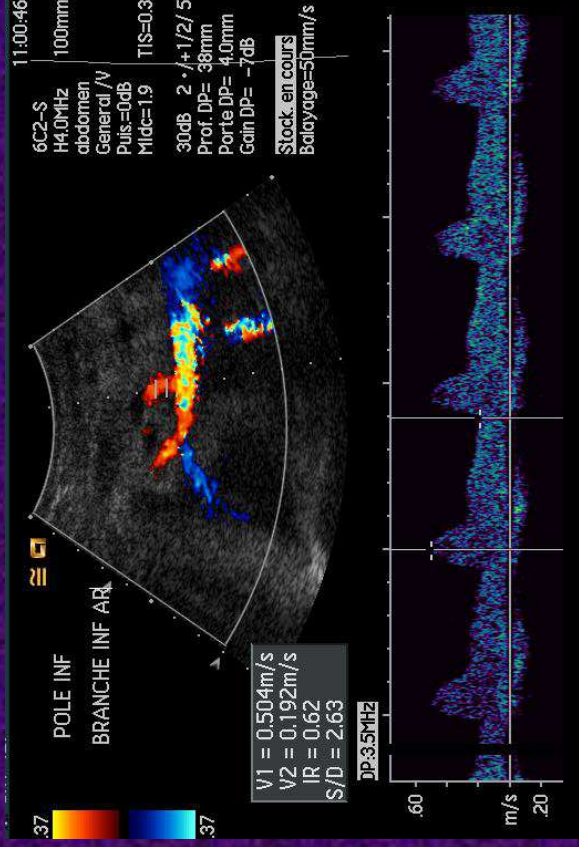
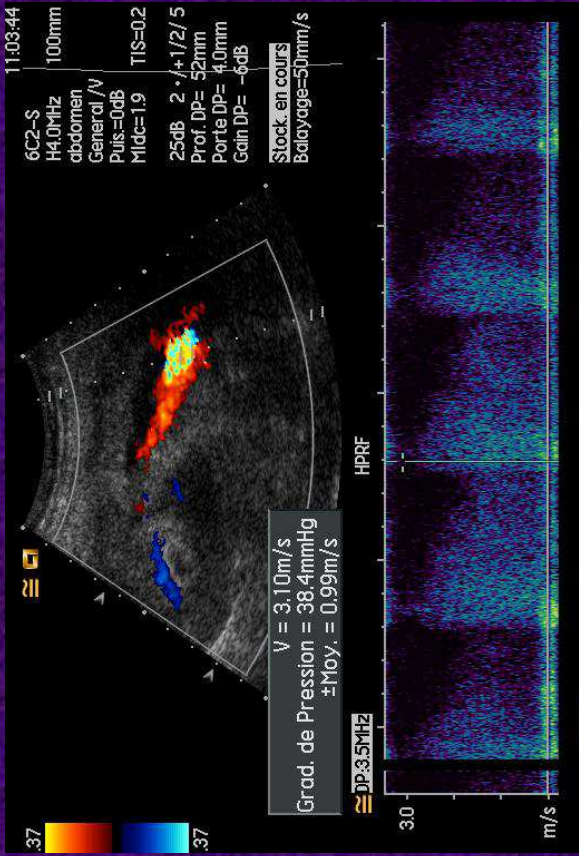


< 4 - 147 PORTAL >



< 3 - 147 ARTERIEL >







RENAL PATRICK
 RX VASC CHU TOURS F
 I: 164127
 M: 20.12.1966
 ADELHOMMALS
 M: 3/1
 I: 26/49
 FLTR: 15%

RENALES DROITE OAD
 I: 164127
 M: 20.12.1966
 ADELHOMMALS
 M: 3/1
 I: 26/49
 FLTR: 15%



RENAL PATRICK
 RX VASC CHU TOURS F
 I: 164127
 M: 20.12.1966
 ADELHOMMALS
 M: 3/1
 I: 26/49
 FLTR: 15%

CONTROLE DILAT
 I: 164127
 M: 20.12.1966
 ADELHOMMALS
 M: 3/1
 I: 26/49
 FLTR: 15%

LAO: 44 CRAN: 1



RENAL PATRICK
 RX VASC CHU TOURS F
 I: 164127
 M: 20.12.1966
 ADELHOMMALS
 M: 3/1
 I: 26/49
 FLTR: 15%

RENALES DROITE OAD
 I: 164127
 M: 20.12.1966
 ADELHOMMALS
 M: 3/1
 I: 26/49
 FLTR: 15%

GREFFON LG

4C1-S	15MHz	100mm	#34
abdomen			
cps /V			
Puls: -21dB			
MIF=21			MIF=21
80dB	S1/+1/2/4		
Gain CPS = -8	Δ=3		
Stock. en cours	+1/M:2		
11:31:18	02:06		02:24

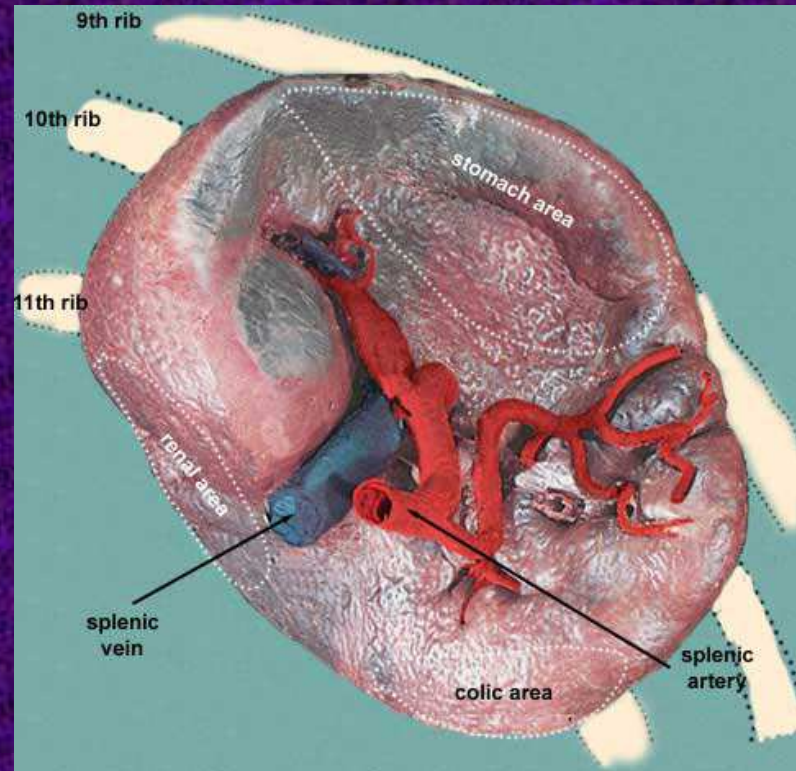
ref 6.2mm 30.2mm2
 min 1.9mm 2.8mm2
 %red 69.4% 90.7%

Dist = 0.17cm
 Dist = 0.71cm

Applications non hépatiques : la rate

➤ Particularités anatomiques et histologiques :

- Dépéritonéisée à son pôle sup et post,
- Lobulation foetale,
- Vascularisation terminale,
- Pulpe splénique :
 - Pulpe rouge périphérique, terminale avec sinus veineux,
 - Pulpe blanche centrale siège des amas lymphoïdes,



➤ Protocole d'examen

- Temps B IV(-) : balayage par voie intercostale dans 2 plans orthogonaux,
- Temps DC et/ou DE,
- Temps avec injection de 1.2 à 2.4 ml de Sonovue® suivi d'un rinçage par 5cc de sérum physiologique,
- Interprétation sur 3 phases d'exploration :
 - Artérielle de 5 à 25 s,
 - Portale de 45 à 90 s,
 - Sinusoïdale > 90s

➤ Particularités en échographie de contraste :

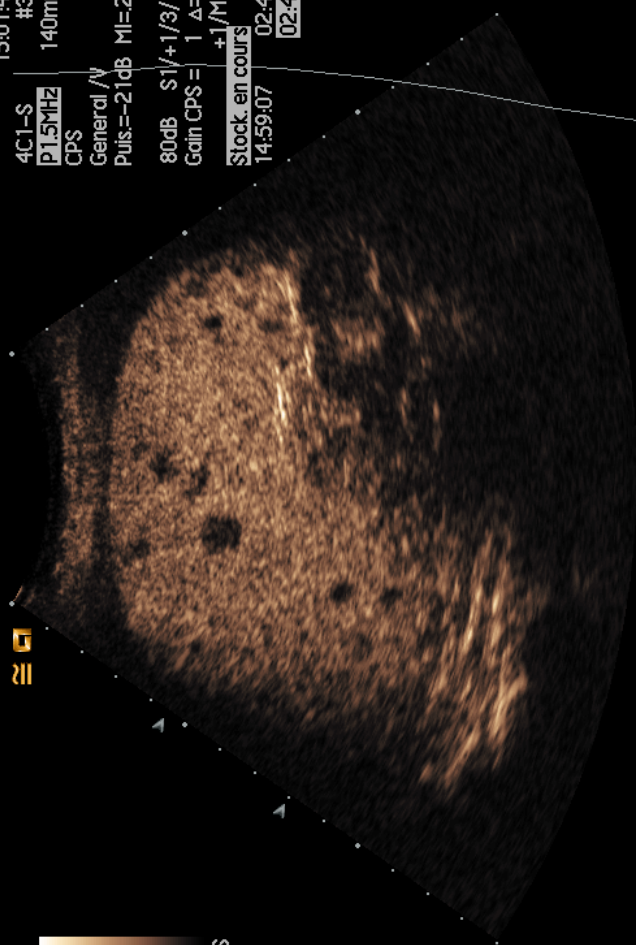
❖ *Rehaussement hétérogène précoce en « patchy » entre 0 et 20 s* dans 90% des cas (id TDM et IRM)

❖ Homogénéisation 60s après IV : temps de détection des lésions,

❖ *A 4min, captation spécifique de la rate* alors que décroissance du signal au niveau du foie (propriété du Sonovue® de mécanisme non connu),

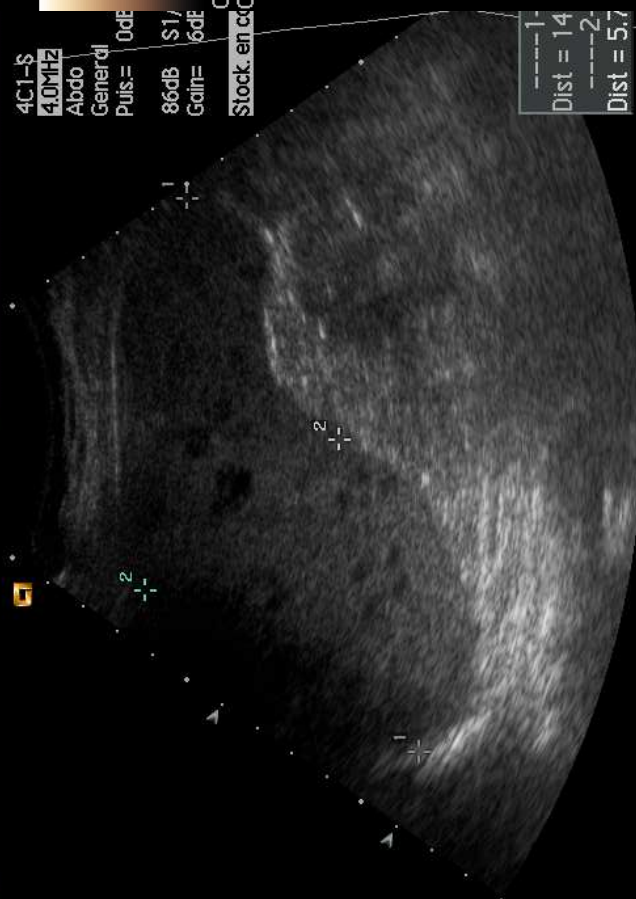
20 Jun 03

15:01:49
 #38
 140mm
4C1-S
1.5MHz
 CPS
 General /V
 Puis = -21dB MI=21
 80dB S1/+1/3/4
 Gain CPS = 1 Δ=3
 +1/M:2
Stock en cours
 14:59:07 02:41
 02:48



20

4C1-S
40MHz
 Abdo
 General/dl
 Puis = 0dB
 86dB S1/
 Gain = 6dB
CPS
Stock en cours



-----1-
 Dist = 14
 -----2-
 Dist = 5.7

Sélect grp:

Verrous

Suppr. grp

27 Mai 05

14:15:02

#37

120mm

4C1-\$
H3.0MHz
ABDOMEN
Generel / V

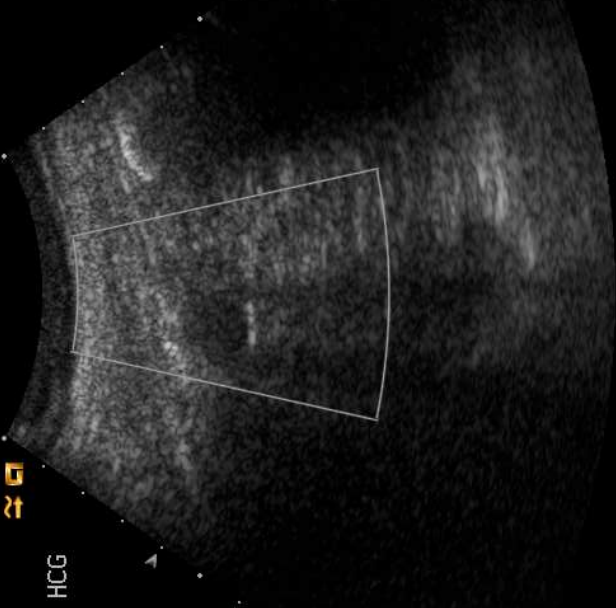
Puis.=0dB
Mlde=19
TIS=2.3

T1/ 0/ 2/W3

2/3 DC:3.0MHz

Gain DC = 50

Stock. en cours



.067



27 Mai 05

14:21:18

120mm

4C1-\$

P1.5MHz

CPS

General / V

Puis.=-21dB

Ml=21

80dB

S1/+1/3/4

Gain CPS = 5

Δ=3

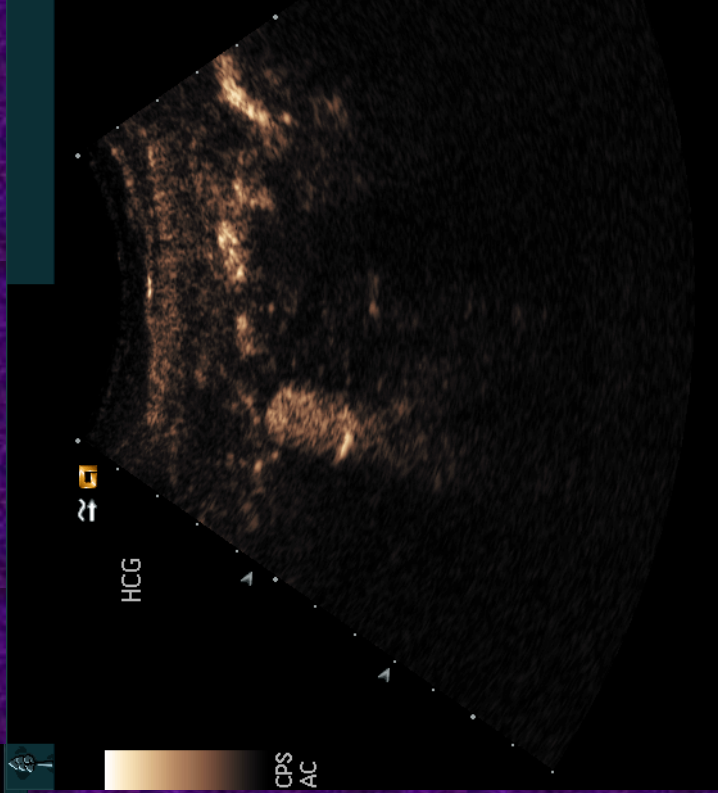
+1/M:2

Stock. en cours

14:19:17

02:01

02:07



↑

↔

HCG

CPS

AC

Autres applications recommandations de niveau A

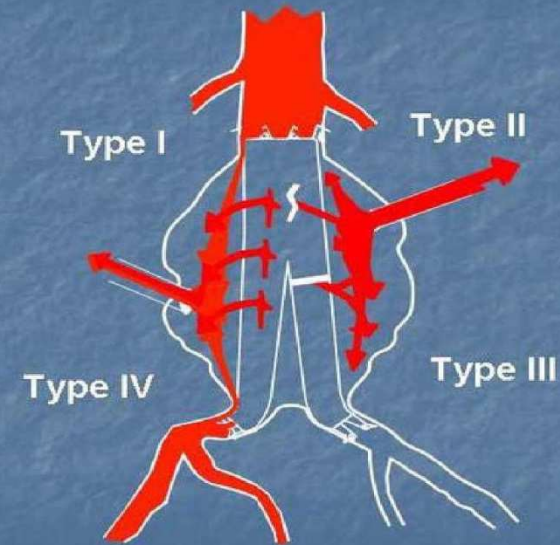
Pancréas par échoendoscopie,
Contrast Enhanced Endoscopic US,
Recherche de reflux vésico-urétéral,
Traumatisme abdominal,
Suivi et détection des endofuites sur endoprothèses aortiques,
Détection des vaisseaux intracrâniens,

Applications non hépatiques : Suivi des endoprothèses aortiques détection des endofuites



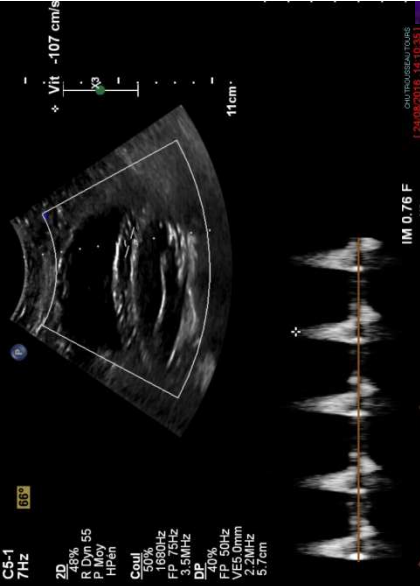
Type of Endoleak

- Type I**
Attachment Leak
- Type II**
Branch Flow
- Type III**
Defect in graft or
Modular disconnection
- Type IV**
Fabric porosity
- Type V**
Endotension



White et al., Endoleak Classification, Journal of Endovascular Surgery, 1998;5:305-309





C5-1
7Hz

2D 48%
R Dyn 55
P Moy
H Fen
Coul
50%
F 50Hz
3.5MHz
DP
40%
V ES 50Hz
V ES 2.2MHz
5.7cm



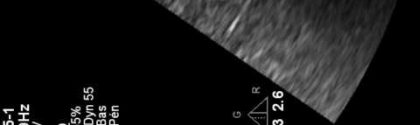
C5-1
14Hz

RS
Contraste IM Bas
53%
R Dyn 50
P Bas
Geric



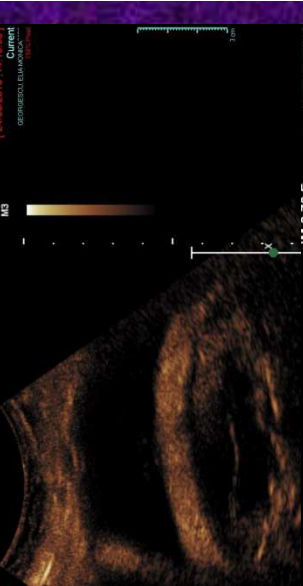
C5-1
14Hz

RS
Contraste IM Bas
53%
R Dyn 50
P Bas
Geric



C5-1
14Hz

RS
Contraste IM Bas
53%
R Dyn 50
P Bas
Geric



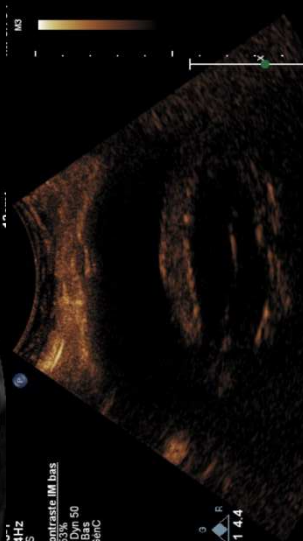
C5-1
14Hz

RS
Contraste IM Bas
53%
R Dyn 50
P Bas
Geric



C5-1
14Hz

RS
Contraste IM Bas
53%
R Dyn 50
P Bas
Geric



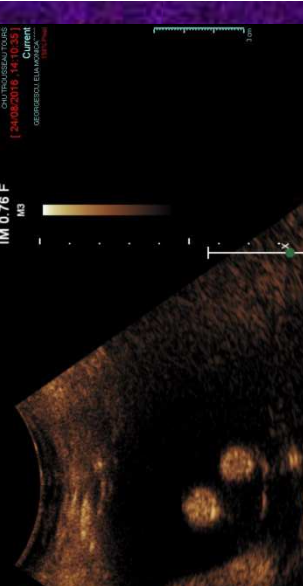
C5-1
14Hz

RS
Contraste IM Bas
53%
R Dyn 50
P Bas
Geric



C5-1
14Hz

RS
Contraste IM Bas
53%
R Dyn 50
P Bas
Geric



C5-1
14Hz

RS
Contraste IM Bas
53%
R Dyn 50
P Bas
Geric



C5-1
14Hz

RS
Contraste IM Bas
53%
R Dyn 50
P Bas
Geric



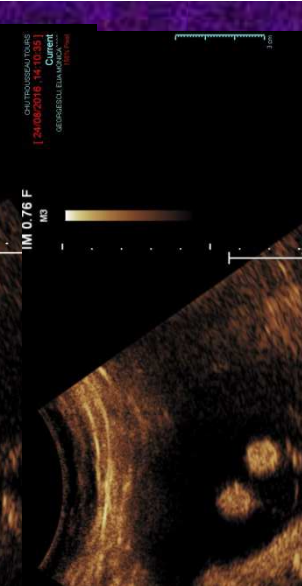
C5-1
14Hz

RS
Contraste IM Bas
53%
R Dyn 50
P Bas
Geric



C5-1
14Hz

RS
Contraste IM Bas
53%
R Dyn 50
P Bas
Geric



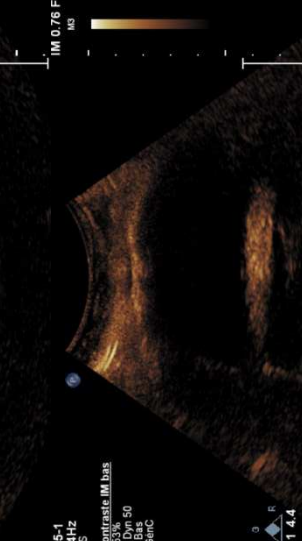
C5-1
14Hz

RS
Contraste IM Bas
53%
R Dyn 50
P Bas
Geric



C5-1
14Hz

RS
Contraste IM Bas
53%
R Dyn 50
P Bas
Geric



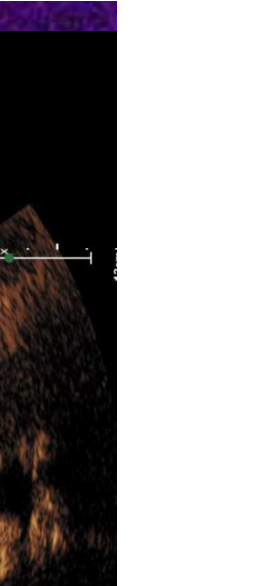
C5-1
14Hz

RS
Contraste IM Bas
53%
R Dyn 50
P Bas
Geric



C5-1
14Hz

RS
Contraste IM Bas
53%
R Dyn 50
P Bas
Geric



C5-1
14Hz

RS
Contraste IM Bas
53%
R Dyn 50
P Bas
Geric



C5-1
14Hz

RS
Contraste IM Bas
53%
R Dyn 50
P Bas
Geric



C5-1
14Hz

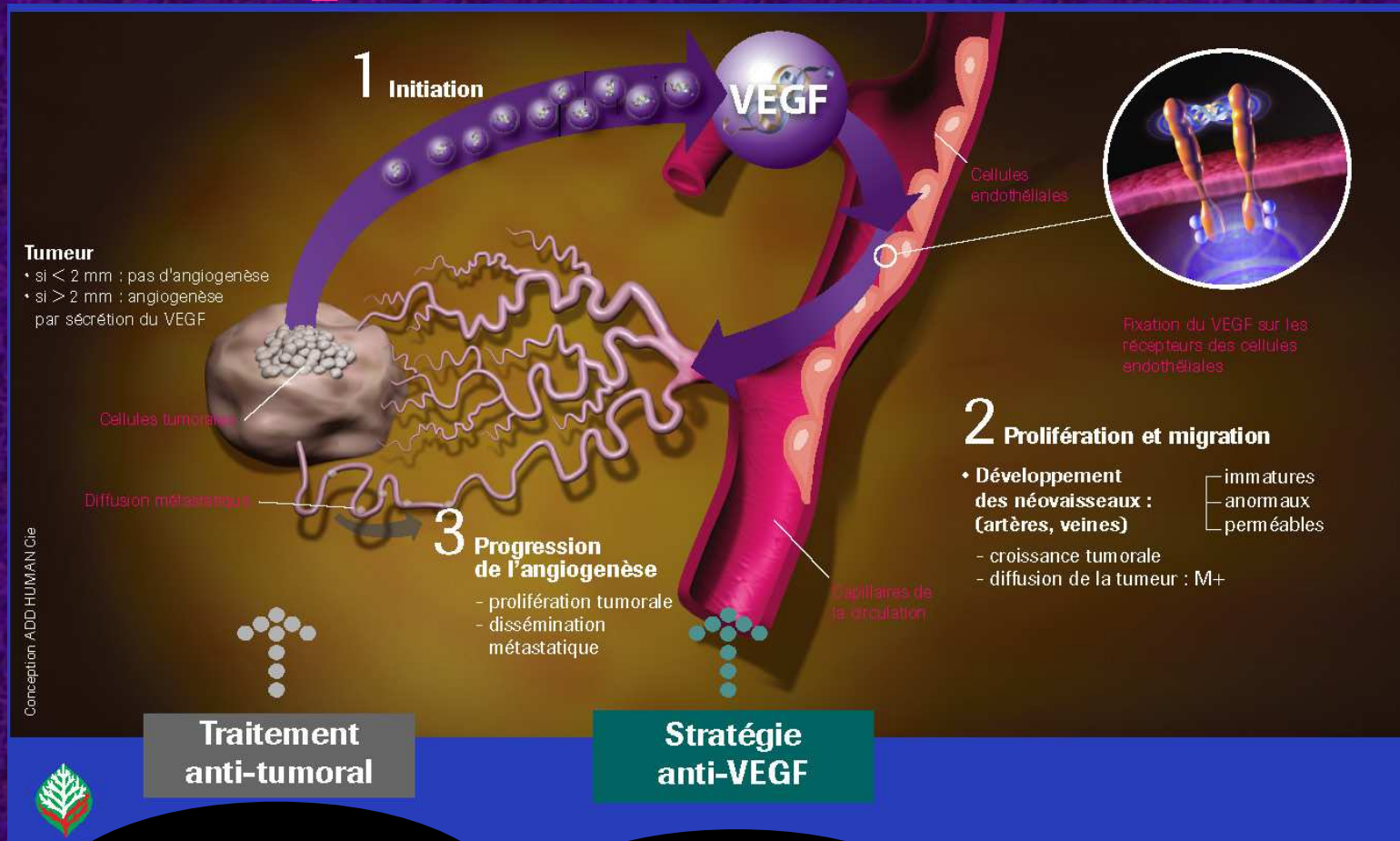
RS
Contraste IM Bas
53%
R Dyn 50
P Bas
Geric



C5-1
14Hz

RS
Contraste IM Bas
53%
R Dyn 50
P Bas
Geric

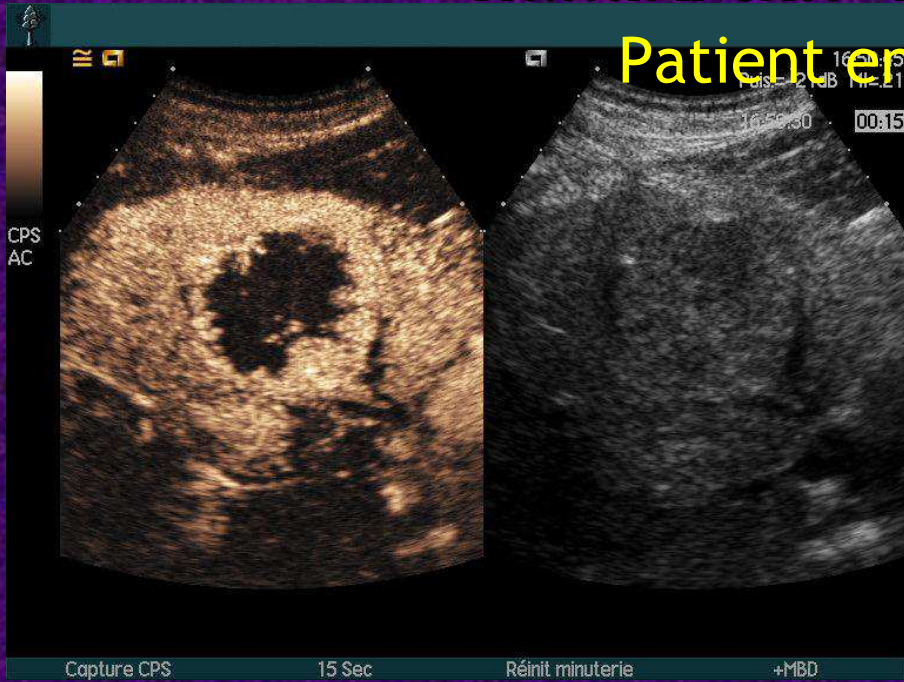
ECUS et quantification de la perfusion tumorale



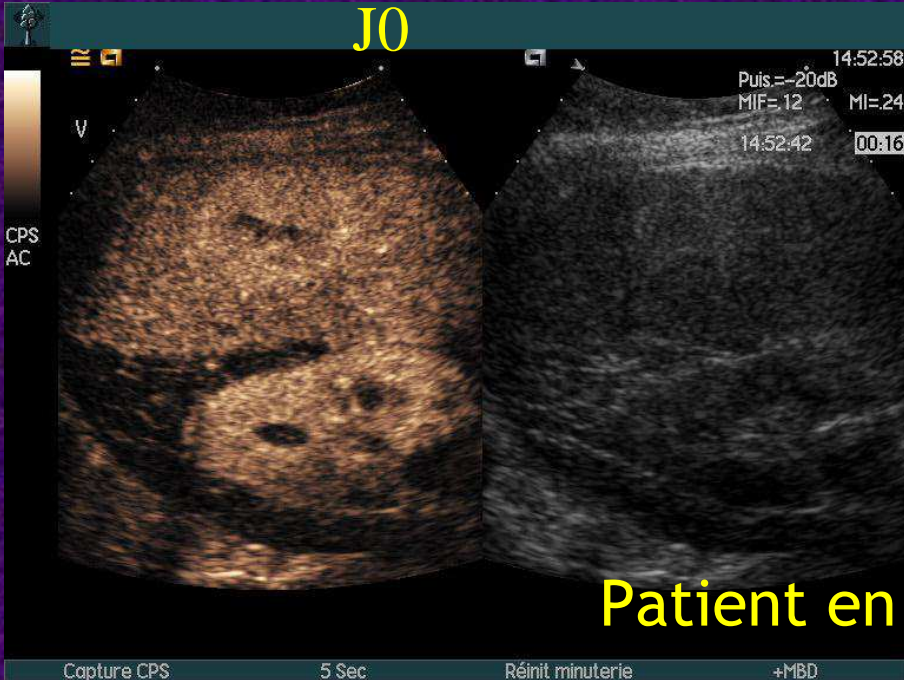
Traitements
antitumoraux

Avastin®

Patient en progression



J0

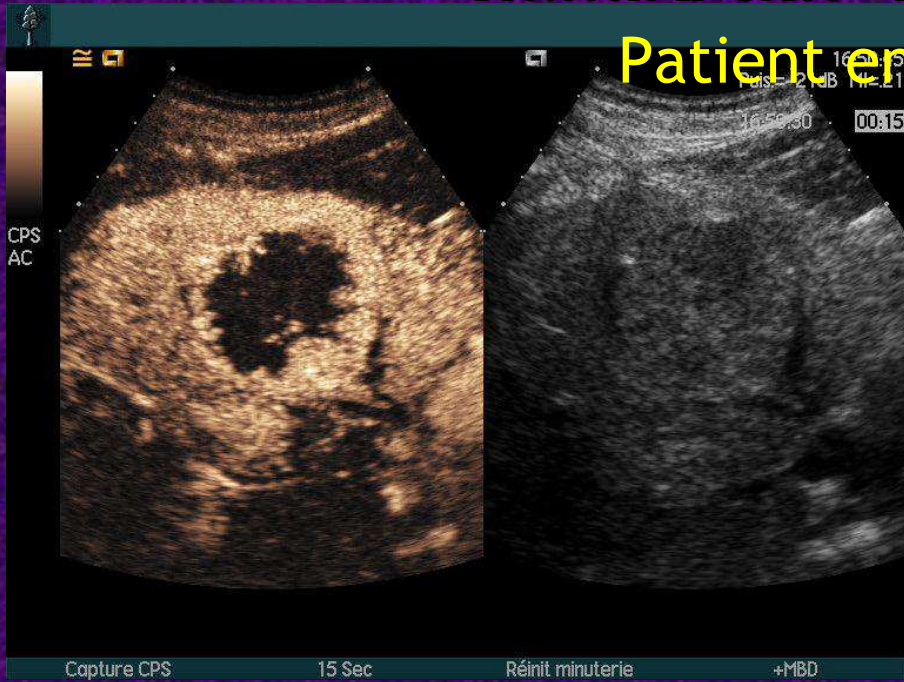


J15

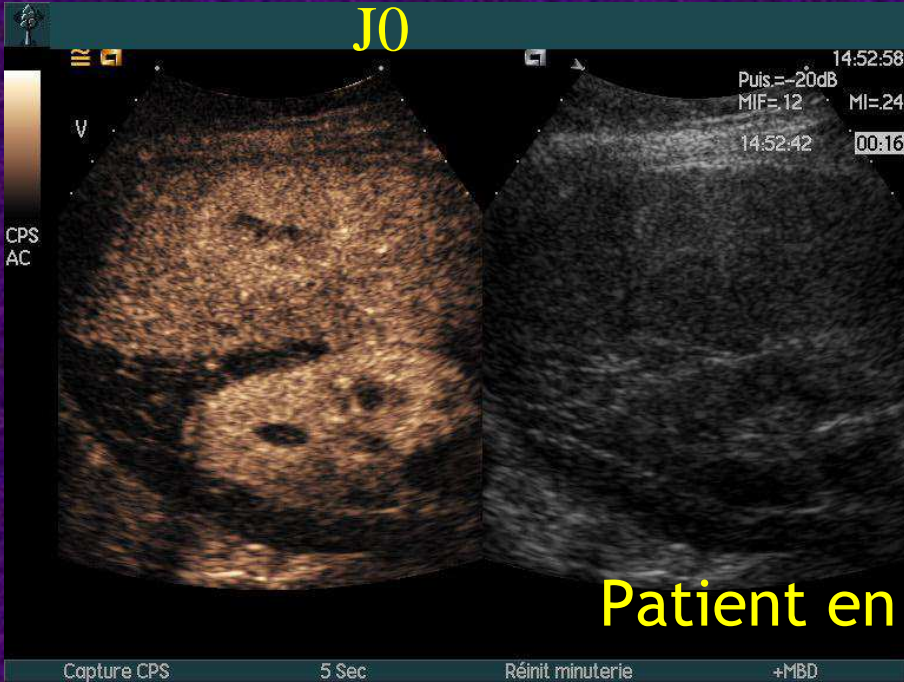


Patient en réponse partielle

Patient en progression



J0



J15



Patient en réponse partielle



Parametric 1

Param.

Gain 3 dB

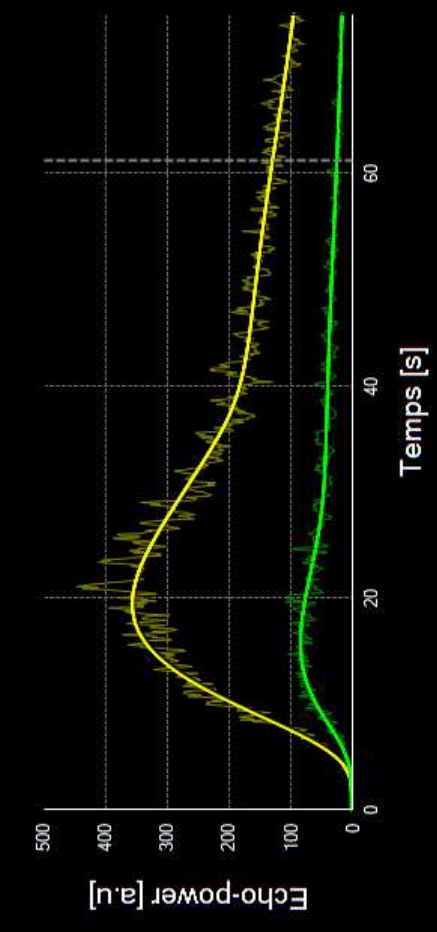
G. Dyn. 20 dB



Capture CPS 5 Sec Réinit. minuterie +HBD

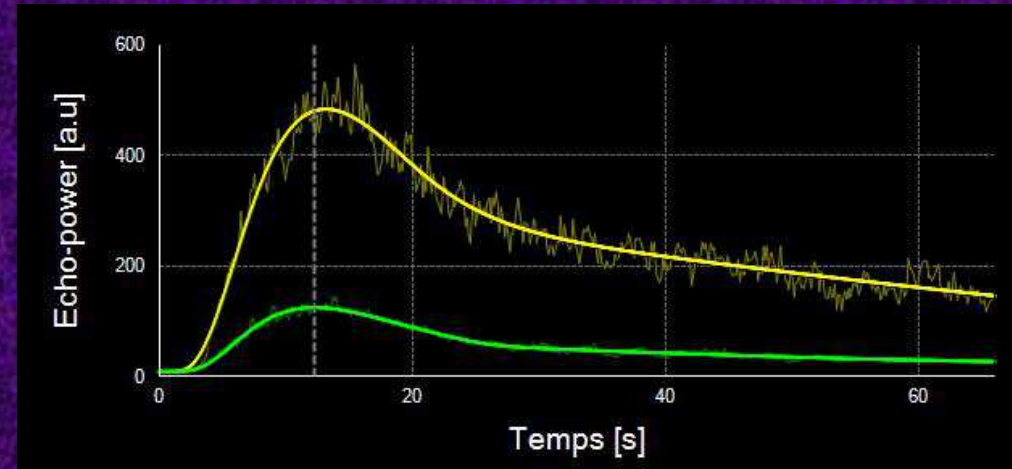
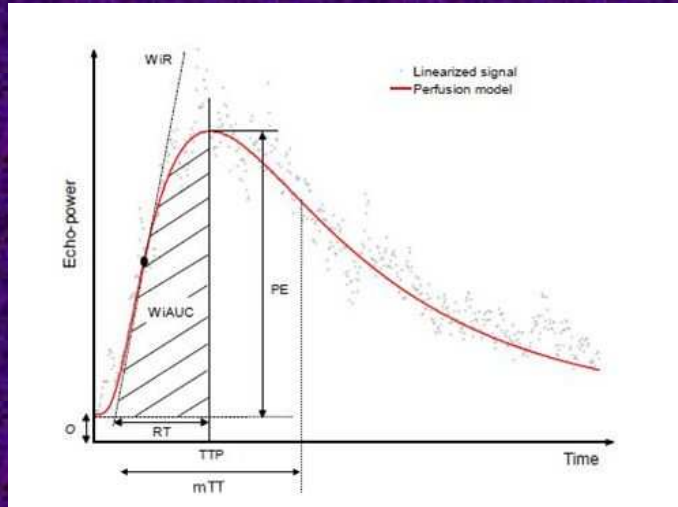
Capture CPS 5 Sec Réinit. minuterie +MBD, WiPI [dB] Gain: 3 GD: 20

WiPI - Indice de perfusion en phase de remplissage (WiAUC / RT)



Global		ROI	[a.u]	Ref [%]	Ref [dB]
<input type="checkbox"/>	Ref	Lesion	52,92	22,90	-6,40
<input checked="" type="checkbox"/>	Ref	Foie sain	231,09	100,00	0,00
<input type="checkbox"/>					
<input type="checkbox"/>					

Quantification des paramètres vasculaires



Paramètres temporels :

Le temps de montée du produit de contraste (RT)

Le temps de transit moyen (mTT)

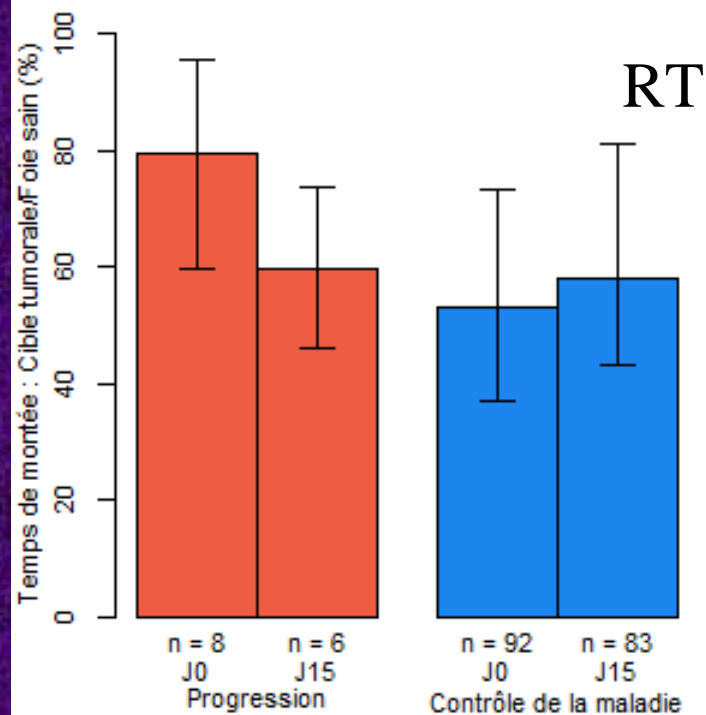
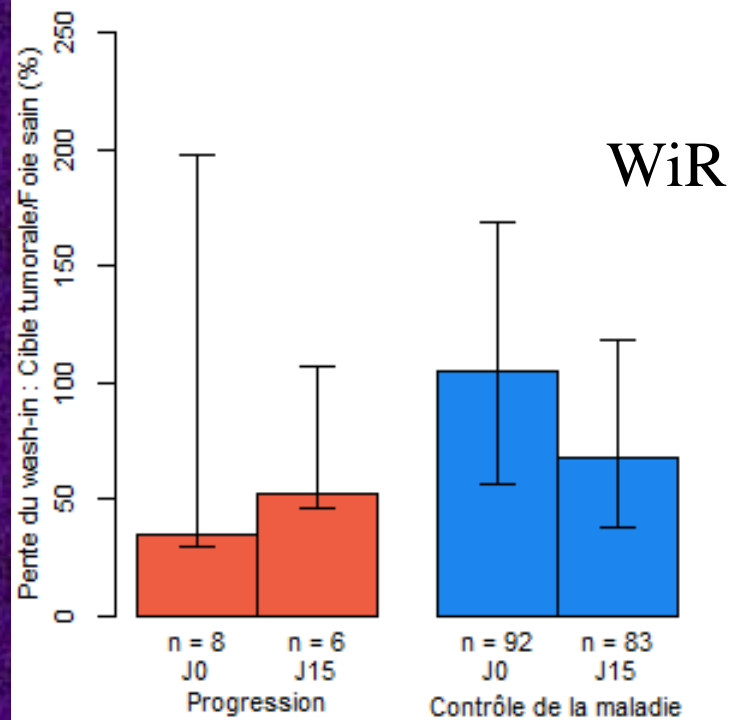
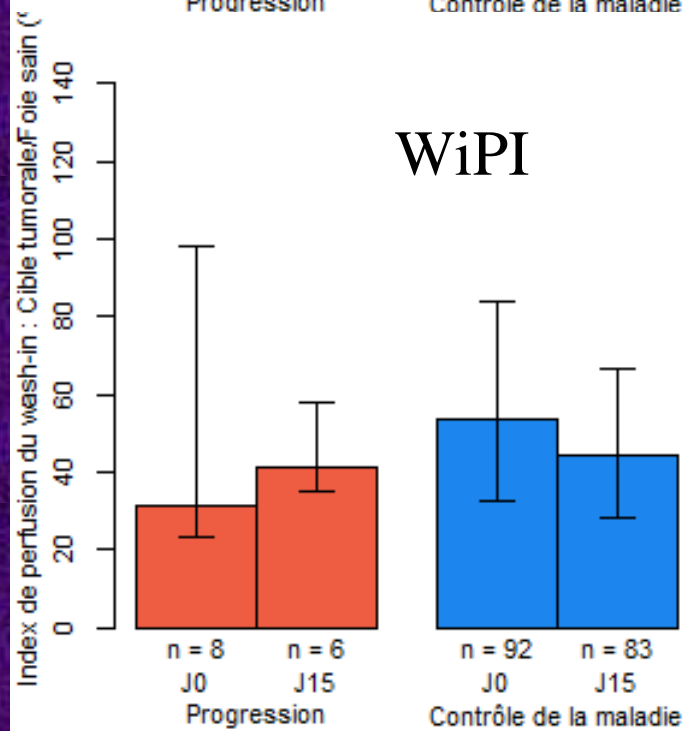
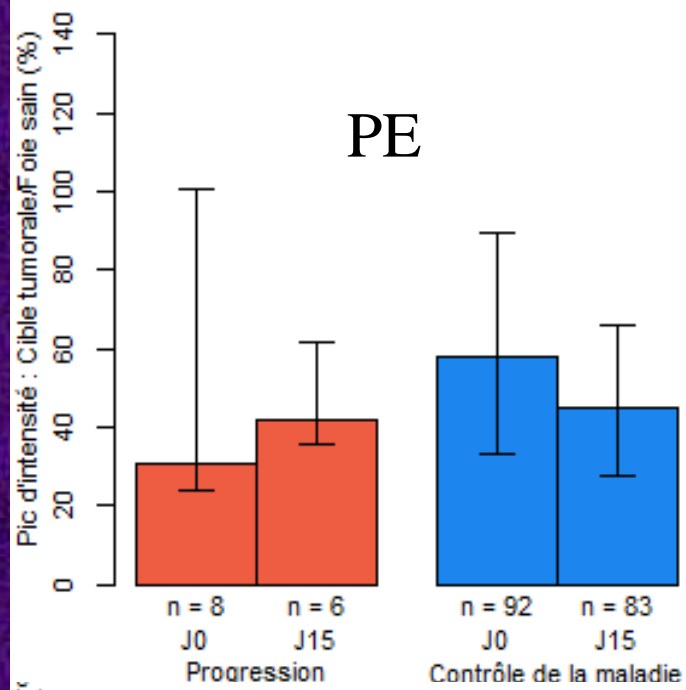
Paramètres d'intensité :

Le pic d'intensité (PE)

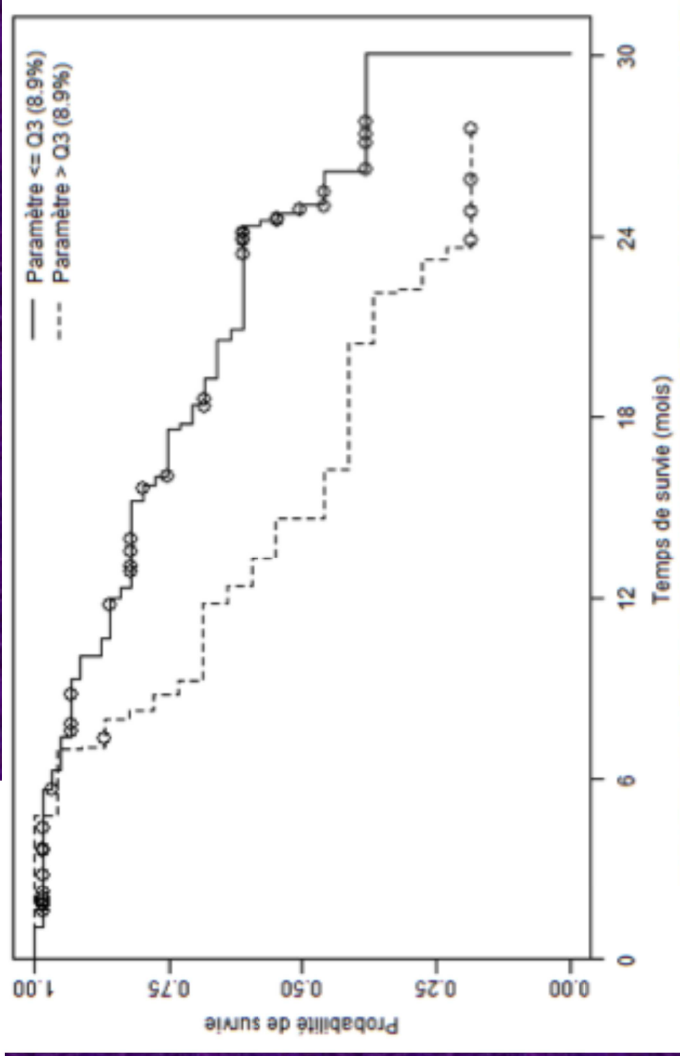
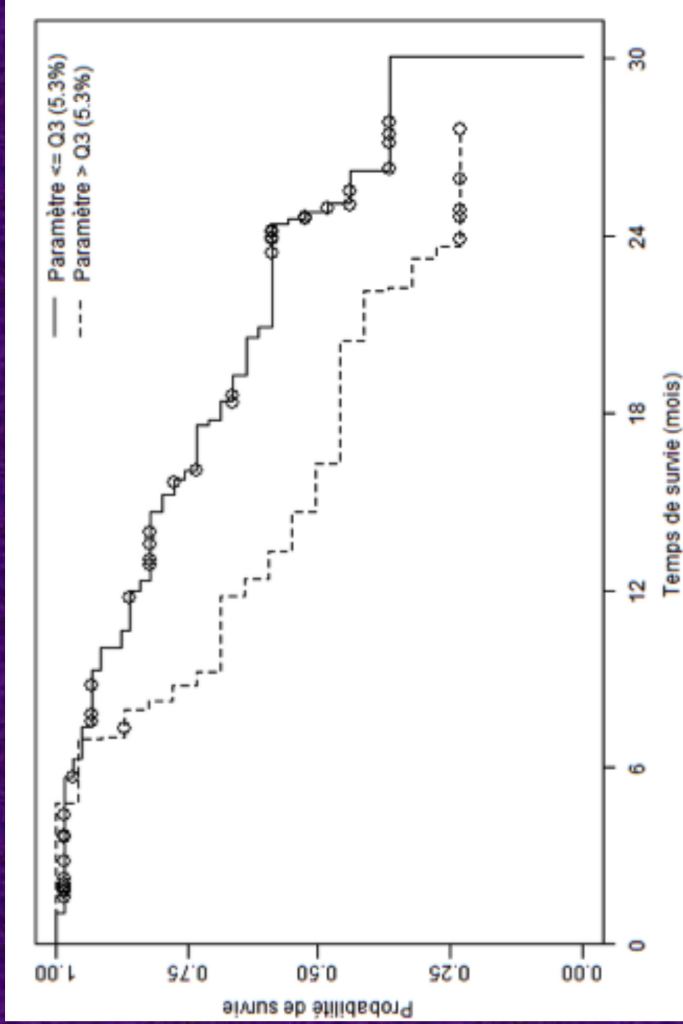
L'aire sous la courbe du wash-in (WiAUC)

L'index de perfusion du wash-in ($WiPI = WiAUC / RT$)

La pente du wash-in (WiR)



WiPI J15-J0



PE J15-J0



The end

Merci