

Masses annexielles:

Quelle est la place de l'IRM?

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# Echographie

- Examen de 1<sup>ère</sup> intention
  - Bénin
  - Malin
  - Complexe

# Echographie

- Lésions bénignes
  - Femme jeune
  - Critères de bénignité à l'US (formation anéchogène, homogène, paroi fine sans signal Doppler)
  - CA125 normal



- Surveillance pendant 3 cycles

# Echographie

- Lésions malignes

- Femme ménopausée
- Critères de malignité à l'US (kyste multiloculaire, hétérogène, cloisons internes > 3 mm, végétations endo et exokystiques, nodules de carcinomatose péritonéale, ascite, vascularisation centrale et index de résistance: < 0,53)
- CA 125 et/ou CA 19-9 élevés

= > CT scan thoraco-abdominal= Validé

= > Laparotomie et extemporané ou laparoscopie diagnostique

# Echographie

- Lésions annexielles complexes
  - Le plus souvent **bénignes**
- => importance du DG pour traitement optimal

# Masses annexielles complexes

- Buts de l'imagerie
  - Réduire le nombre de femmes qui subissent inutilement une chirurgie carcinologique et préserver la fertilité
  - Orienter patiente centre spécialisé si oncologie ovarienne
  - Absence de tumeur résiduelle post-chirurgie primaire: facteur pronostic important

# Masses annexielles complexes

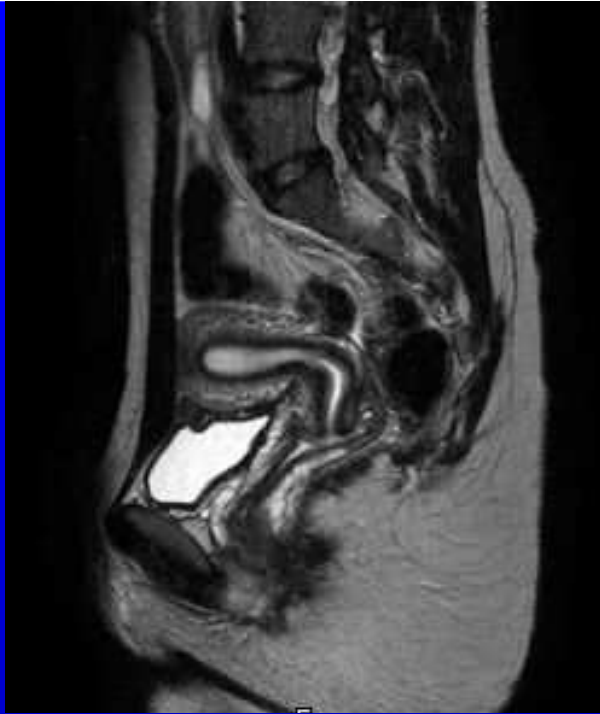
- Distinction *bénin-malin* masse annexielle complexe
  - IRM: précision 83-93 %
  - US: précision 63-92 %

# Protocole IRM masses annexielles

- **Séquences classiques**
  - T2: sagittal, axial, coronal
  - T1: sagittal
  - T1 fat sat: sagittal (axial)
  - T1 fat sat + Gd
  
- => **Imagerie fonctionnelle**
  - Diffusion
  - Perfusion



Sag T2



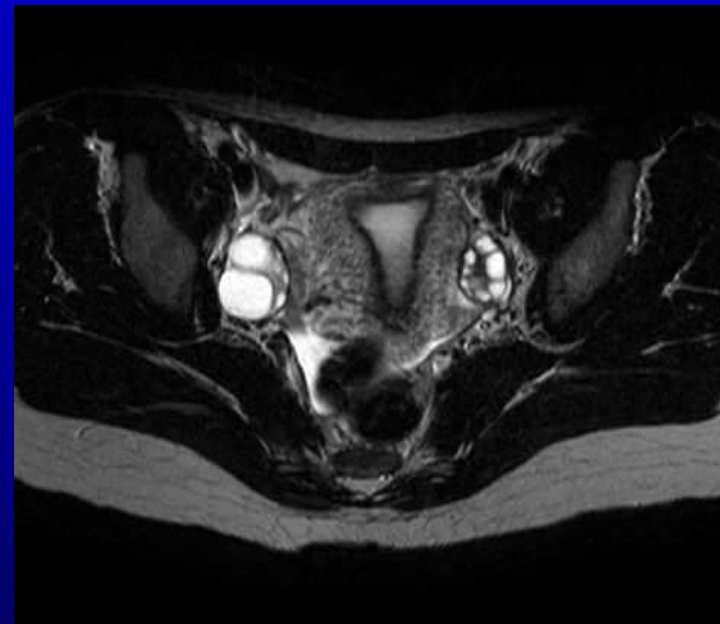
Sag T1



Sag T1 fat sat

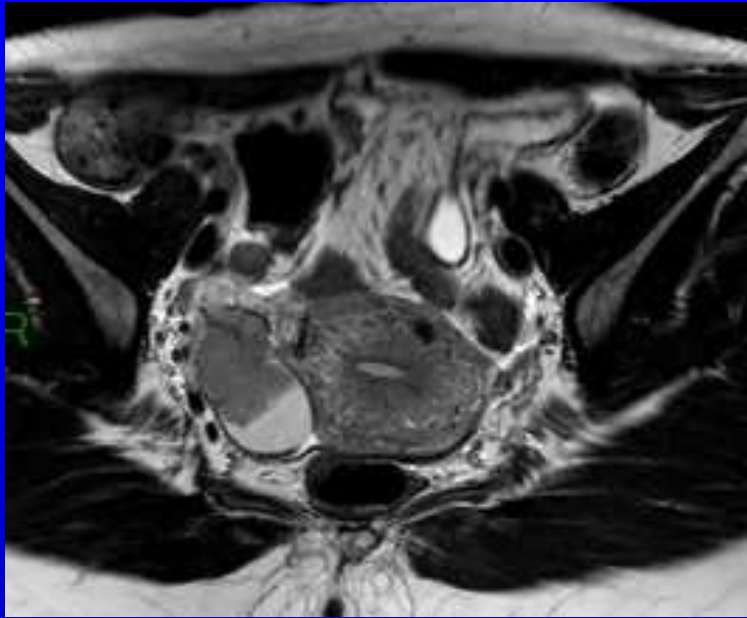


Coro T2

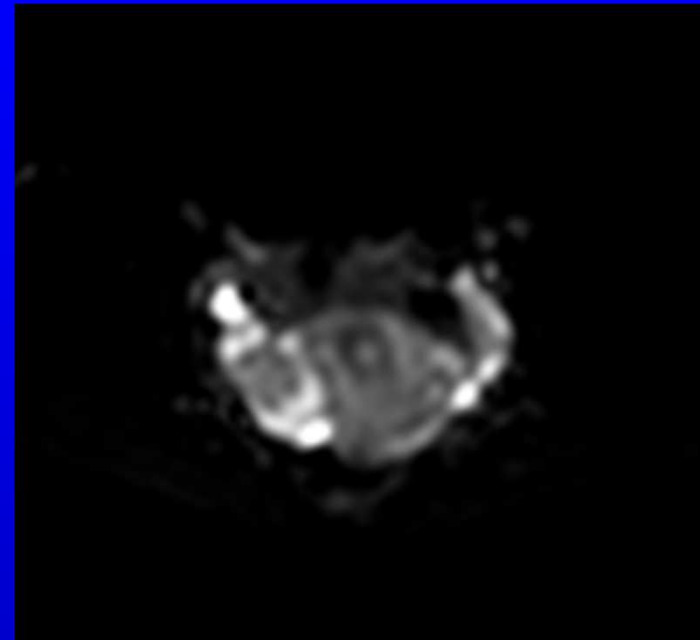


# Protocole IRM masses annexielles

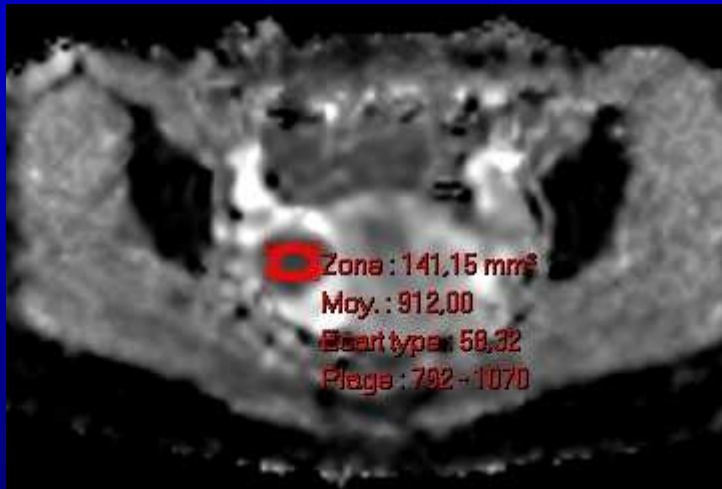
- Séquence diffusion (DWI)
  - Plan axial
  - $b_{(0,50,100)}$
  - $b_{(800-1000-1200)}$ 
    - Analyse qualitative du signal: hypo-hyper en  $b_{1000}$
    - A corrélérer aux séquences anatomiques
    - Analyse quantitative: carte ADC



T2



b<sub>0</sub>



ADC



b<sub>1000</sub>

# Protocole IRM masses annexielles

- Séquence diffusion (DWI)



- Hyposignal  $b_{1000}$

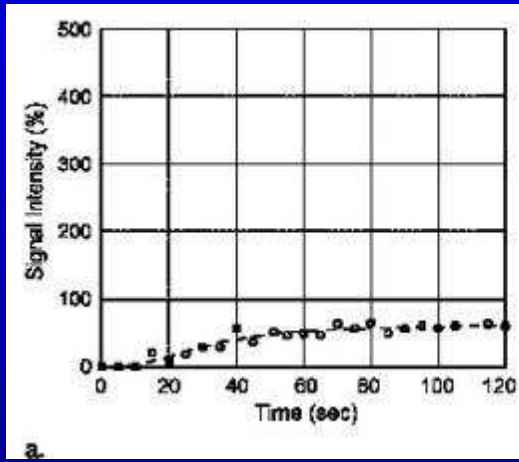
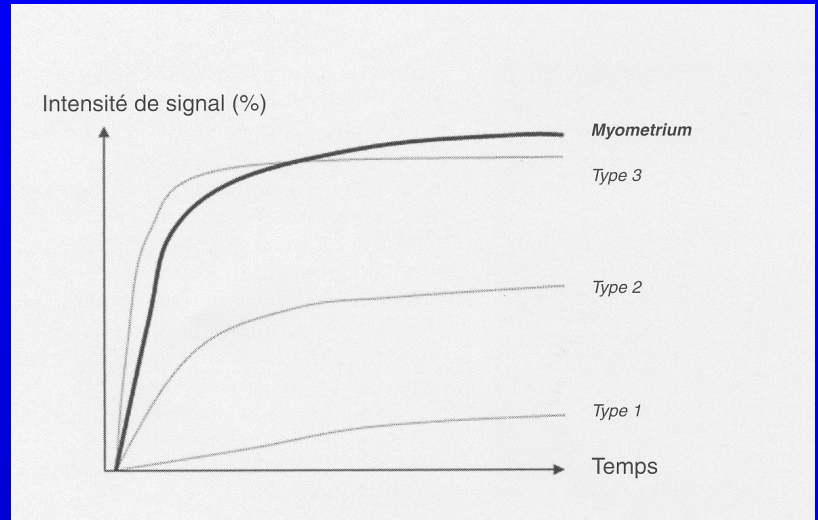
- = BENIN

- Hypersignal  $b_{1000}$

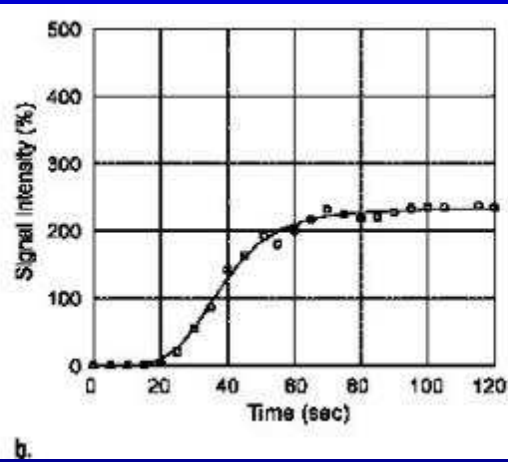
- Benin (séquences anatomiques)
- Malin

# Protocole IRM masses annexielles

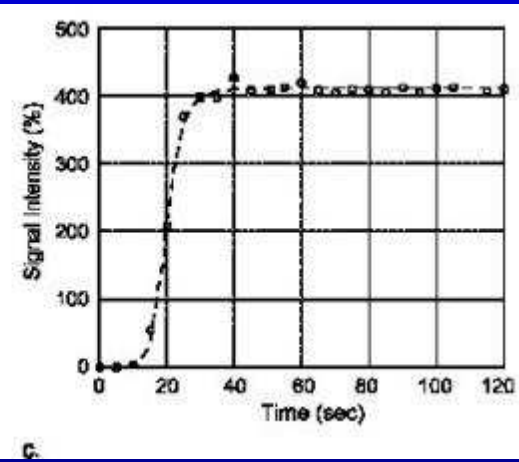
- Séquence de perfusion
  - Séquence dynamique T1 EG
  - Résolution temporelle: 2-4 s ( 320 s)



Bénin

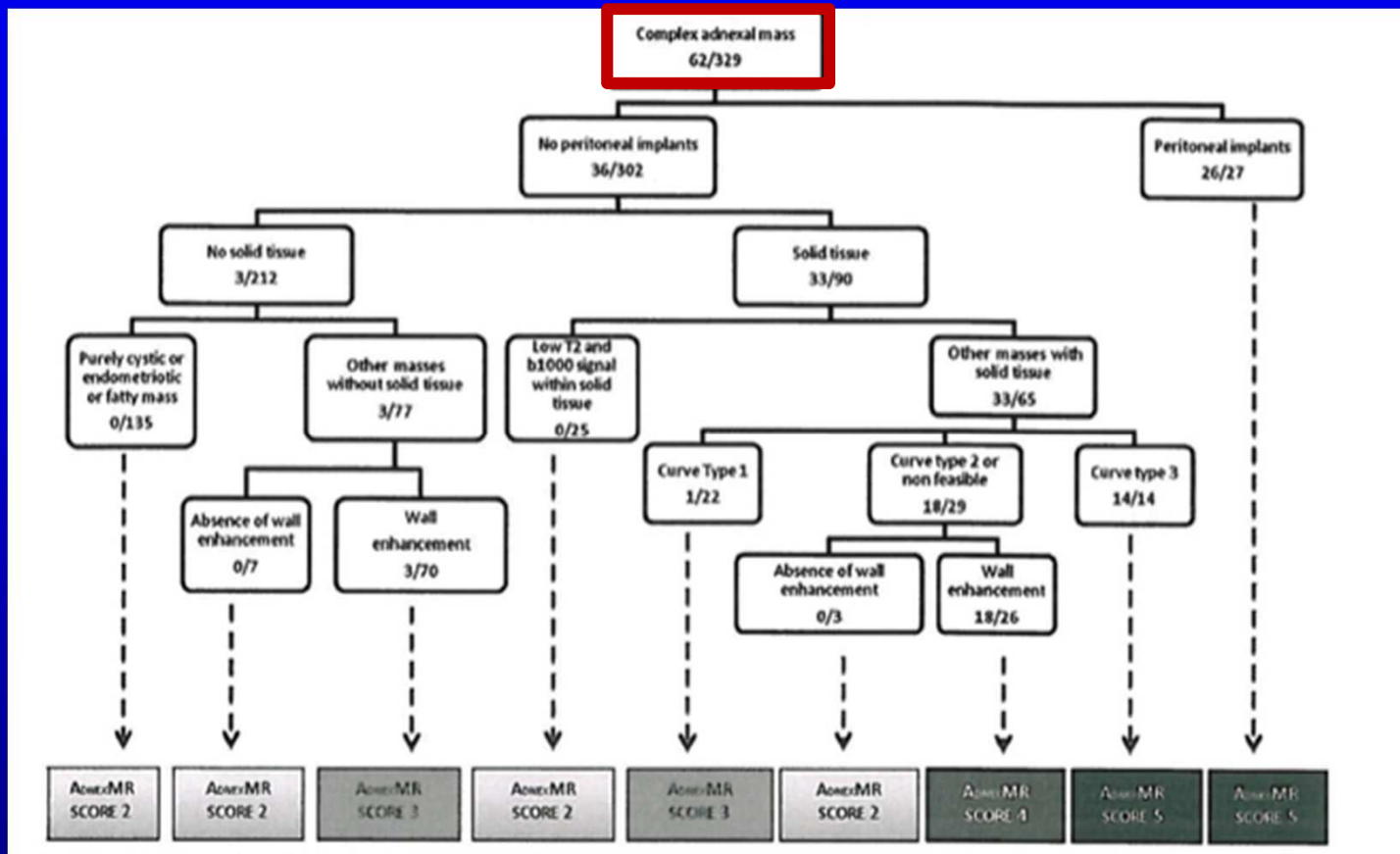


Borderline



Malin

# Score lésionnel



# Score lésionnel

- Score 1: pas de lésion
- Score 2: bénin (51,7 %)
- Score 3: probablement bénin (28%)
- Score 4: risque malignité (7,9%)
- Score 5: probablement malin(12,5%)



# Score lésionnel

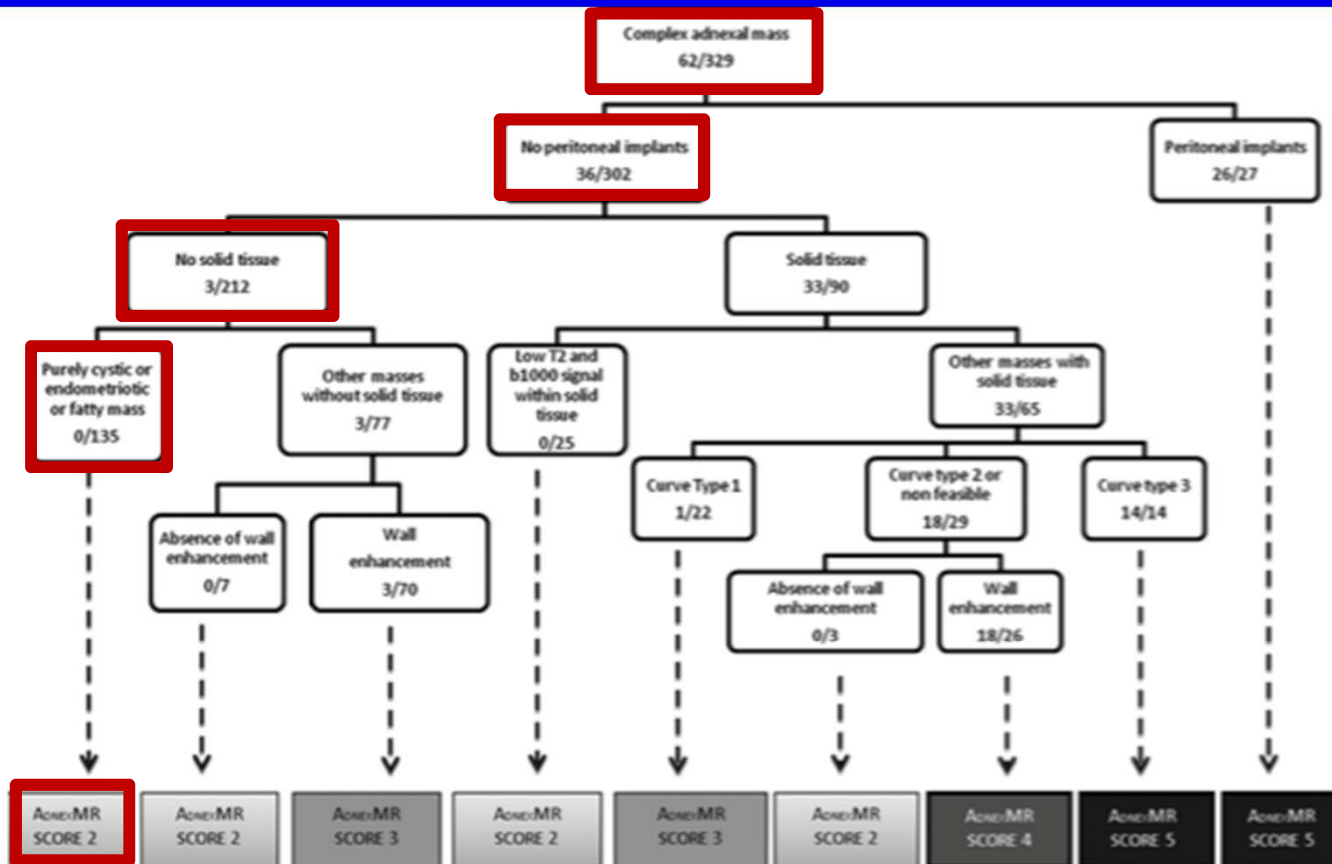


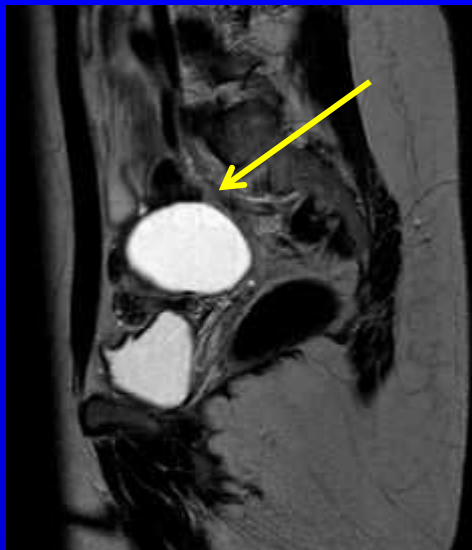
Figure 1: ADNEX MR SCORING system. *non feasible* = No myometrial data were available or there were too many image artifacts.

# Masses complexes non solide

- Kystique
- Contenu hémorragique: endométriose
- Contenu graisseux

—=> Score 2 = BENIN

Sag T2



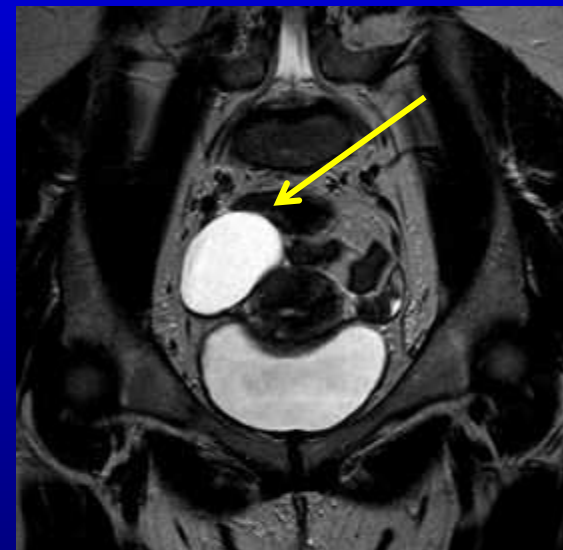
Sag T1



Sag T1 fat sat

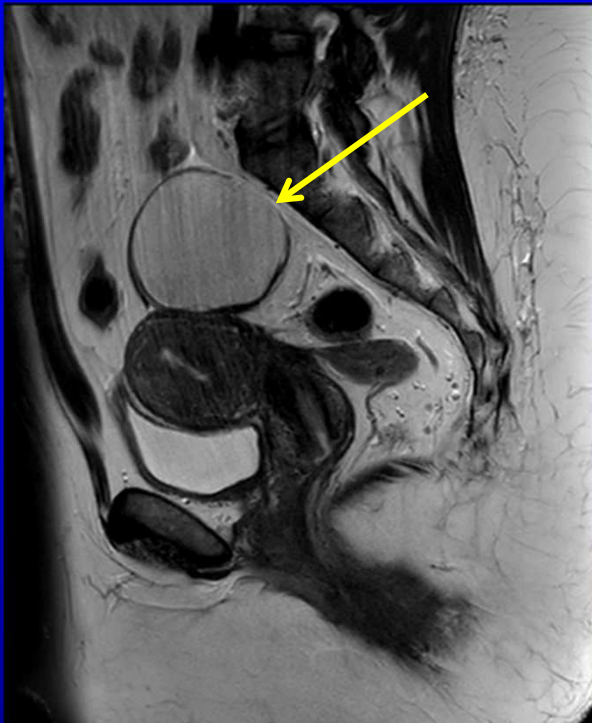


Axial T2



Kyste

Sag T2



Sag T1

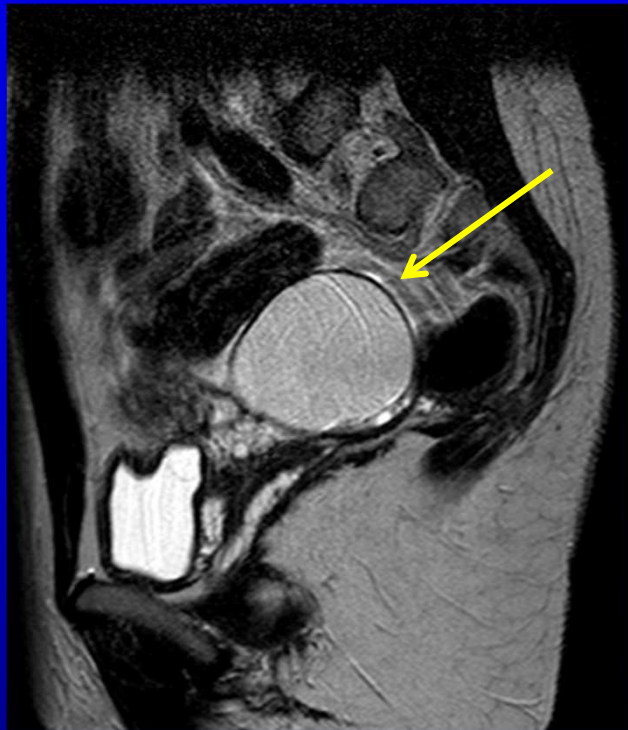


Sag T1 fat sat



**Hyper**  
T1 fat sat=  
endométrrome

Sag T2



Sag T1



Sag T1 fat sat



**Hypo**  
T1 fat sat=  
Dermoïde

# Score lésionnel

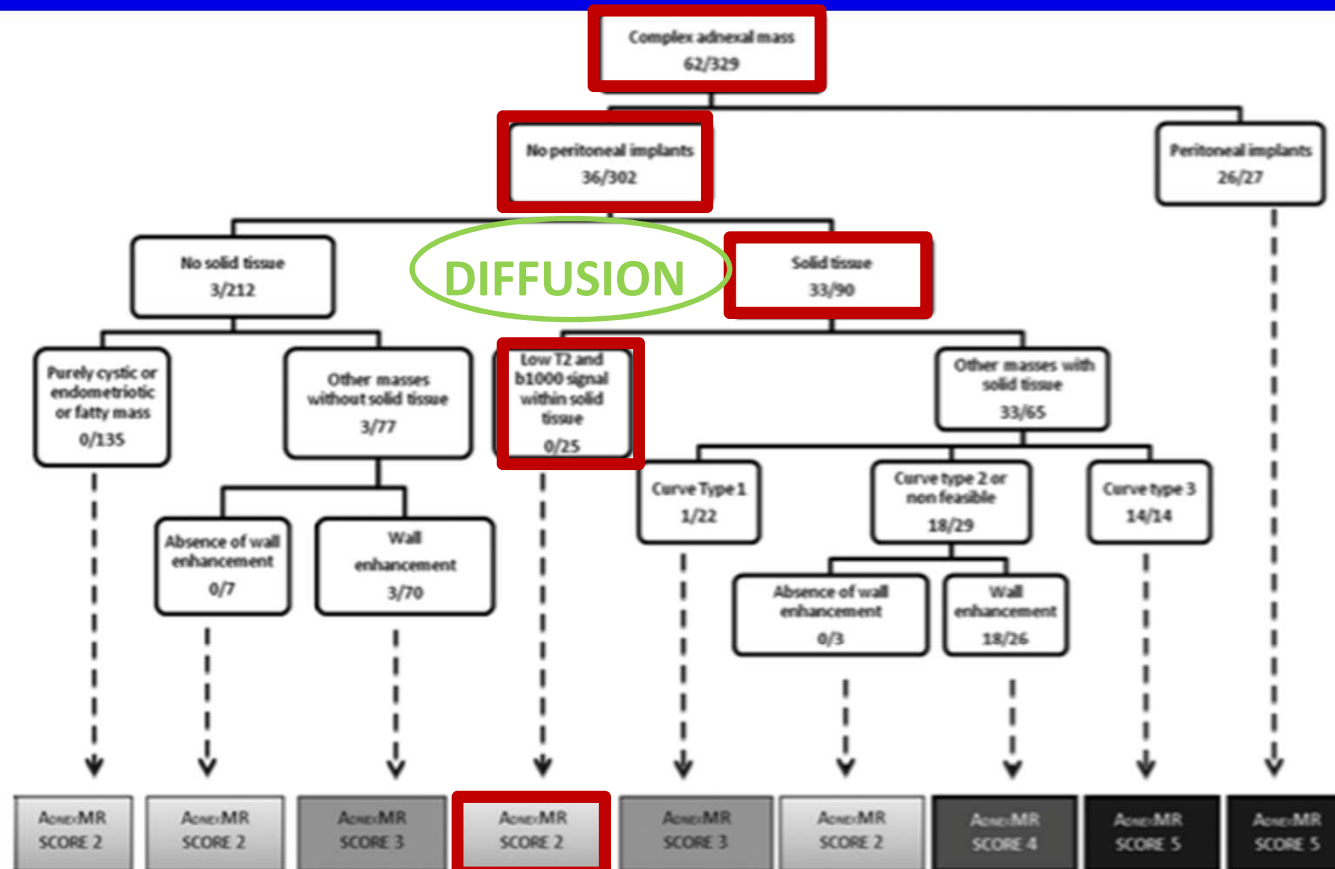


Figure 1: ADNEX MR SCORING system. *non feasible* = No myometrial data were available or there were too many image artifacts.

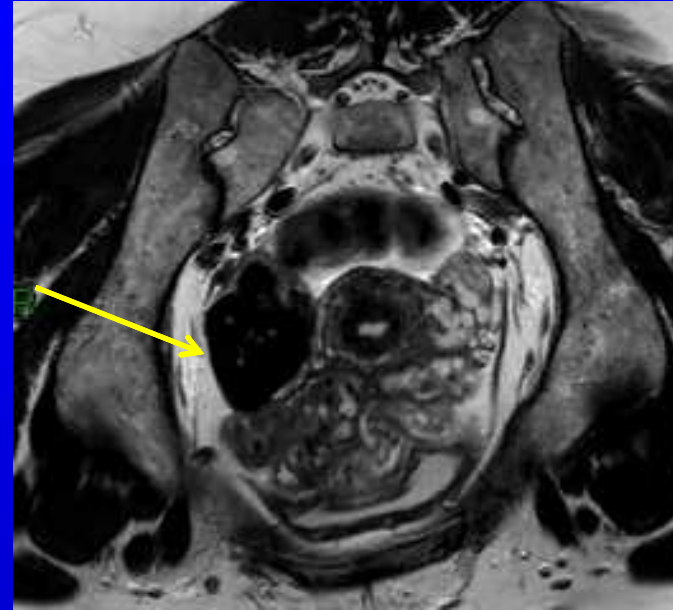
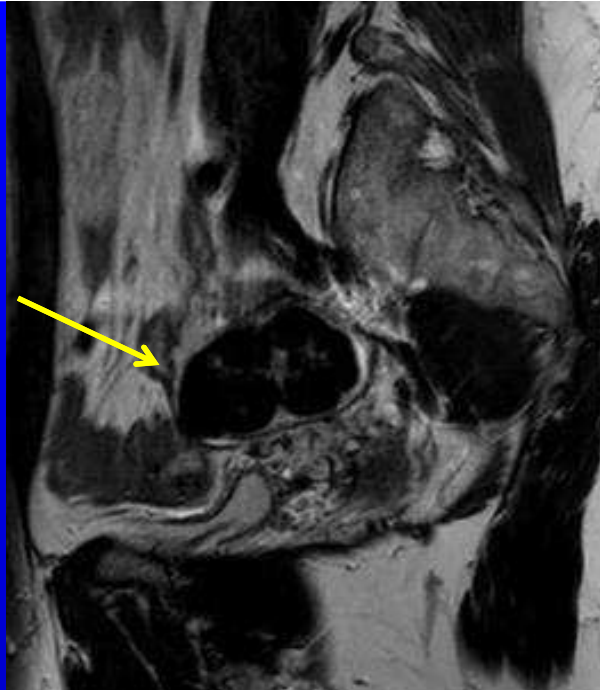


# Masse complexe solide

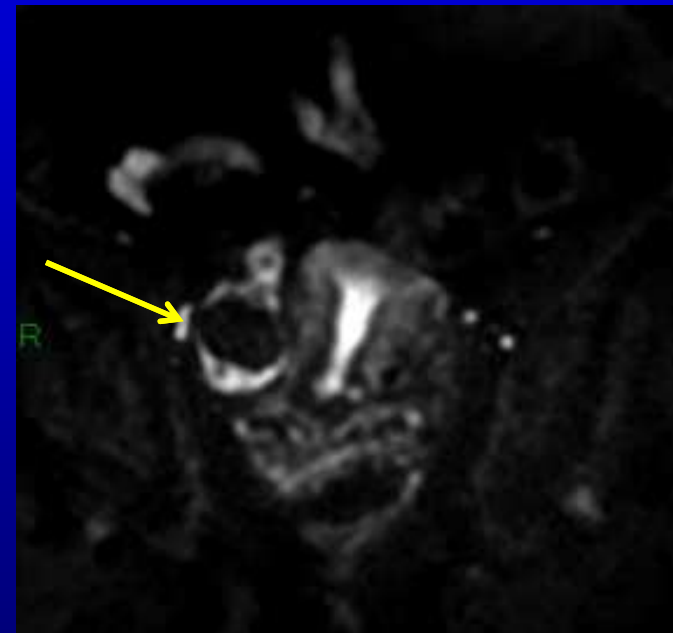
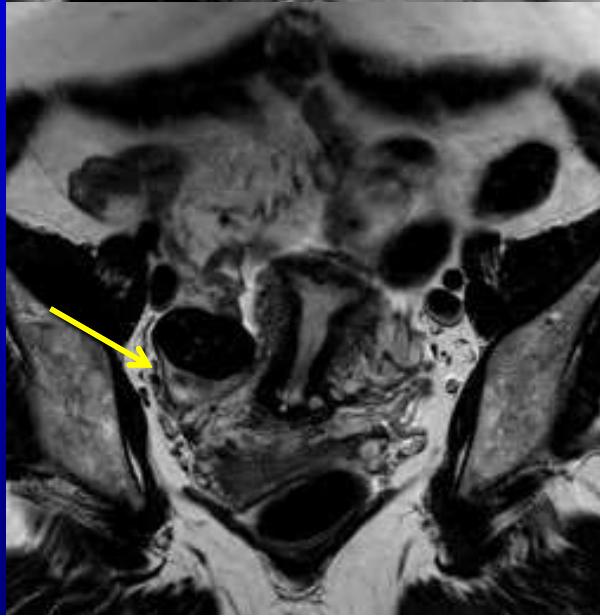
- Hypo  $b_{1000}$  et hypo T2 = BENIN

**PLRs and Negative Likelihood Ratios of Malignancy for MR Imaging Findings**

MR Imaging Finding	PLR	Negative Likelihood Ratio
Size > 51 mm	1.7	0.27
Purely cystic mass	0	1.30
Purely endometriotic mass	0	1.17
Purely fatty mass	0	1.15
Absence of wall enhancement	0	1.34
Bi- or multilocularity	1.66	0.63
Grouped septa	2.32	0.62
Absence of solid tissue	0.08	4.38
Vegetation	2.62	0.81
Solid portion	0.92	1.54
Thickened irregular septa	9.83	0.68
Low T2-weighted signal intensity within solid tissue	0.03	1.75
Low $b = 1000 \text{ sec/mm}^2$ -weighted signal intensity within solid tissue	0.07	3.5
Low T2-weighted and low $b = 1000 \text{ sec/mm}^2$ -weighted signal intensity within solid tissue	0	1.93
Curve type 1	0.02	3.38
Curve type 3	$\infty$	0.42
Peritoneal implants	111.97	0.58



T2



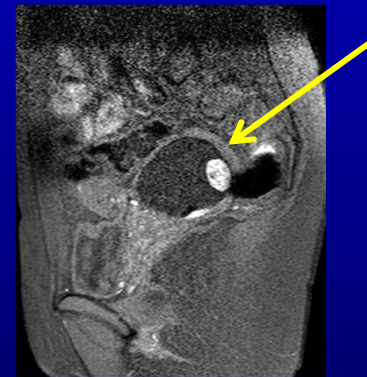
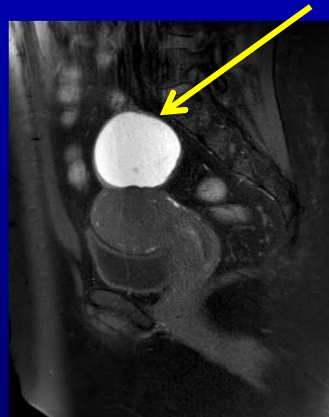
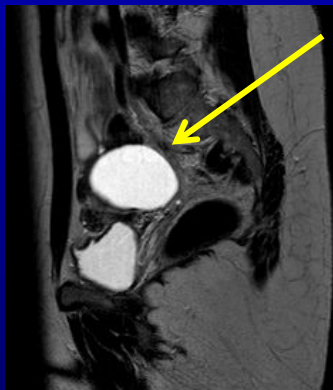
$b_{1000}$

Fibrome ovarien



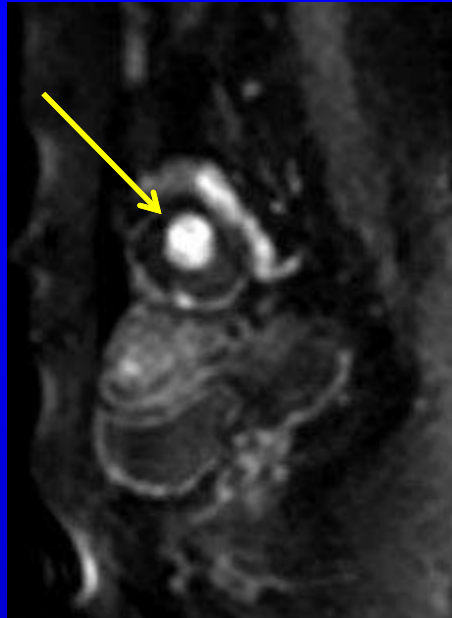
# Masse complexe solide

- Si hyper  $b_{1000}$  : bénin ou malin
    - Bénin
      - Liquide
      - Sang
      - Dermoïde (substances kératinoides)
- => séquences anatomiques

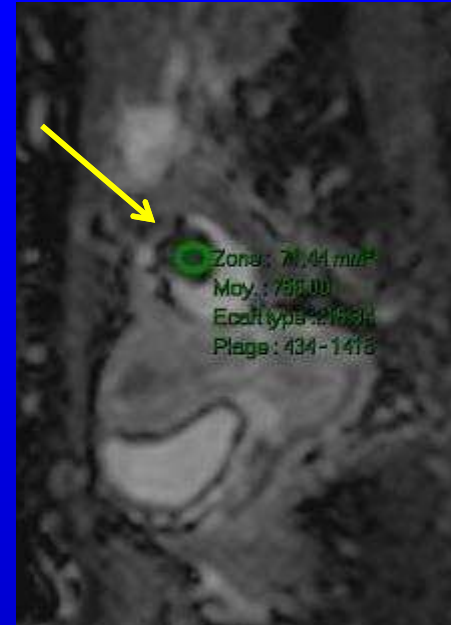




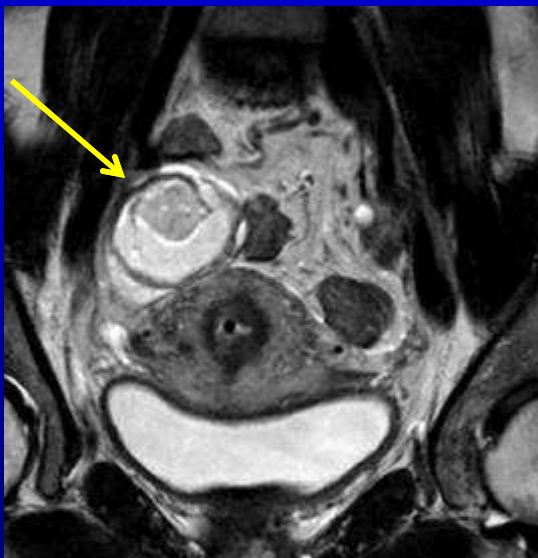
T2



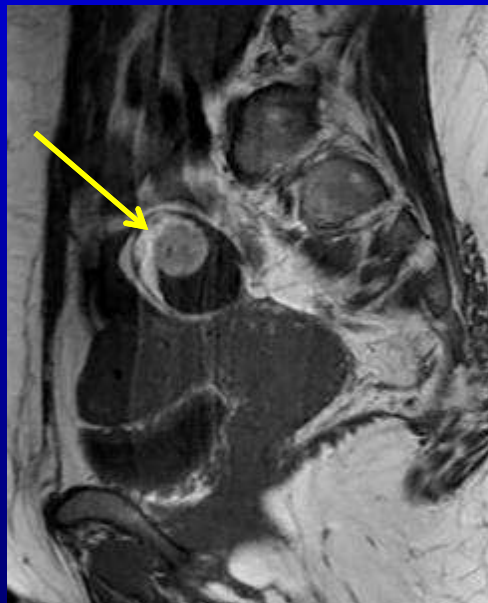
$b_{1000}$



ADC=0,756



T2



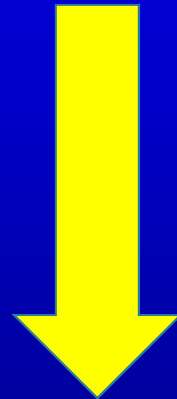
T1



T1 fat sat

# Masse complexe solide

- Hyper  $b_{1000}$  et signal intermédiaire en T2  
– => risque de malignité



MESURE ADC

PERFUSION

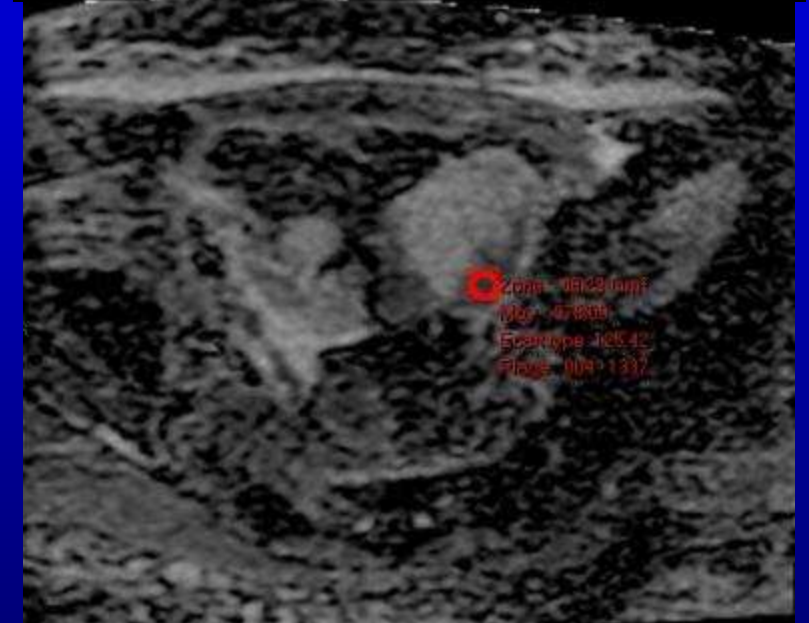
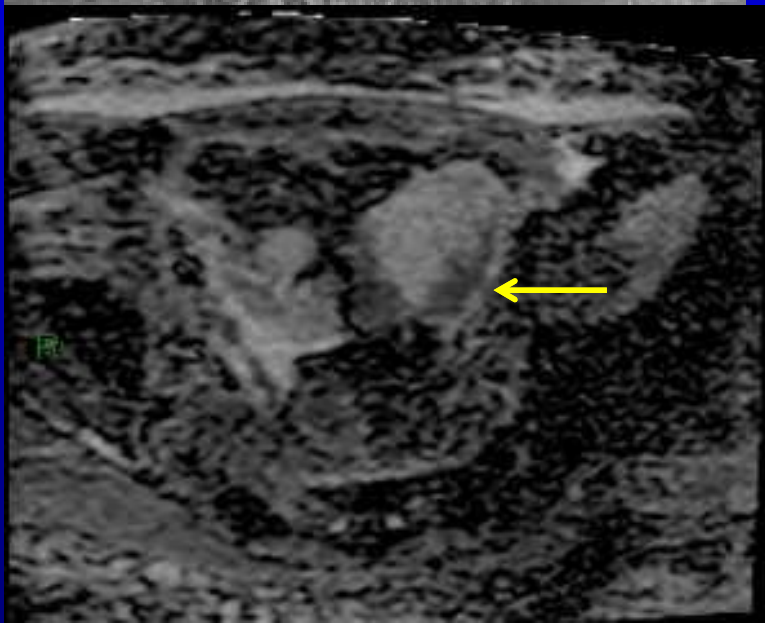
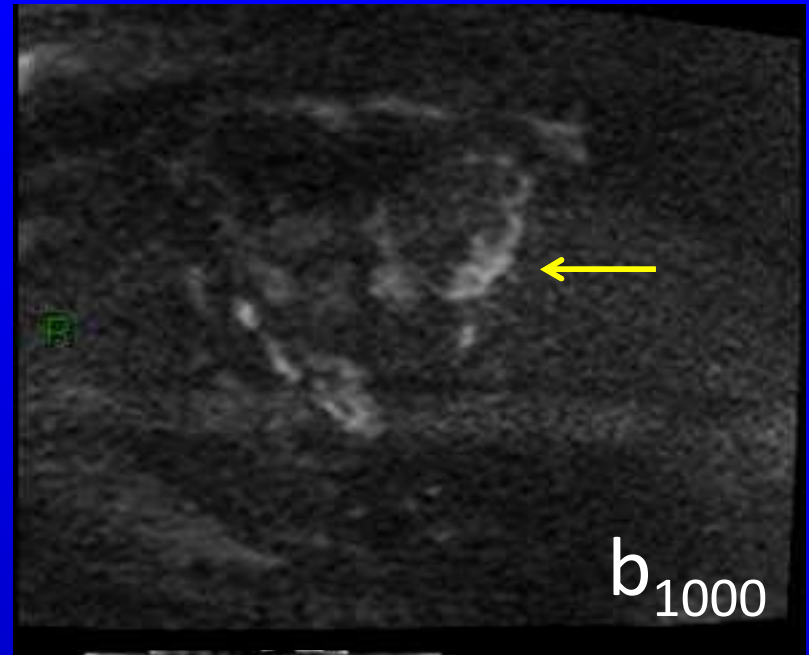
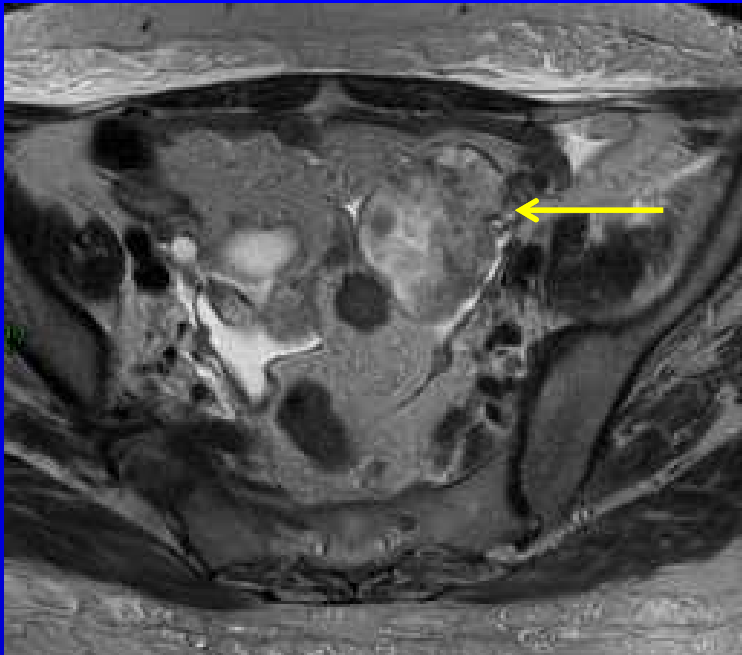
# Masse complexe solide

- Hyper  $b_{1000}$  et signal intermédiaire en T2  
– => risque de malignité
- Mesure quantitative en post-processing: ADC
- Les valeurs d'ADC sont plus basses dans les tumeurs malignes ( $< 1,2 \cdot 10^{-3} \text{ mm}^2/\text{sec}$ )

# ADC: limites

- Difficulté de placement des  $R_{ois}$  au niveau des zones d'intérêts et mesures non reproductibles
- Faux(-): Zones de nécroses liquidiennes tumeurs malignes => ADC élevé
- Faux (+): Tumeurs bénignes riches en fibroblastes, en substances kératinoïdes, endométriomes => ADC bas
- ***Beaucoup de chevauchements entre bénin et malin même quand les endométriomes et tératomes sont exclus***

T2



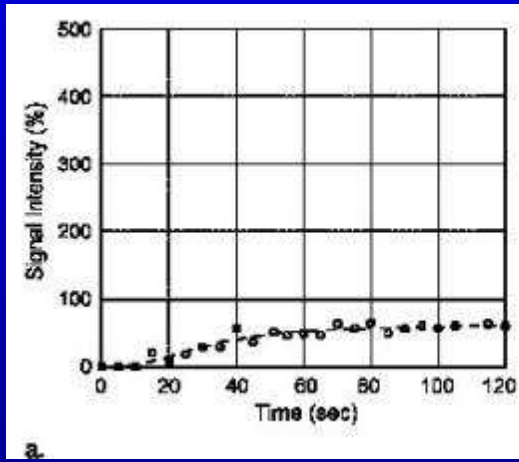
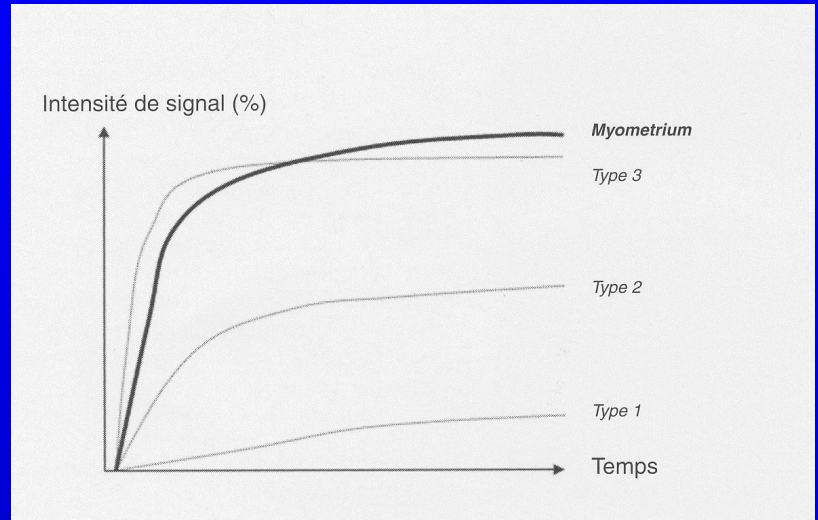
ADC: 0,978

# Masse complexe solide

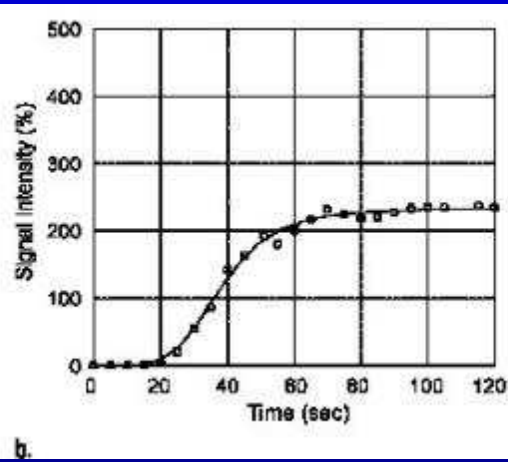
- Perfusion

- Séquences dynamiques en T1 echo de gradient
- Injection gadolinium: 2ml/sec
- Mesures séquentielles toutes les 2-4 sec pendant 320 sec ( départ à 10 sec)
- Mesure myomètre de référence et mesure zone d'intérêt
- Courbes de rehaussement dans le temps

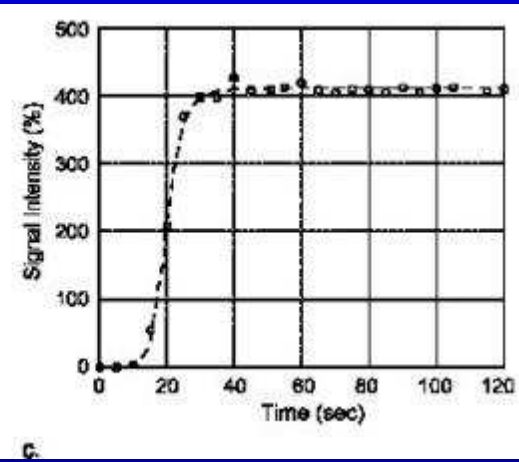




Bénin



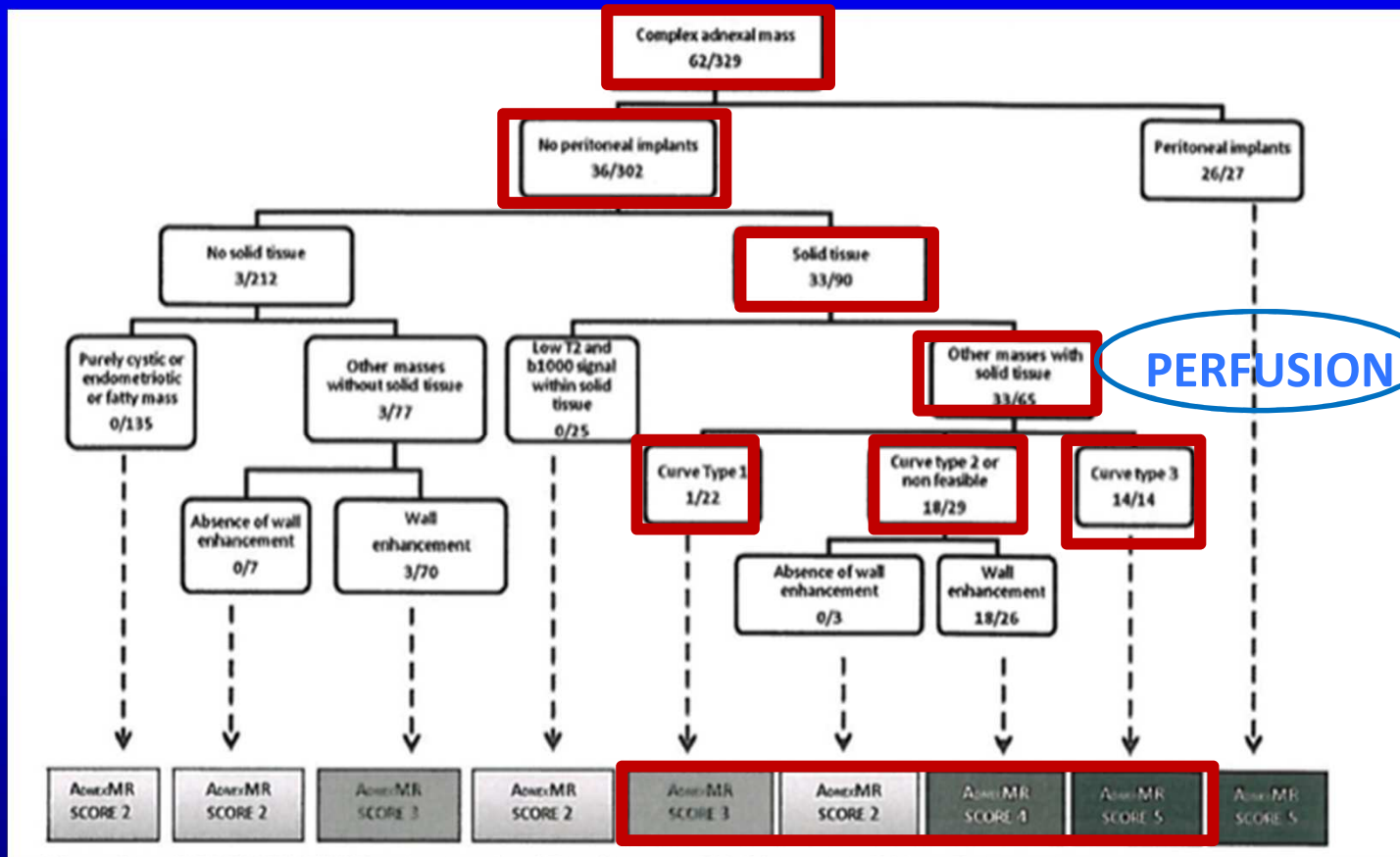
Borderline

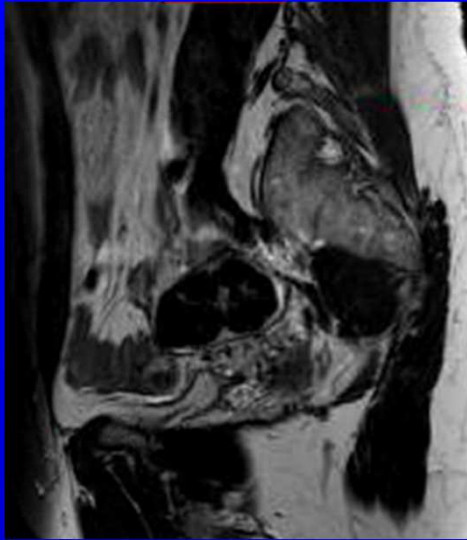


Malin

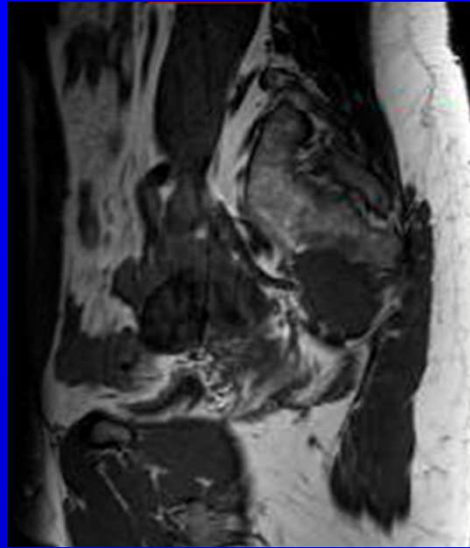


# Score lésionnel

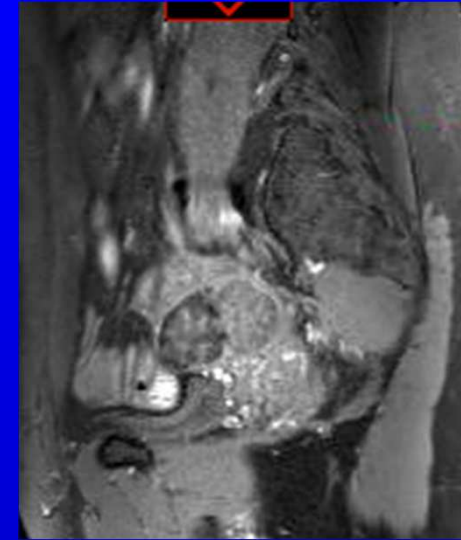




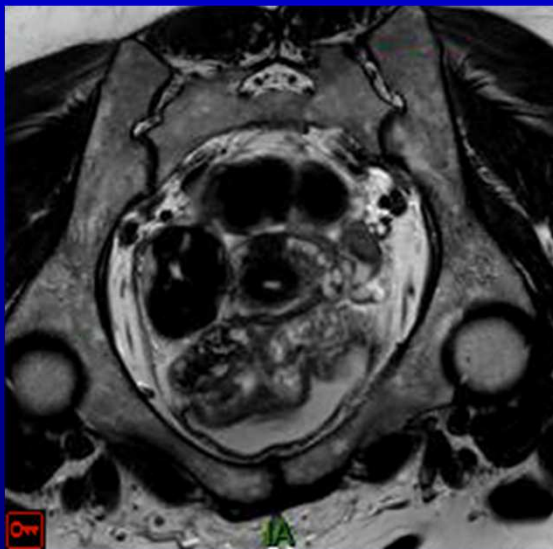
T2



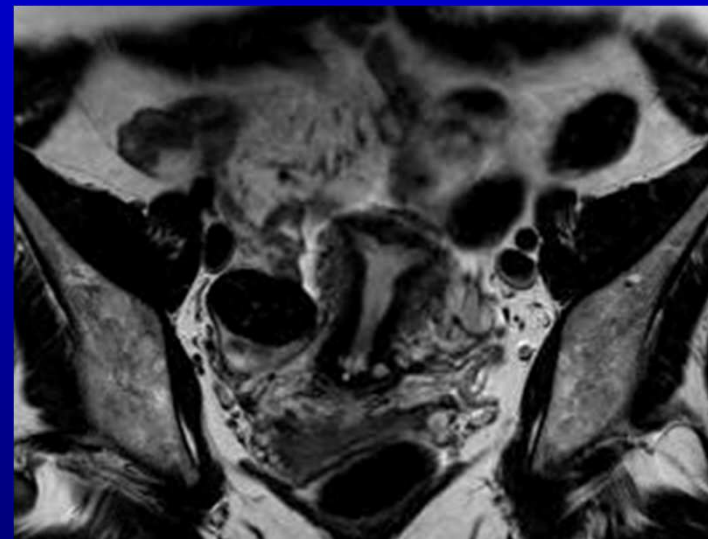
T1



T1 fat sat

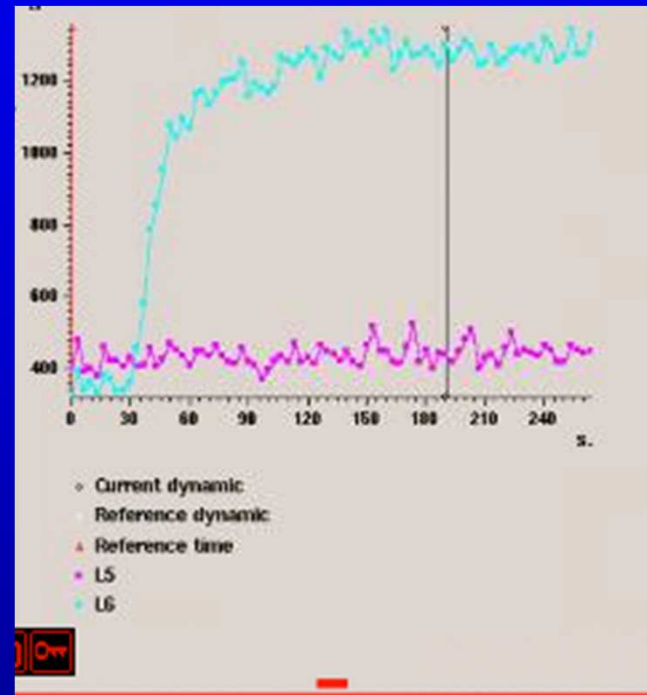
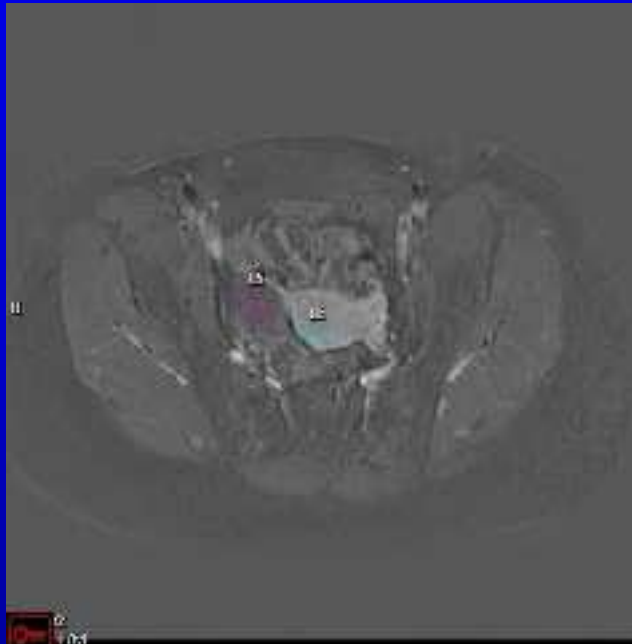


T2

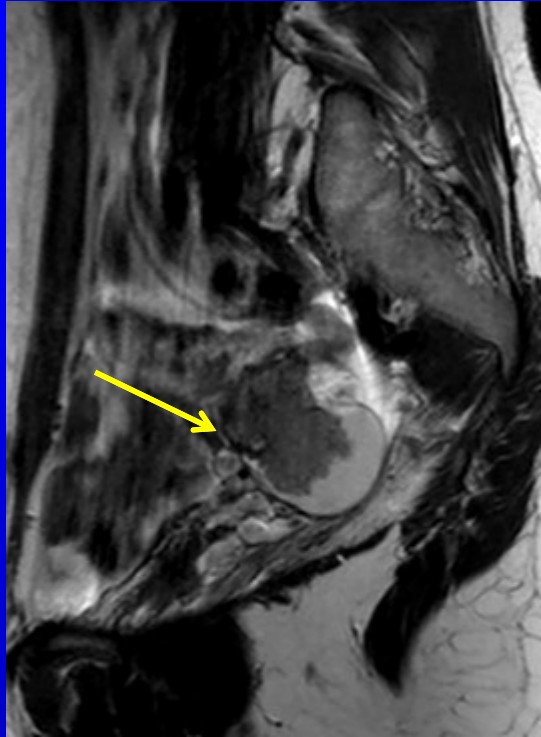


T2

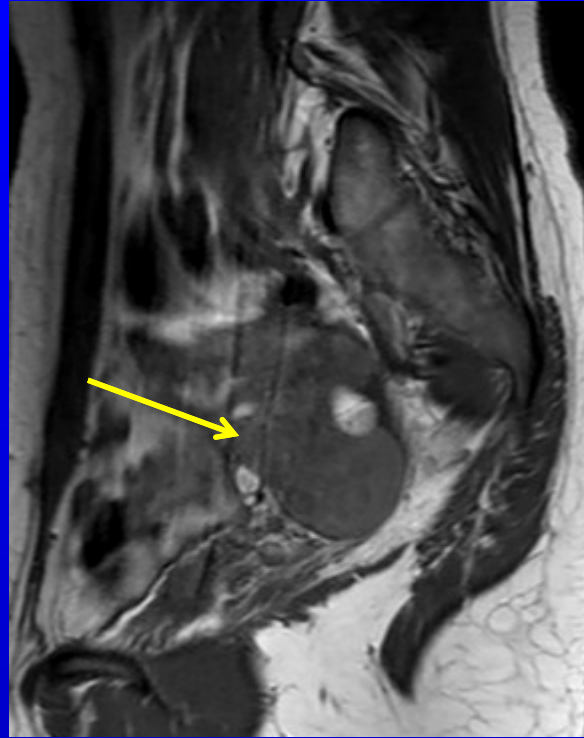
# Perfusion



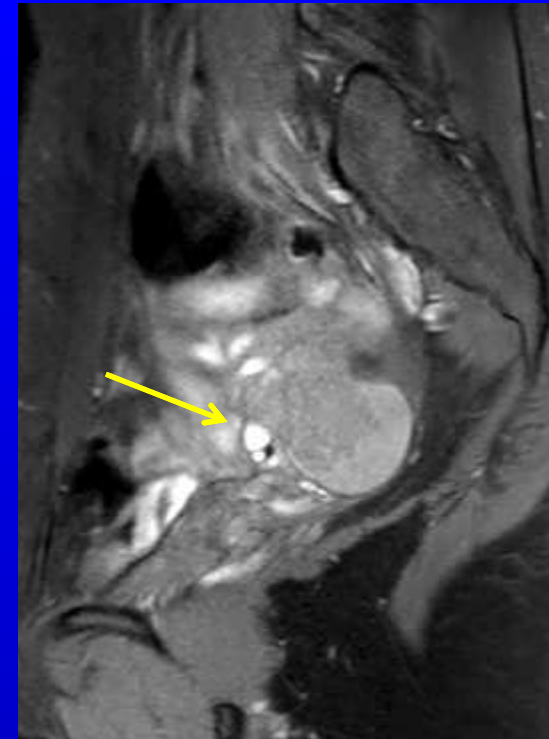
Type 1 => Fibrome utérin



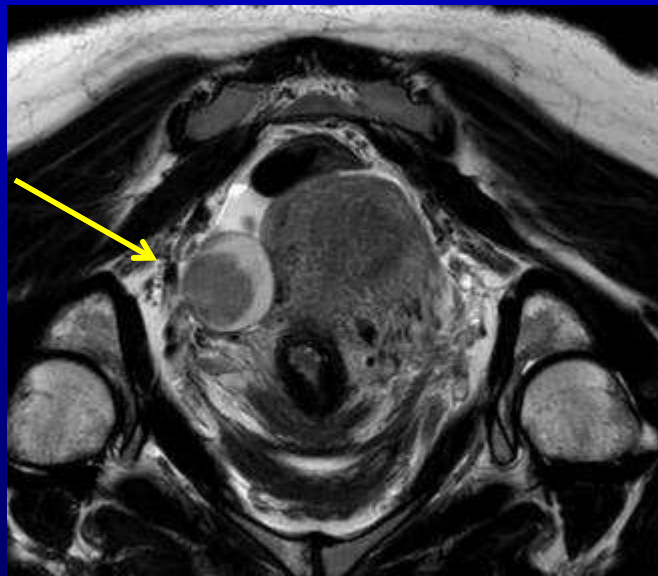
T2



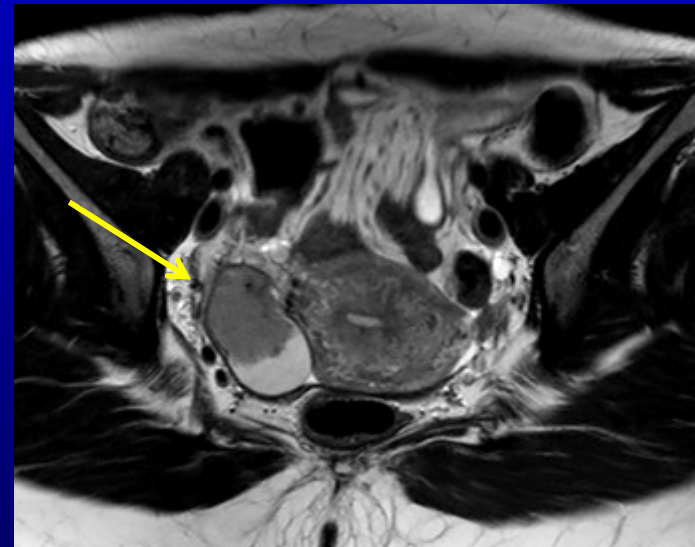
T1



T1 fat sat

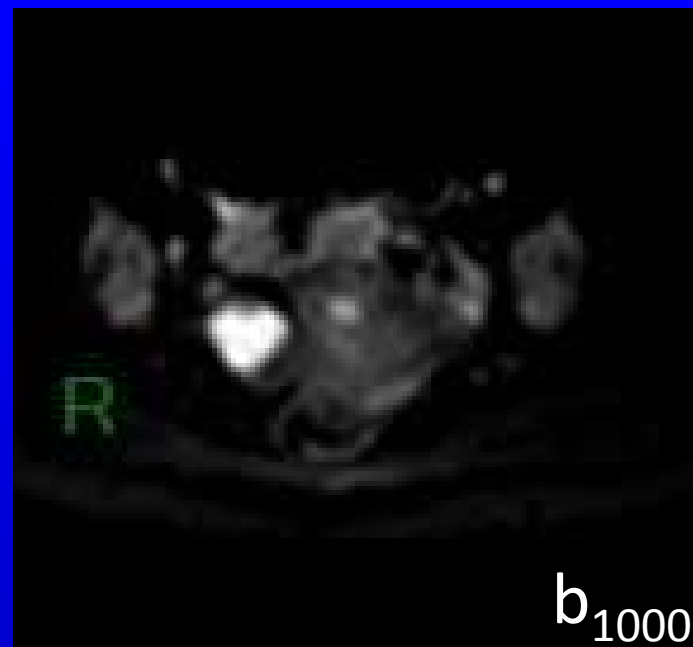
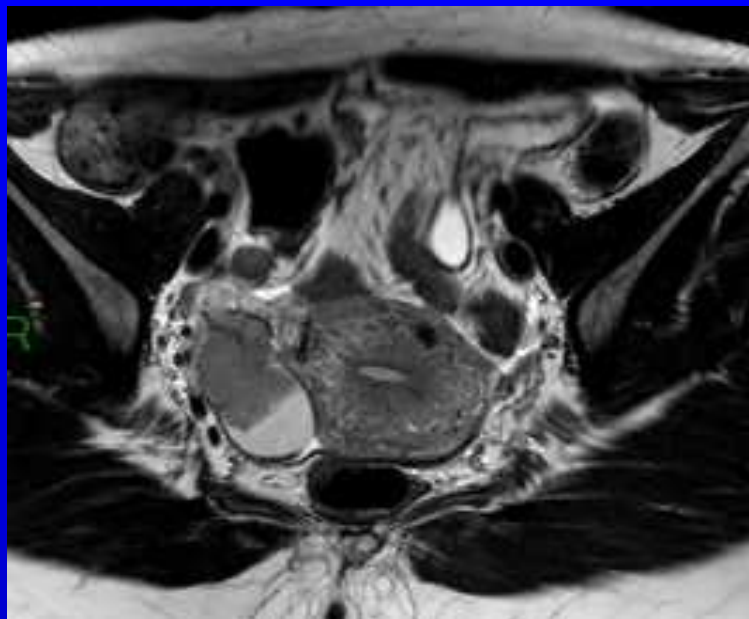


T2

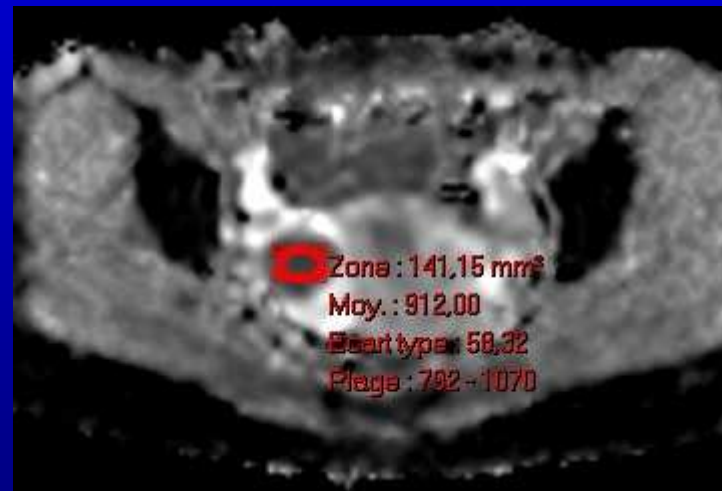
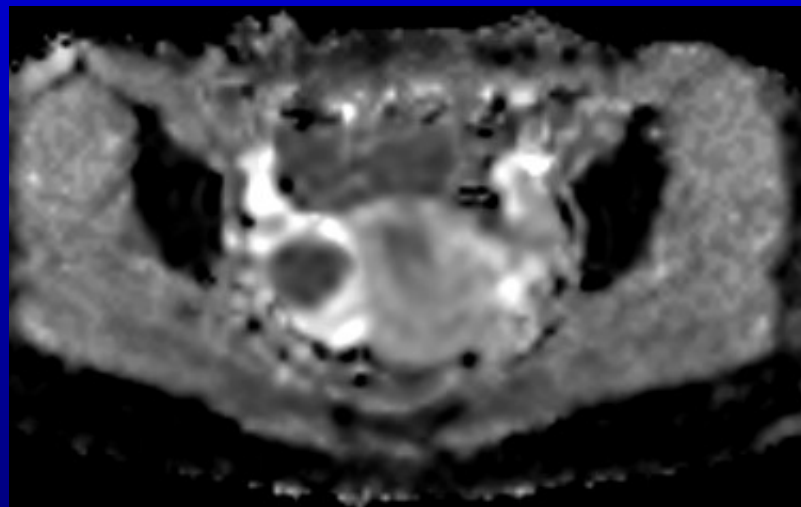


T2

T2

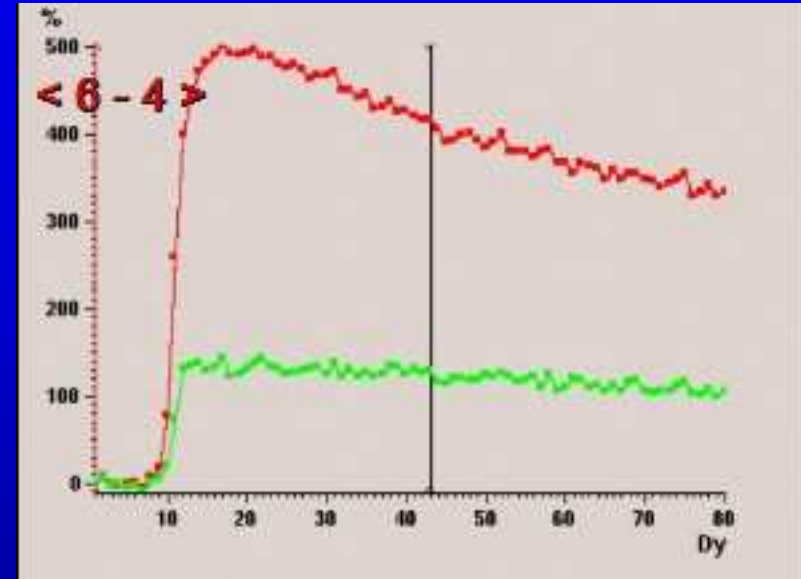
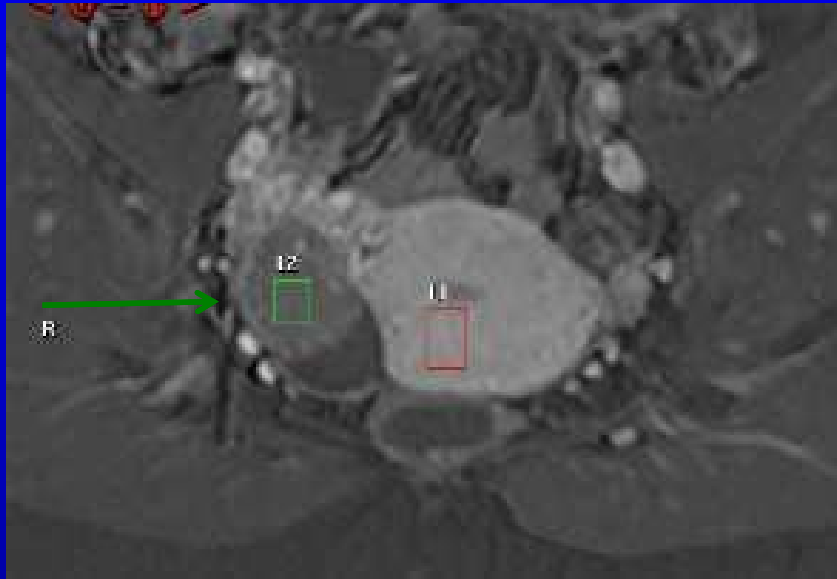


b<sub>1000</sub>

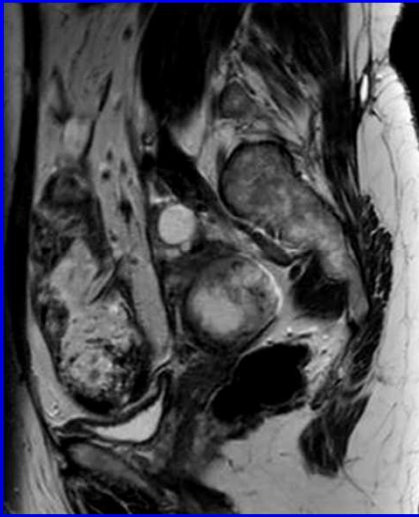


ADC= 0,912

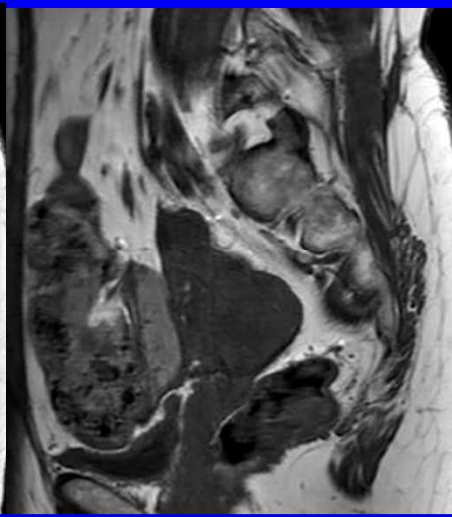




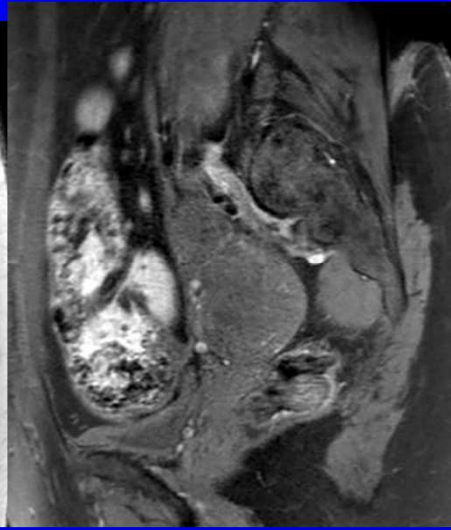
Type 2 => Borderline



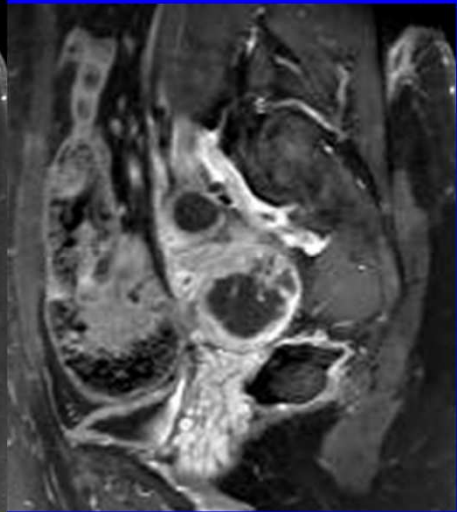
T2



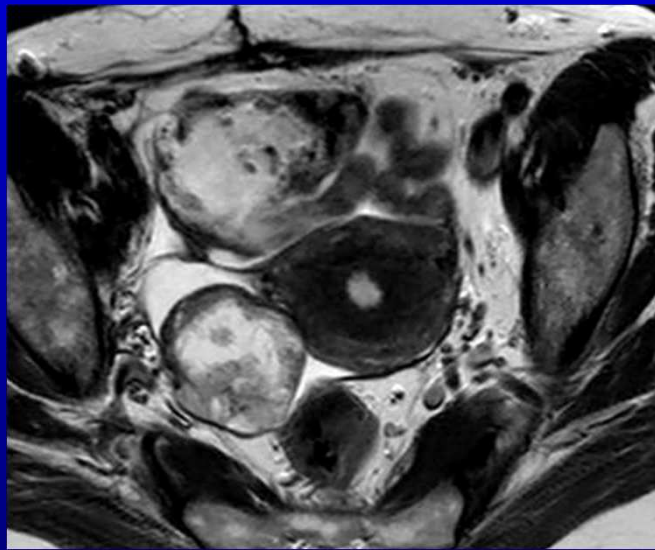
T1



T1 fatsat



GD

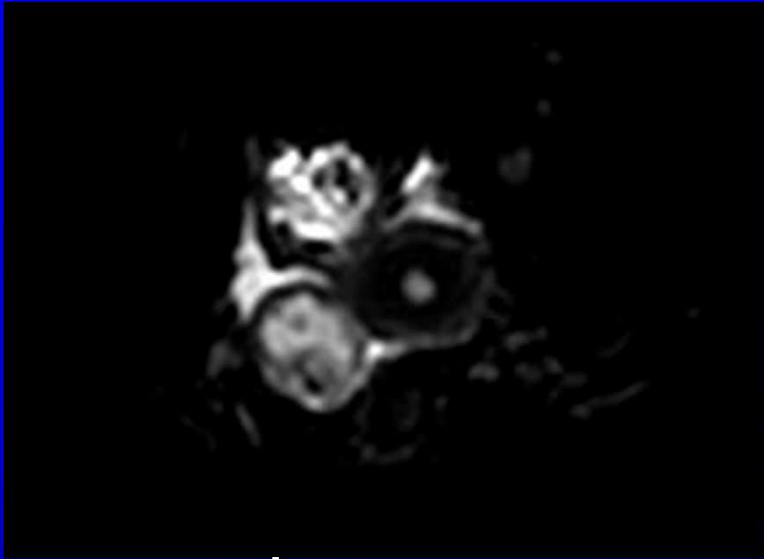


T2

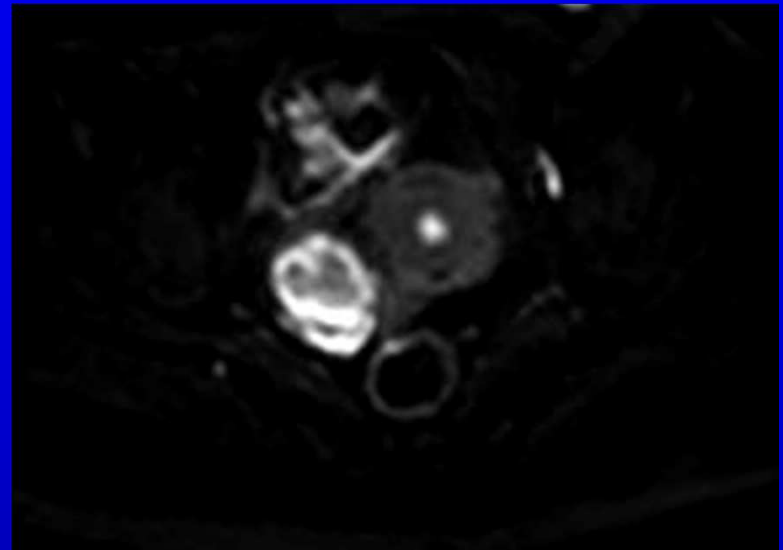


T2

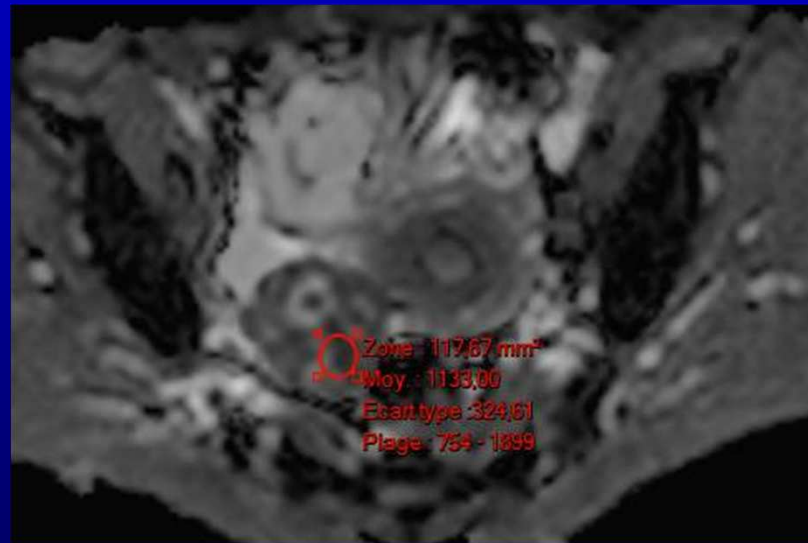
# Diffusion



$b_0$



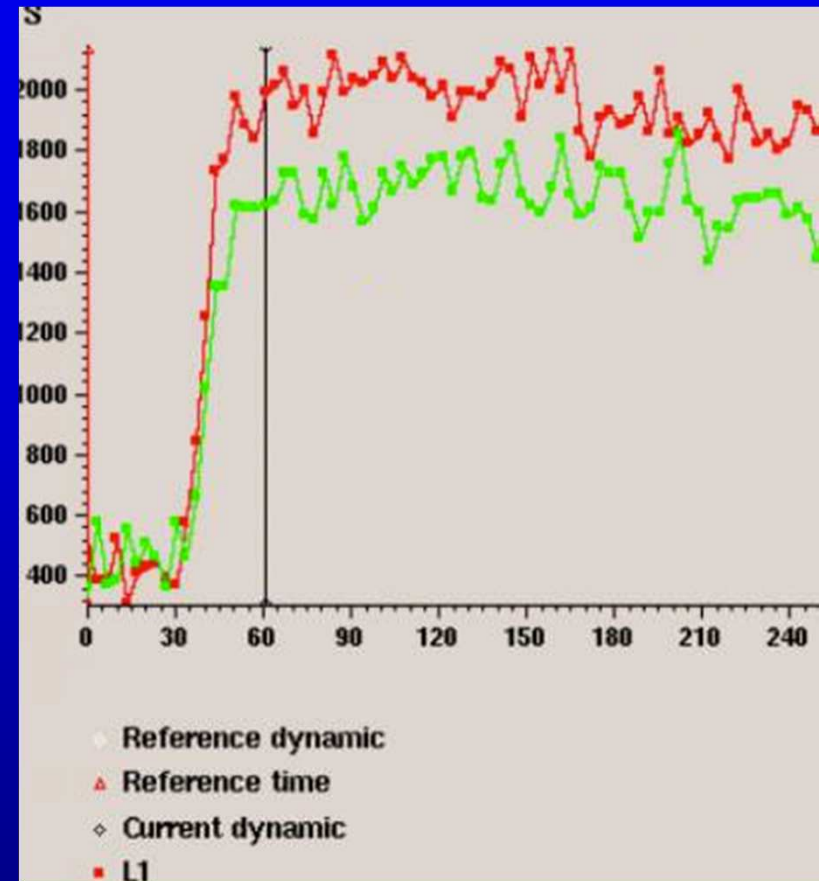
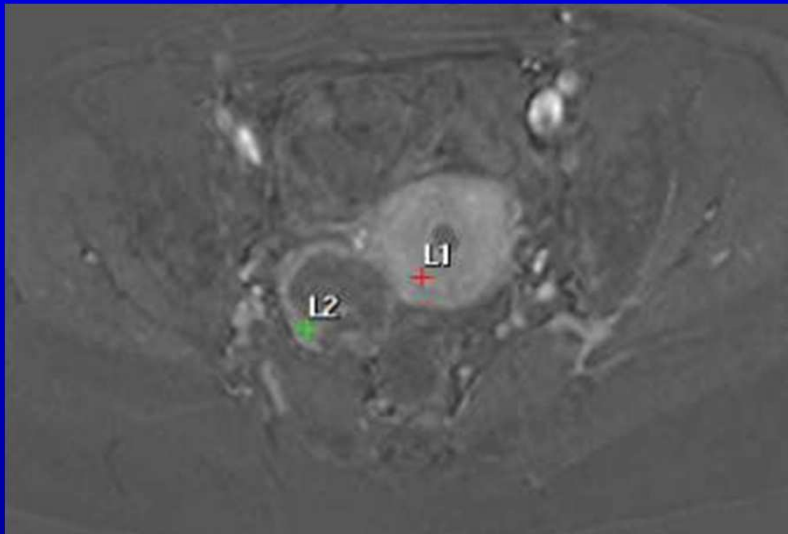
$b_{1000}$



ADC=1,1



# Perfusion



Type 3 => métastase ovarienne

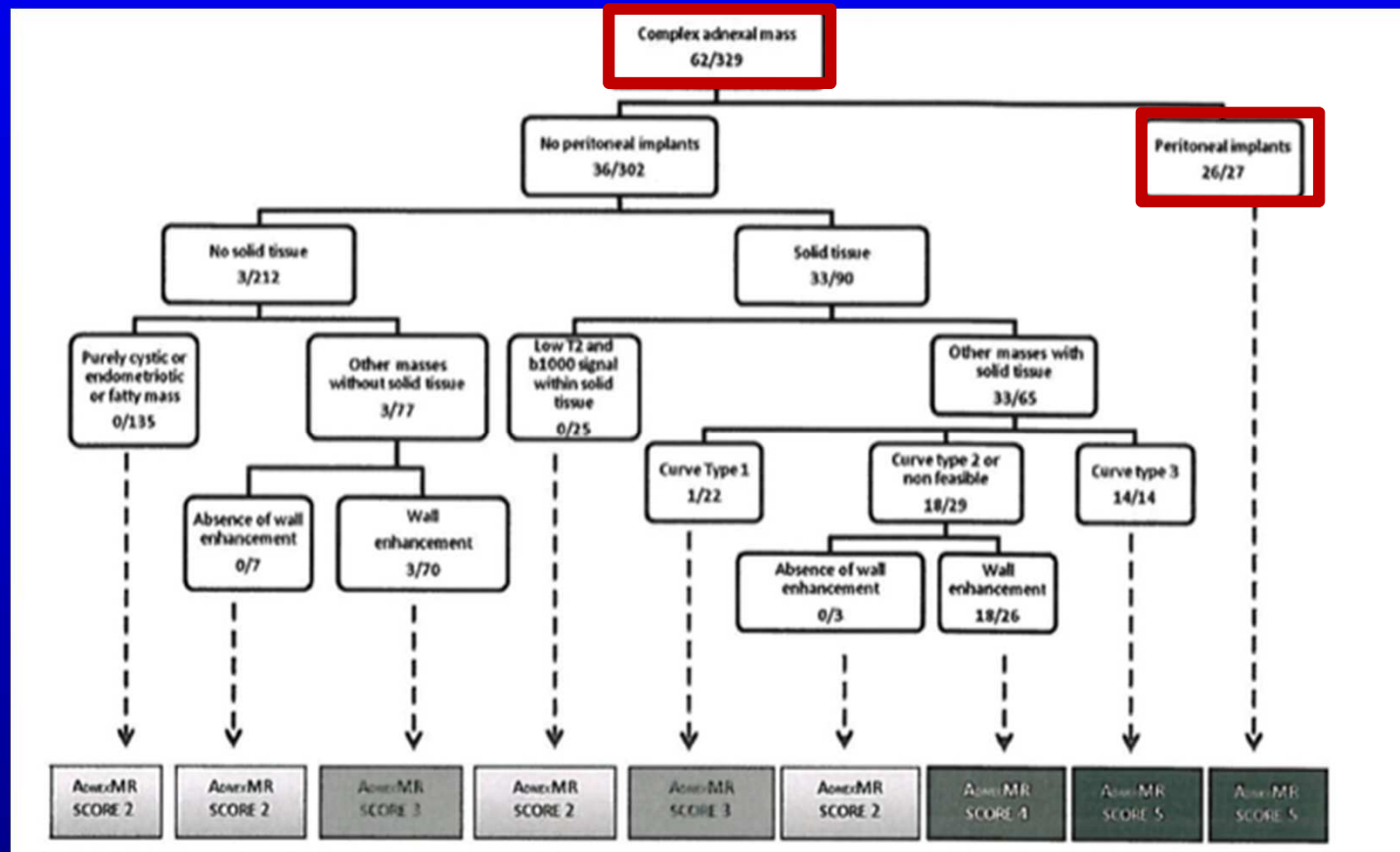
# Masses annexielles

- IRM: précision diagnostique de 70 %
- IRM+ **DWI**: précision diagnostique ↑ de 16%
- IRM+ **perfusion**: précision diagnostique ↑ de 25%
- IRM+ **DWI+ perfusion**: précision diagnostique est de 91-98 % ( exclusion des endométriomes et dermoïdes)

# Conclusion

- Donc, masses annexielles
  - Hypo  $b_{1000}$  et Hypo T2= bénin
  - Hyper  $b_{1000}$ 
    - Séquences anatomiques
    - Perfusion

# Score lésionnel



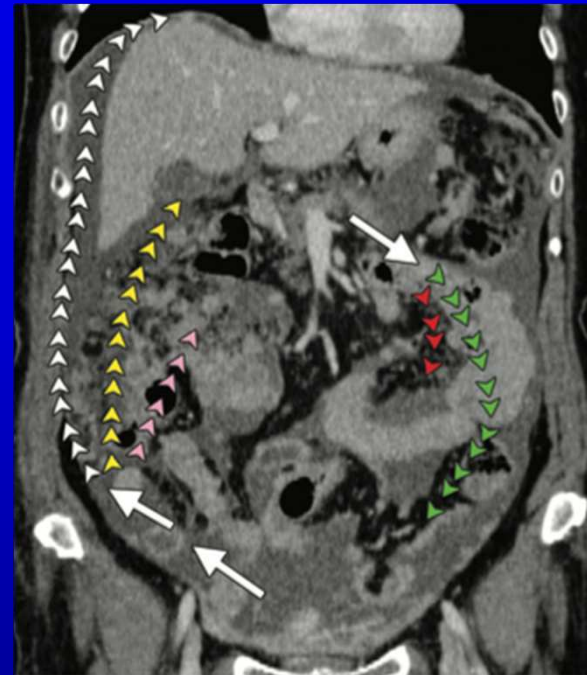
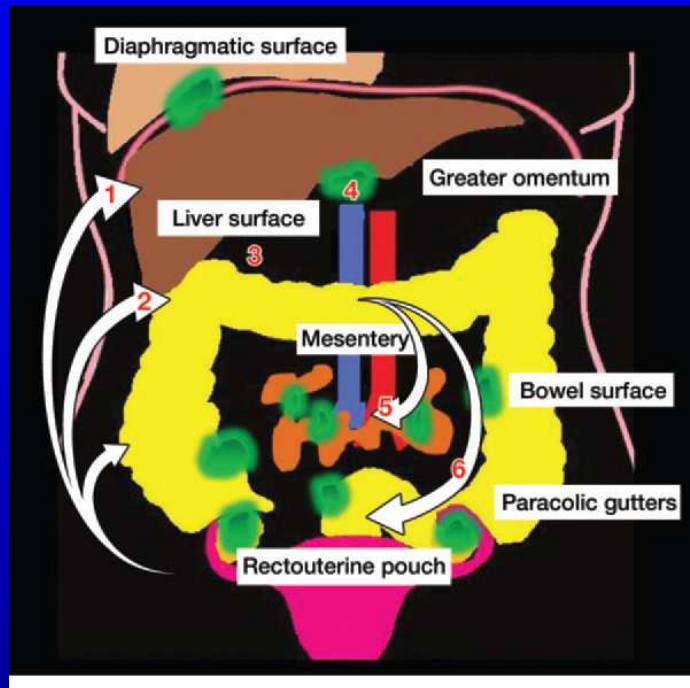
# Cancer ovaire et carcinomatose péritonéale

- Cancer ovaire, 2<sup>ème</sup> cancer gynécologique et diagnostic tardif
  - Stade III: carcinomatose péritonéale
  - Stade IV: métastases
- Mauvais pronostic: taux survie à 5 ans 20-40% stade III et 10% stade IV

# Carcinomatose péritonéale

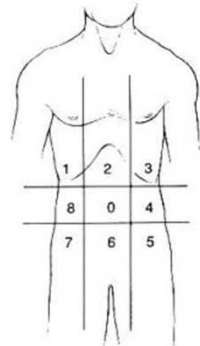
- Pronostic de la patiente dépend de la résection ou disparition complète des implants => importance de la détection *exhaustive*
- L'ampleur et la localisation anatomique de la carcinomatose dicte le choix du traitement
  - Cyréduction primaire ou chimiothérapie néoajuvante => cartographie précise de la carcinomatose péritonéale

# Carcinomatose péritonéale



# Carcinomatose péritonéale

## Peritoneal Cancer Index



### Regions

- 0 Central
- 1 Right Upper
- 2 Epigastrium
- 3 Left Upper
- 4 Left Flank
- 5 Left Lower
- 6 Pelvis
- 7 Right Lower
- 8 Right Flank
- 9 Upper Jejunum
- 10 Lower Jejunum
- 11 Upper Ileum
- 12 Lower Ileum

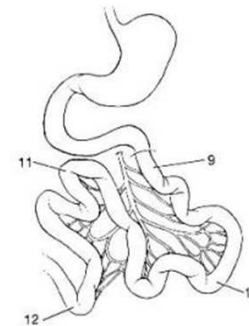
PCI

### Lesion Size

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### Lesion Size Score

- LS 0 No tumor seen
- LS 1 Tumor up to 0.5 cm
- LS 2 Tumor up to 5.0 cm
- LS 3 Tumor > 5.0 cm  
or confluence





# Carcinomatose péritonéale: imagerie

- US Doppler: sensibilité 69 %
- CT (validé)
- IRM
- FDG-PET/CT

# Carcinomatose péritonéale: imagerie

## CT avec contraste (validé)

- Bonne qualité imagerie avec contraste
- Rapide
- Moins d'artefact respiratoires
- Moindre coût
- Exploration thoraco-abdominale

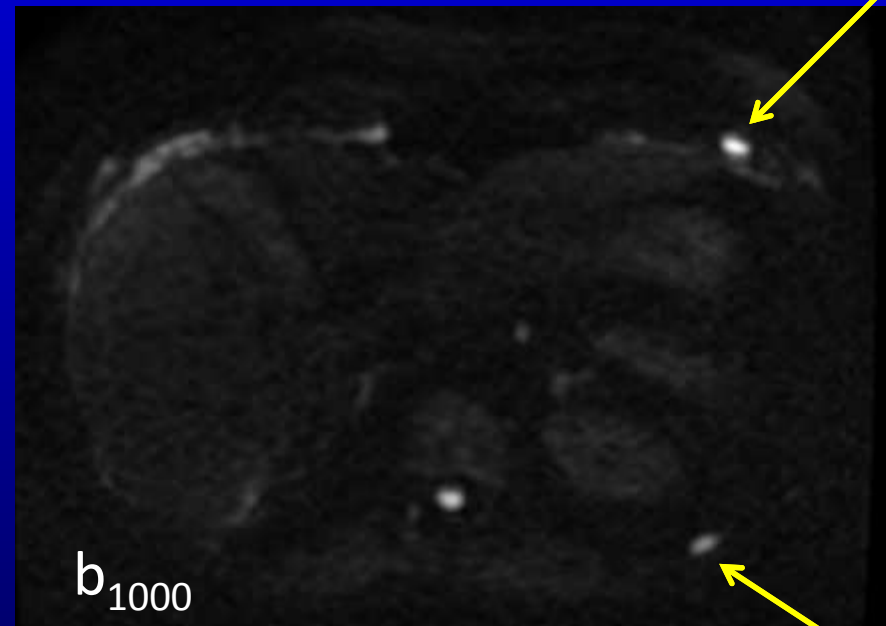
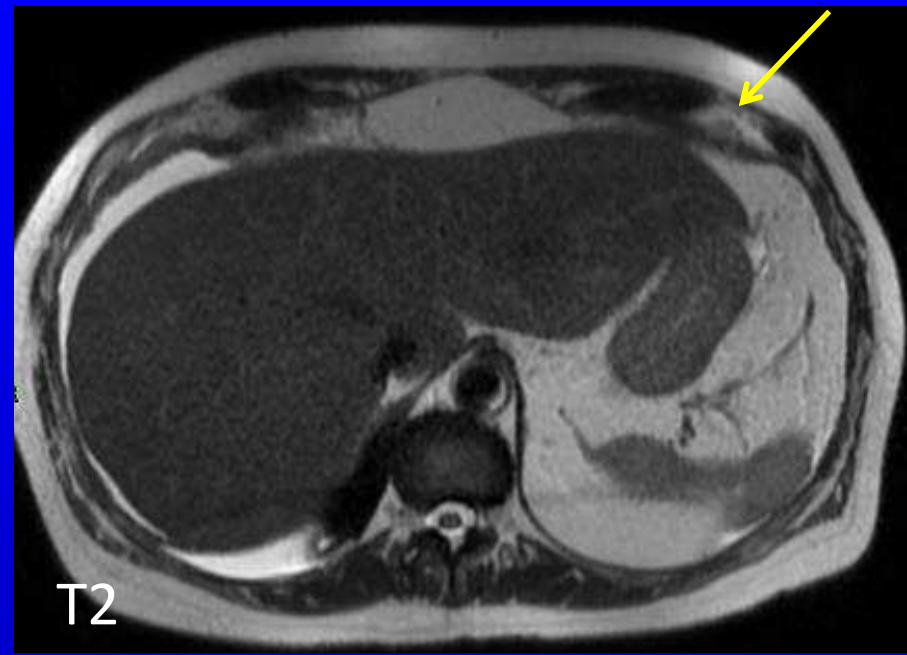
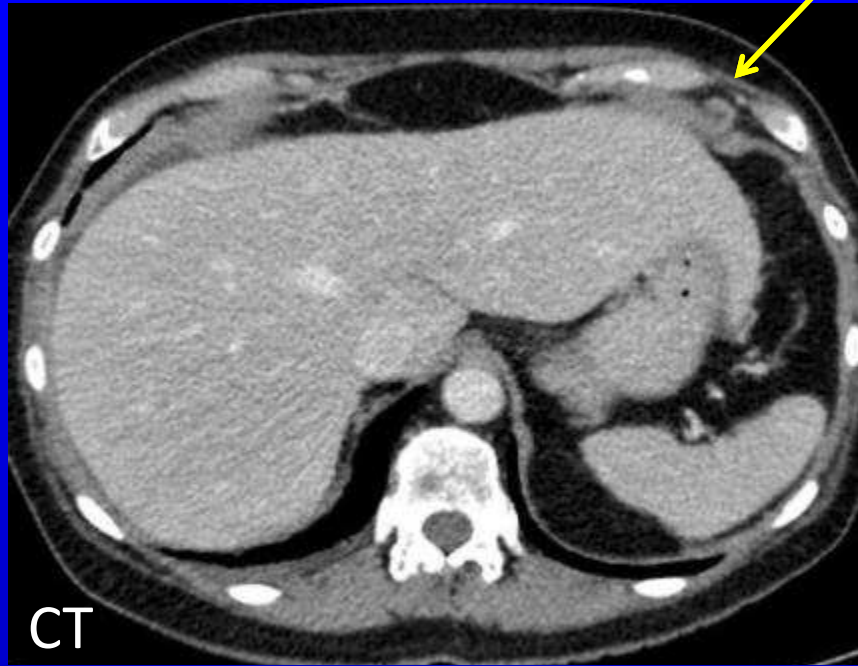
# CT

- Sensibilité 70-90%
  - Dépend du site
  - Taille des lésions
  - Morphologie des dépôts
  - Opacification digestive (optimale)
  - Ascite

Nougaret S. Radiographics 2012

Soussan M. Eur Radiol 2012

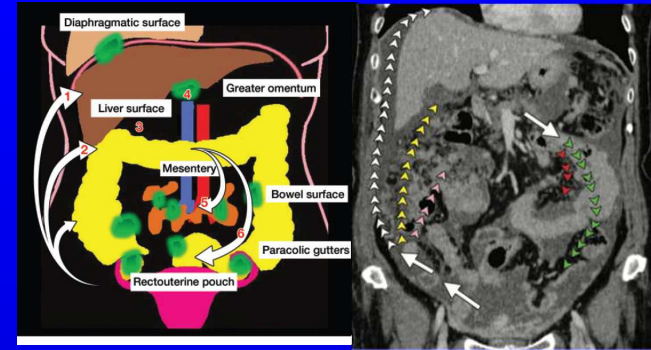
- En fonction du site, la sensibilité passe de 70-90 % à 25-37 %
  - coupole droite, racine mésentère, séreuse grêle
- Si taille < à 1cm, la sensibilité passe de 70-90 % à 7-50 %



# Imagerie et techniques

- MR-DWI
- FGD-PET/CT

# DWI

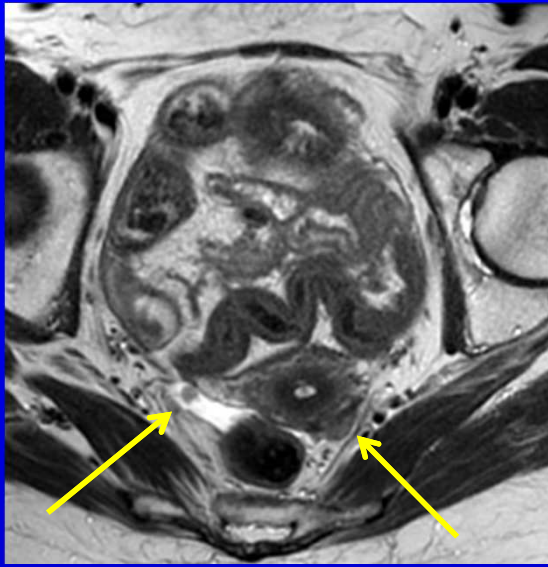


- Séquences anatomiques
- Axial DWI abdominal complet: des coupes diaphragmatiques au pubis
- $b_0$  et  $b_{1000-1200}$  plus le  $b$  est élevé, plus on est spécifique mais moins sensible
- T2 dans le même plan et même épaisseur de coupe
- Carte ADC
- Fusion

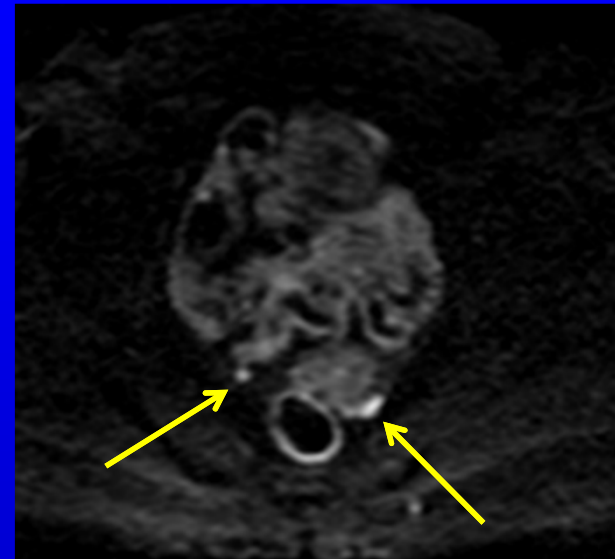
# DWI

- But= DETECTION optimale des lésions
- $b_{1000}$  : hypersignal sur les implants de carcinomatose et effacement du reste
  - Ascite
  - Anses digestives ( il faut un b élevé)
  - Graisse
- Flash en hypersignal sur les sites difficiles à explorer: coupole droite, anses digestives, pelvis..

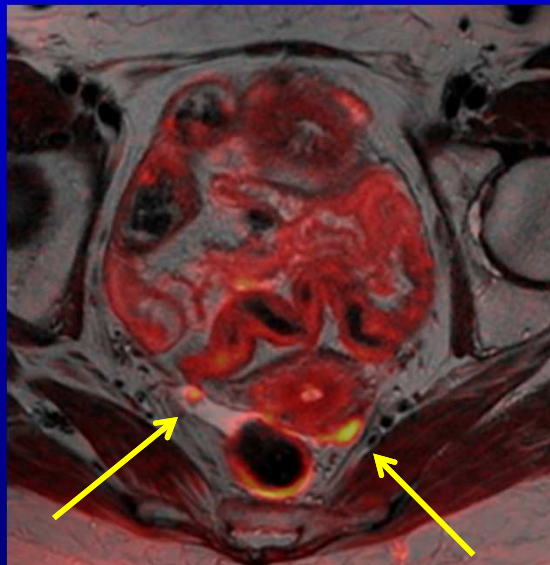




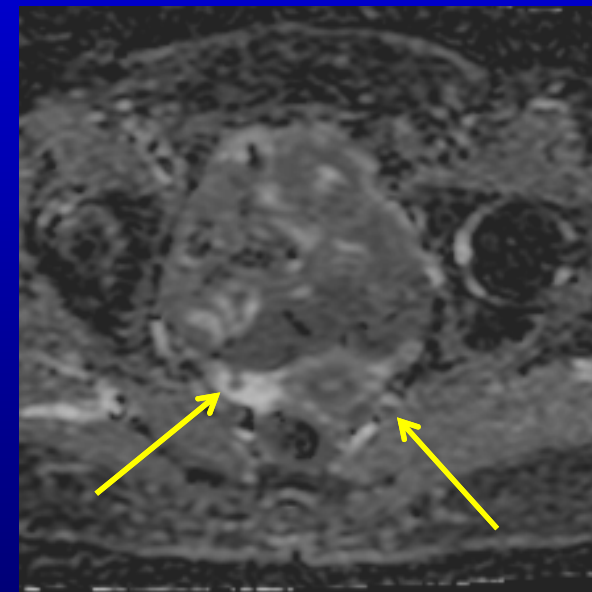
T2



b<sub>1000</sub>



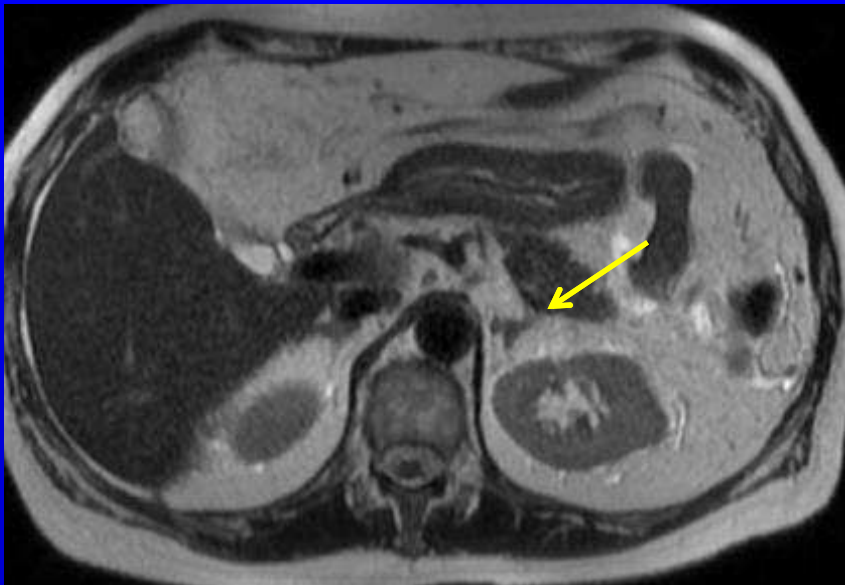
Fusion b<sub>1000</sub> / T2



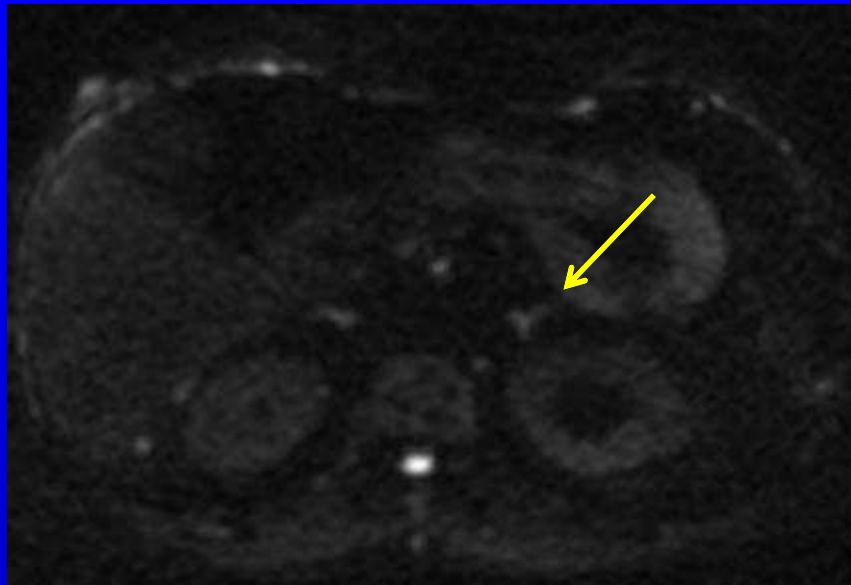
ADC

# Limites DWI

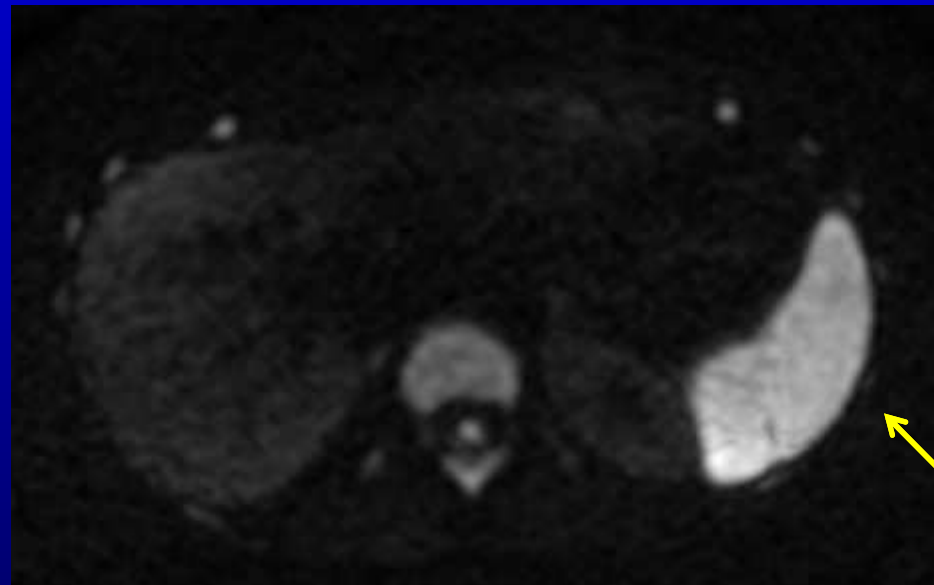
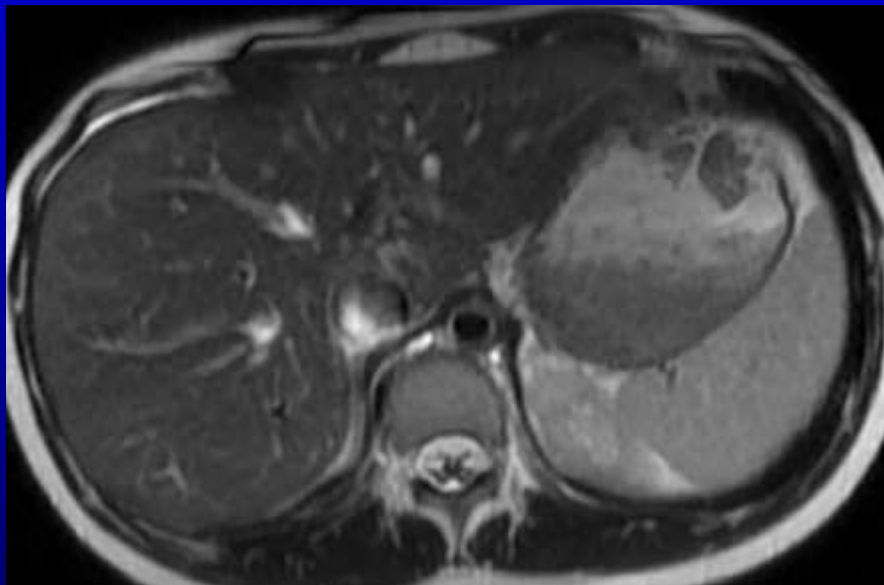
- Hypersignal en  $b_{1000}$ 
  - Rate
  - Ganglions
  - Surrénales
- Effet T2 shine-through: hypersignal persistant en  $b_{1000}$  sur des structure à fort T2 (F+) => séquences anatomiques et ADC
- Artefact de distorsion



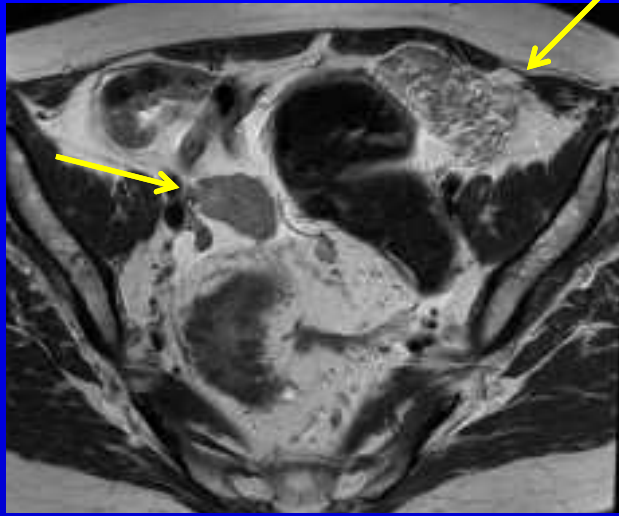
T2



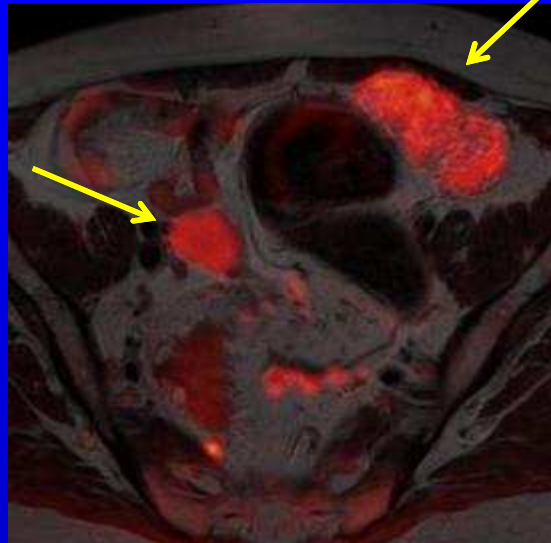
b<sub>1000</sub>



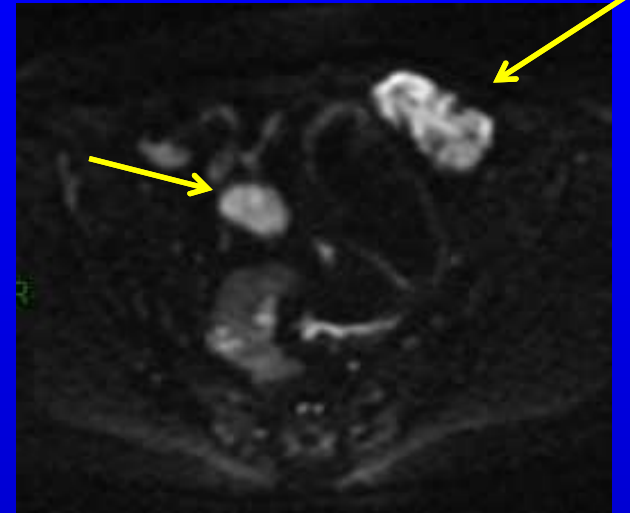
FDG-PET/CT



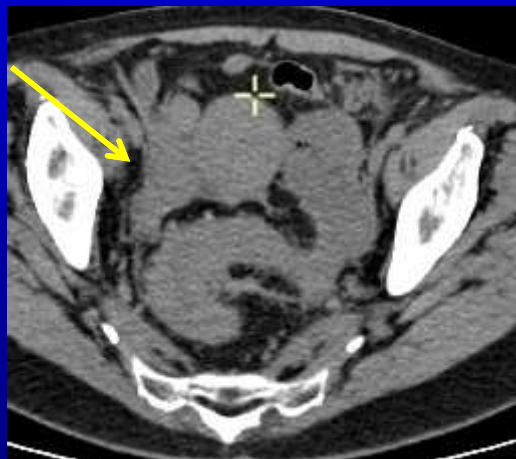
T2



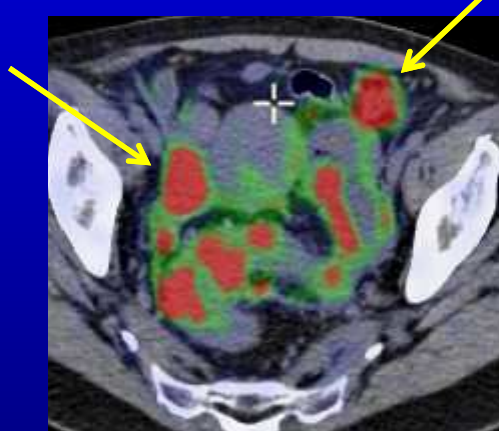
Fusion b1000/T2



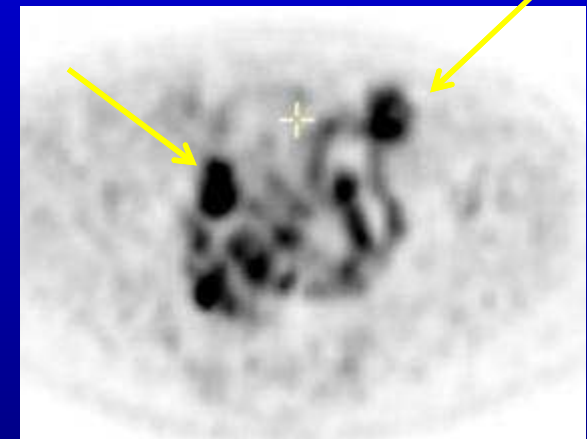
b<sub>1000</sub>



CT



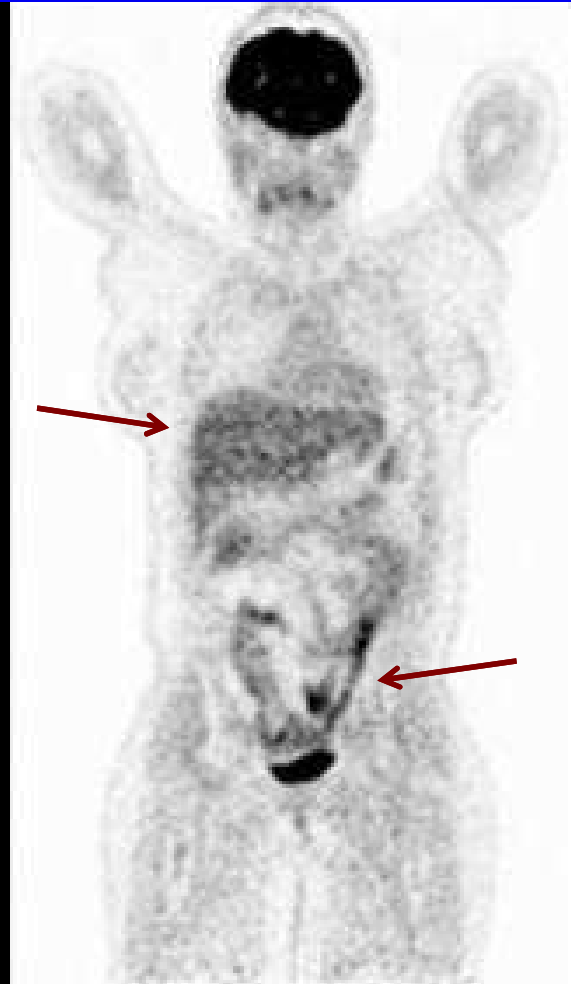
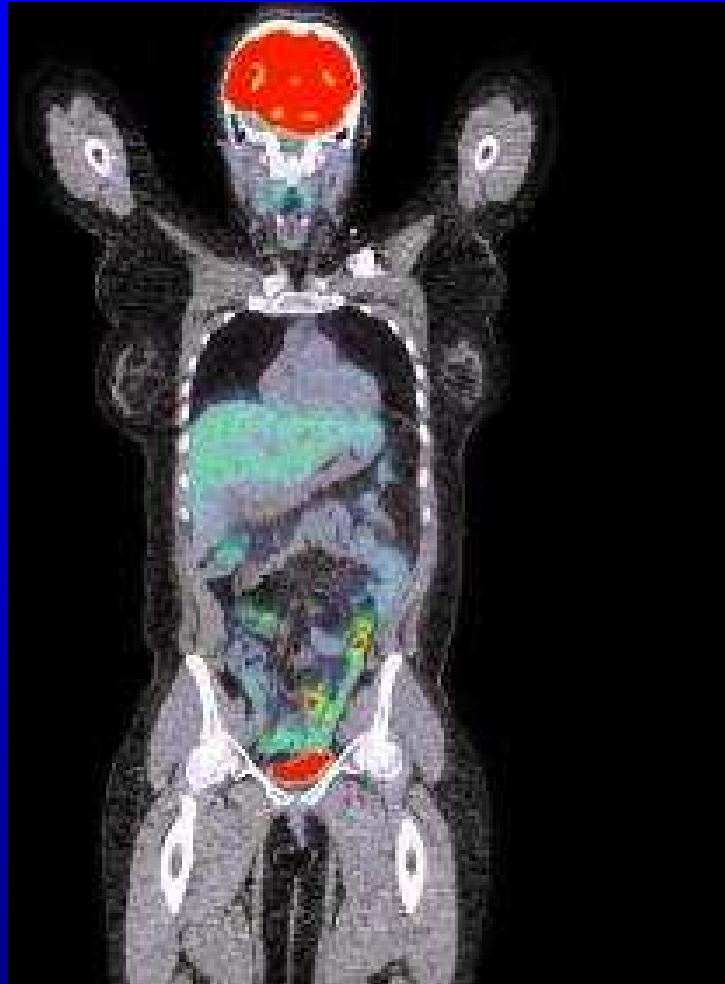
Fusion



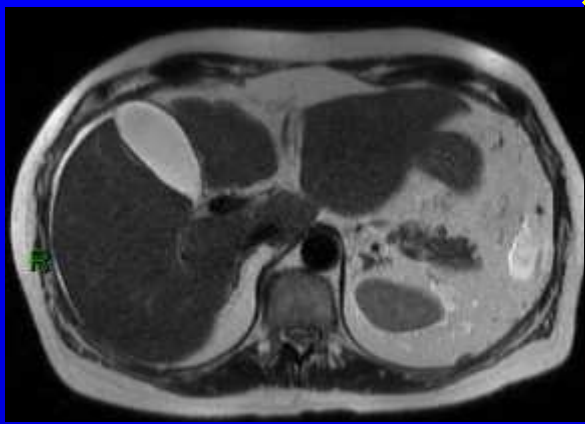
FDG/PET

# FDG-PET/CT: limites

- Résolution spatiale limitée
- Flou lié aux mvts respiratoire: F (-)
- Absorption du FDG par l'estomac, l'intestin: F(+,-)
- Absorption du FDG par le foie: les implants qui captent peu ne sont pas visibles: F (-)



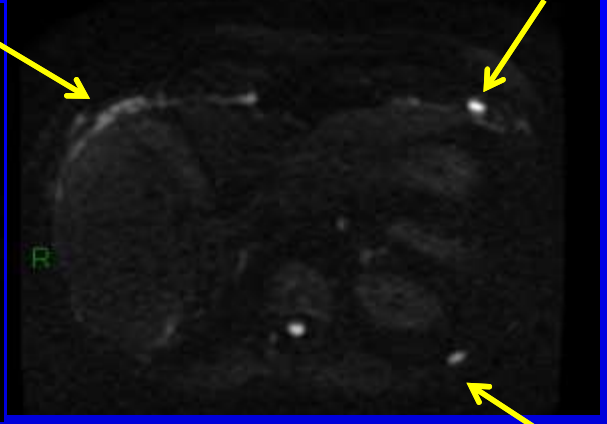




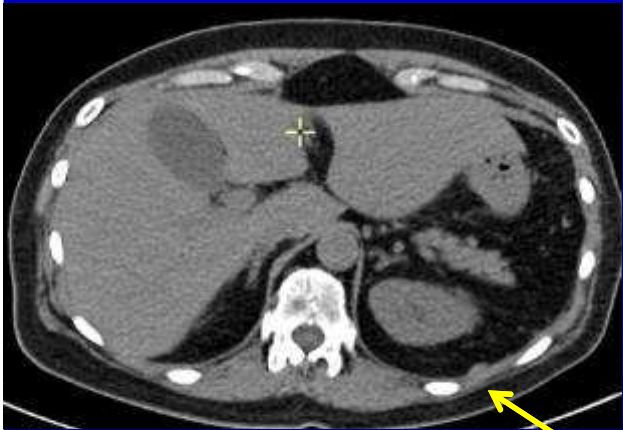
T2



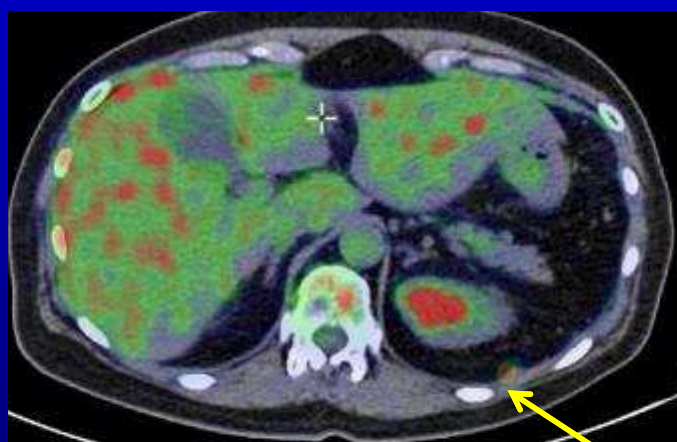
Fusion b1000/T2



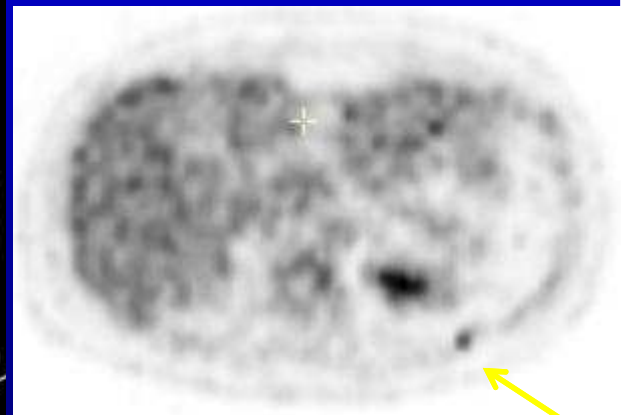
b<sub>1000</sub>



CT

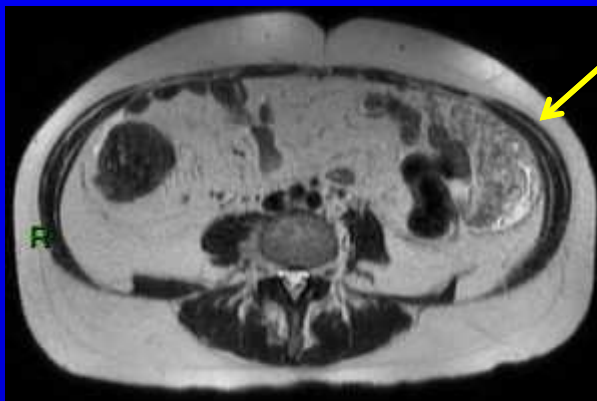


Fusion

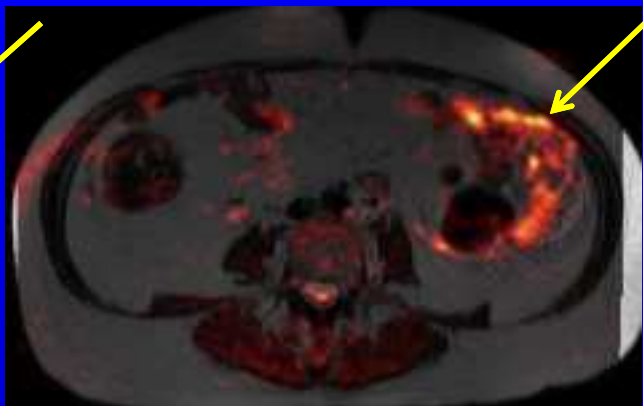


FDG-PET

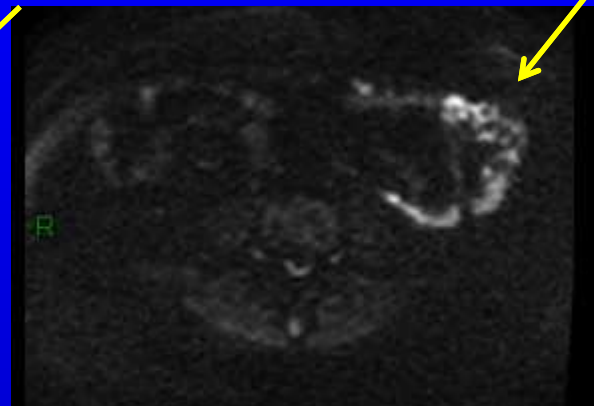




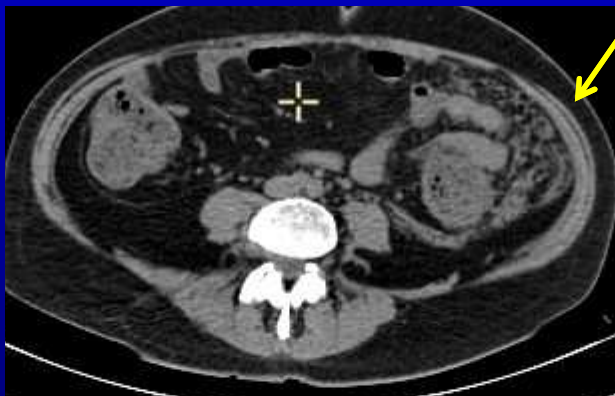
T2



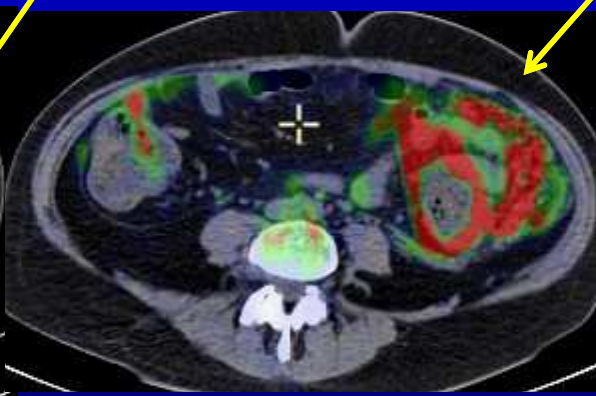
Fusion  $b_{1000}/T2$



$b_{1000}$



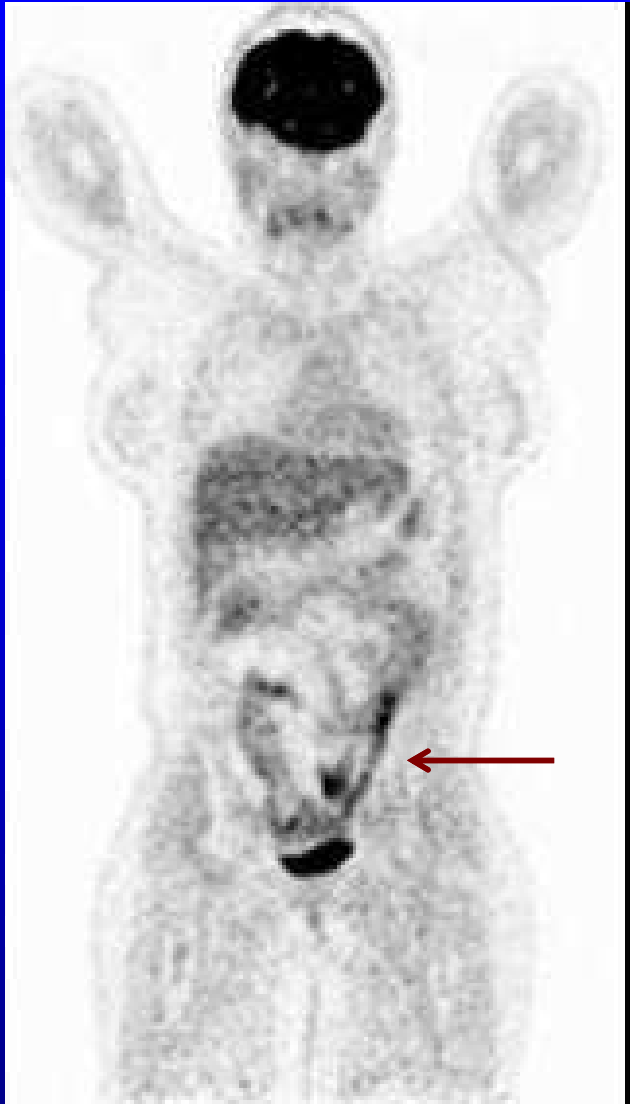
CT



Fusion



FDG/PET



(-)



(+)

<b>Patient par patient</b>	<b>CT</b>	<b>IRM + DWI</b>	<b>PET/CT</b>
Sensibilité	0,83	0,85	0,94
Spécificité	0,87	0,87	0,94
<b>Lésion par lésion</b>	<b>CT</b>	<b>IRM + DWI</b>	<b>PET/CT</b>
Sensibilité	0,76	0,84	0,89

<b>Par patient</b>	<b>DWI</b>	<b>PET/CT</b>
Sensibilité	84	84
Spécificité	82	73
<b>Par site</b>	<b>DWI</b>	<b>PET/CT</b>
Sensibilité	74	63
Spécificité	97	90

# Taille des implants

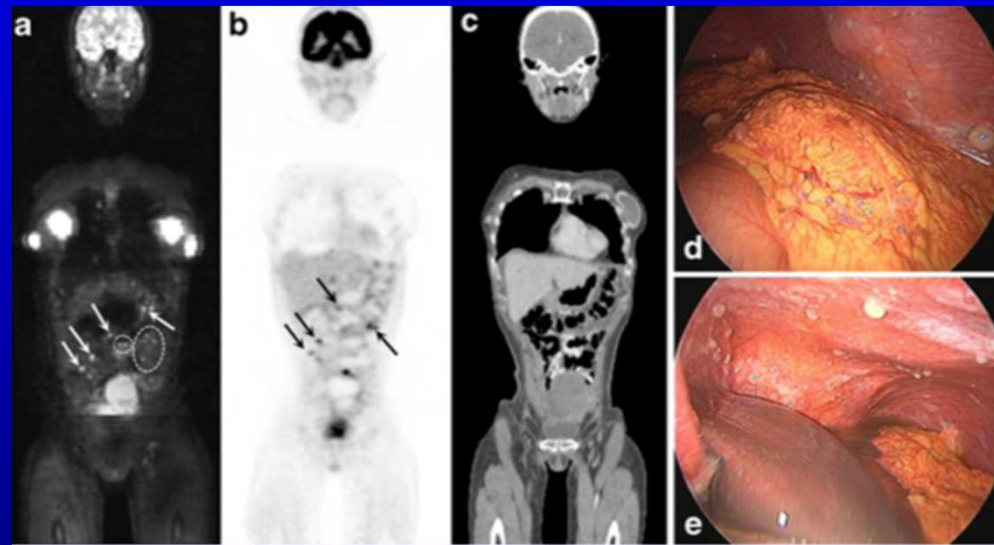
Table 3 Sensitivity of FDG-PET and MR-DWI for detecting the 27 involved sites with subcentimetre or supracentimetre tumour implants

	PET/CT	MR-DWI
Sites with subcentimetre implants (12/27)	42 (5/12)	50 (6/12)
Site with supracentimetre implants (15/27)	80 (12/15)	93 (14/15)

Data are presented as percentage (ratio)

# Perspective

- 11% des patientes ont des métastases à distance (thorax)=> IRM corps entier (WB-DWI/MR)



# Perspective

- Meilleure caractérisation des lésions primaires ovariennes avec le WB-DWI/MRI (Whole-body MRI with diffusion-weighted)
- Carcinomatose péritonéale
  - WB-DWI/MRI > FDG-PET/CT > CT



# Conclusion

- MR-DWI > CT
- MR-DWI = FDG-PET/CT
- WB-DWI/MRI > FDG-PET/CT