

Mammomat B Brilliant

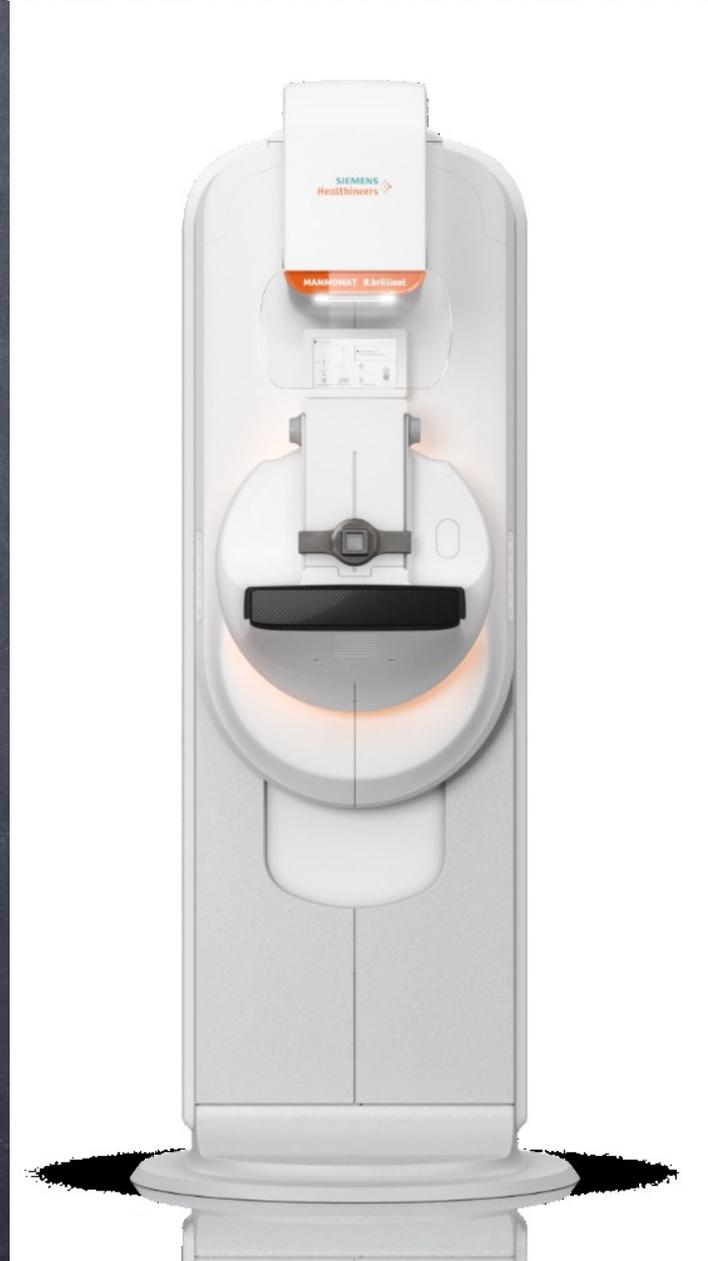
Retour d'expérience

Service Imagerie HP C. Galien

Remerciements Dr M.Keupers; Pr C. Van Ongeval Uz Leuven

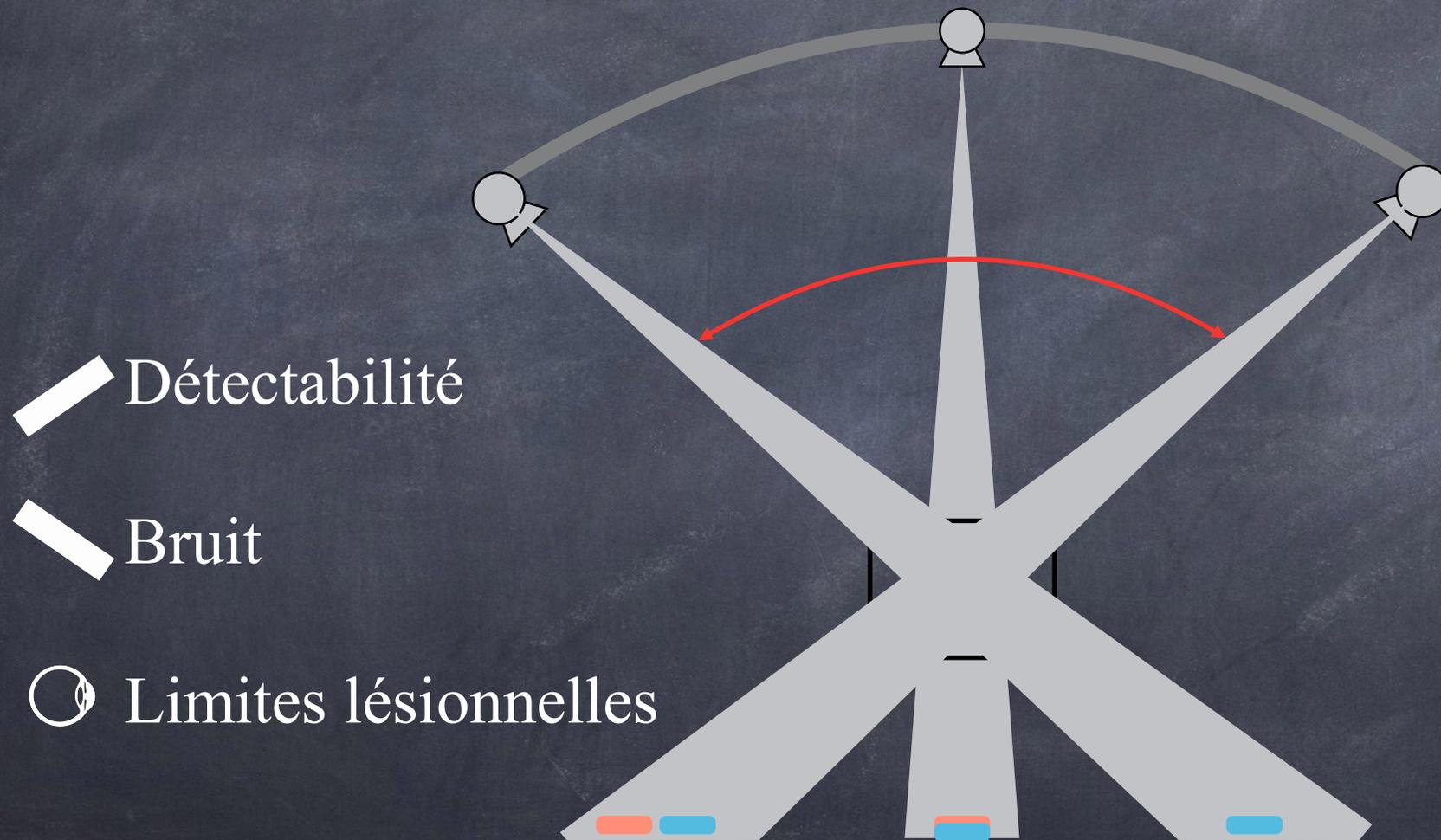
Choix technologiques et multiples offres des constructeurs

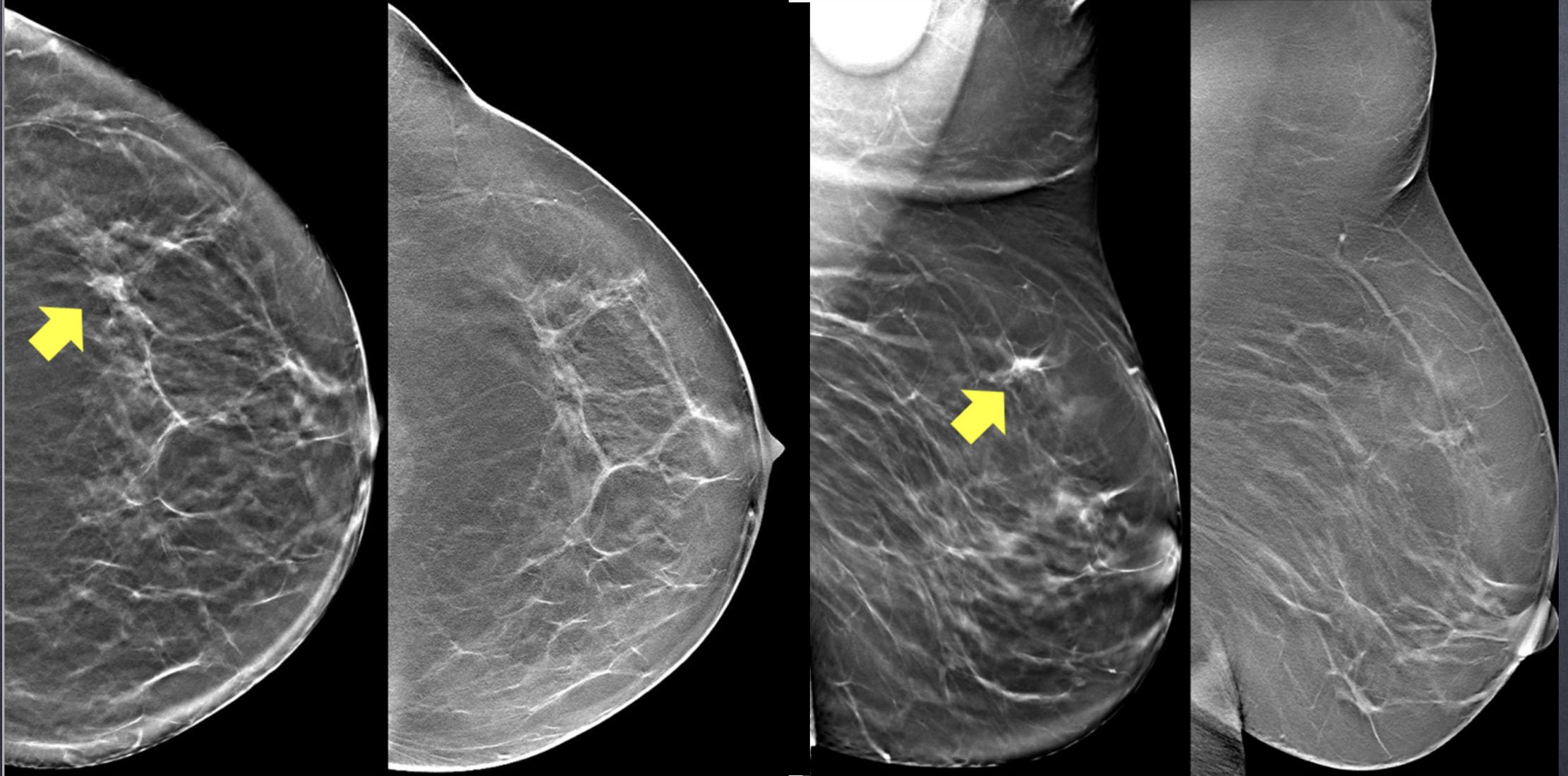
Notre choix



MAMMOMAT B.brilliant

Principe de la tomosynthèse





1) Le balayage avec un angle de 50° en $4,8''$

Modification de l'angle de balayage

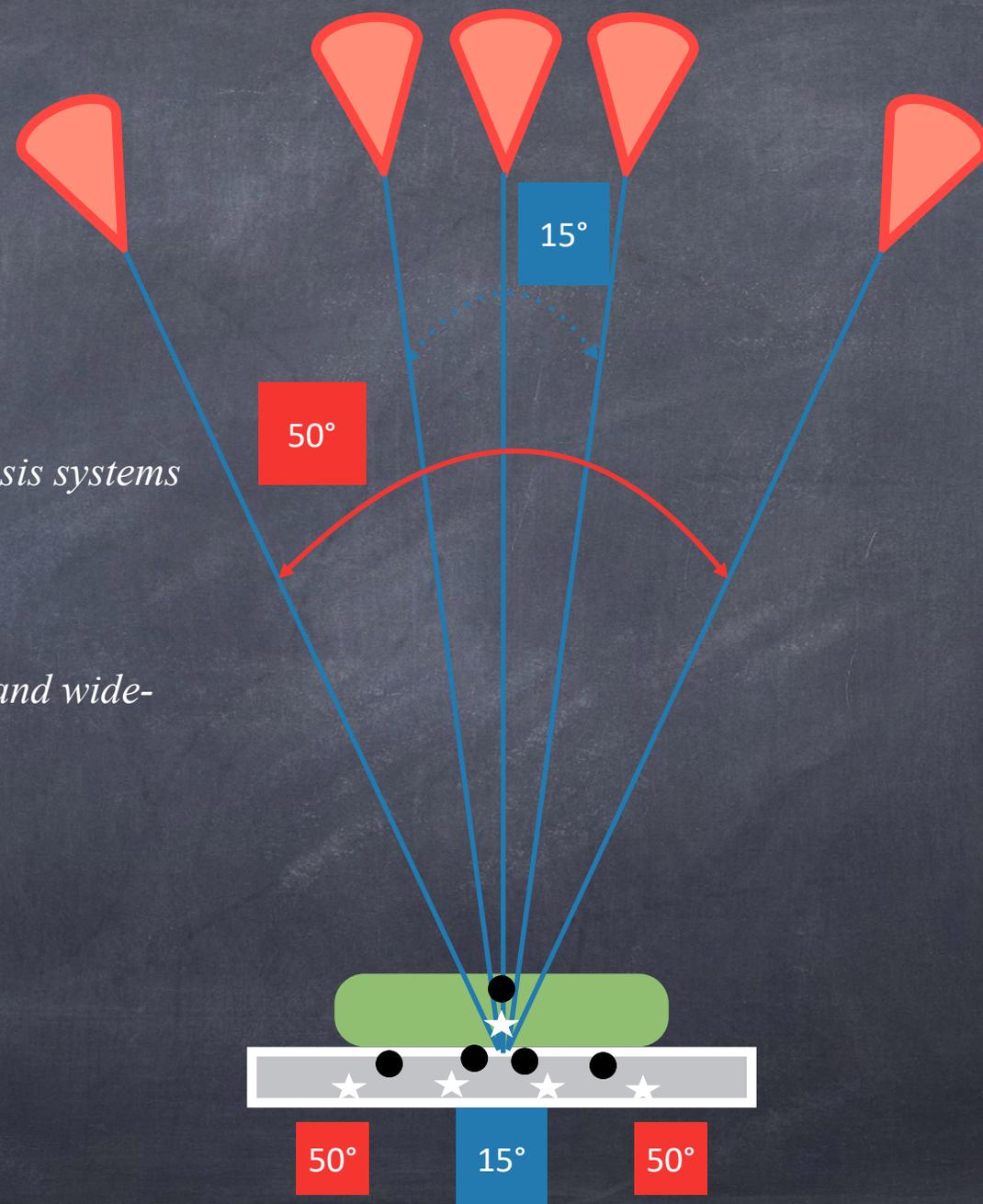
Comparison of narrow-angle and wide-angle digital breast tomosynthesis systems in clinical practice

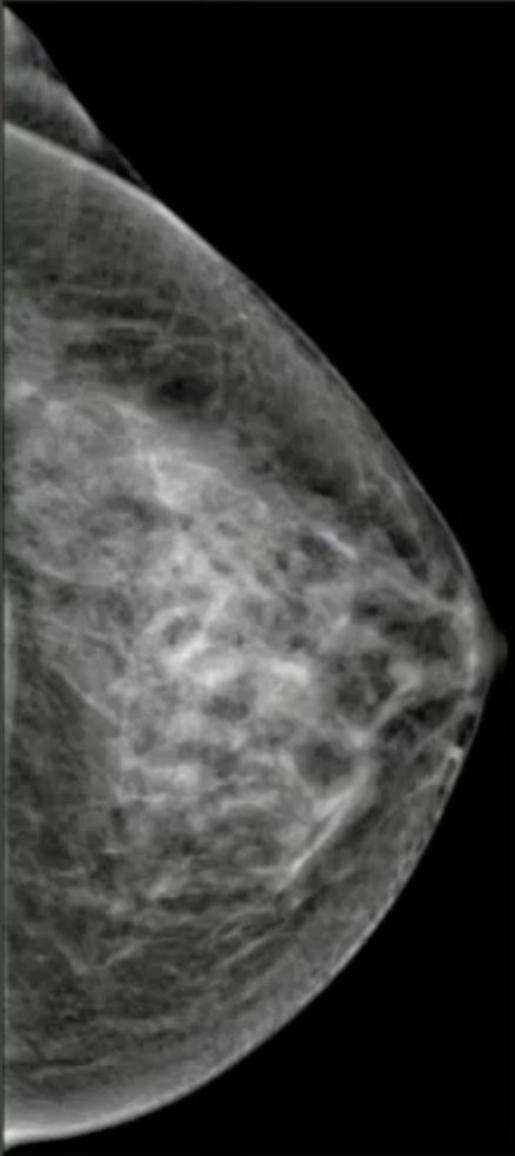
A.M. Winter, St Louis university J. of Med Imag Feb 2021

Comparison of lesion detection and conspicuity between narrow-angle and wide-angle digital breast tomosynthesis for dense and non-dense breasts

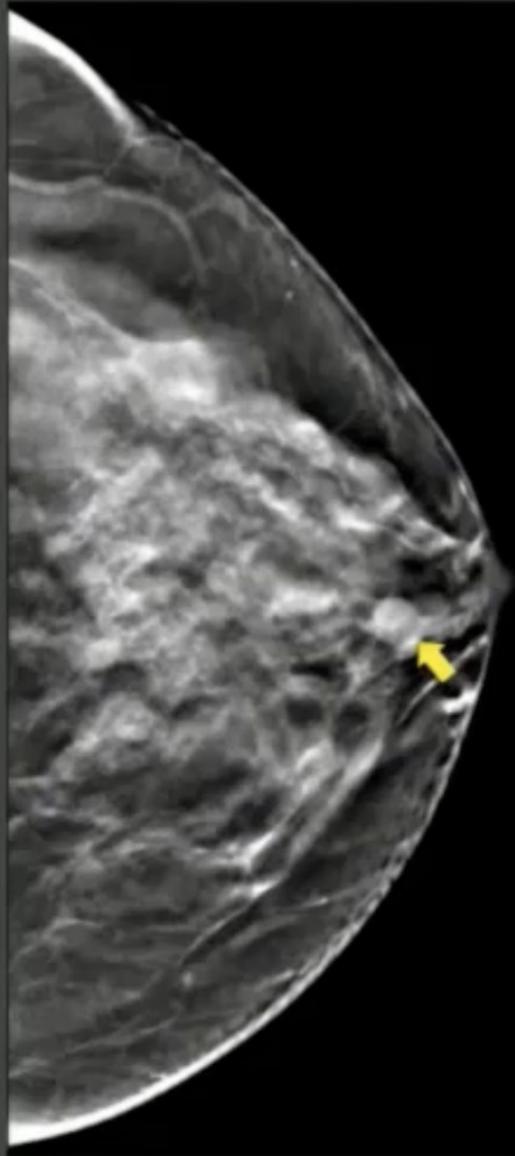
H. Huang et al., Stony Brook Medicine (N.Y.)

J. of Breast Imag Mai 2023

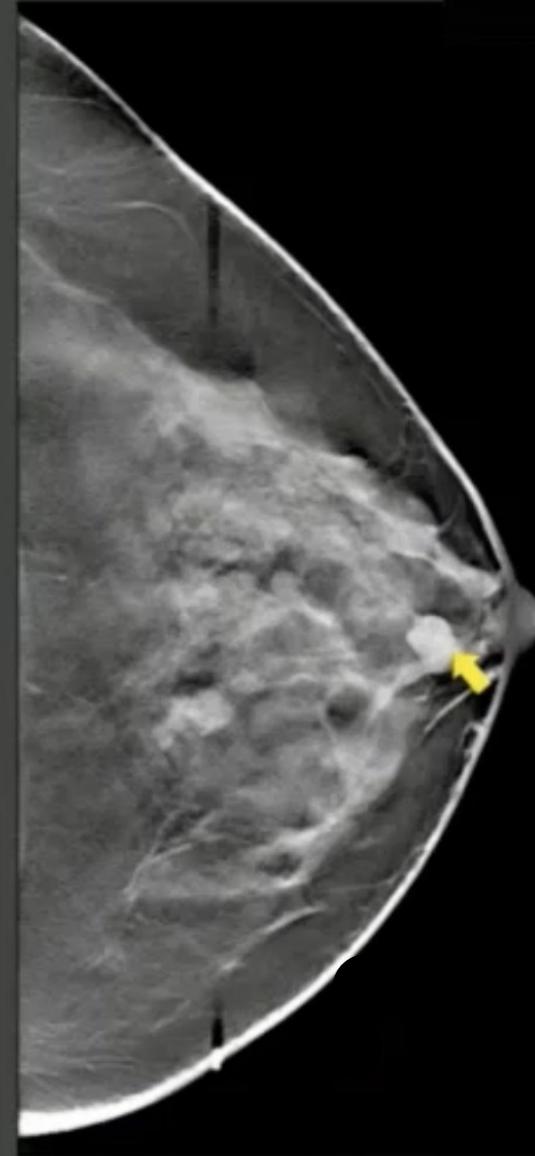




Mammogram

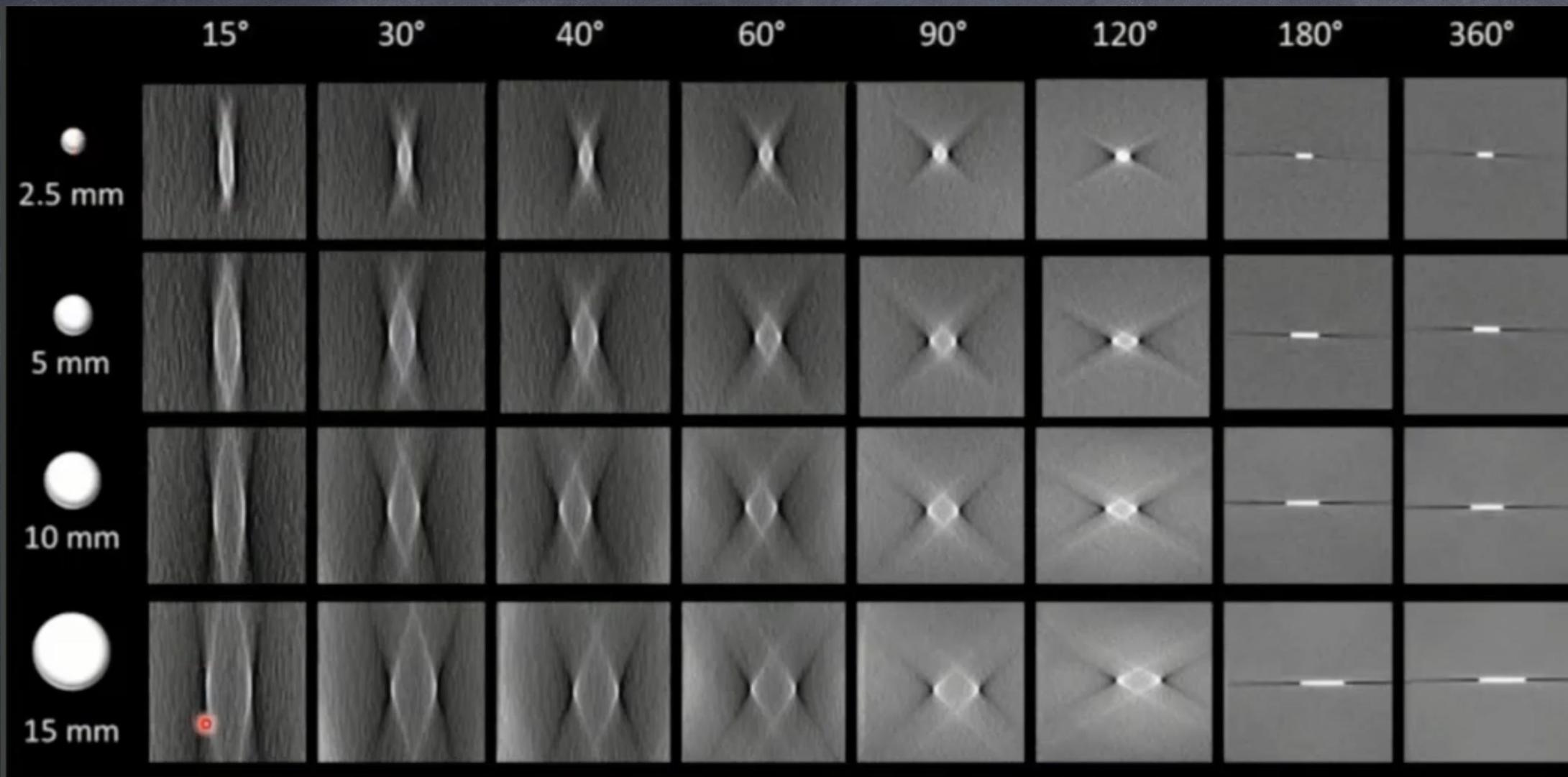


Narrow angle
DBT slice



Wide angle
DBT slice

Etalement



Diminution contraste

A. Nosratieh et al. Med Phys. Déc 2012

Avantages de la tomosynthèse 50°

- Meilleure *délectabilité* des masses
- Meilleure diminution du “*bruit*” de la structure mammaire
- Meilleure *définition des limites* des lésions

2) Le foyer flottant

Taille de point focal plus étroit : meilleure étude des microcalcifications

Balayage 25''
Nécessité du workflow
Foyer fixe

Balayage 4,8''
Workflow intégré
Foyer flottant

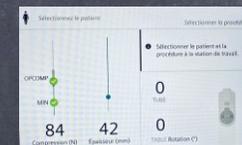
Avant



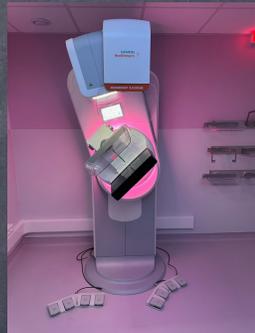
Tomoflow



Après



Mouvement du tube



Tomoflow

Révélation



25''

Transfert de la tomosynthèse

B Brilliant

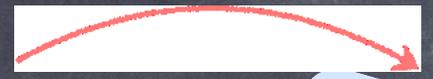


4,8''

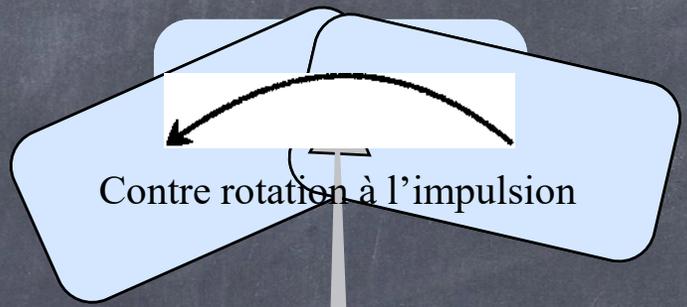
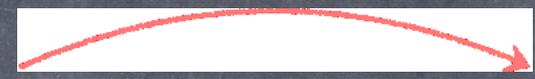
Tomoflow

Le foyer flottant

Mouvement du tube



Mouvement du tube



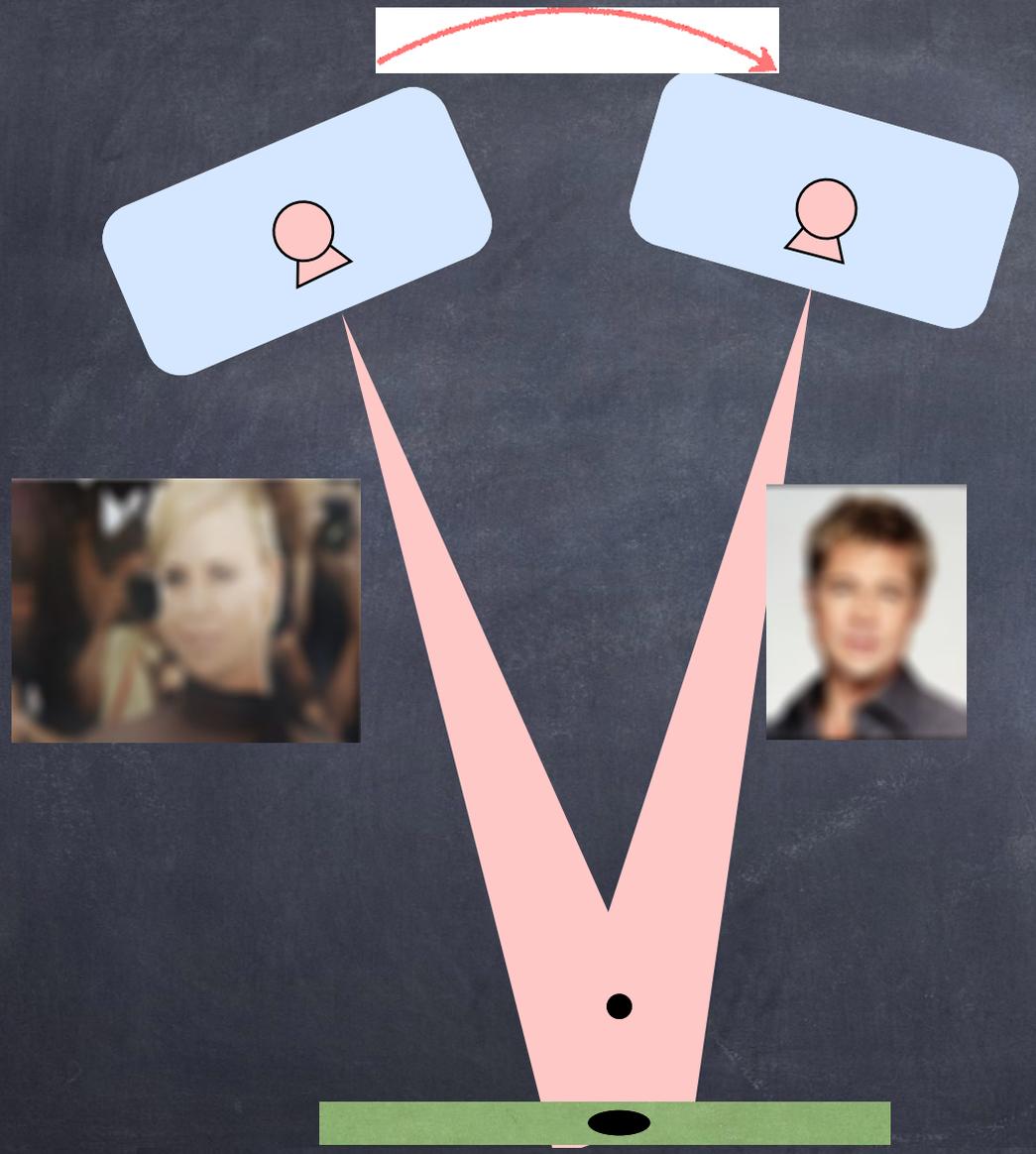
Taille de point focal plus étroit

Réduction de la distorsion

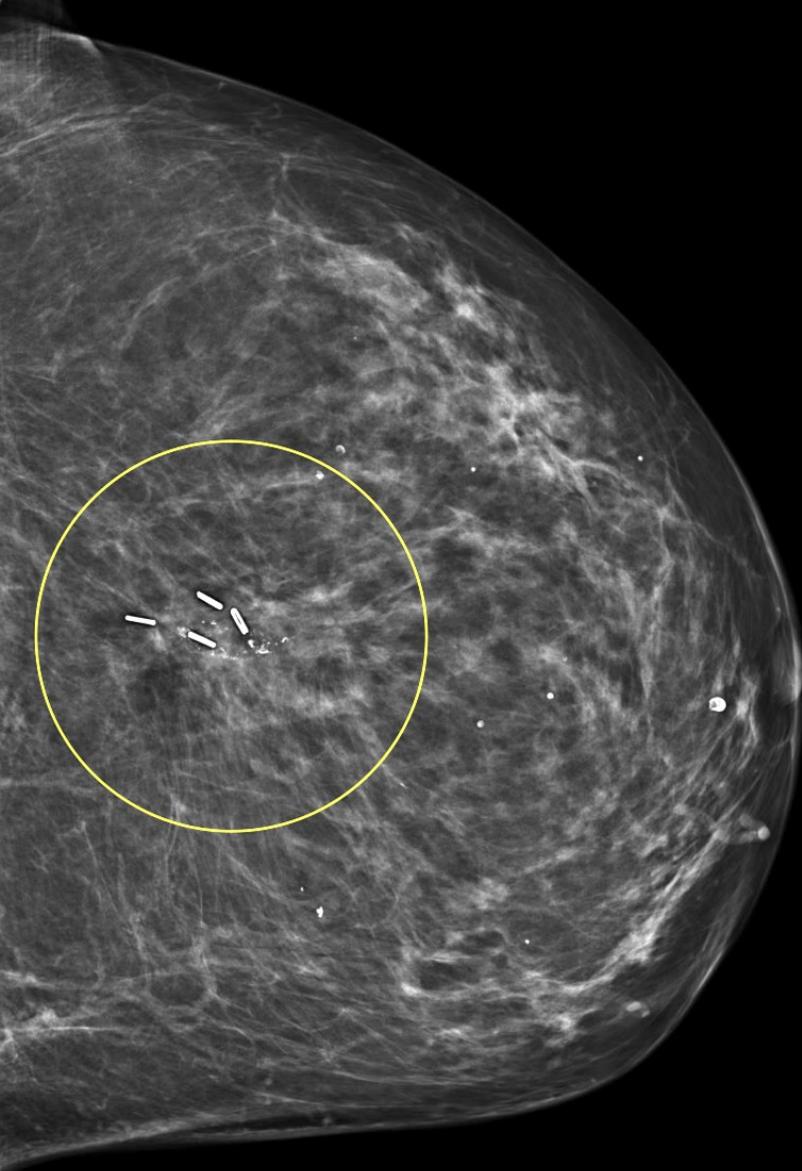
Le foyer flottant

Mouvement du tube

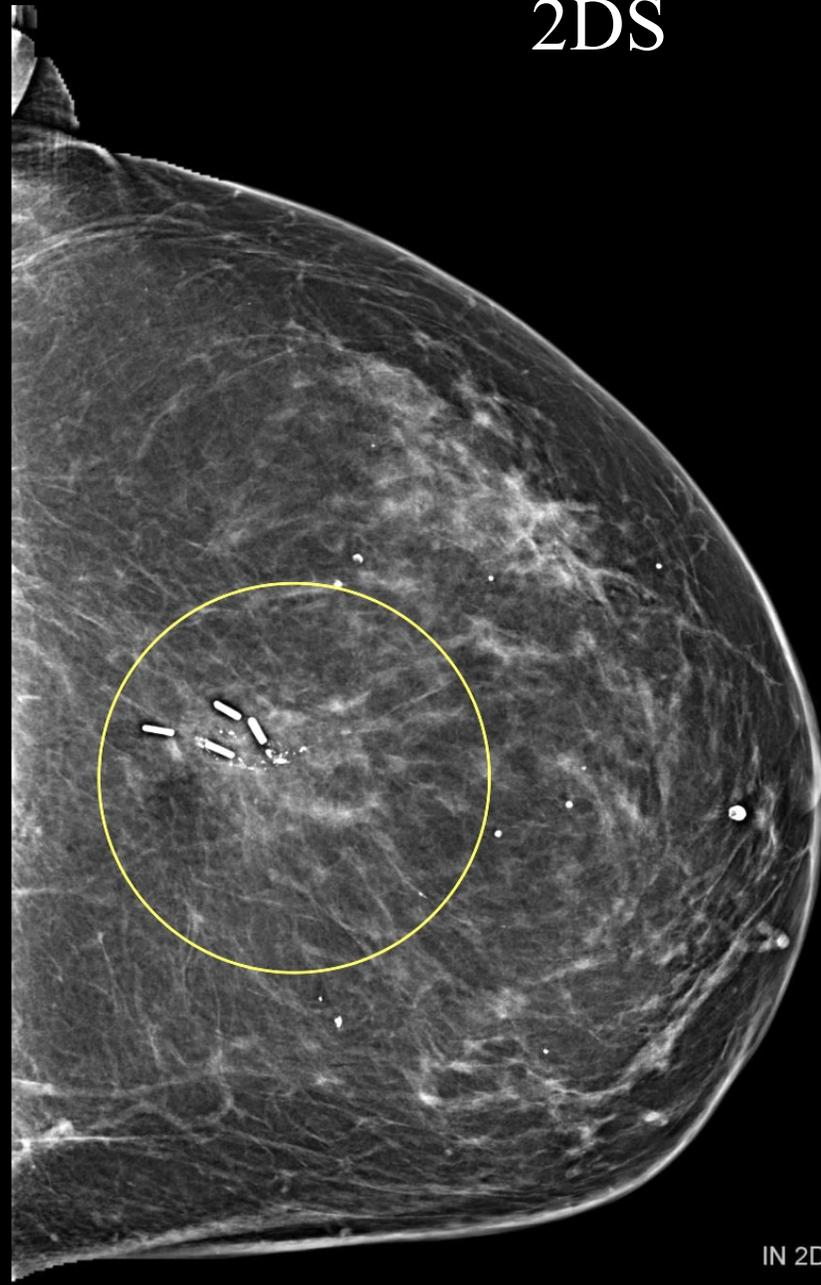
Mouvement du tube



Native

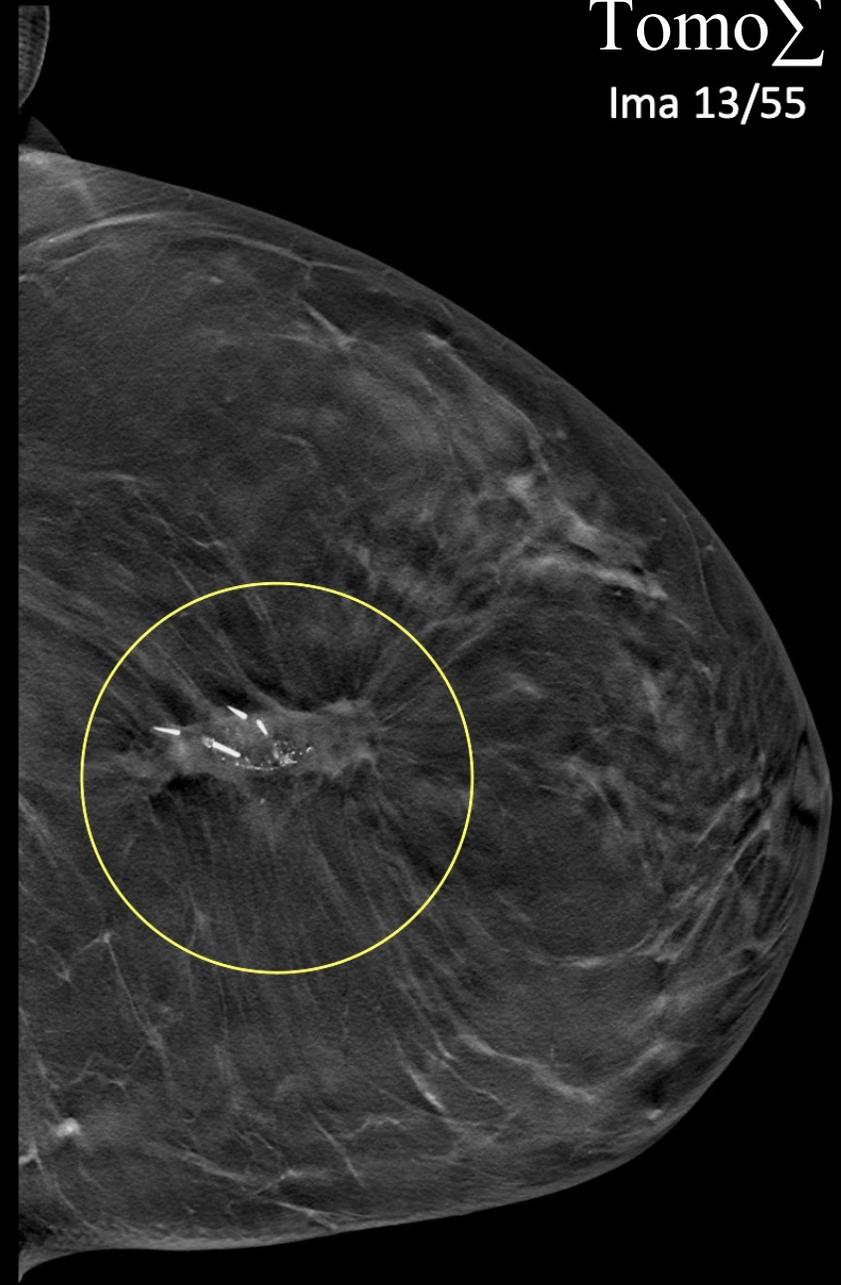


2DS



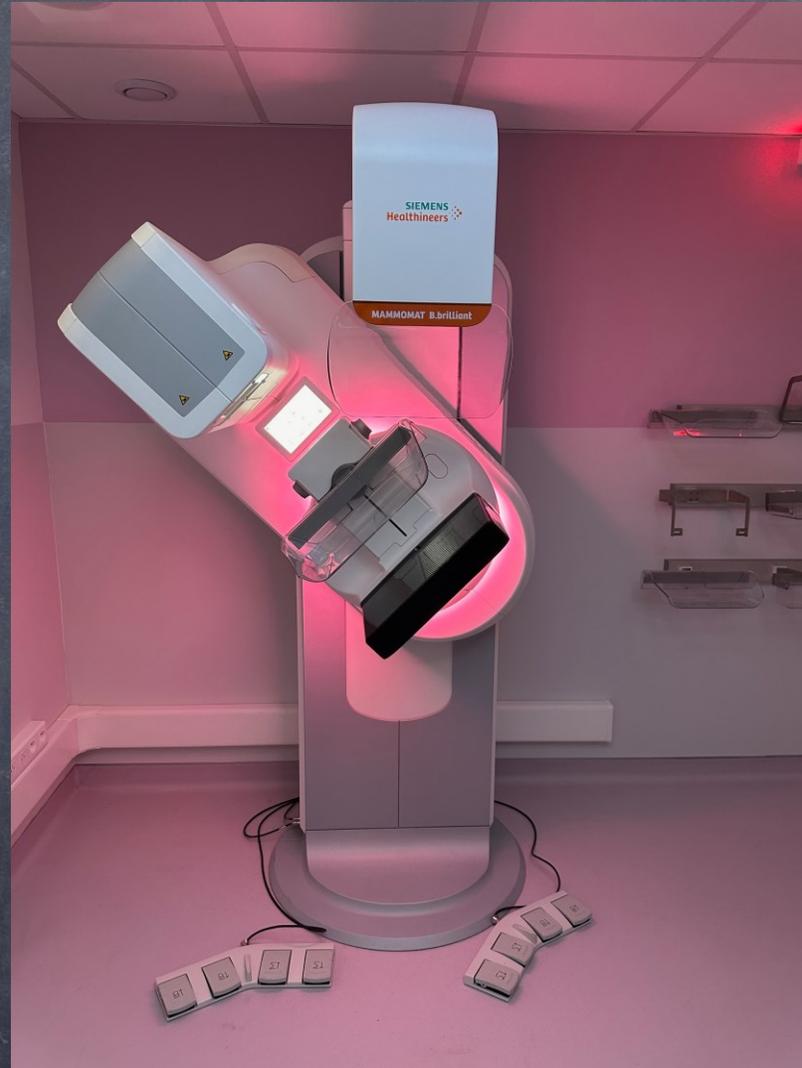
IN 2D

Tomo Σ
Ima 13/55



3) L'ergonomie

Le confort de travail (désaxation du tube)



Position classique



Tube désaxé



4) Le traitement de l'image

Les retraitements de l'image

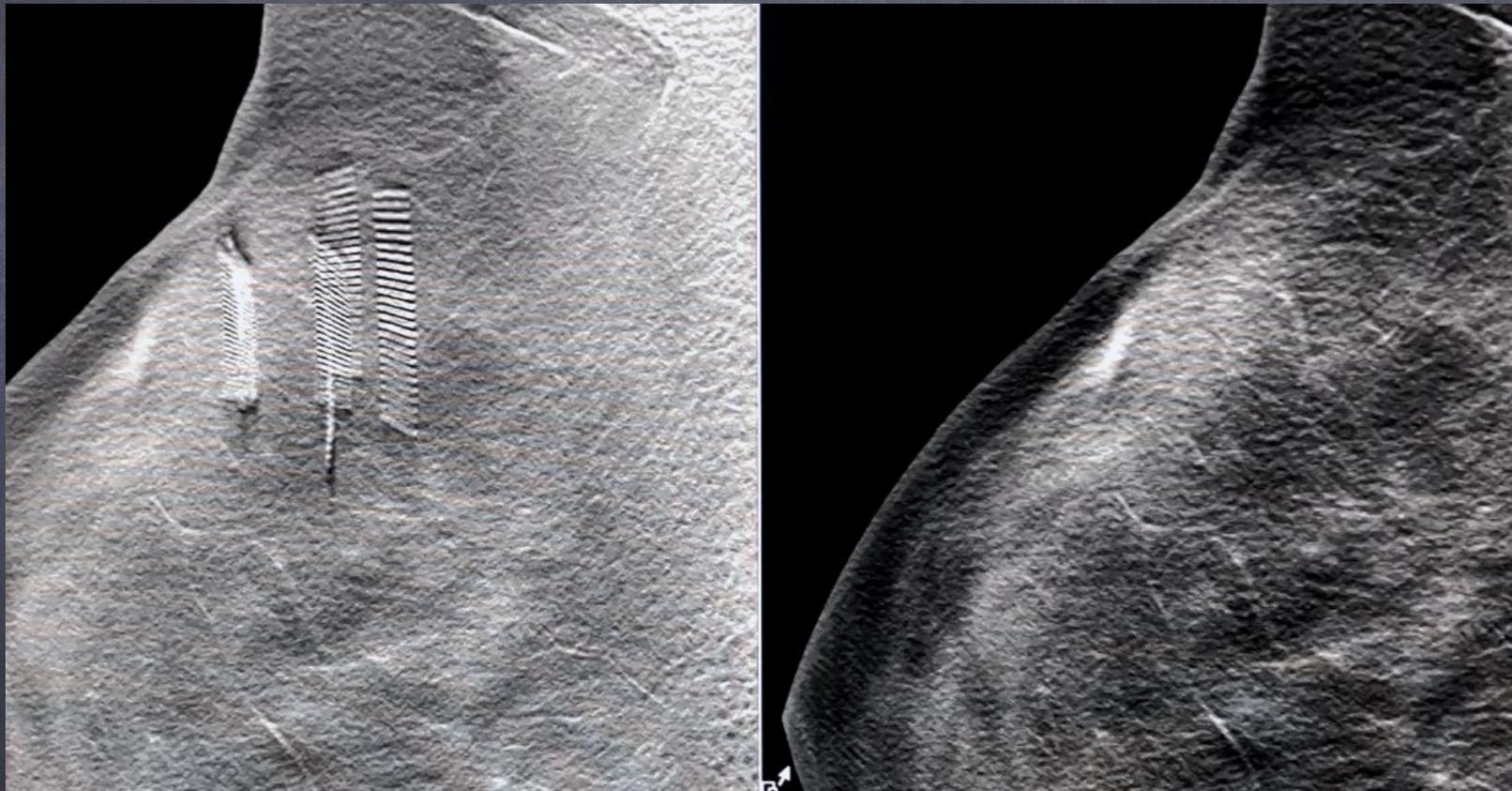
SANS PREMIA



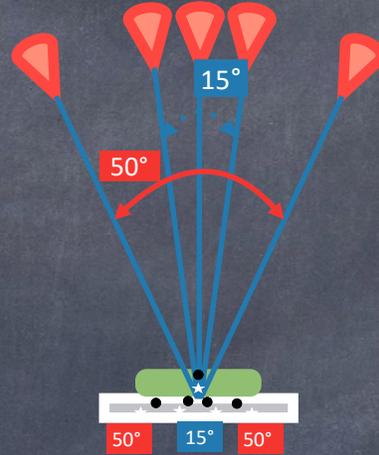
AVEC PREMIA



Les retraitements de l'image



5) Les grands et les petits plus



Le balayage à 50° en 4,8''

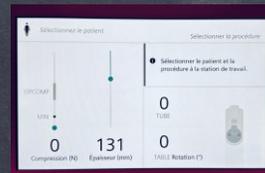
Visualisation de la pièce de prélèvement (inSpect)



Le déclenchement au tube



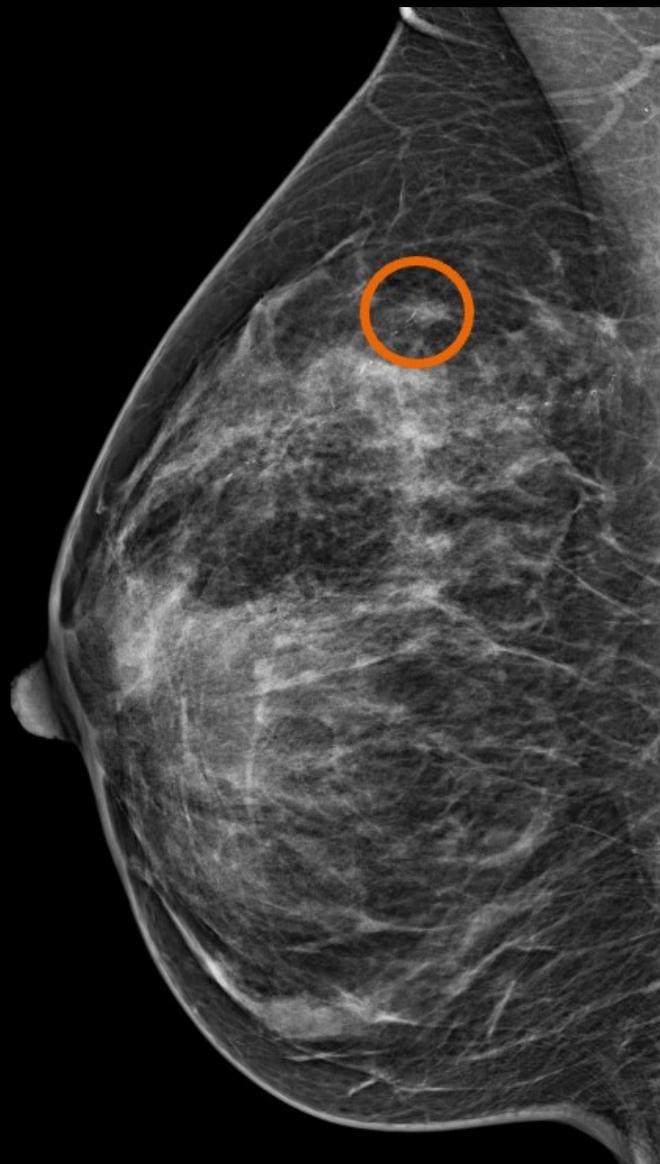
Le suivi temps réel



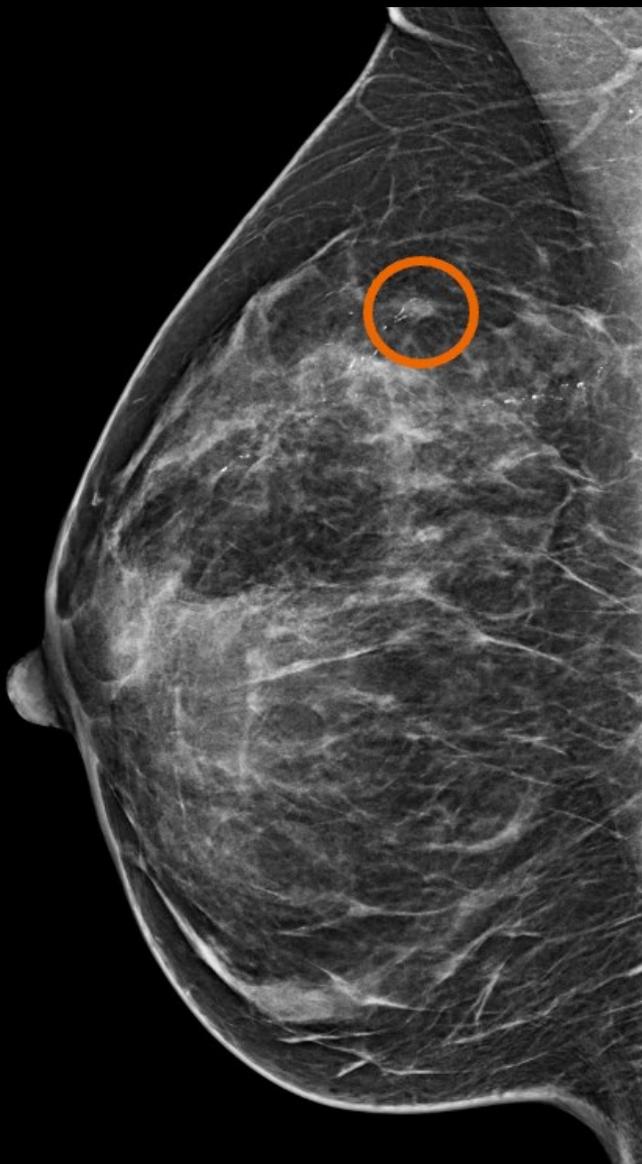
AGE OF TOMOSYNTHESIS IS COMING



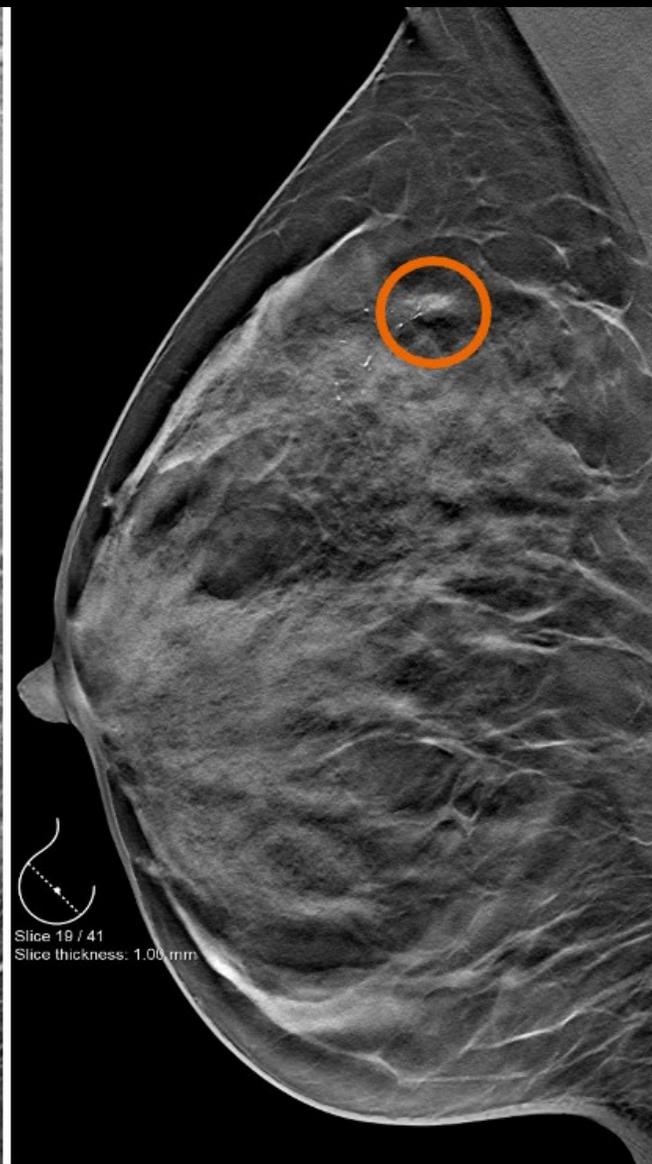
Native 2D



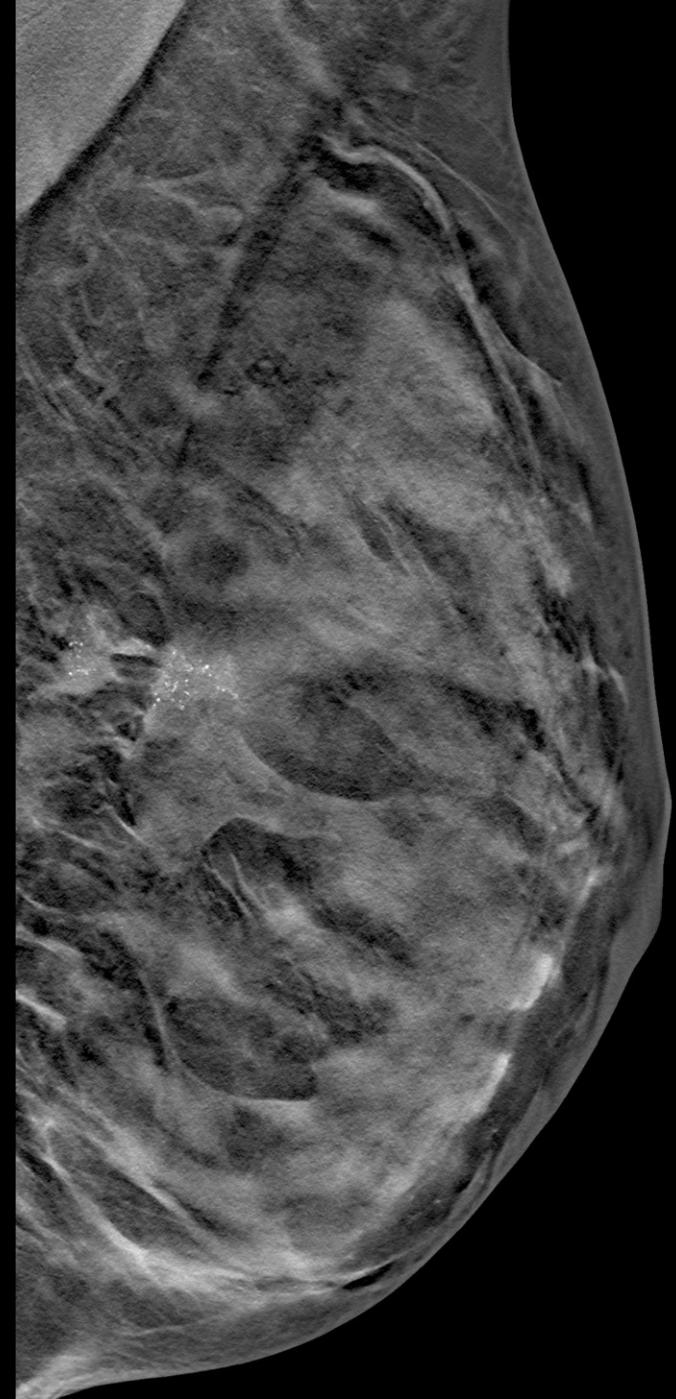
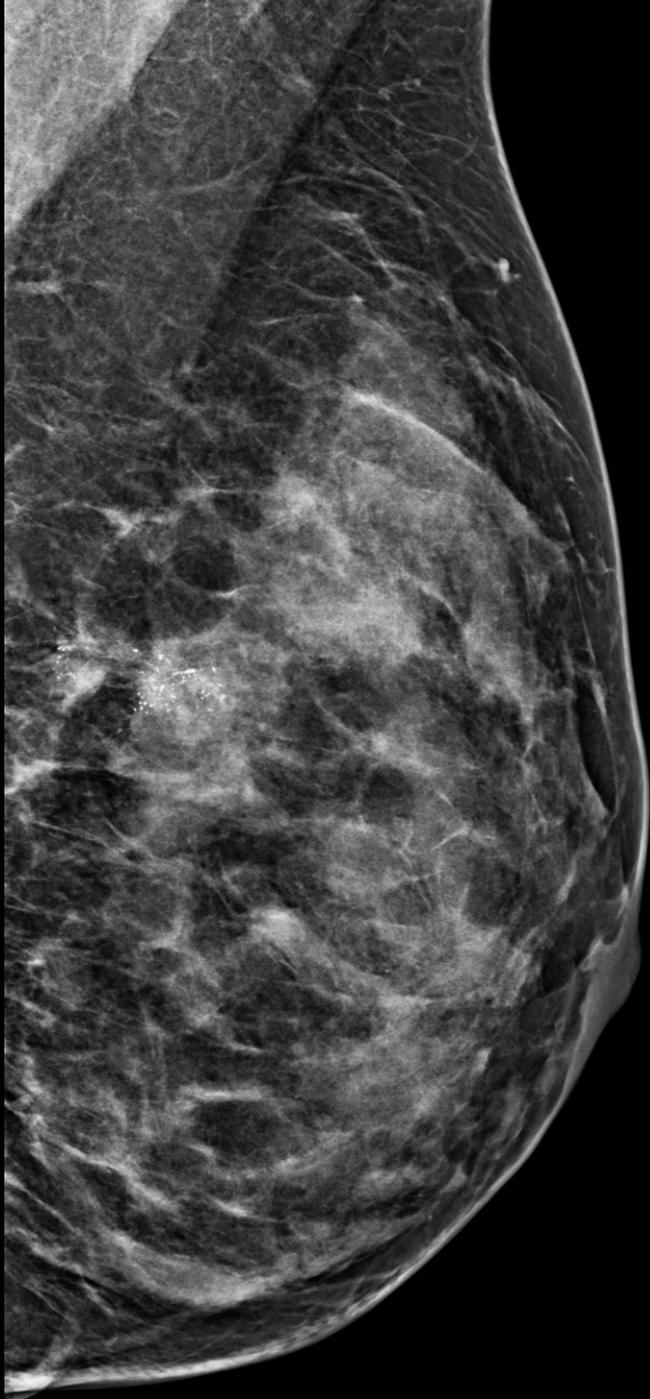
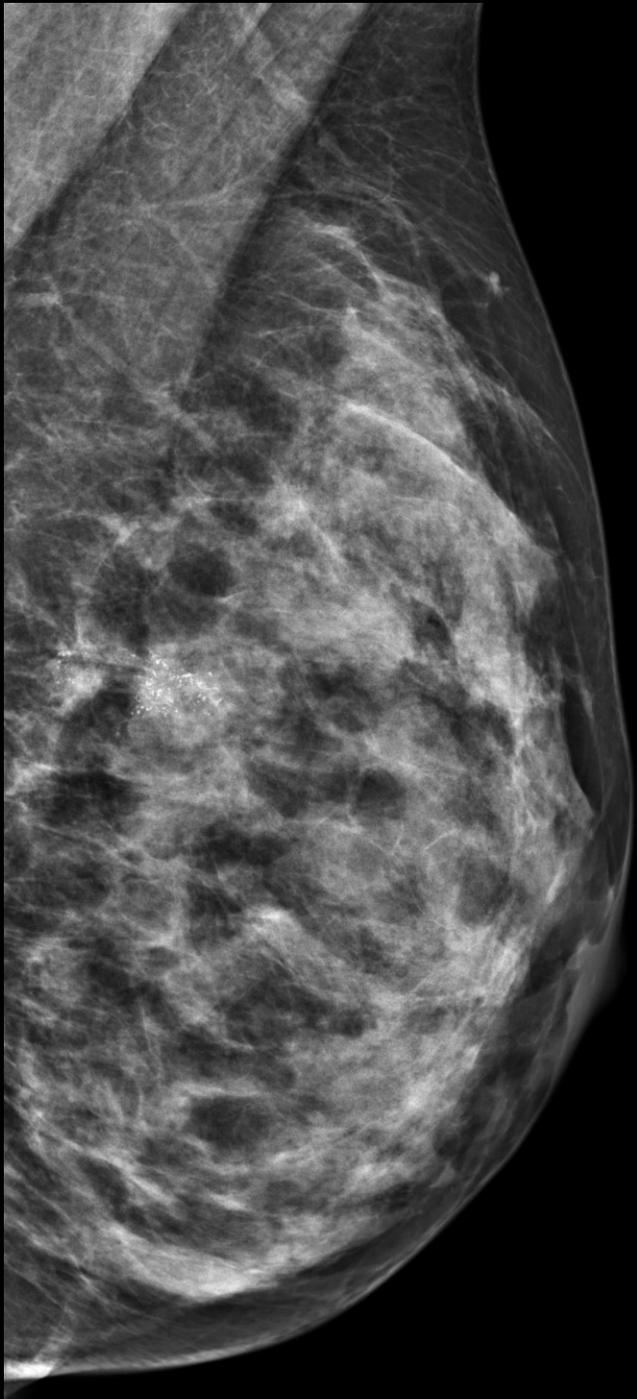
2D Synthé

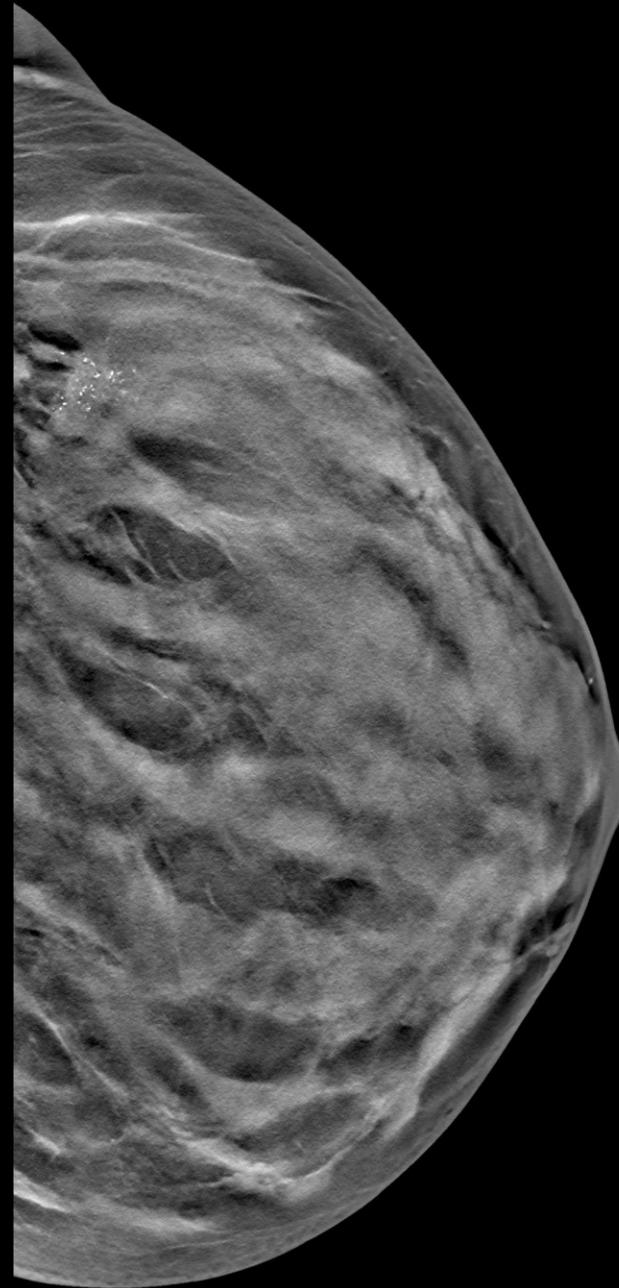
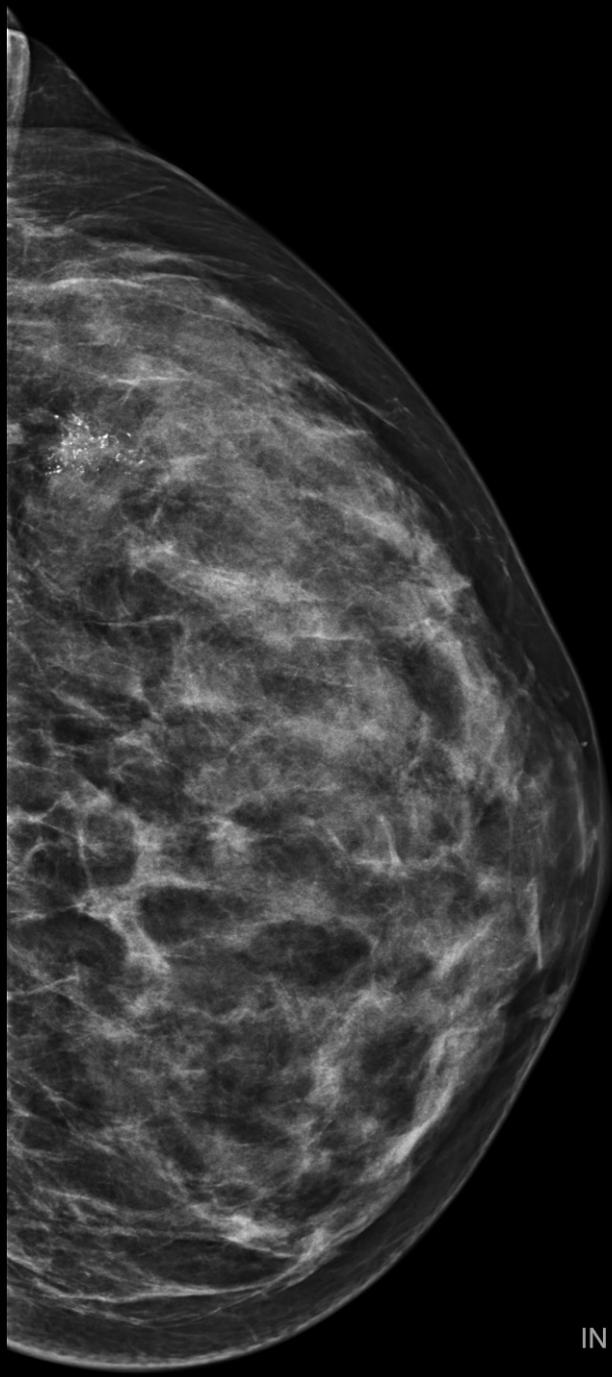
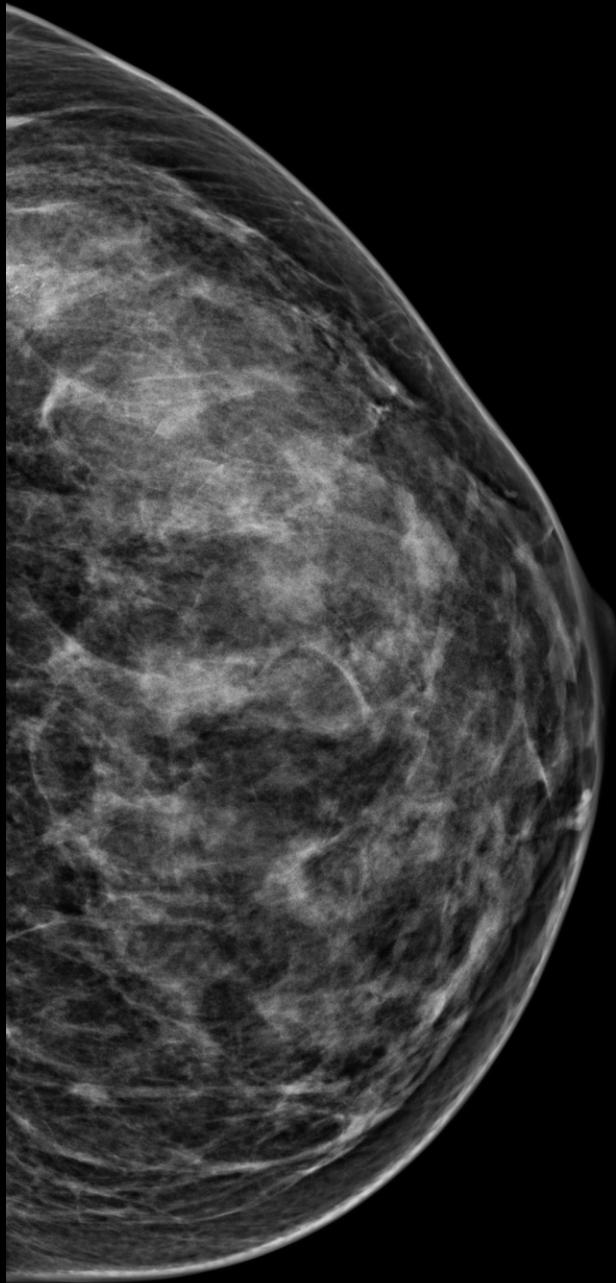


3D



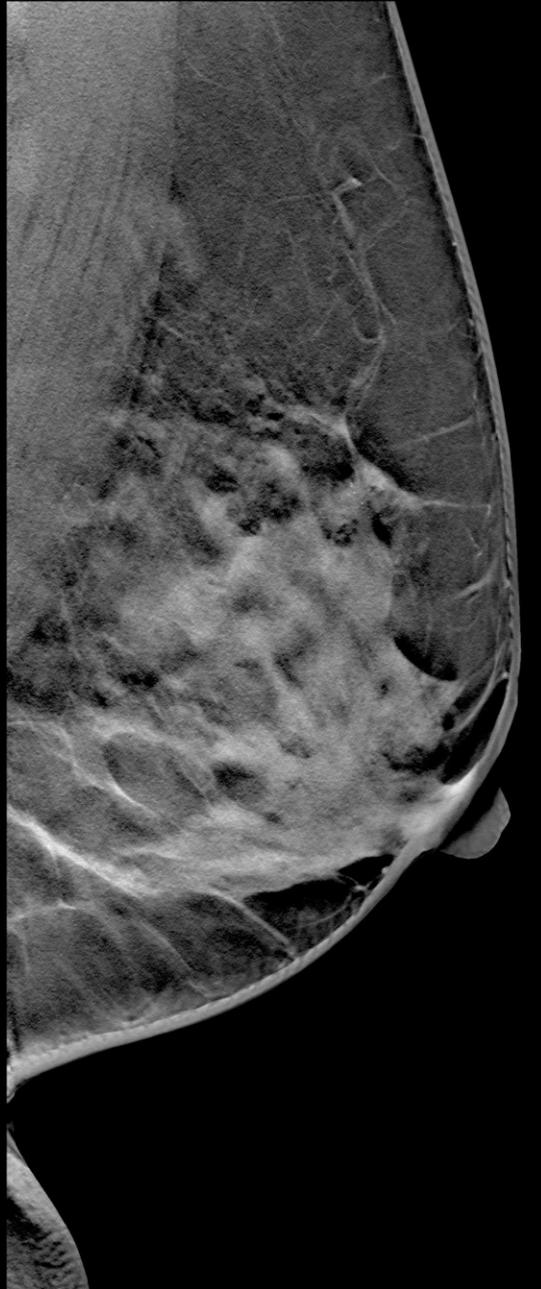
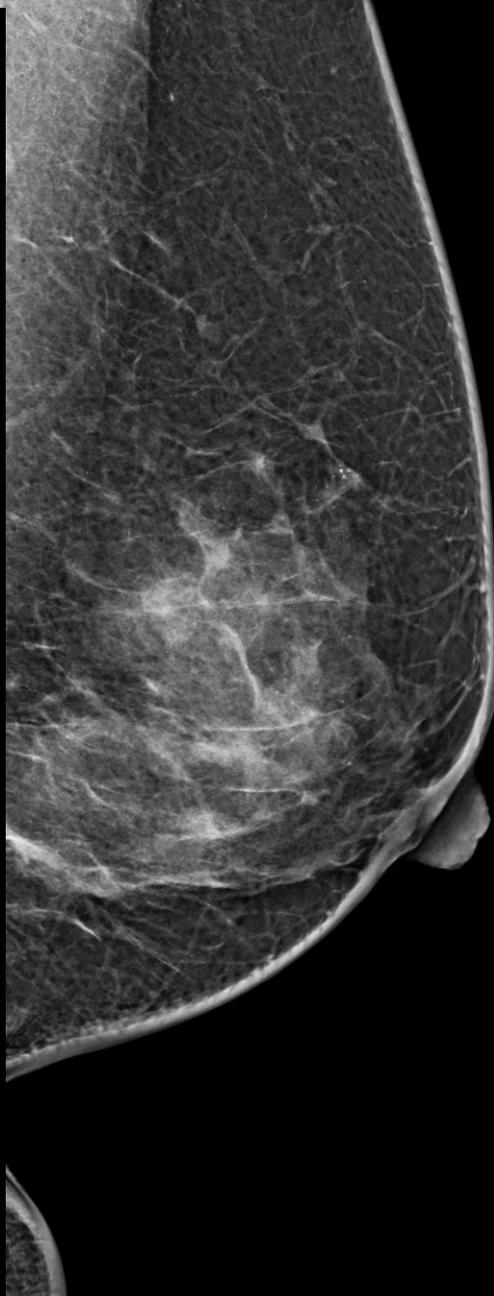
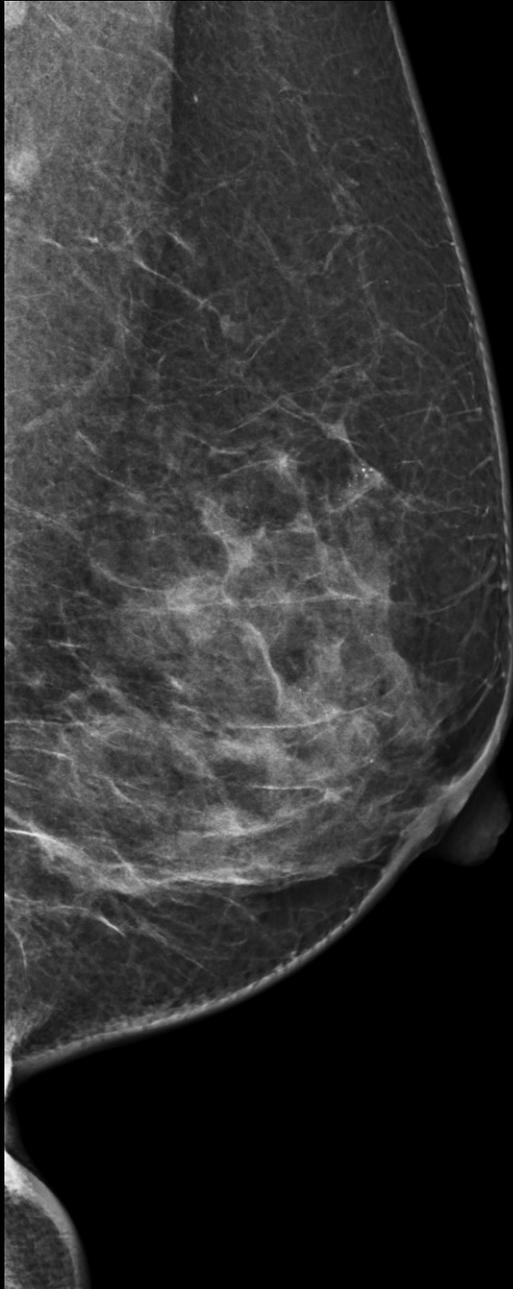
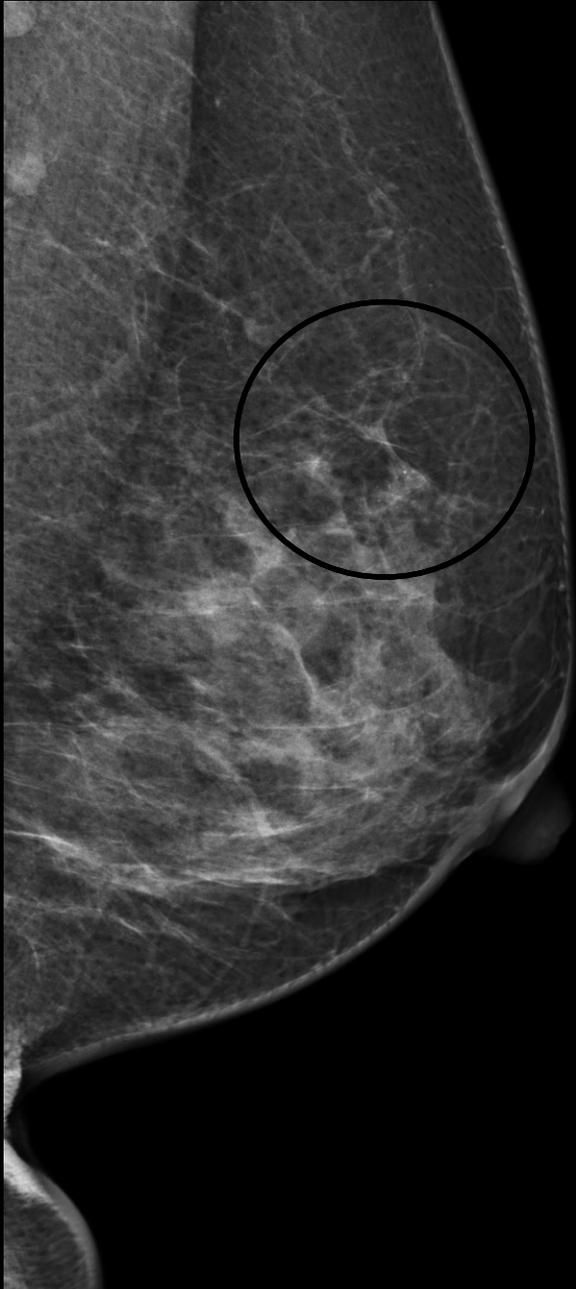
- Tomosynthèse et cancer
- Tomosynthèse et dépistage
- Tomosynthèse et dépistage organisé

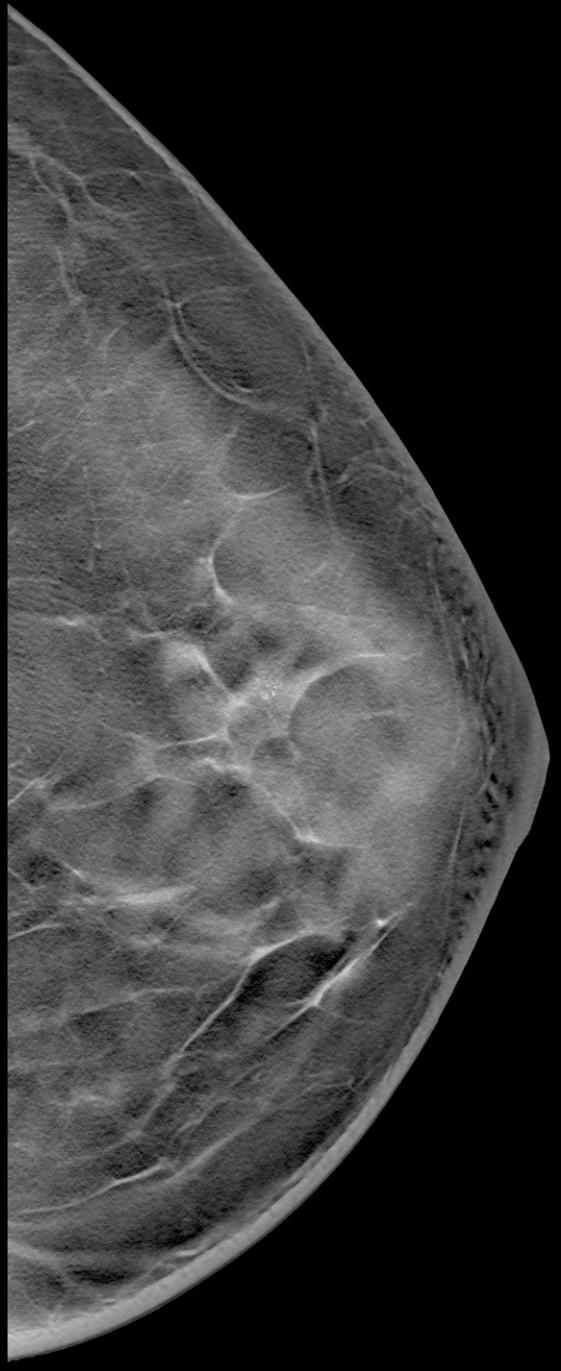
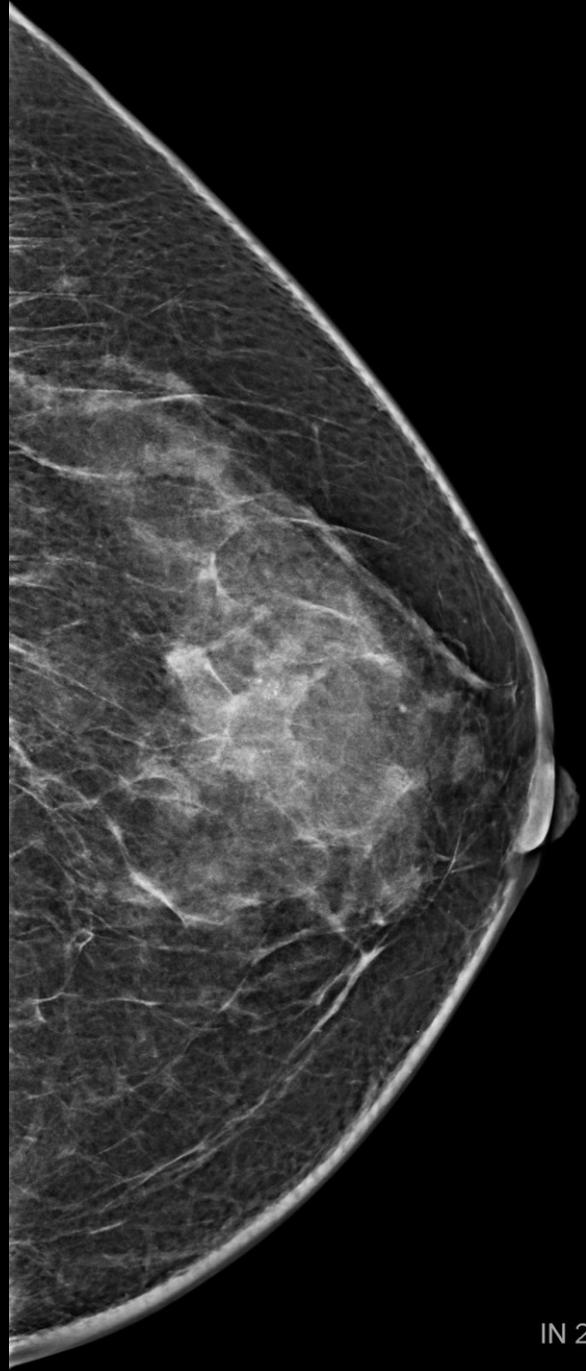




IN 2D

- Tomosynthèse et cancer
- Tomosynthèse et dépistage
- Tomosynthèse et dépistage organisé

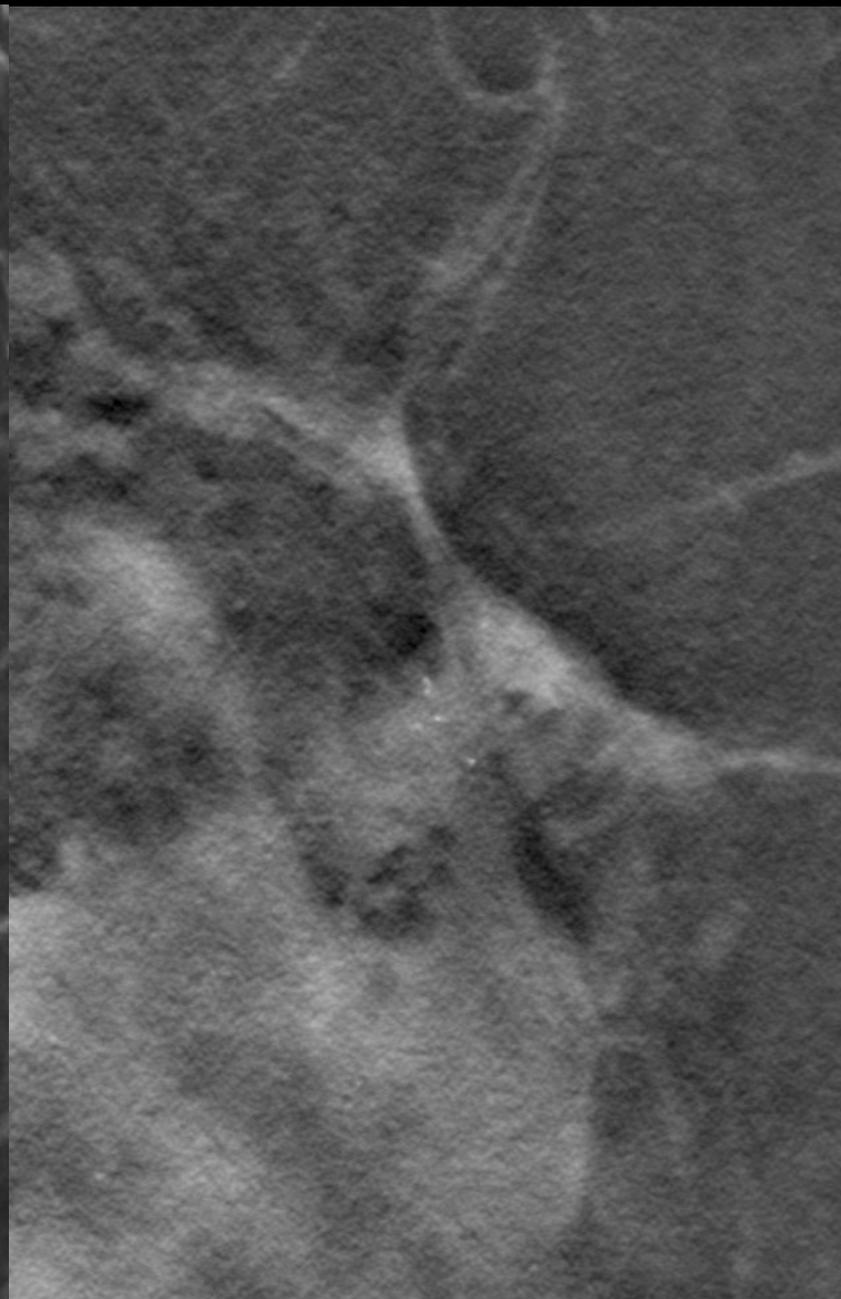
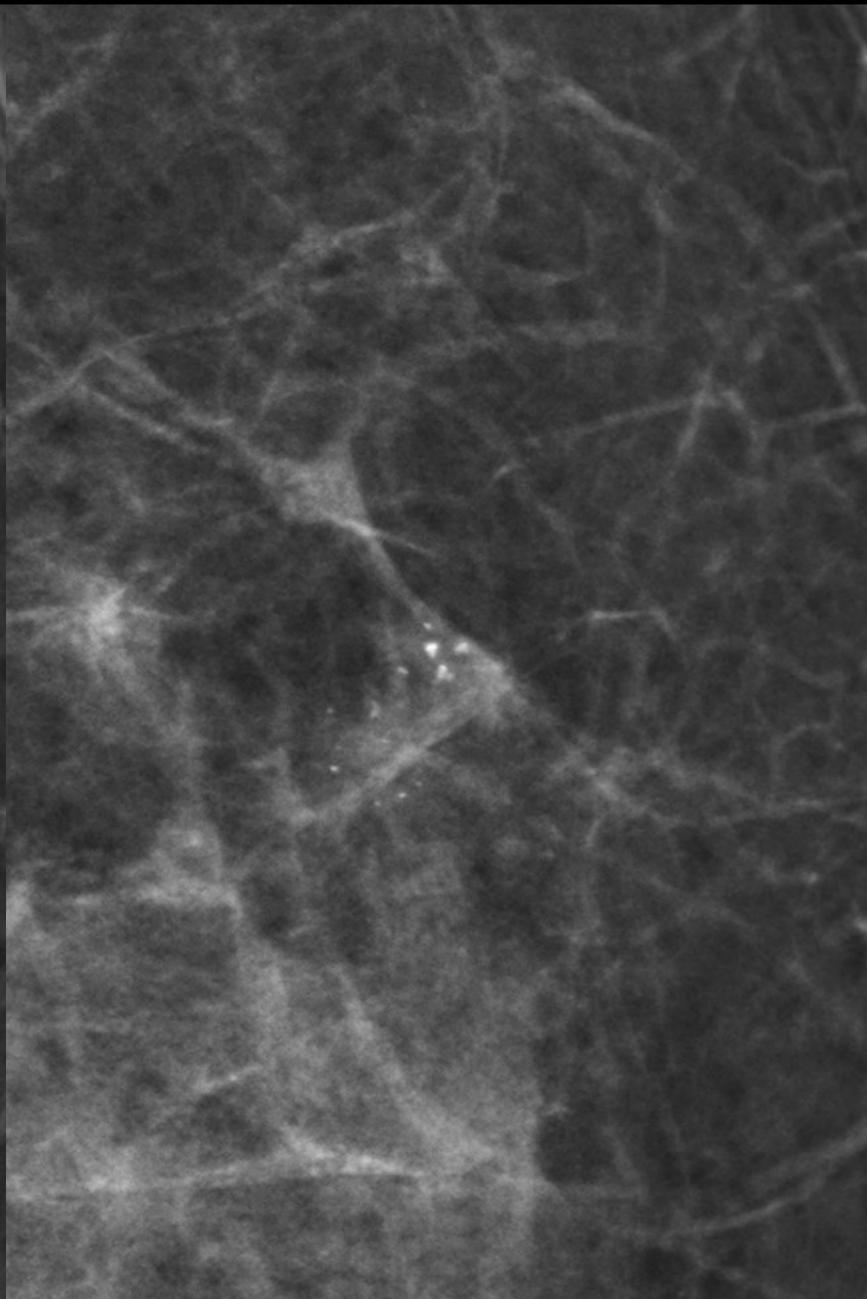
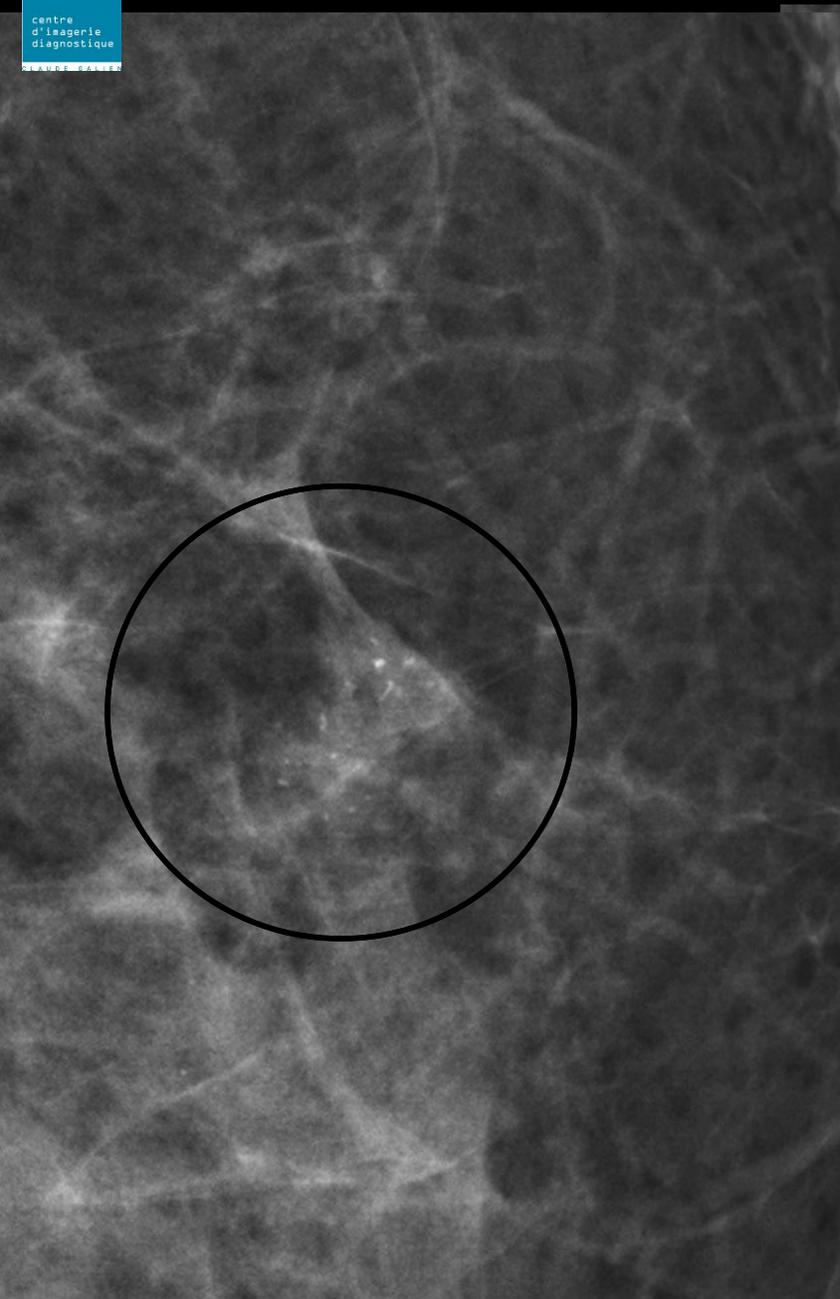


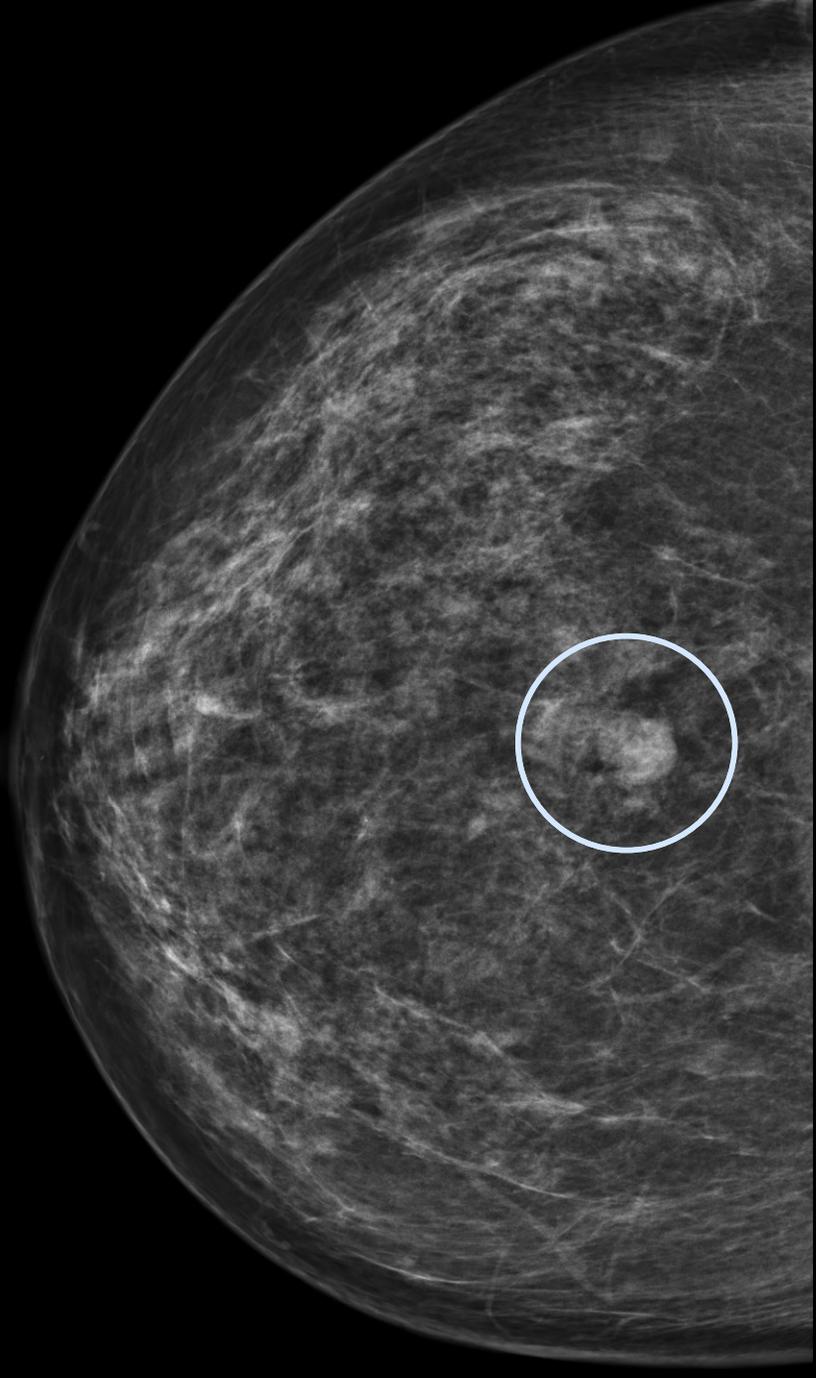
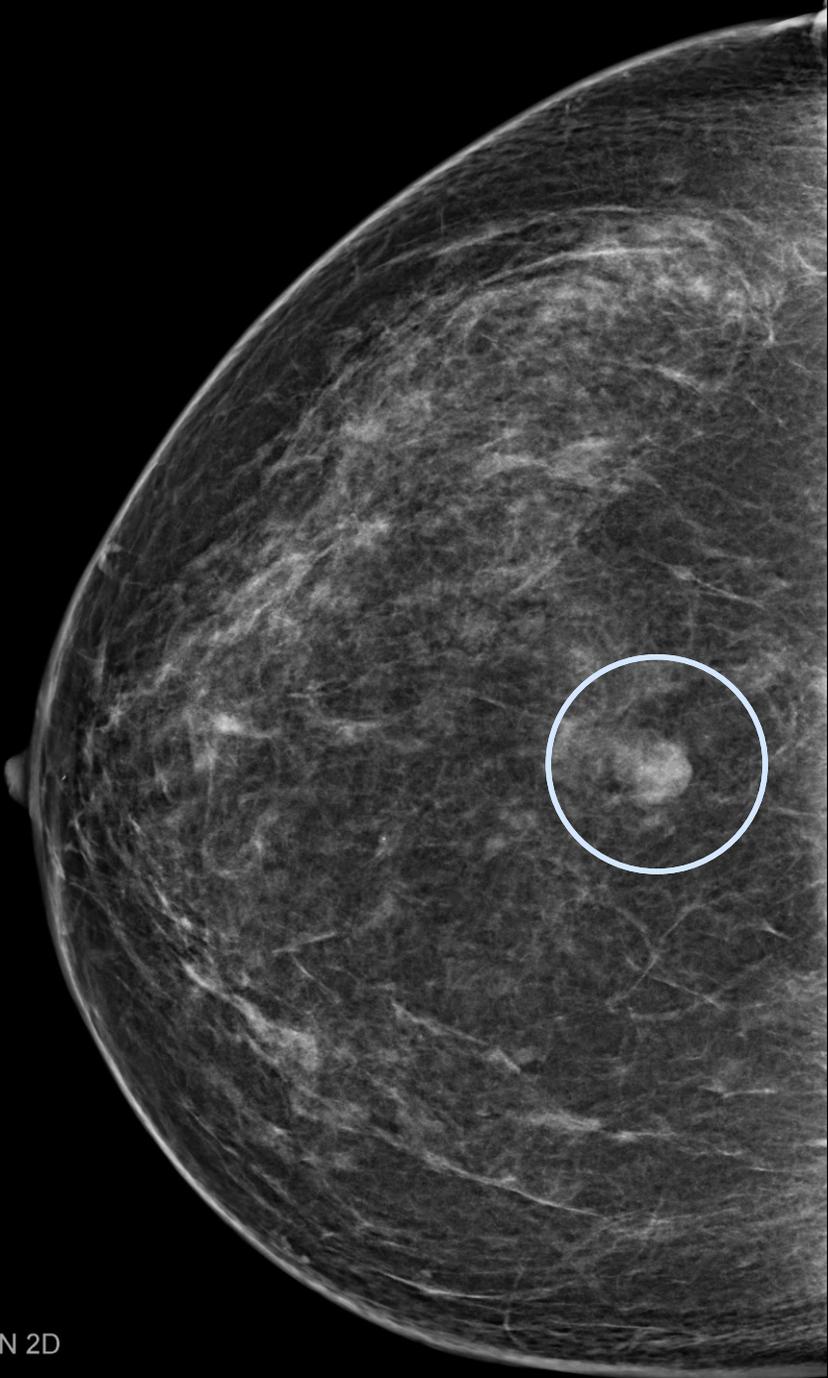


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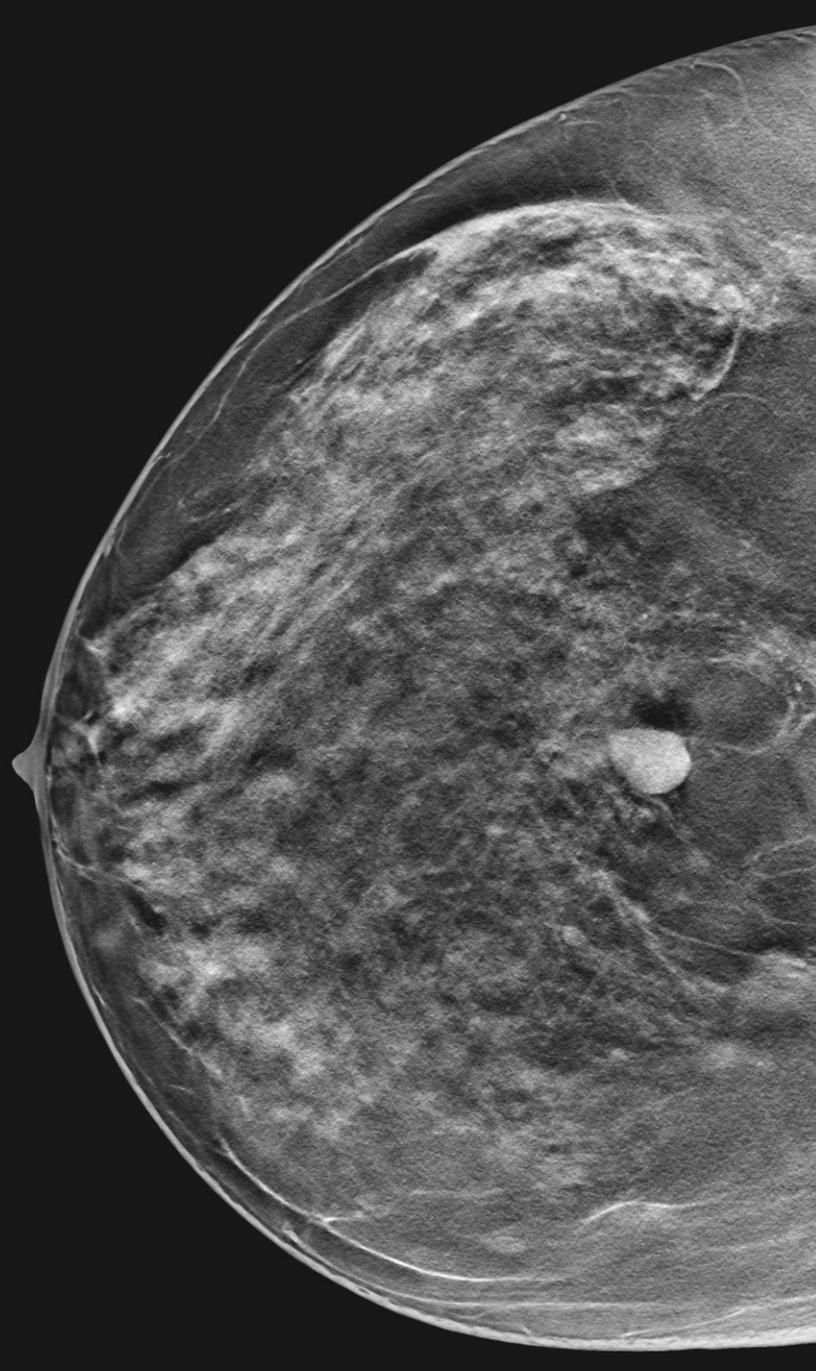
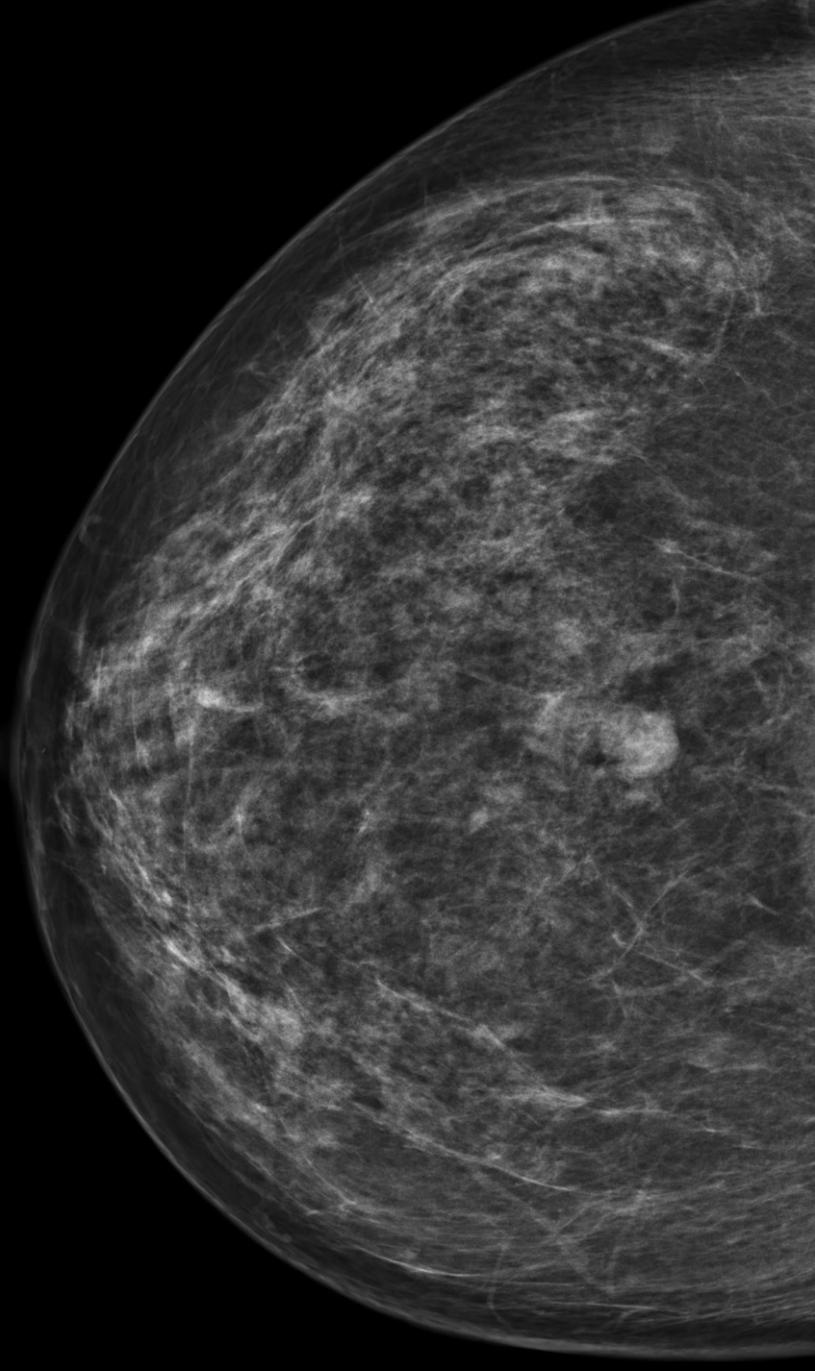
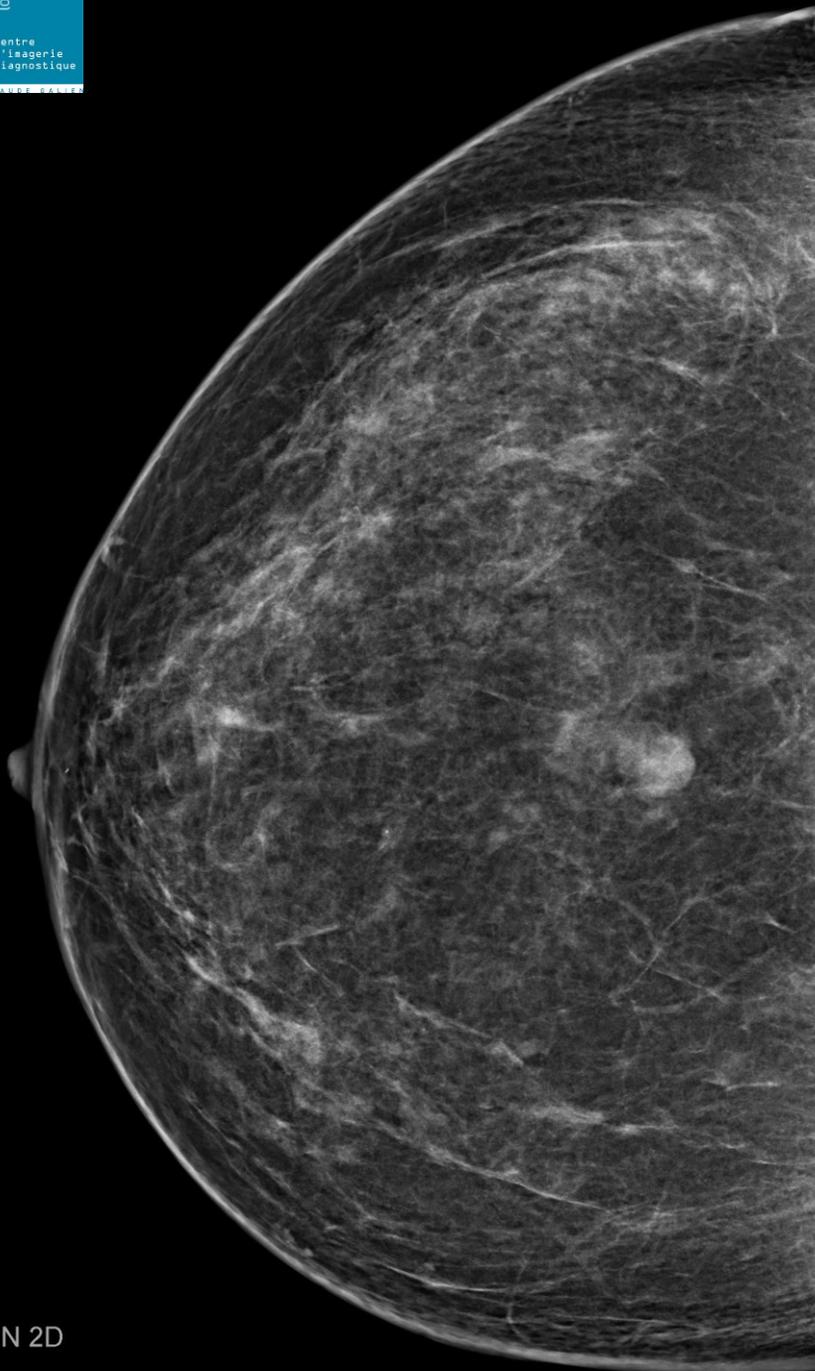


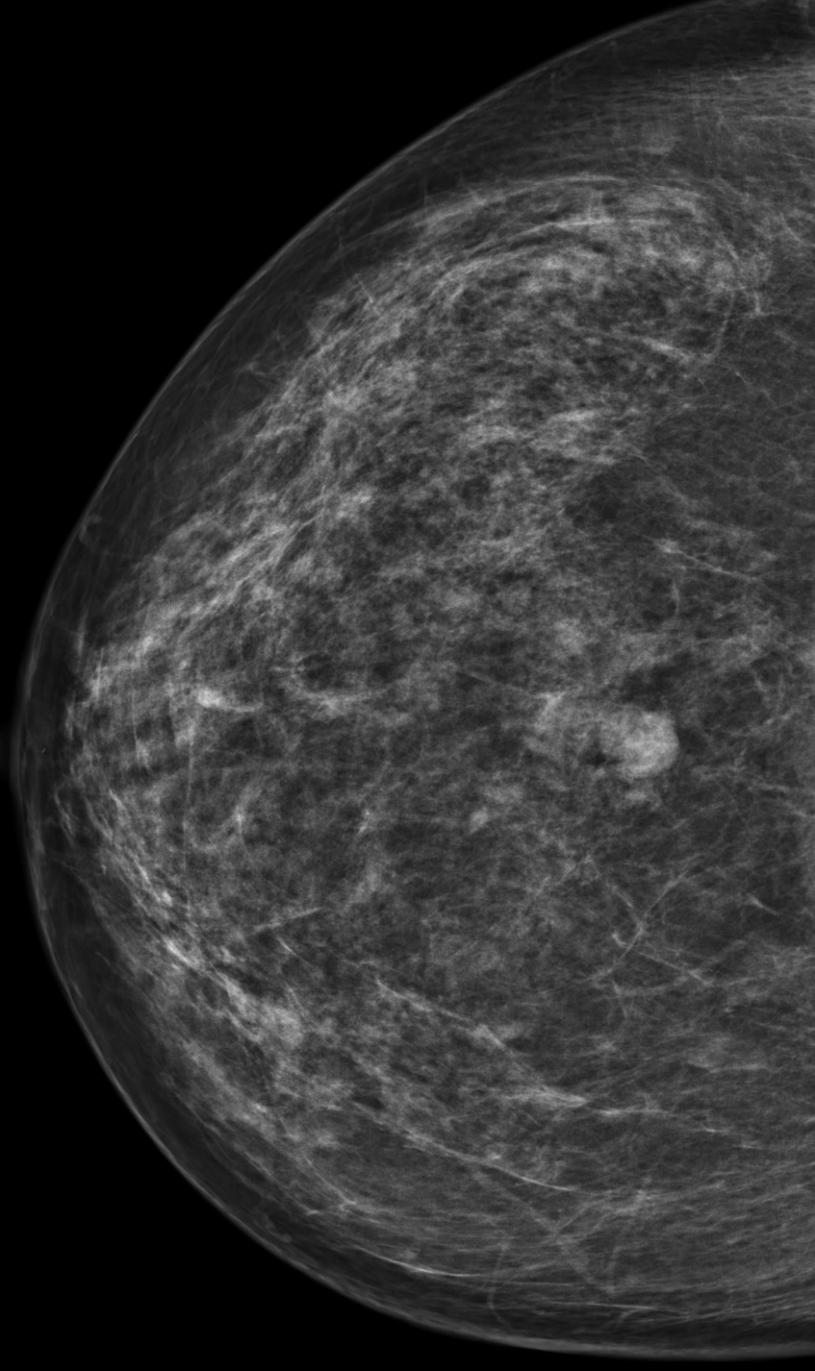
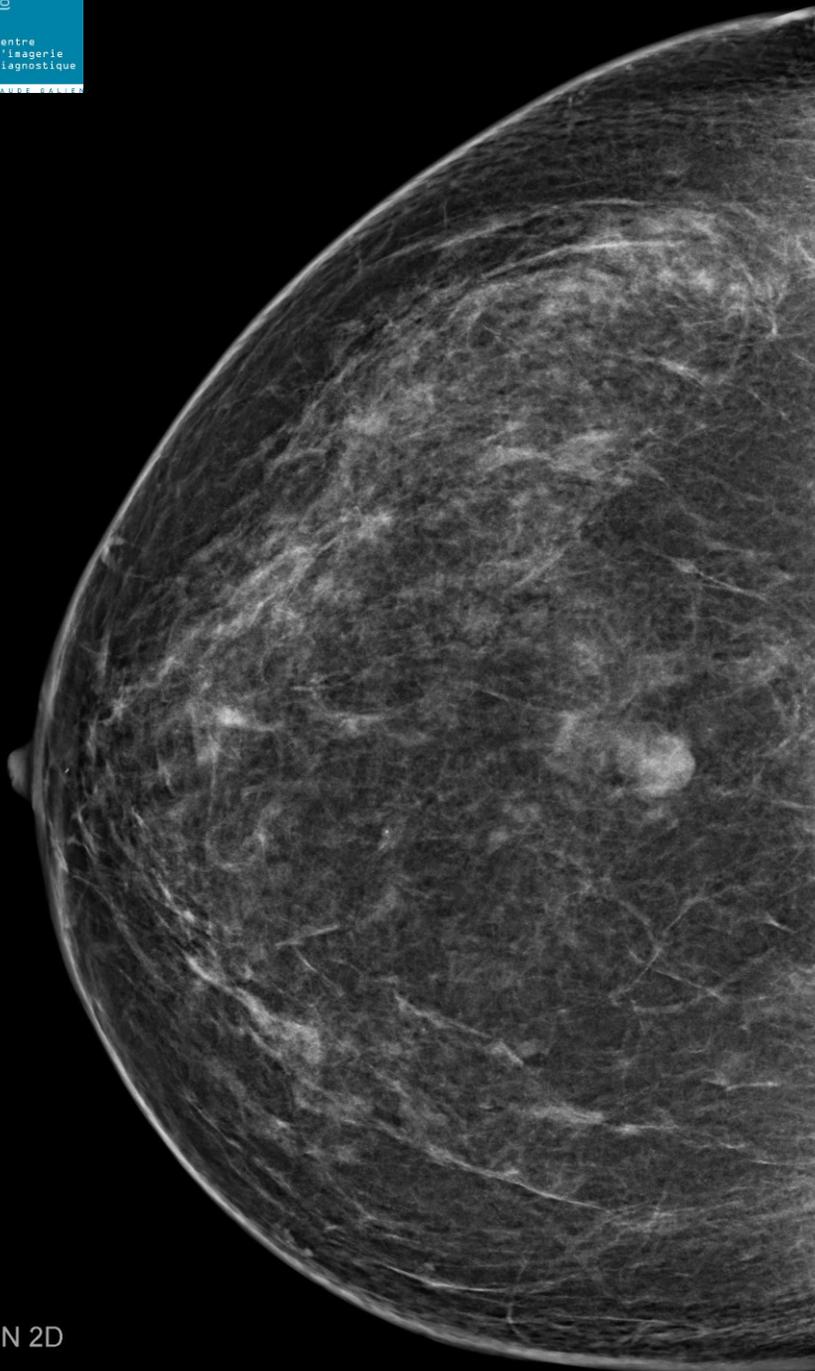
centre
d'imagerie
diagnostique



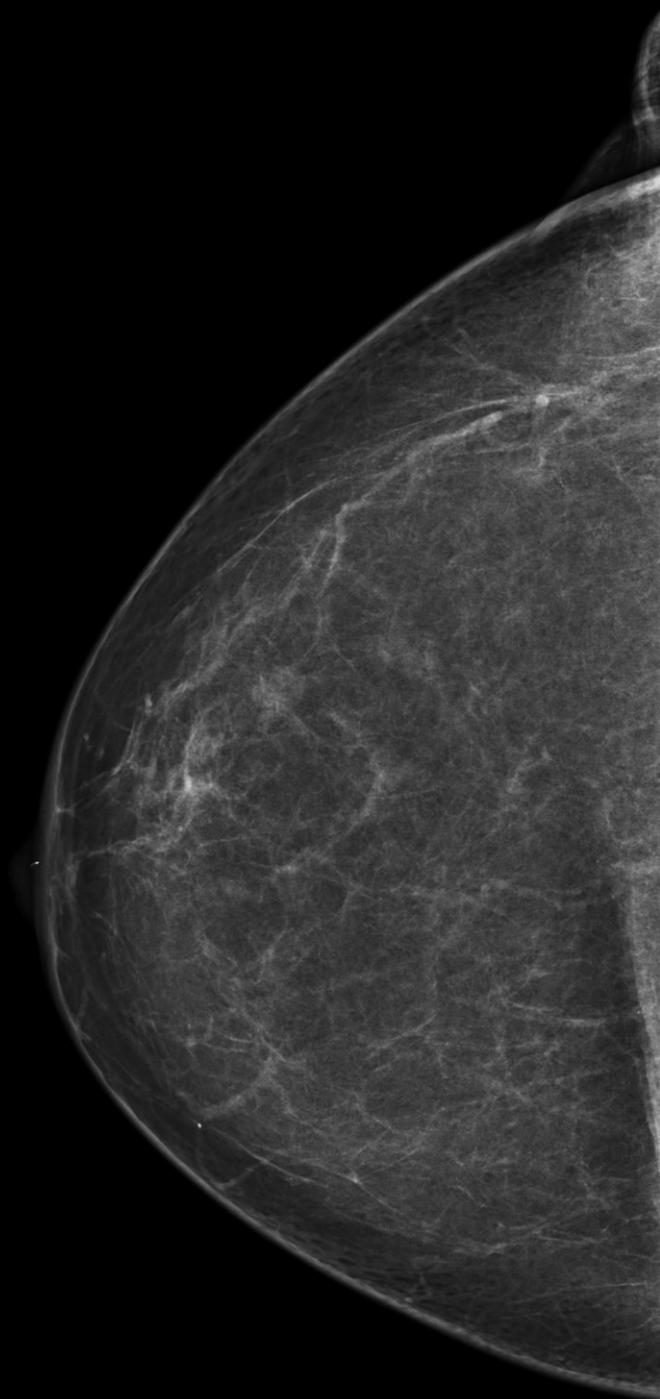
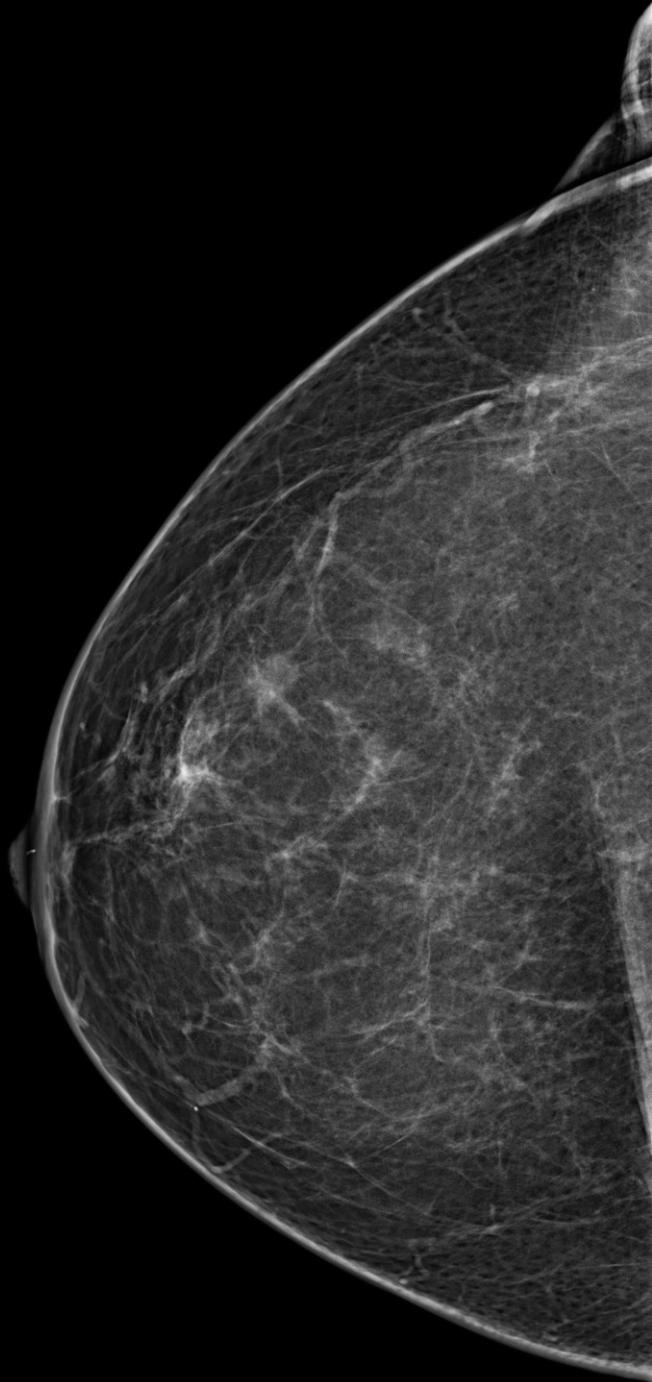


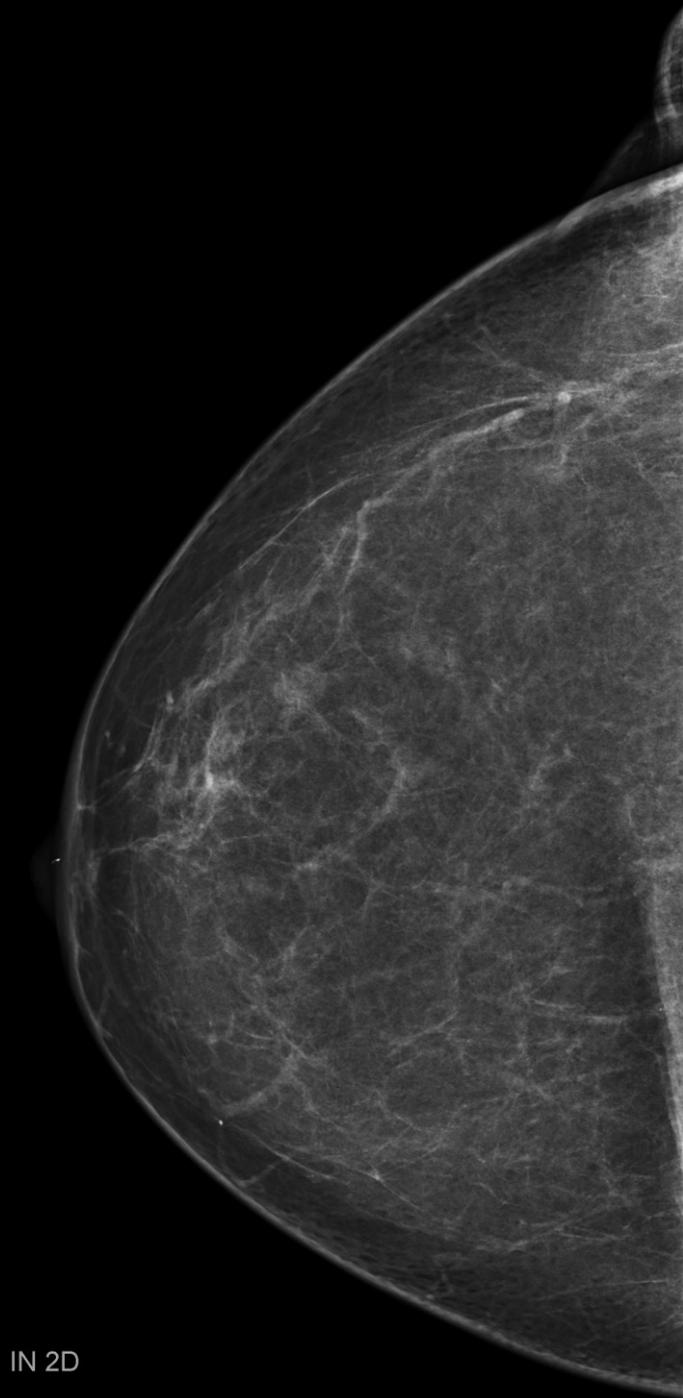
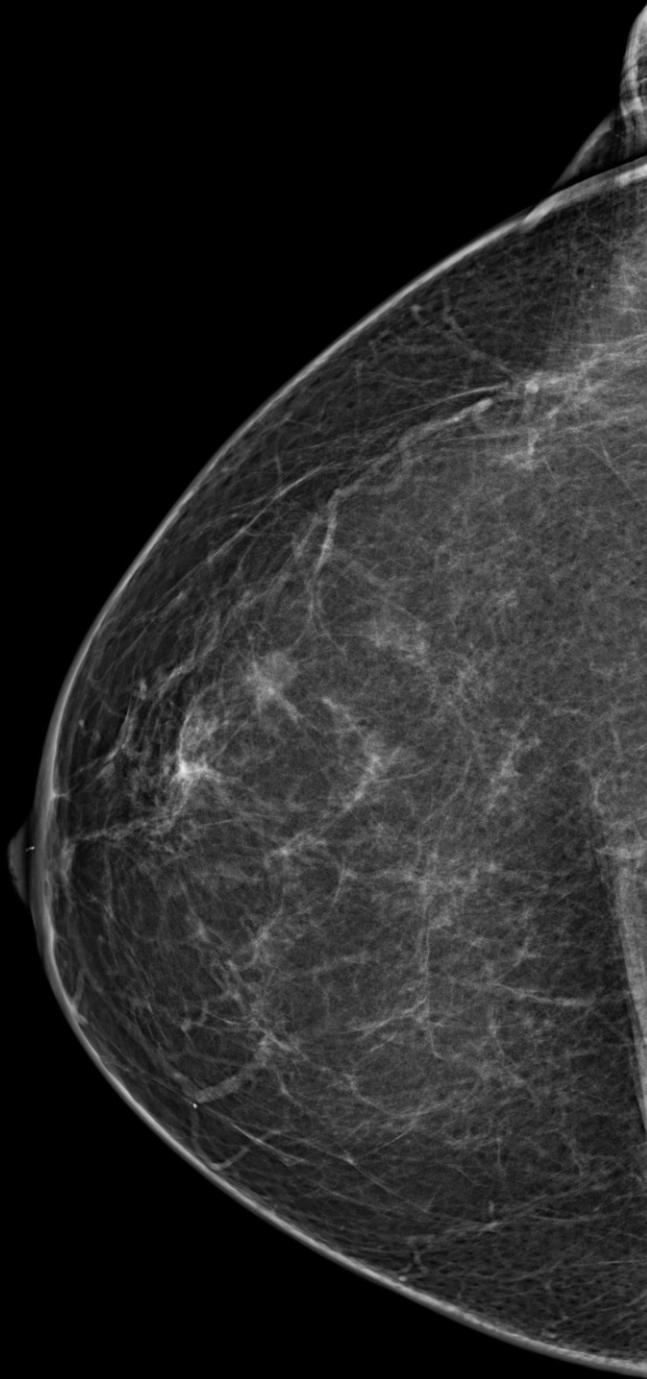
IN 2D



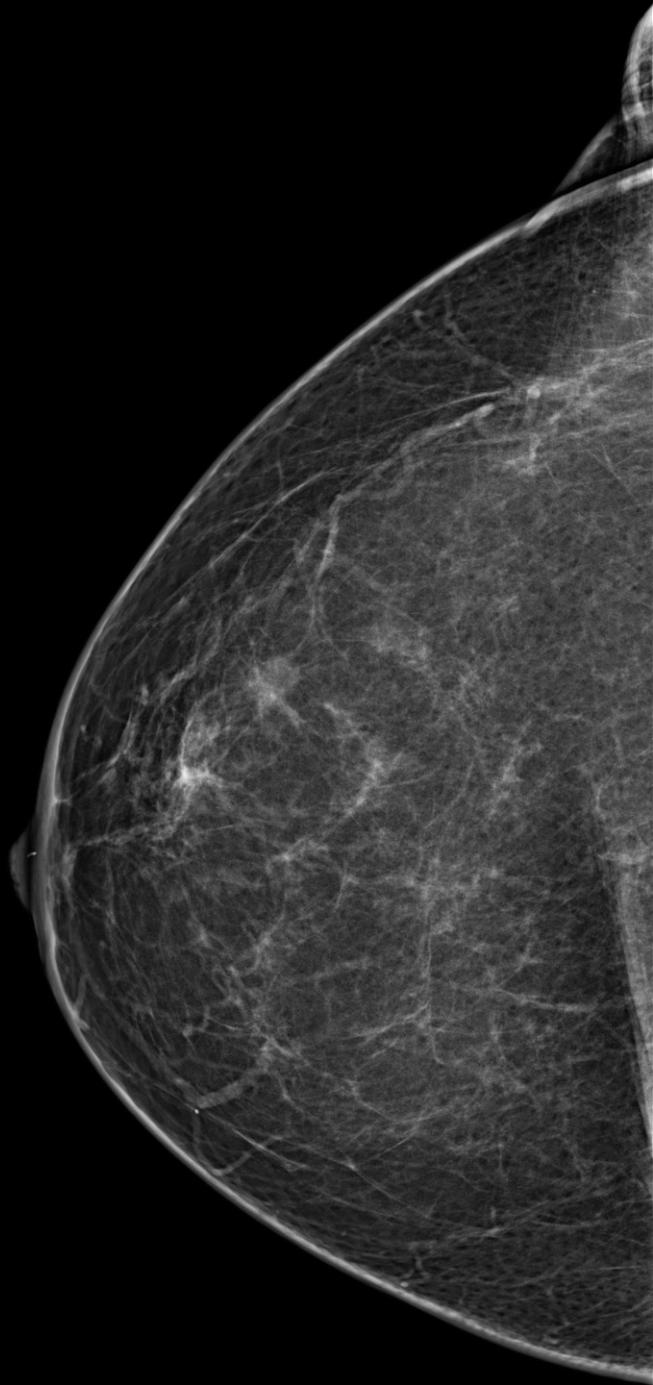


- Tomosynthèse et cancer
- Tomosynthèse et dépistage
- Tomosynthèse et dépistage organisé : Quiz

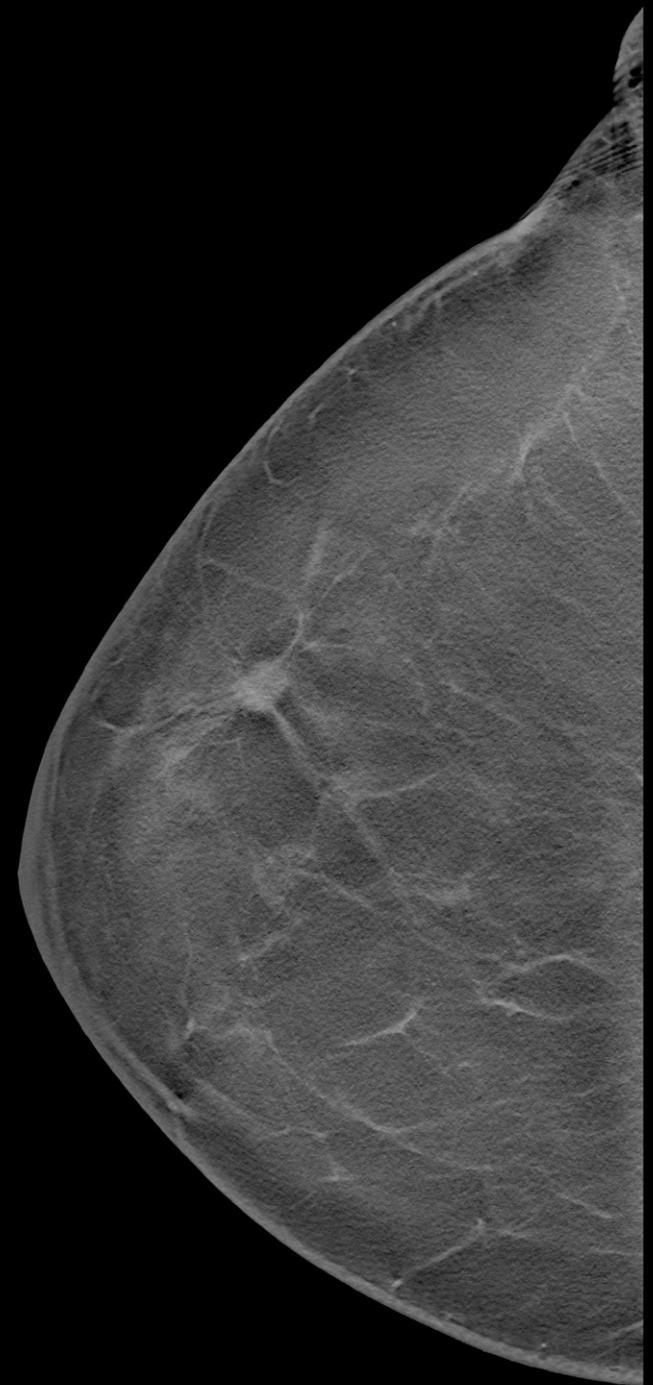
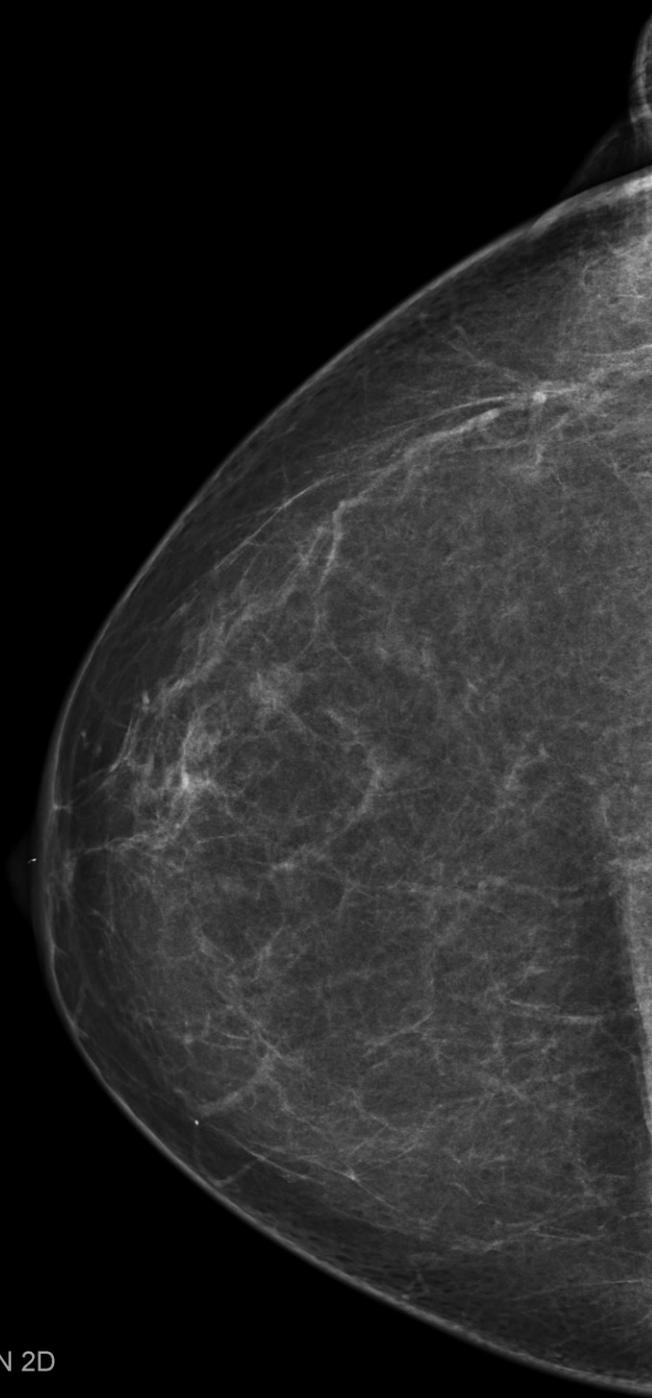


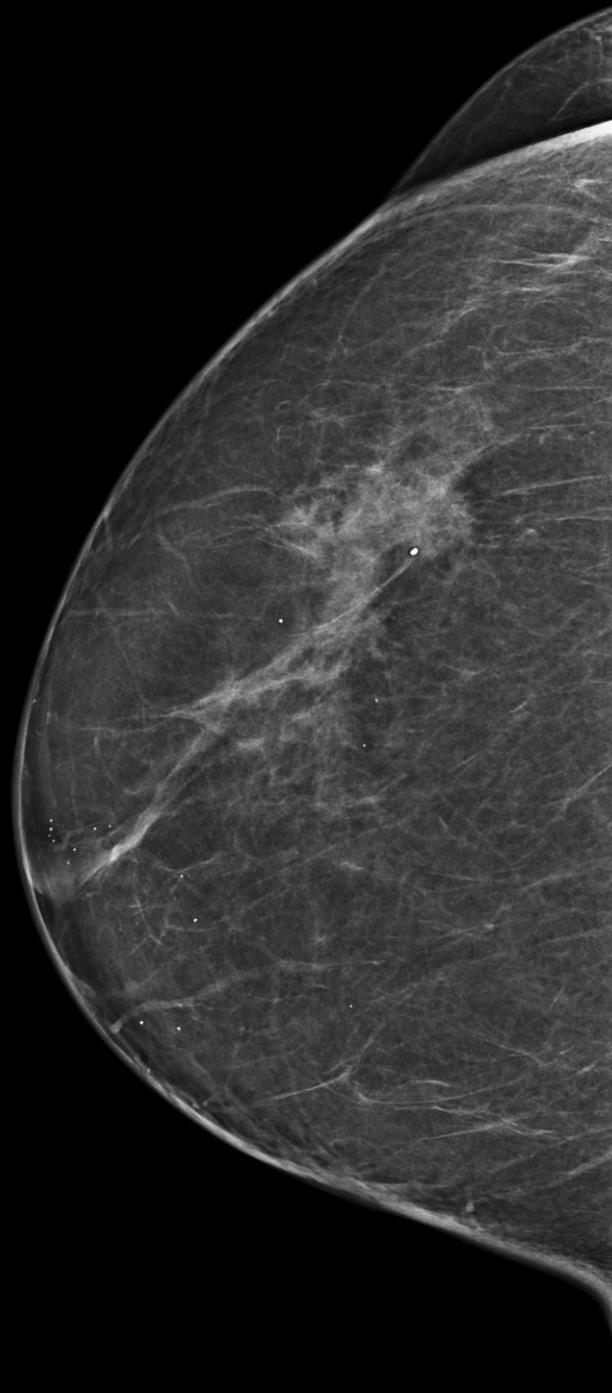
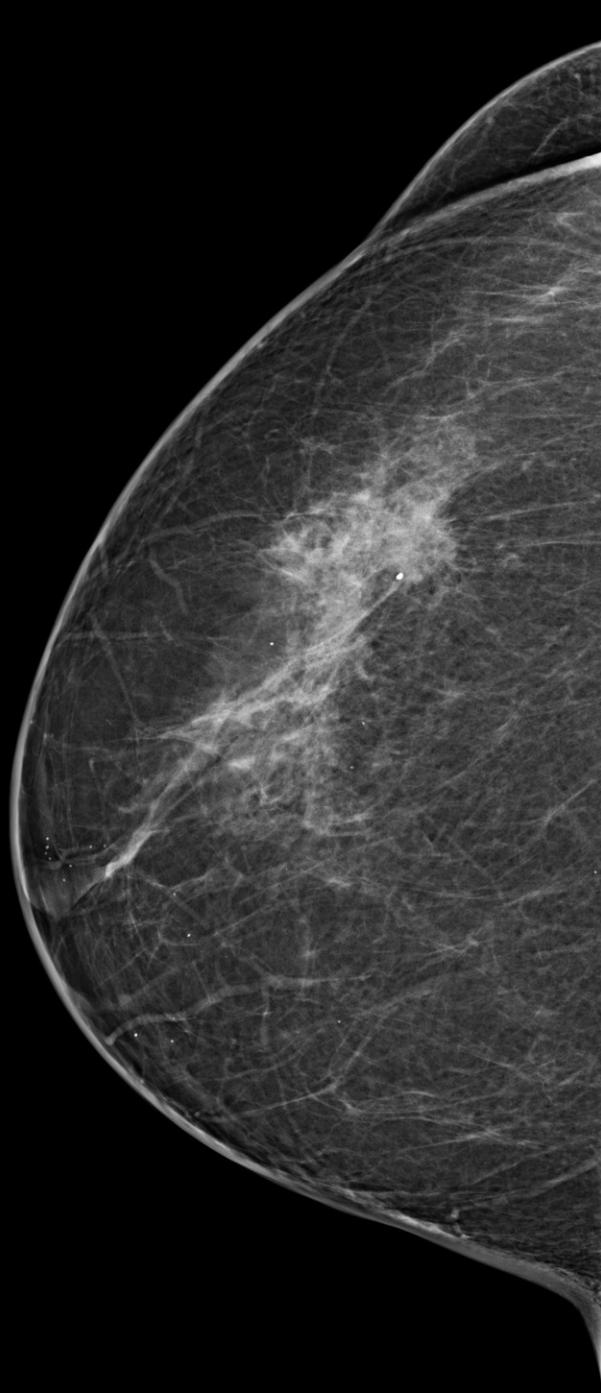


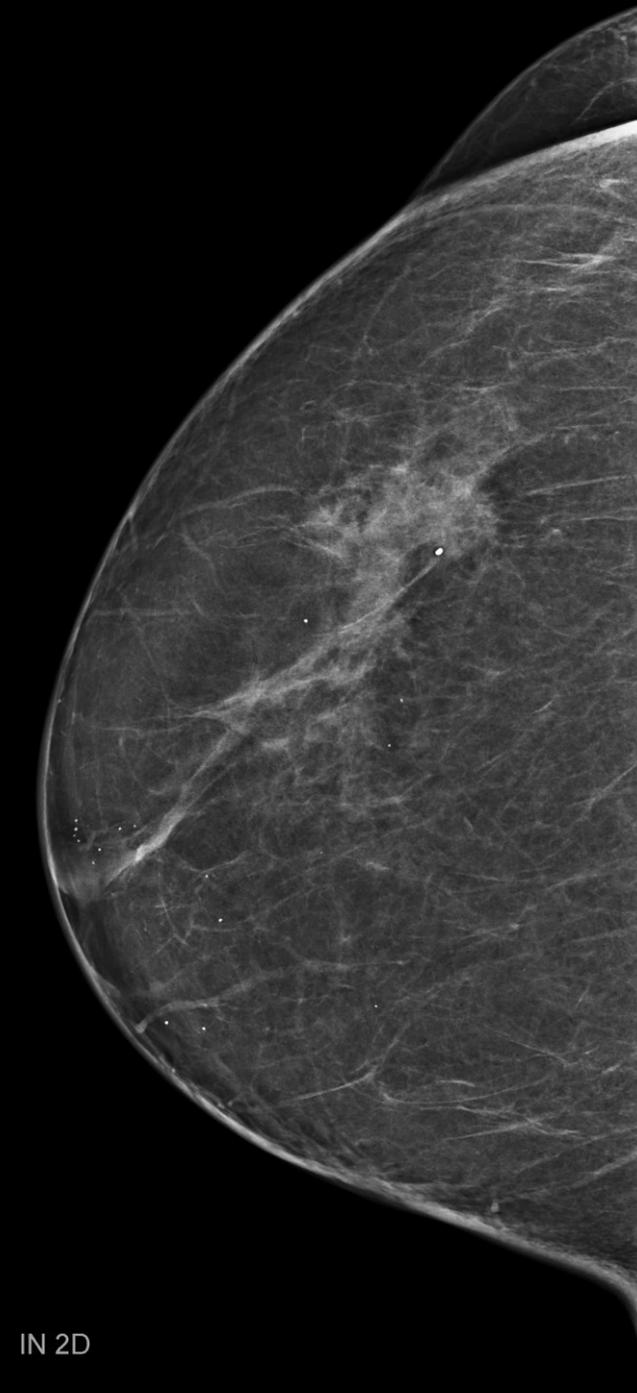
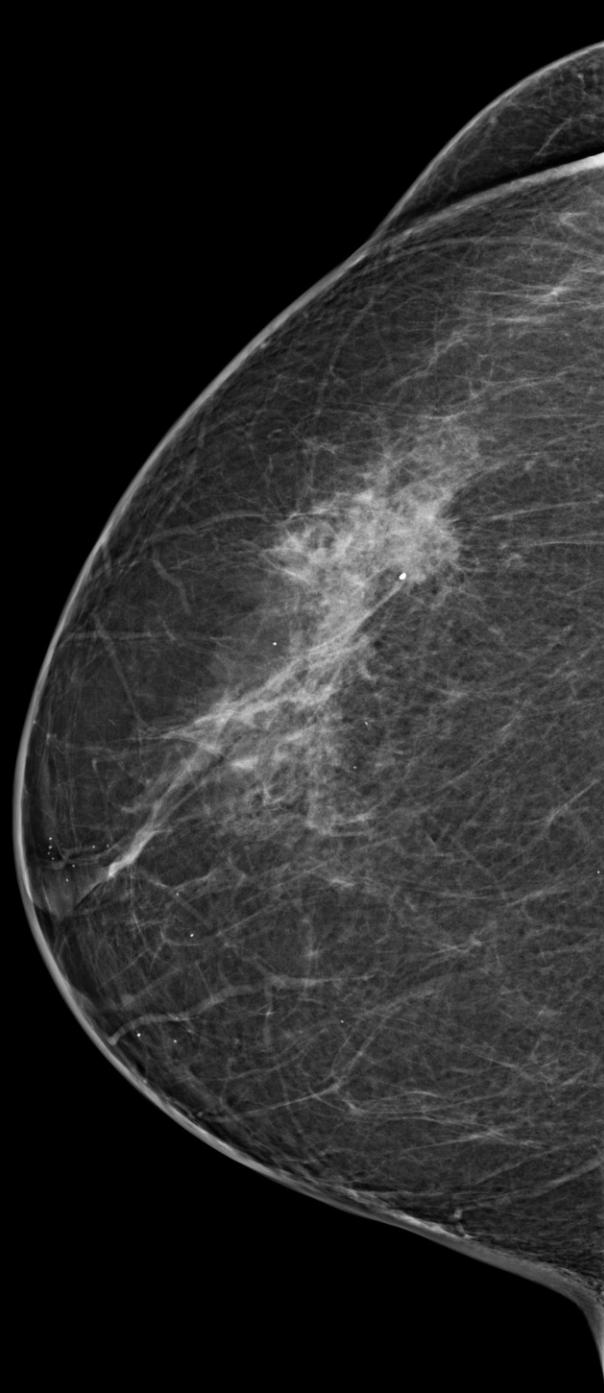
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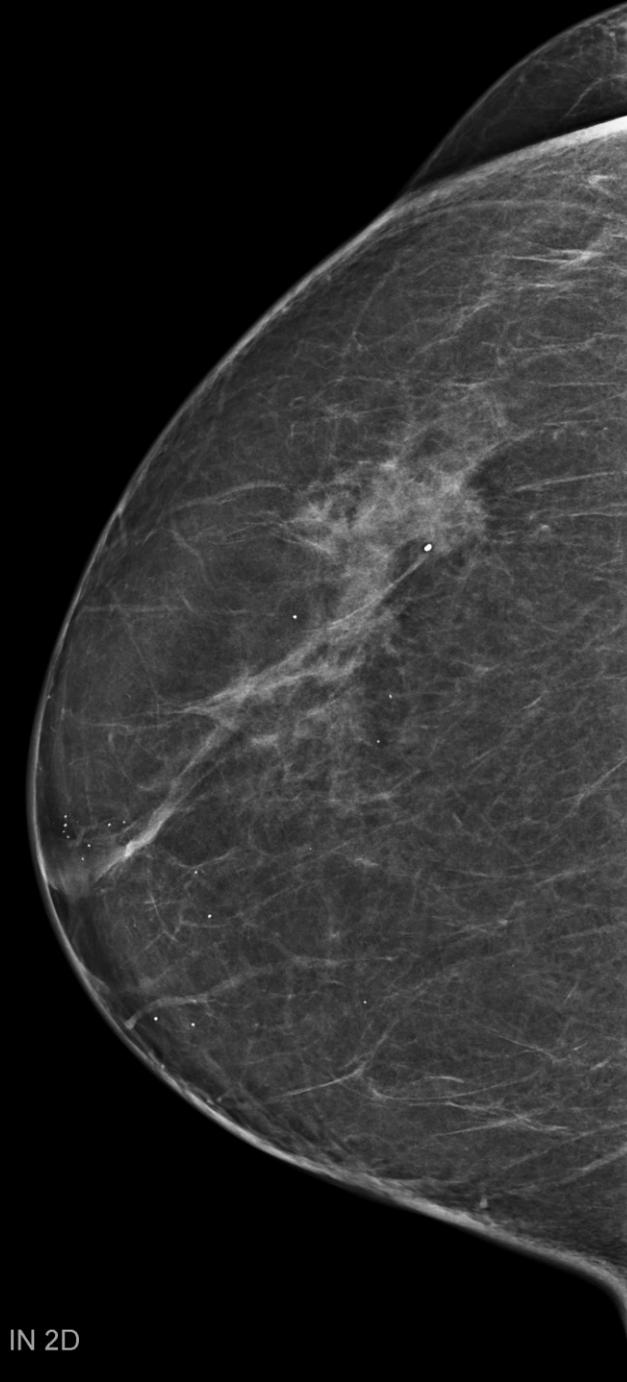
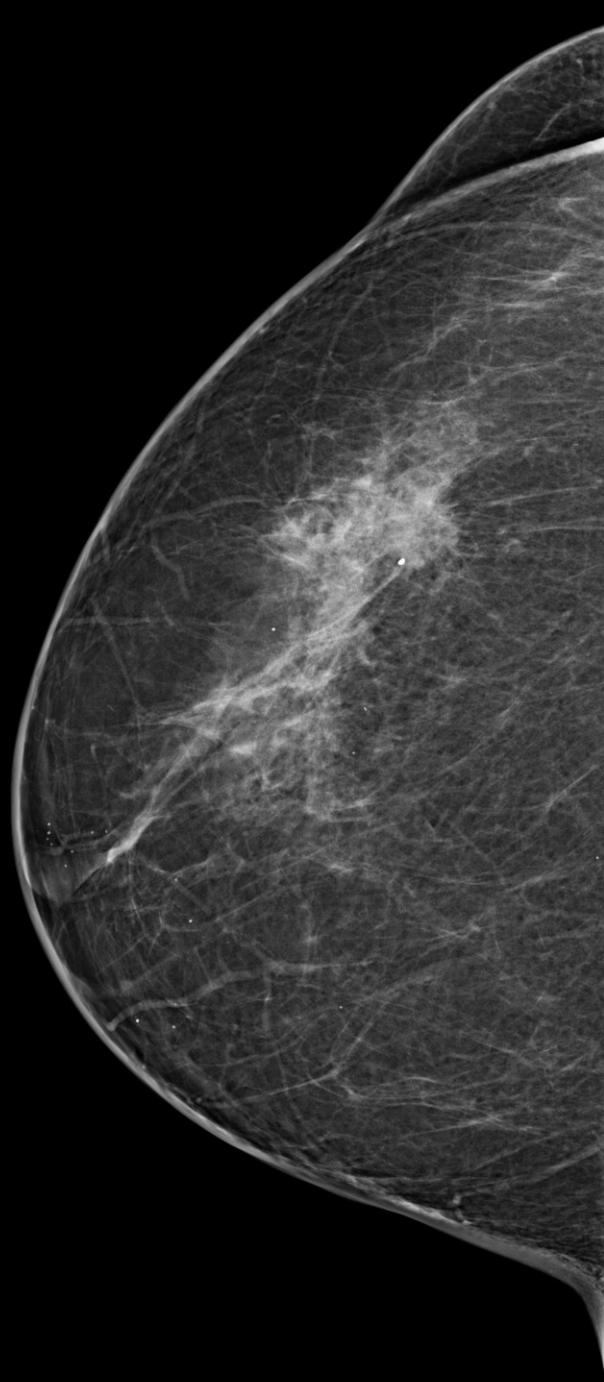
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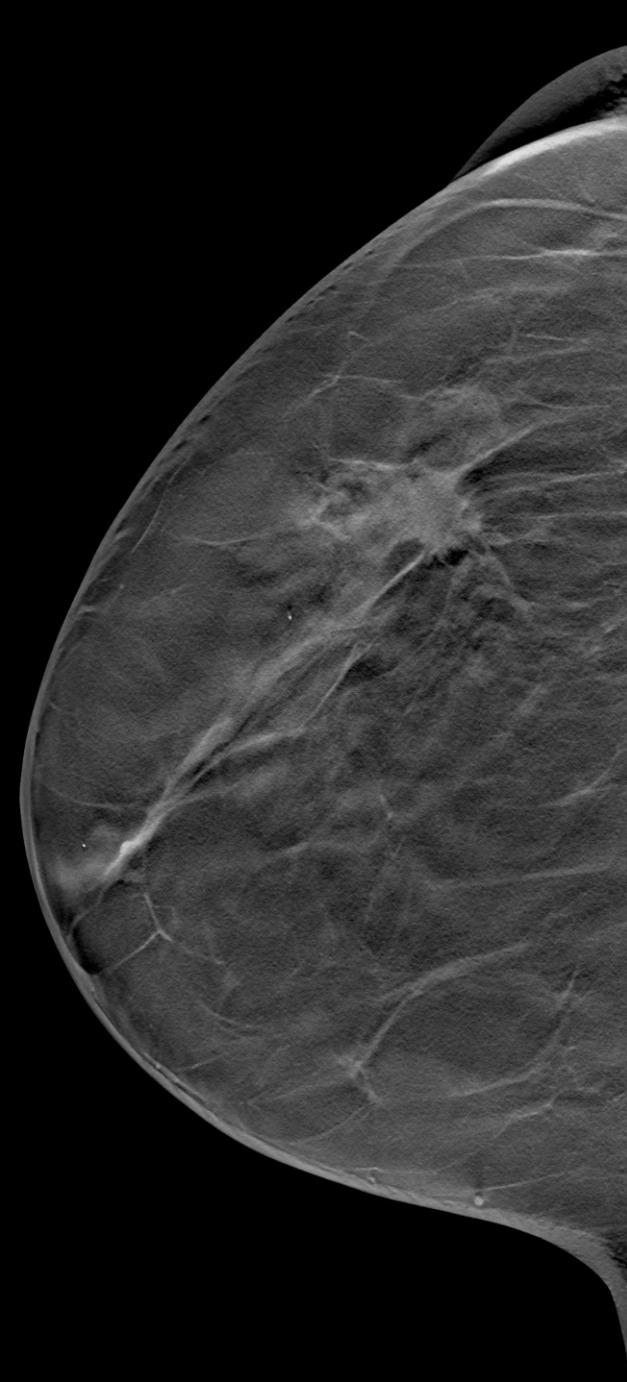




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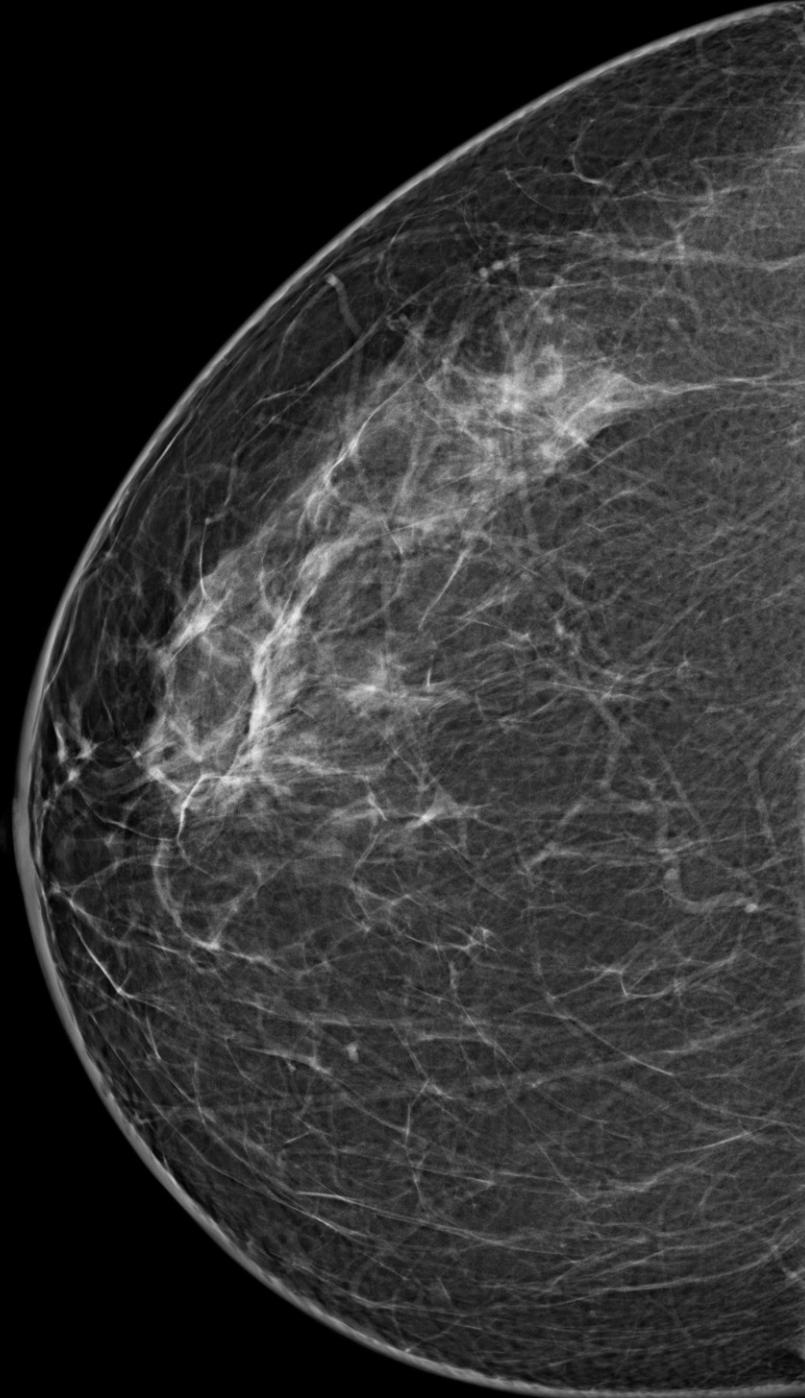
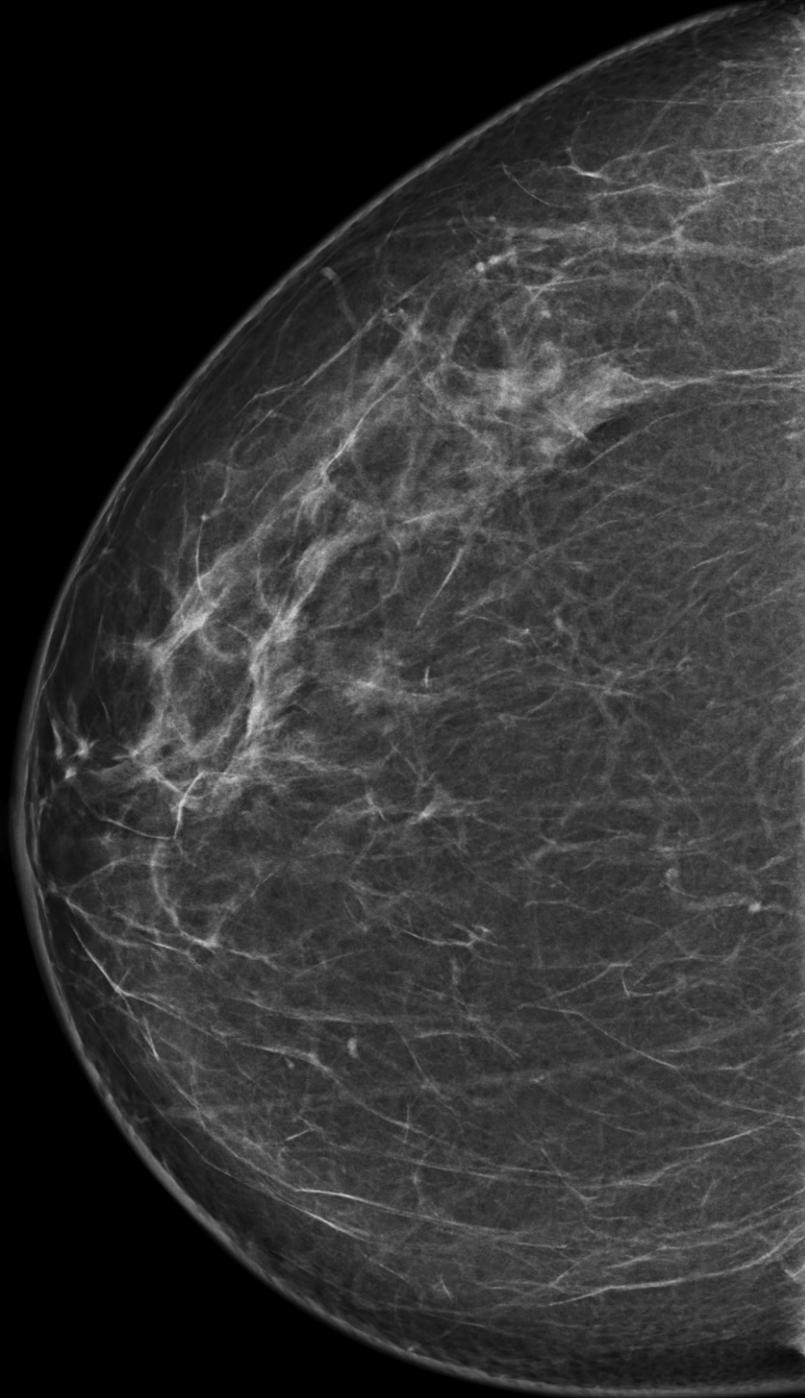
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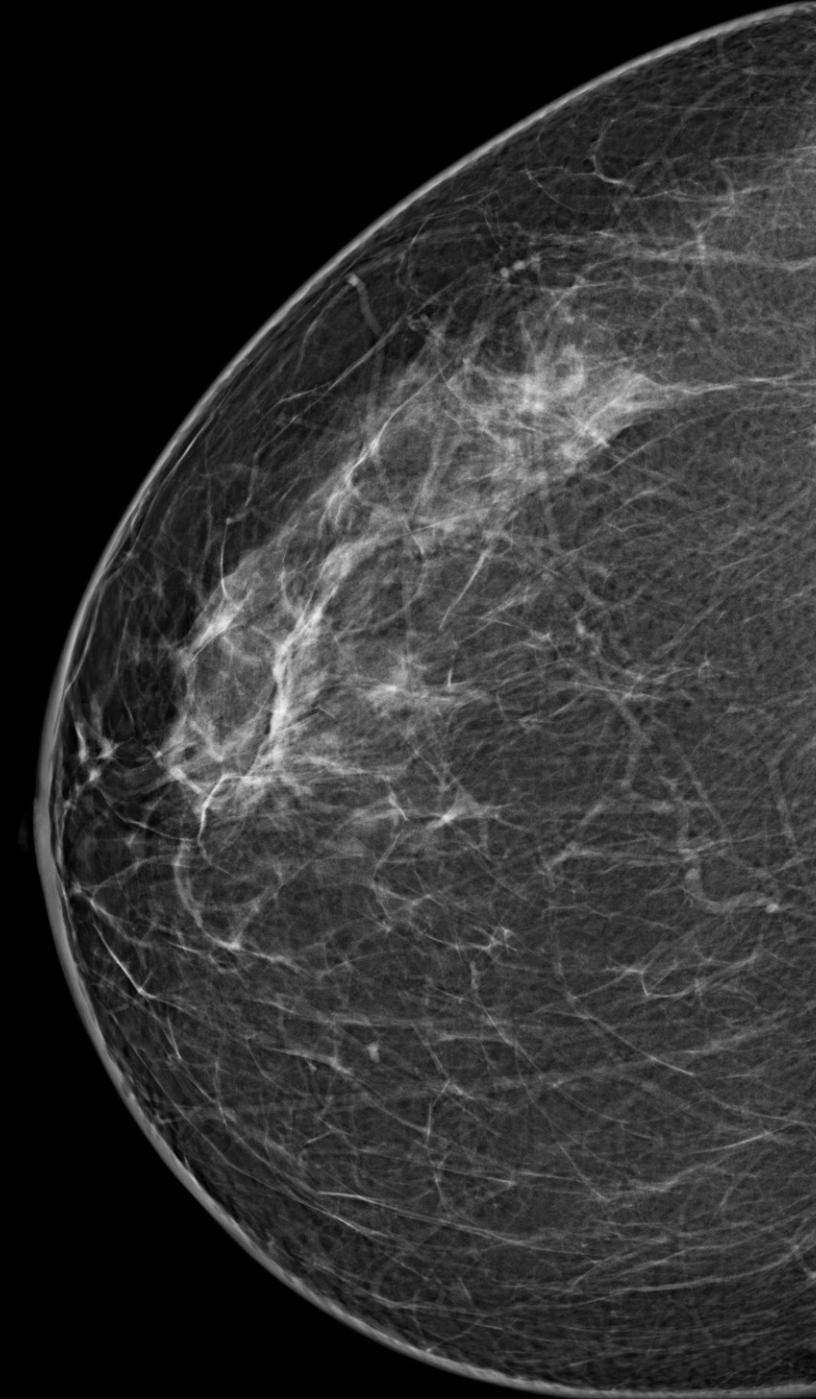


Tomo Σ : LA RECETTE ?

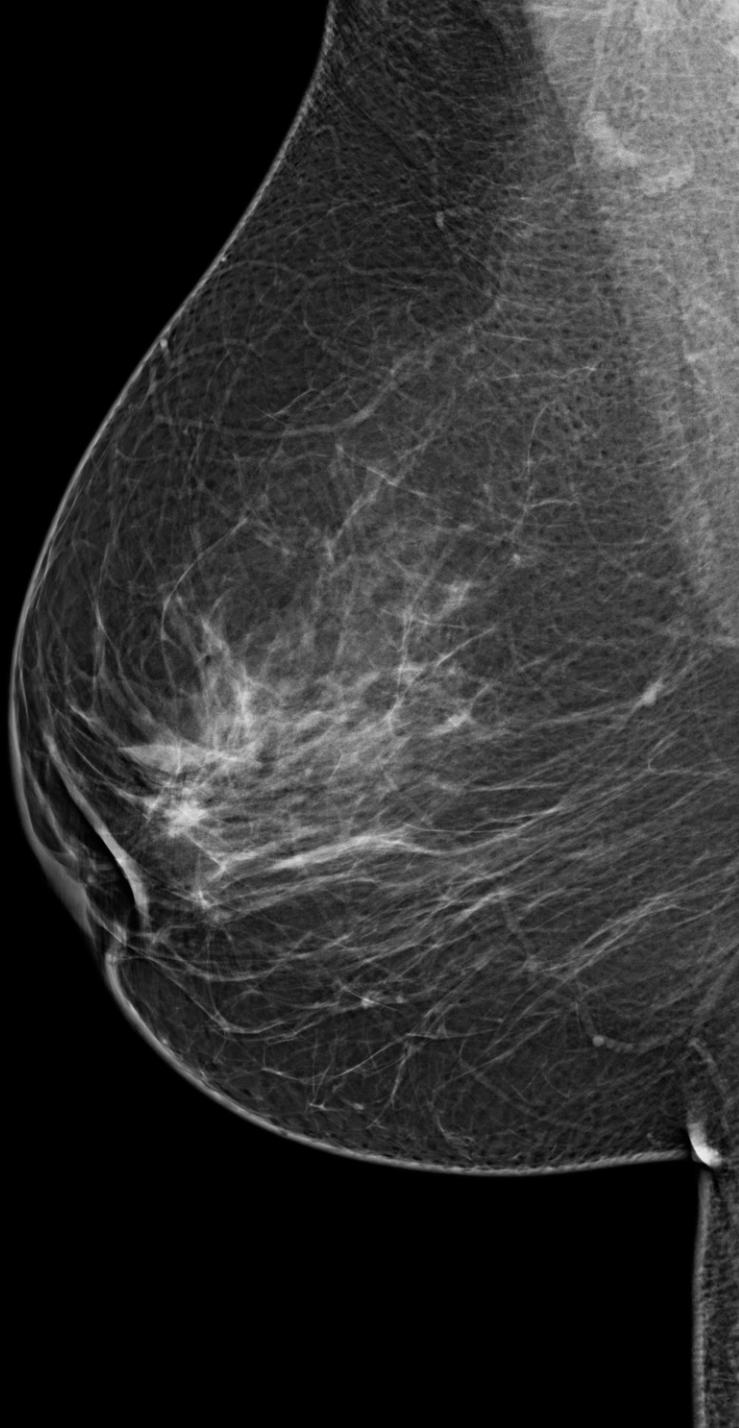
Dépistage organisé et 2DS = problème résolu ?



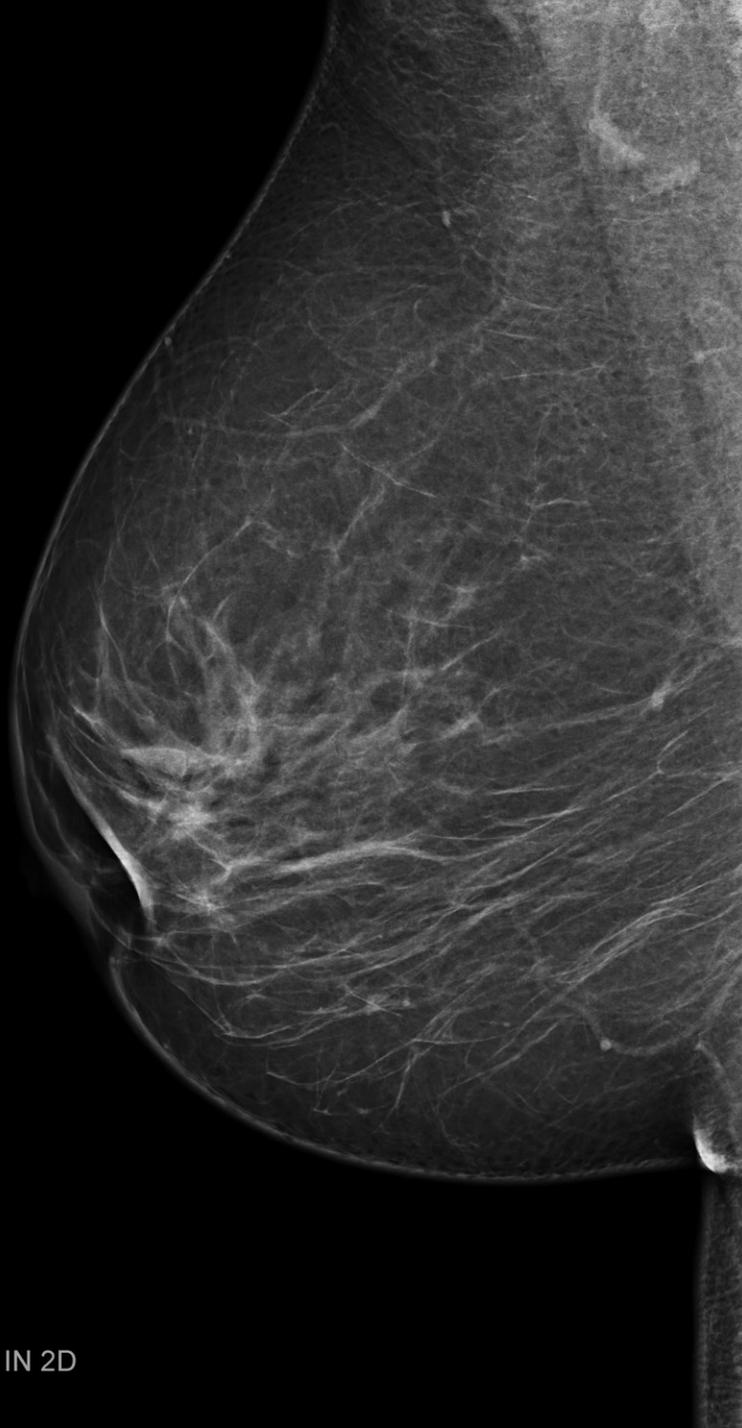




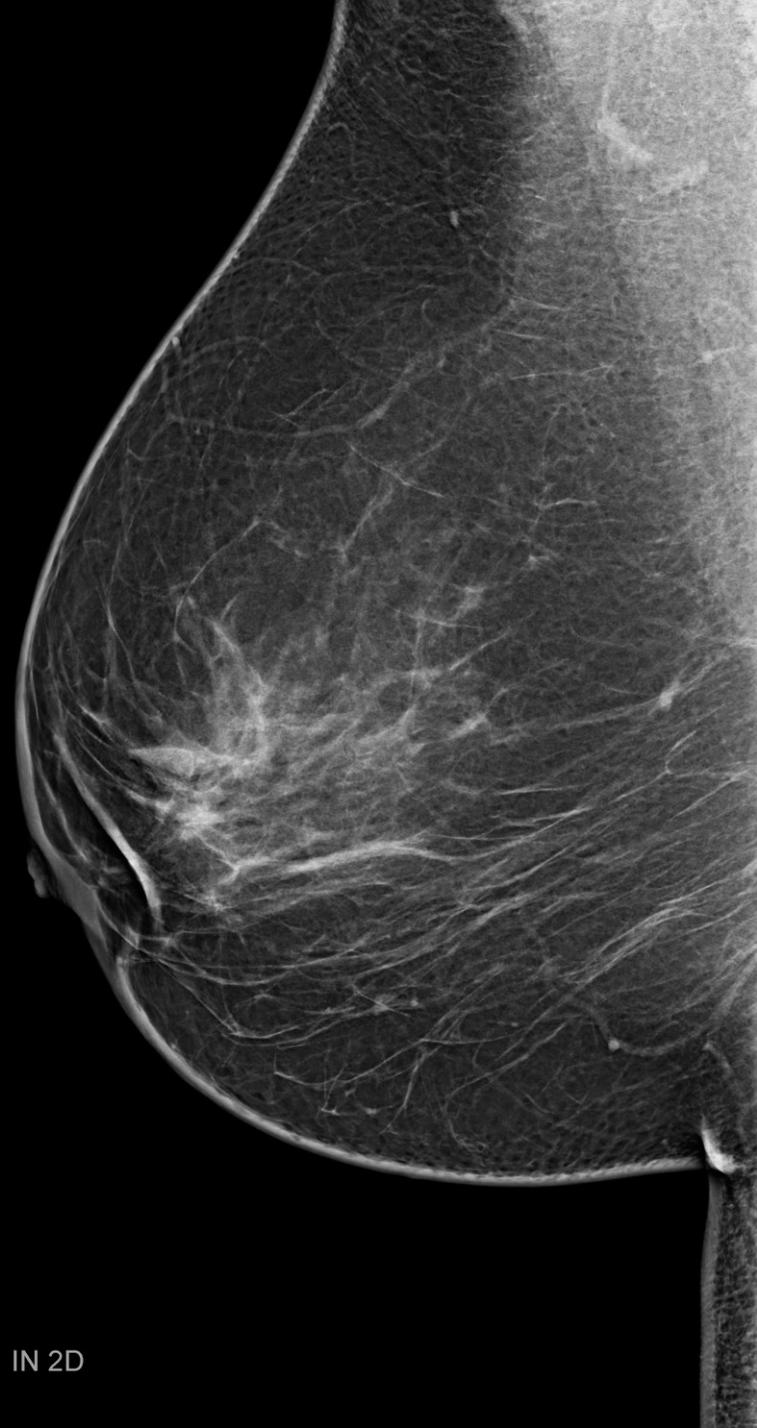
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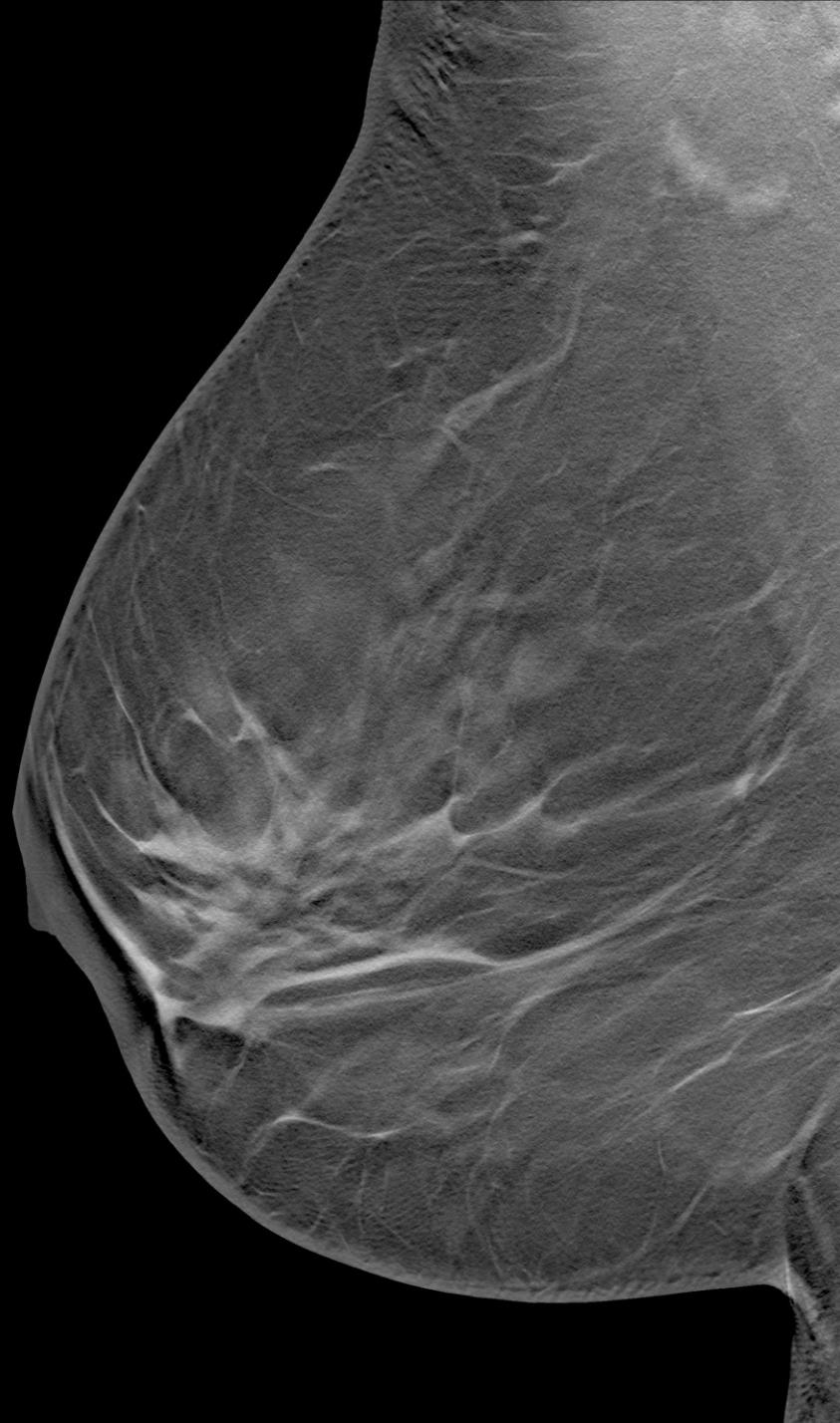
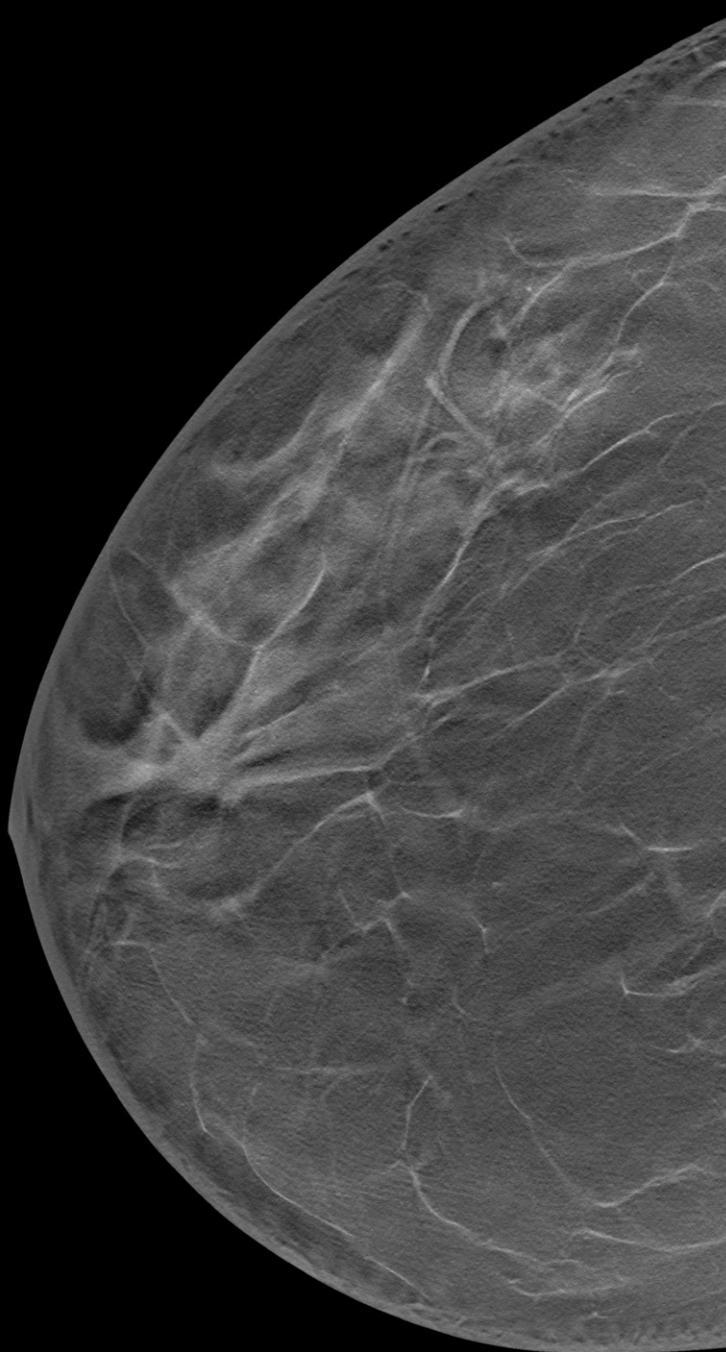


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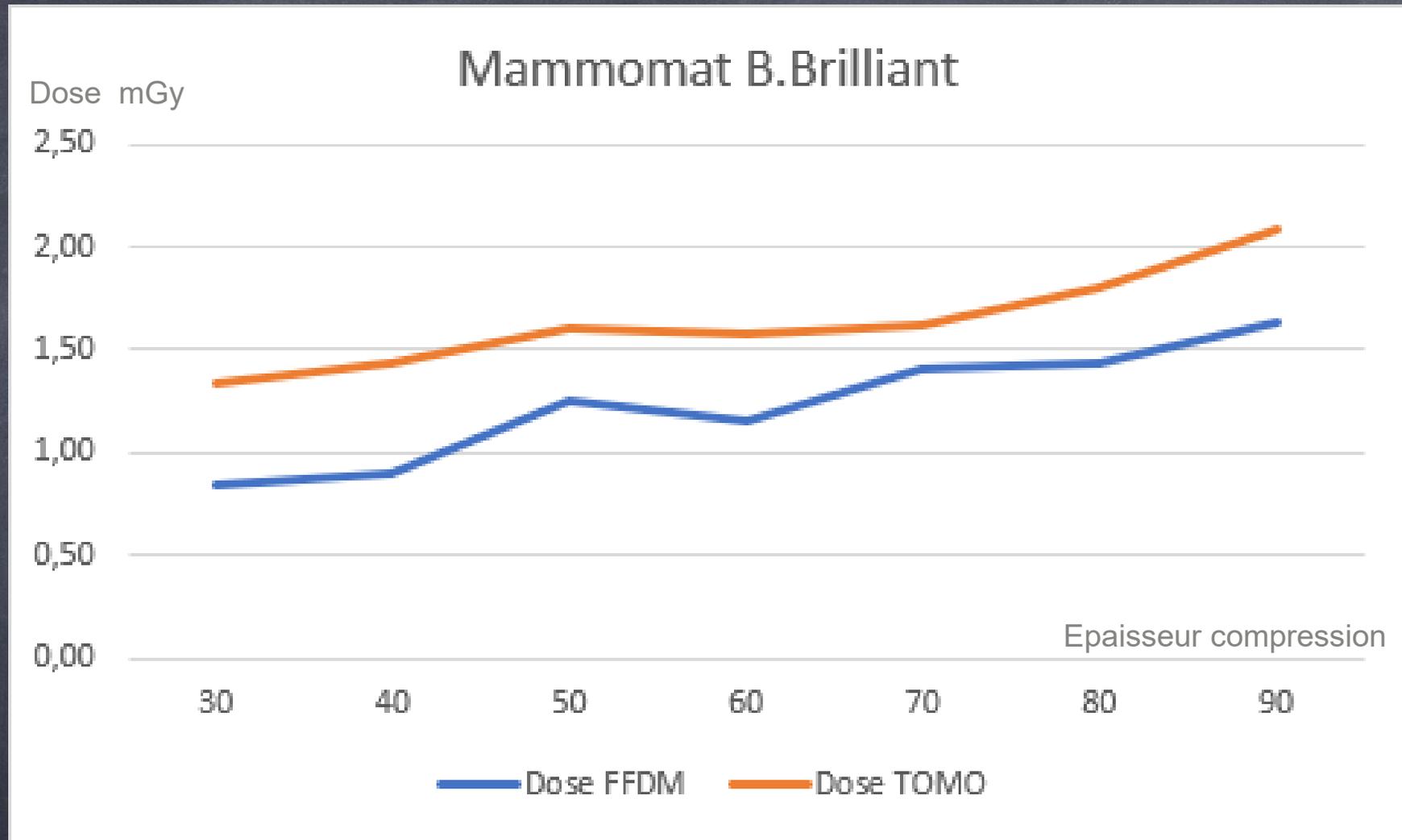


IN 2D





La dose

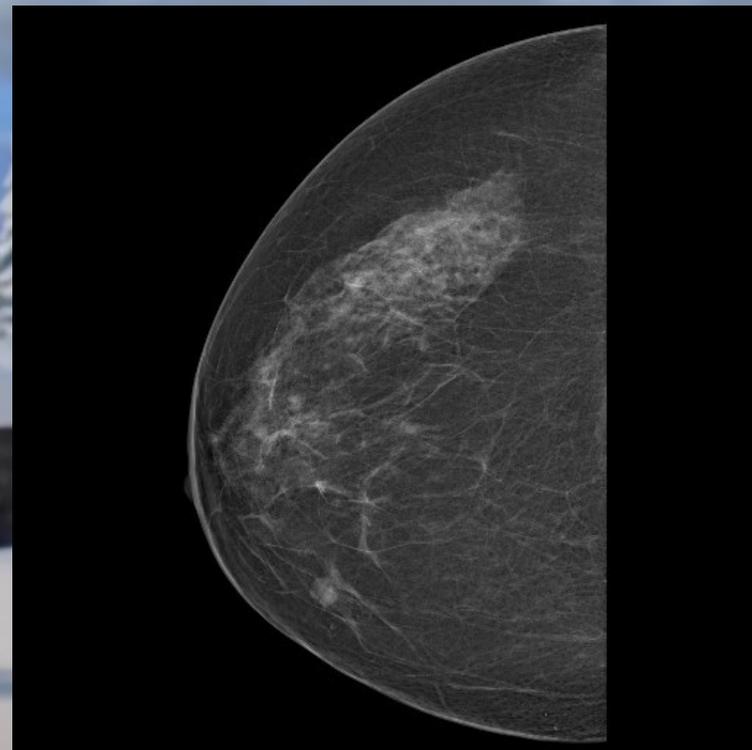
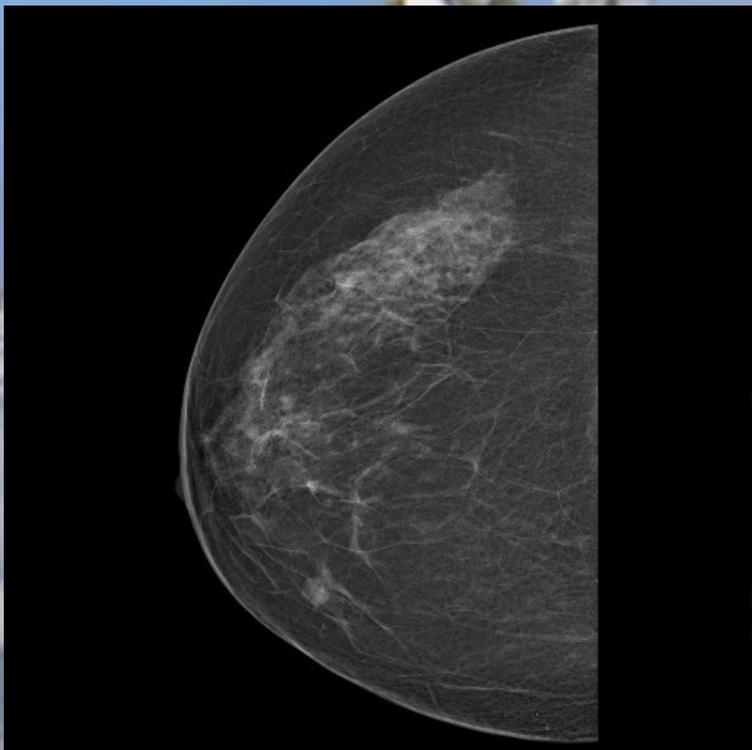


Les dosimétries moyennes en FFDM (2D) et Tomosynthèse sont respectivement de 1,21mGy et 1,62mGy.
NRDs à 1,7mGy pour la 2D et 2,3mGy pour la tomosynthèse (IRSN)

DEPISTAGE
ORGANISE



DEPISTAGE
INDIVIDUEL



Lecteur expert



Lecteur impliqué
et augmenté



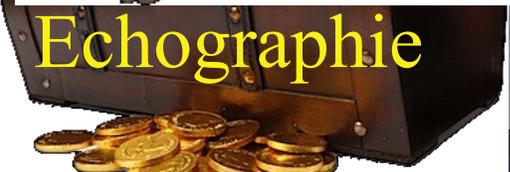
Dématérialisation



Tomo Σ



Examen
clinique



Echographie



APPORT DE L'INTELLIGENCE ARTIFICIELLE EN IMAGERIE PELVIENNE 3D FOCUS ENDOMETRIOSE – ACTUALITES

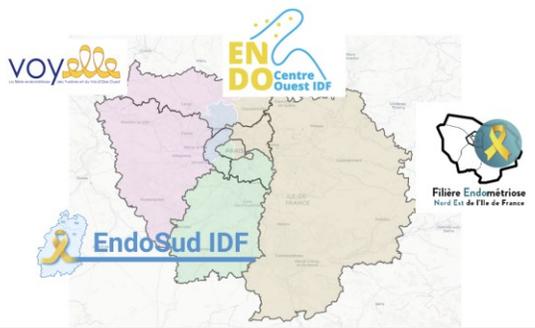
Pr Isabelle Thomassin-Naggara

14 juin 2024



INTRODUCTION

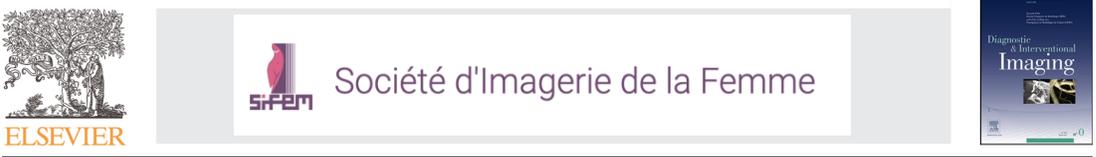
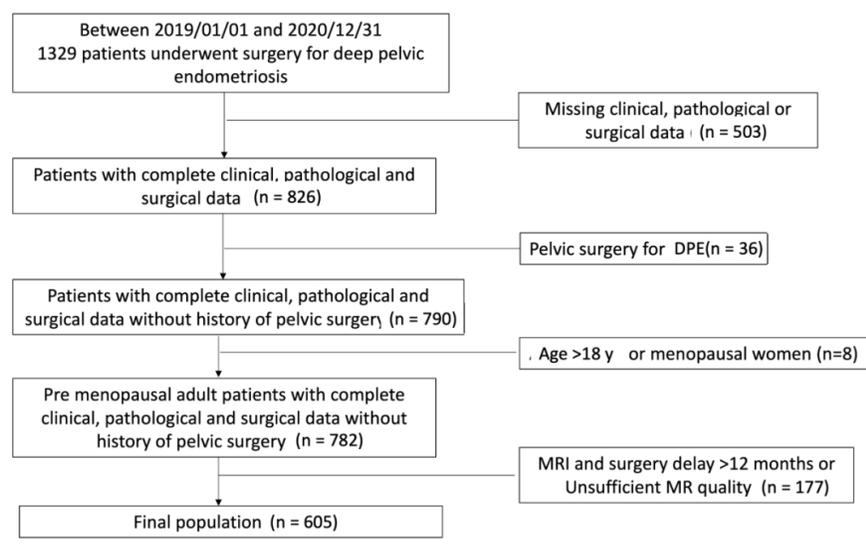
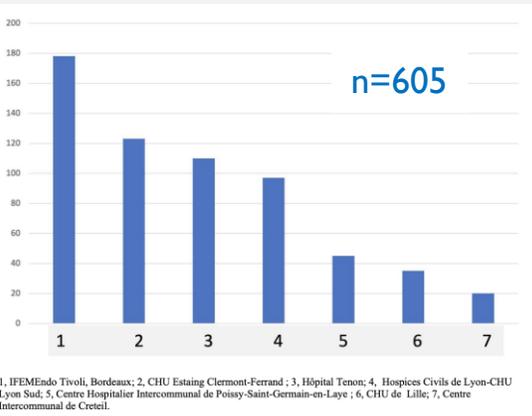
Les filières de
soins
Endométriose



Hiérarchisation
Standardisation
Communication

Etude française multicentrique

SIFEM



Recommendations/*Genitourinary imaging*

Deep pelvic infiltrating endometriosis: MRI consensus lexicon and compartment-based approach from the ENDOVALIRM group

Pascal Rousset^{a,*}, Marie Florin^b, Nishat Bharwani^c, Cyril Touboul^d, Michèle Monroc^e, François Golfier^f, Stéphanie Nougaret^g, Isabelle Thomassin-Naggara^h, ENDOVALIRM Group¹

JAMA Network Open. 2023;6(5):

Original Investigation | Obstetrics and Gynecology

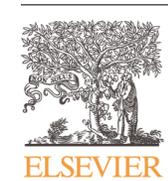
Multicenter External Validation of the Deep Pelvic Endometriosis Index Magnetic Resonance Imaging Score

Isabelle Thomassin-Naggara, MD, PhD; Michele Monroc, MD; Benoit Chauveau, MD; Arnaud Fauconnier, MD, PhD; Pauline Verpillat, MD; Yohann Dabi, MD; Marie Gavrel, MD; Pierre-Adrien Bolze, MD, PhD; Emile Darai, MD, PhD; Cyril Touboul, MD, PhD; Samia Lamrabet, MD; Pierre Collinet, MD, PhD; Elise Zareski, MD; Nicolas Bourdel, MD, PhD; Horace Roman, MD, PhD; Pascal Rousset, MD, PhD

Standardisation du
lexique en IRM
pelvienne

Standardisation d'une
classification en IRM
pelvienne

LEXIQUE SIFEM



Société d'Imagerie de la Femme



Recommendations/Genitourinary imaging

Deep pelvic infiltrating endometriosis: MRI consensus lexicon and compartment-based approach from the ENDOW

Pascal Rousset^{a,*}, Marie Florin^b, Nishat Bharwani^c, Cyril Toussaint^d, François Golfier^f, Stéphanie Nougaret^g, Isabelle Thomassin-^h



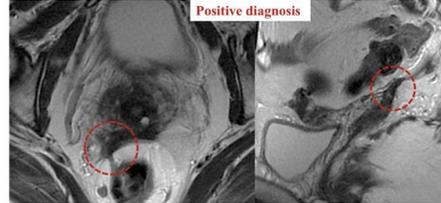
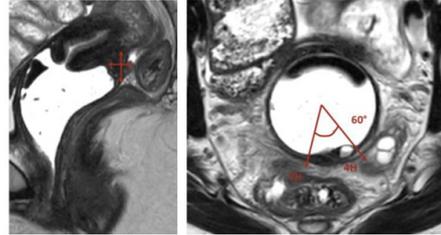
SCAN ME

Certaine

- Epaissement rétractile (spiculations visibles sur 2 plans)
- Epaissement nodulaire (aspect nodulaire visible sur 2 plans)
- Epaissement avec implant hémorragique (régulier ou pas)
- Epaissement régulier >5mm

Incertaine

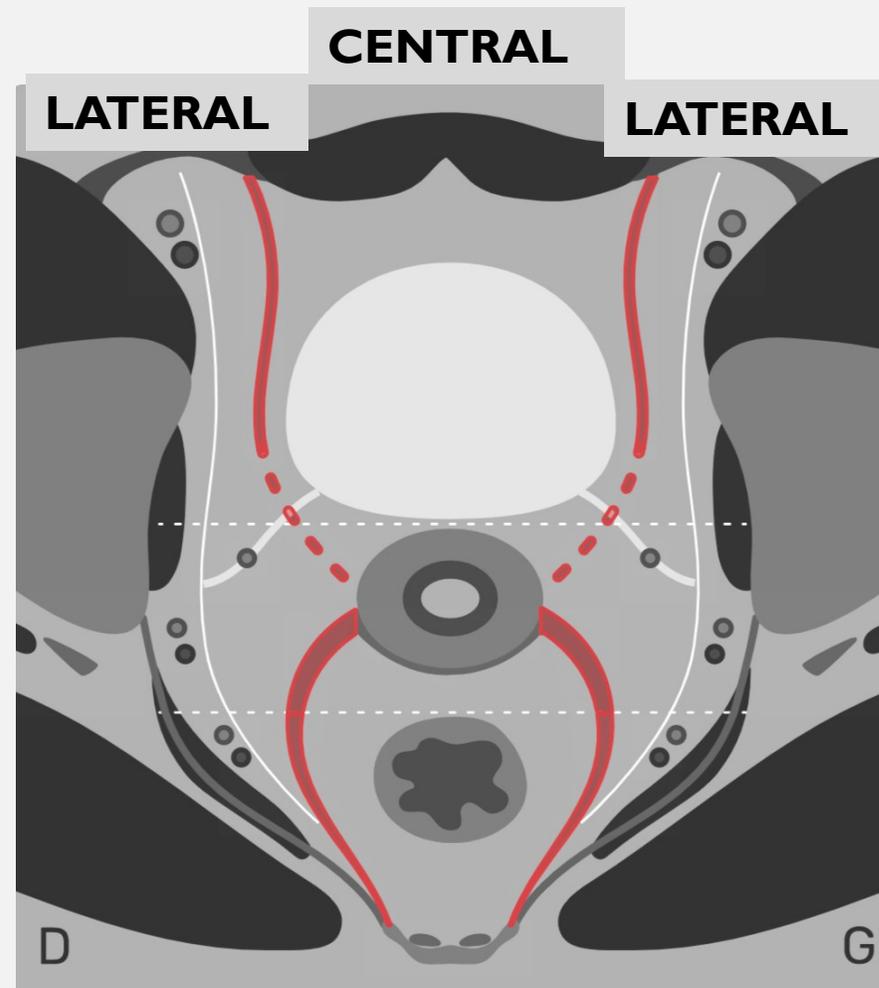
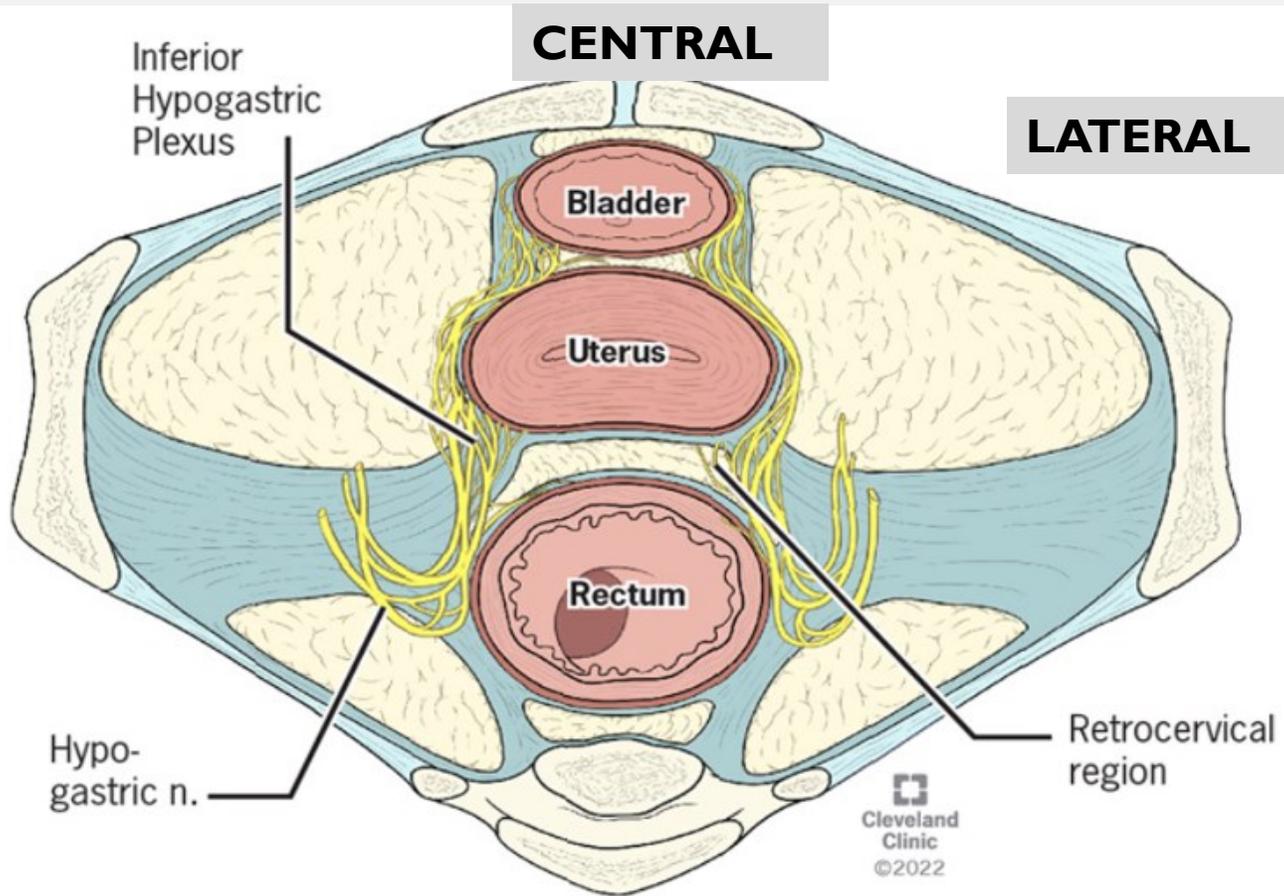
- Epaissement pseudonodulaire (nodularité visible sur un plan)
- Epaissement irrégulier (spiculation ou irrégularité sur un plan)
- Epaissement régulier entre 3 et 5mm

Anatomic structure	MRI reporting	Representative figures
Torus and proximal uterosacral ligaments (USL)	<p>Mediocentral compartment "Proximal" corresponds to USL \leq 2 cm from the torus. Positive diagnosis (dashed circle) if: - With or without hemorrhagic implant(s): • Regular or irregular fibrotic thickening >5 mm. And/or • Nodular (defined as if nodule is present in two planes). And/or • Retraction (spiculate defined as irregularity present in two planes, distortion of the shape, surrounding fat infiltration) - Presence of hemorrhagic implant(s), whatever the thickening. Uncertain diagnosis (dashed circle) if: • Irregular or pseudonodular (defined as present in only one plane).</p>	<p>"Positive diagnosis"</p>  <p>"Uncertain" diagnosis</p>   

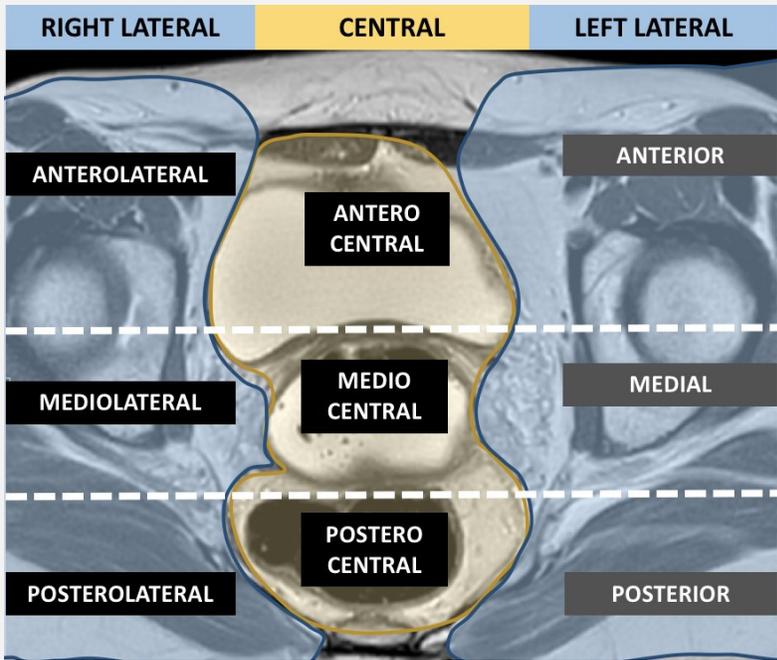


Comptes-rendus Standardisés

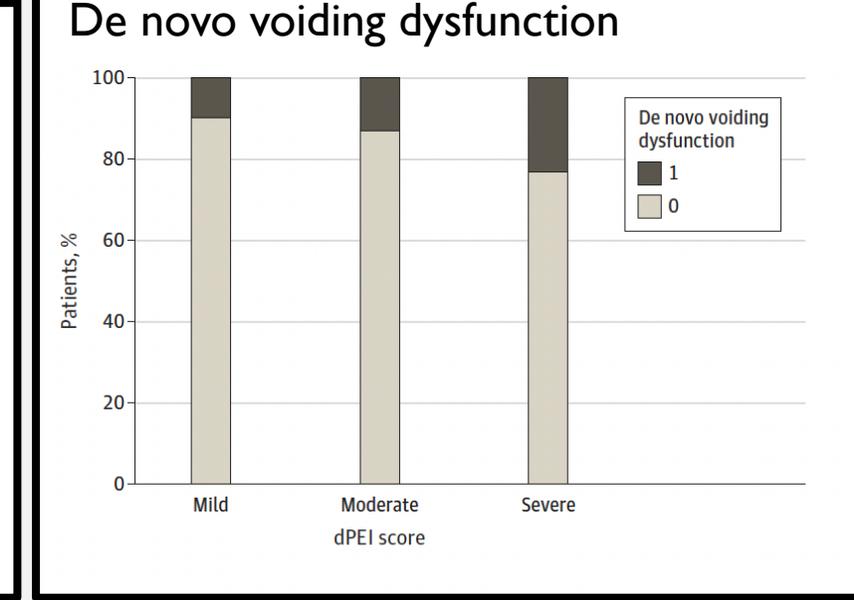
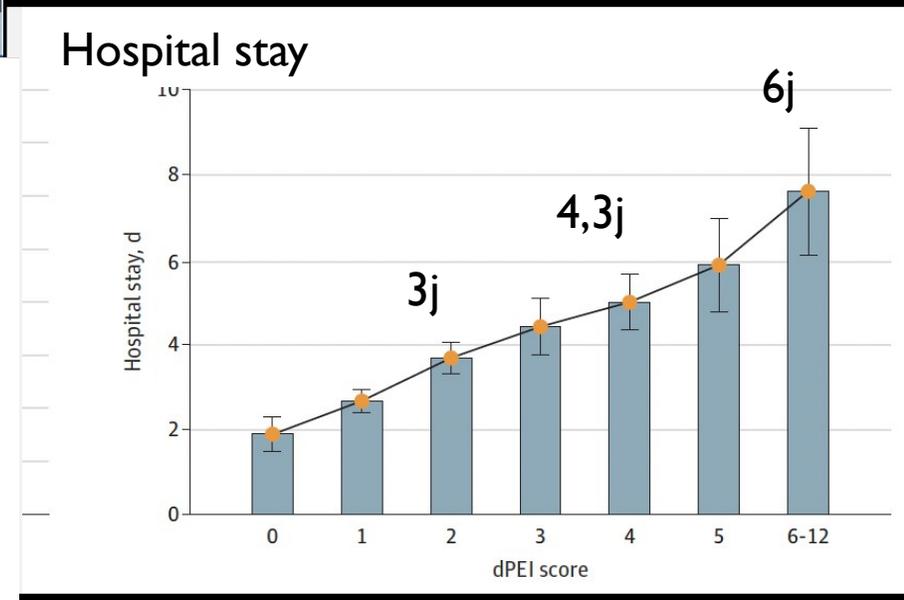
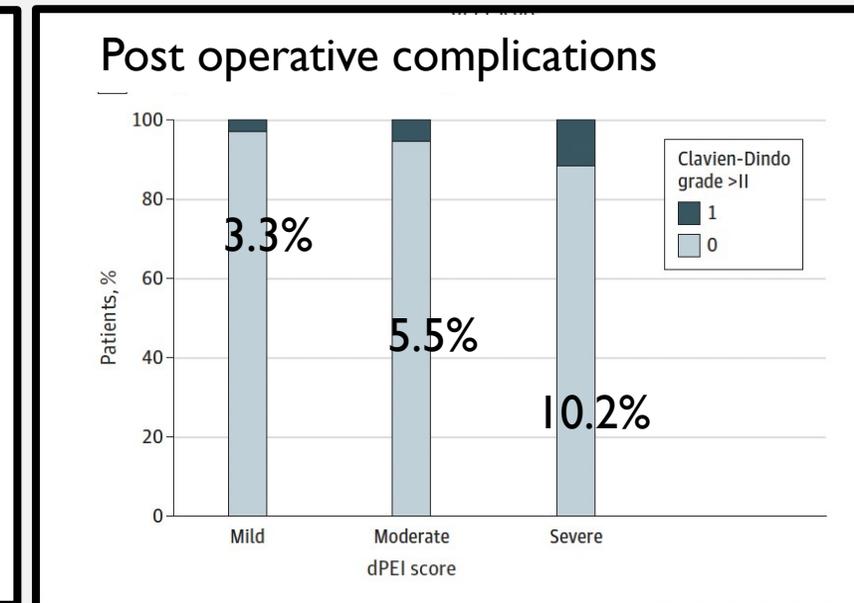
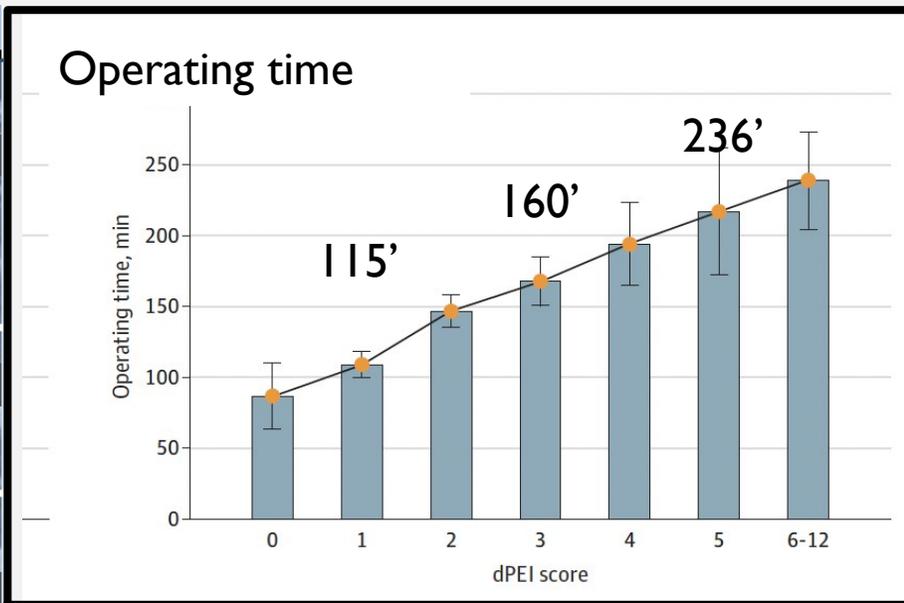
➔ IRM-Bilan d'endométriose



dPEI score = Nb de compartiments + 1 point if vagin or uretere ou base vesicale or paroi pelvienne



Anterolateral Distal round ligament	Anterocentral Proximal round ligament Bladder	Anterolateral Distal round ligament
Mediolateral Parametrium Ureter Uterine artery Visceral fascia and pelvic wall	Mediocentral Torus and proximal USL Posterior vaginal fornix Rectovaginal septum External myometrium adenomyosis	Mediolateral Parametrium Ureter Uterine artery Visceral fascia and pelvic wall
Posterolateral Distal USL Sacro-recto- genital septum	Postero-central Rectum and rectosigmoid junction	Posterolateral Distal USL Sacro-recto- genital septum
Extrapelvic Caecum- ileum- appendix Sigmoid colon Abdominal wall Inguinal regions Ureters at the level of common iliac artery		



CONSENSUS STATEMENT

Publié dans 7
journaux
simultanément
en mai 2024

Non-invasive imaging techniques for diagnosis of pelvic deep endometriosis and endometriosis classification systems: an International Consensus Statement

G. CONDOUS^{1#}, B. GERGES^{1,2#}, I. THOMASSIN-NAGGARA³, C. BECKER⁴, V. C. TOMASSETTI^{5,6}, H. KRENTTEL⁷, B. J. VAN HERENDAEL^{8,9}, M. MALZONI¹⁰, M. S. ABRAO¹¹, E. SARIDOGAN¹², J. KECKSTEIN¹³, Intersociety Consensus Group[†] and G. HUDELIST¹⁴



George Condous



*Joerg Keckstein
Ertan Saridogan*



*Gernot Hudelist
Harald Krentel*



Bruno van Herendael



*Mauricio Abrao
Mario Malzoni*



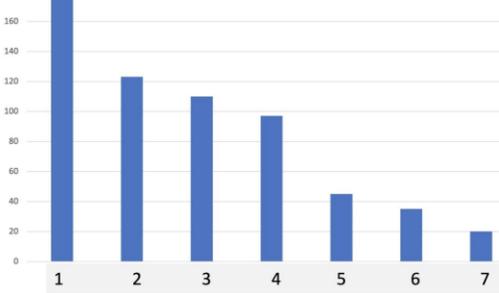
*Carla Tomasetti
Christian Becker*



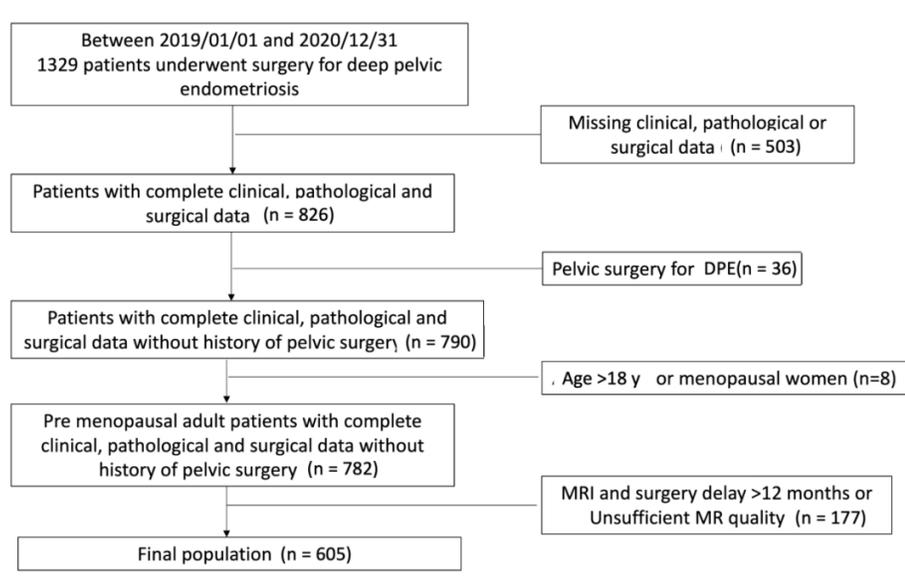
Isabelle Thomassin Naggara

French national multicentric retrospective study

n=605



1, IFEMendo Tivoli, Bordeaux; 2, CHU Estaing Clermont-Ferrand; 3, Hôpital Tenon; 4, Hospices Civils de Lyon-CHU Lyon Sud; 5, Centre Hospitalier Intercommunal de Poissy-Saint-Germain-en-Laye; 6, CHU de Lille; 7, Centre Intercommunal de Creteil.



Standardisation du protocole
en IRM pelvienne



PROTOCOLE

- Variabilité importante

→ preparation des patientes **AVANT** IRM (ESUR¹)



questionnaire

Recommandé

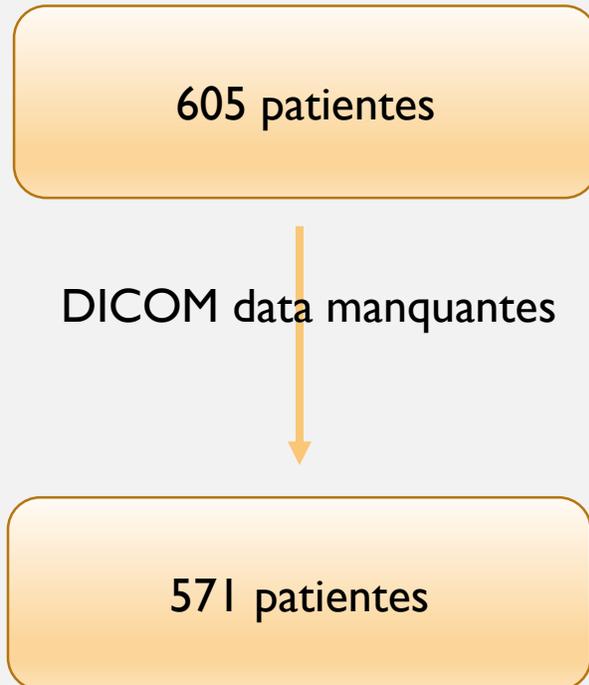
- A jeun (3-6 hours)
- Préparation digestive
- Contention abdominale
- Antiperistaltiques ++
- Vessie modérée remplie

No consensus

- Opacification vaginale
- Opacification rectale

POPULATION

- Etude retrospective (n=7 centres) (from the ENDOVALIRM group cohort ¹)



	Nb (%)
Préparation digestive	51.4% (311)
Opacification vaginale	41.4% (251)
Opacification rectale	37.3% (114)
3T Magnet unit	14% (85)
Séquences additionnelles	52.3% (317)
Gadolinium	11.7% (71)

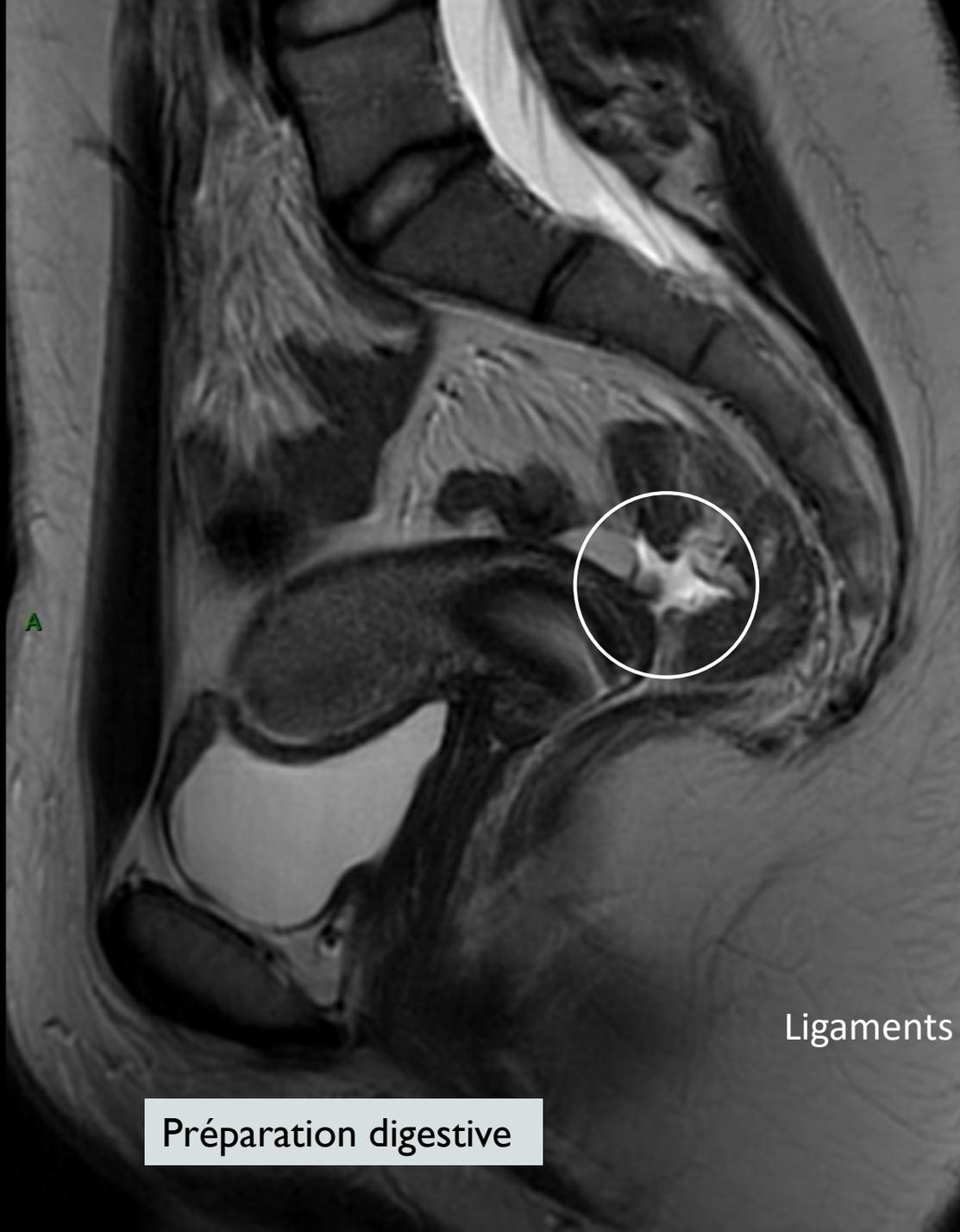
RESULTS

- Concordance entre IRM et chirurgie

		Torus/USL	Vagin	Rectosigmoïde	Vessie
Préparation digestive	Yes (n =311)	94,9% (295) *	79,7% (248)	85,9% (260)*	96,8% (301)
	No (n=260)	85% (221)	81,5% (212)	77,7% (202)	98,1% (255)
Opacification rectale	Yes (n= 114)	88,6% (101)	81,6% (93)	81,6% (93)	96,5% (110)
	No (n= 457)	90,8% (415)	80,3% (367)	82,3% (457)	97,6% (446)

Sans préparation digestive
 Oui : 92,2% (47/51)
 Non : 79,4% (166/209) *

*p<0,05



Préparation digestive

Ligaments utéro sacrés



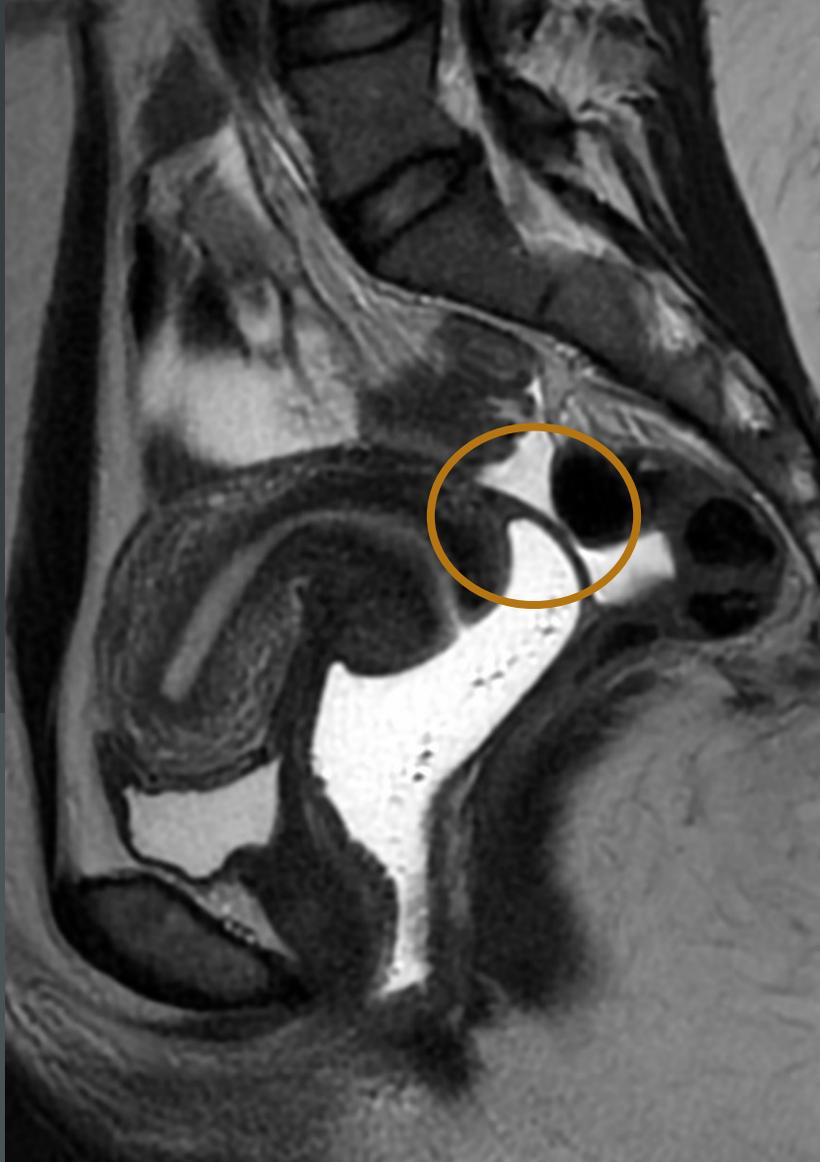
Pas de préparation digestive
Opacification digestive

RESULTATS

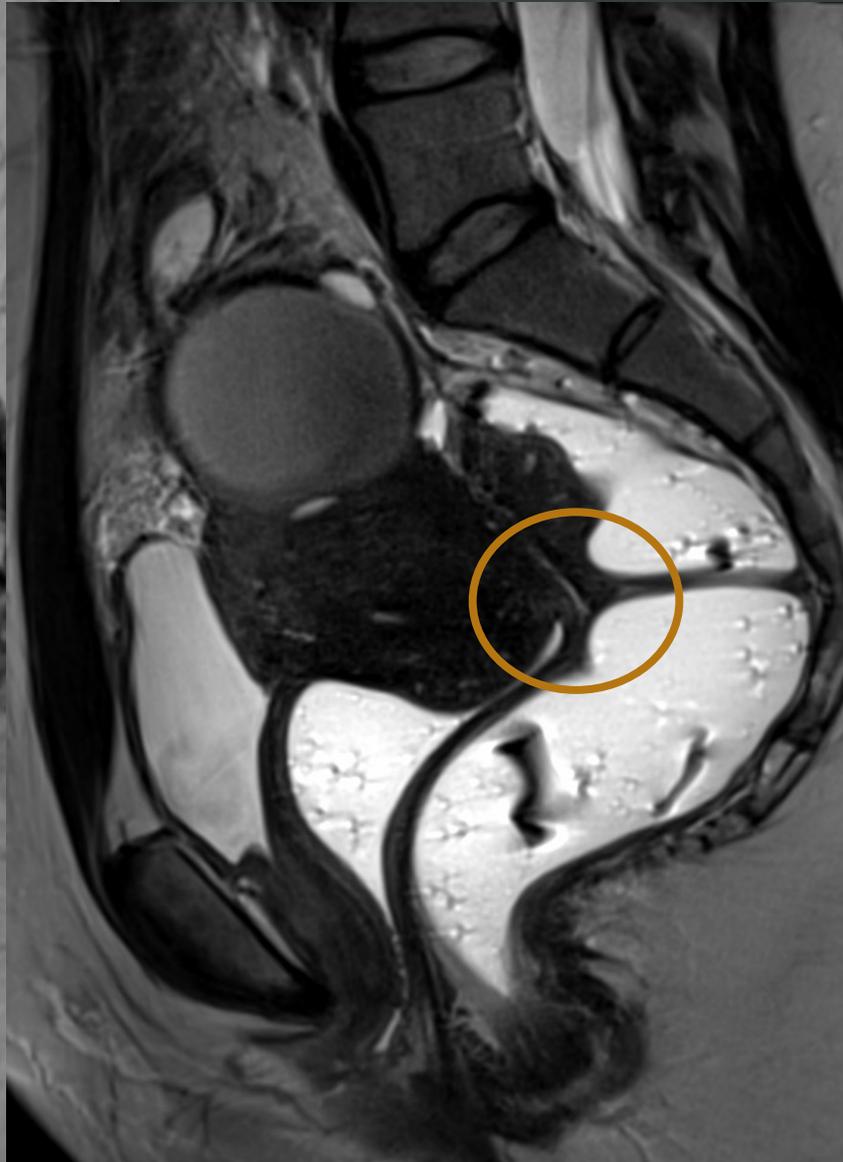
- Concordance between MR imaging and surgical findings

		Torus/USL	Vagin	Rectosigmoide	Vessie
Préparation digestive	Yes (n =311)	94,9% (295) *	79,7% (248)	85,9% (260)*	96,8% (301)
	No (n=260)	85% (221)	81,5% (212)	77,7% (202)	98,1% (255)
Opacification rectale	Yes (n= 114)	88,6% (101)	81,6% (93)	81,6% (93)	96,5% (110)
	No (n= 457)	90,8% (415)	80,3% (367)	82,3% (457)	97,6% (446)
Opacification vaginale	Yes (n=251)	85,7% (215) *	80,1% (201)	81,7% (251)	97,2% (244)
	No (n=320)	94.1% (301)	80,9% (259)	82,5,4% (254)	97,5% (312)

*p<0,05



Opacification vaginale

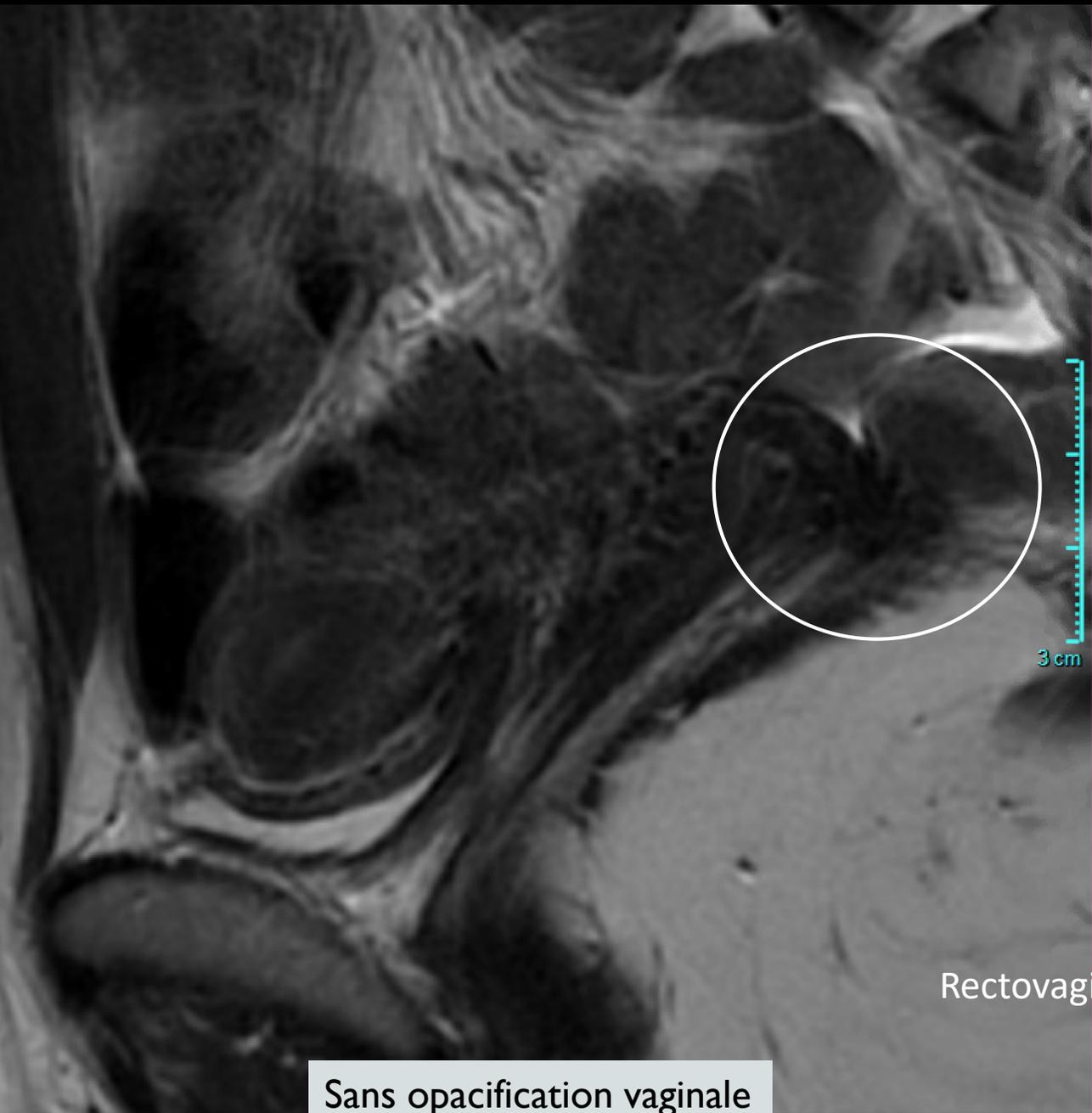


Opacification rectale et vaginale



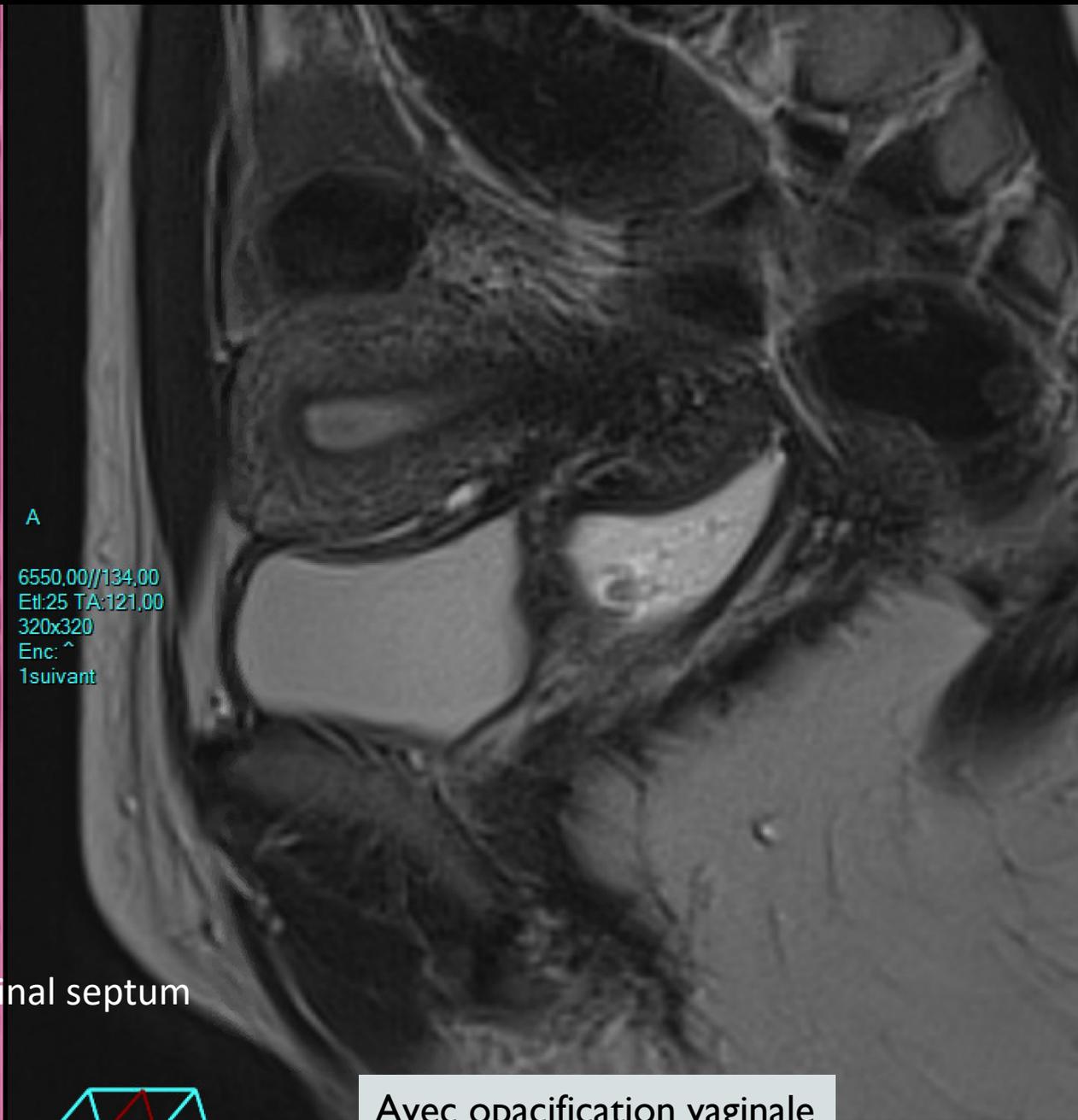
Pas d'opacification

Préparation digestive



Sans opacification vaginale

Rectovaginal septum

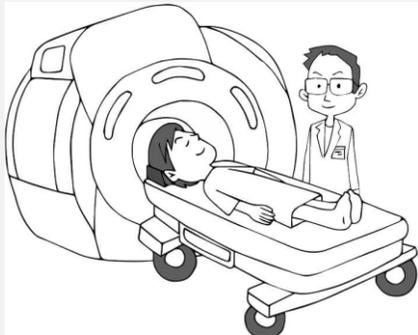


Avec opacification vaginale



PROTOCOLE

- Variabilité importante
→ preparation des patientes **DURANT** MRI (ESUR)



Patient installation
MRI acquisition

Recommandé

- Multiplanaire 2D T2W sequences (sag, ax, oblique)
- T1W FS / Dixon
- Coupes sur les reins

No consensus

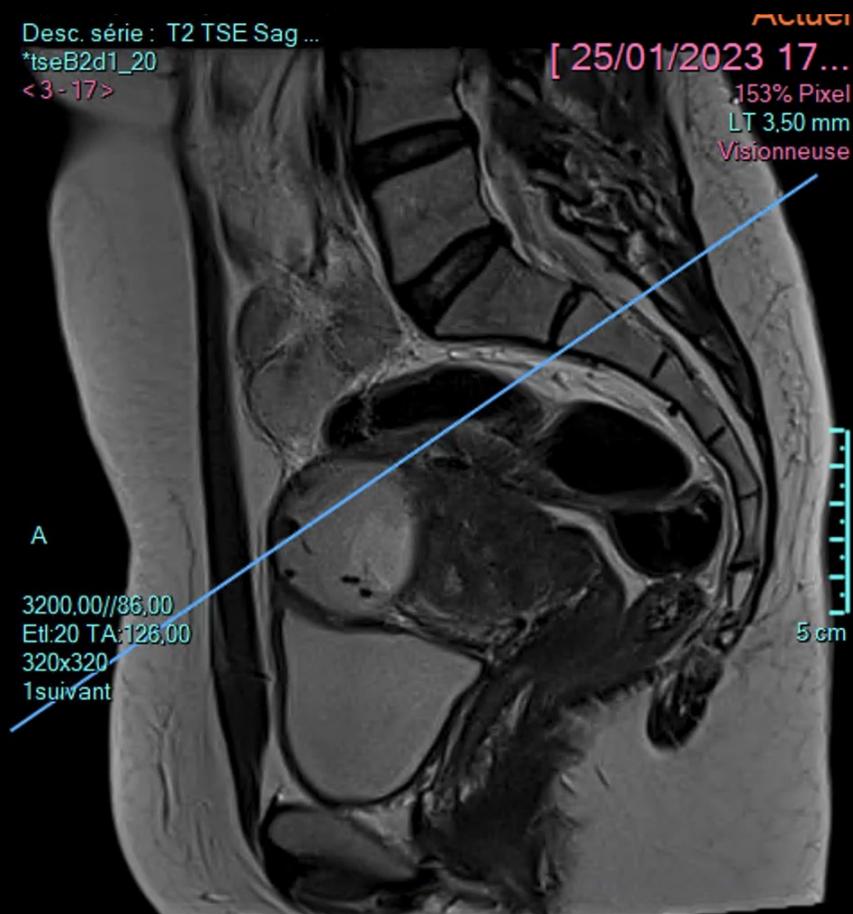
- 3D T2W

No recommandation

- MR unit 1.5 T ou 3T
- gadolinium injection

3D T2 W sequence

2D T2W oblique thin slices



4mn
Reproductibilité

ENJEUX QUALITE IMAGE INTERET DE L'INTELLIGENCE ARTIFICIELLE

- Temps d'acquisition 3D trop long >> Limiter temps d'examen est le facteur essentiel pour améliorer la qualité image 3DT2DLR
- Plus le temps est court moins la patiente bouge
- Et plus la patiente est contente !!

TECHNIQUES D'ACCELERATION

- Compress sensing : Sensible aux artéfacts de mouvements >>> majorés en reconstruction multiplanaire

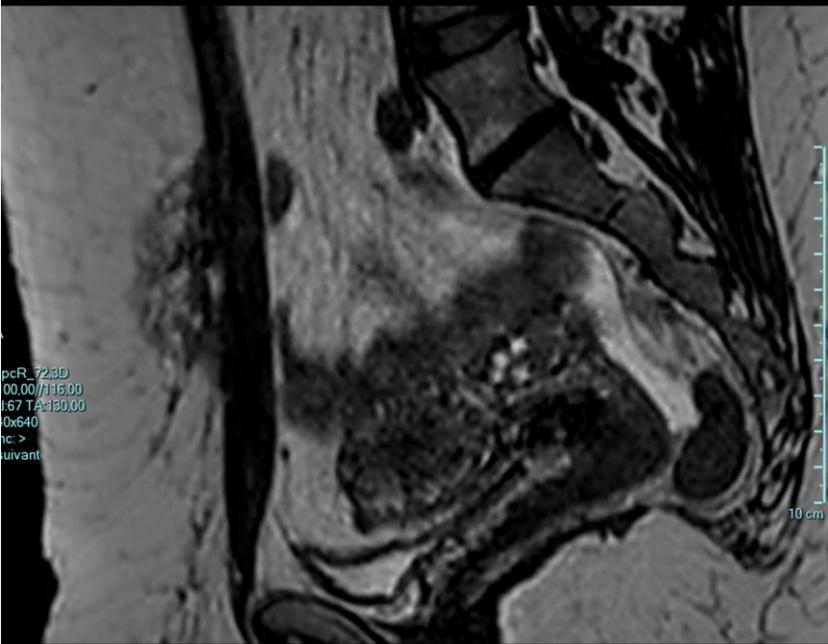
AX 3DT2

Ax 3DT2 CS

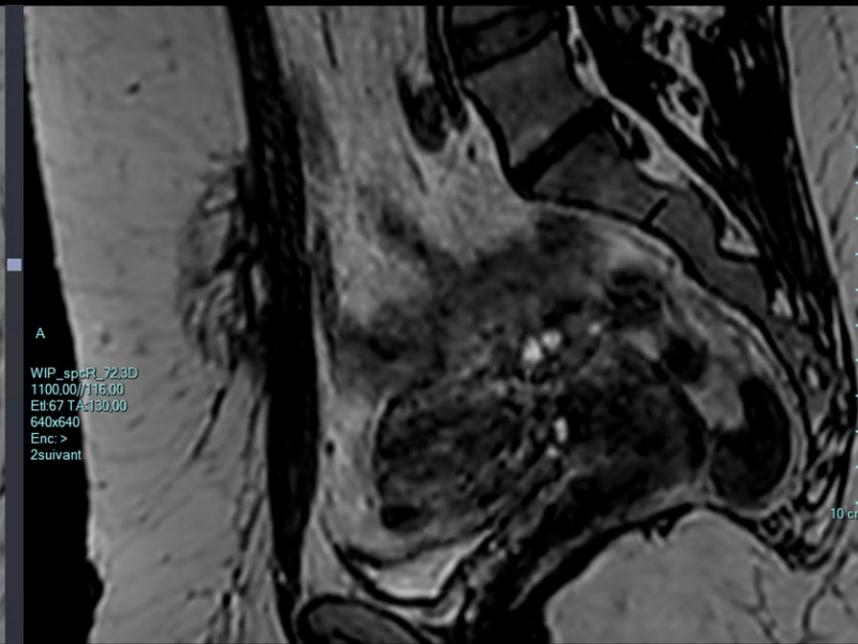
TECHNIQUES D'ACCELERATION

- Compress sensing : Sensible aux artéfacts de mouvements >>> majorés en reconstruction multiplanaire

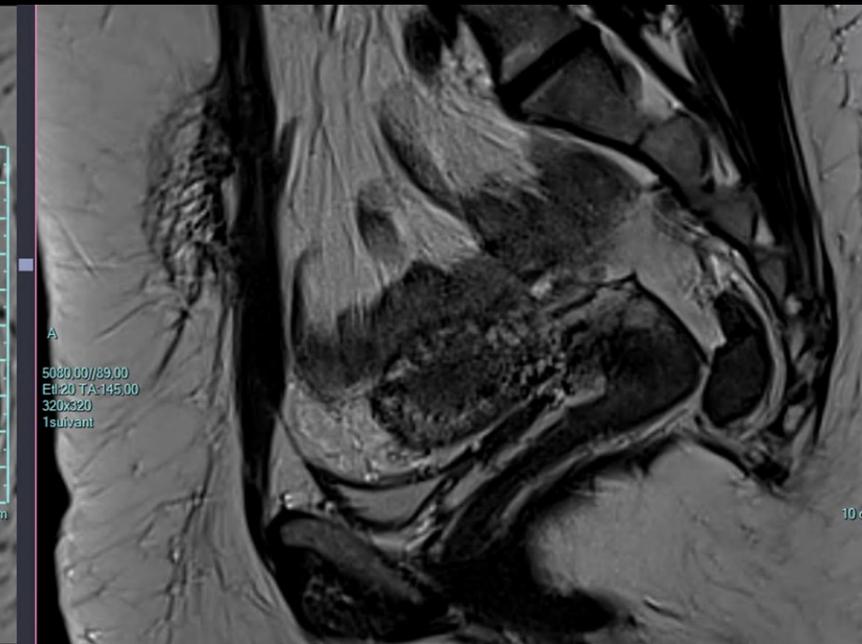
Ax 3DT2 reformat



Sag 3DT2 CS reformat

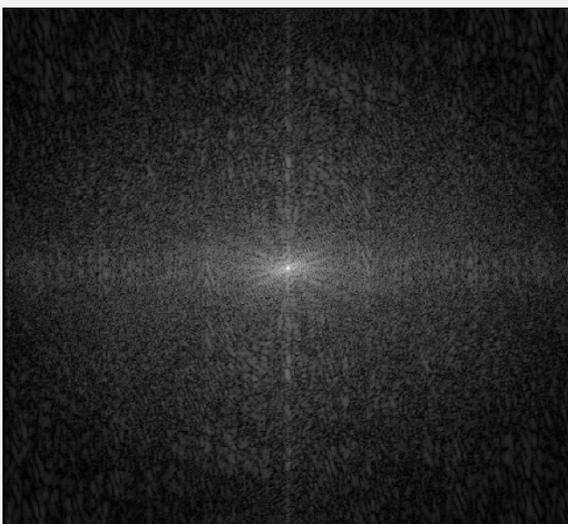


Sag 2DT2



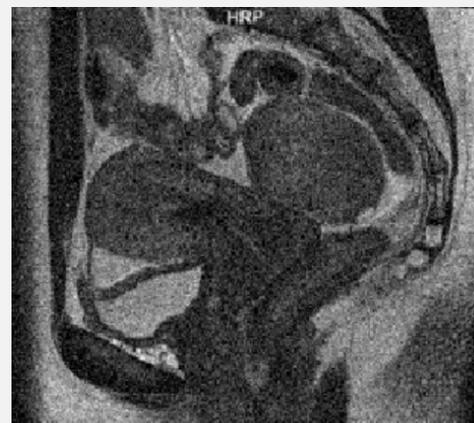
TECHNIQUE D'ACCELERATION

- Deep Learning reconstruction

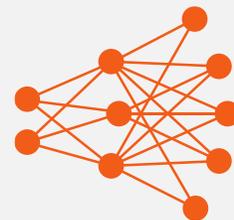


Raw data
acquisitions rapides

Conventional
reconstruction



Bruit+++
Qualité Image ---

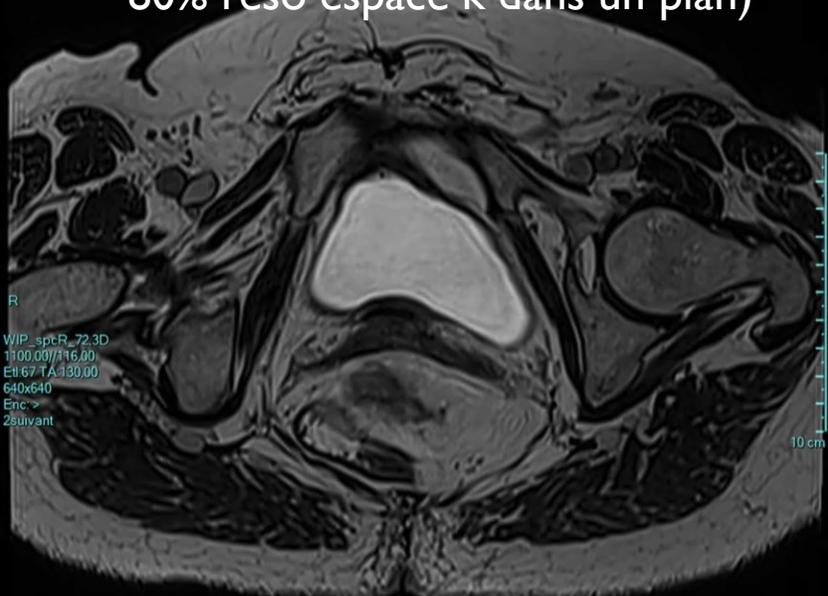


Deep Resolve
Boost

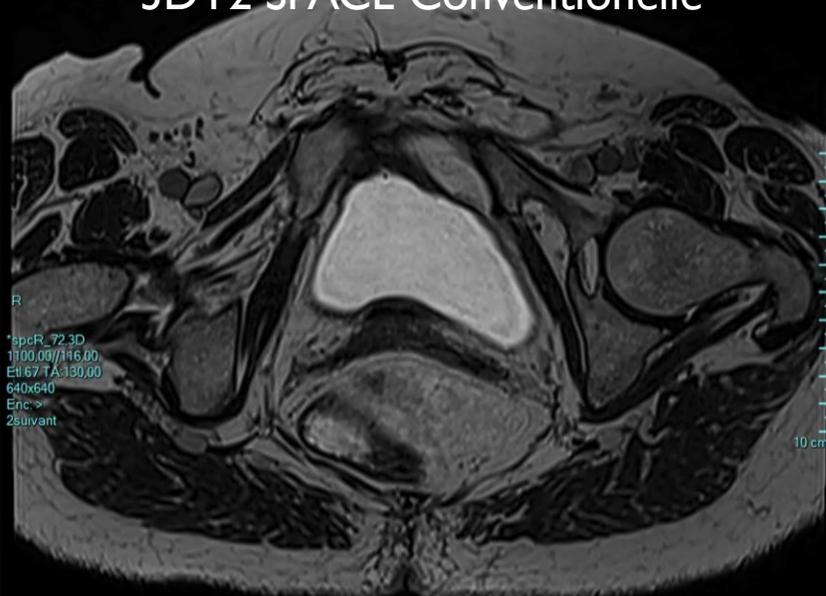


Bruit---
Qualité Image +++

2mn29 (DLR)
80% reso espace k dans un plan)



4mn37
3DT2 SPACE Conventionelle

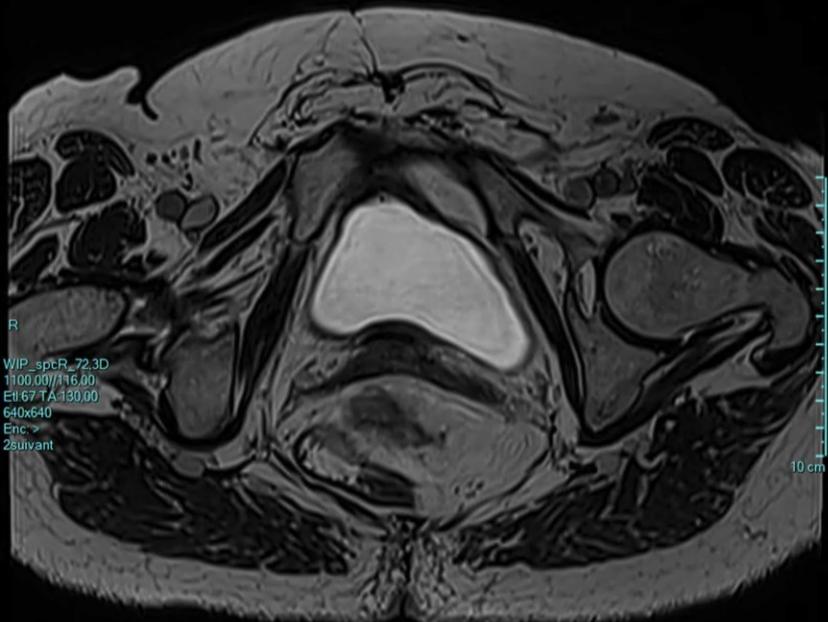


3mn14 (DLR)
100% reso espace K)

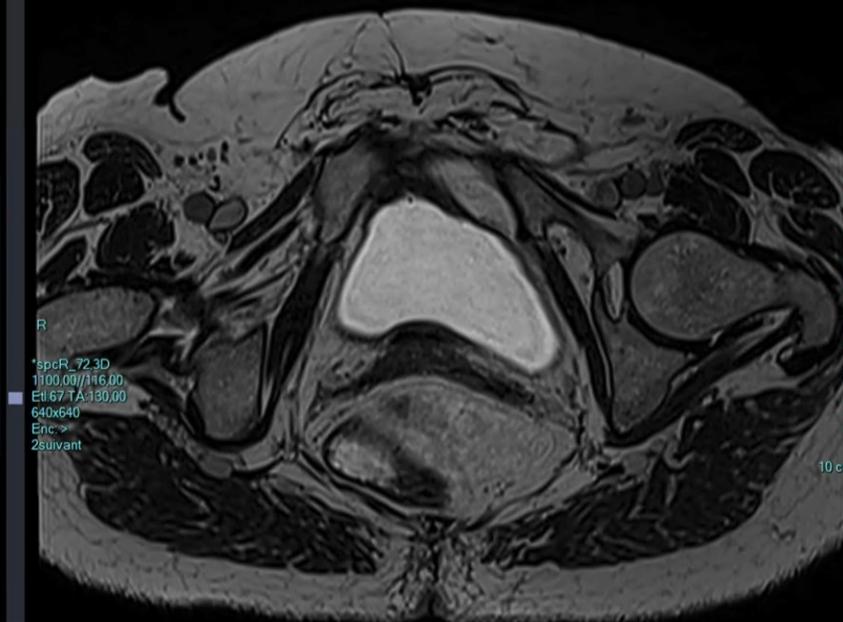


INTELLIGENCE ARTIFICIELLE 3DT2W - ACCELERATION

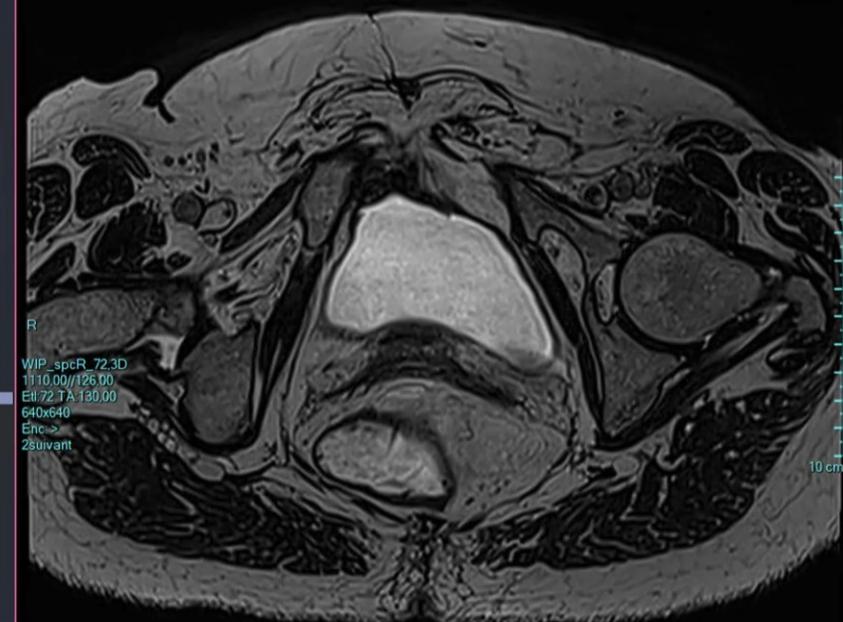
2mn29 (DLR)
80% reso espace k dans un plan)



4mn37
3DT2 SPACE Conventionelle



3mn14 (DLR)
100% reso espace K)



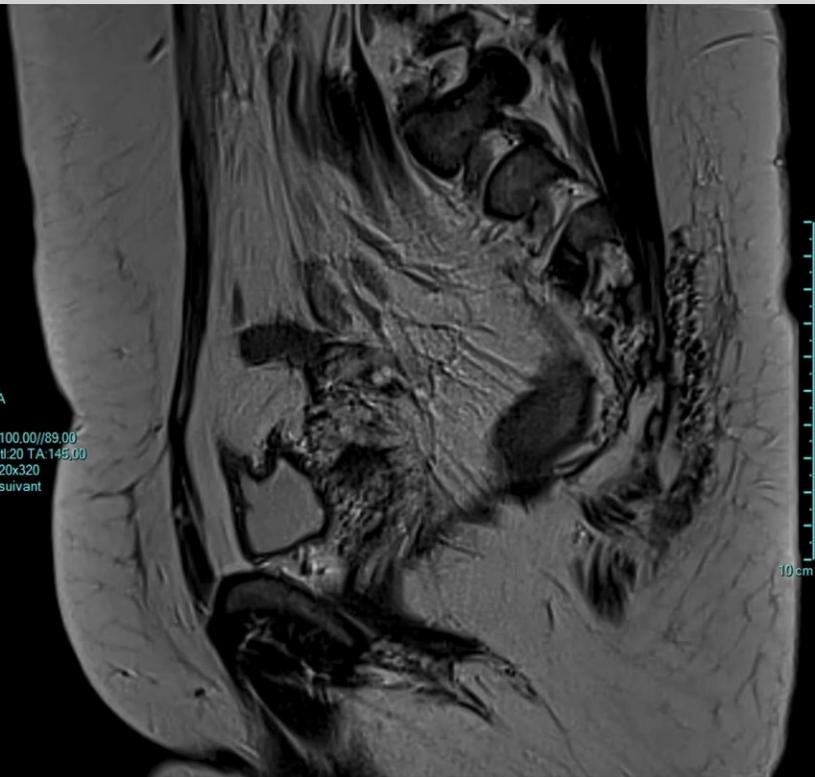
IRM PELVIENNE

CLINIQUE :

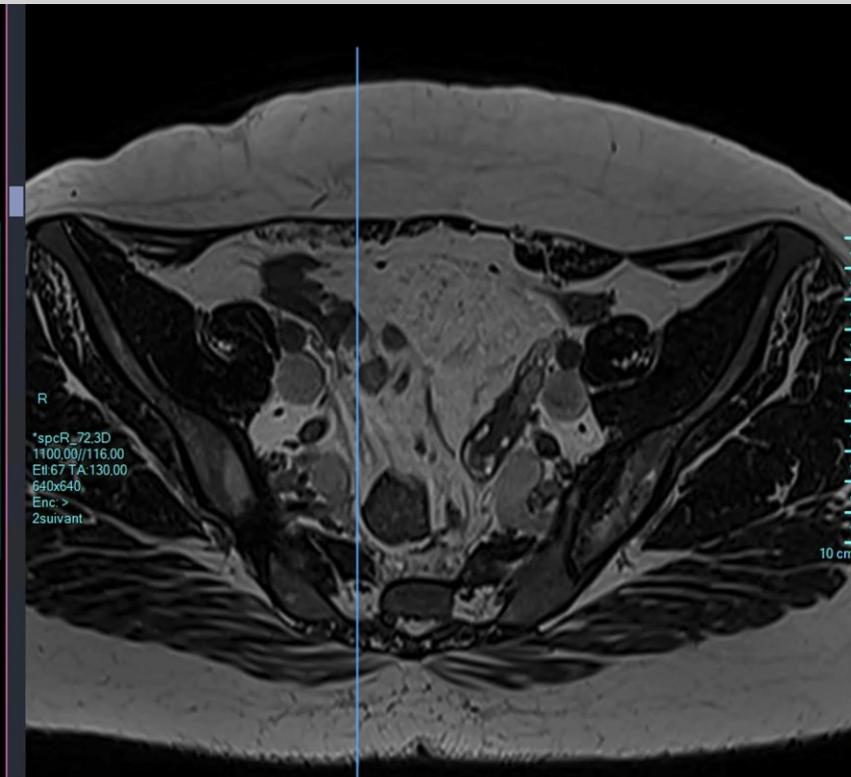
Patiente âgée de 38 ans, en aménorrhée secondaire (stérilet Jaydess), G1P0, adressée pour réévaluation de l'endométriose dans un contexte des crises de sciatique bilatérales, plus marquée à droite depuis 6 mois, avant elles étaient plus marquées à gauche.

Antécédents de colectomie subtotala et proctectomie avec anastomose iléo-anale en 2016 pour une atteinte digestive inflammatoire (recto-colite hémorragique).

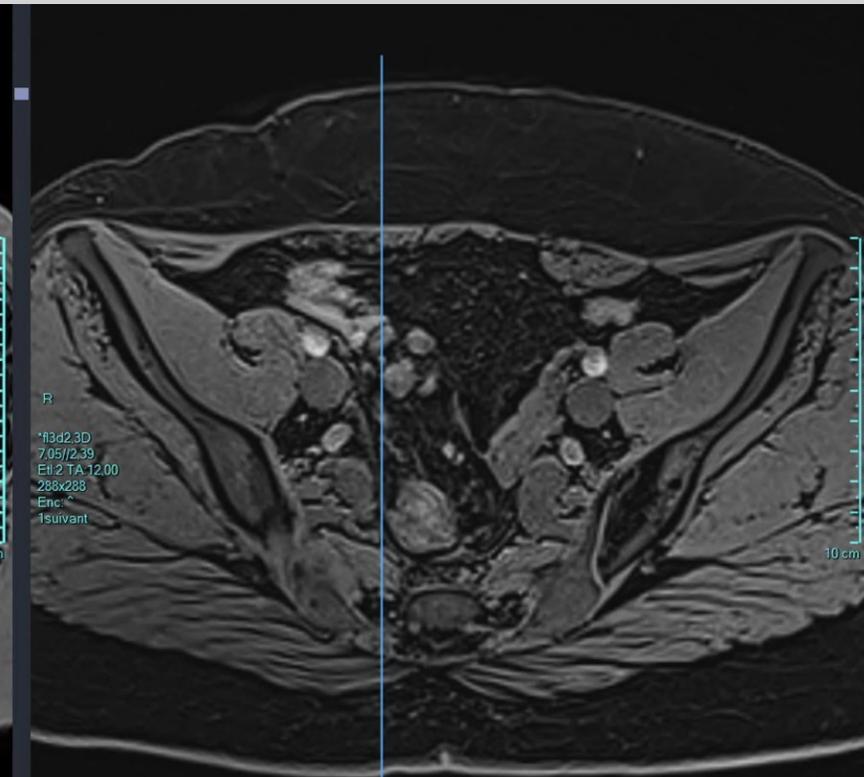
Patiente adressée par le Pr TOUBOUL



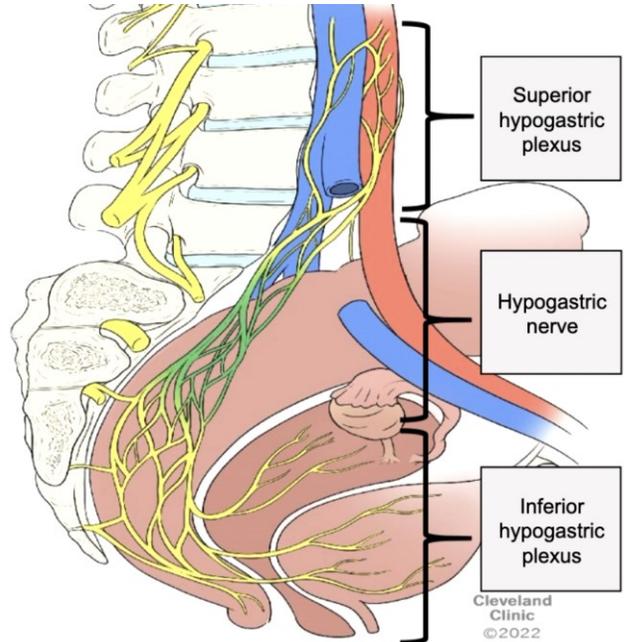
Sag 2DT2W (4mn)



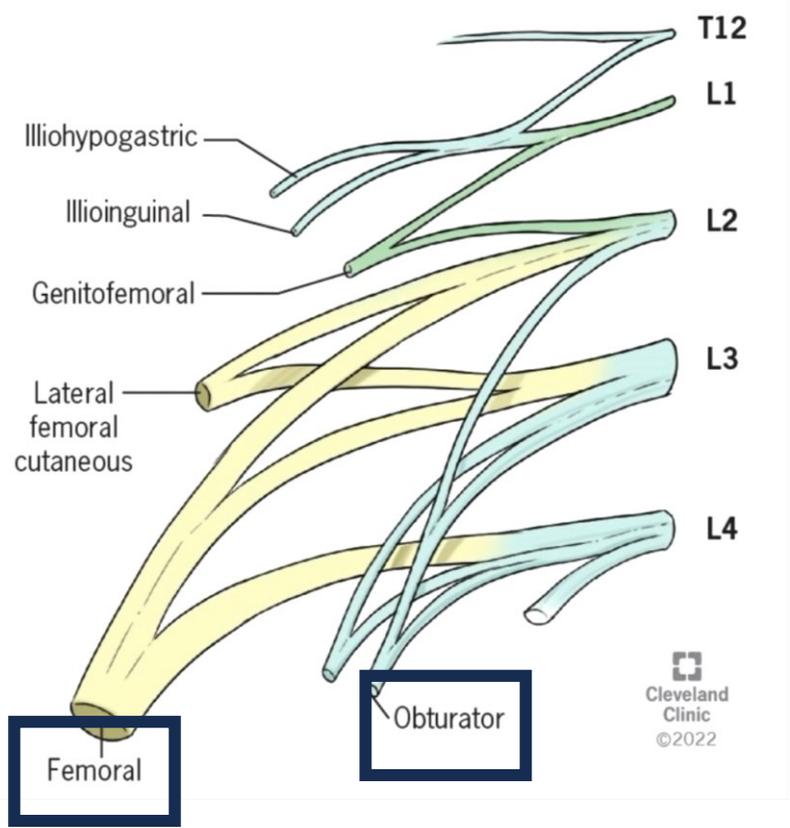
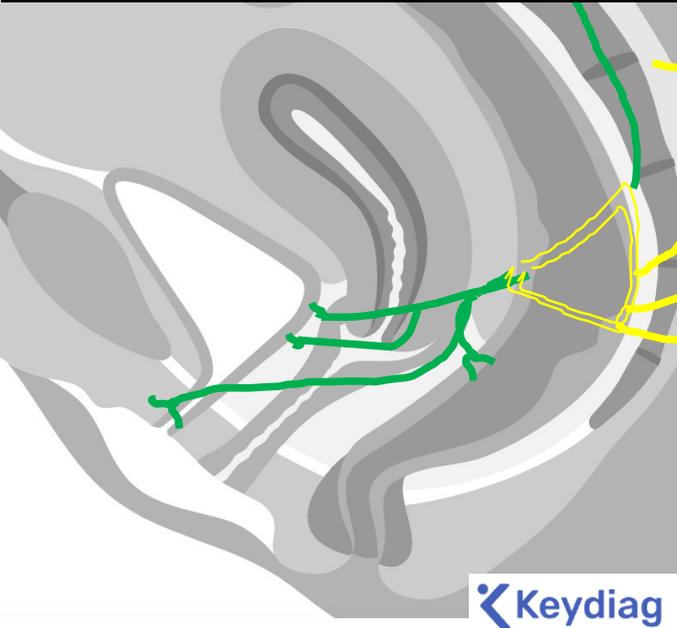
Ax 3DT2W (4mn)



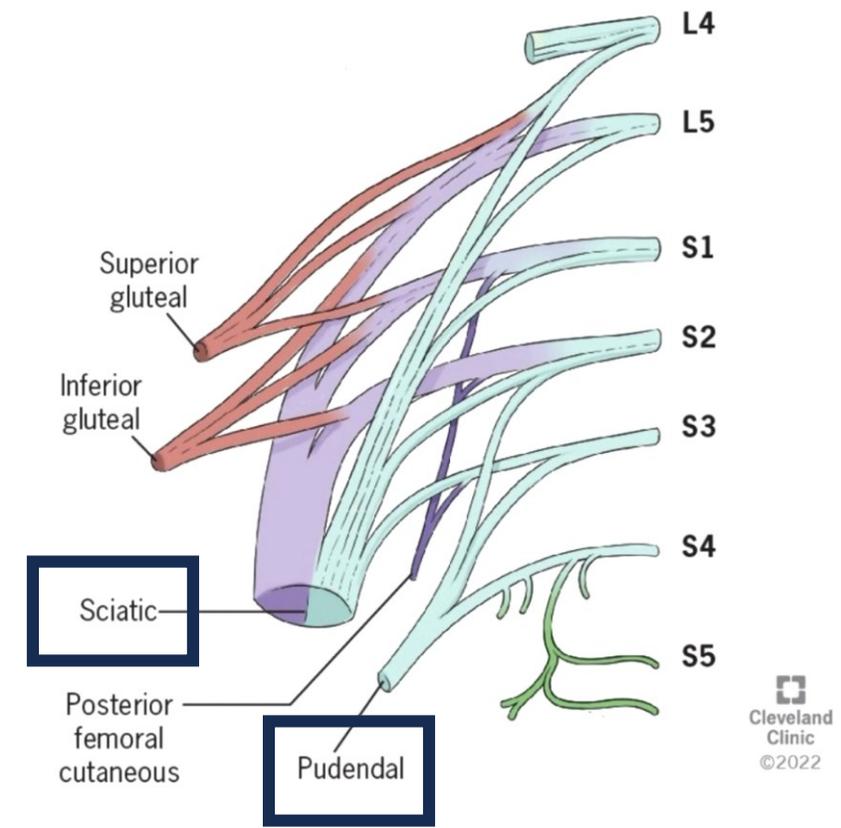
Ax 3DT1WDIXON



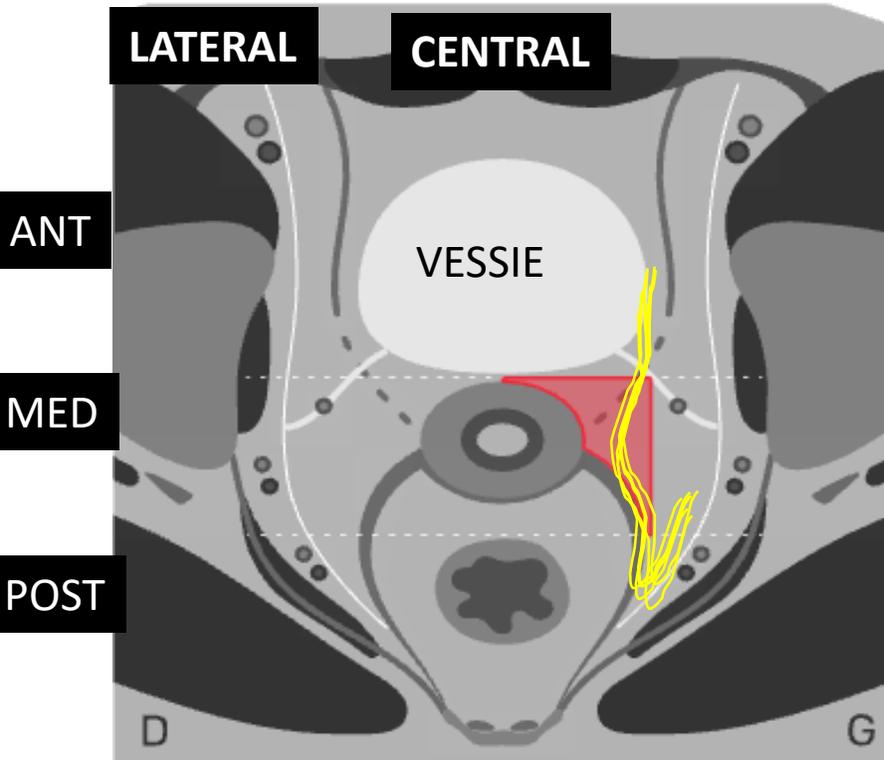
Atteinte plexus hypogastric inf (nerfs sympathiques)



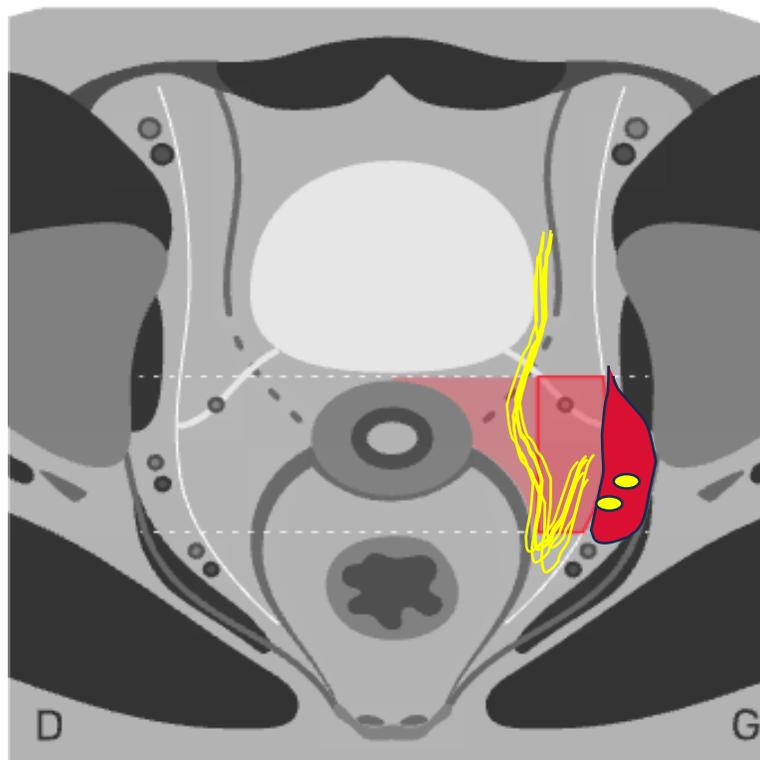
Atteinte plexus lombo sacré (nerfs somatiques)



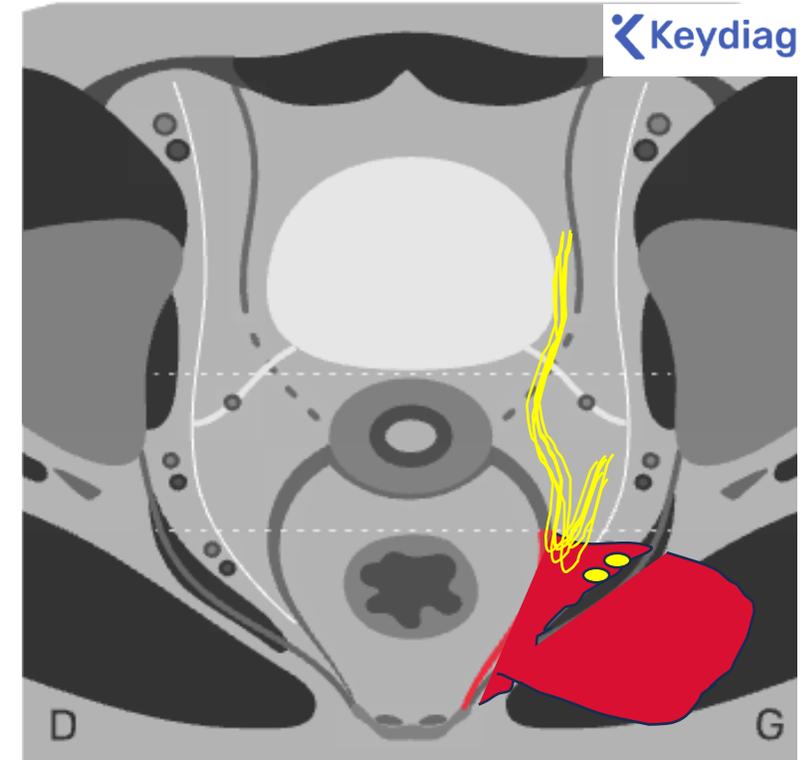
Symptomatologie nerveuse



PARAMETRE
LATERAL PROXIMAL
(plexus hypogastrique)



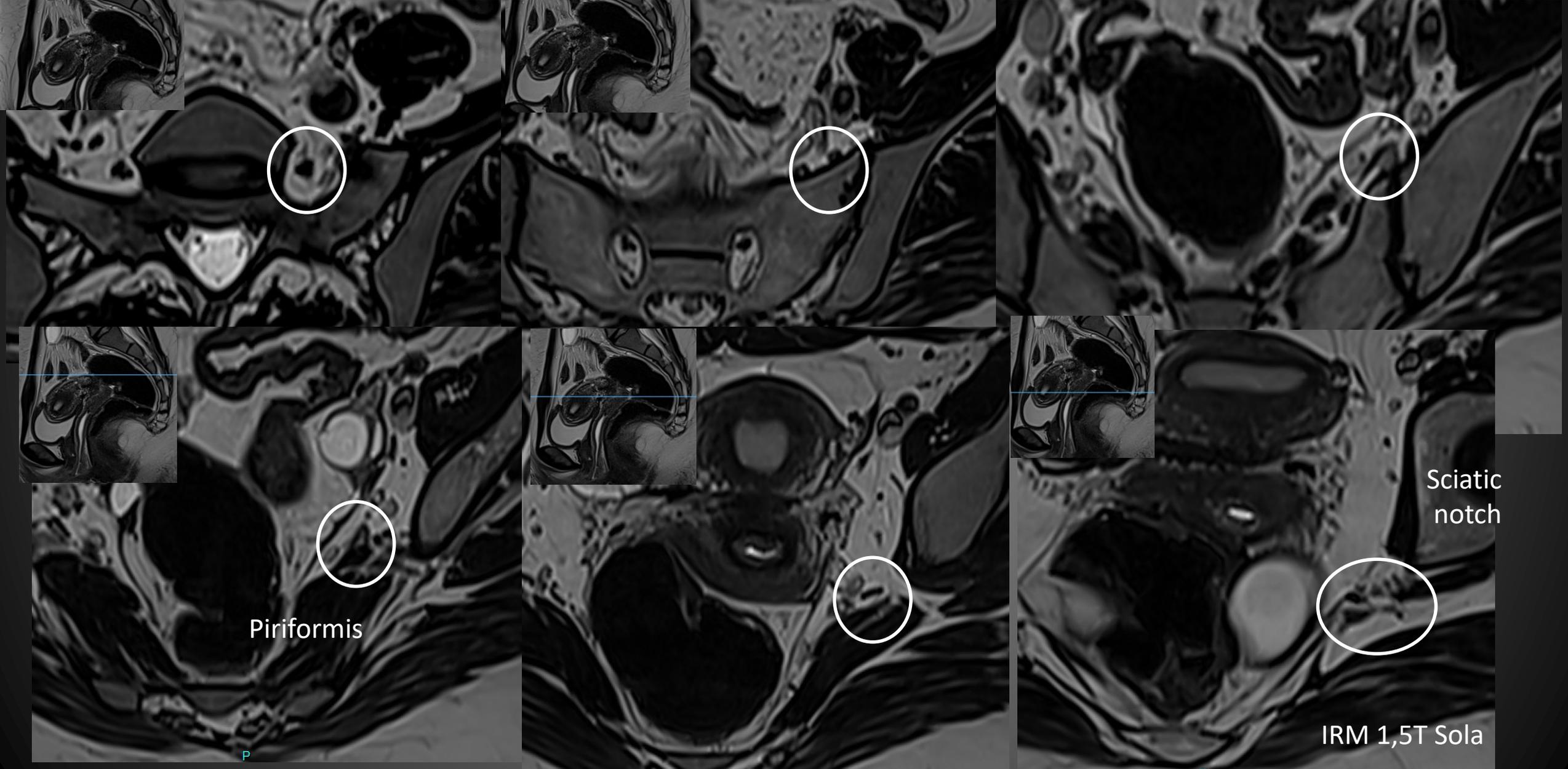
PARAMETRE LATERAL DISTAL
(au delà du fascia pariétal)
(plexus lombaire)



US distal et SACRORECTAL SEPTUM
PARAMETRE POSTERIEUR
Type 1 / type 2
(échancrure ischiatique)

Racines sacrées- Nerf sciatique

L4-S3



Piriformis

Sciatic notch

IRM 1,5T Sola

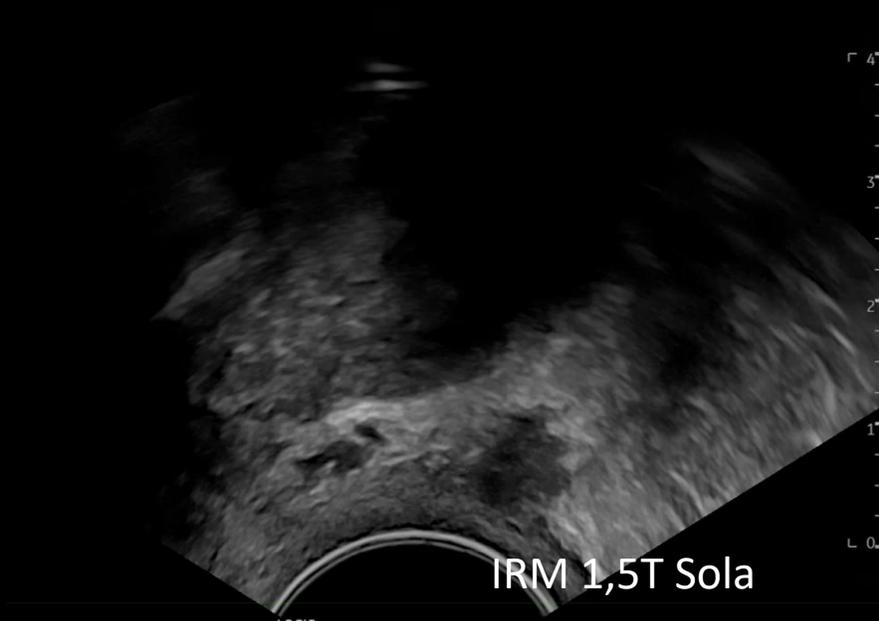
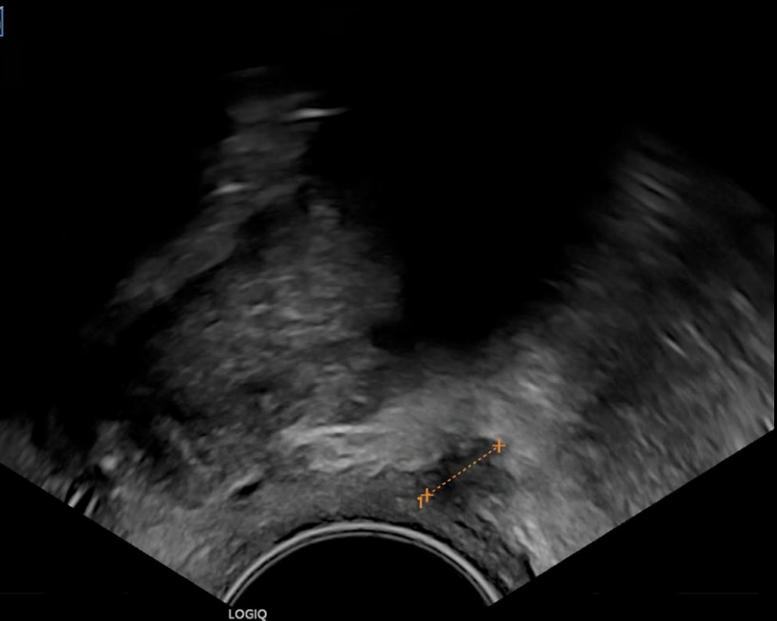
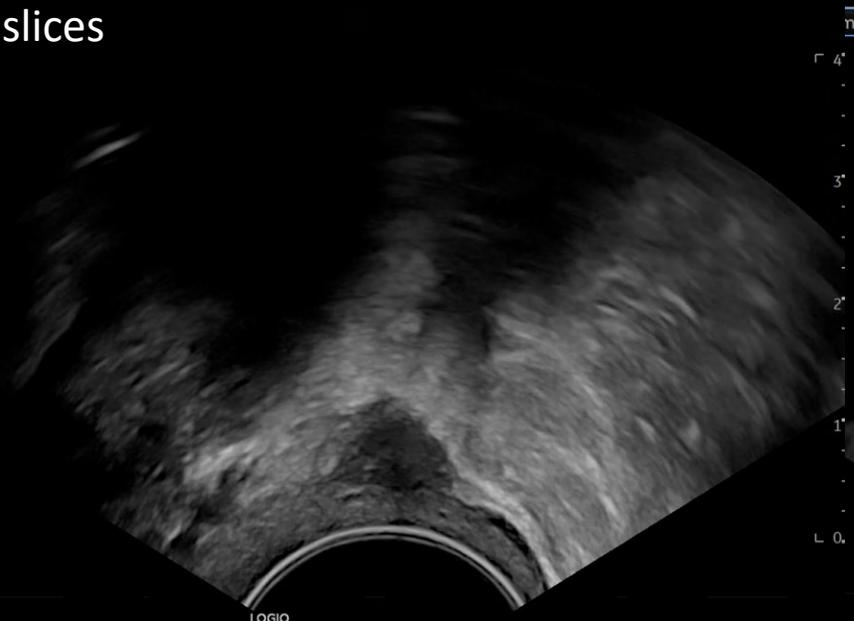
P

3DT2W (4mn)

3DT2W DLR (2mn)

Axial oblique 2DW thin

slices



LOGIQ

LOGIQ

LOGIQ

IRM 1,5T Sola

ENJEUX QUALITE IMAGE INTERET DE L'INTELLIGENCE ARTIFICIELLE

- Temps d'acquisition 3D trop long >> Limiter temps d'examen est le facteur essentiel pour améliorer la qualité image 3DT2DLR
- Préparation digestive +++ >> 3DTIW DLR

Impact de l'Intelligence artificielle +++

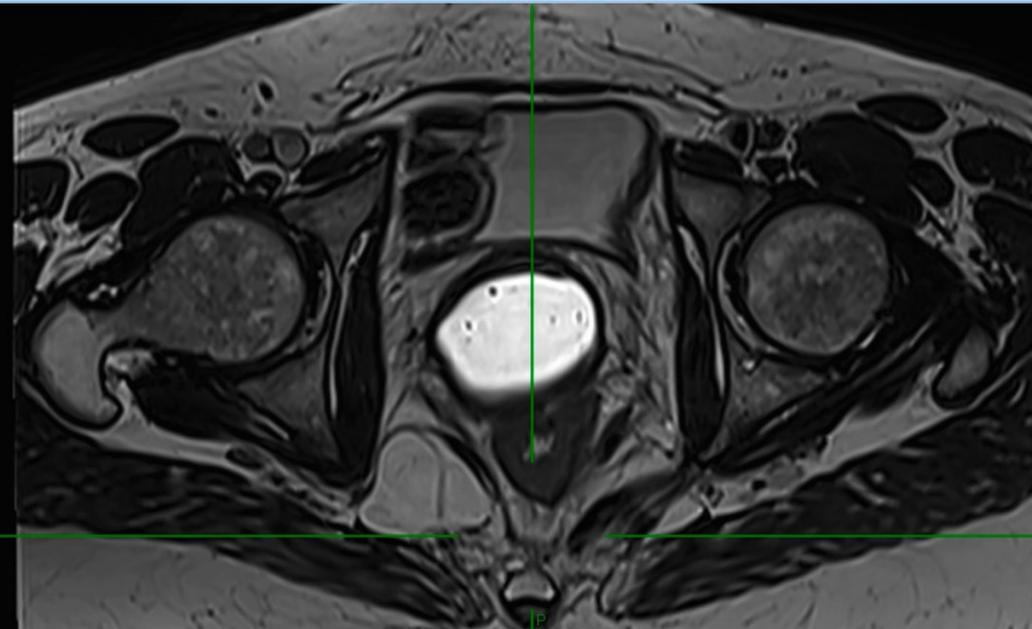
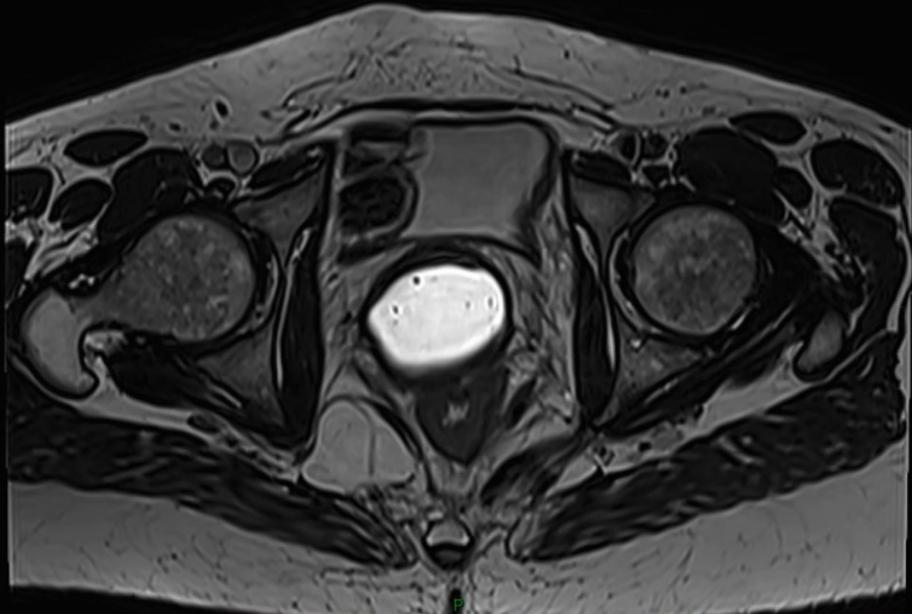
INTELLIGENCE ARTIFICIELLE 3DTIW - ANALYSE DU TUBE DIGESTIF

Patiente âgée de 39 ans, adressée pour une endométriose opérée avec hystérectomie subtotal, résection du nodule inter vésico-vaginal et du paramètre gauche, colectomie gauche (anastomose termino-terminale) et urétérolyse extensive par coelioscopie en avril 2018. Dyspareunie profonde positionnelle et douleurs post coitales, dyschésie intense. Dysurie et pollakiurie.

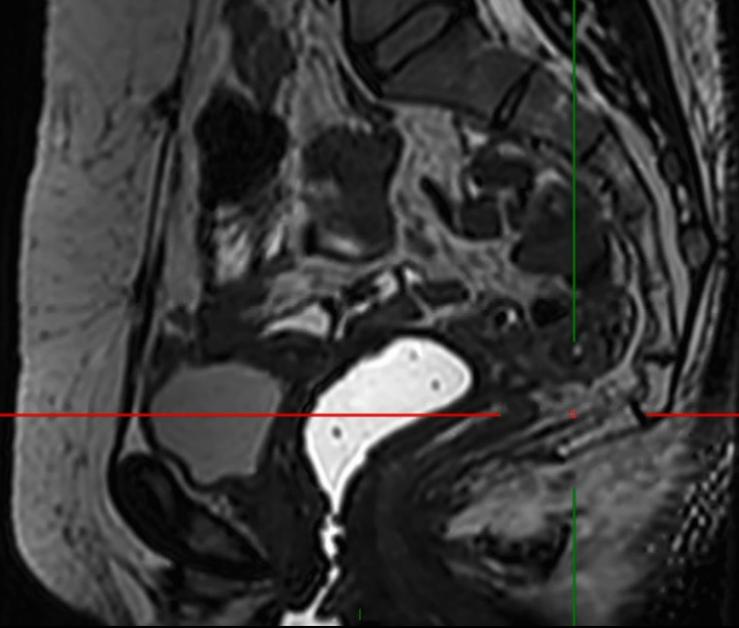
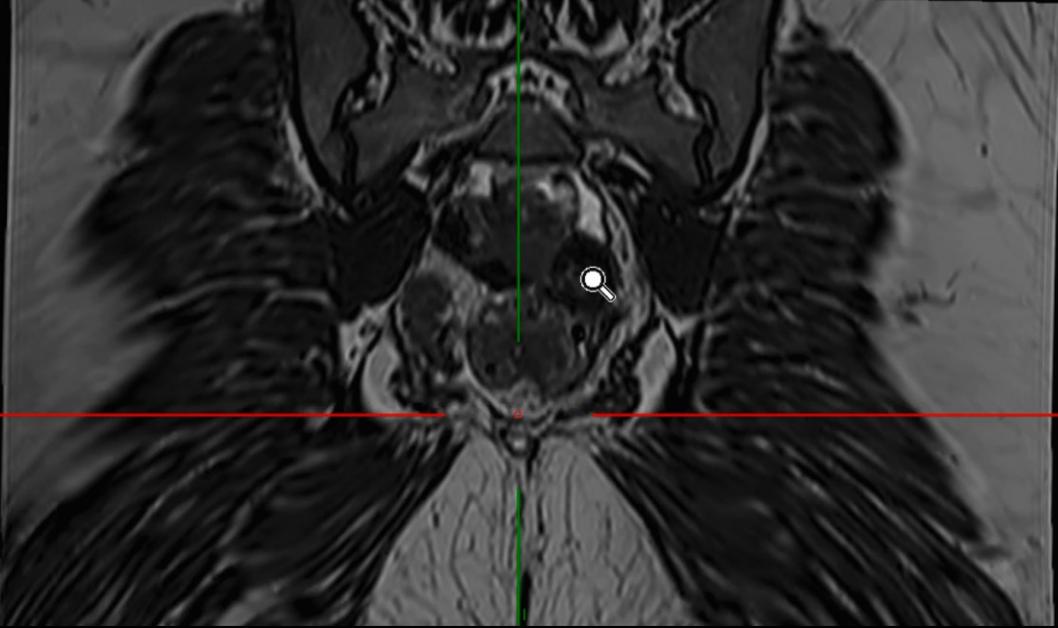


IRM 1,5T Sola

Actuel
[22/04/2024 11:36:25]

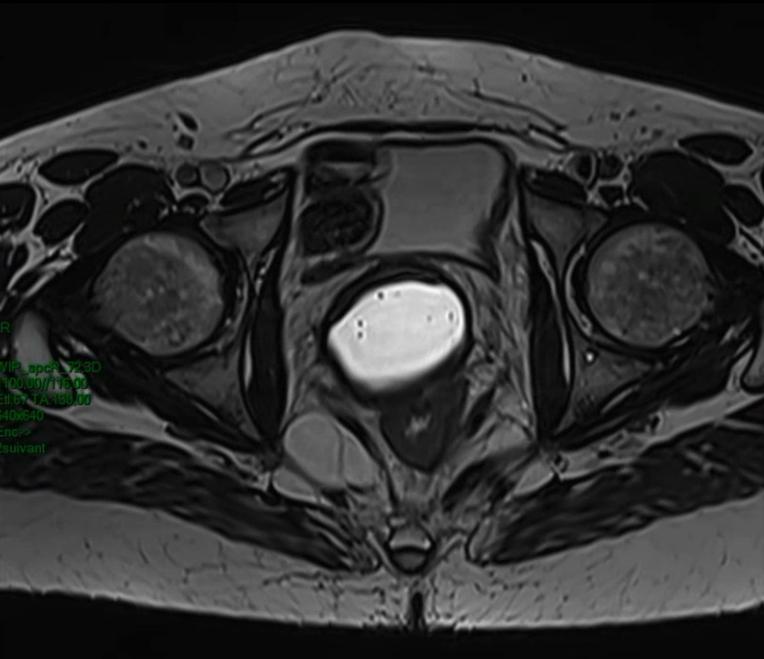


A

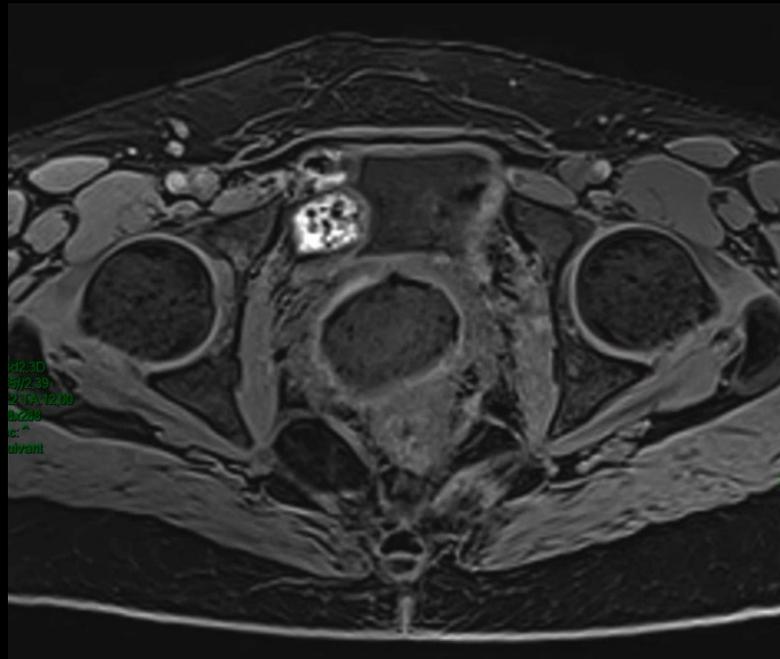


Séquence 3DT2 DLR 2mn30

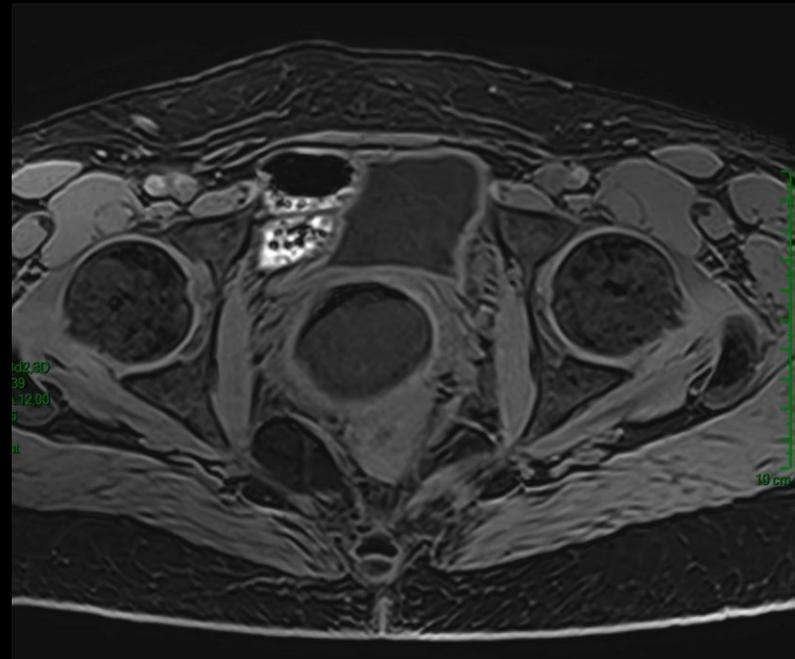
IRM 1,5T Sola



Ax 3D T2



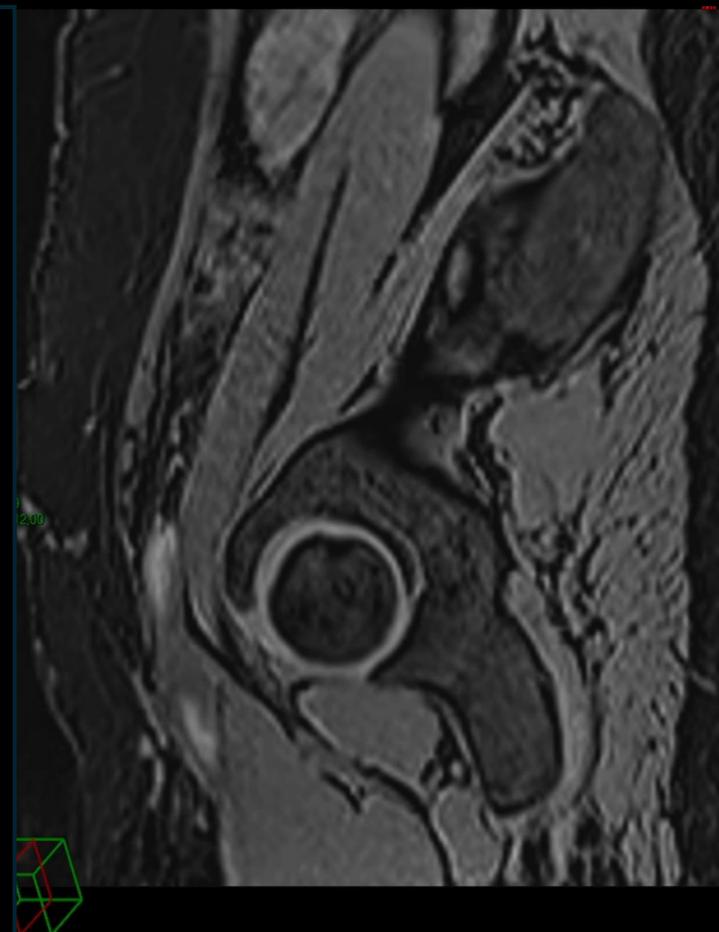
Ax 3DT1 classique (3mn)



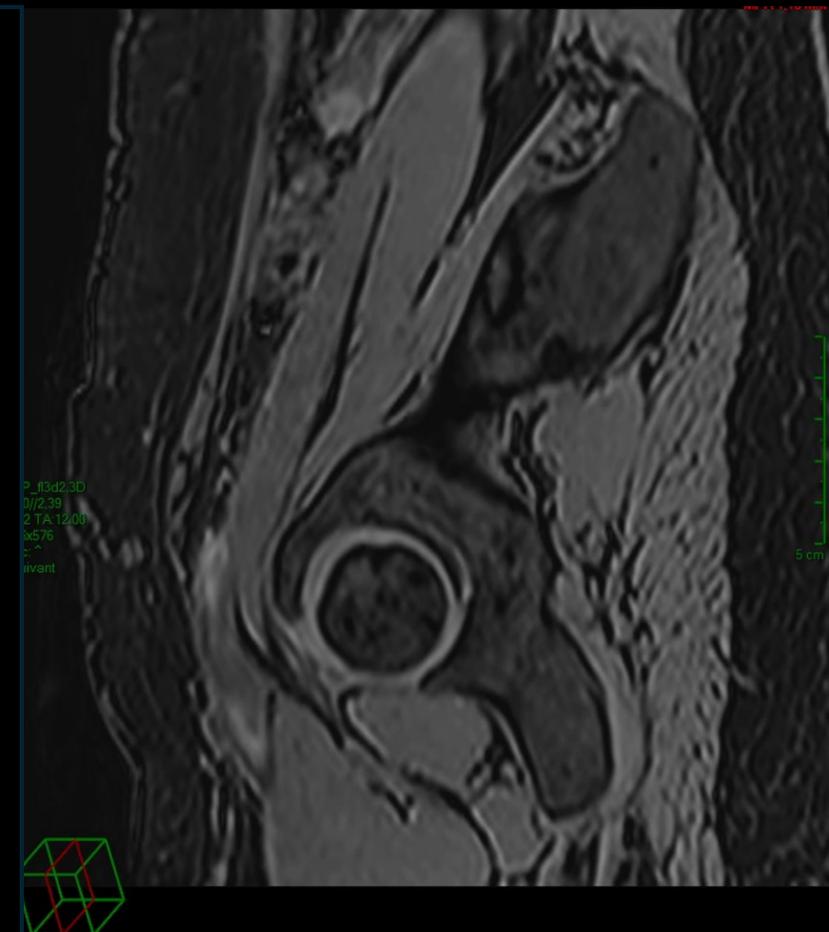
Ax 3DT1 FS DLR (1mn21)



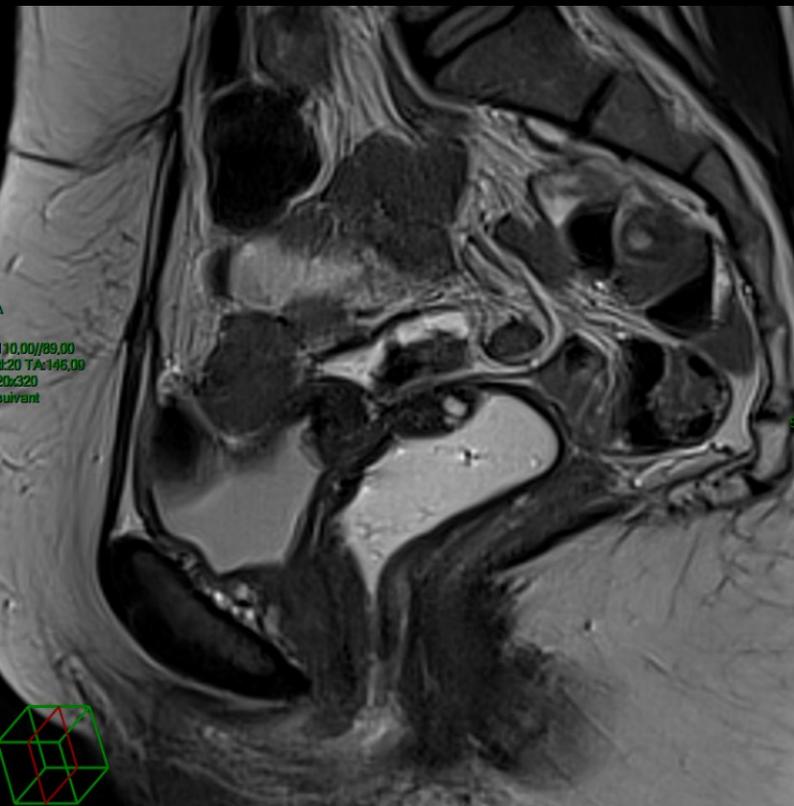
Sag T2



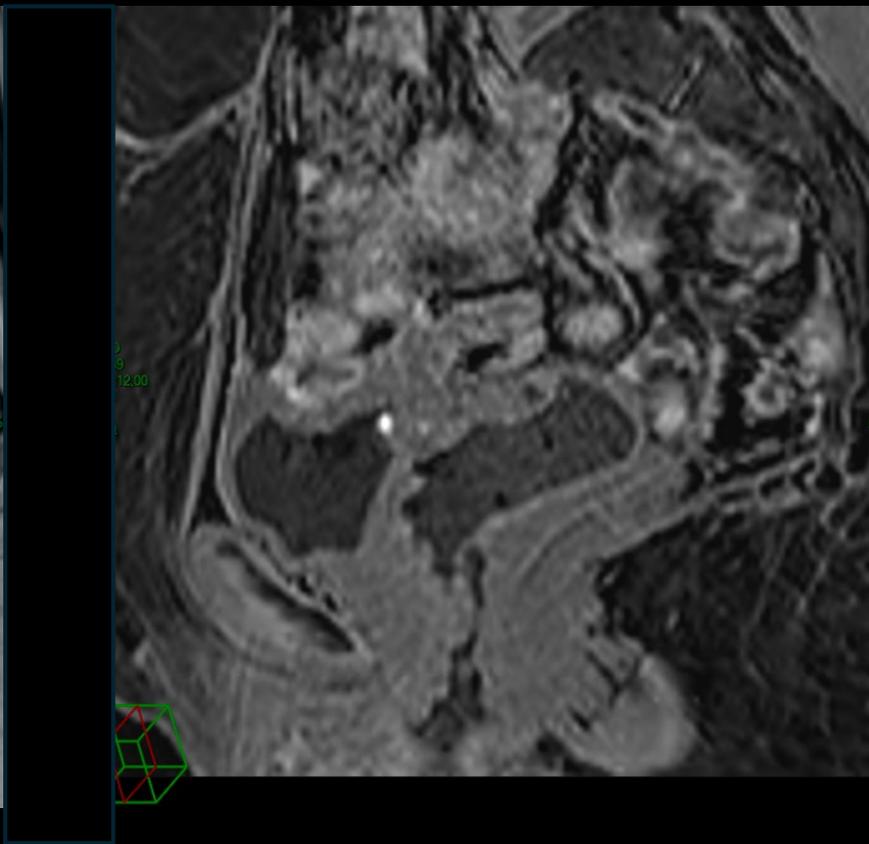
Ax 3DT1FS reformat



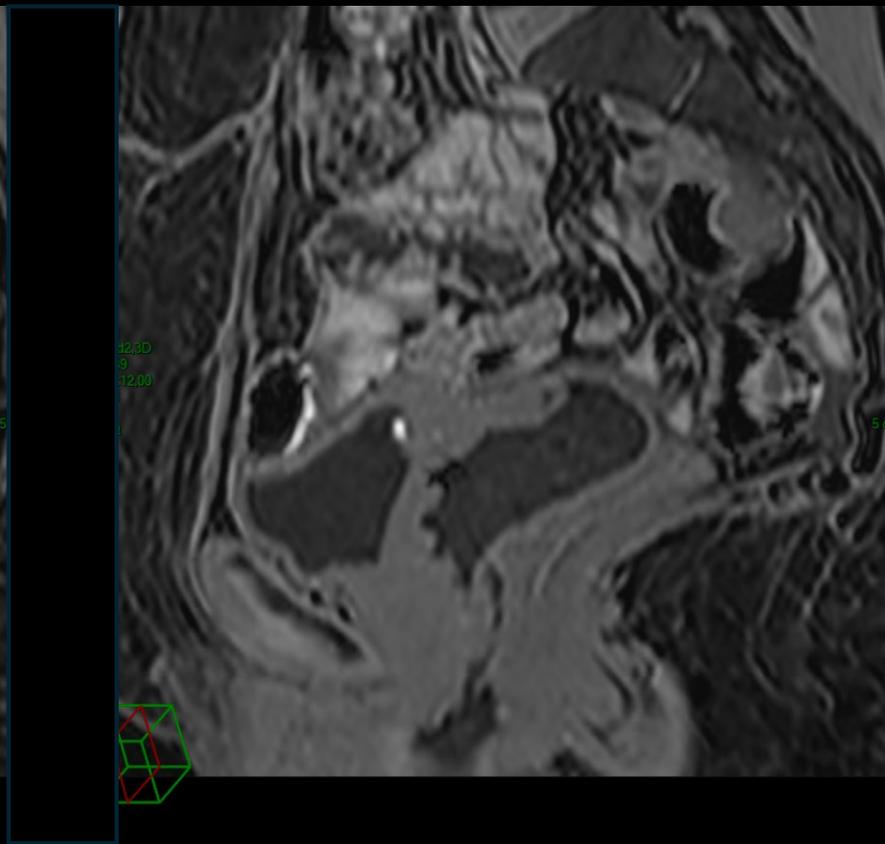
Ax 3DT1FS DLR reformat



Sag T2

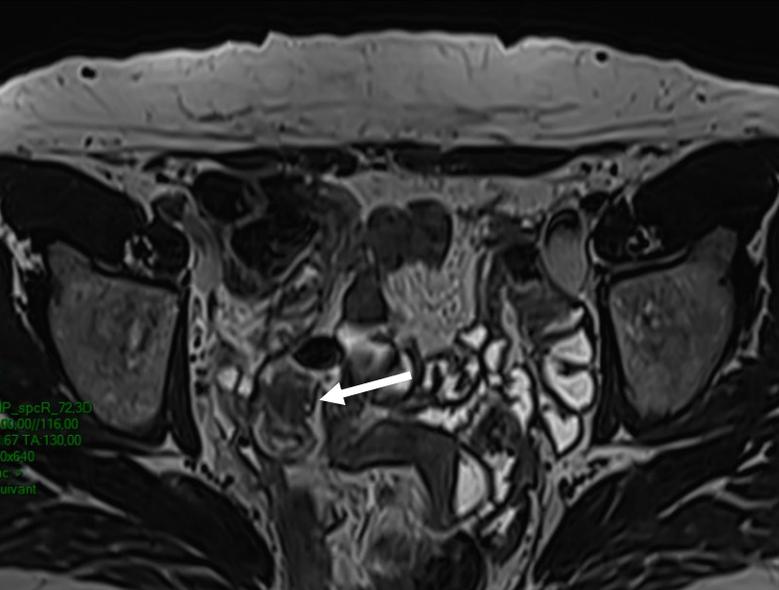


Ax 3DT1FS reformat

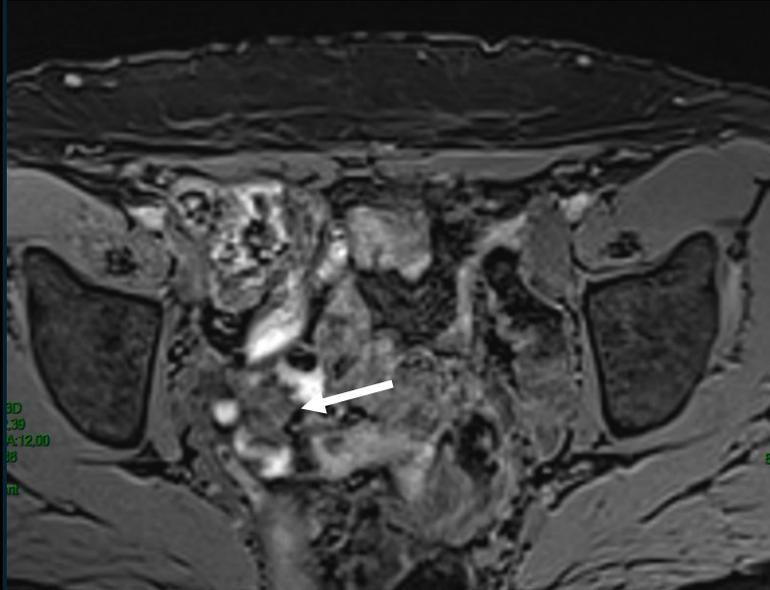


Ax 3DT1FS DLR reformat

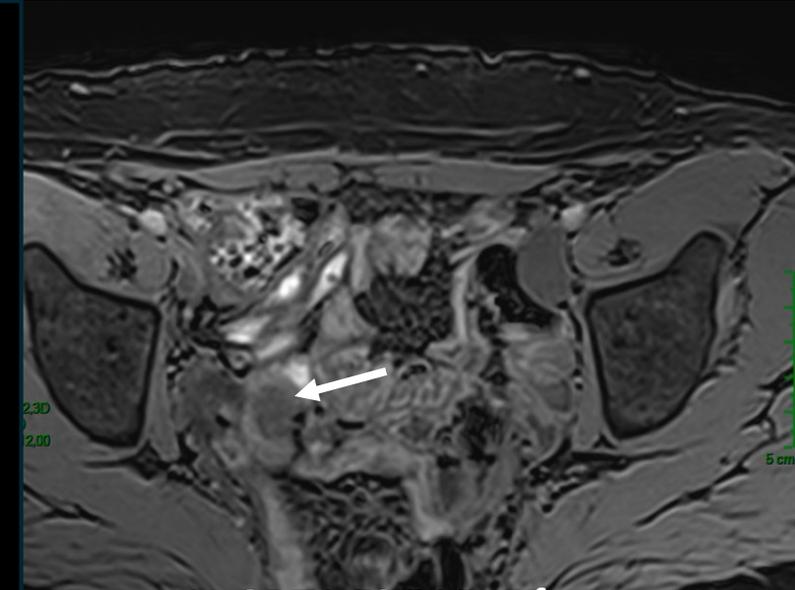
IRM 1,5T Sola



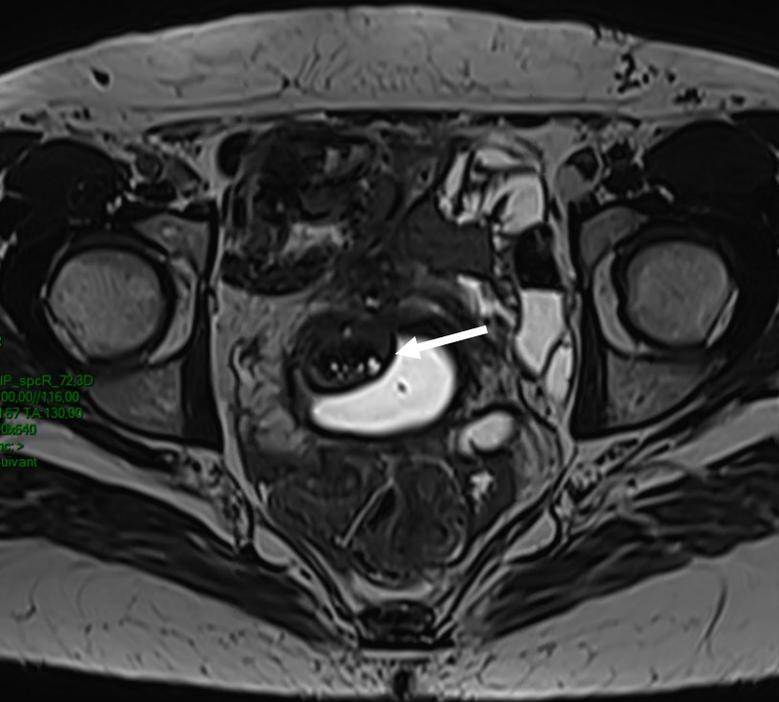
Ax 3D T2



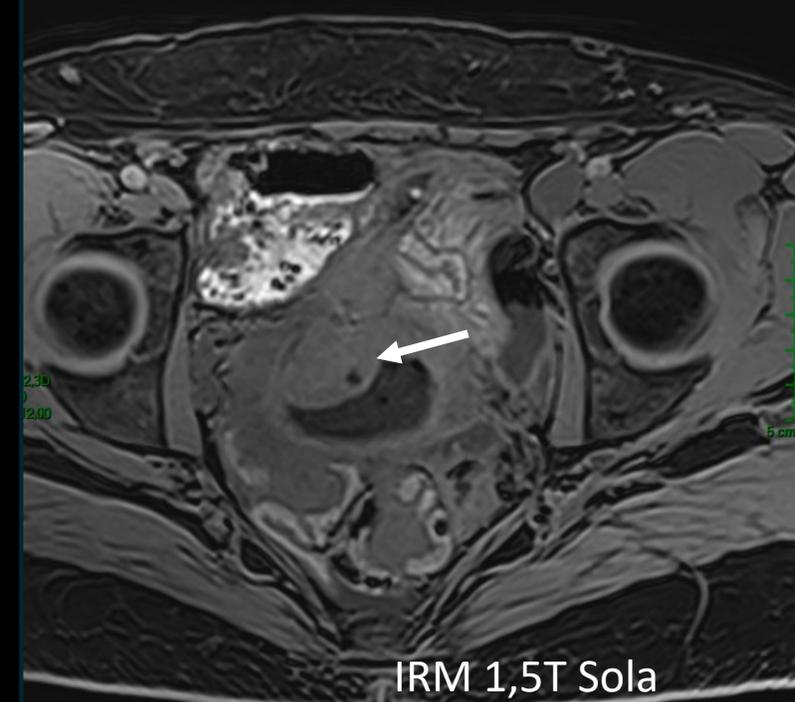
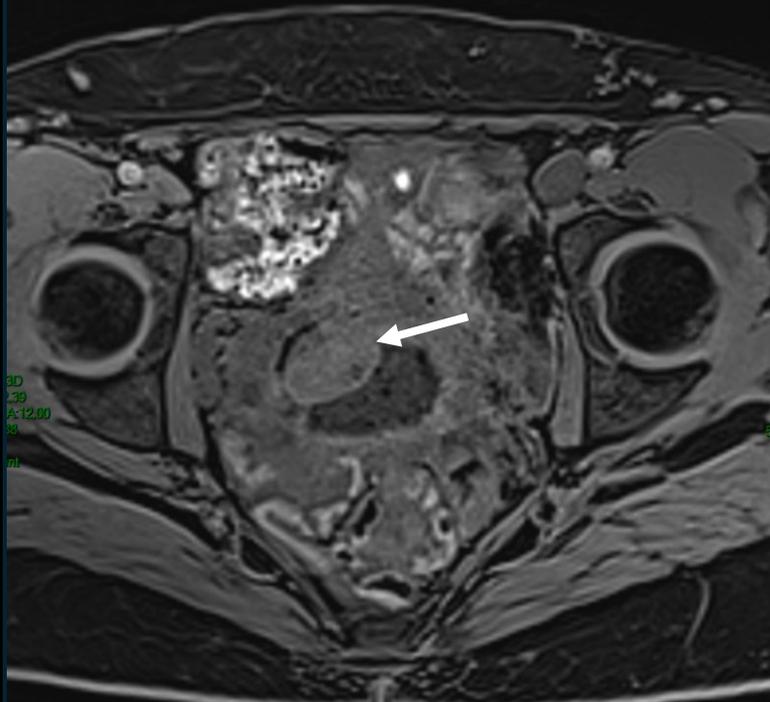
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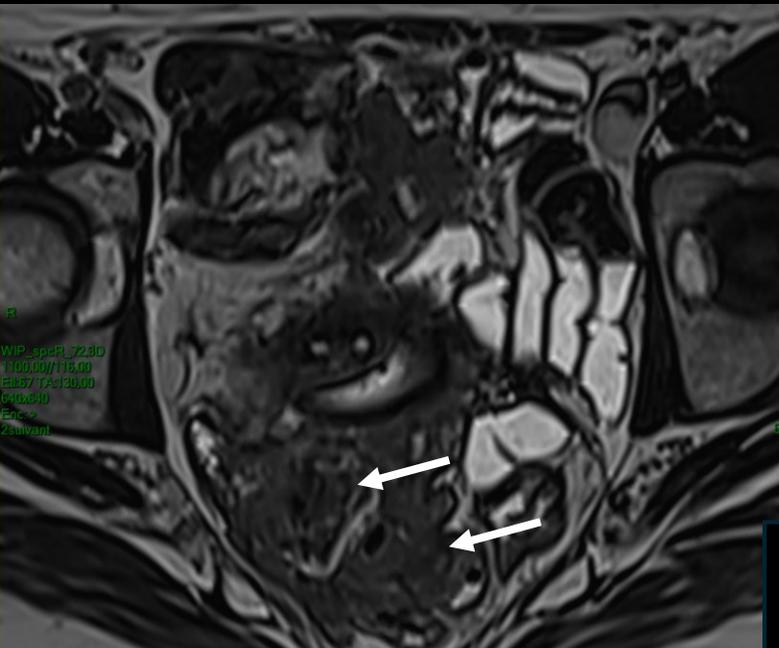


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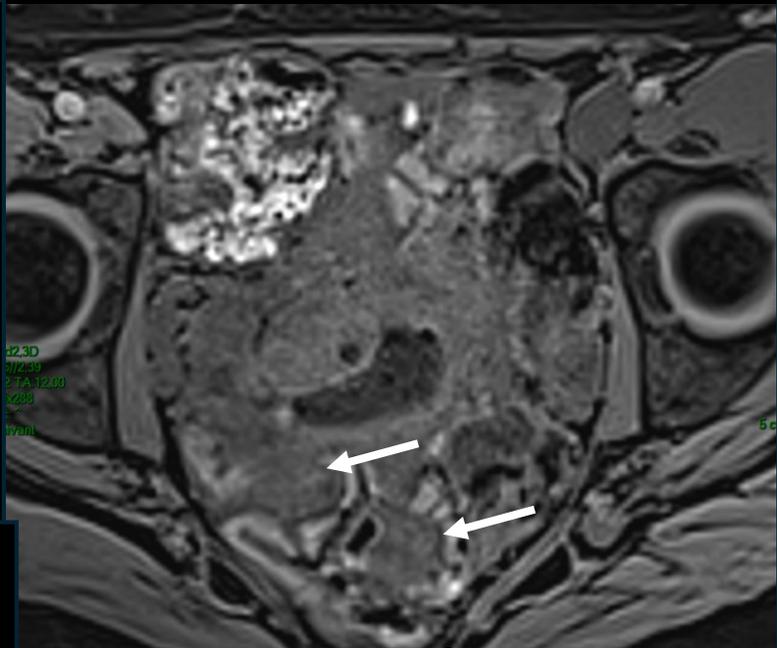


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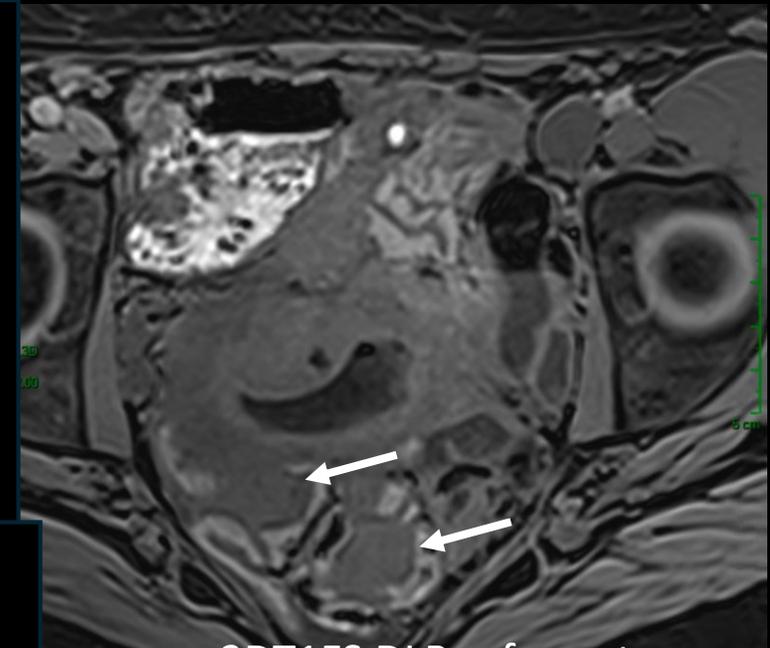




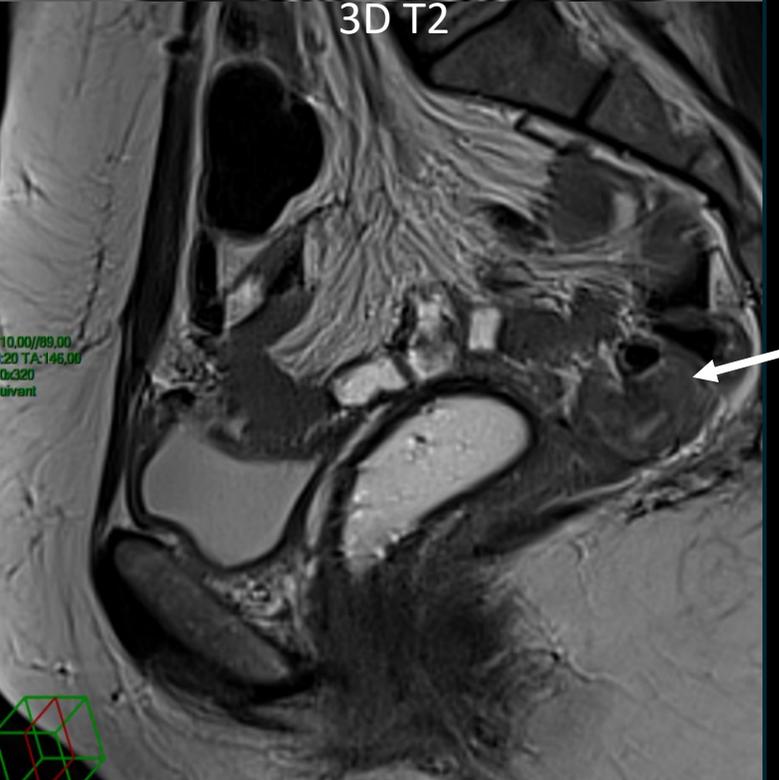
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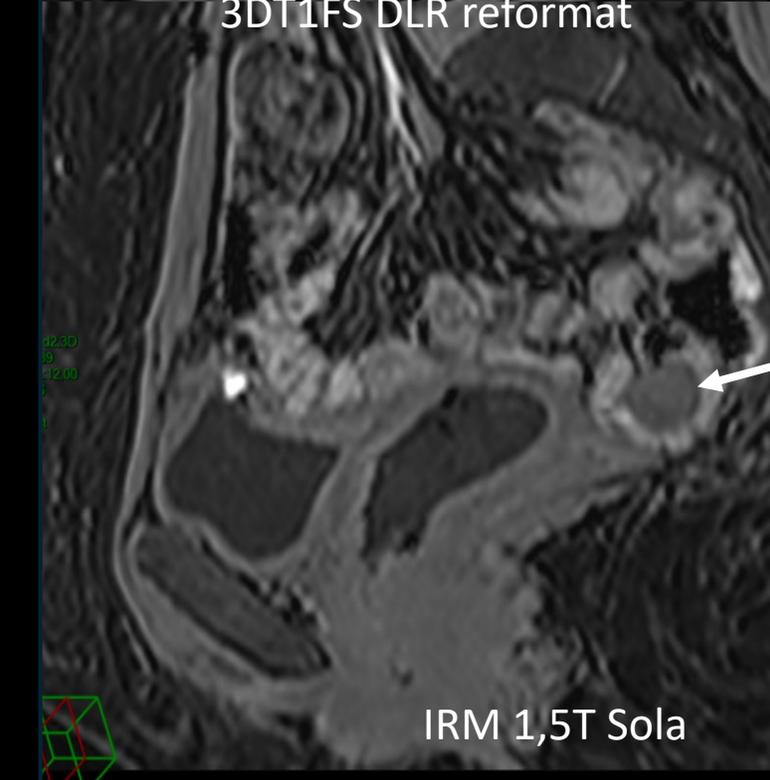
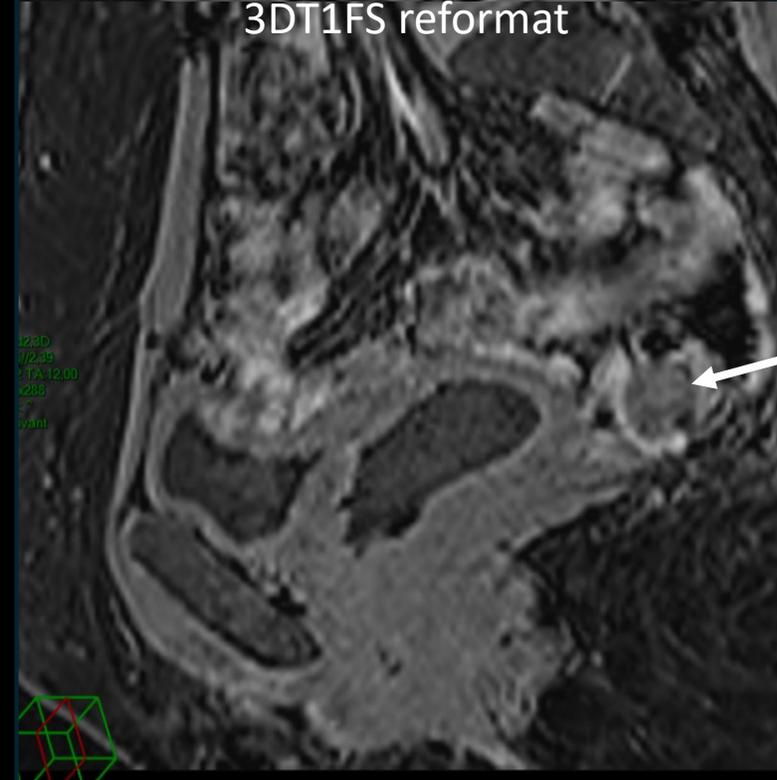
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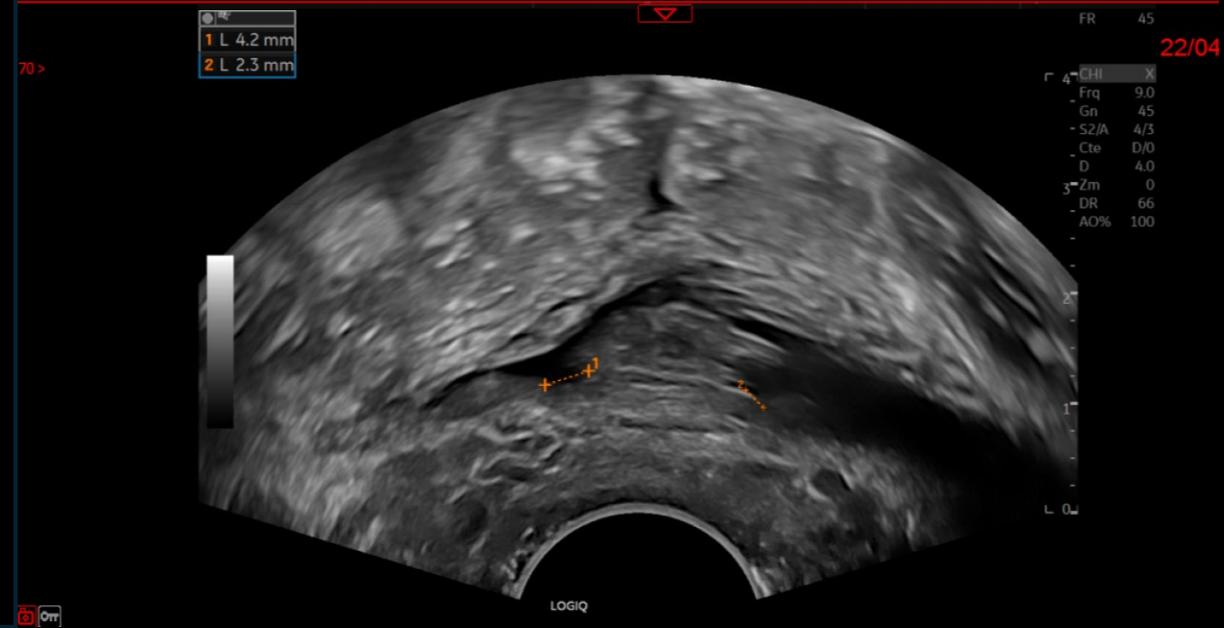
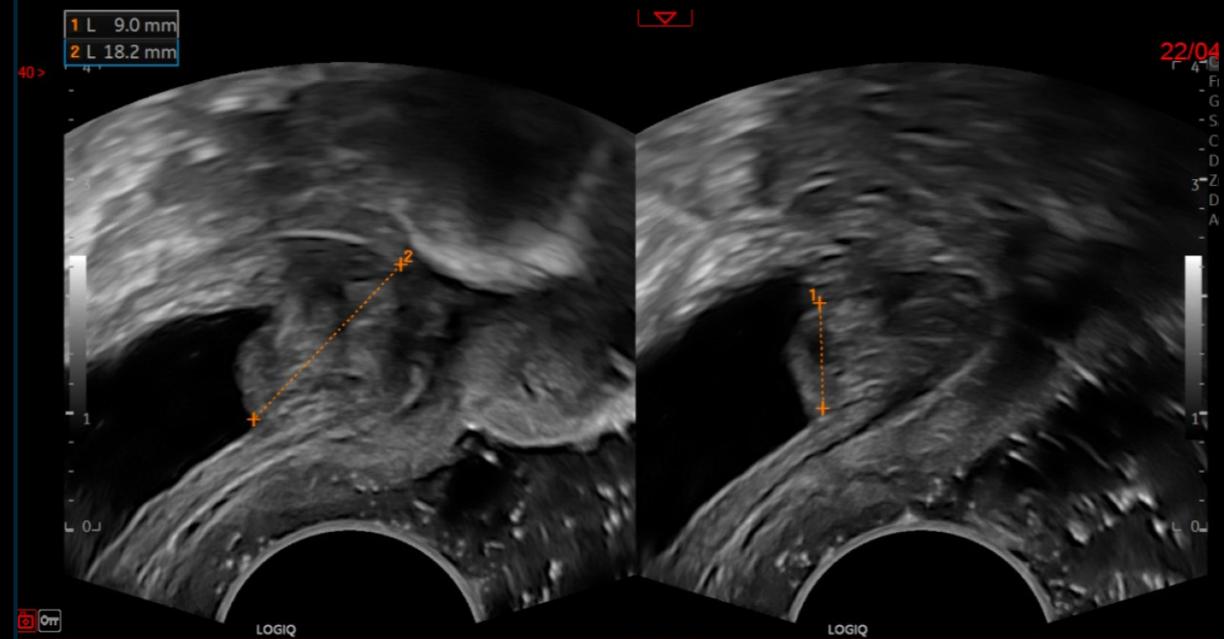
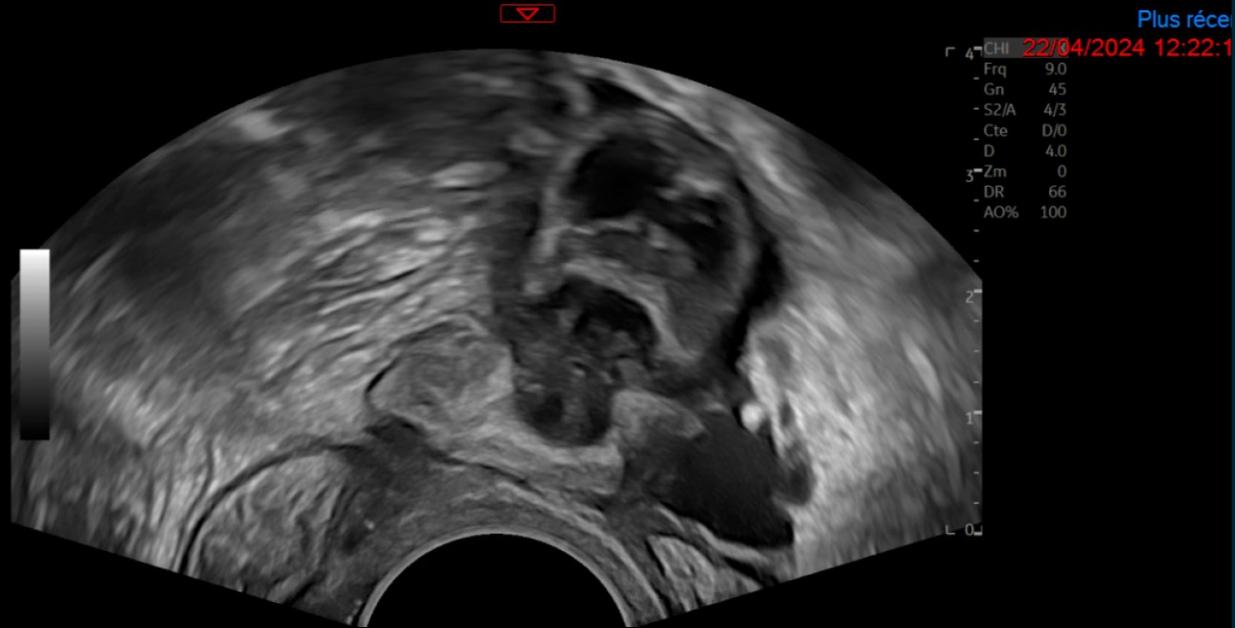
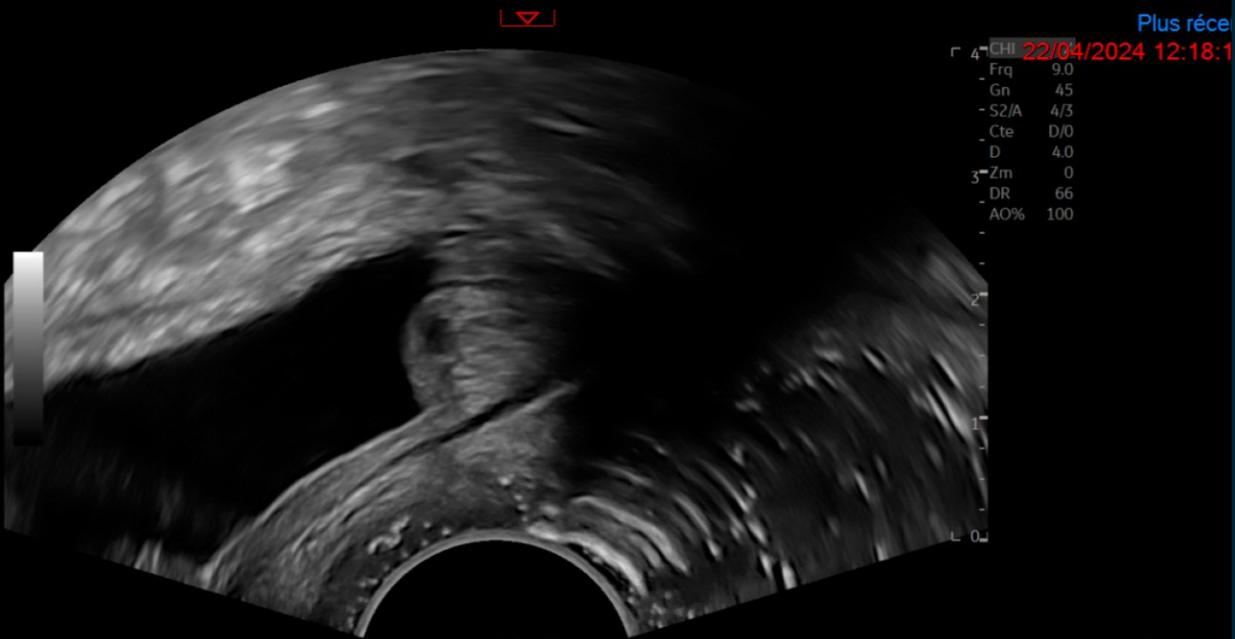


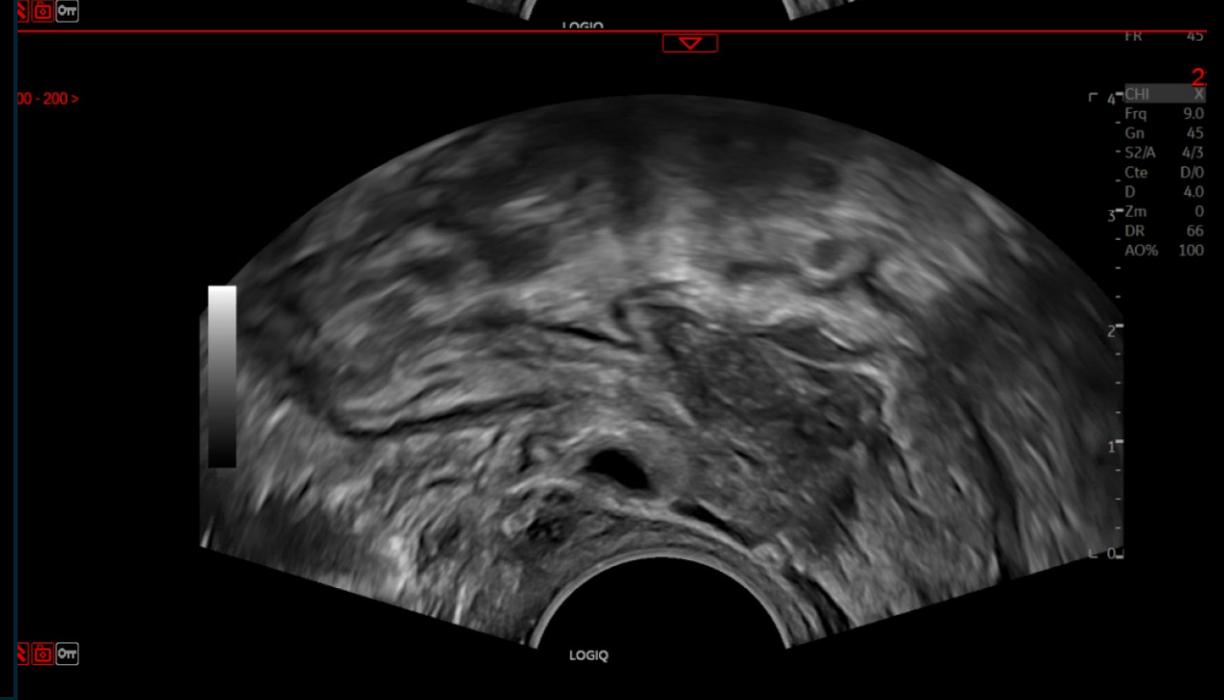
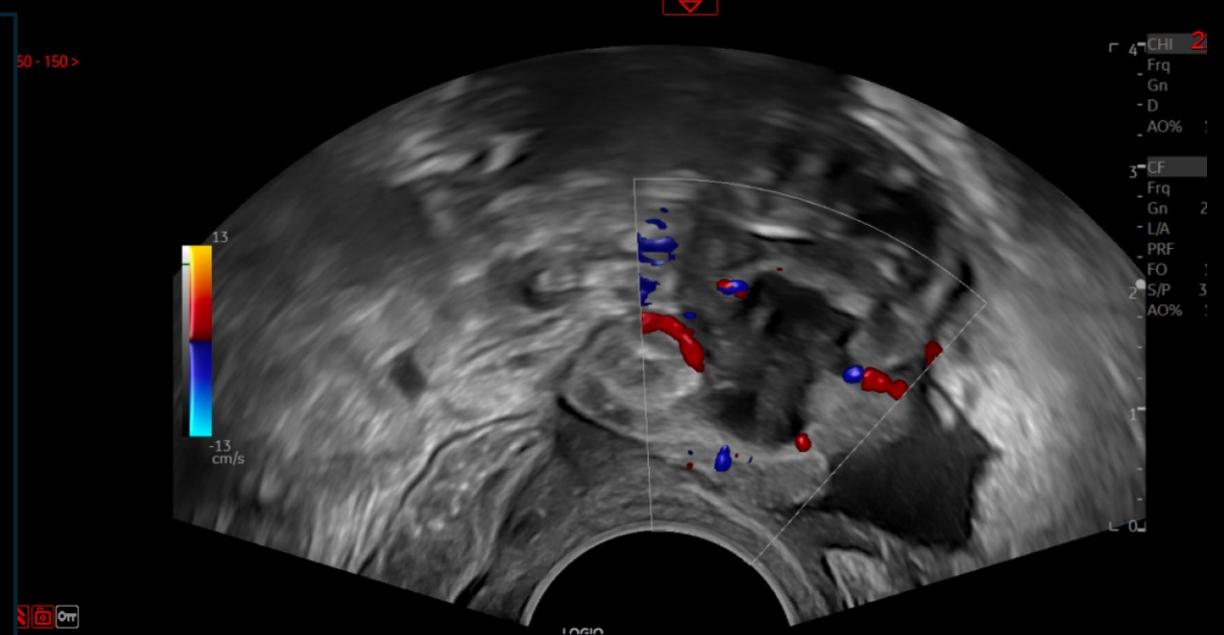
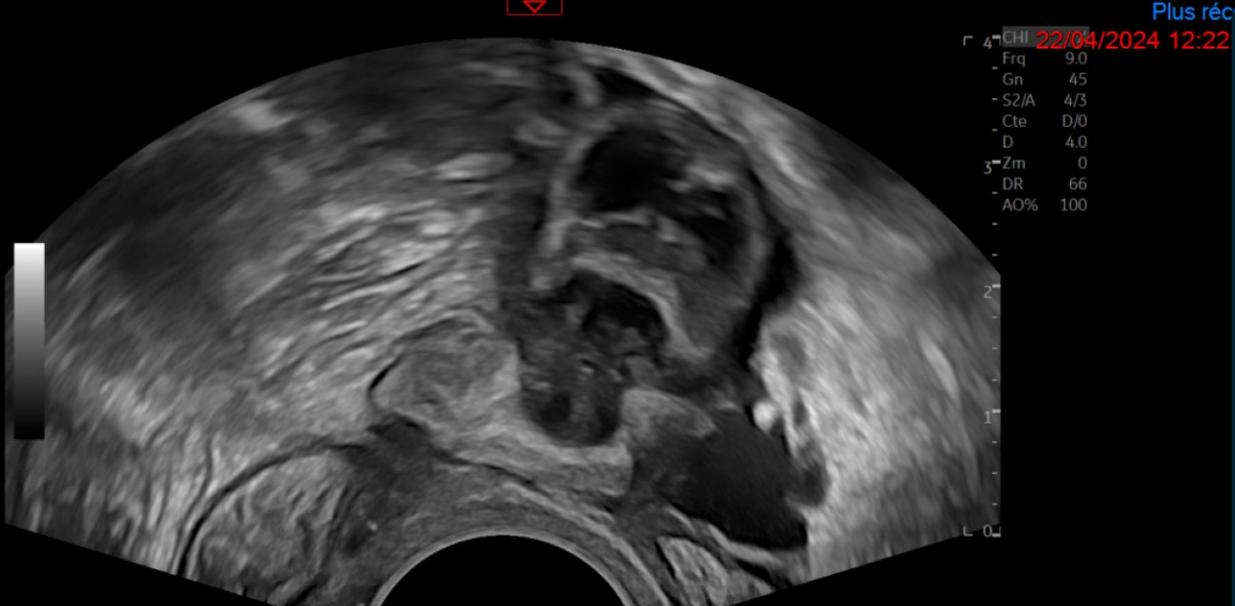
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IRM 1,5T Sola





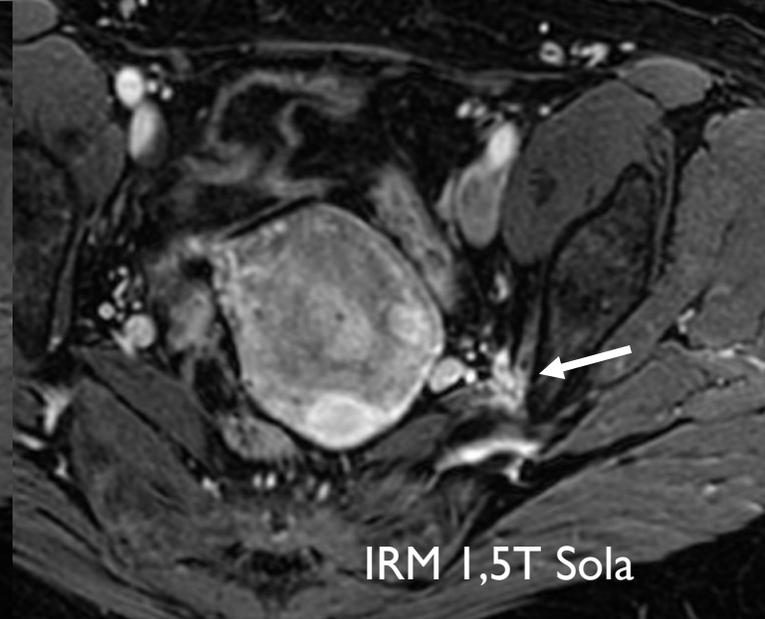
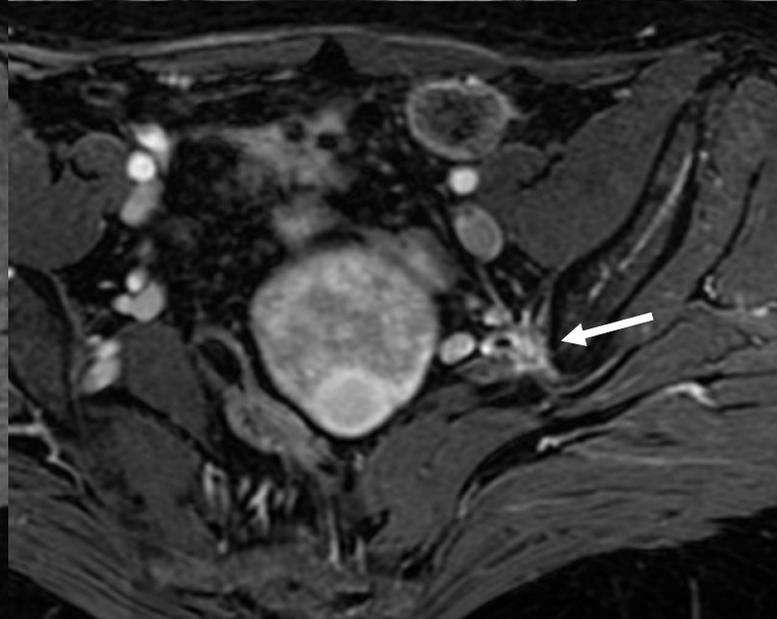
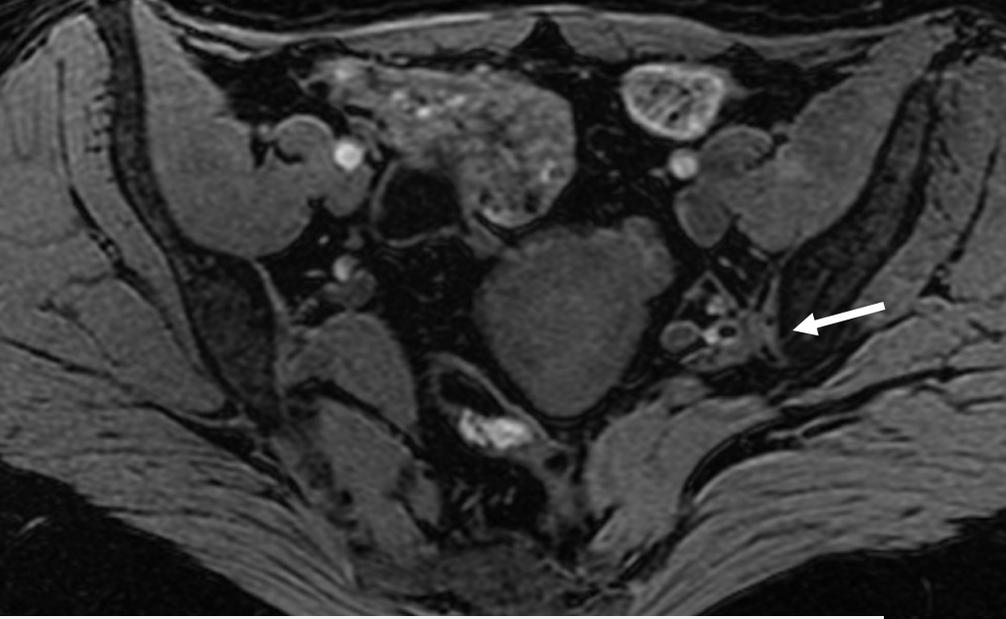
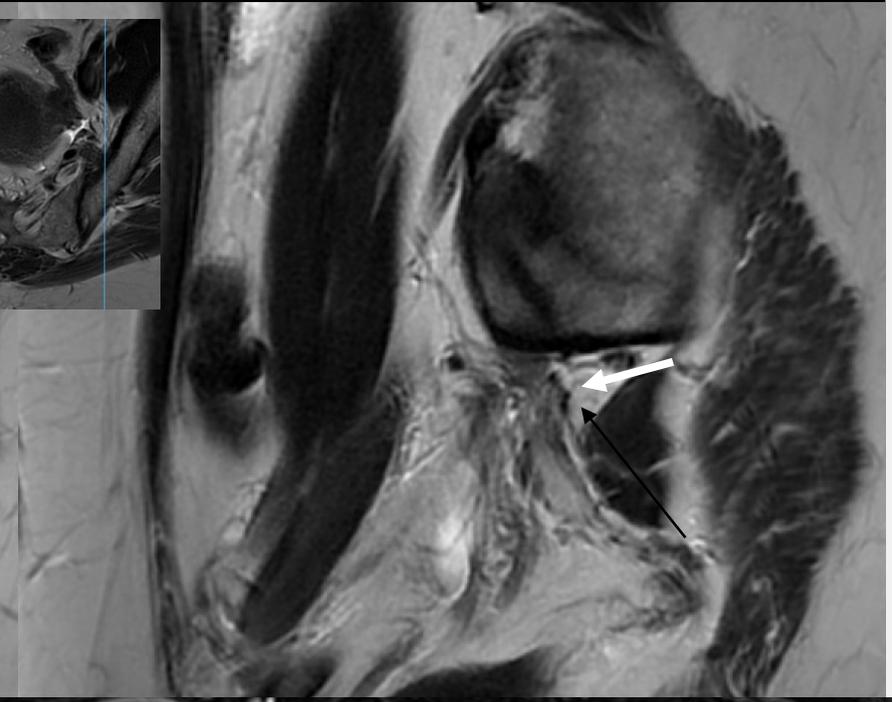
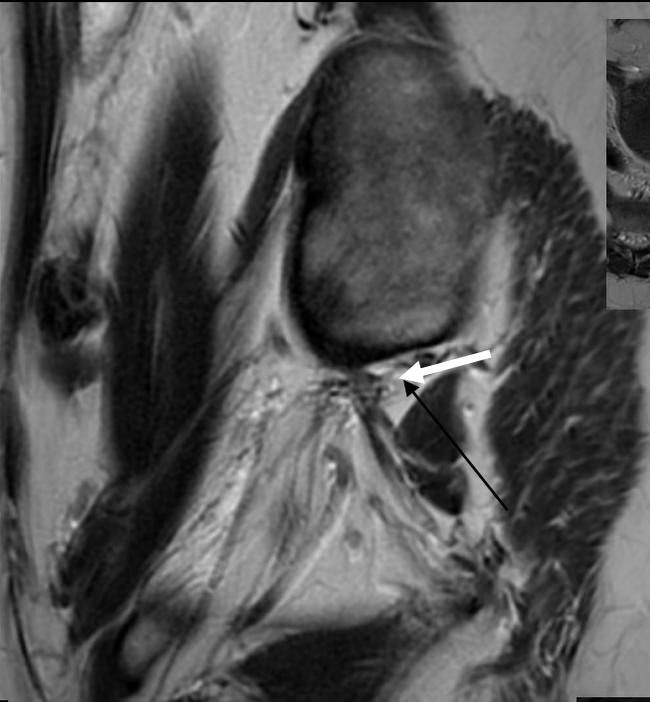
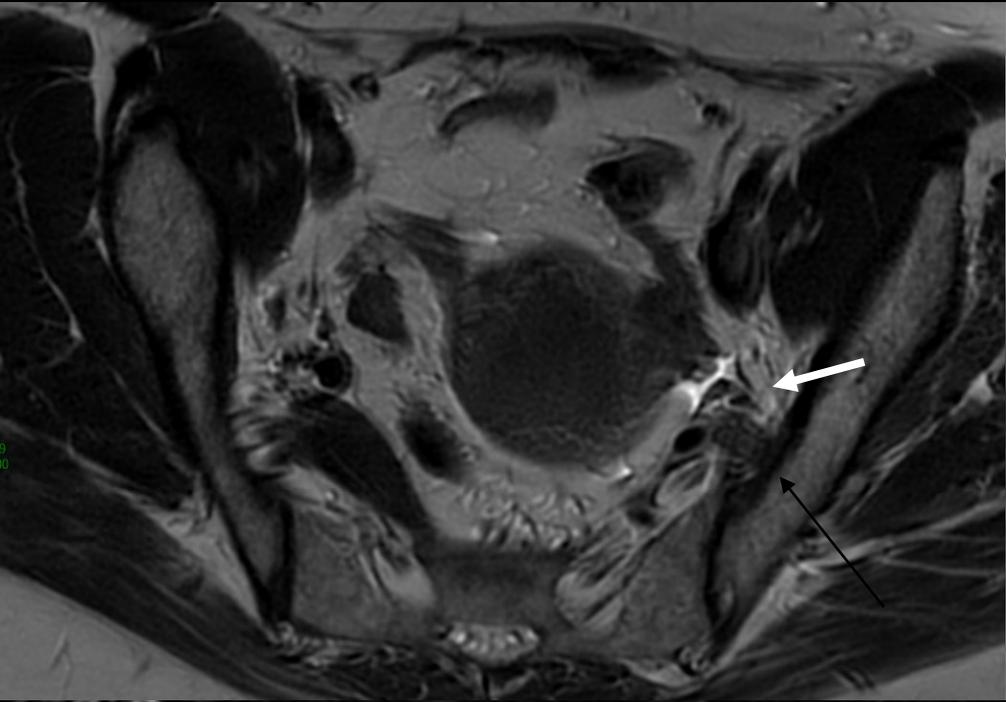


PROTOCOLE STANDARDISE

- Injection de gadolinium ? OPTIONNEL +++
 - Endometriome atypique (O-RADS MR)
 - Evaluation pré thérapeutique des nodules
 - Suspicion d'envahissement nerveux somatique



Atteinte des racines sacrées et nerf sciatique



CONCLUSION

**NOTE DE
CADRAGE**

Prise en charge de l'endométriose : Actualisation de la place des examens d'imagerie et Fiches pratiques en échographie et IRM

1.5. Objectifs

Les objectifs de ce travail sont d'aider les professionnels de santé à la prise en charge des femmes suspectes d'endométriose et de rendre homogène cette prise en charge sur le territoire :

- Améliorer et homogénéiser les conditions et procédures des examens d'imagerie diagnostique
- Standardisation des compte rendus d'imagerie diagnostique
- Préciser la stratégie d'imagerie : place des différents examens d'imagerie pour le diagnostic d'endométriose

Un grand merci à l'ensemble de l'équipe du service IRIS avec une mention spéciale pour notre équipe de manipulateurs IRM



« Webseries Endotenon » épisode 3/10 : comment se déroule une IRM pour #endometriose - Votre podcast du mardi (2mn)

Centre constitutif de la **Filière Endométriose Nord-Est Ile-de-France**

AP-HP, Assistance Publique - Hôpitaux de Paris Sorbonne Université Hôpital Tenon @Iristenon Association EndoFrance ENDOmind France Fondation Endométriose Association AFPPE



CONGRÈS ANNUEL
SIFEM 2025
12 > 14 JUIN | CNIT FOREST PARIS



CORINNE BALLEYGUIER & ISABELLE THOMASSIN-NAGGARA

Responsabilité

Eco responsabilité

Sein / Gynecologie

Personnalisation

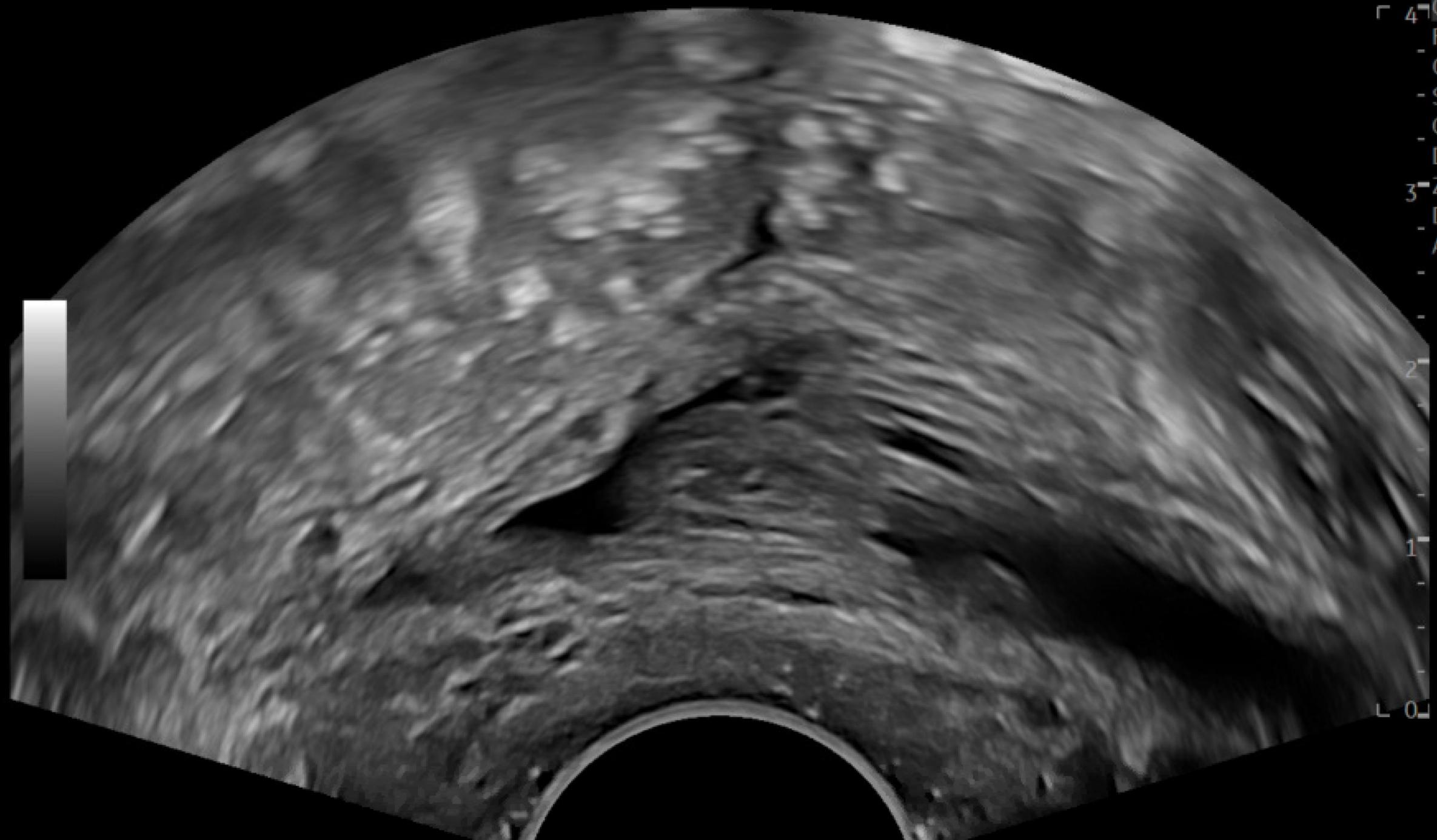
Innovations

Risque

Eco soins







CH
Frq
Gn
S2/
Cte
D
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AO

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