

**Together, we make it possible**



# **Cardio IRM**

## **Dernières innovations et perspectives**

**Patrice COUDRAY**  
Directeur de Marchés  
EL

08 Juin 2018

*Made For life*

# Together, we make it possible



- > L'examen rapide et sécurisé
- > Les composants essentiels
- > Les nouvelles séquences
- > L'IRM quantitative
- > À suivre ...

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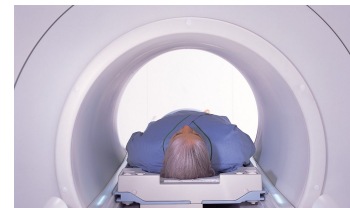
# LA PLUS GRANDE OUVERTURE



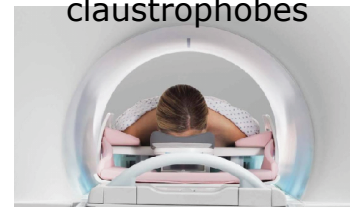
## Confort Pour tous les patients



Pour les obèses

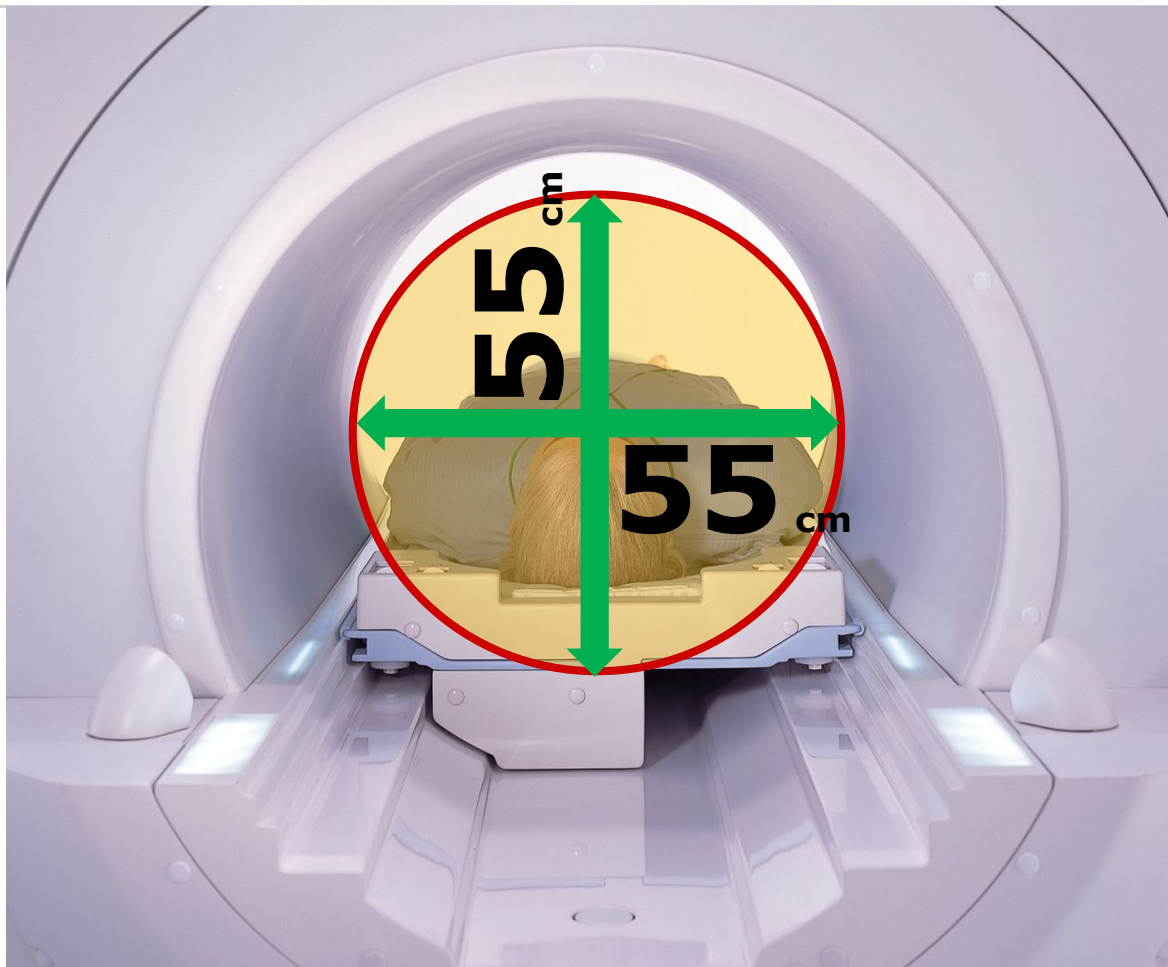


Pour les claustrophobes



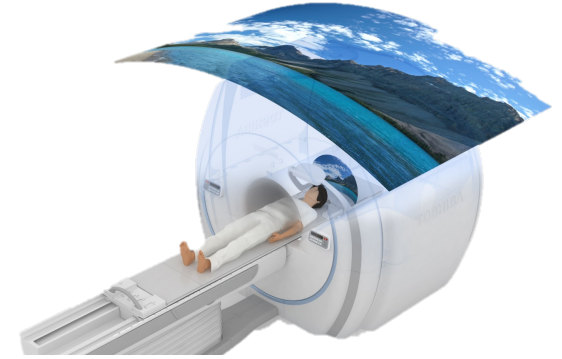
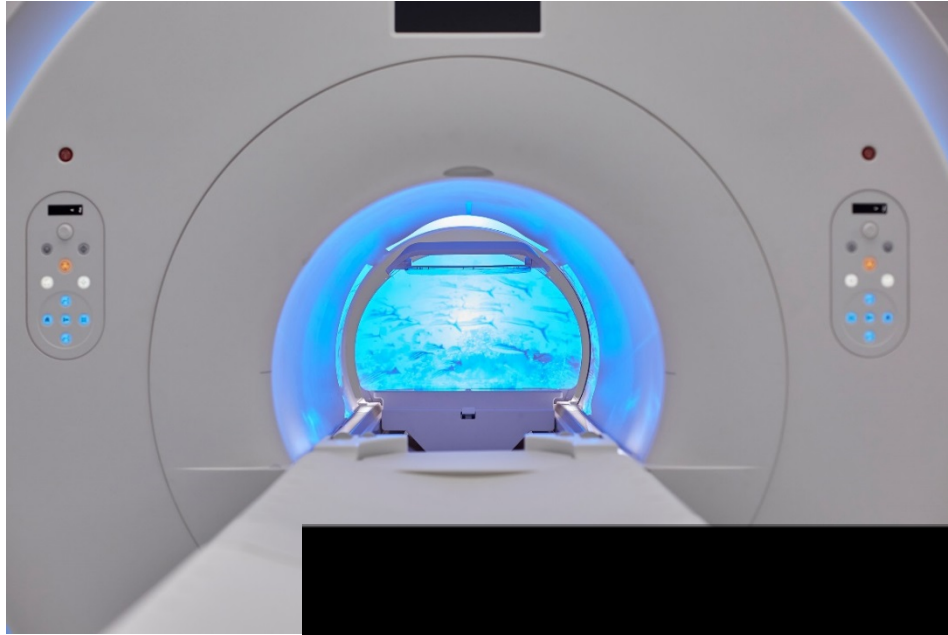
Pour la Mammo IRM

# LE PLUS LARGE FOV





# MR THEATER : L'IMMERSION REALISTE



- > Projection sur toute la surface interne de l'aimant
- > Immersion réaliste
- > Ambiance relaxante
- > 5 choix d'ambiances relaxantes
- > Vidéo et musique du patient
- > Compatible fMRI

# PIANISSIMO : LES GRADIENTS SILENCIEUX

*Pianissimo*



- > Brevet Toshiba (depuis 1999)
- > Solution Hardware + Software
- > Gradients sous vide poussé







# LES 5 PILIERS CLINIQUES



ONCOLOGY



NEURO



CARDIAC



MSK  
SPORT MED



WOMEN'S  
HEALTH

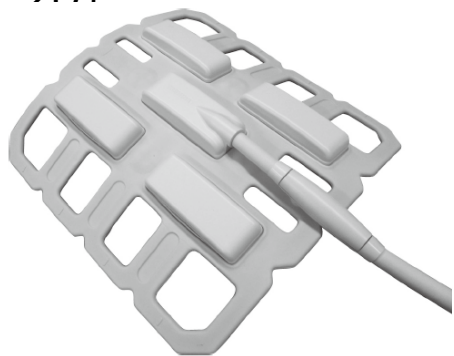


# LES ANTENNES CARDIAQUES

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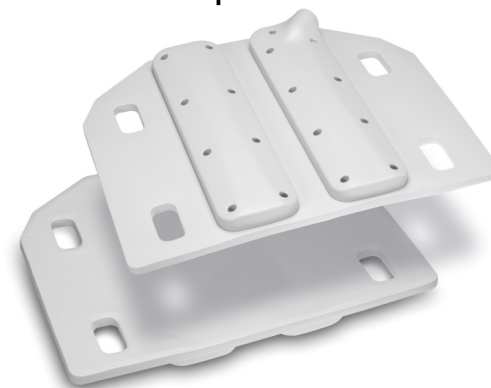
## Antenne Body Atlas

- > 16 éléments
- > Speeder jusqu'à X 3 (image 2D)



## Antenne dédiée Cardio

- > 32 éléments
- > Speeder jusqu'à X 6 (image 2D)
- > Ergonomie et positionnement adaptés



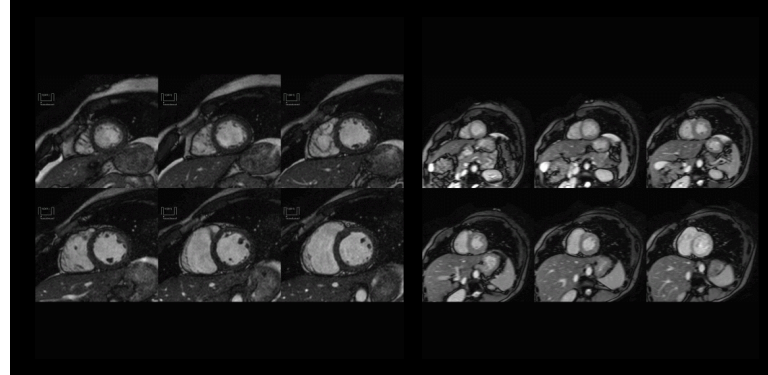
## Antenne Flex Large

- > 16 éléments
- > Speeder jusqu'à X 6 (image 2D)



# La synchronisation ECG, sans fil

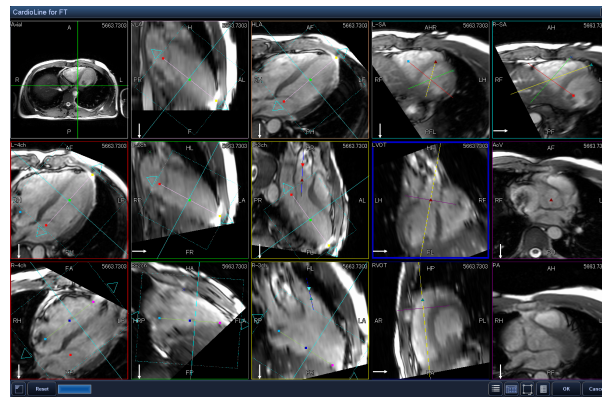
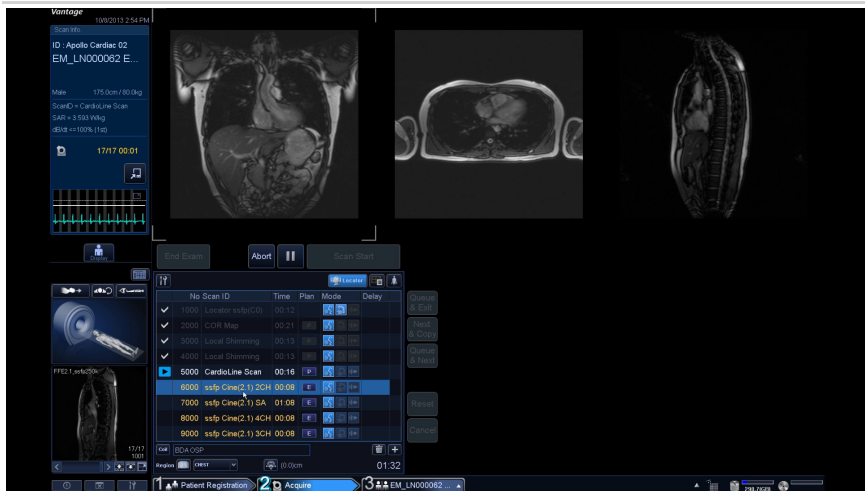
## Optimiser la qualité de la synchronisation



- > Meilleur tracé ECG
- > ECG moins sensibles aux courants induits
- > Meilleure reproductibilité
- > Mise en place capteur facilitée



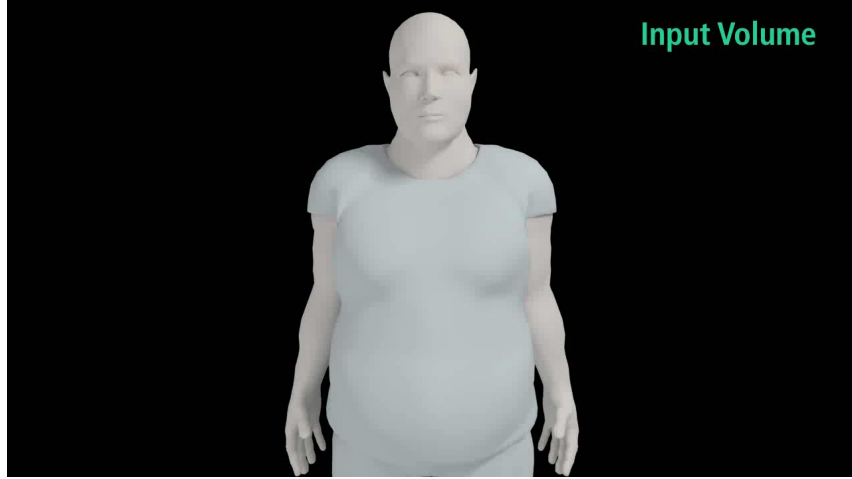
# CARDIO LINE +



- > Reconnaissance automatique des contours VG+VD+Valves
- > Positionnement automatique 15 orientations (ACC)
- > Contrôle visuel et modifications interactive
- > Enchaînement des acquisitions
- > Ergonomie et workflow améliorés
- > Reproductibilité des examens

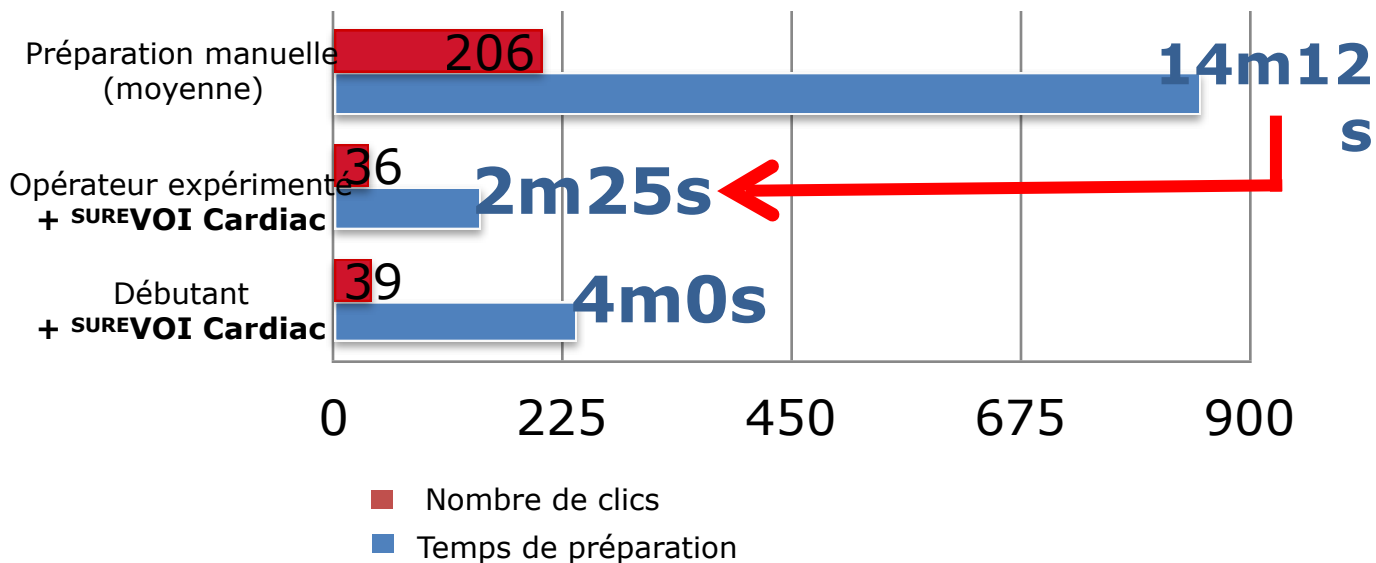
# SUREVOI Cardiac

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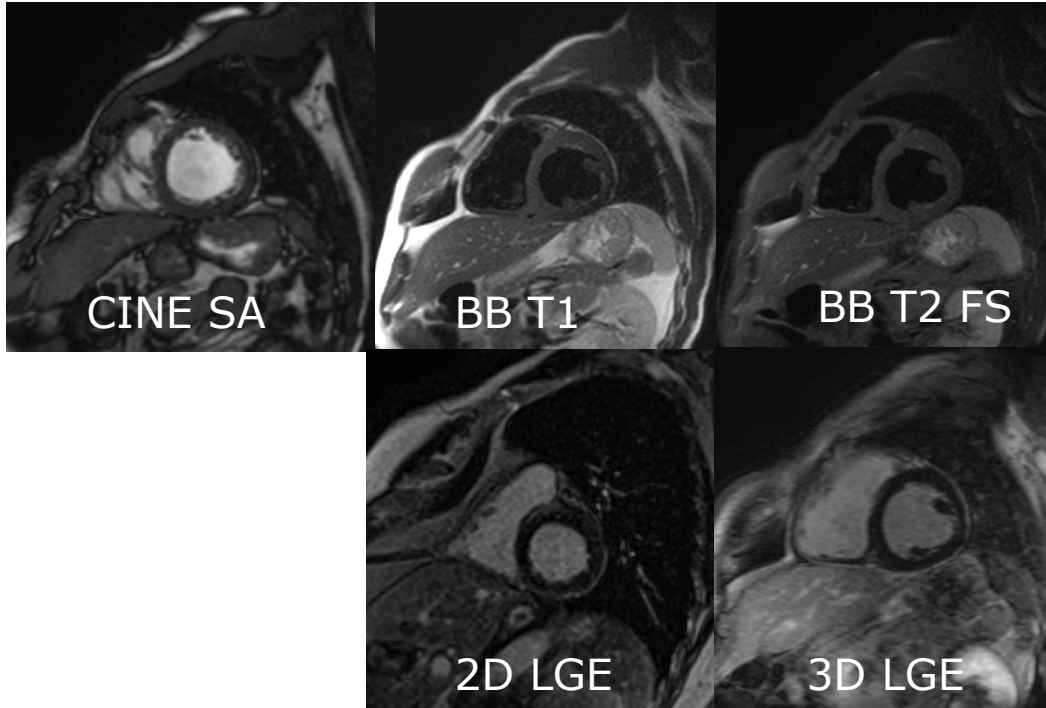
- > Détection automatique du cœur en 3D
- > Ajustement automatique de la position de table
- > Ajustement automatique des FOV
- > Positionnement automatique des coupes (Cardio Line +)
- > Positionnement automatique de l'écho navigateur
- > Sélection automatique des paramètres d'acquisition

## Réduction du temps de préparation de 83%



\* Scan time including Cine (4 direction) , SA T2WI, MRCA

# L'EXAMEN CARDIAQUE



- > SURVOI 3D
- > CARDIOLINE
- > CINE
- > PERFUSION
- > LGE (Late Gadolinium Enhancement )

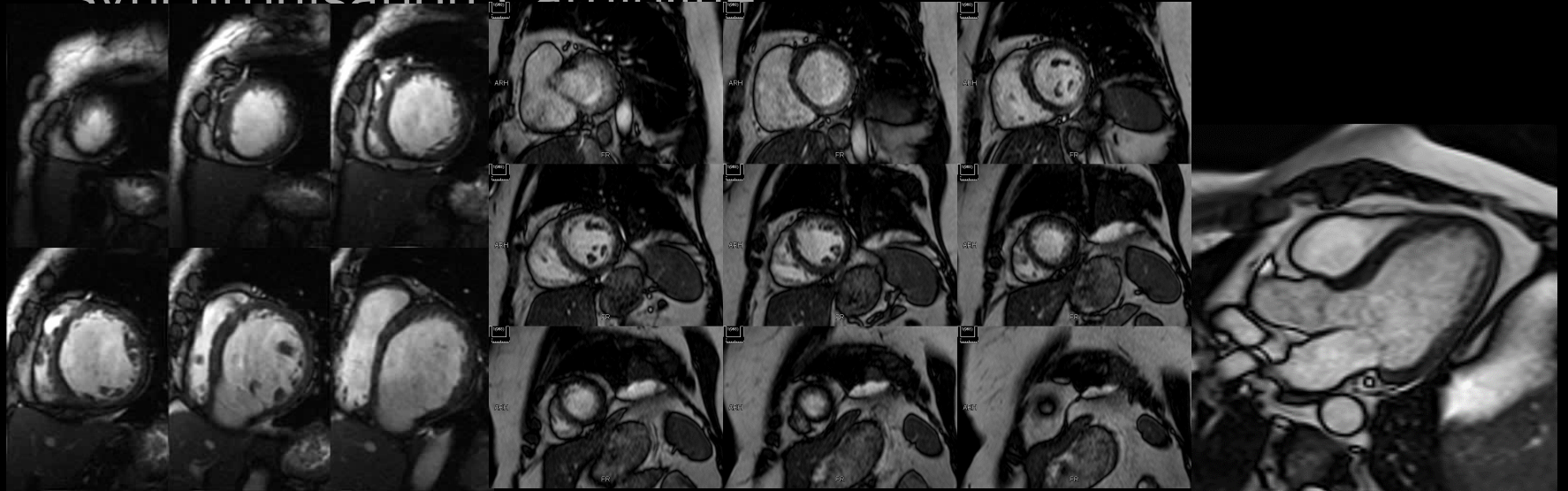
## **Options :**

- > PSIR
- > Black Blood T1, T2 ou T2FS
- > T2 Mapping
- > T1 Mapping



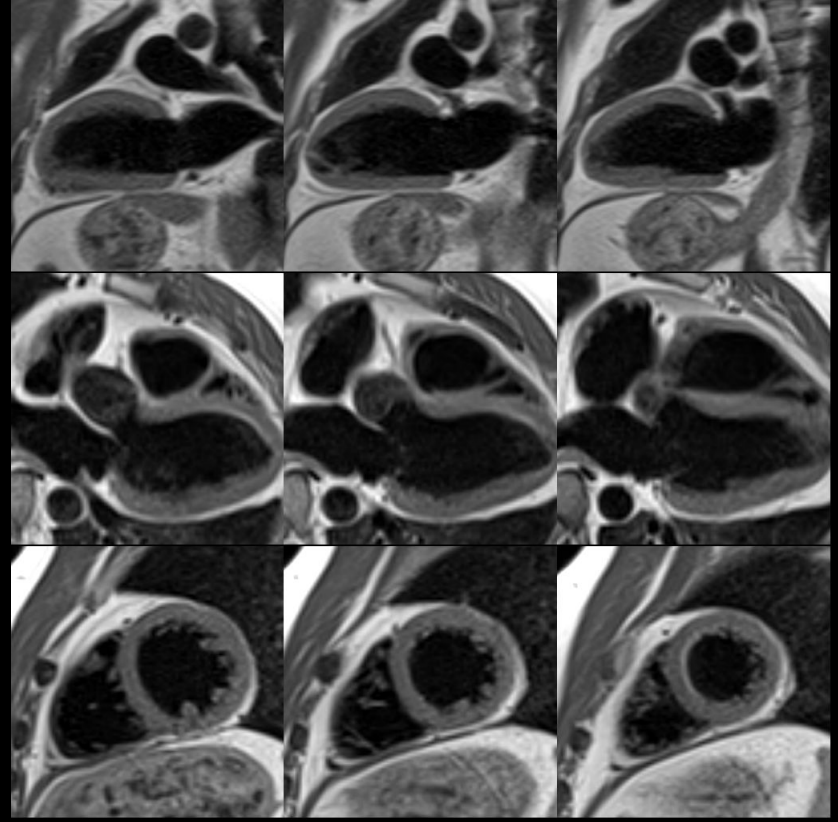
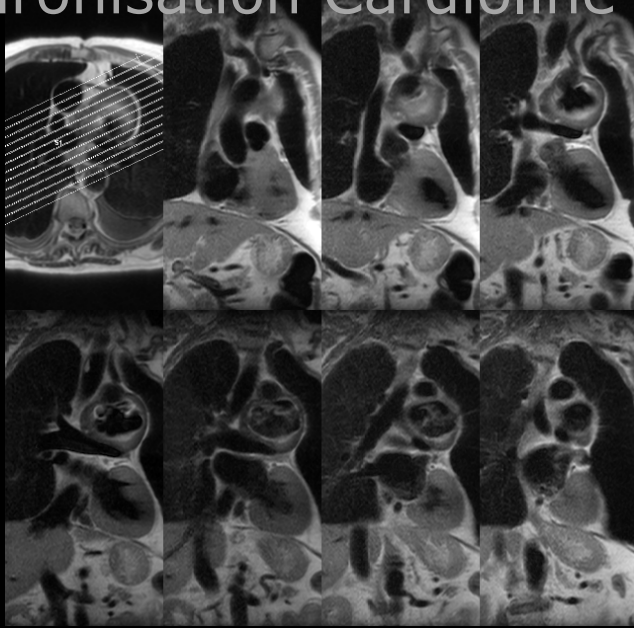
# ACQUISITION CINE - MODE RETROSPECTIVE

- > Positionnement automatique
- > Synchronisation Cardioline

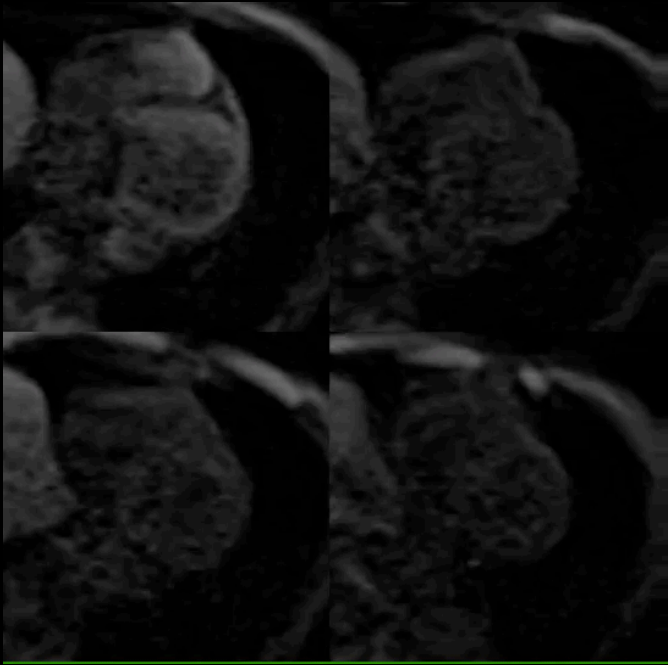
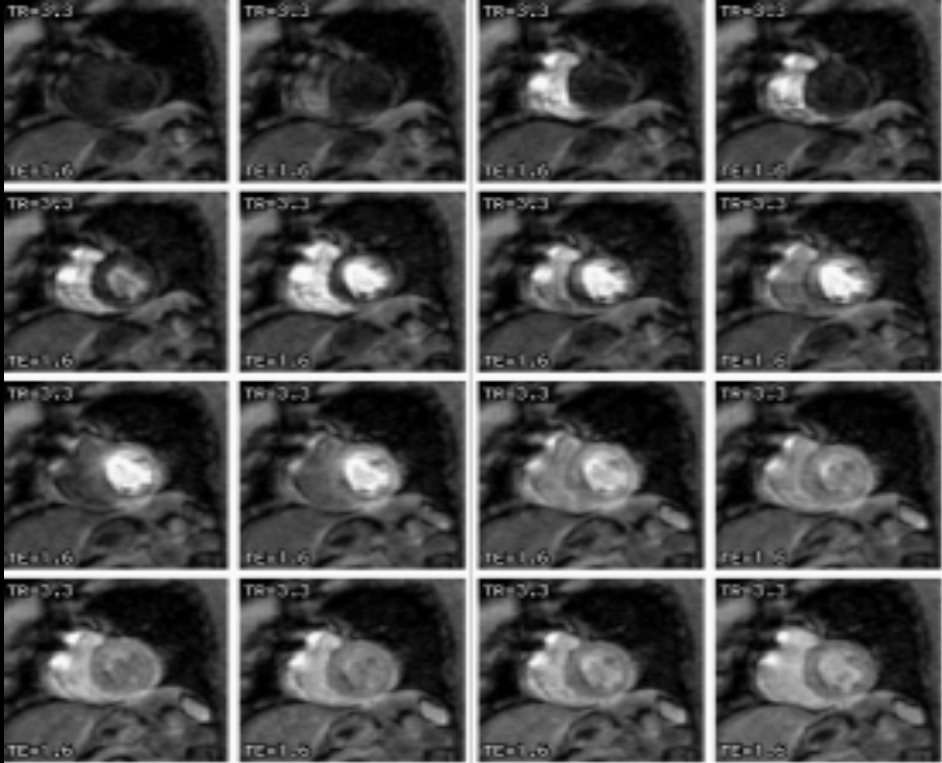


# SEQUENCE SANG NOIR (BB) - MODE PROSPECTIF

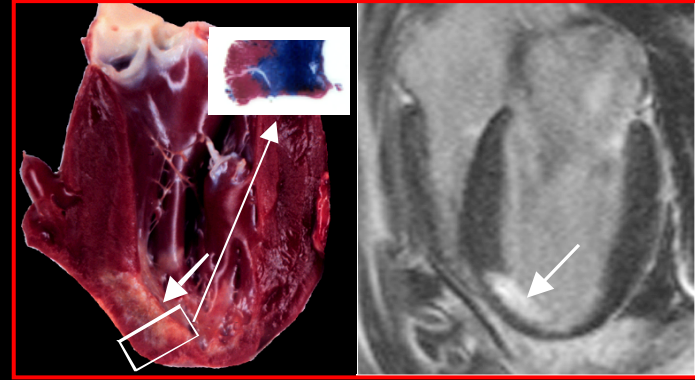
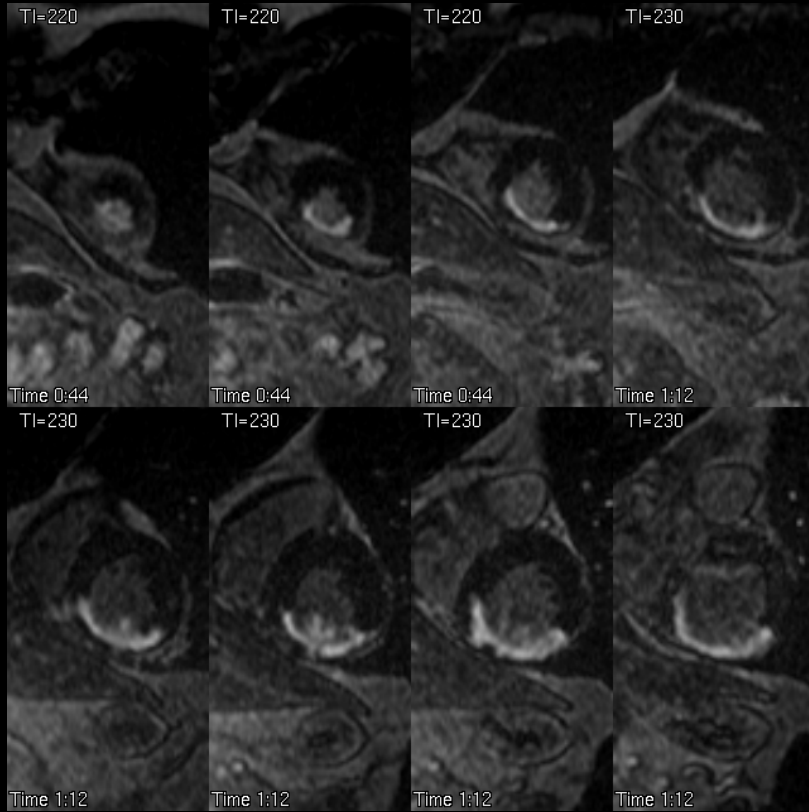
- > Positionnement automatique
- > Synchronisation Cardioline



# PERFUSION



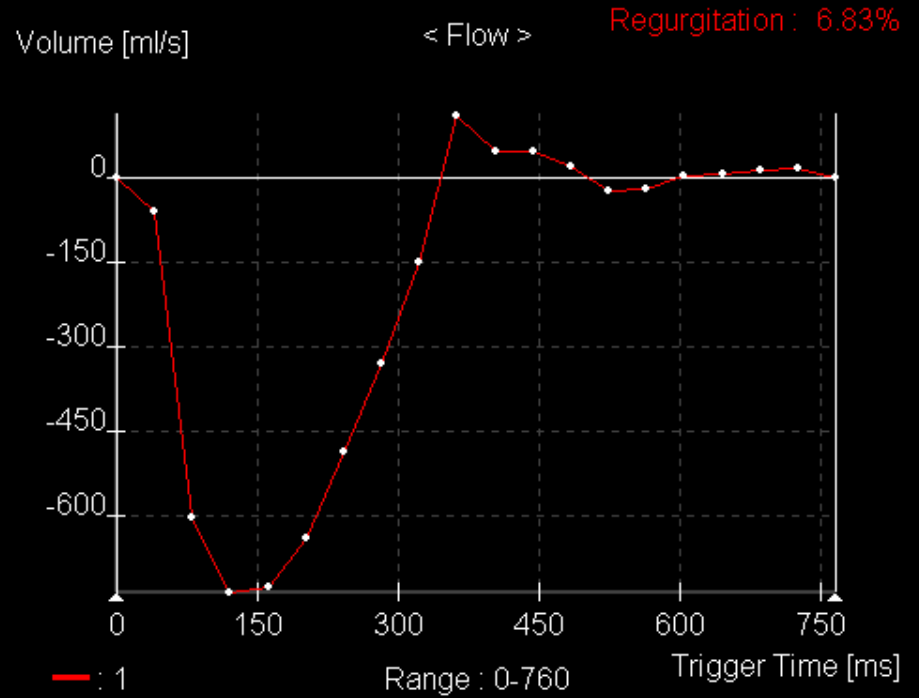
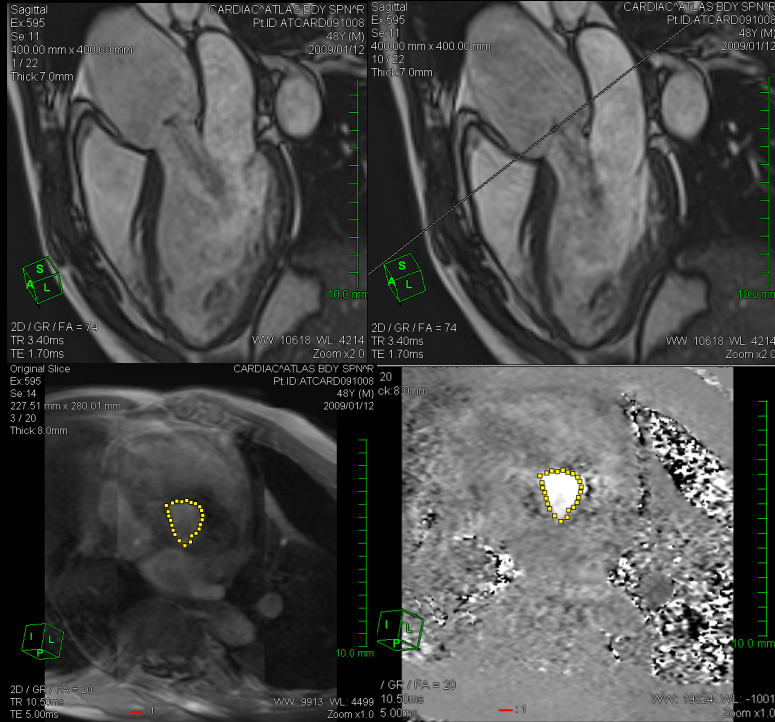
# LGE : REHAUSSEMENT TARDIF



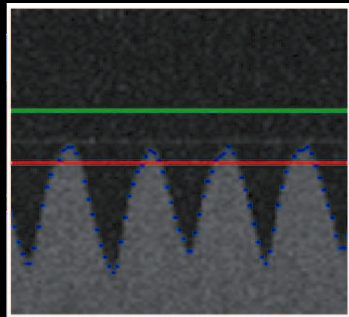
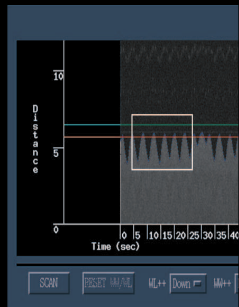
- > Séquence 3D LGE apnée
- > Séquence 3D Navigateur
- > Séquence 2D



# SEQUENCE DE FLUX



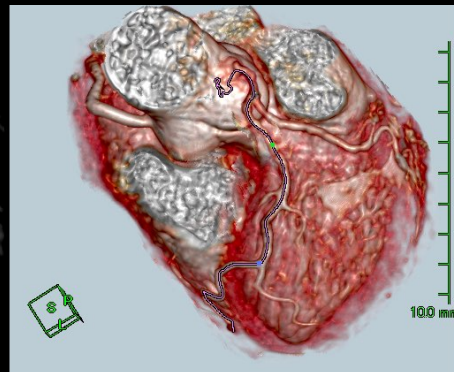
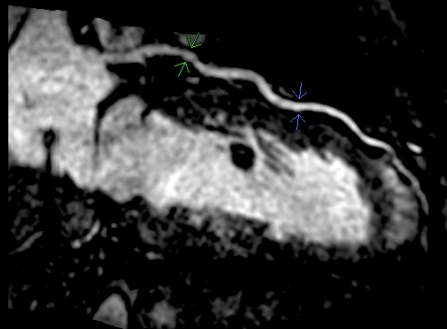
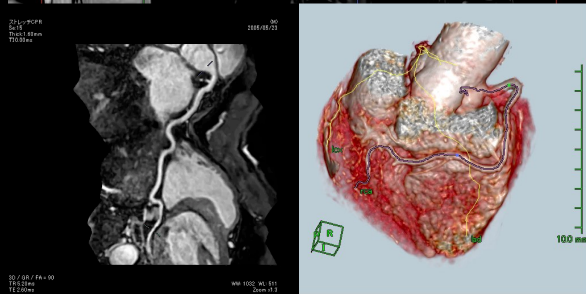
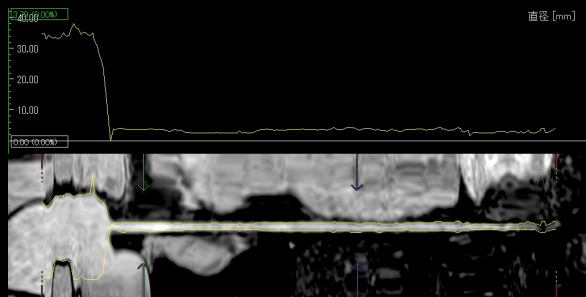
# SEQUENCE CORONAIRES 3D RMC



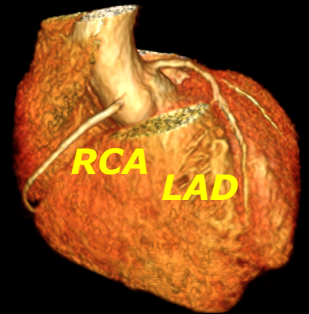
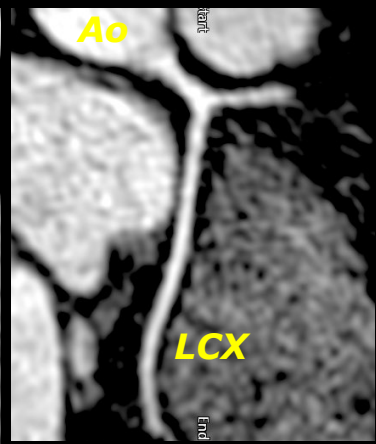
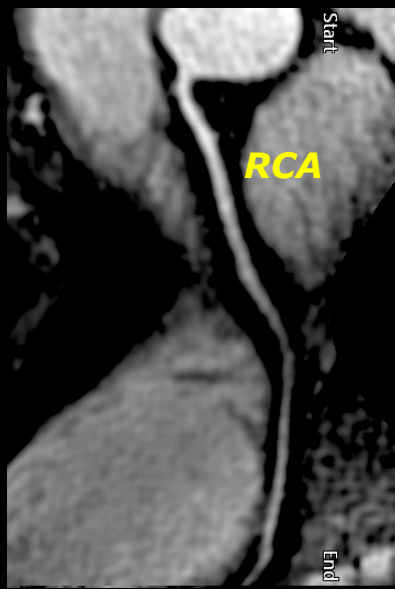
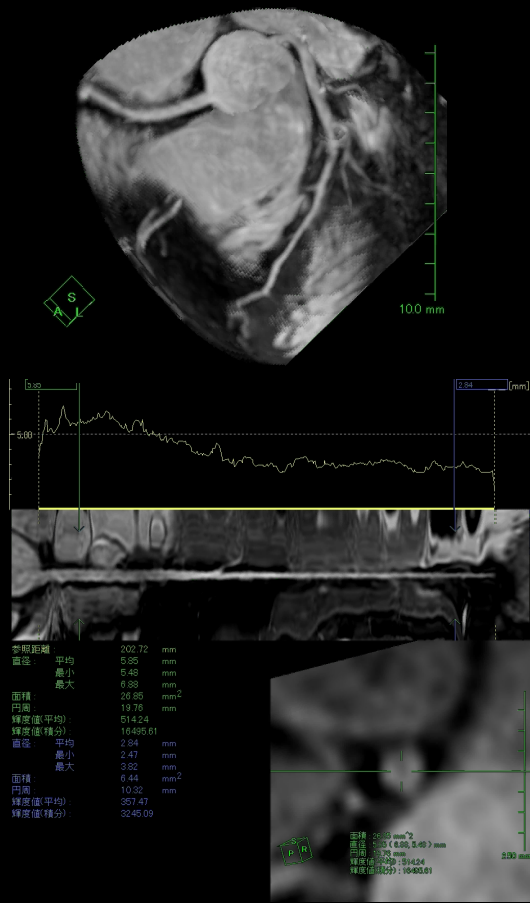
> Acquisition 3D avec écho  
navigateur positionné  
automatiquement par  
SURE VOI Cardiac

> Séquence SSFP

> sans injection de produit de  
contraste

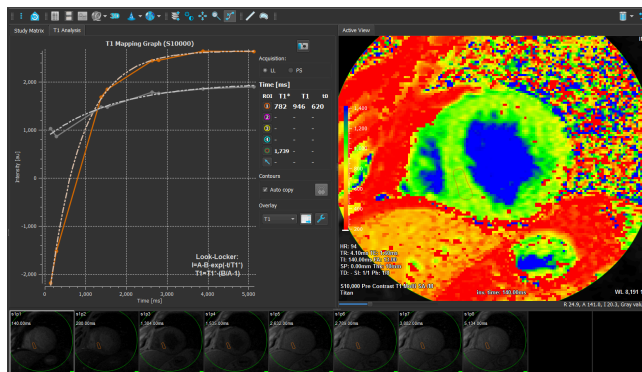


# SEQUENCE CORONAIRES 3D RMC

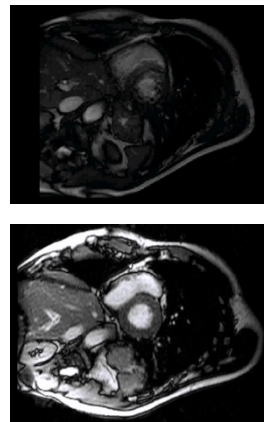
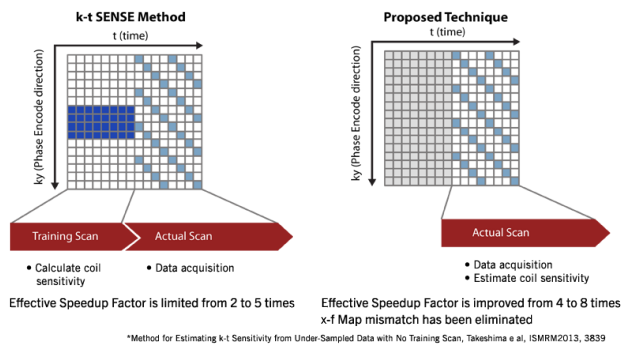


# NOUVELLES SEQUENCES DISPONIBLES

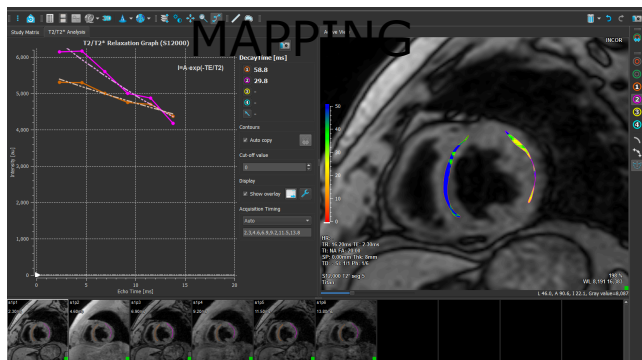
## > T1 MOLLI



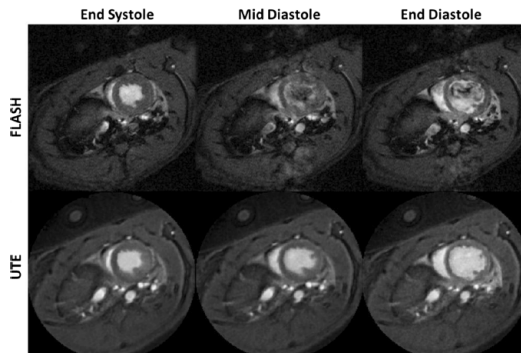
## > K-t Speeder



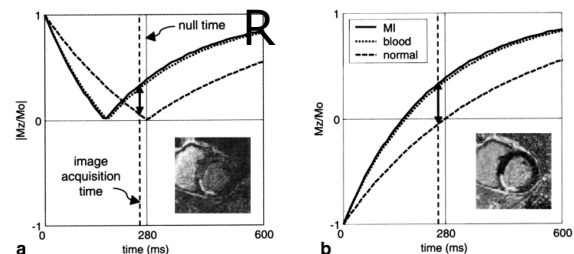
## > T2\*



## > UTE Cardiac



## > PSI

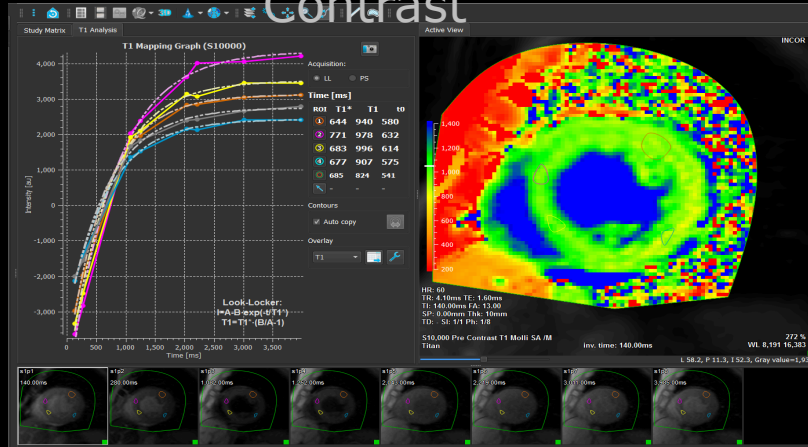




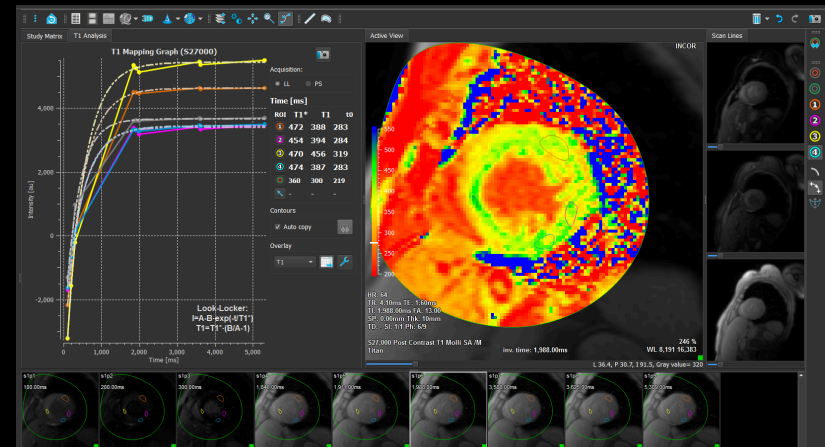
# T1 MOLLI : Modified Look-Locker Inversion recovery

- Mesure exact du temps de relaxation T1 de chaque tissus
- Evaluation quantitative des pathologies myocardiques
- Analyse de l'oedème et de la fibrose myocardique

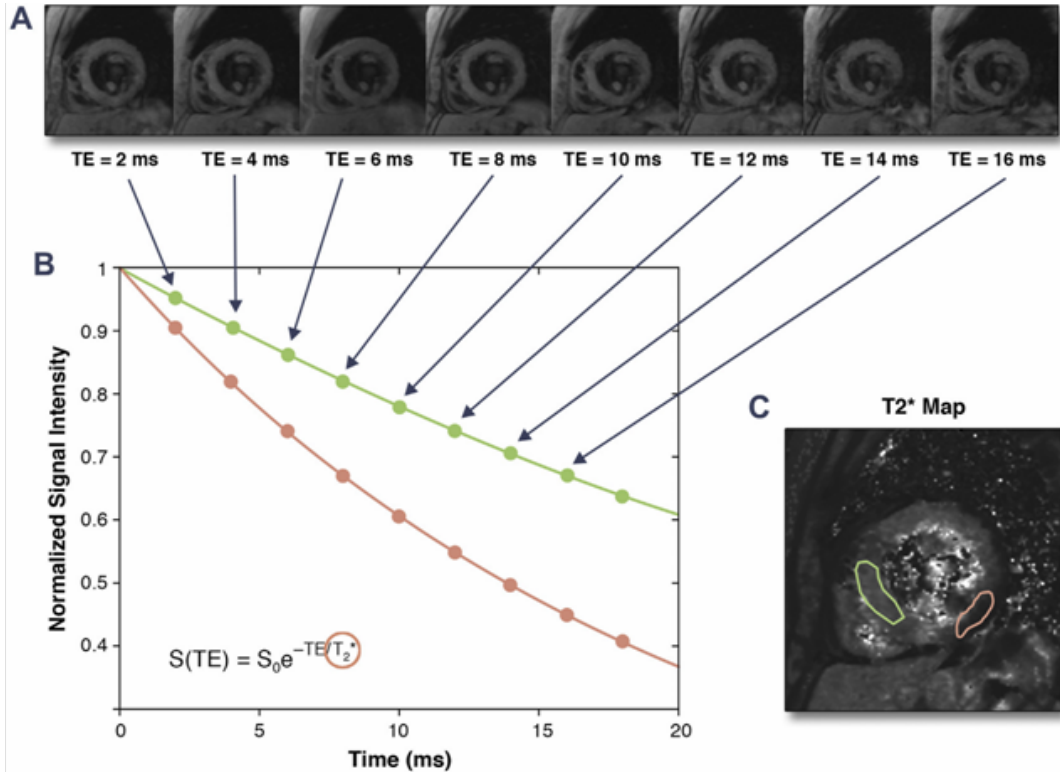
Pré  
Contrast



Post Contrast



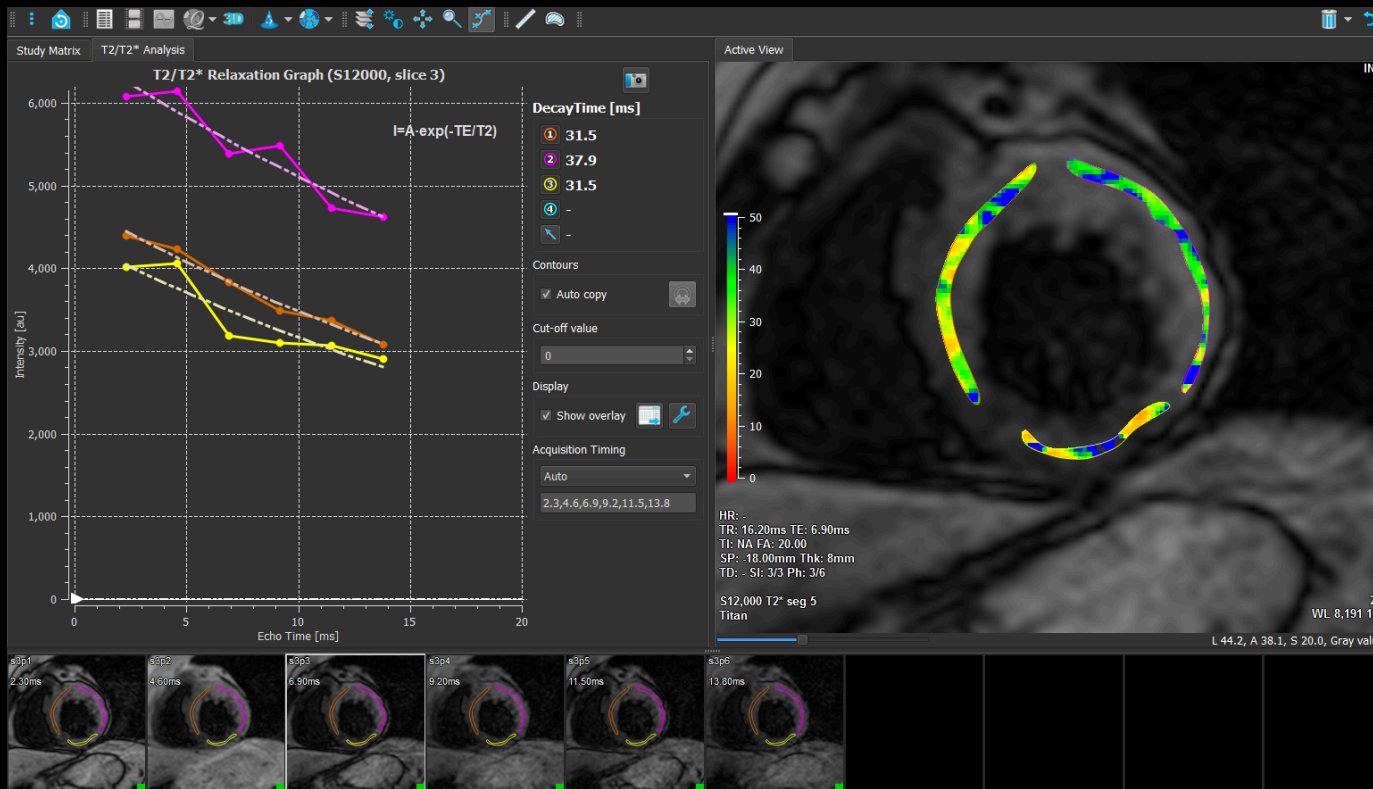
# T2 MAPPING



Analyse quantitative  
de la relaxation T2

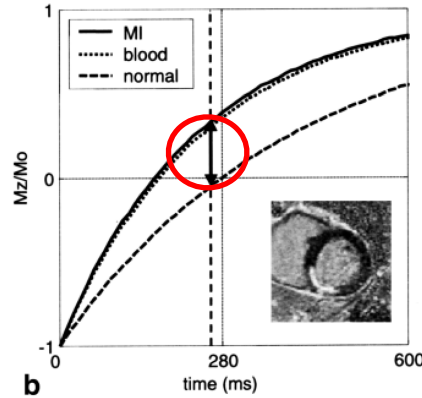
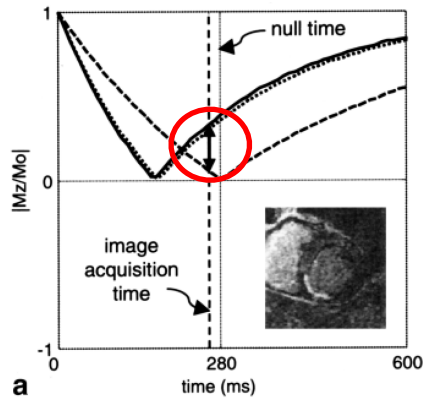
Détection des  
variations spatiale du  
T2\*

# Multi-Focal Myocardial Fibrosis T2\*



# PSIR : Phase Sensitive Inversion Recovery

- Les séquences en réhaussement tardif sont très sensibles à la variation du TI, un mauvais choix du TI conduit à une chute du contraste et à un diagnostic difficile.
- La séquence PSIR est une séquence de réhaussement tardif peu sensible au variation de TI après injection



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Kellman et al.

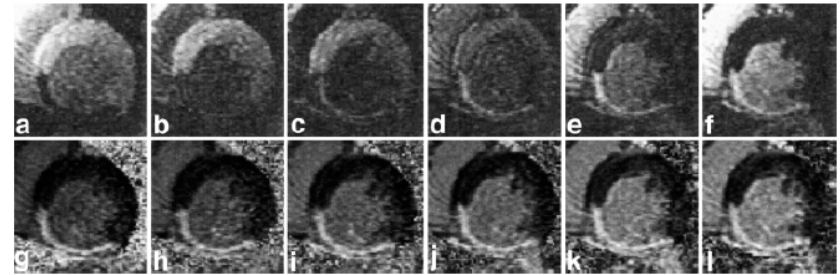
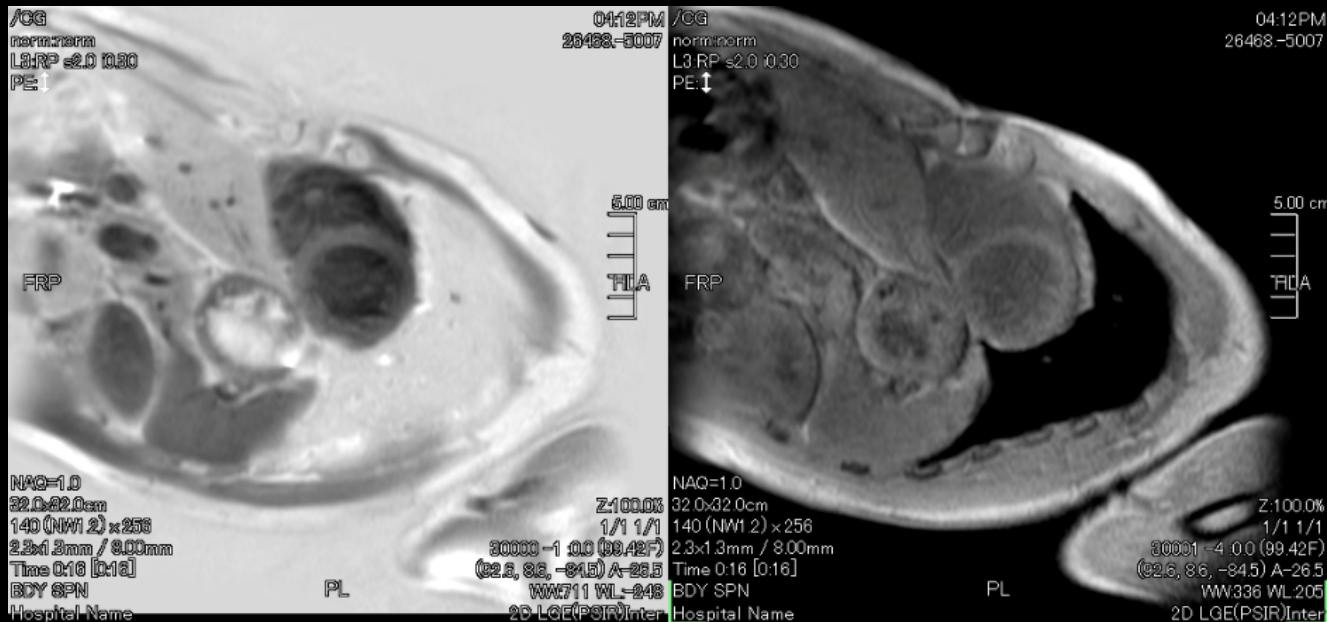


FIG. 7. Short-axis images at varied TIs for a patient with inferior MI. Magnitude (top row) and normalized phase-sensitive (bottom row) detection for TI = 175, 200, 225, 250, 275, and 300 ms from left to right. The appearance and contrast are variable for the magnitude-reconstructed images, while they are consistent for the normalized phase-sensitive reconstruction.

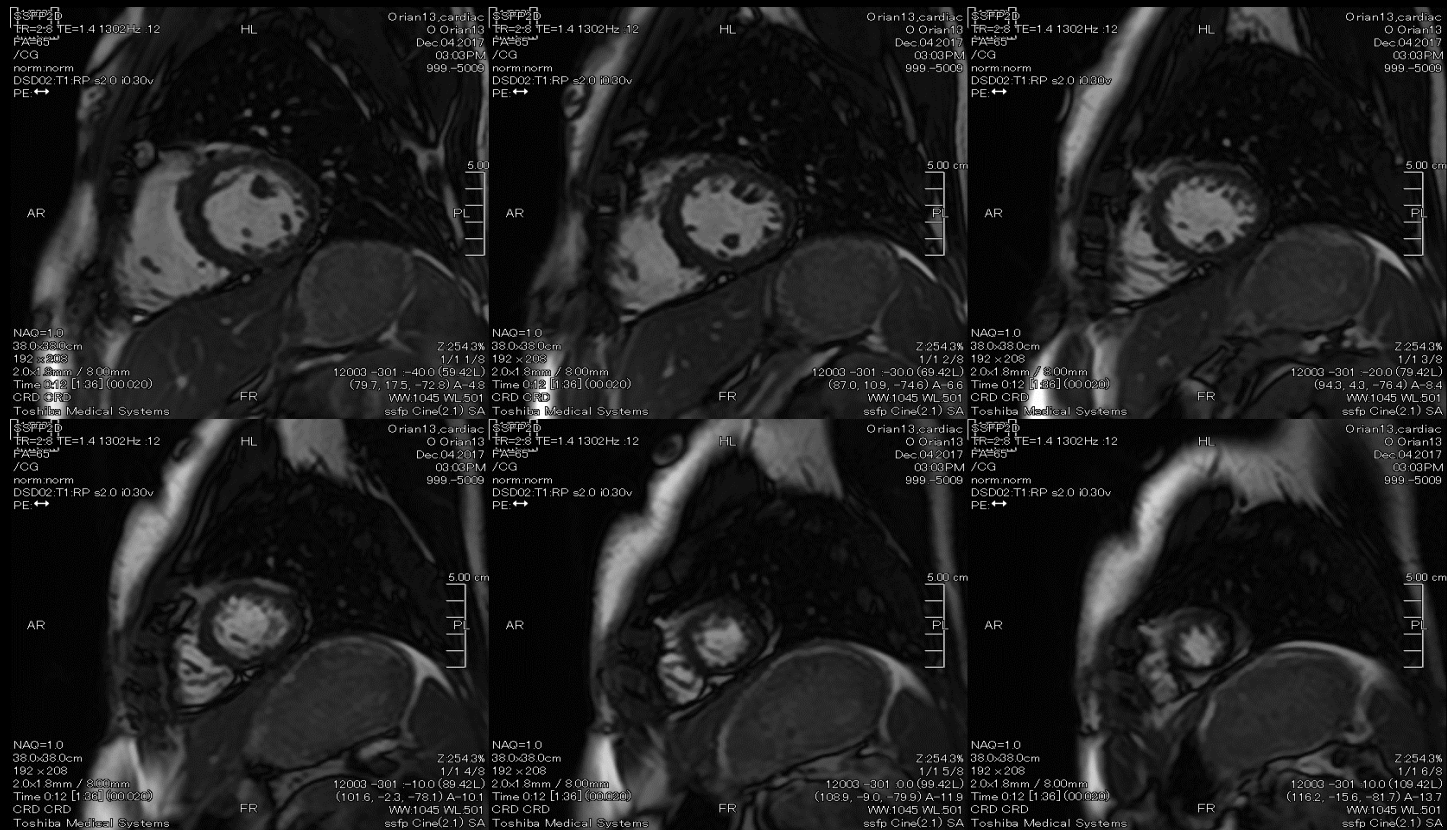


# PSIR : Phase Sensitive Inversion Recovery

- > Séquence de réhaussement tardif peu sensible au variation de TI après injection

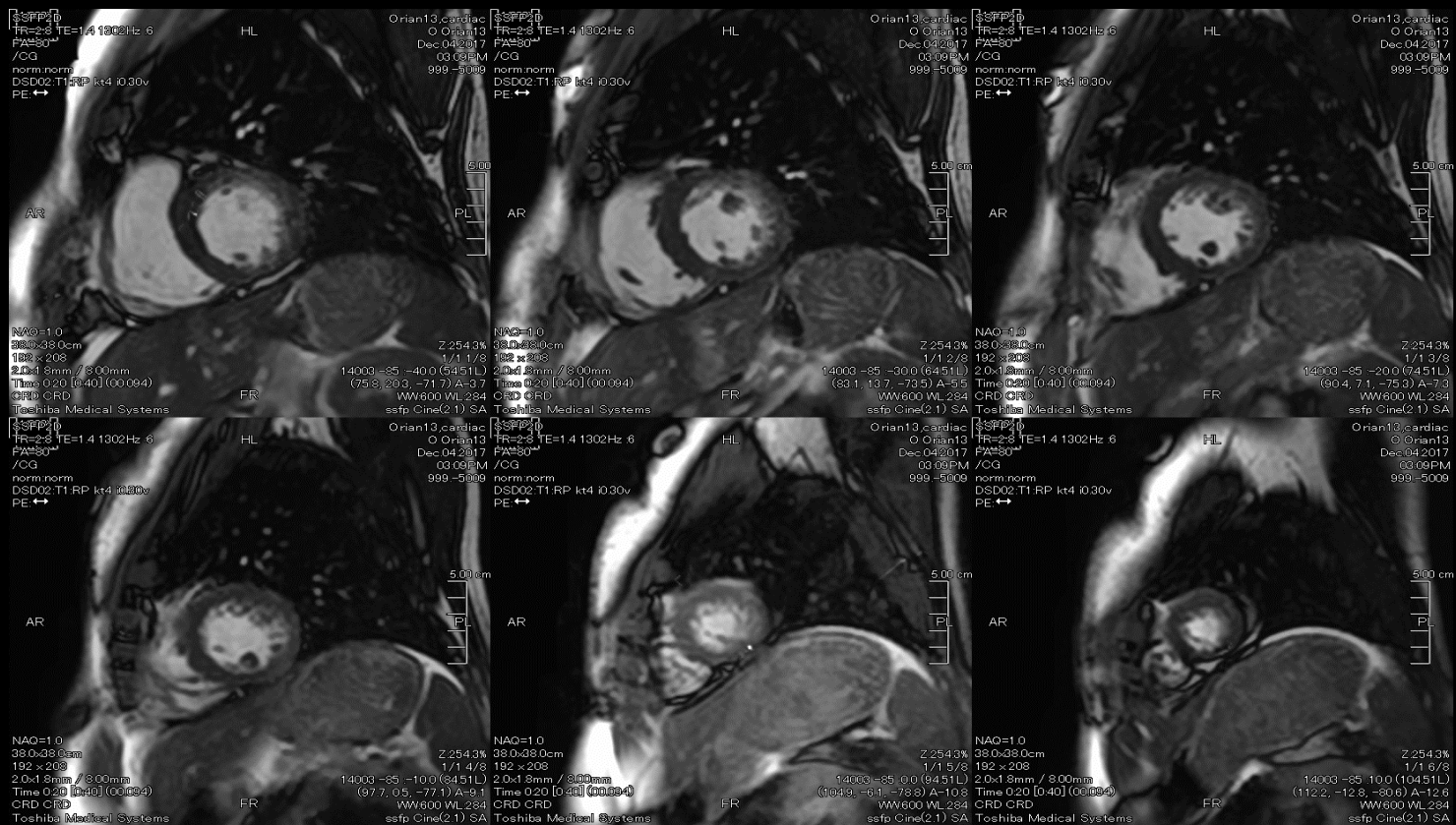


# K-t SPEEDER



# K-t SPEEDER

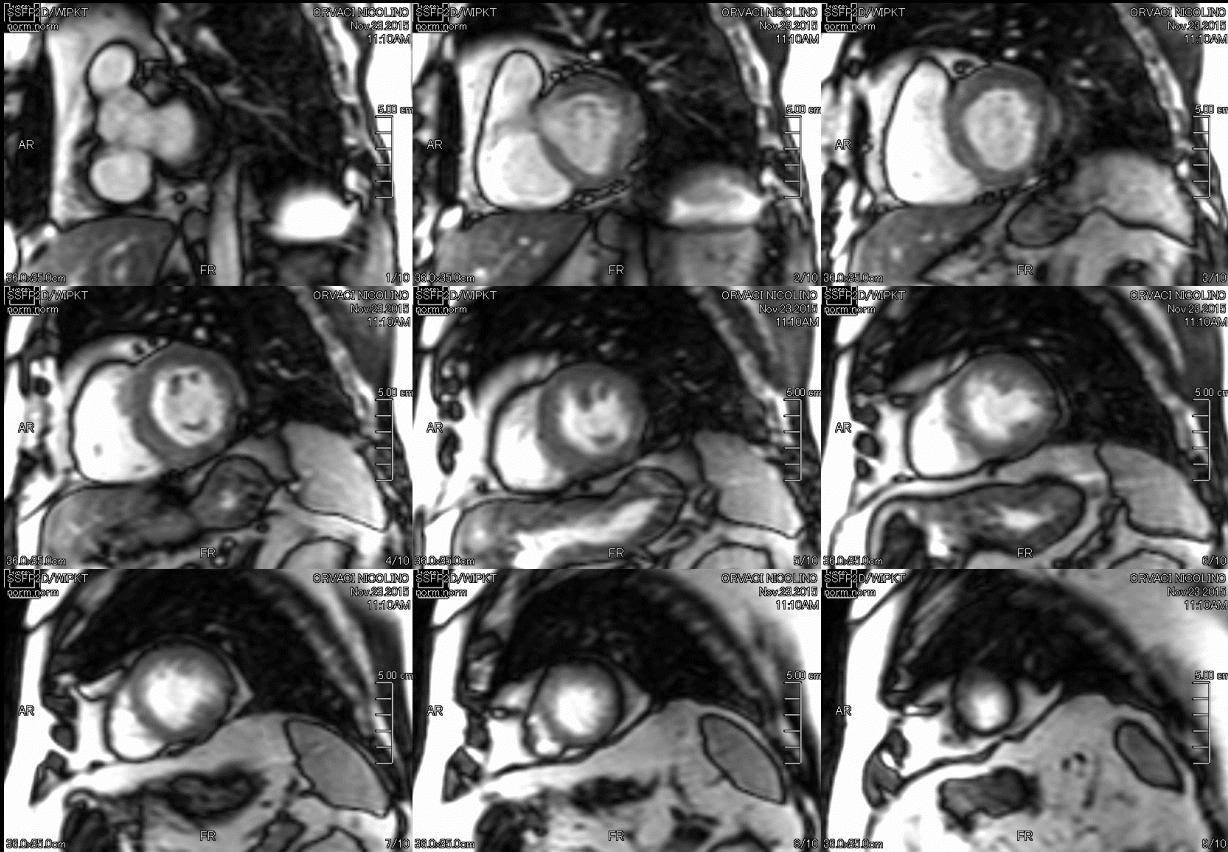
**K-t SPEEDER 4**  
**6 sec / slices**  
**Whole heart: 2 x**  
**20sec**





# K-t SPEEDER

**K-t SPEEDER 8**

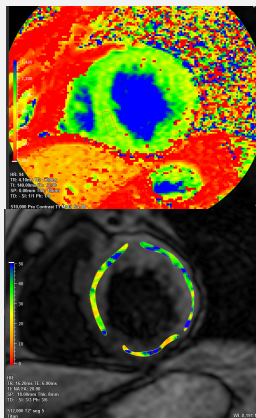


# IRM SYNTHETIQUE : NOVA+ CARDIAC \*

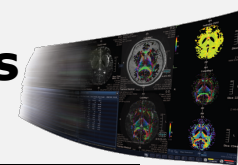
- > Imagerie synthétique multi-contrastes
- > Mêmes images sur le même cycle cardiaque



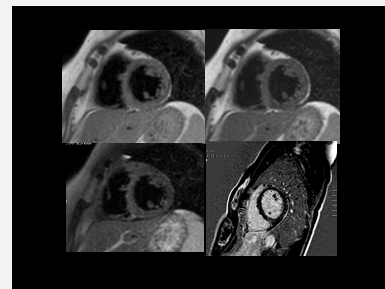
## Acquisition



## Calcul des images



- T1 BB
- T2 BB
- STIR BB
- T2 FS BB
- PSIR
- T1map
- T2map

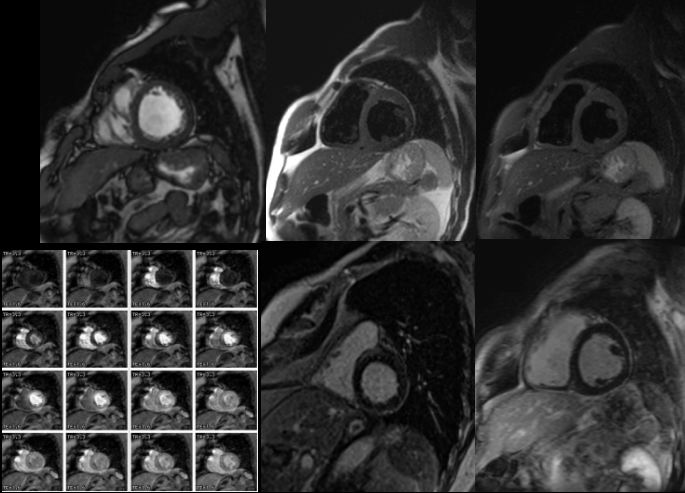


\* En développement



# IA : Deep Learning Reconstruction \*

Based on Deep Learning, remove "only noise " in the image



Input image



Output Image

# *Made For life*

For over 100 years, the Canon Medical Systems `Made for Life' philosophy prevails as our ongoing commitment to humanity - generations of inherited passion creates a legacy of medical innovation and service that continues to evolve as we do. By engaging the brilliant minds of many, we continue to set the benchmark, ~~because we believe quality of life should be a given, not the exception.~~

**Canon**

CANON MEDICAL SYSTEMS