des indications de l'IRM coeur: en pratique?

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NO conflict of interest to disclose

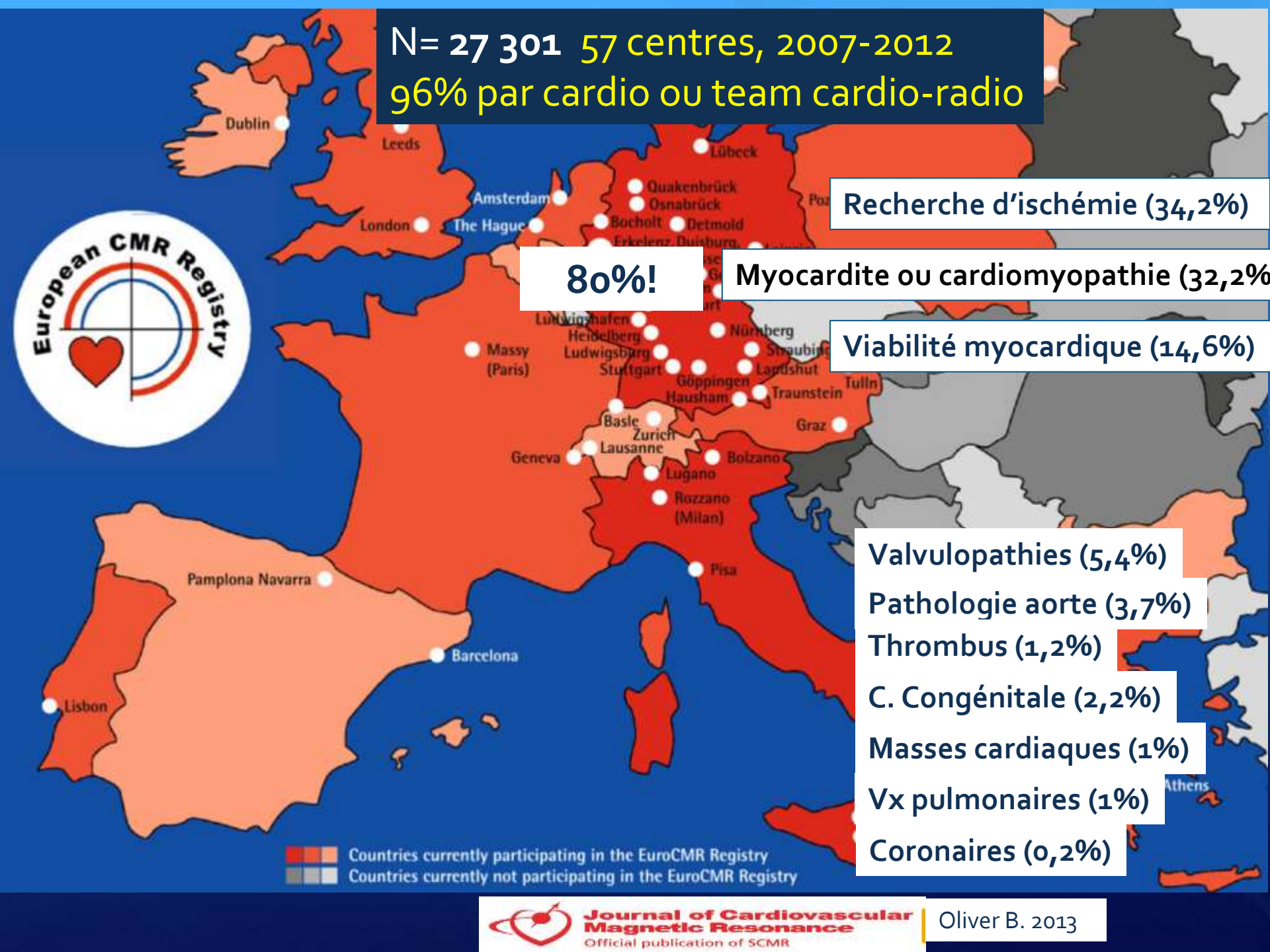
Introduction

- Technique de référence pour l'imagerie morphologique: tumeurs, PCC, congénitale…
- Etude des fonctions VG et VD : la plus reproductible
- Imagerie de perfusion
- Imagerie de RT: viabilité, cardiomyopathie

→Evolution des recommandations

- MAIS indication raisonnée, coût/bénéfice
- Approche multimodalité: complément de l'ETT

- CI: DAI, PM non compatibles, clips cérébraux, éclats métaliques occulaires
- Pas de CI aux stents et prothèses



Journal of Cardiovascular Magnetic Resonance
Official publication of SCMR

Oliver B. 2013

IRM cardiaque dans la vraie vie

Impact des résultats de l'IRM sur la gestion des patients dans 62%!

Journal of Cardiovascular Magnetic Resonance
Official publication of SCMR Oliver B. 2013

Notre série, N= 387

Viabilité: 40%

Myocardites et Cardiomyopathies

Pathologie du VD

SCA à coronaires normales

PCC

Masses VG

Suivi de chimiothérapie

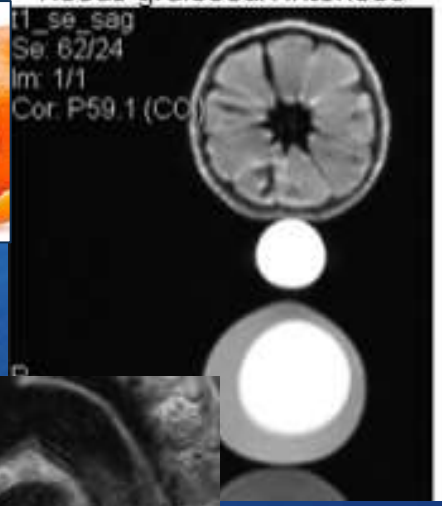
IRM cardiaque: Protocole

Séquences morphologiques
Séquences ciné
Perfusion
Réhaussement
(Séquences de flux)

Séquences morphologiques

Caractérisation tissulaire → inflammation, œdème, épanchement, graisse

Imagerie pondérée T1
Tissus graisseux intenses

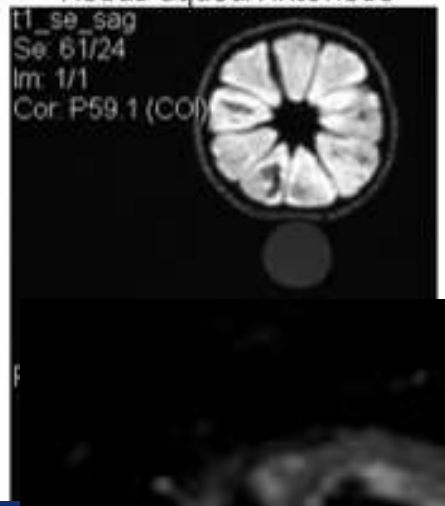


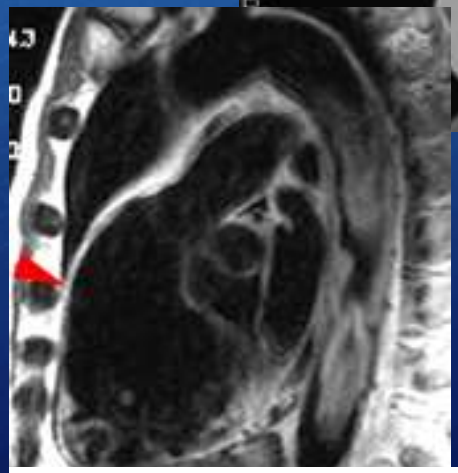
Mandarine (pulpe sans graisse)

Huile isio4 pure

Œuf (blanc albumine jaune cholestérol)

Imagerie pondérée T2
Tissus aqueux intenses

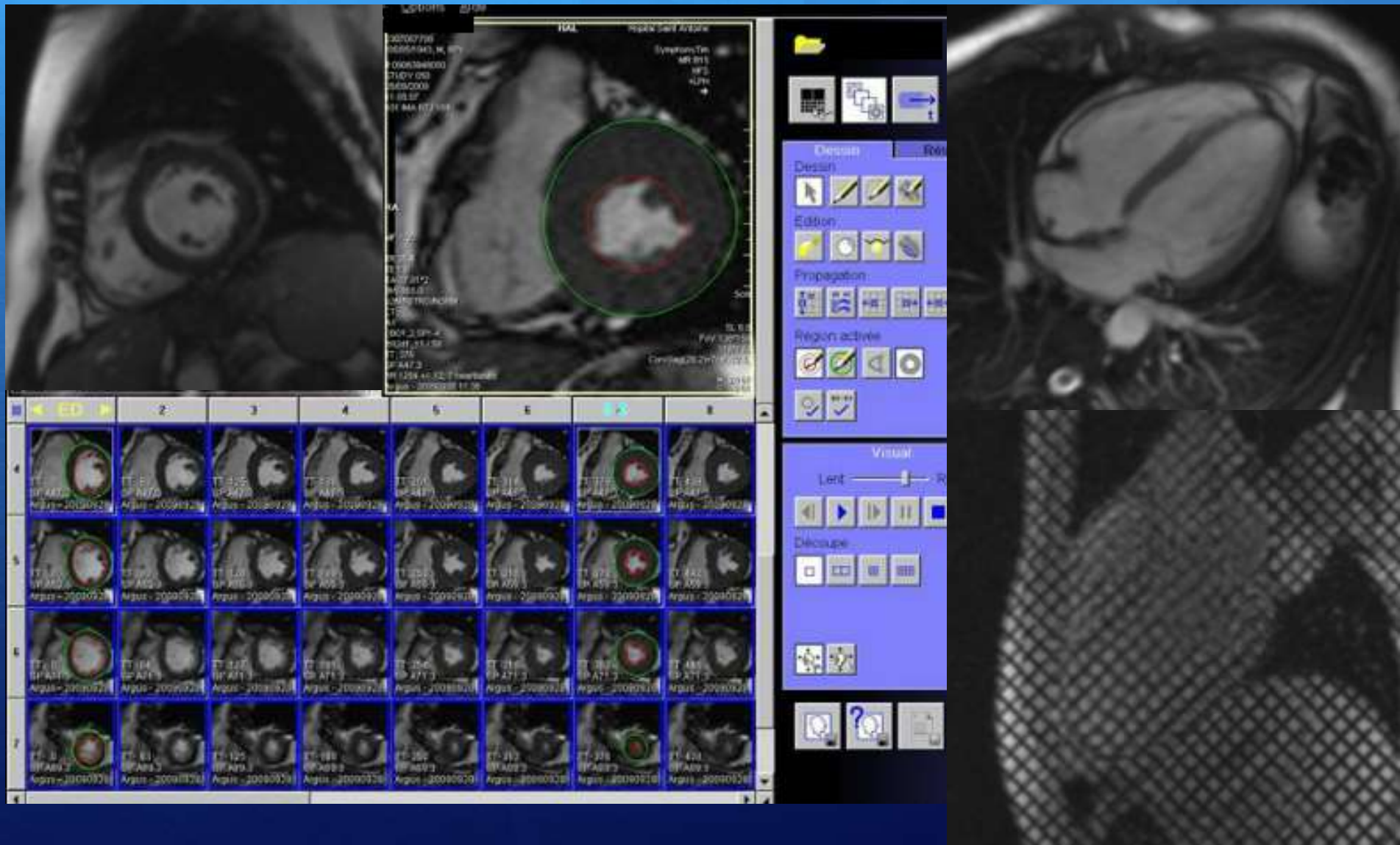




DVDA: graisse en hypersignal

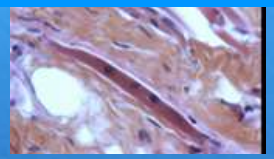
IDM récent: oedème

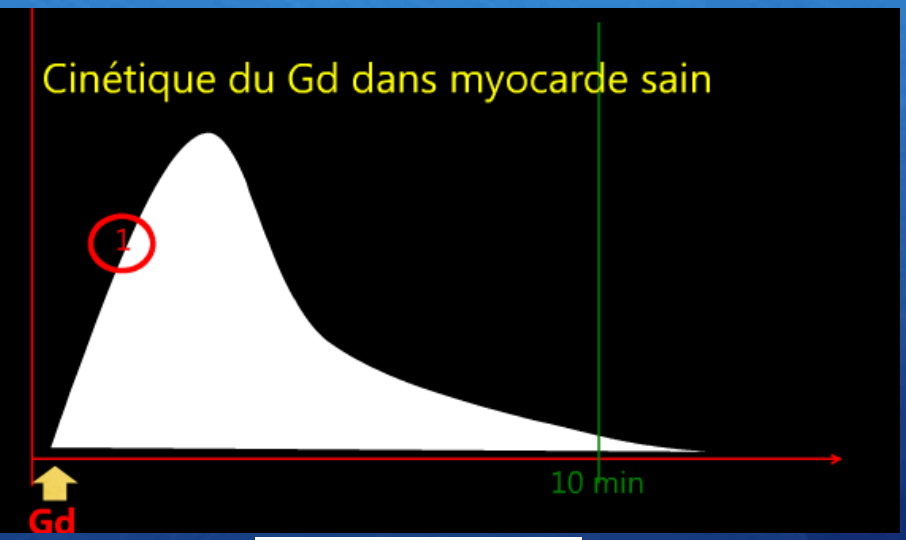
Séquences ciné



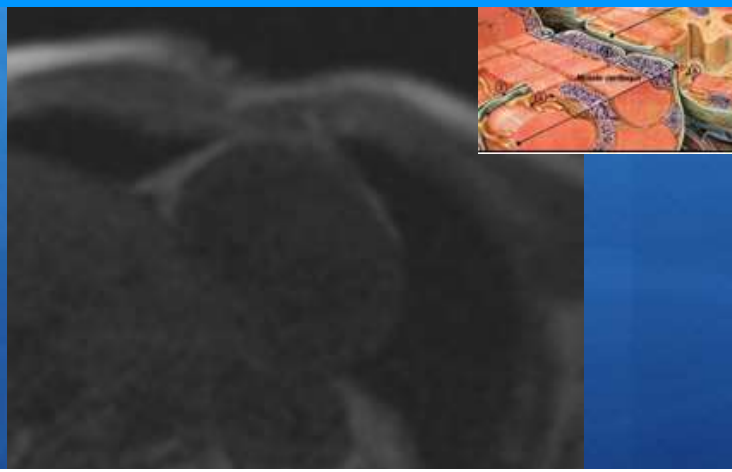
Protocole: Imagerie de perfusion et de réhaussement: **Gadolinium** = extracellulaire

Secteur vasculaire: 5% + Secteur Interstitiel: 15% + Secteur cellulaire: 80%

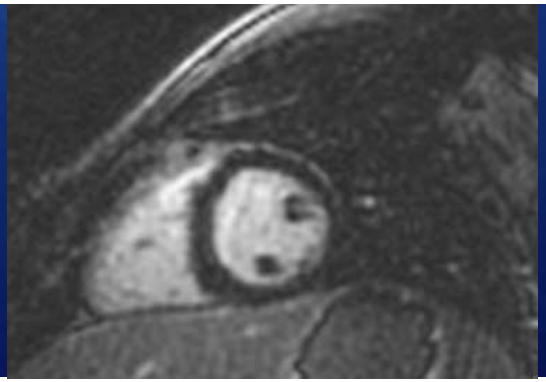




Myocarde sain

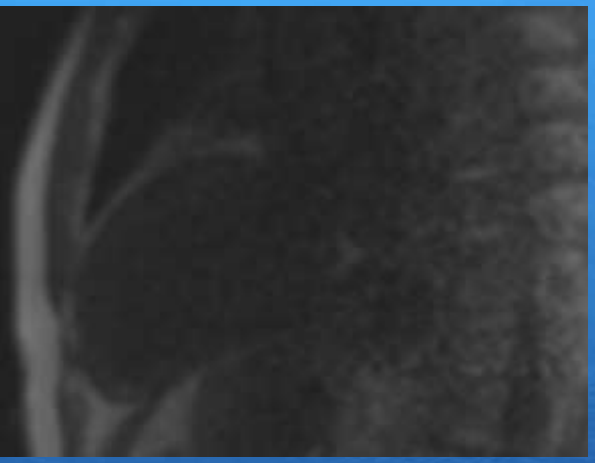


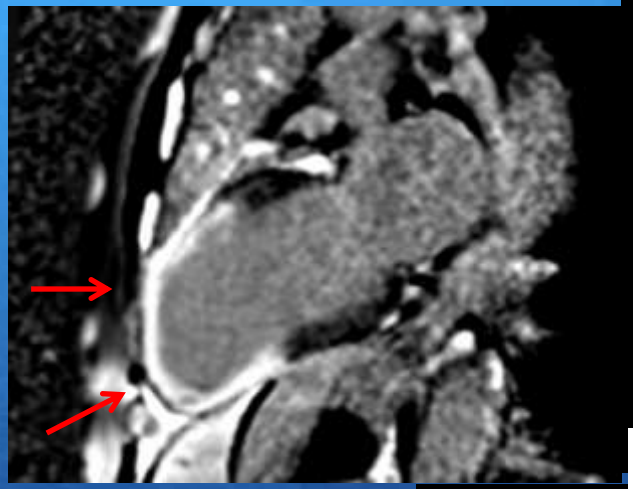
étude dynamique de la prise de contraste du myocarde au premier passage de gadolinium

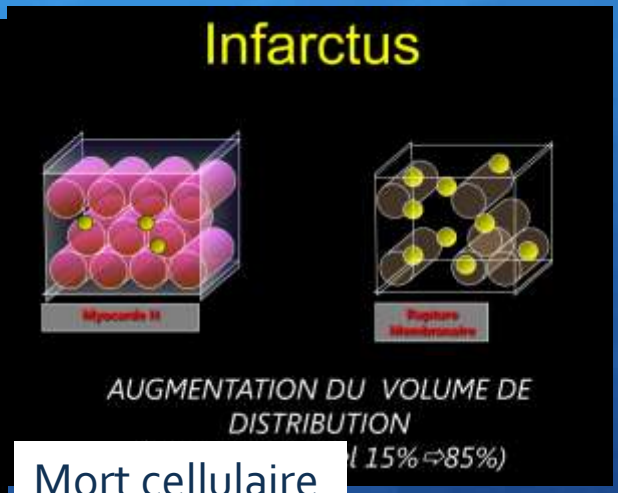


Étude du réhaussement du myocarde 5 à 10 min après injection de gadolinium (0,1mmol/kg)

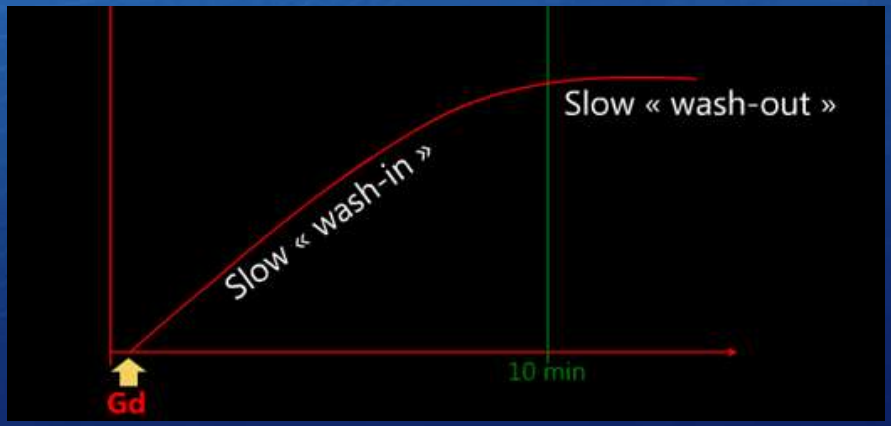
Perfusion et RT: myocarde pathologique

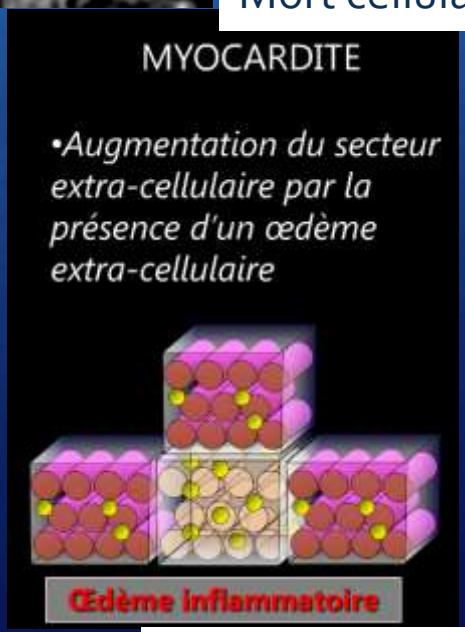






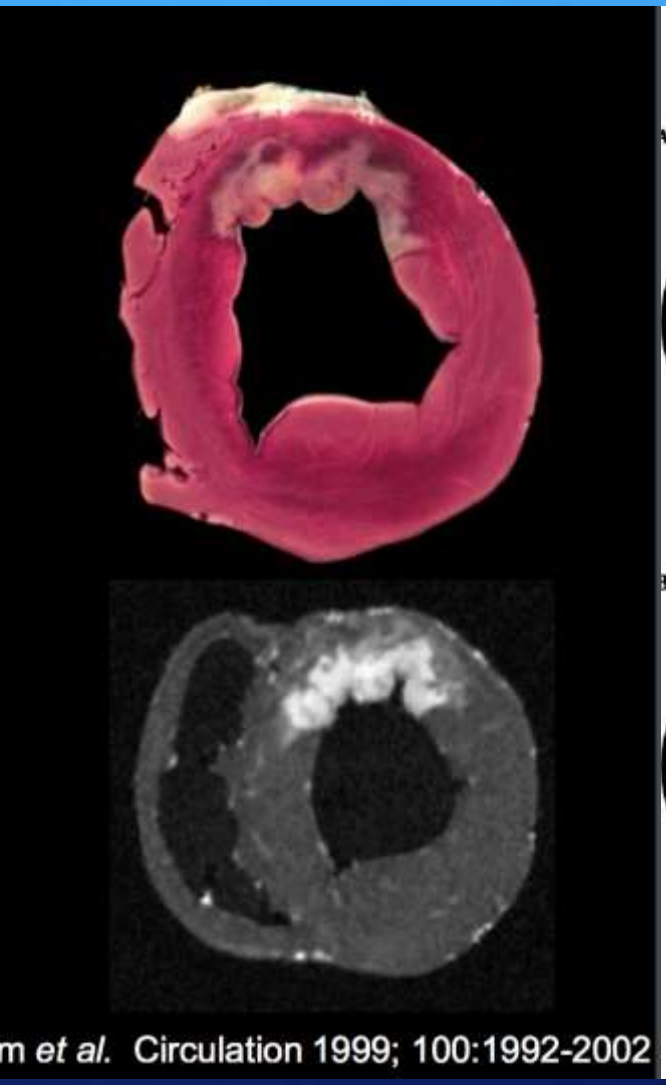
Mort cellulaire

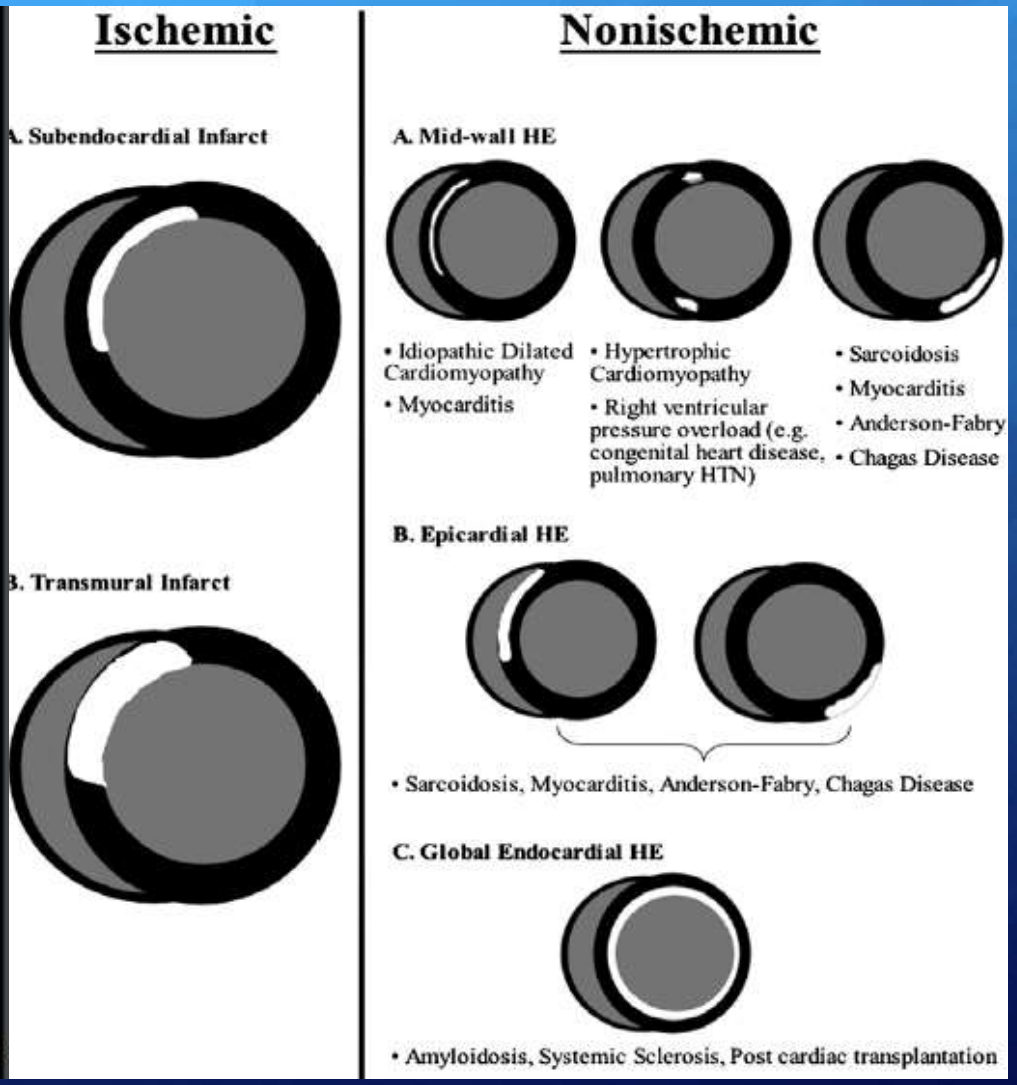




Infiltration du tissu de soutien

RT en IRM: valeur localisatrice de la fibrose





Mahroldt, H. et al. Eur Heart J 2005

Indications de l'IRM dans la maladie coronaire

- Détection de la maladie coronaire (AHA 2014/ESC 2013)

- Évaluation de la fonction VG et VD
- Viabilité myocardique
- Thrombus

→Indications de classe I

ACCF/ACR/AHA/NASCI/SCMR. Expert Consensus Document on CMR.2010

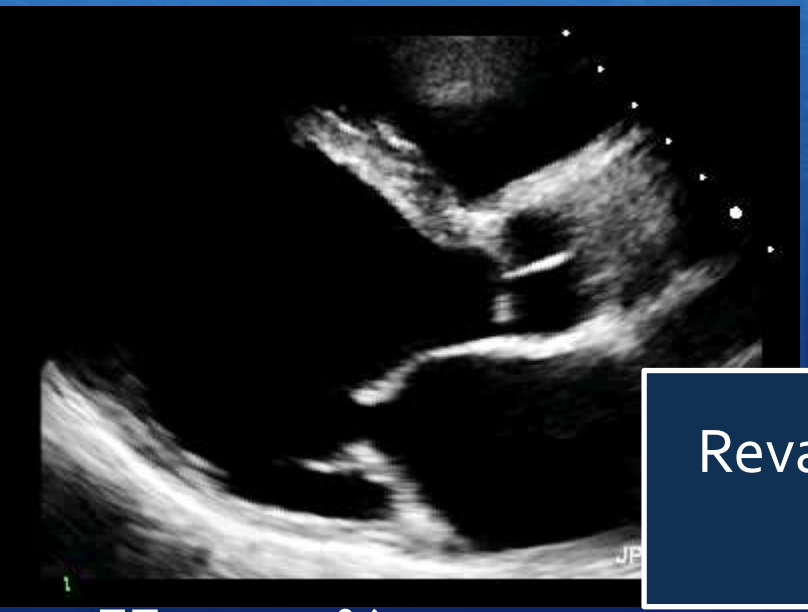
D Crochet et al. Guide de bonnes pratiques et recommandations en imagerie cardiaque en coupes Archives of Cardiovascular Diseases (2009)

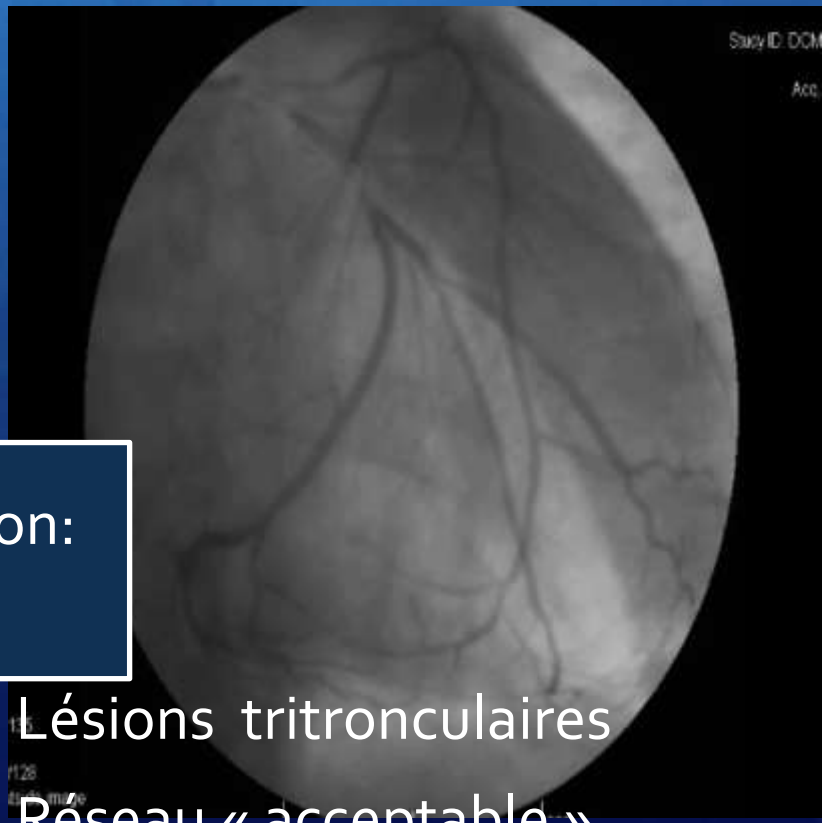
IRM cardiaque dans la maladie coronaire

36 ans, diabète type 2 récent

J25 post-IDM, non traité

PAS d'angor mais dyspnée, Discrets signes d'IVG





Revascularisation: viabilité?

- FE: 10-15%
- VG: 61 mm (33mm/m²)

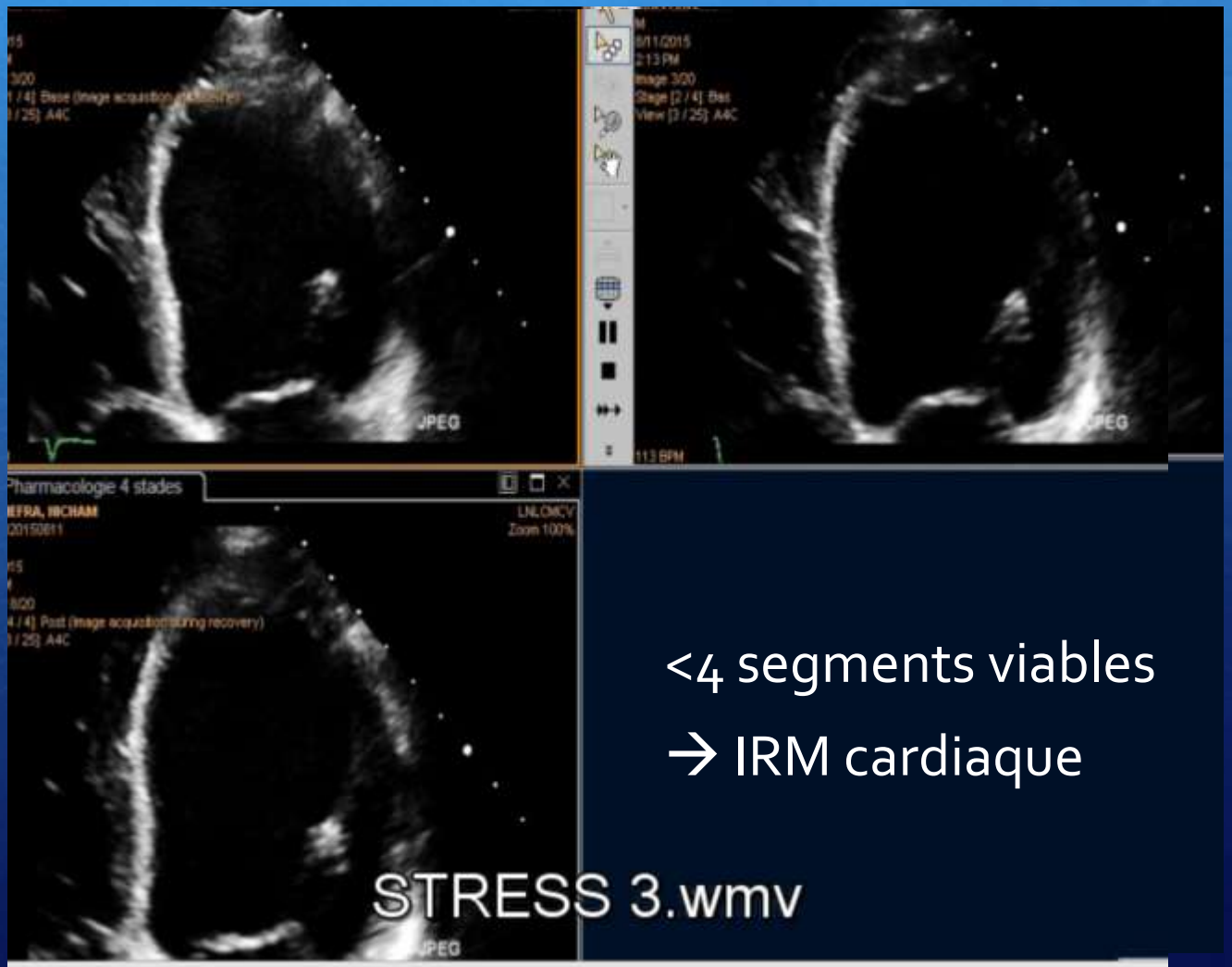
- Lésions tritronculaires
- Réseau « acceptable »

Quelle imagerie de viabilité? FE VG ≤ 35%

Physiopathologie	Intégrité membranaire Métabolisme	Réserve inotrope	Altérations cellulaires Réserve inotrope
Epaisseur pariétale	0	+	++
Transmuralité	0	0	++
Atteinte pluritronculaire	±	+	+
Limites	Obésité	Arythmies Echogénicité Sténose du tronc	Prothèses Claustro-phobie Arythmies (IRM stress)
Accessibilité	+	++	+
	Sens:88% Spé: 57%	Sens: 80% Spé: 85%	Sens: 94% Spé: 85%

+ Dobu
→Spé: 92%

Réserve contractile par écho dobu



<4 segments viables

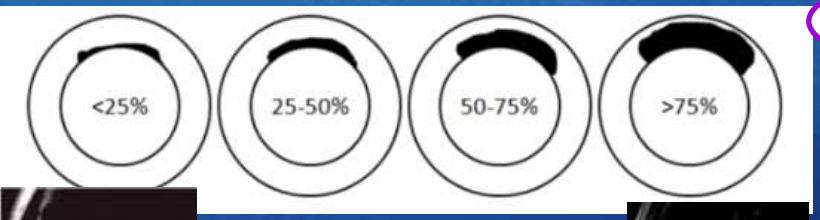
→ IRM cardiaque

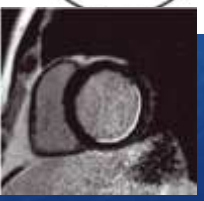
IRM et viabilité: concept de transmuralité

The NEW ENGLAND JOURNAL of MEDICINE

Kim and al. 2000

Transmuralité= inversement corrélée à la récupération contractile après revascularisation



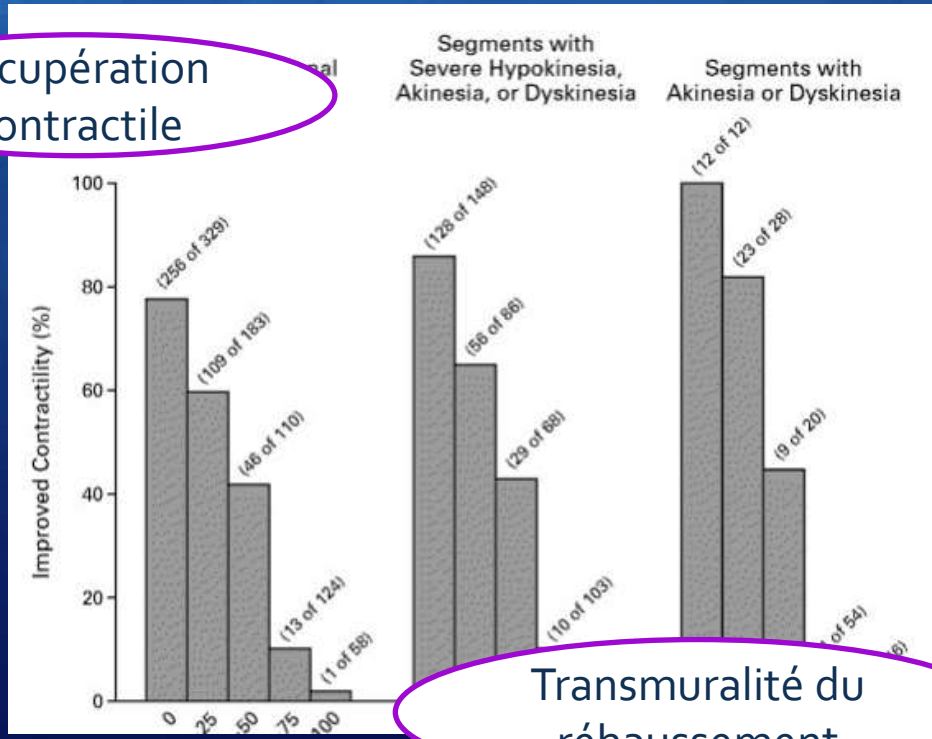


VIABLE

RC

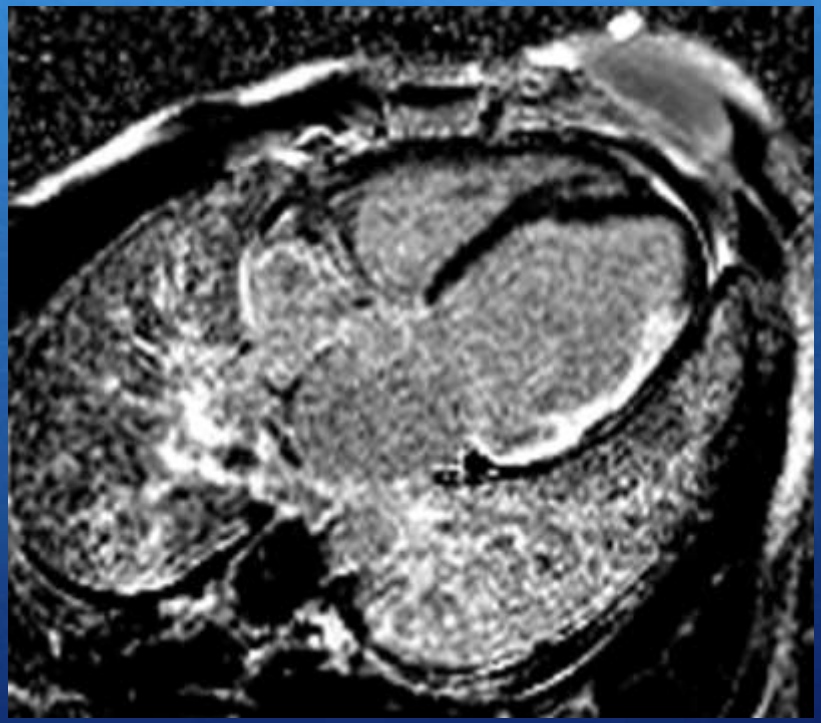
NON

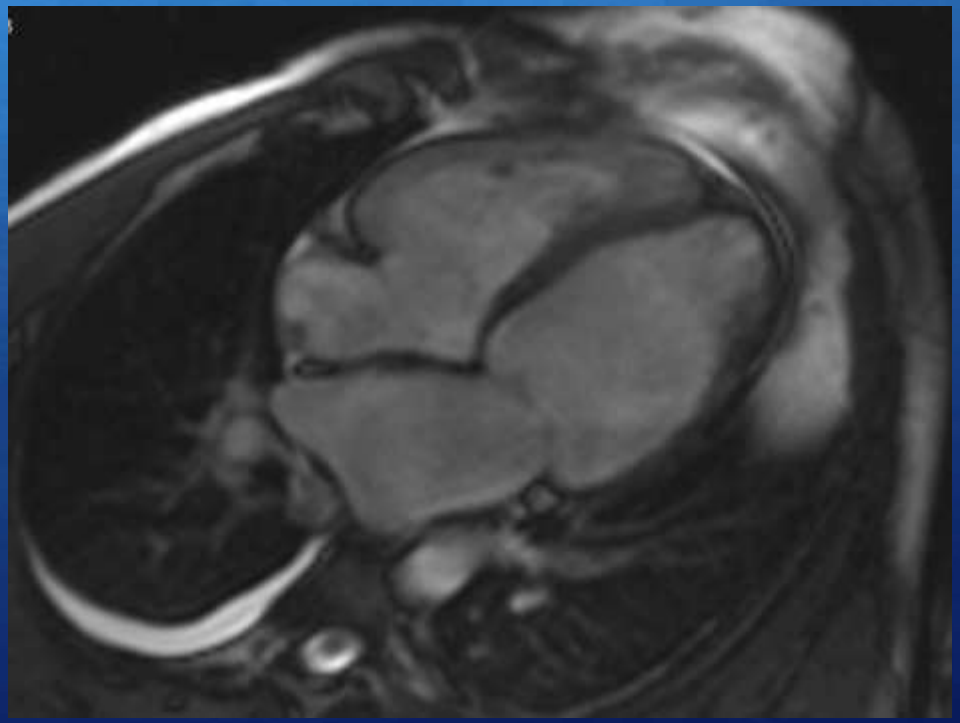
Récupération contractile



Transmuralité du réhaussement

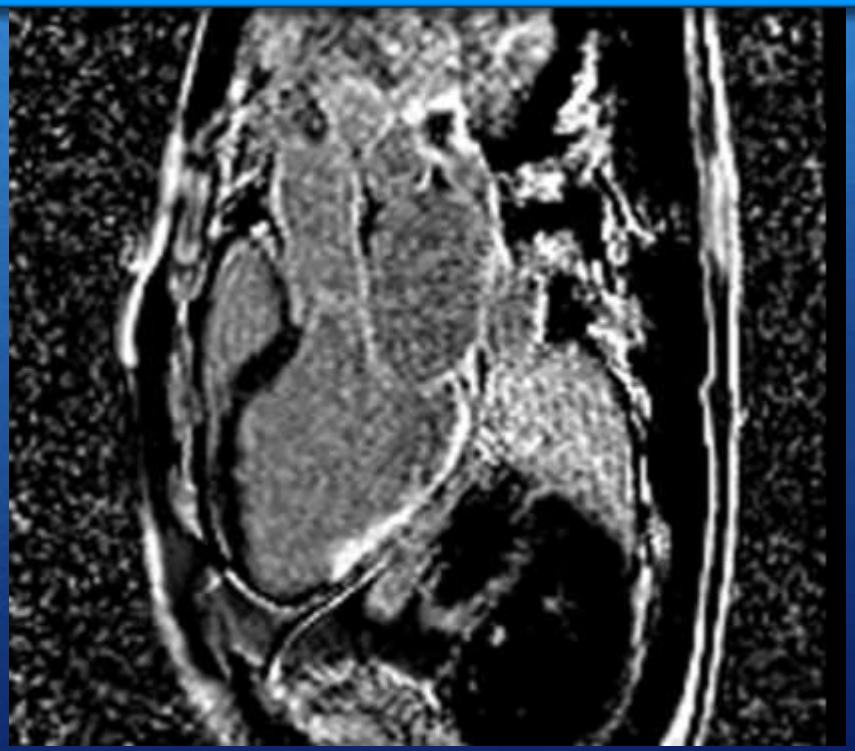
Viabilité par IRM





Viabilité par IRM

Revascularisation avec ECMO en attente

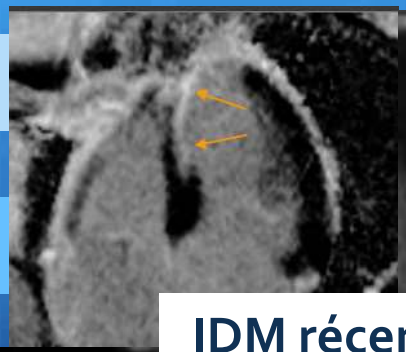


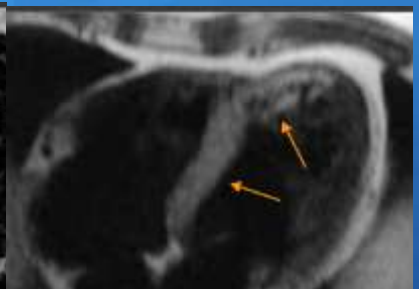
IRM cardiaque et IDM: examen complet

Non invasif, non irradiant, tous les plans, tout morphotype

Référence pour Volumes/FE

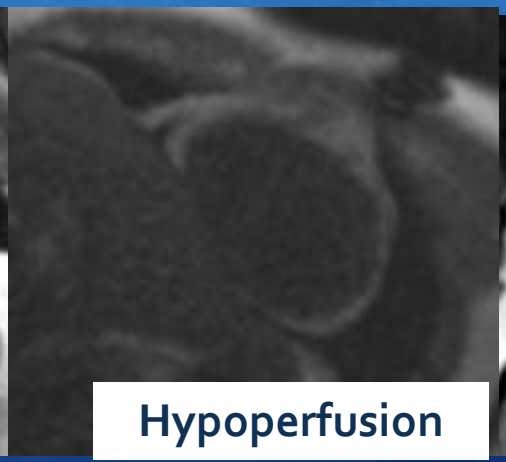
Caractérisation tissulaire:



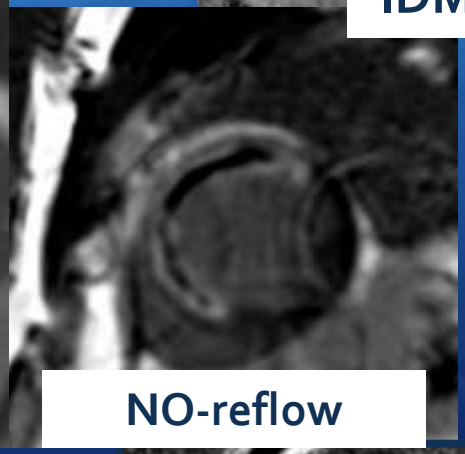


IDM récent: Zone à risque

Oedème



Hypoperfusion

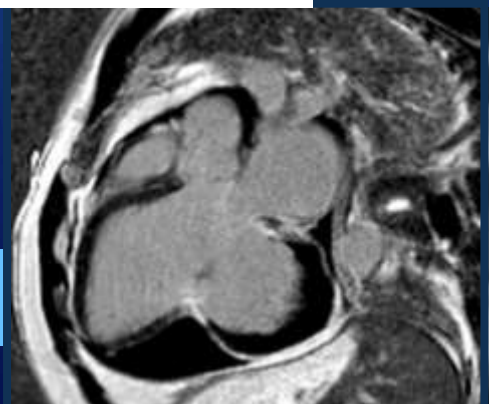


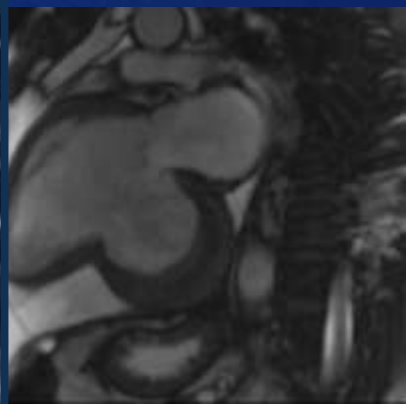
NO-reflow

Réserve contractile: dobu

Wellnhofer.Circulation, 2004

Complications post IDM





Indications de l'IRM dans les cardiomyopathies

Indications de classe I

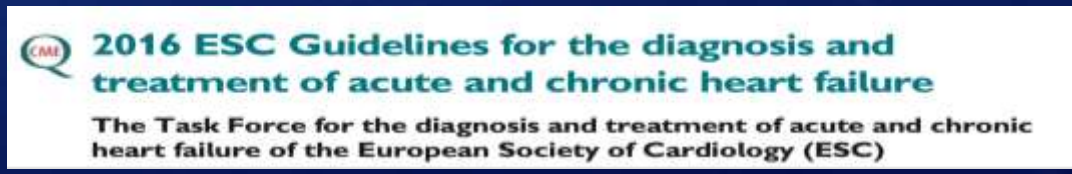
- Les cardiomyopathies dilatées
- Les cardiomyopathies hypertrophiques
- Les cardiomyopathies restrictives
- Les myocardites aiguës
- La Sarcoïdose et pathologies inflammatoires systémiques
- La dysplasie arythmogène du ventricule droit

NCVG

Amyloses, Fabry, Chagas
Hémochromatose

ROLE MAJEUR pour le Diagnostic, Etiologie, Pronostic

Atteinte cardiaque dans les maladies de système: rare MAIS tournant évolutif



ACCF/ACR/AHA/NASCI/SCMR. Expert Consensus Document on CMR.2010

D Crochet et al. Guide de bonnes pratiques et recommandations en imagerie cardiaque en coupes Archives of Cardiovascular Diseases (2009)

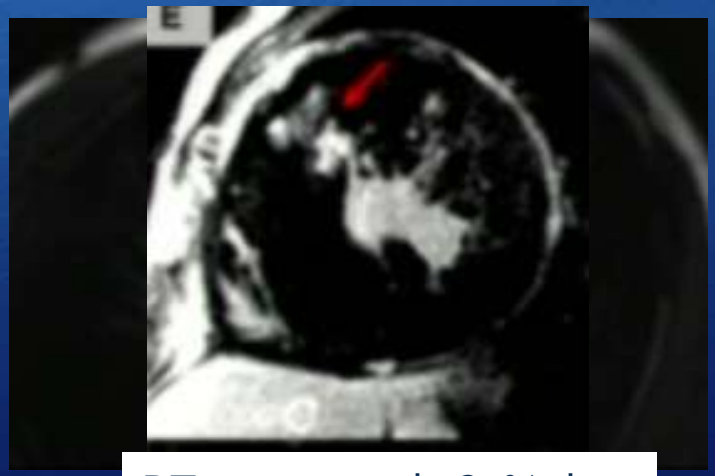
IRM et Cardiomyopathie hypertrophique

1) Diagnostic positif:

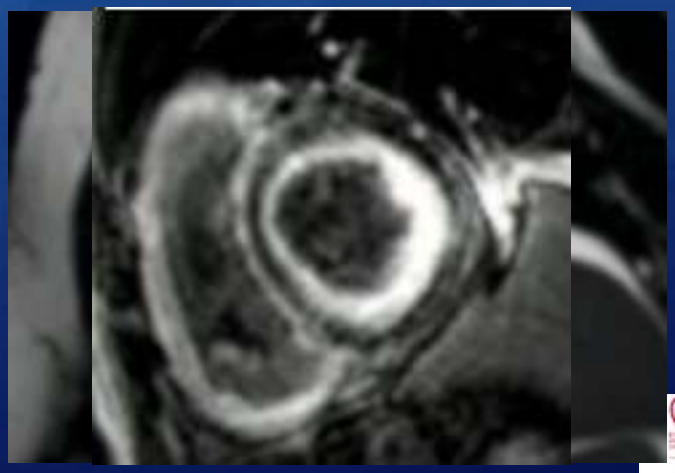
- Calcul masse VG
- Visualisation apex, A et AL,VD,
- Anévrysme apical, thrombus

In the absence of contraindications,		
CMR with LGE imaging should be considered in patients with suspected apical hypertrophy or aneurysm.	IIa	C
extent of myocardial fibrosis.		

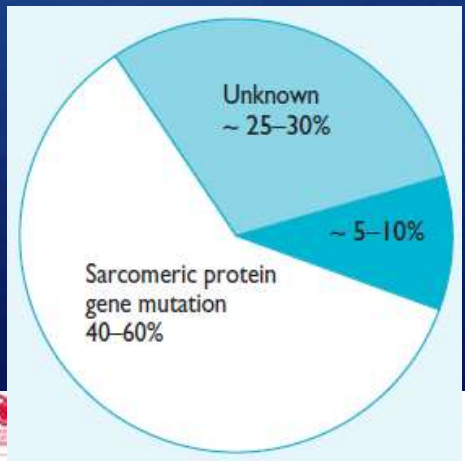
2) Diagnostic différentiel= RT



RT en motte ds 60% des CMH sarcomériques



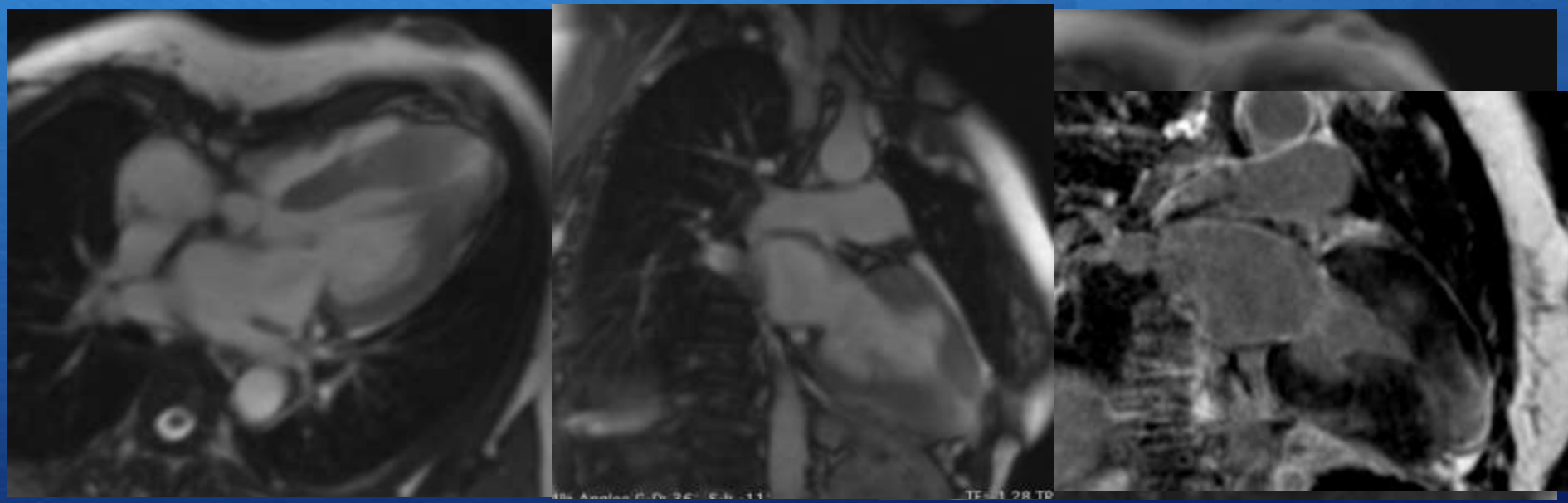
RT type amylose



2014 ESC Guidelines on diagnosis and management of hypertrophic cardiomyopathy

IRM et CMH

Mdm Mki. 62 ans, Dyspnée, TVNS, CMH bi-ventriculaire apicale….



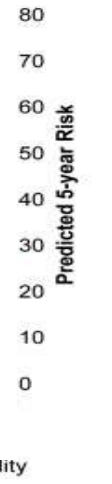
→CMH médio-ventriculaire avec ischémie et anevrysme apical

European Heart Journal - Cardiovascular Imaging Advance Access published February 3, 2015

European Heart Journal – Cardiovascular Imaging
doi:10.1093/ehjci/jeu291

CONSENSUS PAPER

Role of multimodality cardiac imaging in the management of patients with hypertrophic cardiomyopathy: an expert consensus of the Europ ing



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Ismail TF and al. H

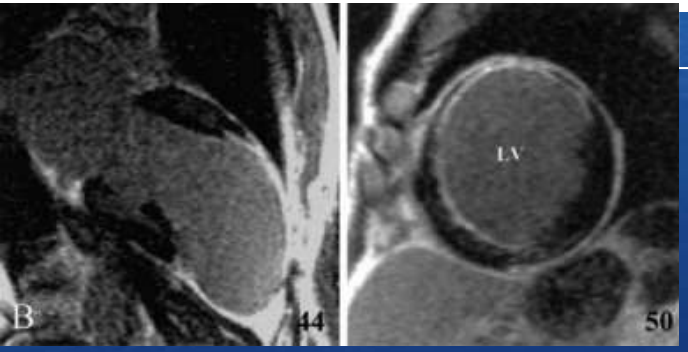
ICM

Table 5 **EACVI expert consensus key points on MMI in HCM**

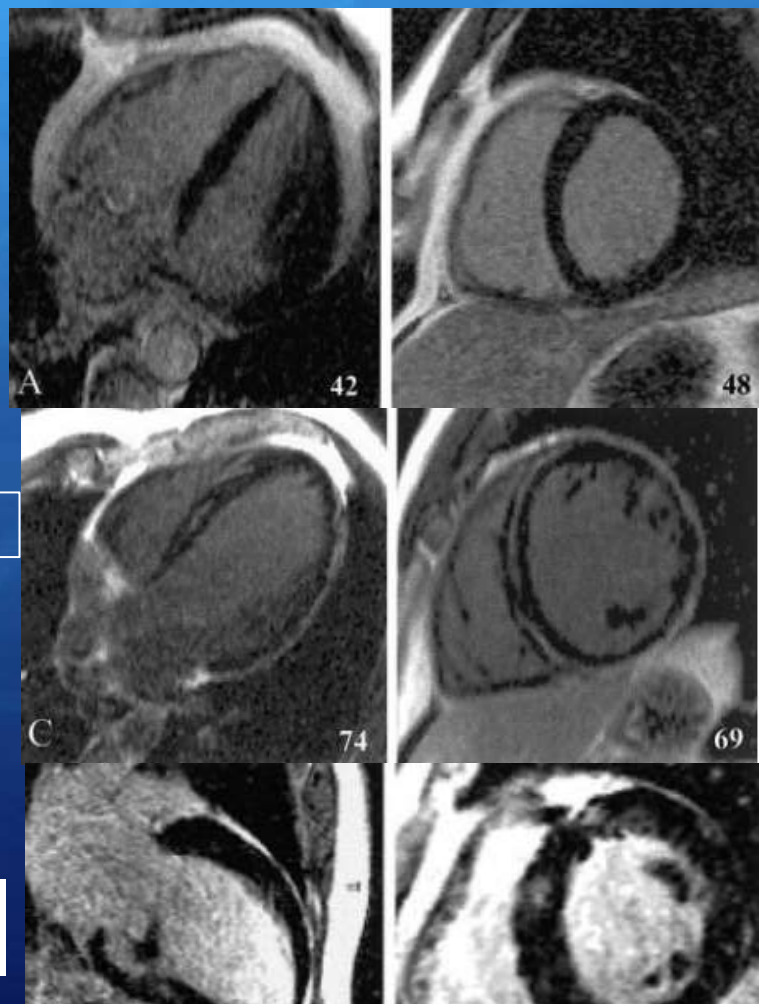
1. Imaging tests play an essential role in HCM, and a MMI approach is encouraged in the assessment of this disease.
2. Experts in different imaging techniques must collaborate and the different imaging methods must be seen as complementary rather than competitive. Each test must be selected in an integrated and rational way, providing answers to specific clinical questions and problems, trying to avoid redundant and duplicated information, always taking into account its availability, benefits, risks, and cost.
3. Echocardiography is recommended in all HCM patients and should be performed every 1–2 years in clinically stable patients.
4. CMR should be considered in all HCM patients. It should be performed at least once (at the initial evaluation) if local resources and expertise permit, and may be repeated according to potential changes in the clinical status, in order to answer to specific clinical questions and problems.

IRM cardiaque et CMD: RT et étiologie

- N= 90, 63: CMD /coro normale:
- 40% RT
- dont 1/3 de type sous-endocardique



McCrohon and al.Circ. 2003



N=1488 RT=38% **Gulati JAMA 2013**

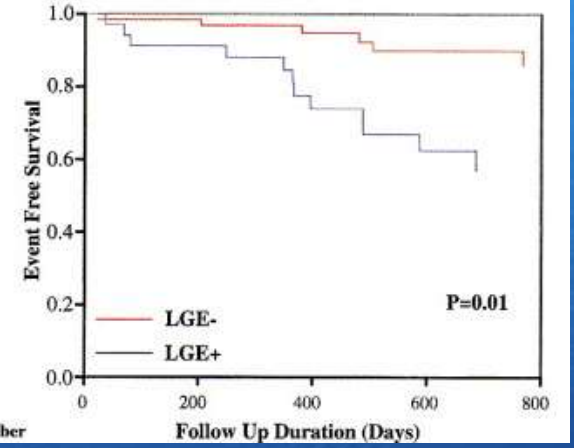
Si CMD <35% sans RT: pas de coronaropathie

Assomul RG and al. Circulation 2011

CMD: RT et pronostic

N= 101 CMD suivi 2 ans

Fibrose 35%: MACE ↗

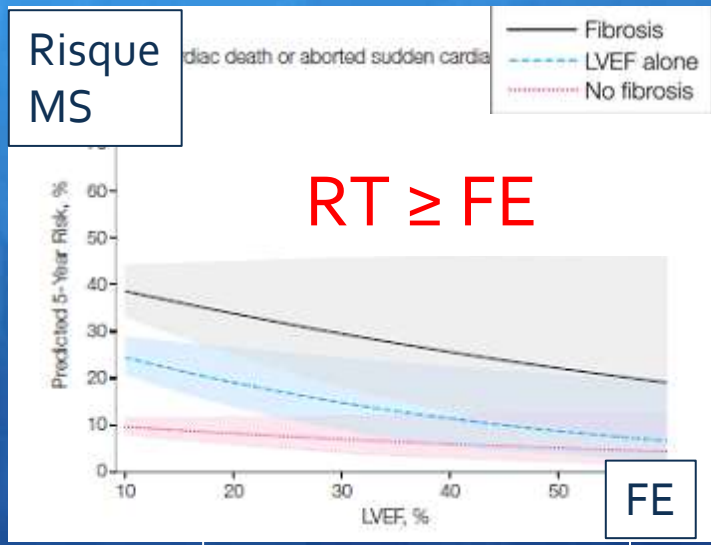


Décès, RR: 3,4

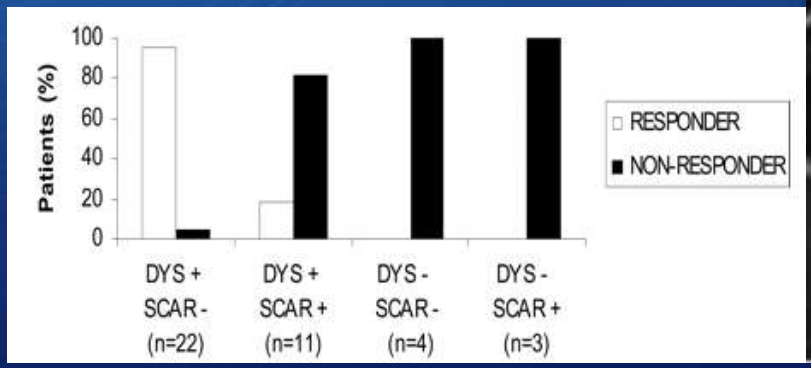
MS et TV, RR:5,4

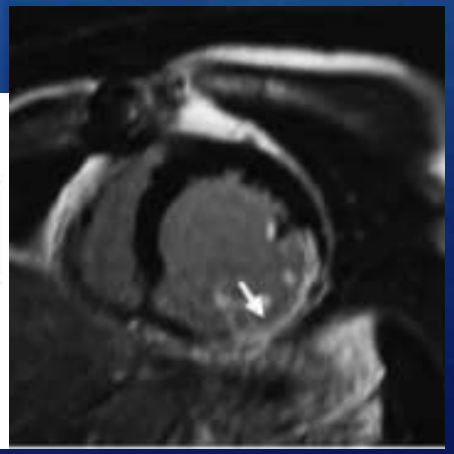
Assomul and al. JACC 2006

Risque MS



Gulati A JAMA 2013



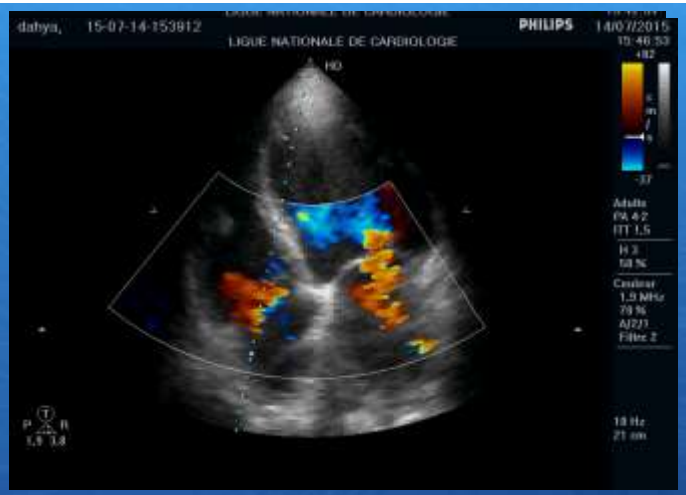


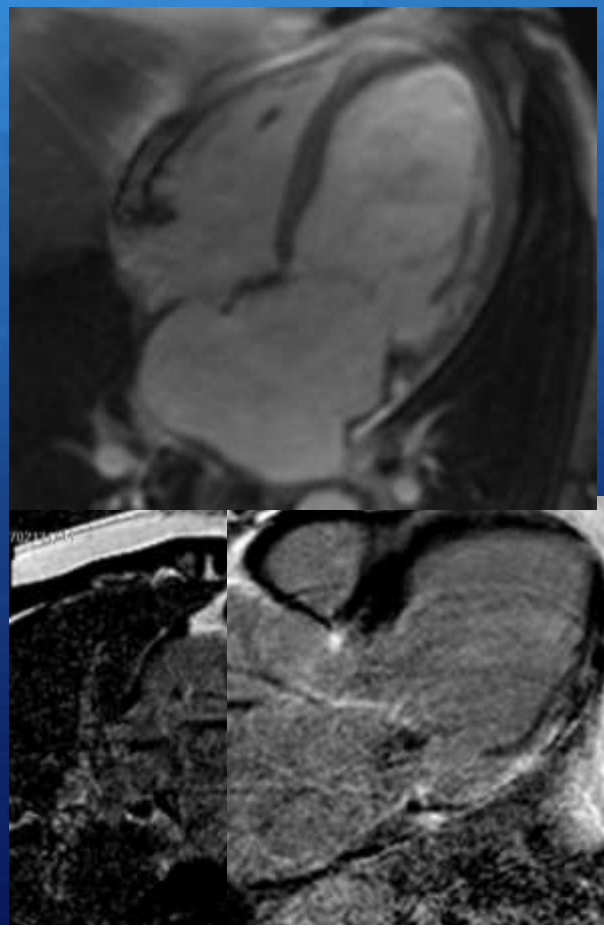
Bleeker GB and al. Circulation 2006

DAI

IRM et CMD:

M. Dah. 6o ans, ICG, CMD “idiopahique”,
IM fonctionelle importante, TV++

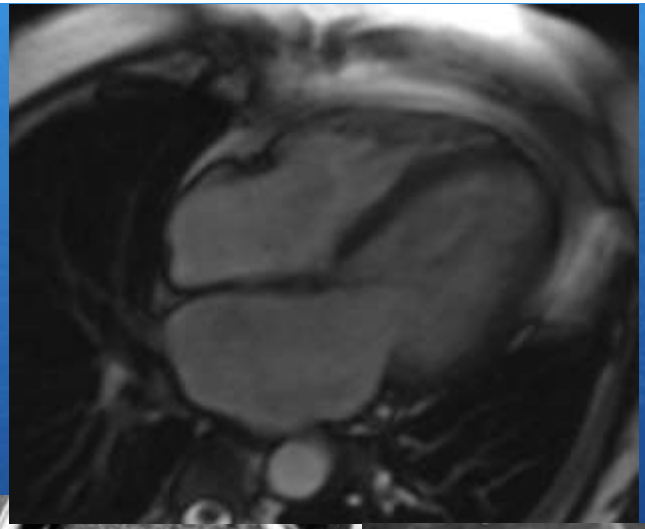


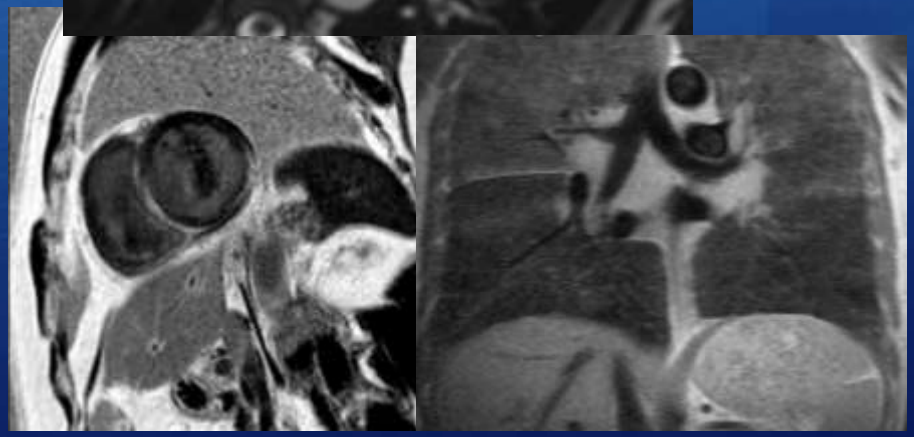


IM ischémique, coro refaite
→PAC+ plastie mitrale+ DAI+CRT

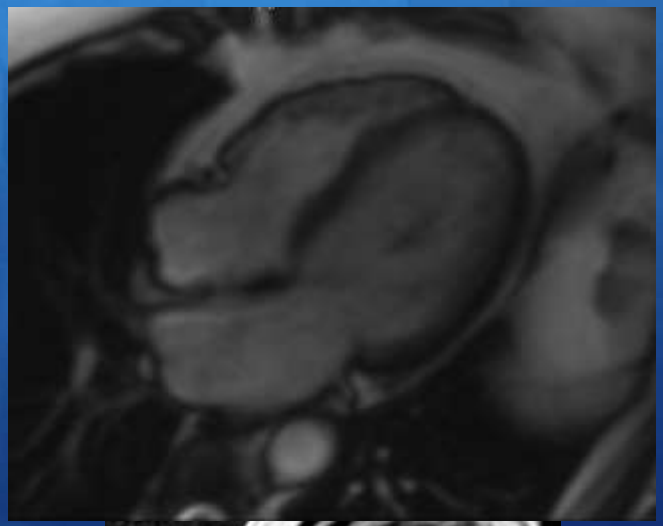
IRM et CMD

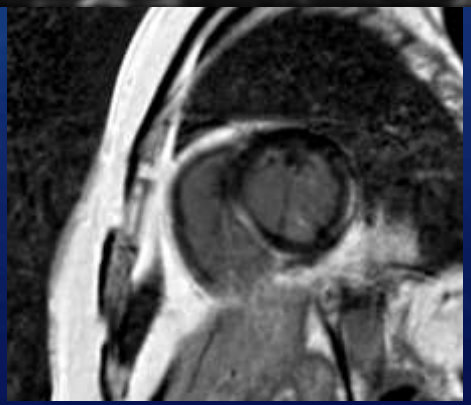
Mr Chen. 48 ans, Lithiase rénale,
ICG, FE= 38% sur CMD "virale"??????,



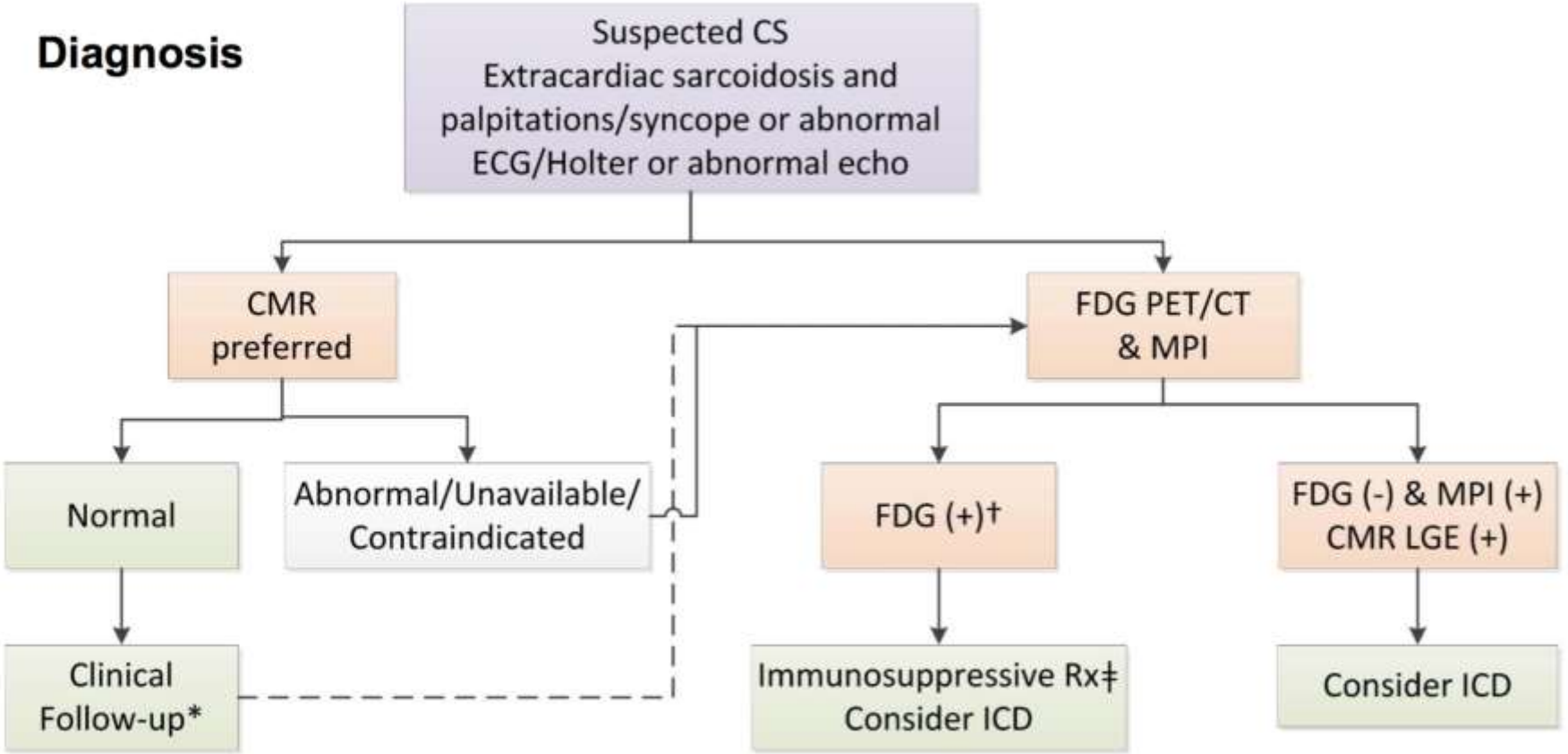


Après MTX





A Joint Procedural Position Statement on Imaging in Cardiac Sarcoidosis Endorsed by EACVI, EANM, ASNC



Slart R et al, EHJ Cardiovasc Imaging (in press)

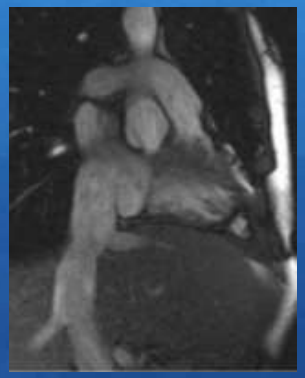
treatment of acute and chronic heart failure

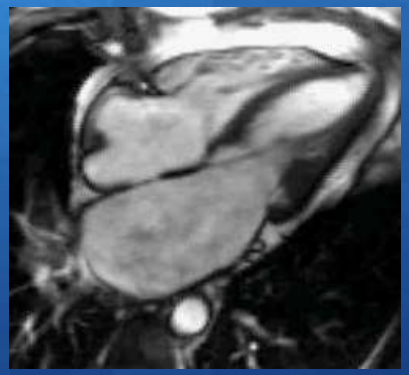
The Task Force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC)

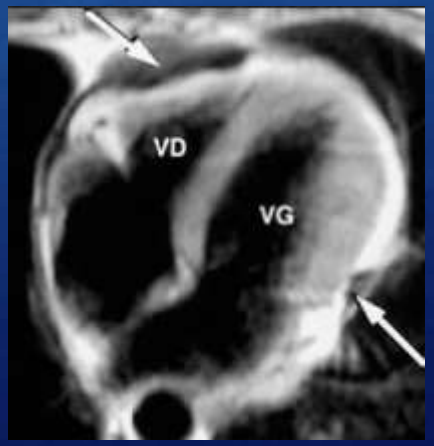
IRM et Cardiomyopathies Restrictives

Dysfonction diastolique avec gêne au remplissage ventriculaire

- Dilatation biatriale +/- VCI,
- ventricules normaux
- Profil mitral restrictif





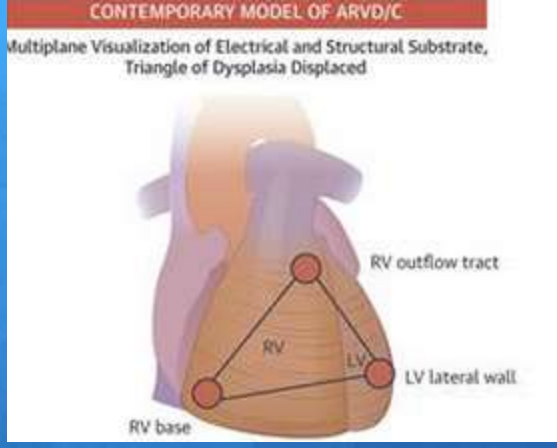


- **Diagnostic étiologique**
- **Diagnostic différentiel avec PCC**

Bogaert J. CC RMI 2005

DVDA

- Desmosomes
- Transformation fibreuse ou adipeuse VD
- TDR, MS jeune+++



Riele A S.J.M et al. JACC img 2015

IRM:

Gold standard volumes/FE, caractérisation tissulaire

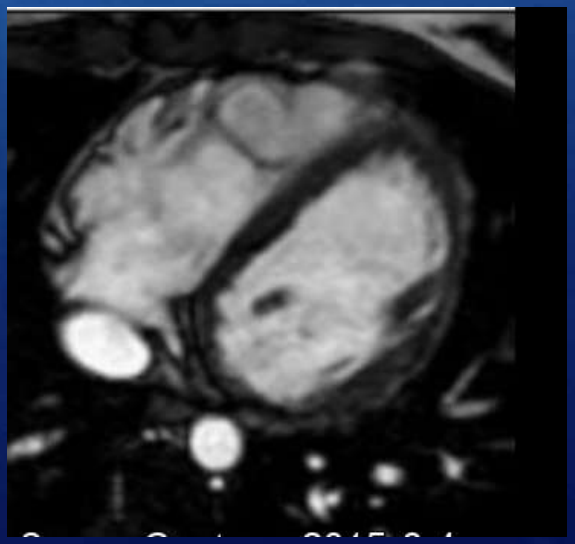
By MRI:

1) Troubles de la cinétique segmentaire:

Akinésie+++ (ou dyskinésie, anévrysme)

2) Et : FE **≤ 40%** ou **VTD VD ≥ 110** ml/m²

Marcus F. Circulation 2010



Basso et al Circulation 1996

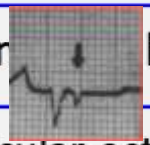
Augmentation de la spécificité

European Heart Journal (2010) 31, 806–814
doi:10.1093/eurheartj/ehq025

SPECIAL REPORT

Diagnosis of arrhythmogenic right ventricular cardiomyopathy/dysplasia

Proposed Modification of the Task Force Criteria

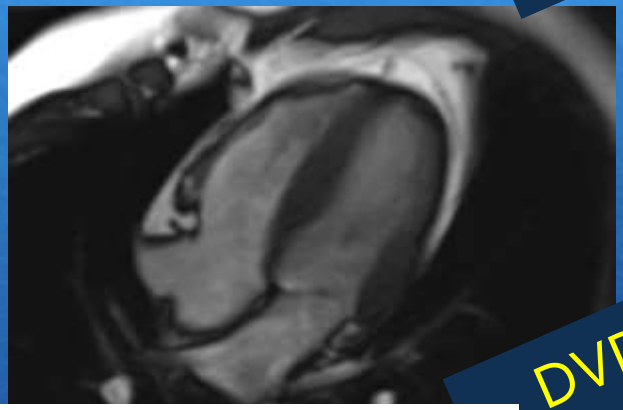
Morphology Criteria	TTE, MRI, RV angiography
Repolarisation Criteria	T wave inversion in precordials leads
Depolarization criteria	Epsilon  late conduction delay in V1-2, late potential (1/3)
Ventricular arrhythmias	Ventricular ectopies/ tachycardia with LBBB morphology
Anatomopathology	Myocyte degeneration, fibrosis infiltrates
Familial history	Of ARVC, early SCD, molecular genetic

1 critère majeur = 2 points, 1 mineur= 1 point
Diagnostic retenu: 4 points, probable: 3 points, possible: 2 points

DVDA ?

42 ans, syncopes, **T- de V4-V6,**
4000 ESV/24h,
PT +, EE: TVNS, SVP: -

3 points

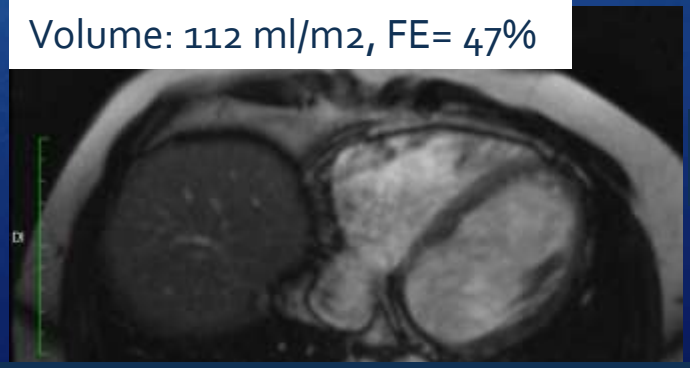


VTD: 95ml/m2, FE= 50%

DVDA probable

UN AN plus tard

Volume: 112 ml/m2, FE= 47%

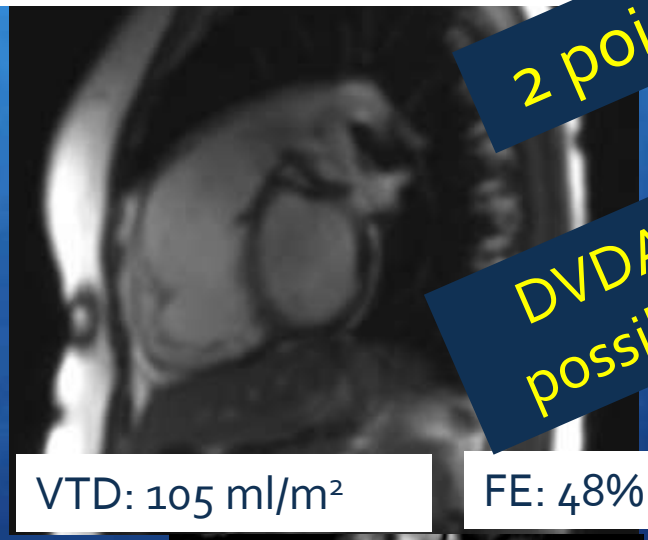


+1 point

→ 4 points: diagnostic DVDA retenu

26ans, palpitations,
T- de V1-V3 en l'absence de BBD

2 points



DVDA possible

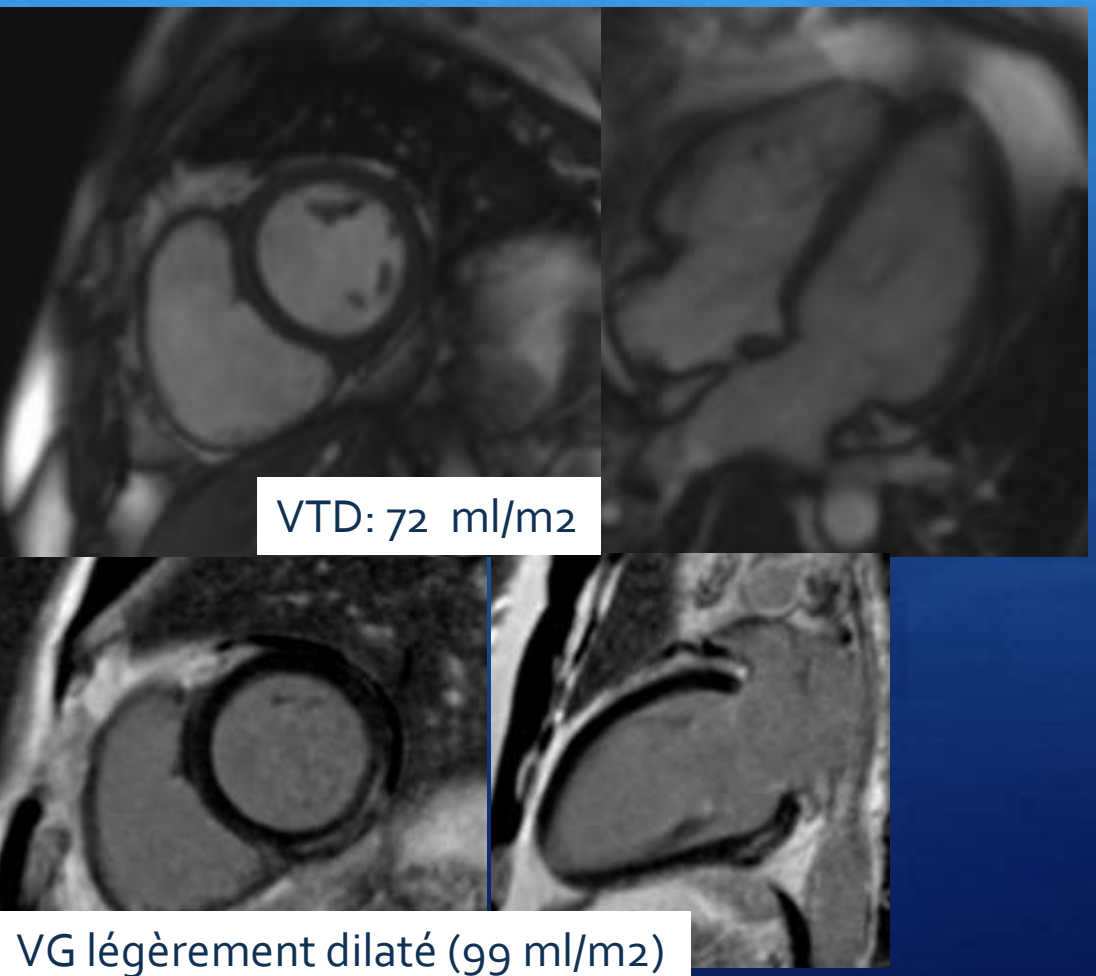
VTD: 105 ml/m²

FE: 48%

CIA sinus veinosus + RVPA

DVDA ?

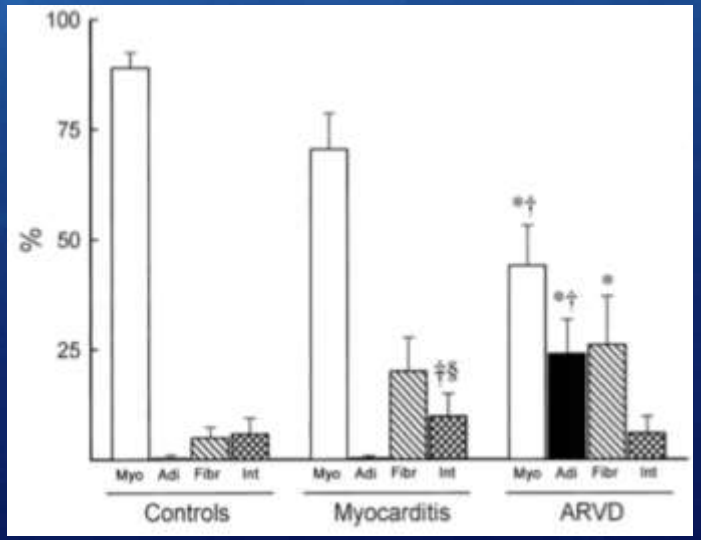
Mr Ab. 51 ans, ESV et **TVNS**
VD légèrement dilaté à l'ETT



VTD: 72 ml/m2

VG légèrement dilaté (99 ml/m2)
avec séquelles de myocardite

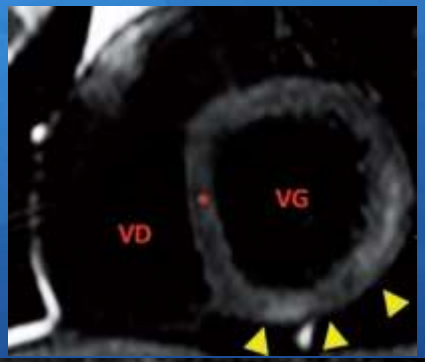
N: 30, suspicion DVDA
BBGC, TV
Imagerie et angiographie: ?
Histologie fait la différence:
30% DVDA, 70% myocardite!



Chimenti et al JACC 2004

IRM et Myocardite=examen clé

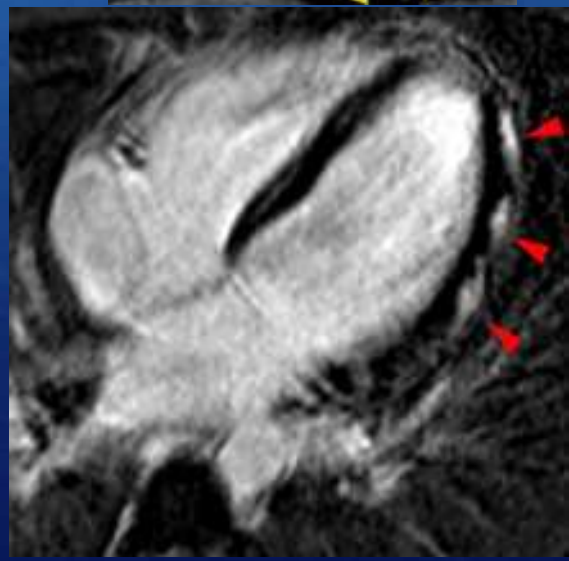
Inflammation du muscle cardiaque le plus souvent par atteinte virale (infiltrat lymphocytaire +/- nécrose)



IRM:

- Hypersignal en T2 (Œdème)
- Réhaussement précoce: 5 min
- RT: Sous épicardique souvent latéro-VG

} Critères du Lac Louise



→Approche étiologique

→ Facteur pc

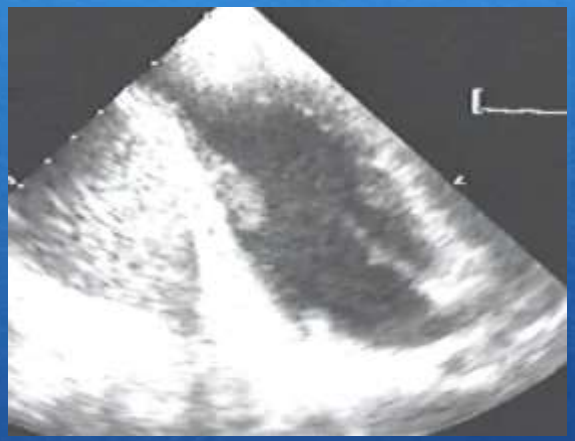
→Oriente biopsie

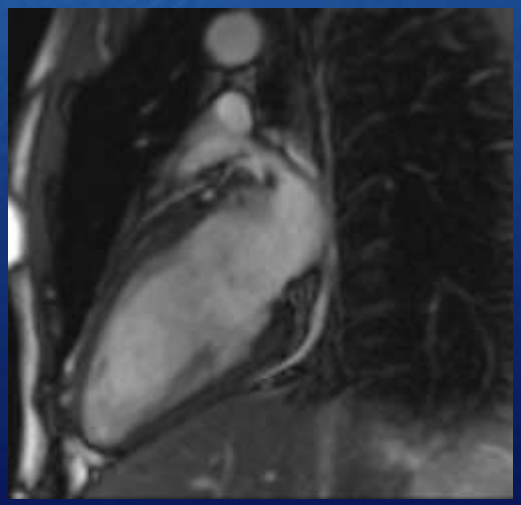
→Diagnostic différentiel

Feldman A.and al.. NEJM. 2000
Childs et al, Prog Cardiovasc Disease, 2011

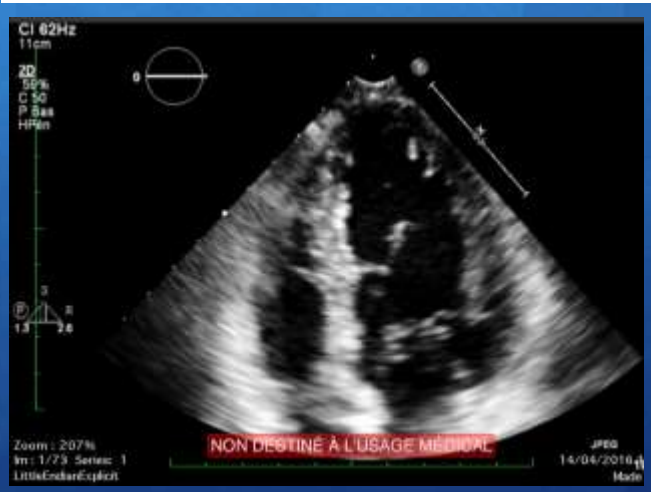
IRM et SCA coro normale

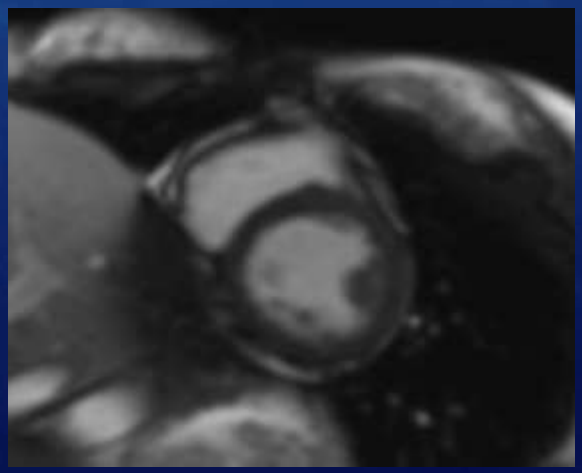
Mr Adi, 40 ans , tabagique,
DT1 depuis 15 ans,J30 SCA ST-





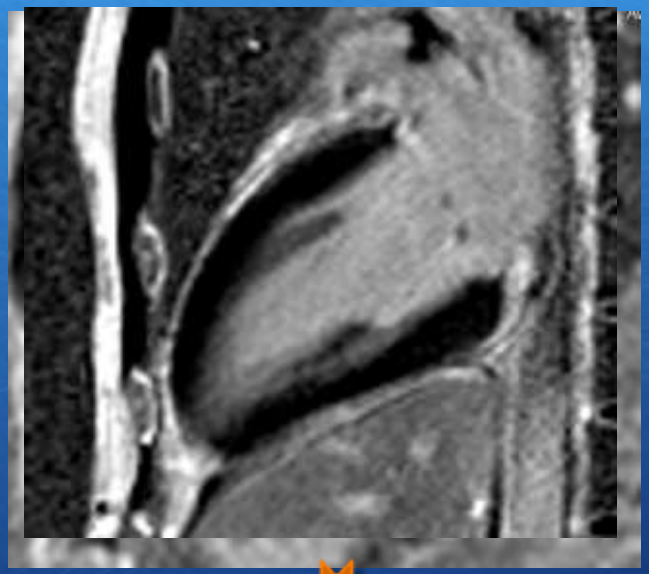
Mdm Asr 32 ans, tachycardie
Discret sous-décalage en V4-5





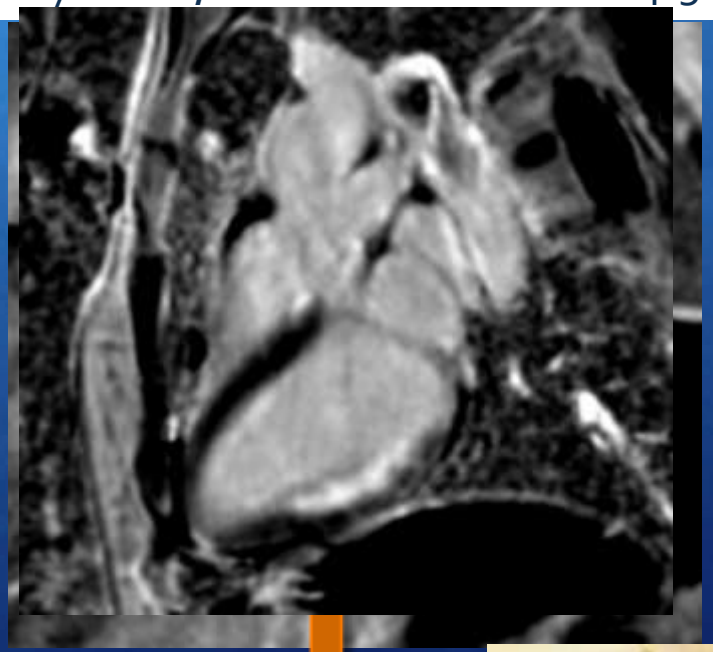
SCA coro normale

Mr Adi. 40 ans , tabagique, DT1 depuis 15 ans, SCA ST-



Myocardite localisée

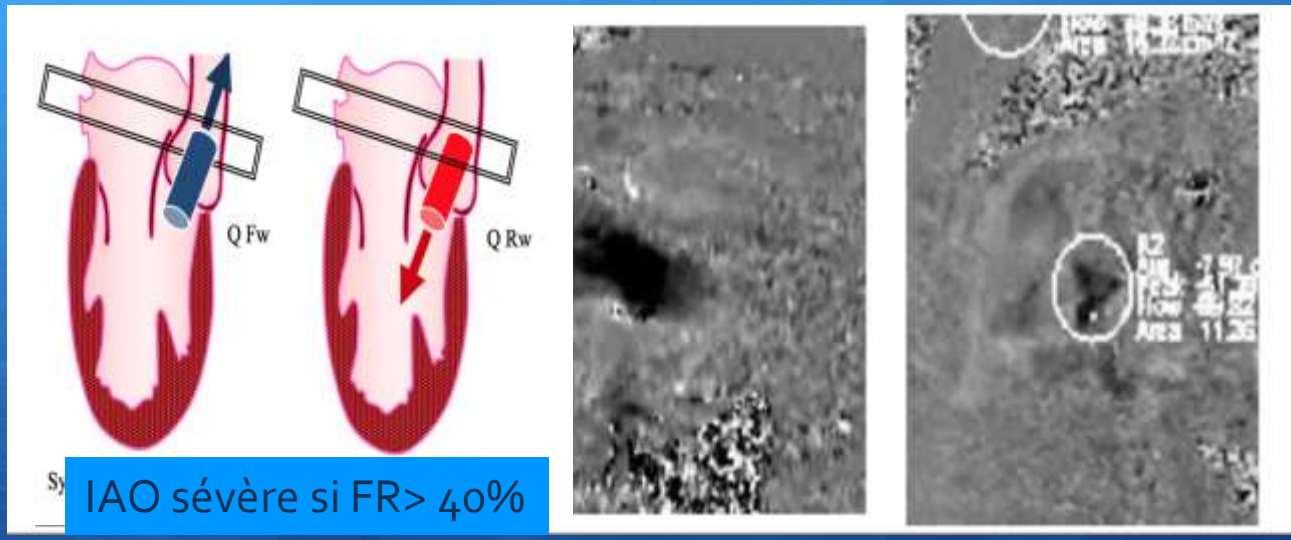
Mdm Asr. 32 ans, 1 fausse couche
Tachycardie, Discret sous-déc en V4-5



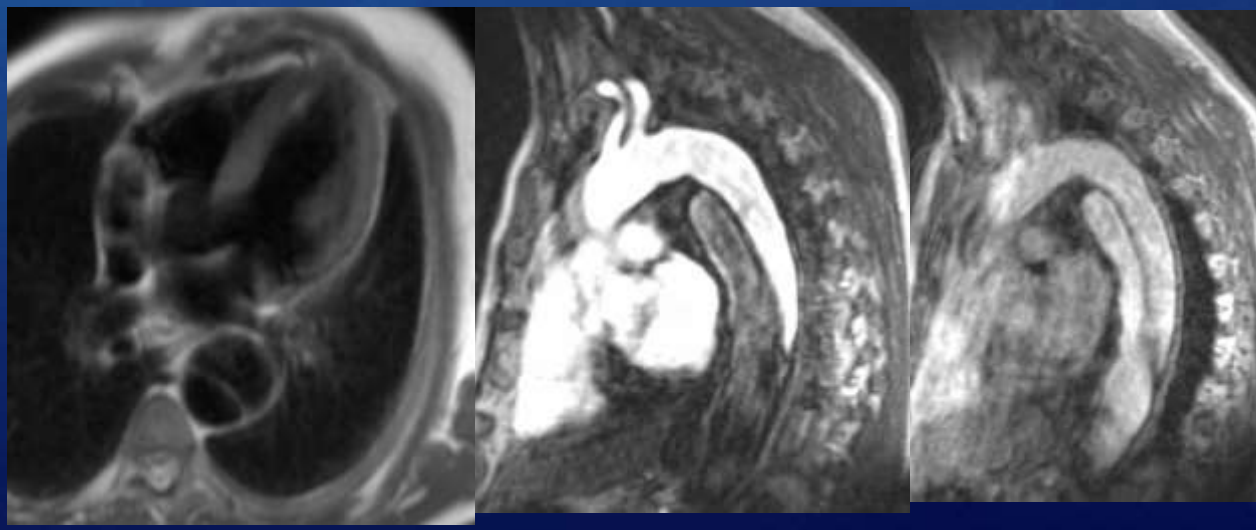
Infarctus latéral!!
Recherche étiologique:
→ Déficit protéine S sur maladie caeliaque
→ Traitement: régime sans gluten!!!

Indications moins fréquentes: en images

Fuites valvaires en particulier aortique Classe I (B): Suboptimal echo images (AHA 2014)



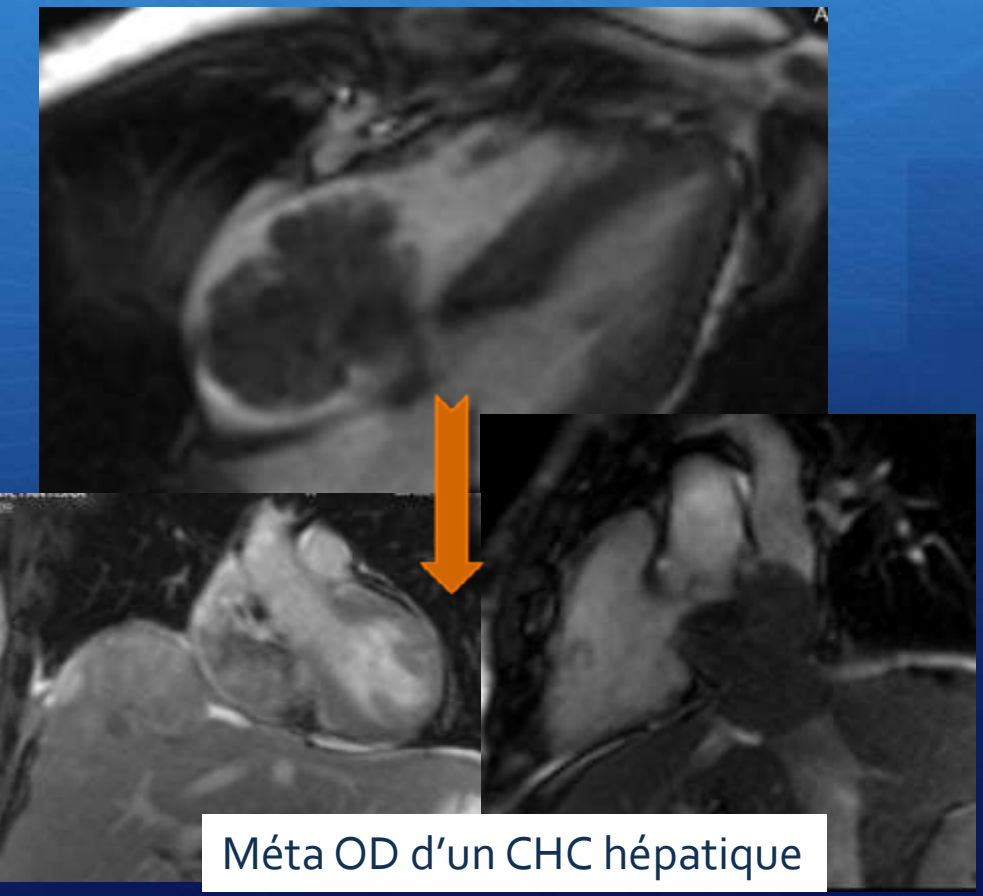
Pathologies chroniques de l'aorte



Indications moins fréquentes: en images

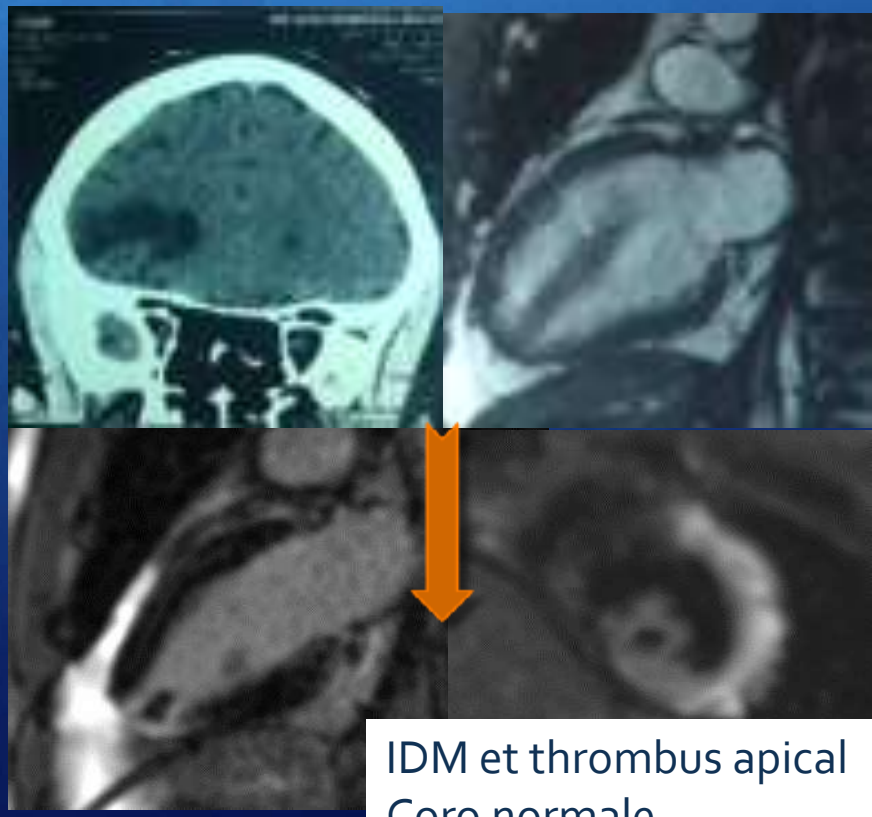
- **Cardiopathies congénitales**
- **Masse cardiaque intracavitaire**

44ans, hépatite B,adressé pour myxome OD



Méta OD d'un CHC hépatique

32ans, adressé pour tm VG→AVC



IDM et thrombus apical
Coro normale
Bilan thrombophilie +

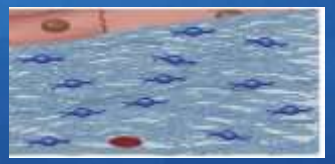
Soufiani A. et al.EuroCMR 2

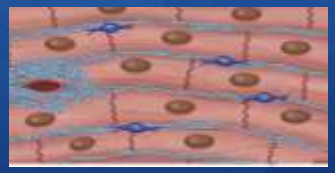
CONCLUSION

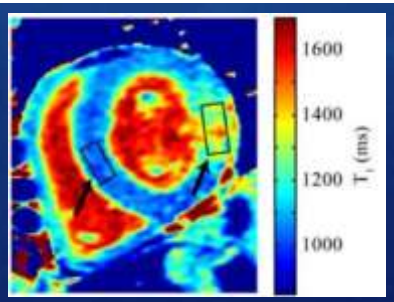
- Indications nombreuses, croissantes, endossées!!
- mais peser le bénéfice/coût
  - **Caractérisation tissulaire+++**

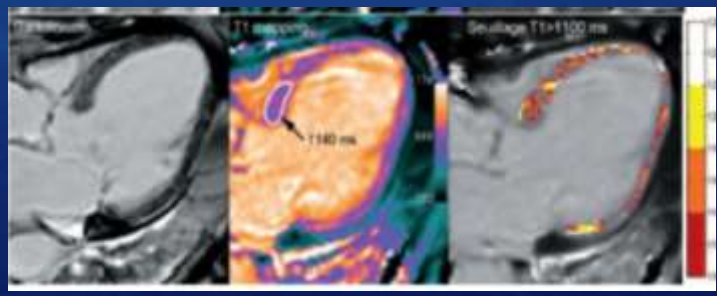
1) RT=Fibrose macroscopique de remplacement

1) T1 mapping= fibrose réactionnelle diffuse: Cardiomyopathies, IDM









700 patient. diverses cardiopathies,

- Impact sur la PEC: DAI?CRT?
- Futur présent!

Wong TC. Circ 2012

Merci pour votre attention