

TOSHIBA

Leading Innovation >>>

SCANNER CARDIAQUE DU FUTUR AU DELA DE LA LUMIERE



PALAIS
DES CONGRES
1 Avenue Edouard VII
BIARRITZ
10/11/12
JUN 2015

APPAC
ACTUALISATIONS
ET PERSPECTIVES
EN PATHOLOGIE
CARDIOVASCULAIRE

Les Progrès attendus....

FONCTIONNEL

CALCIUM / STENT

PRISE EN CHARGE

LE SCANNER VOLUMIQUE DYNAMIQUE



ONE
Aquilion

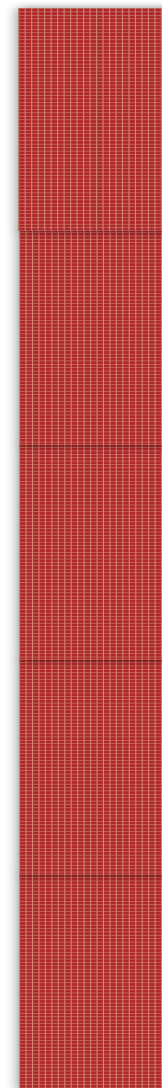
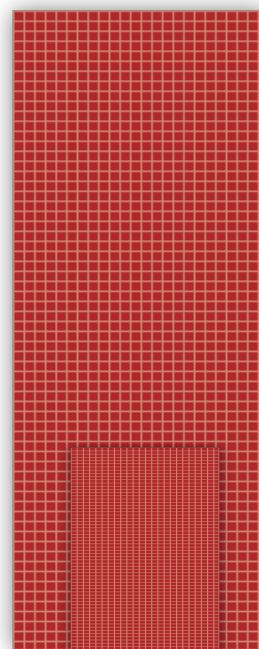
ONE
Aquilion
VISION EDITION

64 Rows

57,344 Elements

320 Rows

291,842 Elements

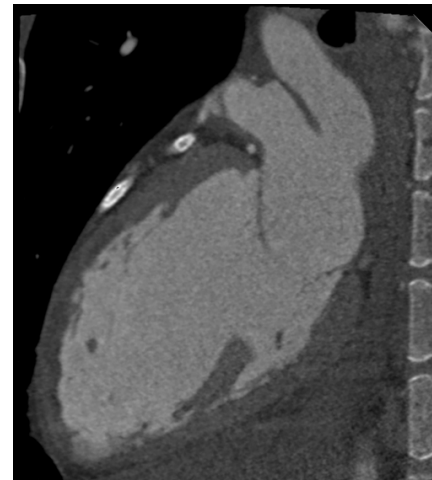
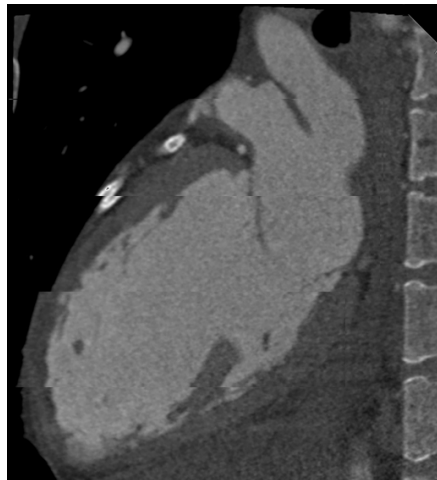
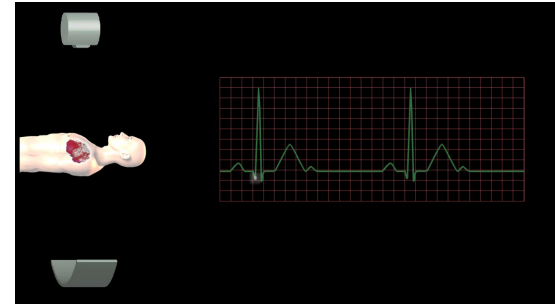


0.5mm x 320

16.0 cm!

Le scanner Volumique Isophasique

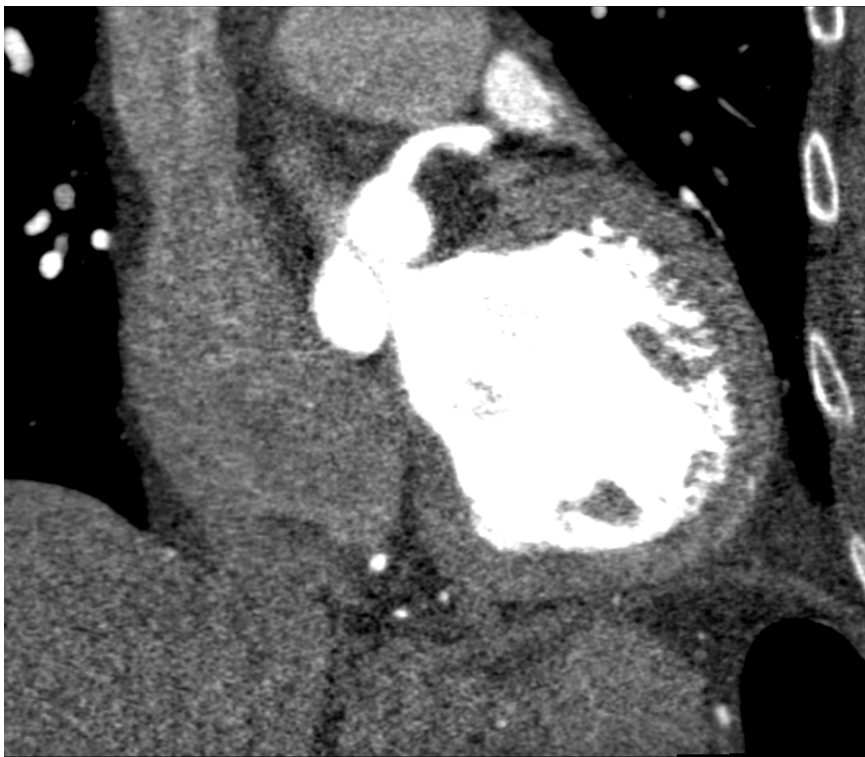
ONE
Aquilion



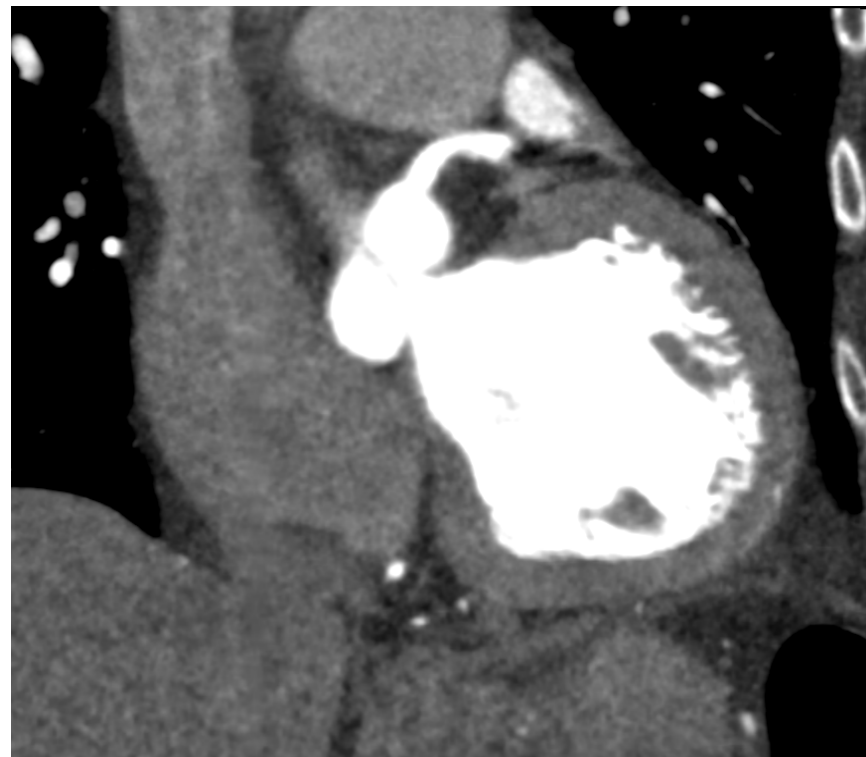
- » Résolution temporelle Volumique divisée par 5
- » Respiration libre sans artéfacts si nécessaire

Adaptive Iterative Dose Reduction

100KV DLP: 69,5 mGy.cm **0.97 mSv**
Réduction du bruit de 75%



Without AIDR 3D

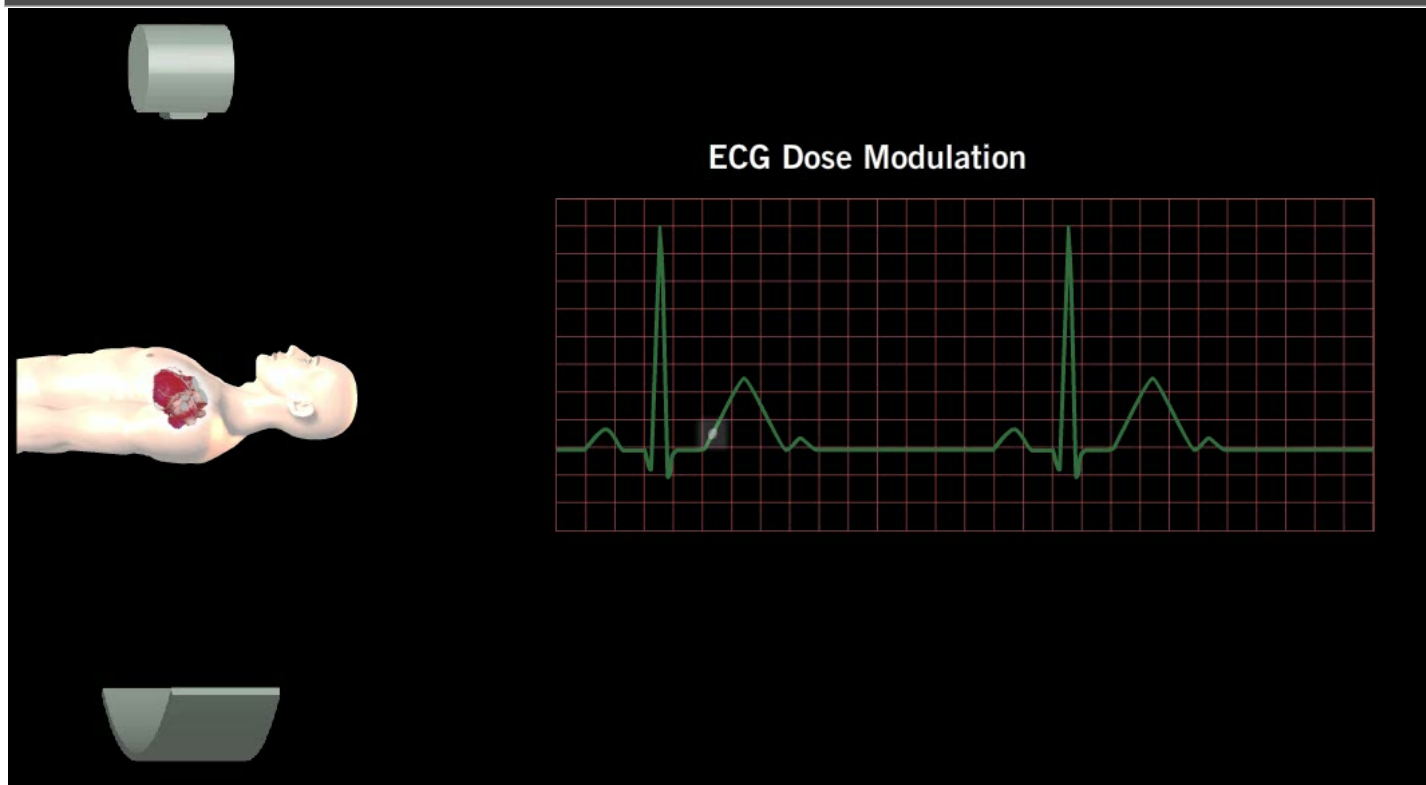


With AIDR 3D

Courtesy Monash Medical Center, Melbourne, Australia

Le scanner Volumique dynamique

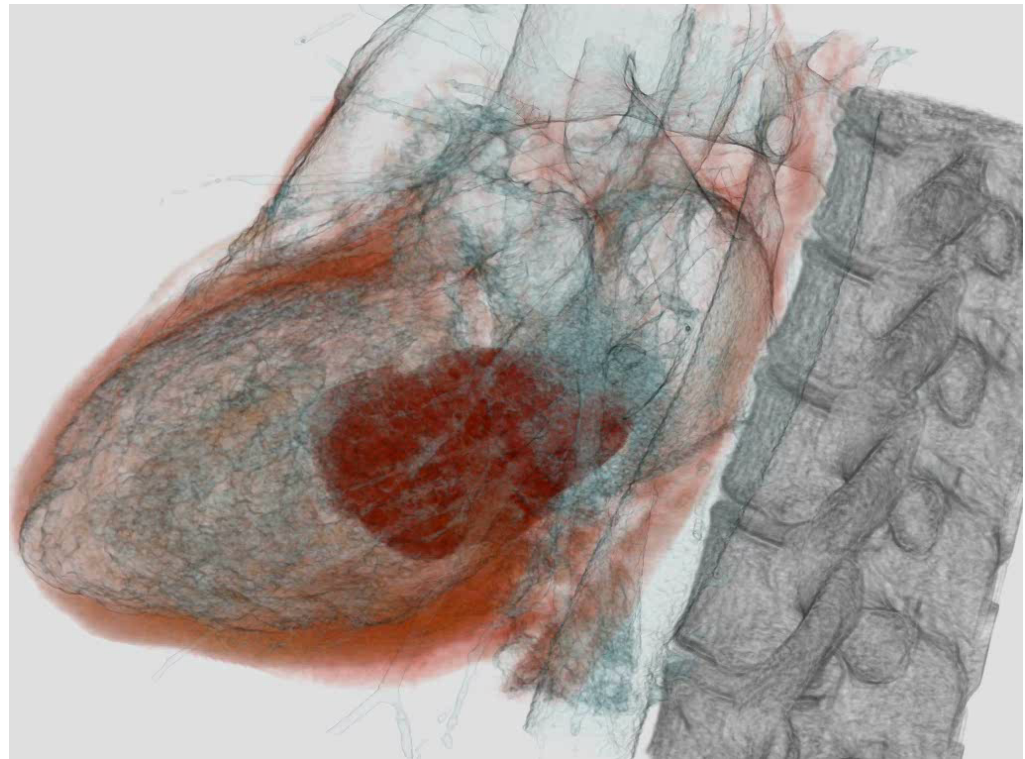
Coronaires, dynamique des parois, fraction d'éjection et fonction cardiaque sur un seul battement en prospectif.



Le scanner Volumique dynamique

One Beat CTA/CFA

Atrial Myxoma, 1,8 mSv



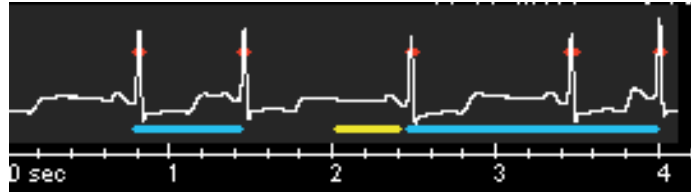
Le scanner Volumique dynamique

Détection des arythmies en temps réel

Automated for unstable or higher heart rates
ensuring diagnostic image quality.

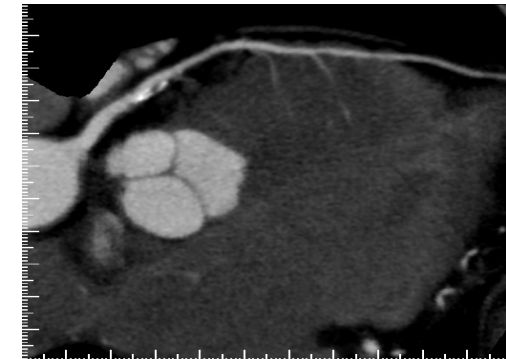
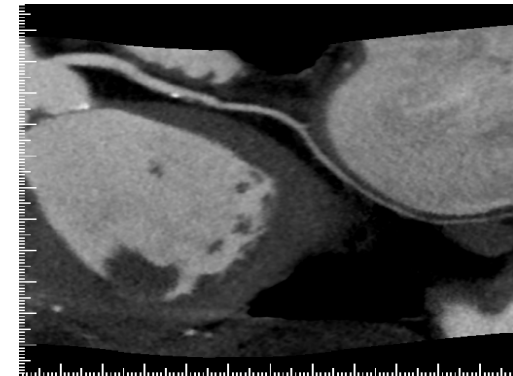
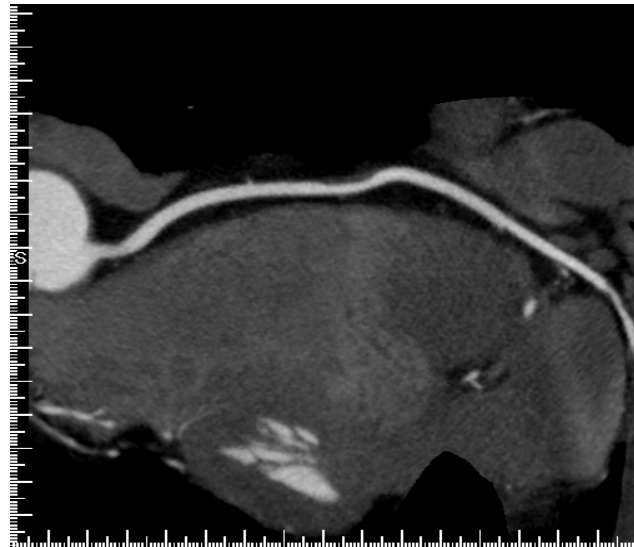
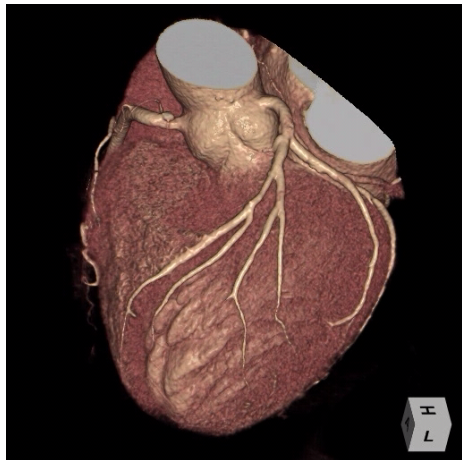


Le scanner Volumique dynamique



Arhythmia 59 – 111 bpm

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ISOPHASIQUE

Densité du contraste homogène chaque niveau est acquis au meme moment : TAG320



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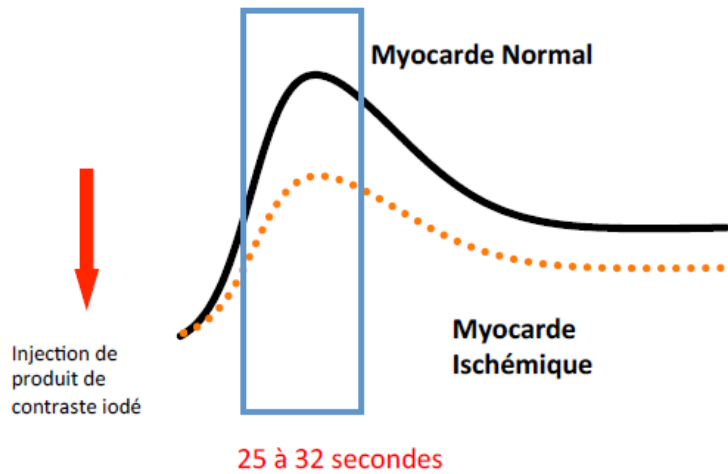
Myocardial Perfusion



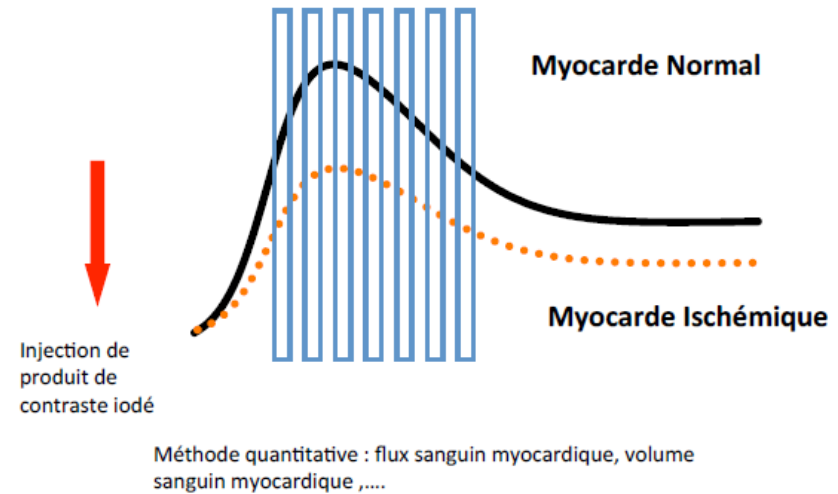
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Correction des artéfacts

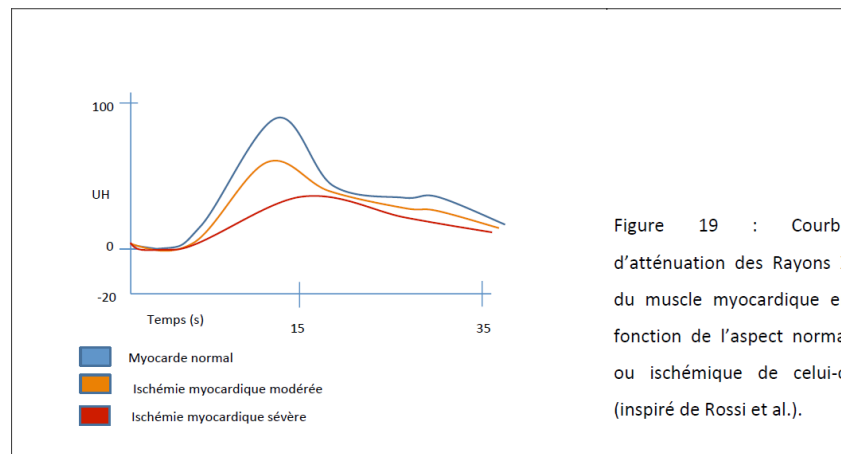
Imagerie classique au pic d'atténuation attendu



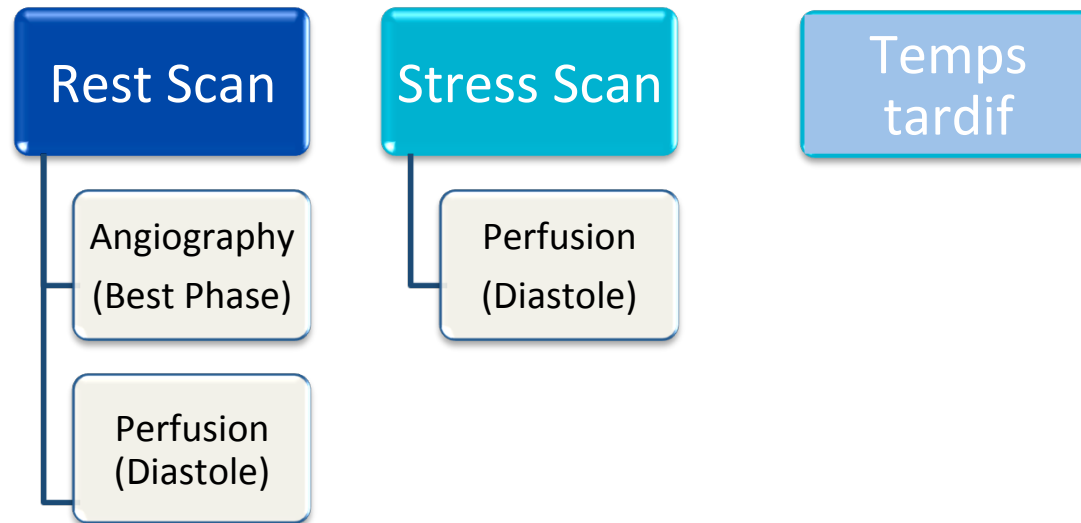
Imagerie de perfusion dynamique: échantillonnage du volume à différents instants post injection



6



Le scanner Volumique Dynamique



SCANNER D'EFFORT?

Le scanner Volumique Dynamique

- 71 year old male
- Atypical angina

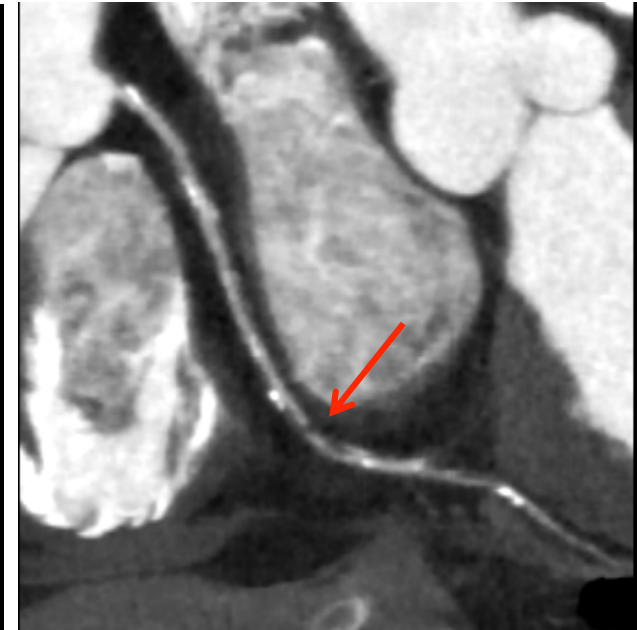
LAD



LCx

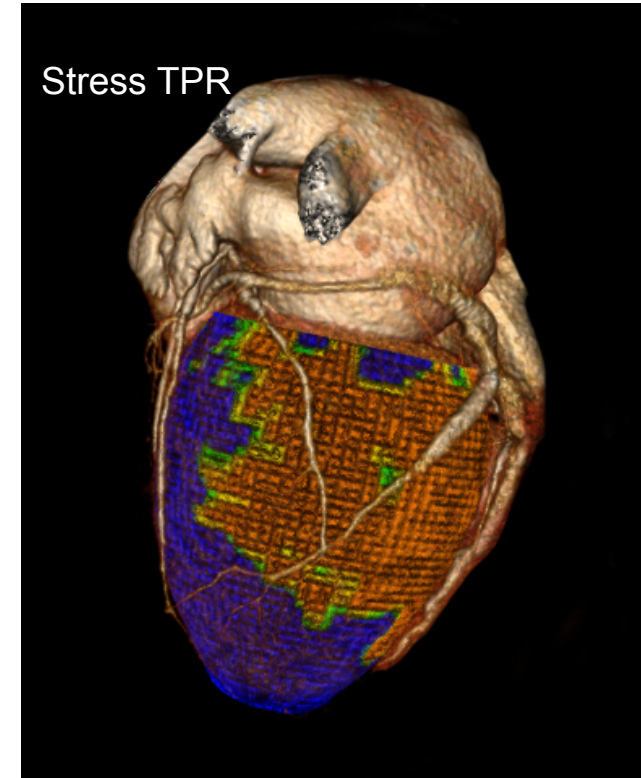
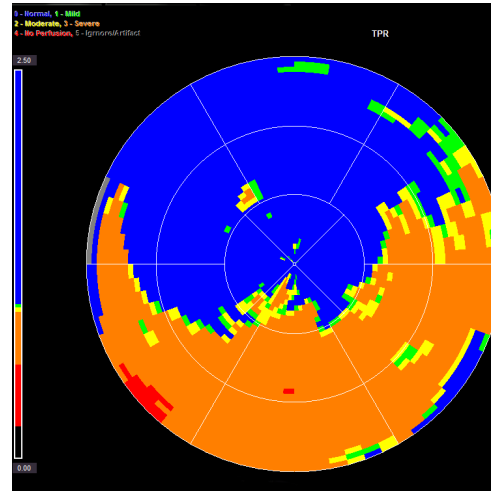
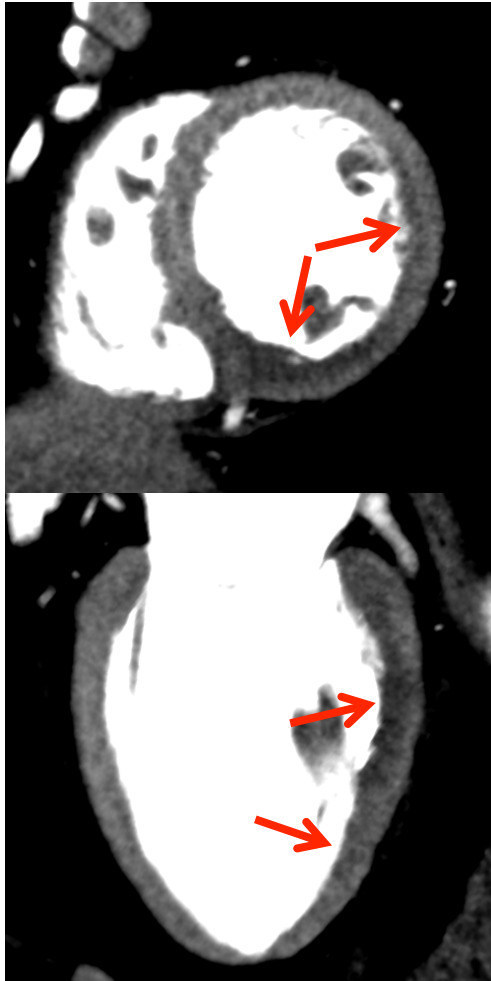


RCA



Stenosis in the mid LCx, severe stenosis in the mid RCA

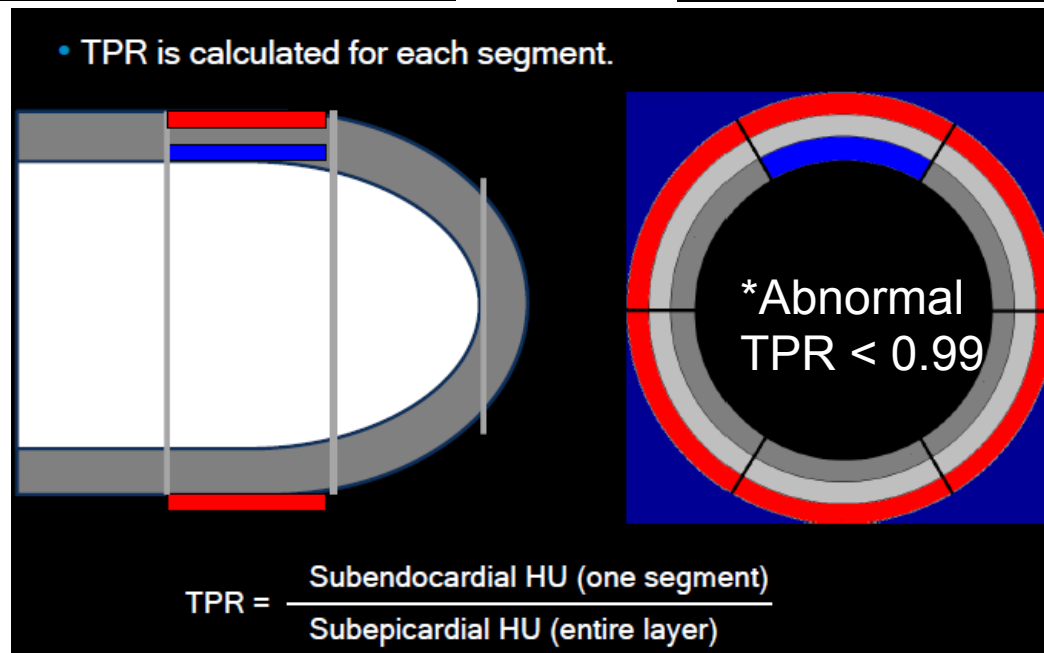
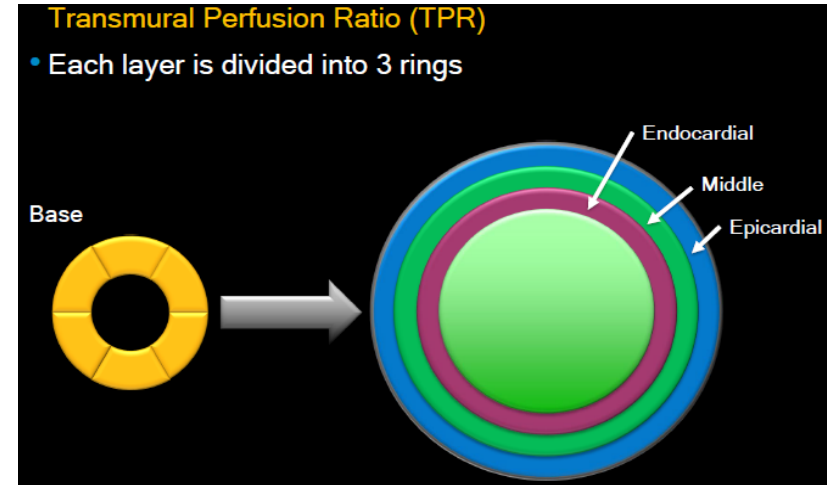
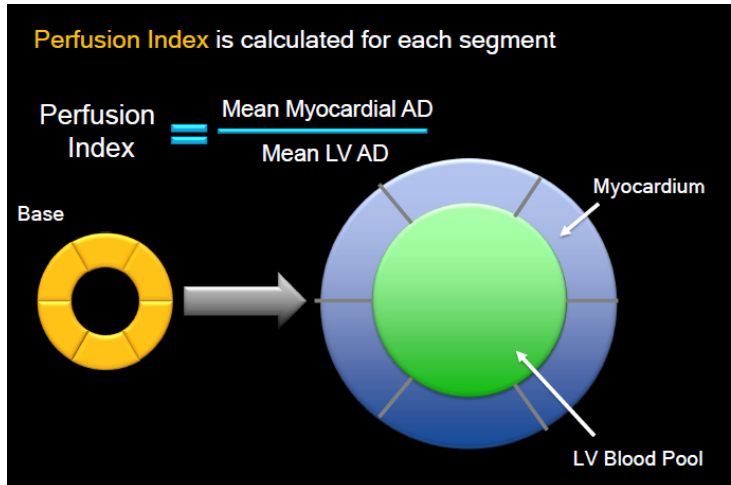
Le scanner Volumique Dynamique



Rotation Speed	0.275s
Dose Reduction	 2,5 mSv
Dose	1.93mSv (k=0.014)

An area of hypo-attenuation is seen in the infero-lateral wall. The Transmural Perfusion Ratio (TPR) map confirms this.

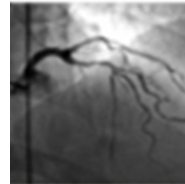
LES MESURES



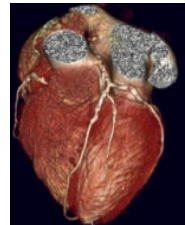
*George RT, et al.
Circ Cardiovasc Imaging. 2009

ANALYSE MORPHOLOGIE

ANALYSE FONCTIONNELLE

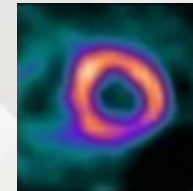


Coronarographie

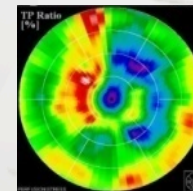


CT angiographie

InCor



Scintigraphie SPECT



CT perfusion

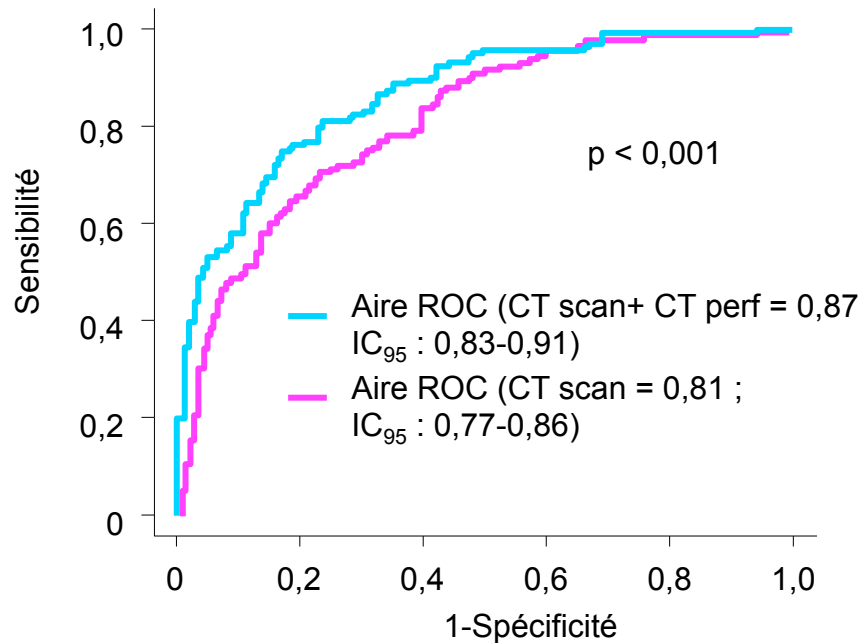
Etude multicentrique 8 pays 16 Hopitaux 381 patients

- » Evaluation du scanner / coronarographie associée à la scintigraphie
- » Performance diagnostique du scanner 320 barrettes

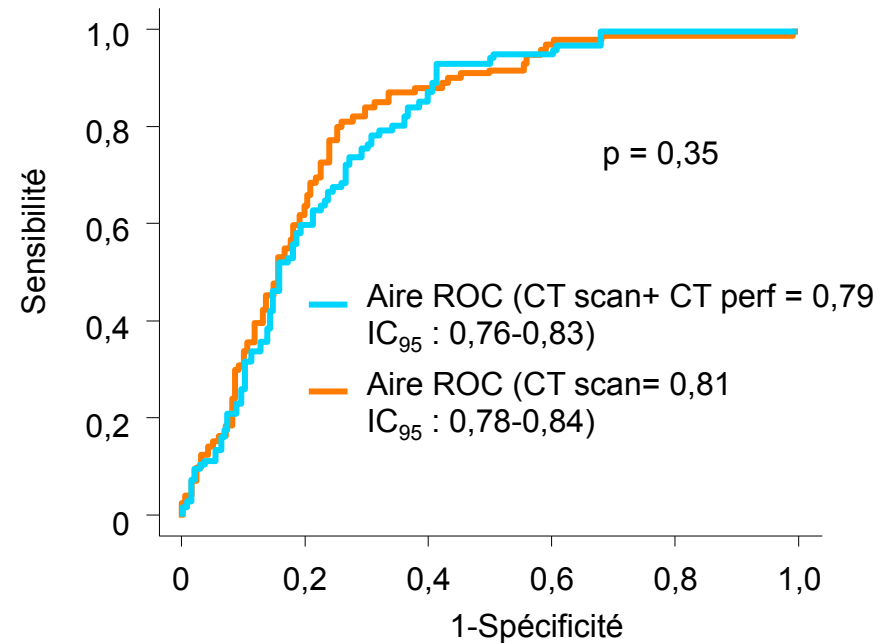


CORE 320

Amélioration CT scanner + CT perfusion
vs CT scanner seul



CT scanner + CT perfusion
vs coro + scintigraphie SPECT



- Le scanner de perfusion améliore la capacité diagnostique par comparaison avec le scanner seul
- La combinaison scanner / scanner de perfusion identifie les patients nécessitant une revascularisation
- Etude anatomique et viabilité lors d'un même examen avec une dose totale modérée (< 5 mSv)

Le scanner Volumique dynamique



European Heart Journal (2012) 33, 67–77
doi:10.1093/eurheartj/ehr268

CLINICAL RESEARCH
Interventional cardiology

Computed tomography stress myocardial perfusion imaging in patients considered for revascularisation a comparison with fractional flow reserve

Brian S. Ko^{1,2}, James D. Cameron^{1,2}, Ian T. Meredith^{1,2}, Michael Leung^{1,2}, Paul R. Antonis^{1,2}, Arthur Nasis^{1,2}, Marcus Crossett^{1,3}, Sarah A. Hope¹, Sam J. Lehman¹, John Troupis^{1,3}, Tony DeFrance^{4,5}, and Sujith K. Seneviratne^{1,2*}

¹Monash Cardiovascular Research Centre Australia ²Department of Medicine Monash Medical Centre

³Department of Diagnostic Imaging MMC ⁴Stanford University USA and ⁵CVCTA Education San Francisco

FFR < 0,8 en référence

Identification de 76% des territoires ischémiques

Identification de 84% des territoires non ischémiques

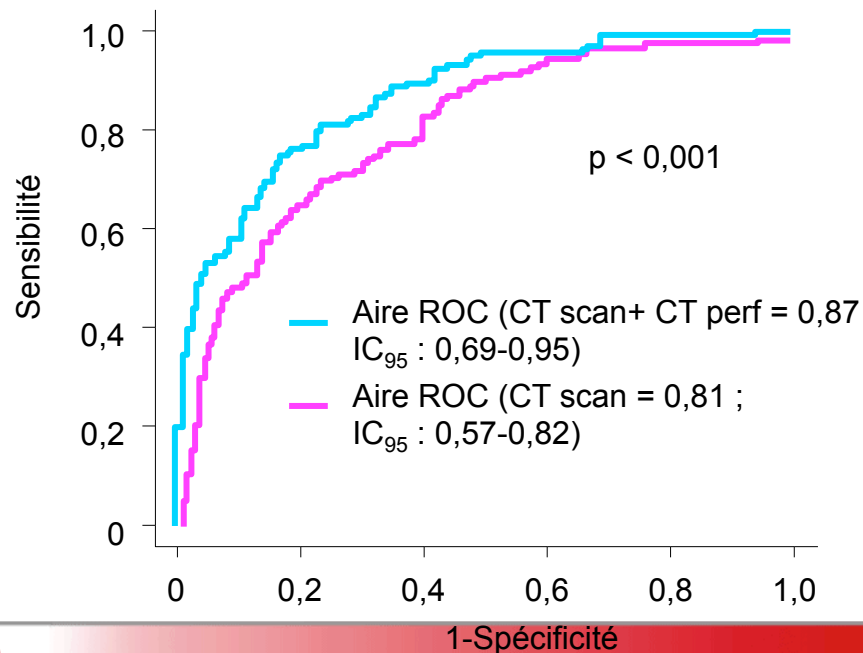
- Défect de perfusion + sténose > 50% spécifique à 98%
- Perfusion normale + lésion < 50% permet d'éliminer une ischémie dans 100% des cas
- Concordance entre les résultats de la FFR et le scanner 320
- Efficacité très élevée quand il y a une concordance entre CTA et CTP pour la mise en évidence ou exclure l'ischémie

CT perfusion salvages non diagnostic CTA for stent assessment

Computed tomography angiography and myocardial computed tomography perfusion in patients with coronary stents: prospective intraindividual comparison with conventional coronary angiography.

Rief M, Zimmermann E, Stenzel F, Martus P, Standl K, Greupner J, Kranz
Department of Radiology, Charité, Berlin, Germany.

Amélioration CT scanner + CT perfusion vs CT scanner seul



JACC

JOURNAL of the AMERICAN COLLEGE of CARDIOLOGY



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Soustraction Coronaires



TOSHIBA
Leading Innovation >>>

SureSubtraction



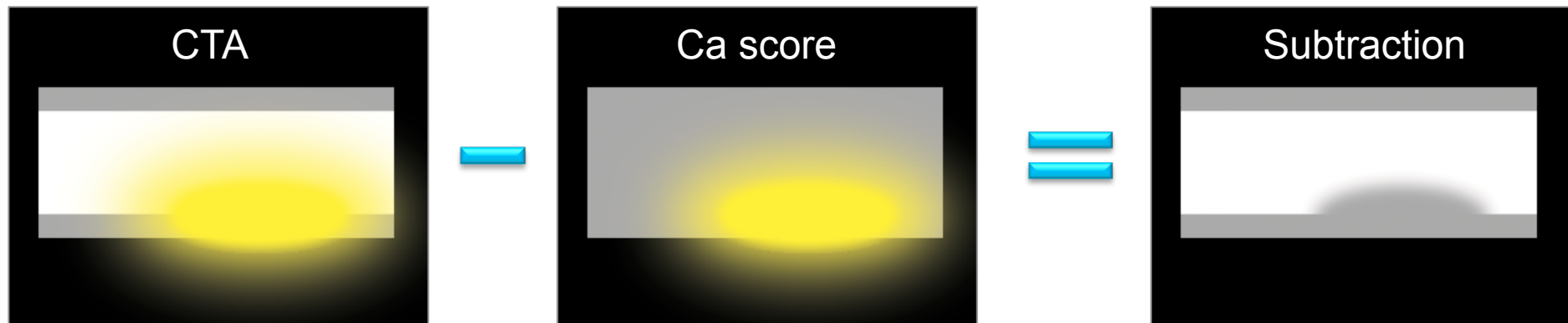
- » ZERO CLICK
- » ZERO ARTEFACTS DE SEGMENTATION

Adaptive Diagnostics
Clinical Solutions

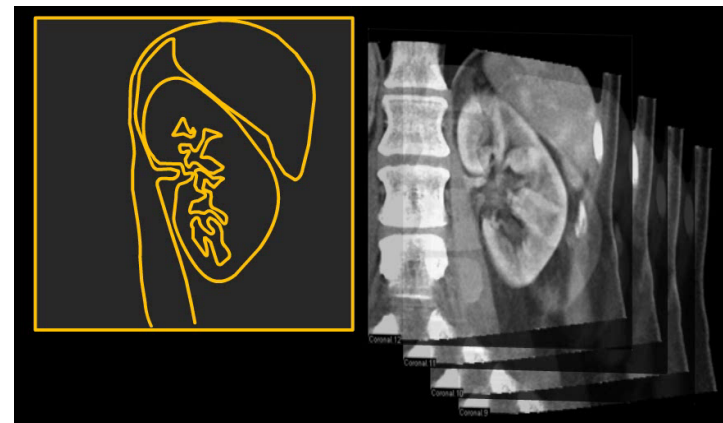
SURE^{RE}Subtraction

Adaptive Diagnostics
Clinical Solutions

AIDR 3D
integrated

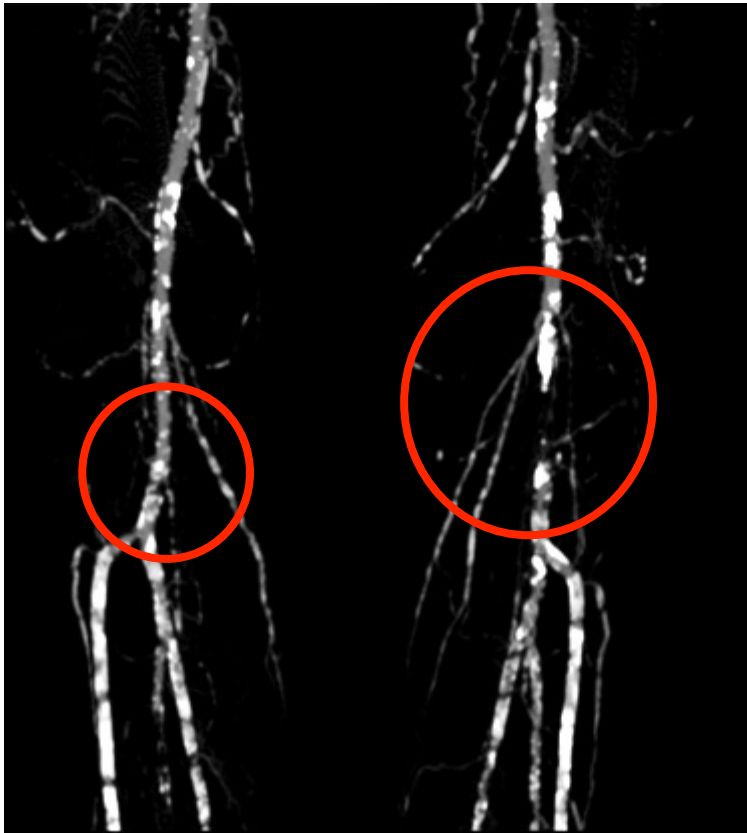


RECALAGE
ELASTIQUE



SureSubtraction

Adaptive Diagnostics
Clinical Solutions

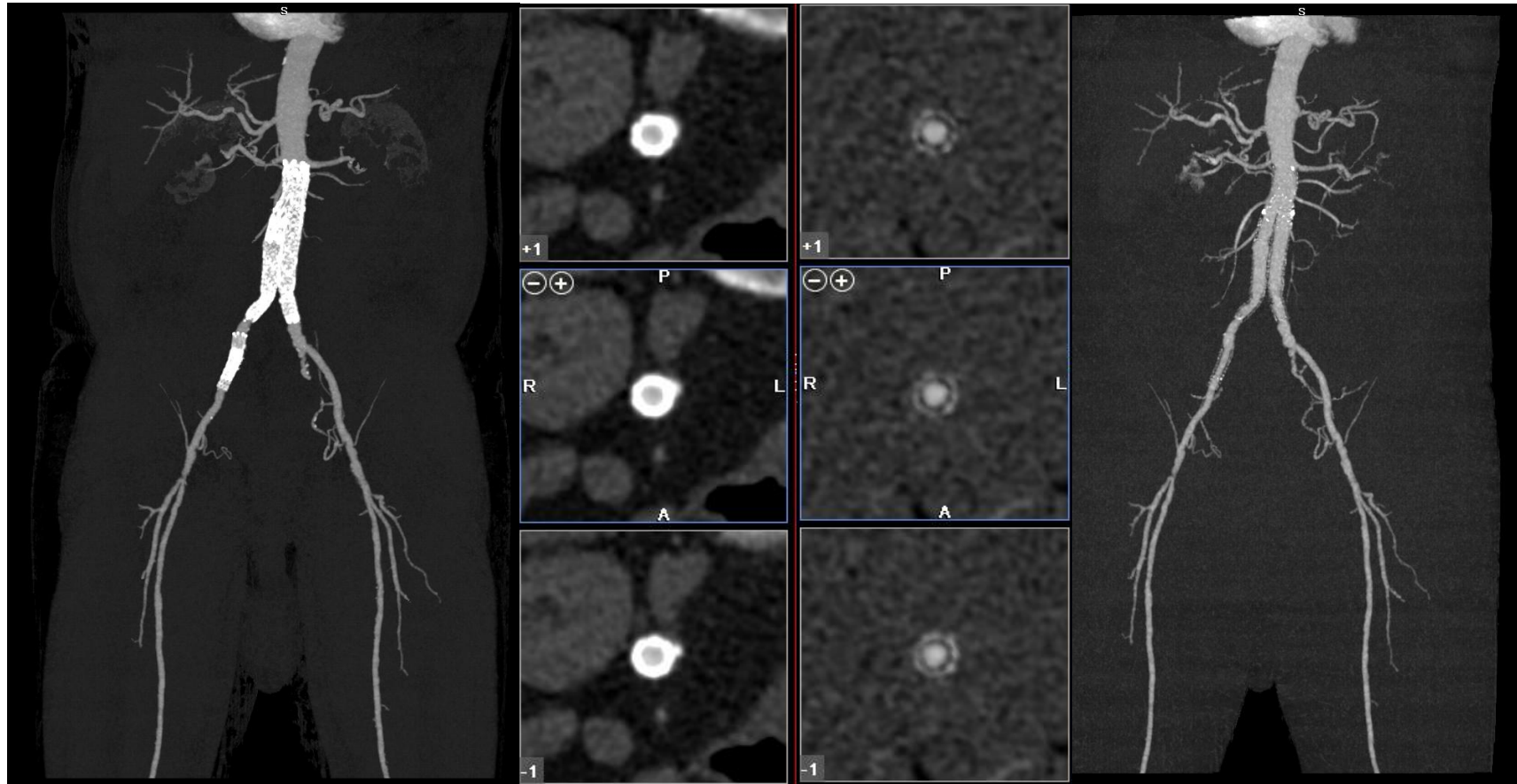


Images Natives



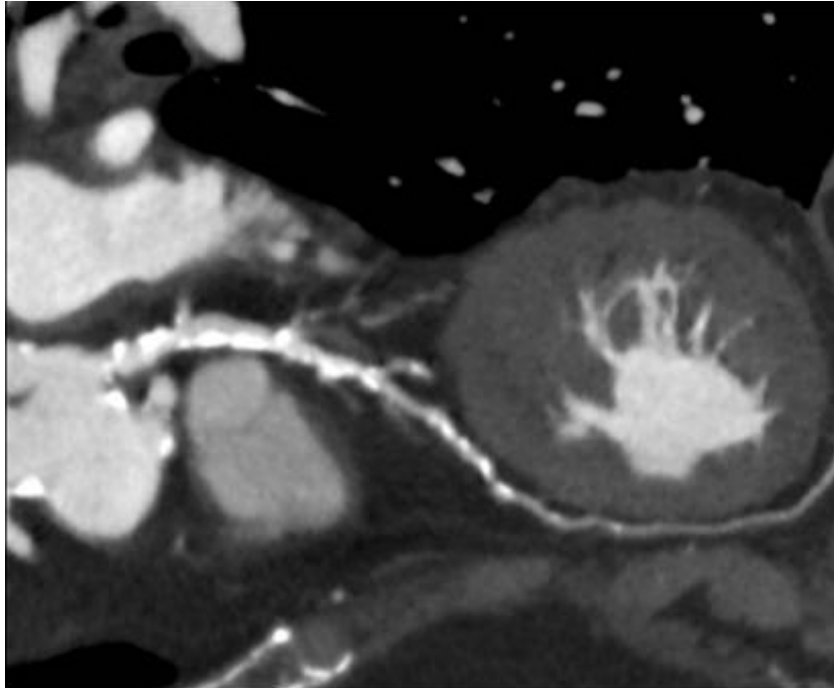
Bone Soustraction

SureSubtraction

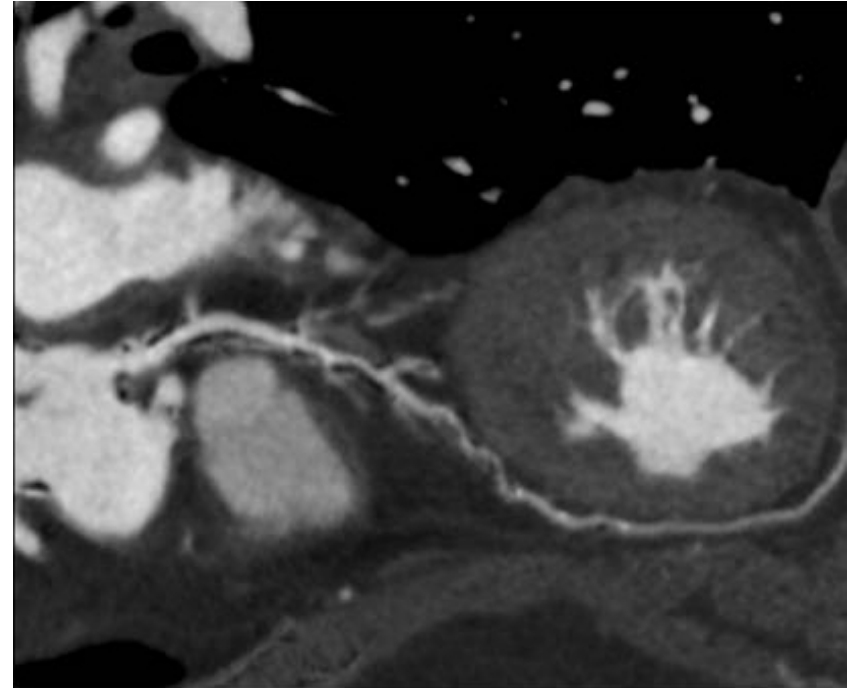


- » Suppression de l'os , du stent et du calcium
- » Suppression des artéfact en blooming
- » Meilleure visualisation de la lumière

SureSubtraction - Coronaires



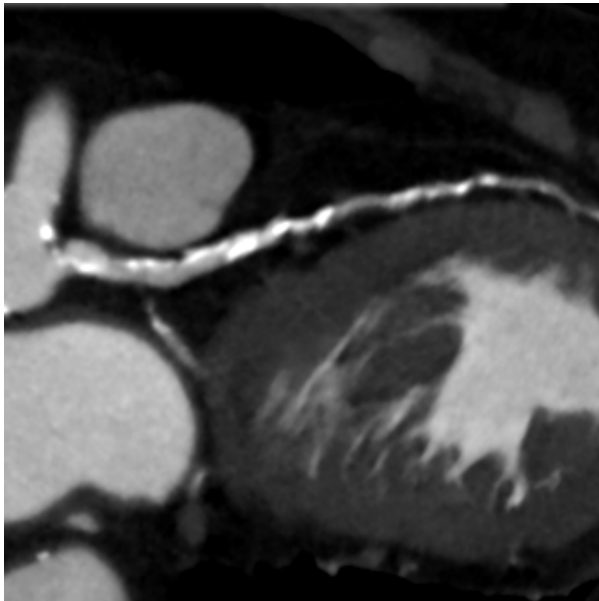
Post Contrast CTA



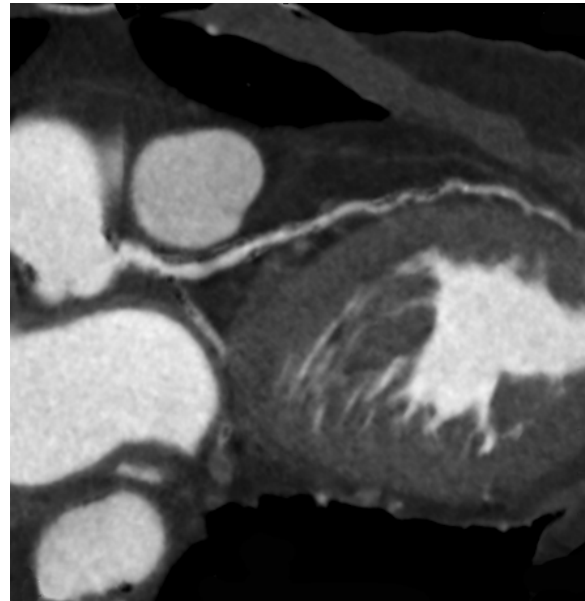
Subtracted

SureSubtraction - Coronaires

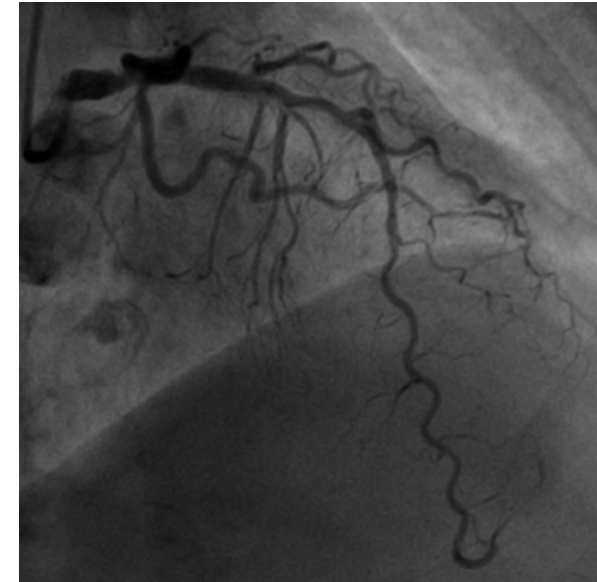
Adaptive Diagnostics
Clinical Solutions



Post Contrast CTA



Subtracted



» Visualisation de la lumière améliorée grâce au recalage élastique

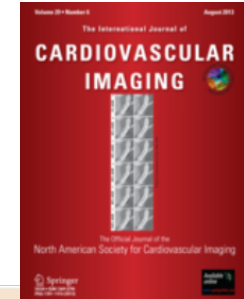
Courtesy Dr Kofoed, Rigshospitalet, Denmark

SureSubtraction - Coronaires

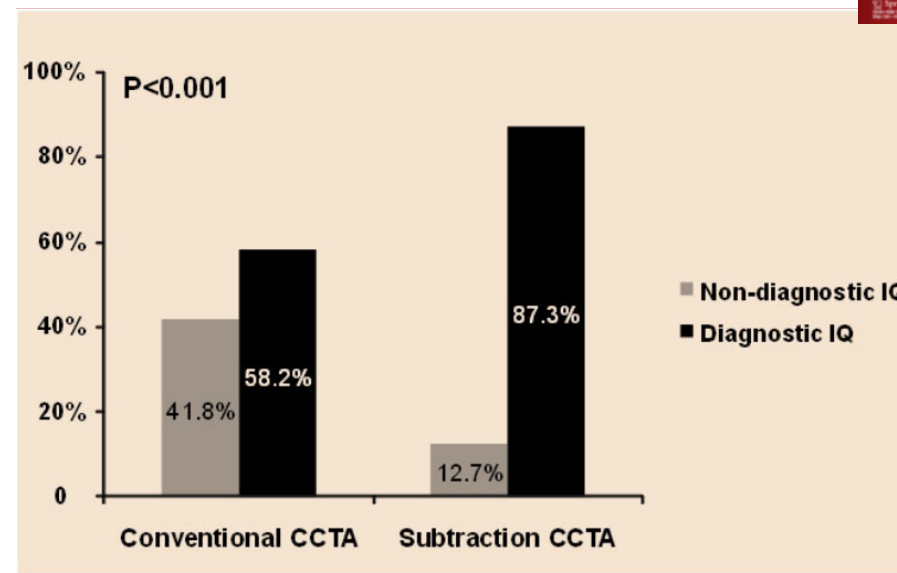
Improved evaluation of calcified segments on coronary CT angiography: a feasibility study of coronary calcium subtraction.

Tanaka R ,Yoshioka K , Muranaka K / Klaus Kofoed MD, Andreas Fuchs

Department of Radiology, Iwate Medical University/ Rigshospitalet, Copenhagen, Denmark



20 patients
CS > 400

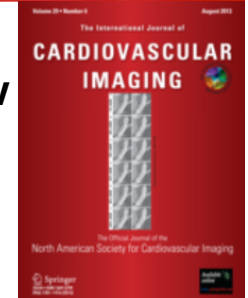


- » Réduction de 41,8 % à 12,7% de segment non diagnostique
- » Augmentation de la précision de 15% de la spécificité de 25%
- » Réduction de 20% des faux positifs

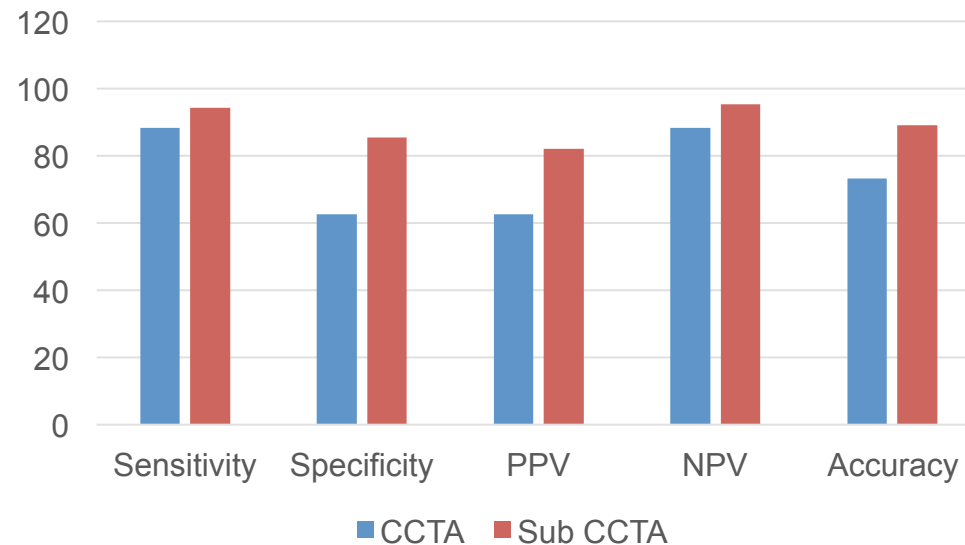
SureSubtraction - Coronaires

Subtraction coronary CT angiography using second-generation 320-detector row

Kunihiro Yoshioka • Ryoichi Tanaka • Kenta Muranaka • Tadashi Sasaki • Takanori Ueda • Takuya Chiba •
Division of Cardiovascular Radiology, Department of Radiology, Iwate Medical University Japan

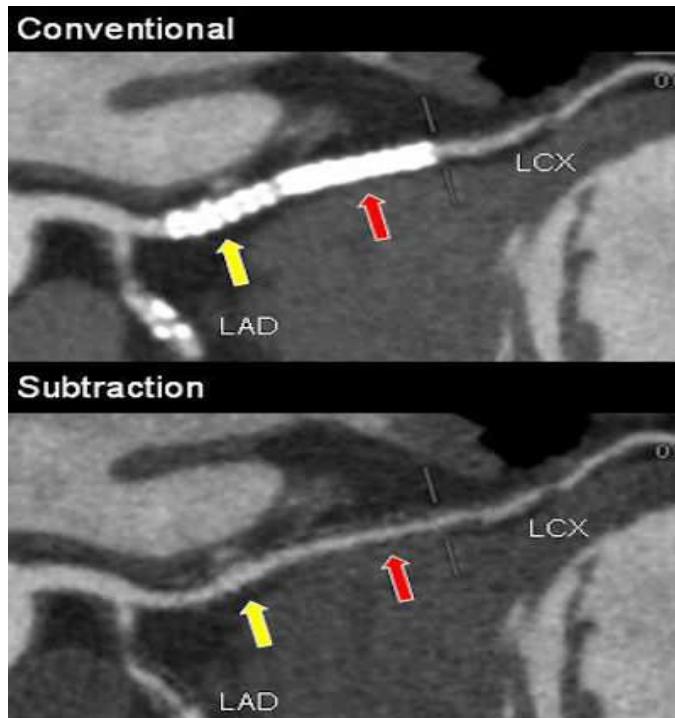


- » 20 patients
- » CS > 400
- » 82 segments
- » Stenose > 50%

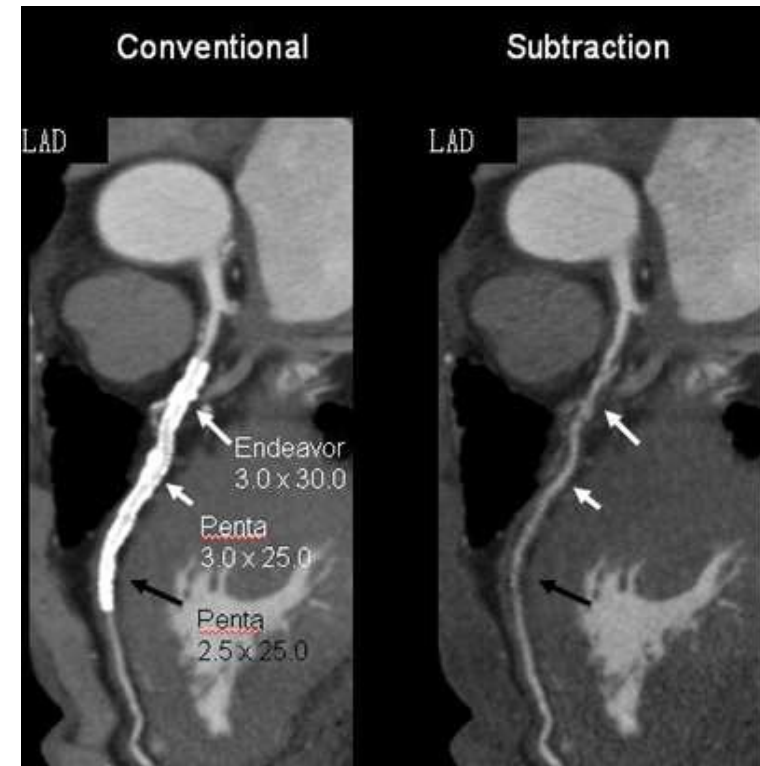
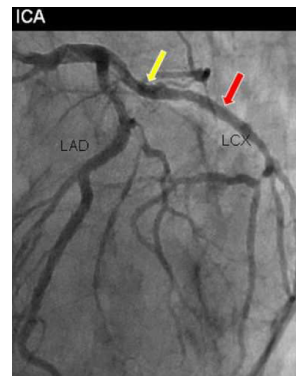


- » Réduction de 43,9 % à 8,5 % de segment non diagnostique
- » Réduction de 20% des faux positifs
- » Dose: 3,2 mSv +/- 1,8

SureSubtraction – Coronaires



- » RSNA 2014
- » 99 Patients
- » Coronarographie



Précision/Taille	CTA	DSCTA
3,5 mm	78 %	92 %
3 mm	61 %	90 %
2,5 mm	37 %	88,2 % P=0,0001

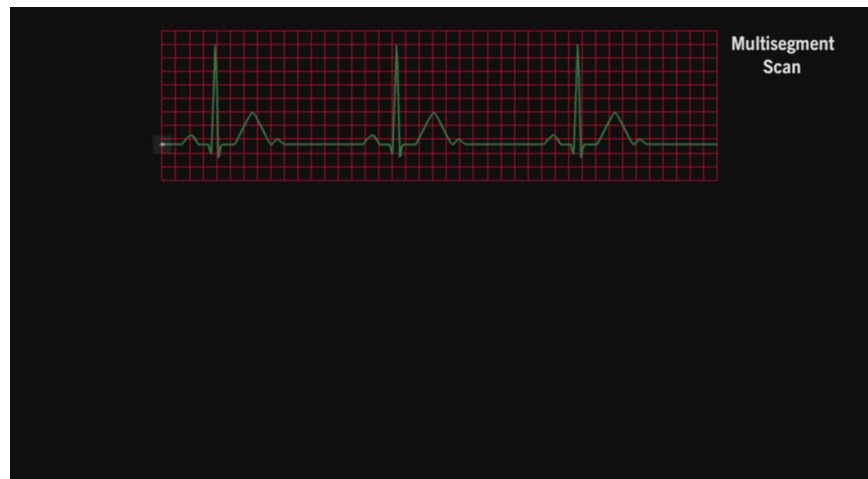
DSCTA vs. CTA for stent imaging					
Exam	Sensitivity	Specificity	PPV	NPV	Accuracy
Conventional CTA	48.6%	58.5%	13.9%	81.9%	57.3%
DSCTA	62.9%	91.7%	66.6%	94.7%	88.2%

Dr Makoto Takase Clinic TAKASAKI JAPAN

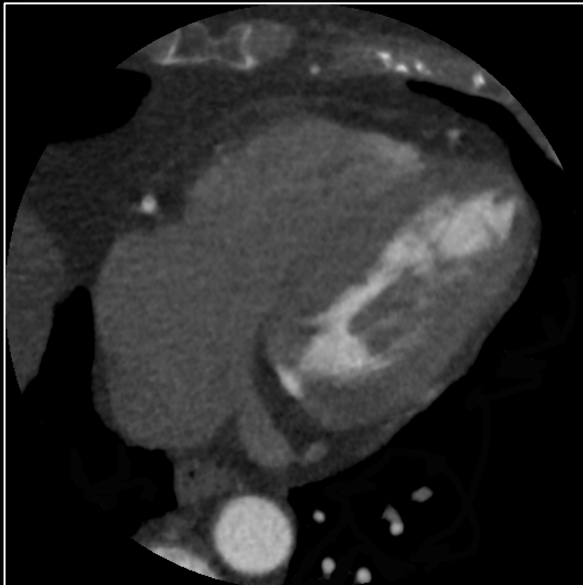
Adaptive Motion Correction

- 46 year old woman
- 90 bpm
- 2 beat scan

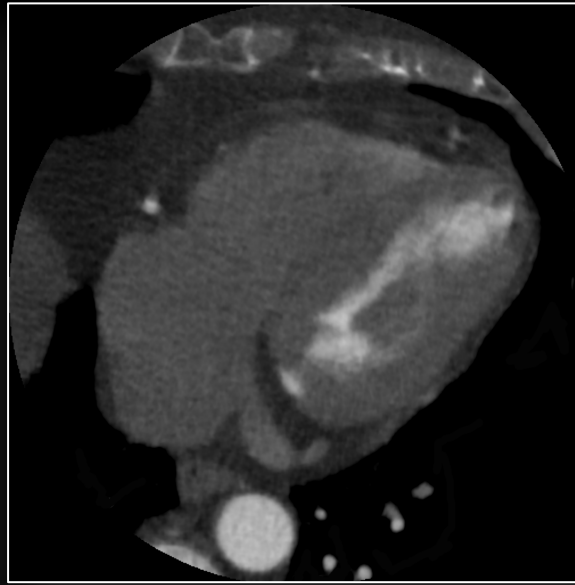
Scan Mode	Collimation	kV	mA	Rotation Speed (s)	Range (mm)	Dose Reduction	CTDI (mGy)	DLP (mGy.cm)	Effective Dose (mSv)
Volume	0.5mm x 200	100	SURE Exposure	0.275	100	AIDR 3D	6.9	69.5	0.97 (k=0.014)



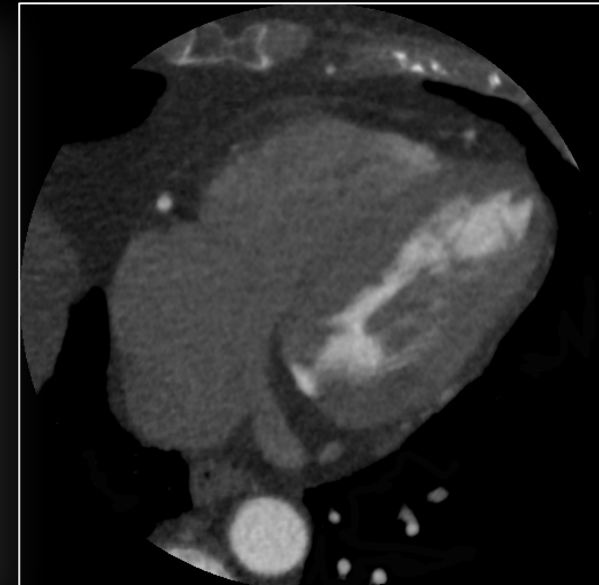
Adaptive Motion Correction



Half Reconstruction
135 ms



Segment Reconstruction
68 ms



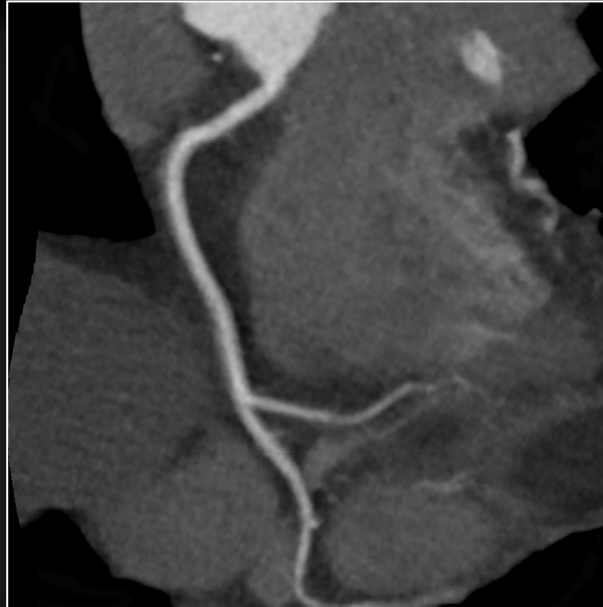
AMC Reconstruction

Courtesy Dr Chen, NHLBI, National Institutes of Health, USA

Adaptive Motion Correction



Half Reconstruction
135 ms



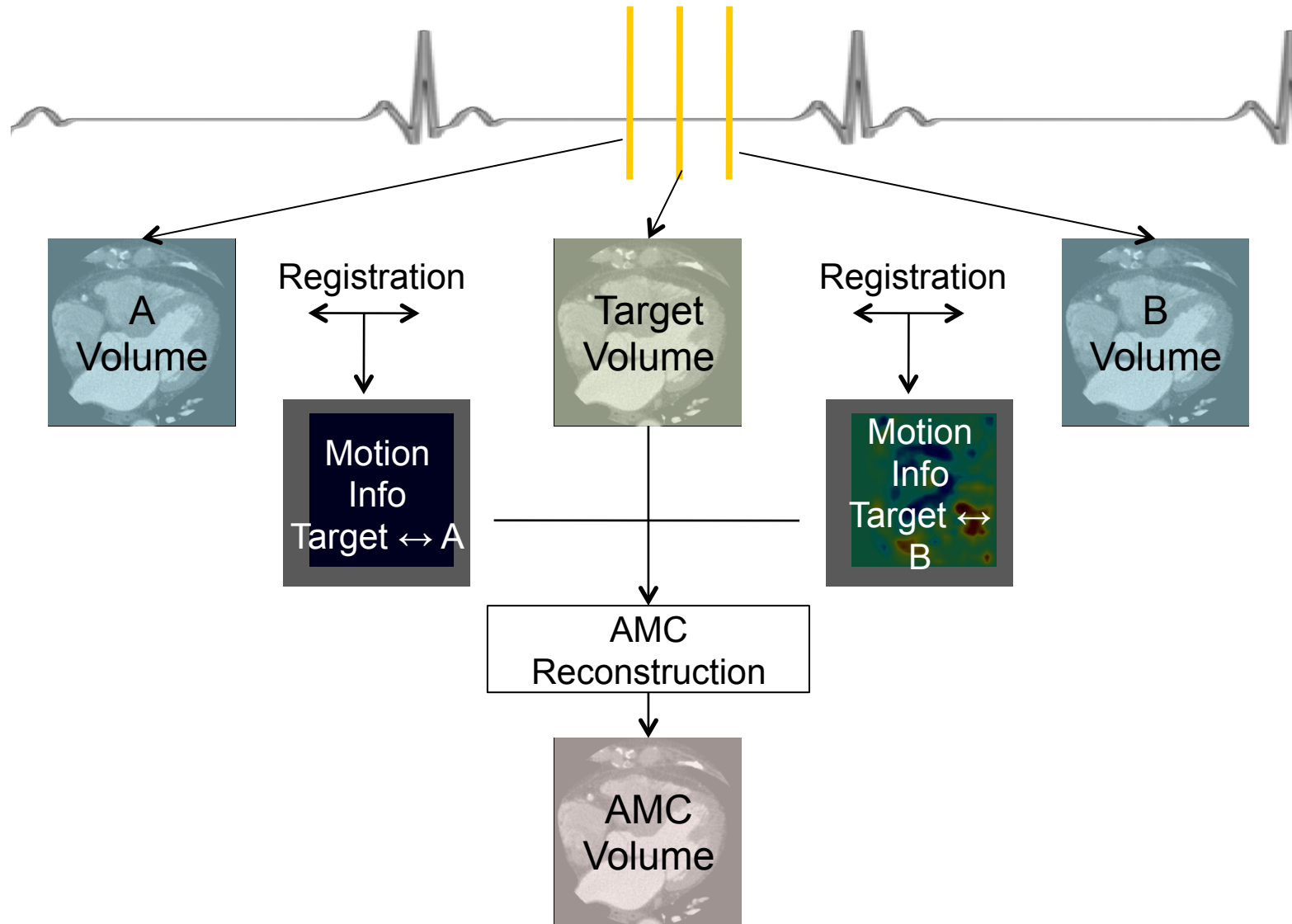
Segment Reconstruction
68 ms



AMC Reconstruction

Courtesy Dr Chen, NHLBI, National Institutes of Health, USA

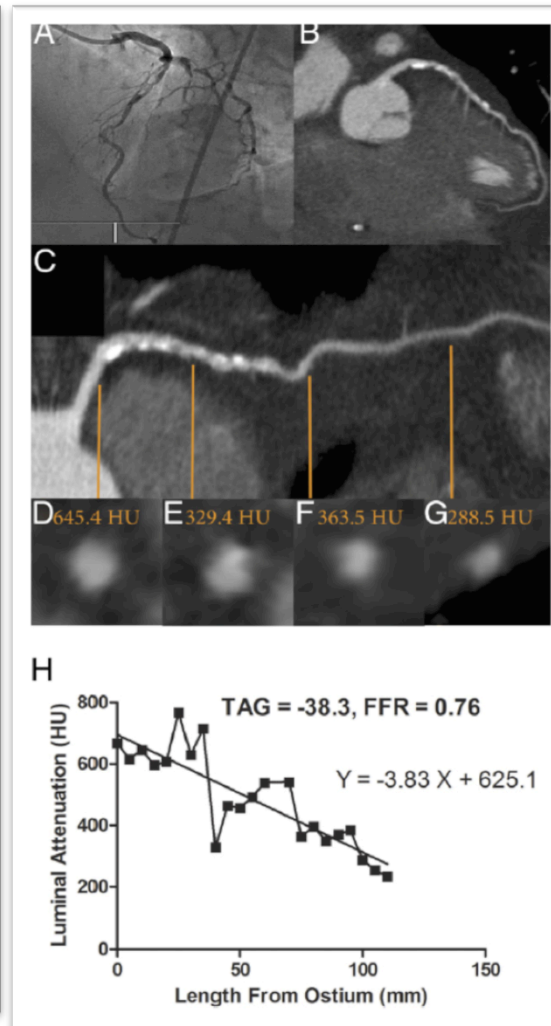
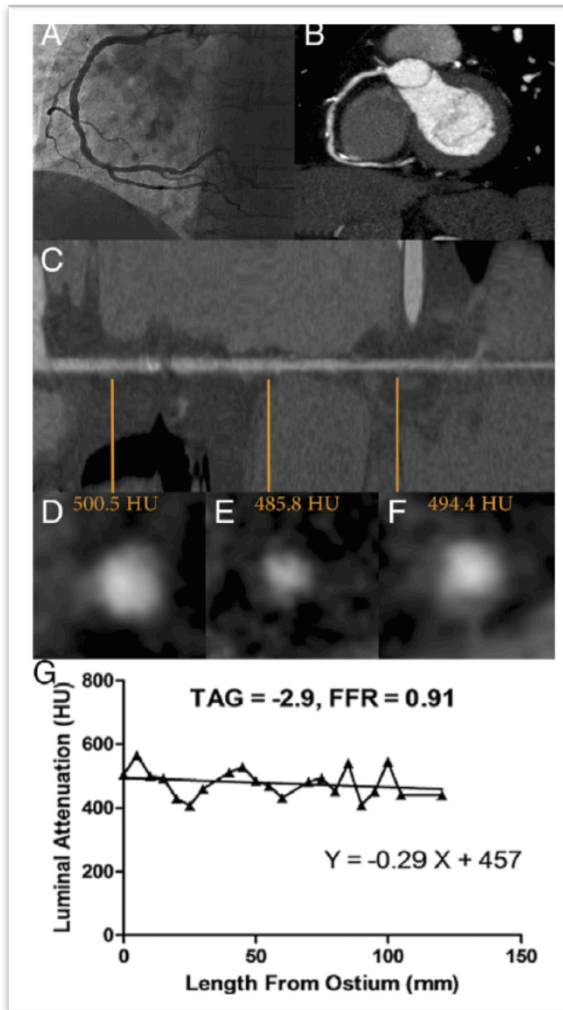
Adaptive Motion Correction



TAG320 : Transluminal Contrast Attenuation Gradient

Coronaire normale Variation des densités / cm

LAD	LCX	RCA
11 UH	12 UH	5 UH



- » Contant et reproductible grâce aux acquisitions Iso phasiques
- » Mesure tout les 5 mm jusqu'a 2mm diarr
- » Mesure des variations de densités/ostiuir et de part et d'autre de la sténose
- » Dés 20% de sténose diminution de 50 U

TAG320 : Transluminal Contrast Attenuation Gradient

Transluminal Attenuation Gradient in Coronary Computed Tomography Angiography Is a Novel Noninvasive Approach to the Identification of Functionally Significant Coronary Artery Stenosis A Comparison With Fractional Flow Reserve JACC Vol 61 no12

- » 57 patients 78 coronaires
- » FFR < 0,8
- » Diminution > 15 UH sur 10 mm mesure tout les 5 mm \varnothing < 2mm

Sensitivity	Specificity	PPV	NPV
77%	74%	67%	86%

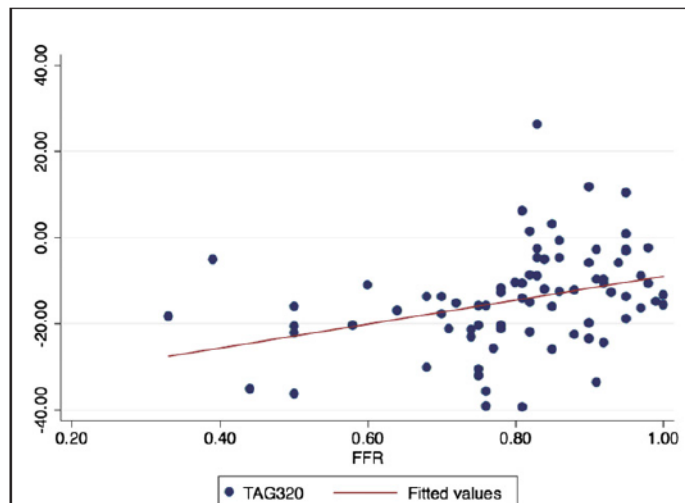


Figure 3 Scatter Plot Showing the Relationship Between TAG320 and FFR

The correlation coefficient between TAG320 and FFR was 0.43 ($p < 0.001$).
FFR = fractional flow reserve; TAG = transluminal attenuation gradient.

TAG320 : Transluminal Contrast Attenuation Gradient

Comparison of Diagnostic Accuracy of Combined Assessment Using Adenosine Stress Computed Tomography Perfusion + Computed Tomography Angiography With Transluminal Attenuation Gradient + Computed Tomography Angiography Against Invasive Fractional Flow Reserve

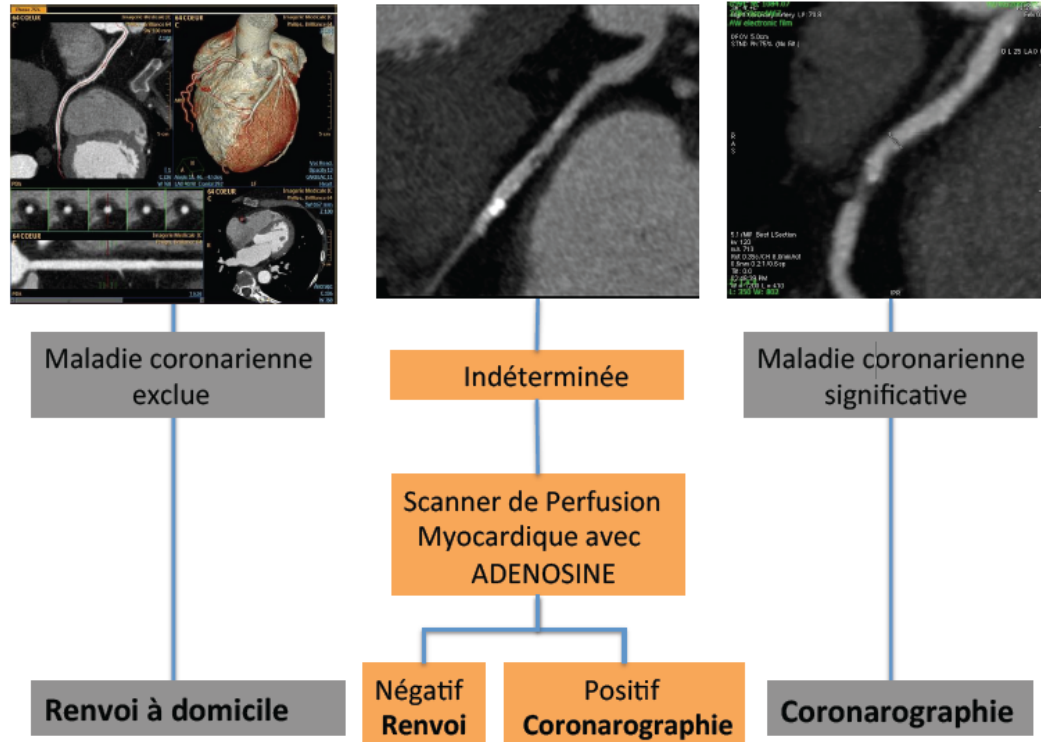
J Am Coll Cardiol. 2014;63(18):1904-1912. doi:10.1016/j.jacc.2014.02.557

- » 75 patients 127 coronaires
- » FFR < 0,8
- » Diminution > 15 UH sur 10 mm mesure tout les 5 mm ϕ < 2mm

Tableau 2	Estimations des précisions diagnostiques par vaisseau de la CC, du scanner coronaire (SC), des combinaisons SC+SPM, SC+GAT et SC+SPM+GAT, comparées à la RDF					
	CC>50%	CC>70%	SC	SC+GAT	SC+SPM	SC+SPM+GAT
	n=127	n=127	n=127	n=97	n=123	n=117
Sensibilité, %	61	25	89	73	76	88
Spécificité, %	88	99	65	97	89	83
VPP, %	73	92	57	92	78	74
VPN, %	81	71	92	87	88	93

	CTA + TAG320	CTA + TCP	CTA+CTP +TAG320
Area Under Curve	0,844	0,845	0,91

Prise en charge



Caractérisation de la plaque WIP » Amélioration de la résolution en contraste (bi – energie..)
» Meilleure résolution spatiale



Plus de 120 Publications

TOSHIBA
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