



100 ans d'innovations en IMAGERIE MEDICALE



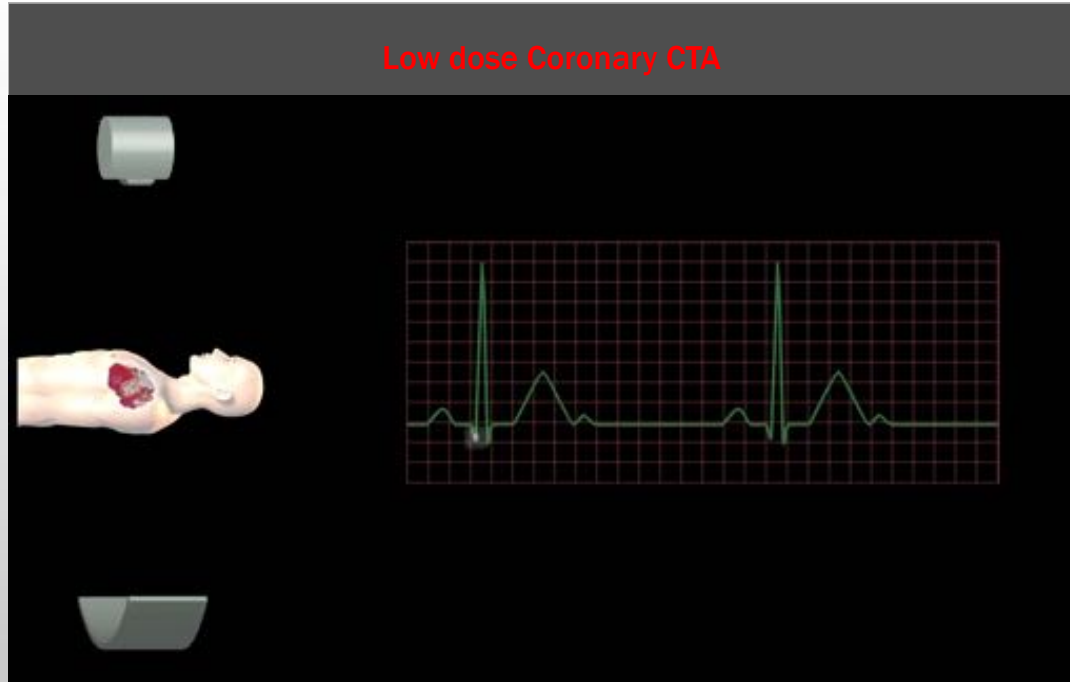
10 ans de développement continu : 4eme génération



1998 START DEVELOPMENT



Le scanner Volumique dynamique

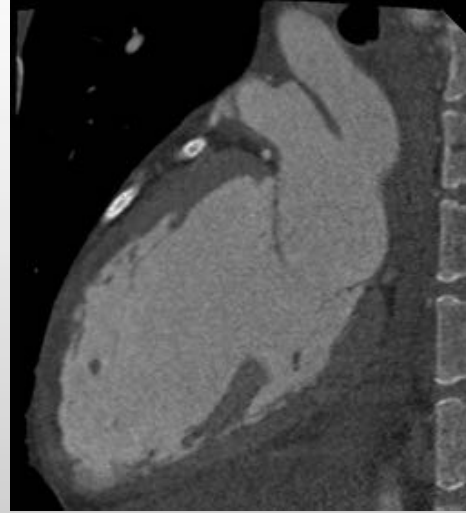
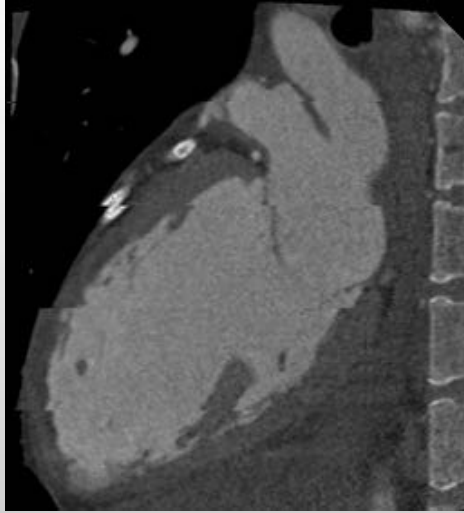


ONE
Aquilion
VISION EDITION

RT: 137 ms

Le scanner Volumique Isophasique

ONE
Aquilion



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

Le scanner Volumique dynamique

Sub mSv in 107 consecutive patients (Chen et al)

- No patient cohort selection
- All heart rates
- Robust CTA scanning
97,2% success rate

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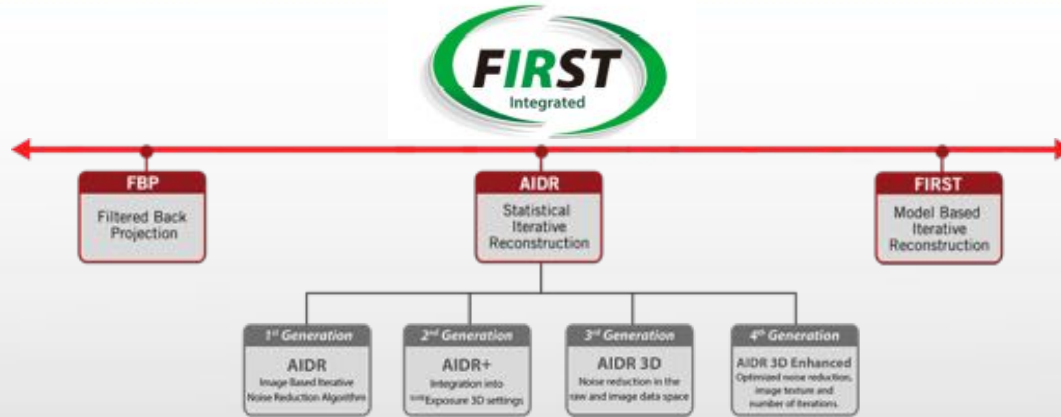
Submillisievert Median Radiation Dose for Coronary Angiography with a Second-Generation 320-Detector Row CT Scanner in 107 Consecutive Patients¹

Marcus Y. Chen, MD
Sujata M. Sherchag, MD
Andrew E. Arai, MD

Purpose: To (a) use a new second-generation wide-volume 320-detector row computed tomographic (CT) scanner to explore optimization of radiation exposure in coronary CT angiography in an unselected and consecutive cohort of patients referred for clinical

107

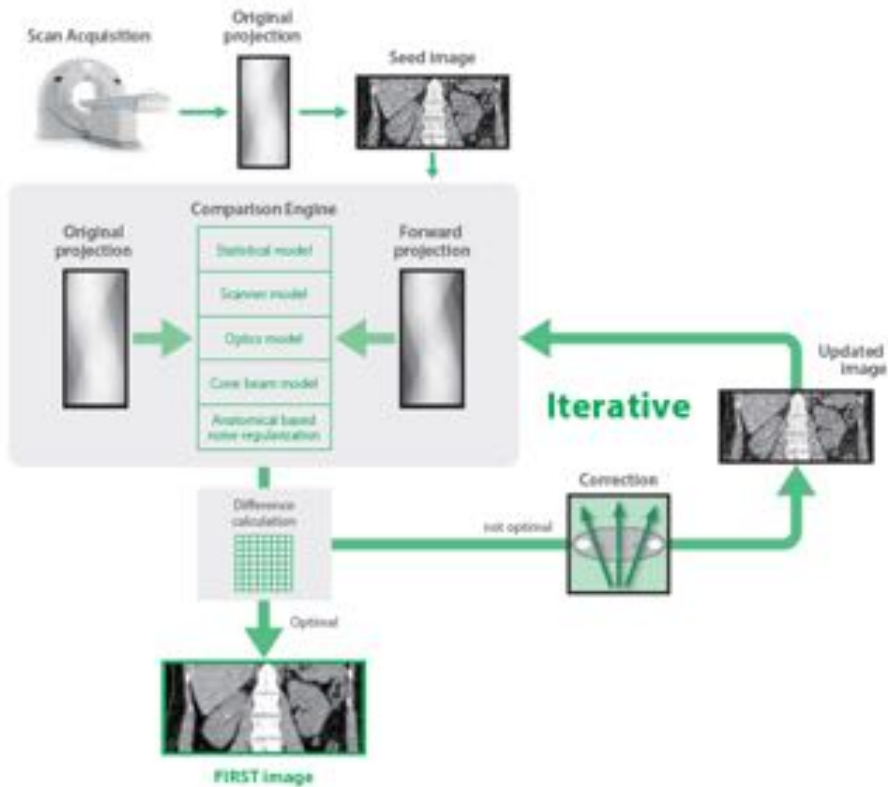
FIRST: MBIR



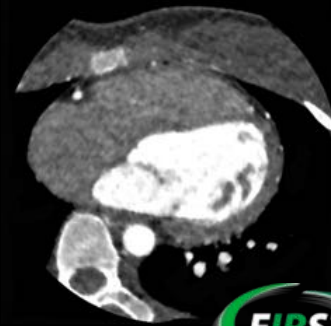
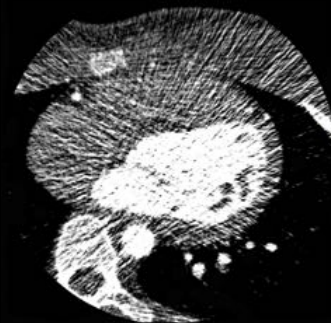
Forward projected model-based **I**terative **R**econstruction **S**olu**T**ion

- » FIRST est une technique de reconstruction de type **MBIR** (Model Based Iterative Reconstruction) ou Full Itérative
- » Intégrable dans une activité clinique de routine – Temps de reconstruction 3mn
- » Reconstruction en parallèle avec **AIDR 3D**

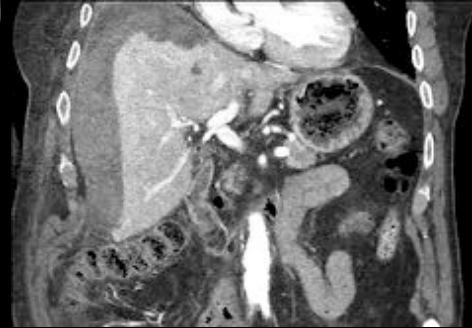
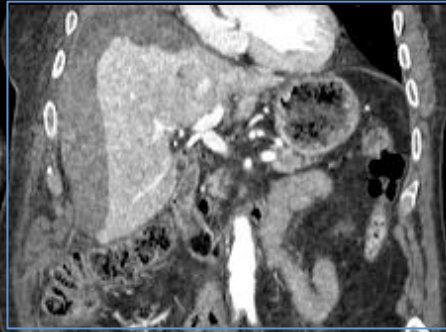
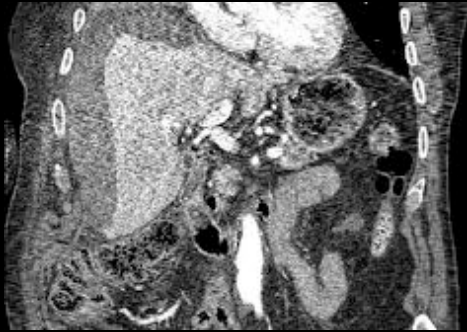
FIRST: MBIR



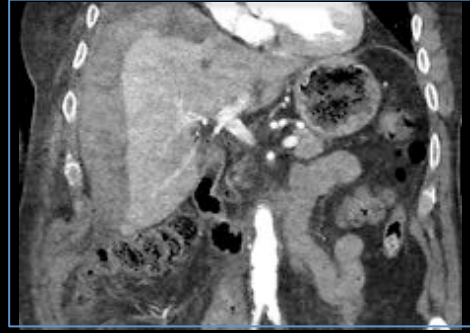
Courtesy of Dr. Chen, NIH, US



Réduction du Bruit / Dose



DLP = 214 mGy.cm, 3.2 mSv



FBP

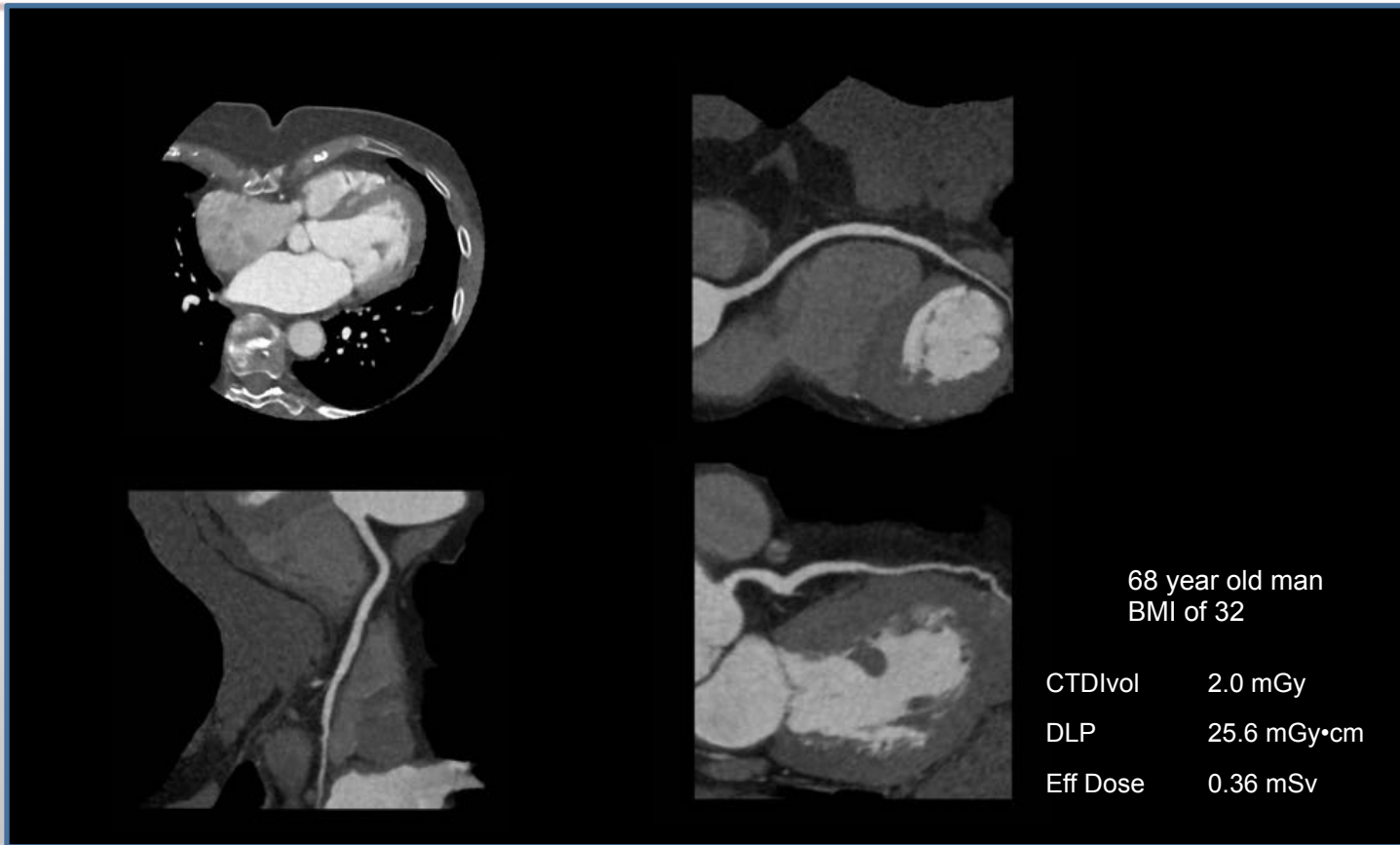
ADR3D

FIRST

DLP = 75 mGy.cm, 1.1 mSv

Courtesy of Prof. Blum , Nancy University, France

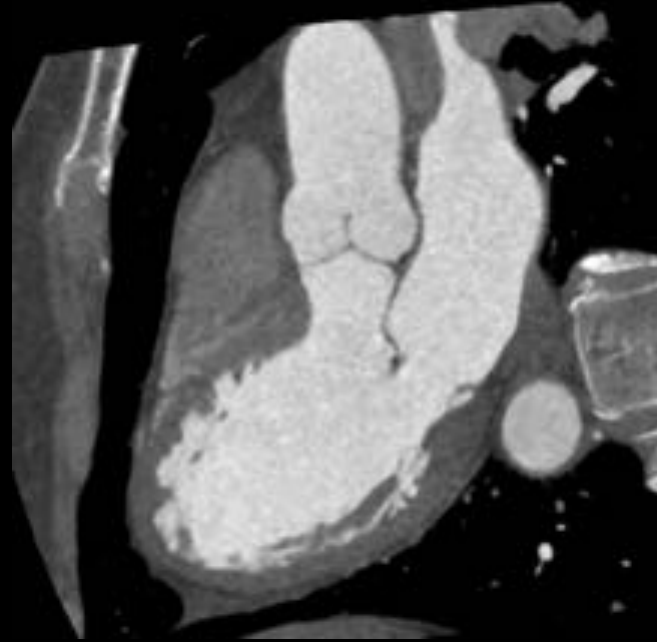
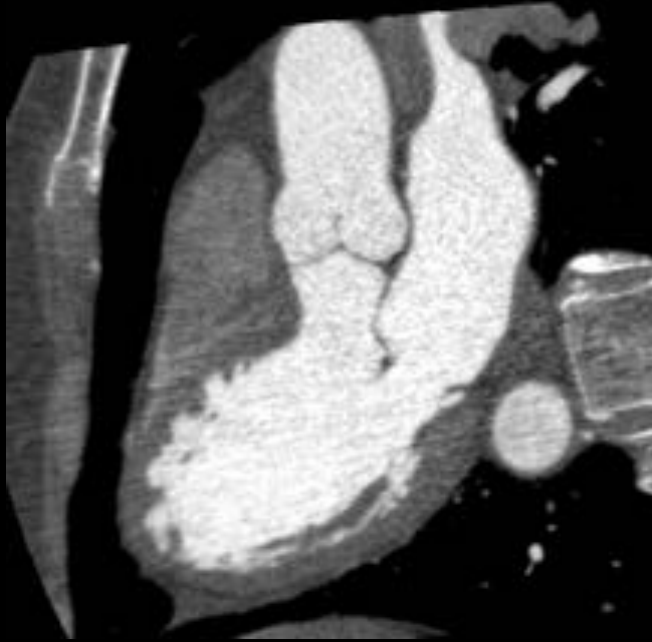
FIRST: MBIR



Réduction des artéfacts

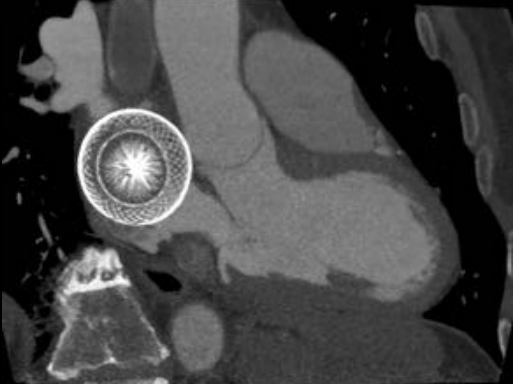
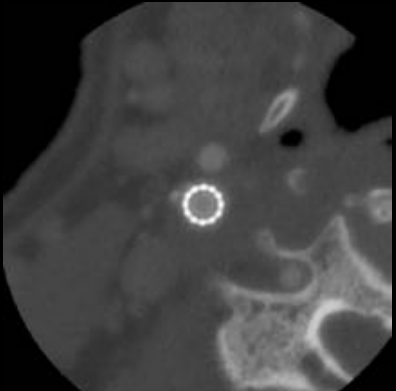
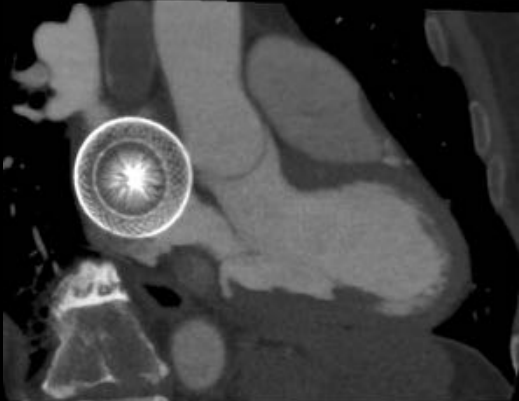
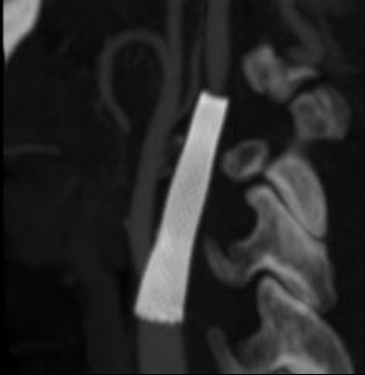
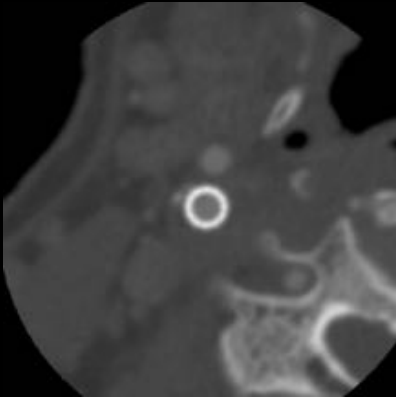
DLP = 27,3 mGy.cm, 0.38 mSv

FBP



Courtesy of Dr. Chen, NIH, US

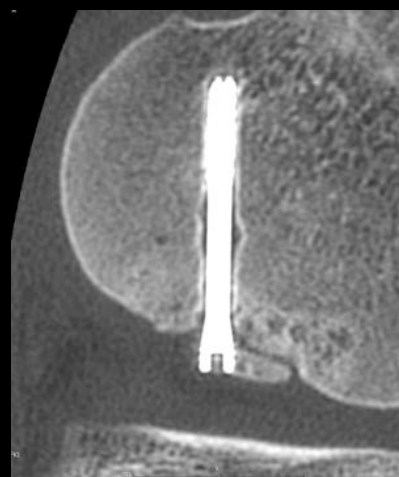
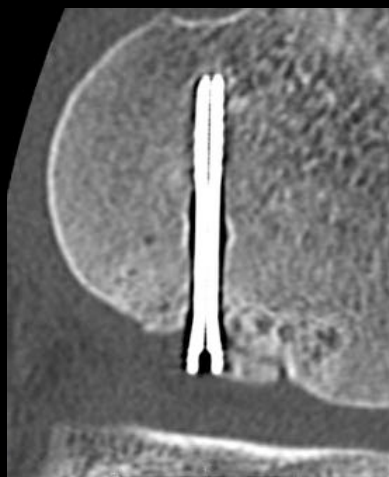
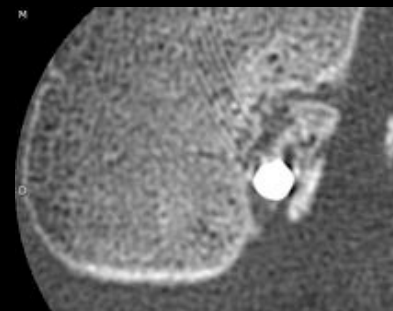
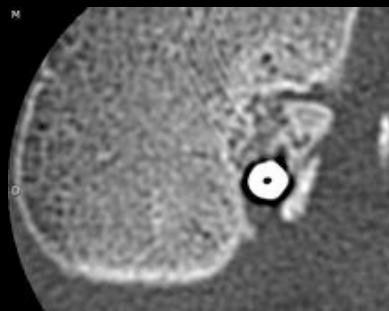
Résolution spatiale



Courtesy of Prof. Awai, Hiroshima University, Japan

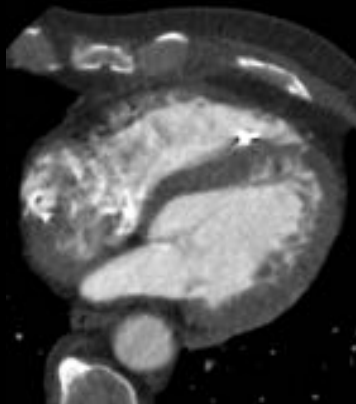
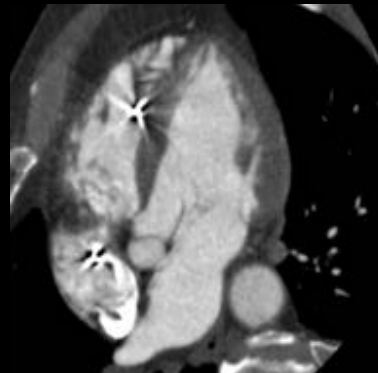
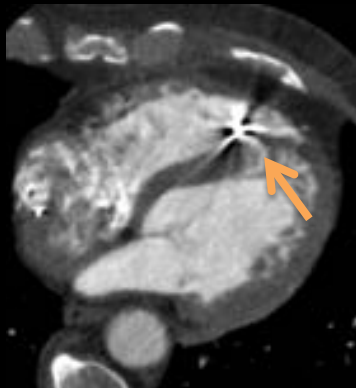
Artefacts de FBP / Ostéo-Articulaire

FBP

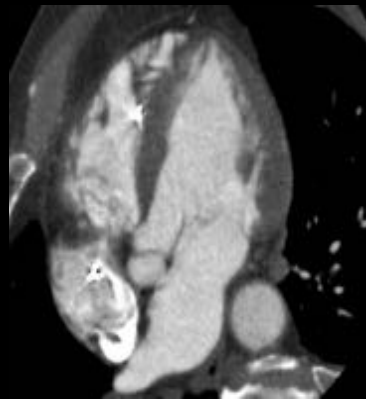


Courtesy of Prof. Blum , Nancy University, France

Single Energie Metal Artefact Reduction



SEMAR



CTDIvol	5.4 mGy
DLP	74.9 mGy•cm
Eff Dose	1.05 mSv

International Journal of Cardiology

A-fib compared to NSR (Uehara et al)

No patient cohort selection

- » 46 patients with Atrium fibrillation
- » 46 patients with Normal Sinus Rhythm
- » High quality: 90.2% vs 95.6%
- » Average quality: 97.9% vs 98.4%



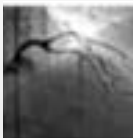
VALIDATION CLINIQUE

Plus de 45 publications



- » Réduction de dose
- » Arythmies
- » Réduction PdC

ANALYSE MORPHOLOGIE

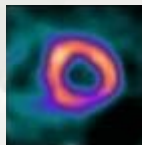


Coronarographie

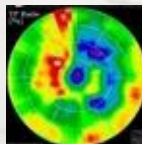


CT angiographie

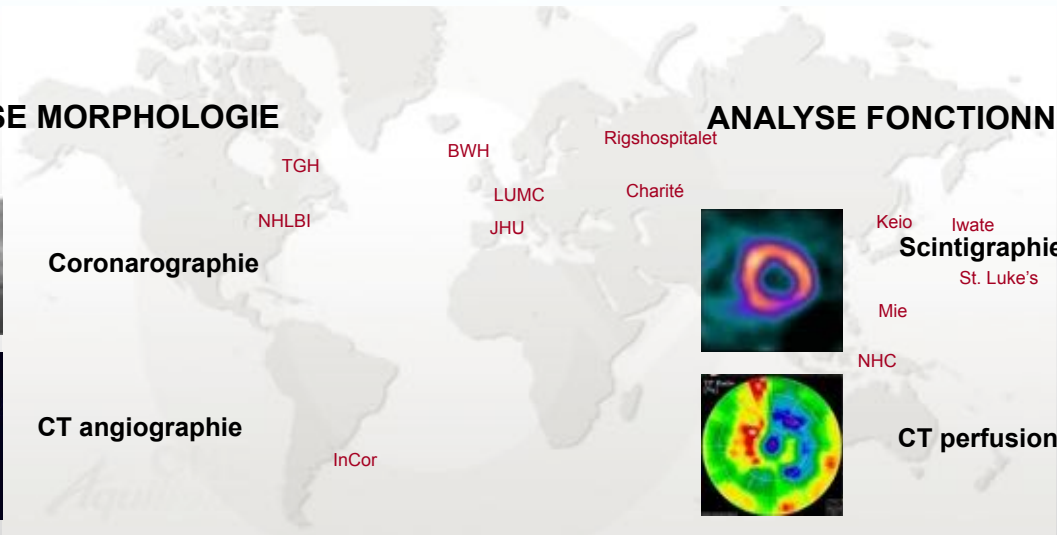
ANALYSE FONCTIONNELLE



Scintigraphie SPECT



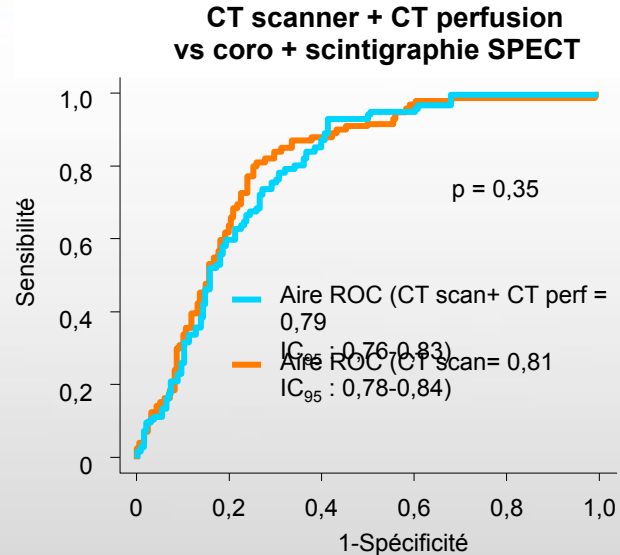
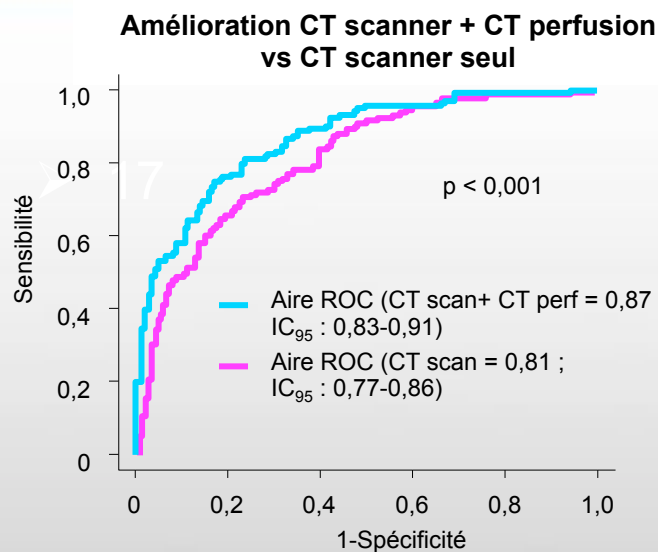
CT perfusion



Etude multicentrique 8 pays 16 Hopitaux 381 patients

» Evaluation du scanner / coronarographie associée à la scintigraphie





- 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)

ESC 2012 - D'après Lima J et al., abstract 3936,

Le scanner Volumique dynamique



European Heart Journal (2012) 33, 67–77
doi:10.1093/eurheartj/ehs348

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

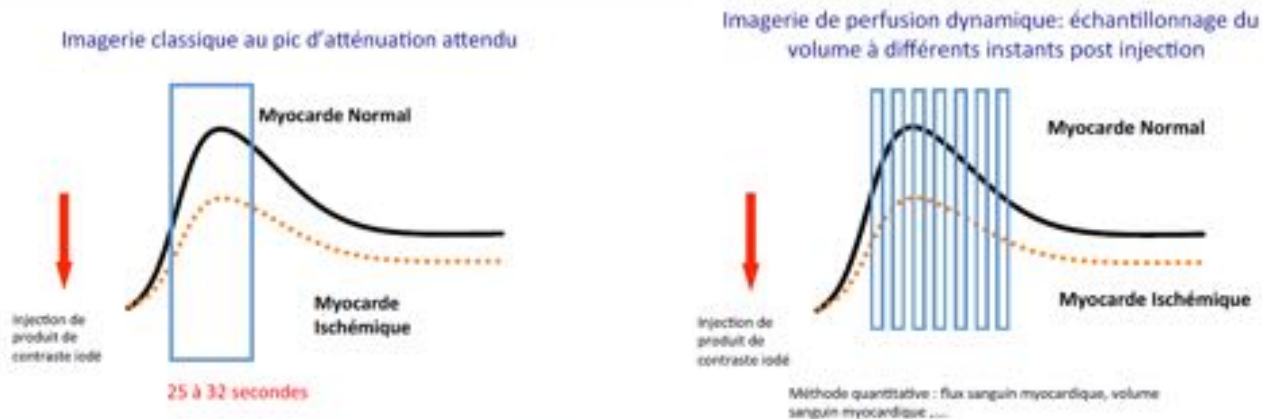
FFR < 0,8 en référence

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

Le scanner Volumique dynamique



Quantification of coronary flow using dynamic angiography with 320-detector row CT and motion coherence image processing: Detection of ischemia for intermediate coronary stenosis

Michinobu Nagao^{a,*}, Yuzo Yamasaki^b, Takeshi Kamitani^b, Satoshi Kawanami^a, Koji Sagiyama^b, Torahiko Yamanouchi^b, Yamato Shimomiya^c, Tetsuya Matoba^d, Yasushi Mukai^d, Keita Odashiro^e, Shingo Baba^b, Yasuhiro Maruoka^b, Yoshiyuki Kitamura^b, Akihiro Nishie^b, Hiroshi Honda^b

^a Departments of Molecular Imaging & Diagnosis, Graduate School of Medical Sciences, Kyushu University, Japan

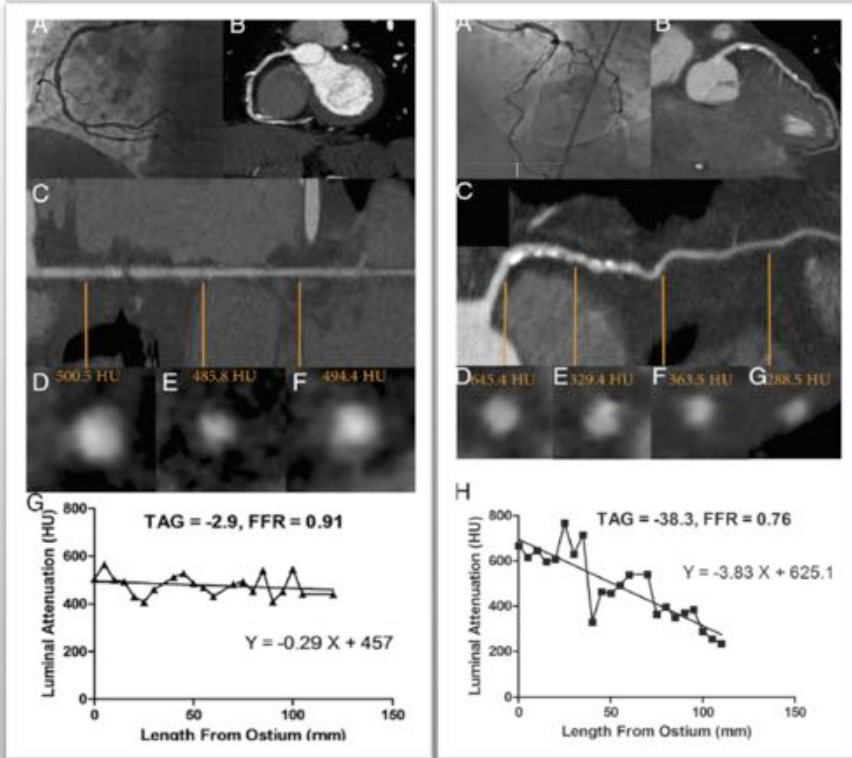
^b Departments of Clinical Radiology, Graduate School of Medical Sciences, Kyushu University, Japan

^c Departments of Medical Technology, Graduate School of Medical Sciences, Kyushu University, Japan

^d Departments of Cardiovascular Medicine, Graduate School of Medical Sciences, Kyushu University, Japan

^e Departments of Medicine and Biogeriatric Science, Graduate School of Medical Sciences, Kyushu University, Japan

TAG320 : Transluminal Contrast Attenuation Gradient



Coronaire normale Variation des densités / cm

LAD	LCX	RCA
11 UH	12 UH	5 UH

- » Constant et reproductible grâce aux acquisitions Iso phasiques
- » Mesure tout les 5 mm jusqu'a 2mm diam
- » Mesure des variations de densités/ostium et de part et d'autre de la sténose
- » Dès 20% de sténose diminution de 50 UH

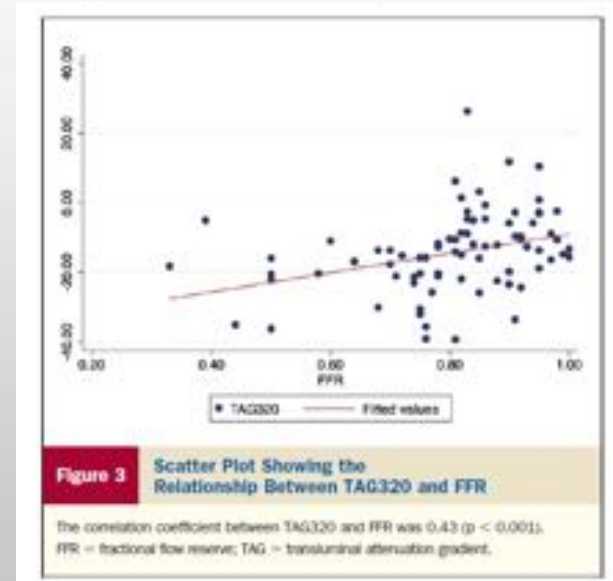
TAG320 : Transluminal Contrast Attenuation Gradient

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 ϕ < 2mm

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



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 ϵ < 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

Soustraction Coronaires



ONE
*Aquilion*TM



SureSubtraction

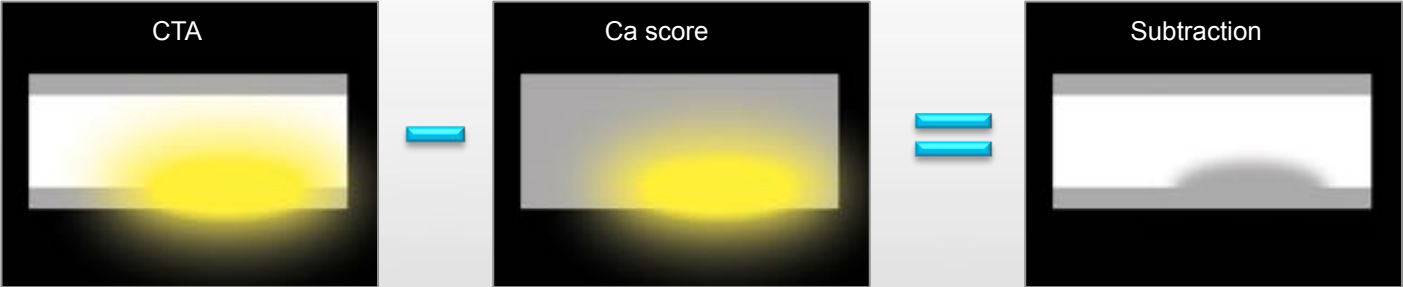


- » ZERO CLICK
- » ZERO ARTEFACTS DE SEGMENTATION

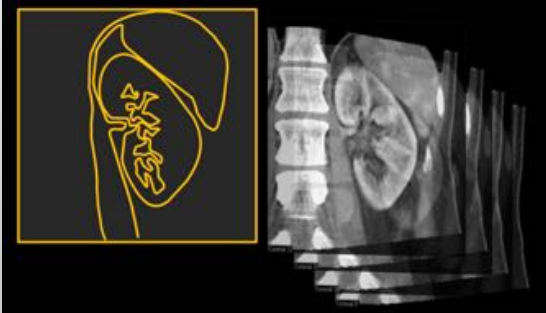


SureSubtraction

Adaptive Diagnostics
Clinical Solutions



RECALAGE
ELASTIQUE



SureSubtraction

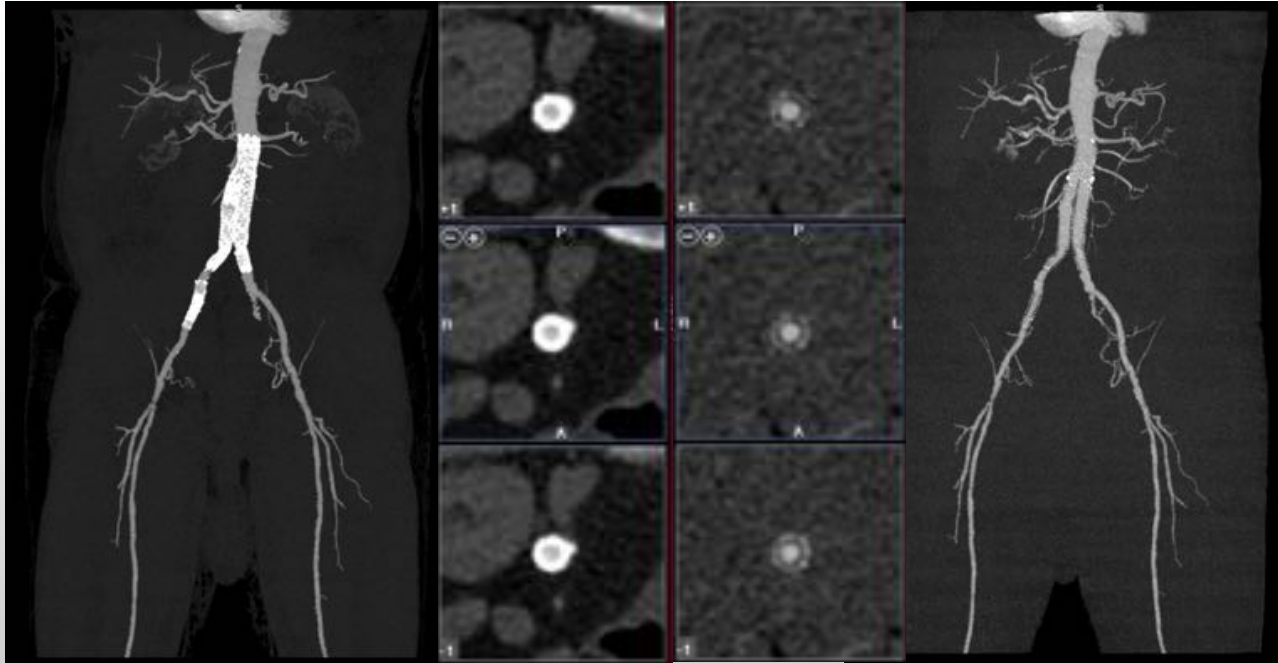


Images Natives



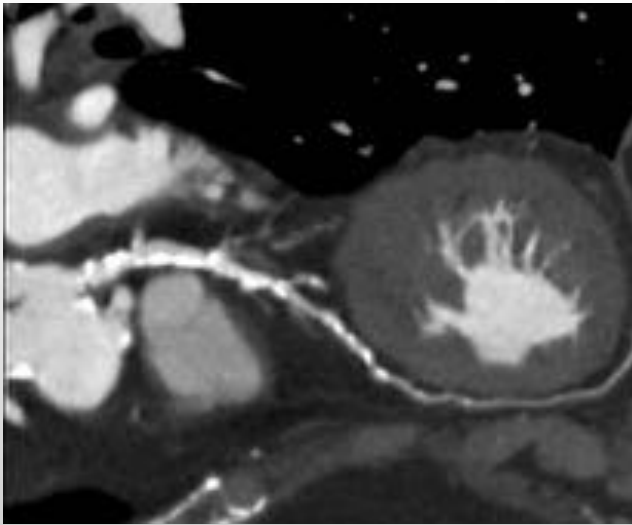
Bone Soustraction

SureSubtraction

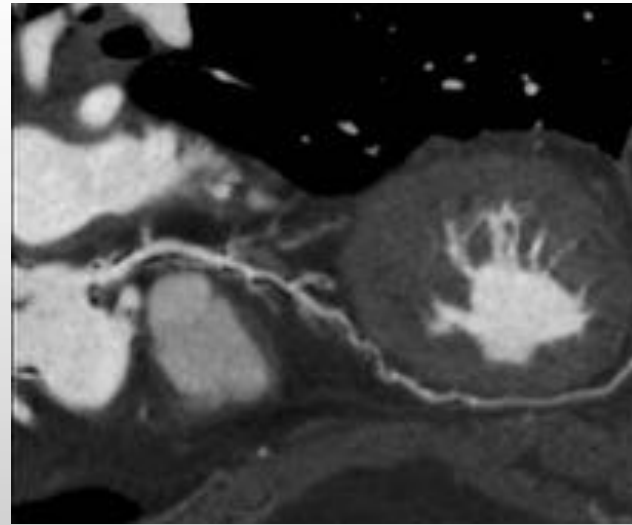


- » Suppression de l'os , du stent et du calcium
- » Suppression des artéfact en blooming
- » Meilleure visualisation de la lumière

SureSubtraction



Post Contrast CTA



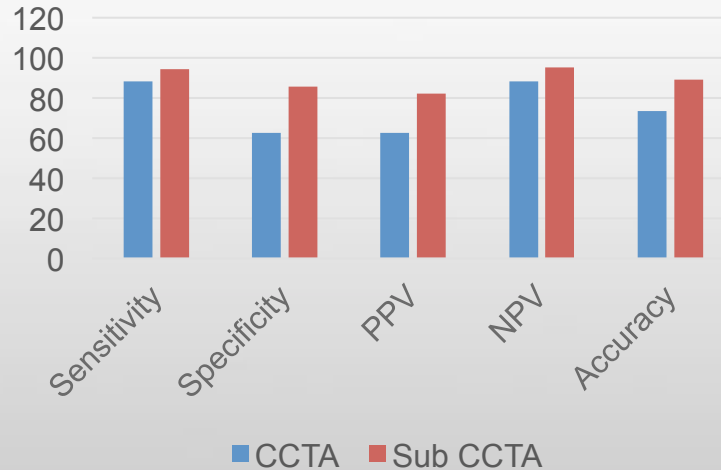
Subtracted

SureSubtraction

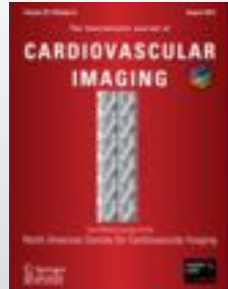
Subtraction coronary CT angiography using second-generation 320-detector row CT

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

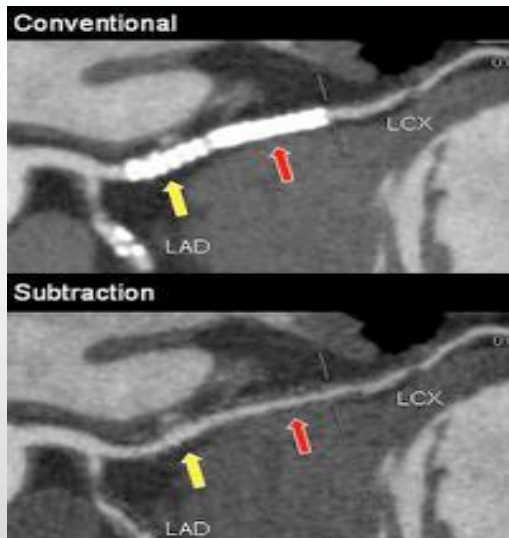
- » 20 patients
- » CS > 400
- » 82 segments
- » Stenose > 50%



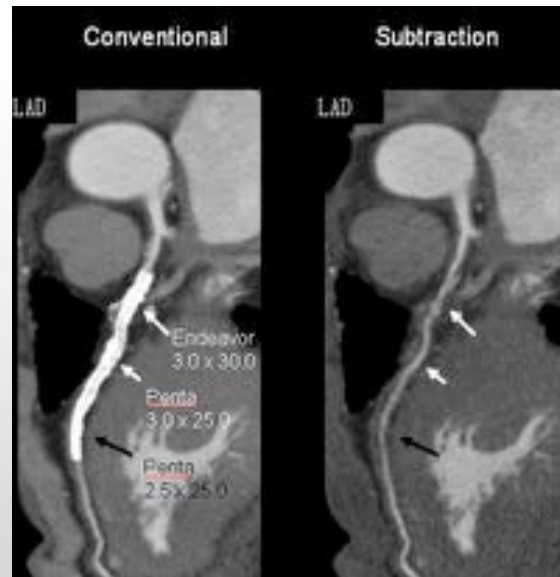
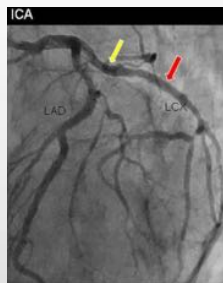
- » Réduction de 43,9 % à 8,5 % de segment non diagnostique
- » Réduction de 20% des faux positifs
- » Dose: 3,2 mSv +/- 1,8



SureSubtraction



- » RSNA 2014
- » 99 Patients
- » Coronarographie

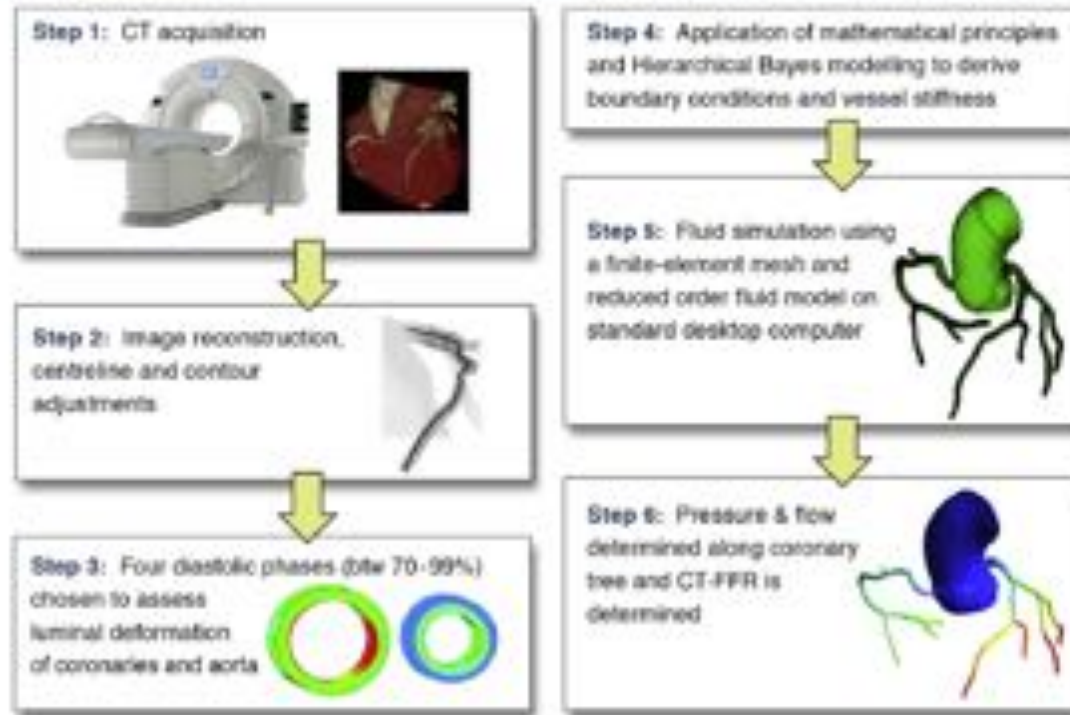


Précision/ Taille	CTA	DSCTA
3,5 mm	78 %	92 %
3 mm	61 %	90 %
2,5 mm	37 %	81 % P=0,0001

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

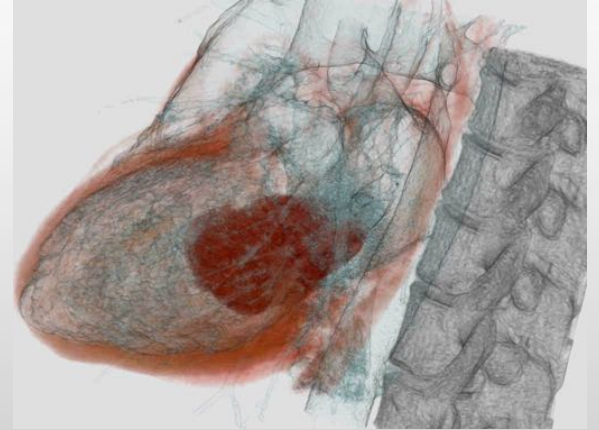
CT-FFR: WIP



- FFR CT calculée sur la déformation de la lumière des coronaires et de l'aorte puis mécanique des fluides

CT-FFR: WIP

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



Noninvasive CT-Derived FFR Based on Structural and Fluid Analysis

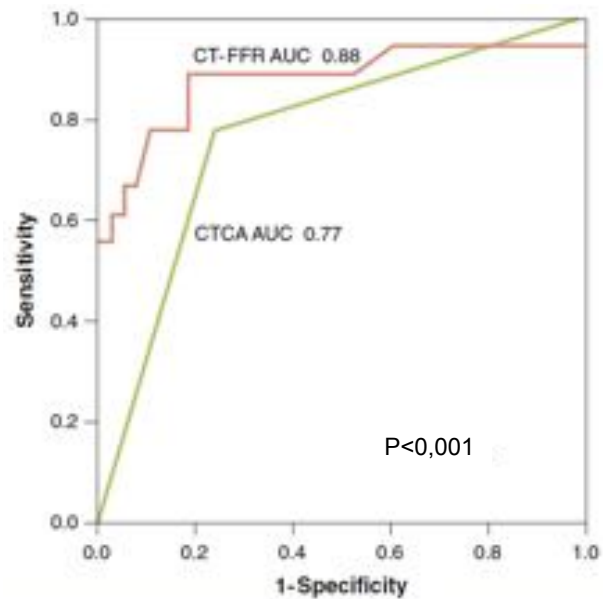
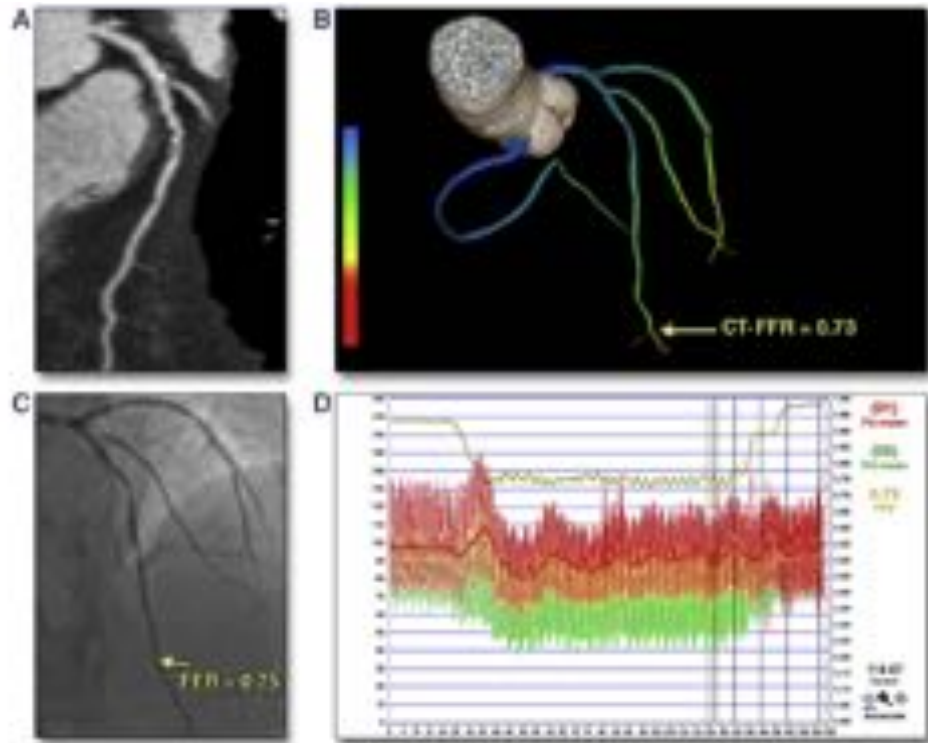
A Comparison With Invasive FFR for Detection of Functionally Significant Stenosis

Brian S. Ko, MBBS (Hons), PhD,^a James D. Cameron, MBBS, BE, MD,^a Ravi K. Munnur, MBBS,^a Dennis T.L. Wong, MBBS (Hons), PhD,^a Yasuko Fujisawa, BSc,^b Takuya Sakaguchi, PhD,^b Kenji Hirohata, PhD,^c Jacqui Hislop-Jambrich, PhD,^c Shinichiro Fujimoto, MD, PhD,^c Kazuhisa Takamura, MD, PhD,^c Marcus Crossett, BSc,^{a,f} Michael Leung, MBBS (Hons), PhD,^a Ahilan Kuganesan, BSc,^{a,f} Yurvaraj Malaiappan, MBBS,^a Arthur Nasis, MBBS (Hons), PhD,^a John Troupis, MBBS,^{a,f} Ian T. Meredith, MBBS (Hons), PhD,^a Sujith K. Seneviratne, MBBS^a

From the ^aMonash Cardiovascular Research Centre, MonashHEART, Department of Medicine, Monash Medical Centre, Monash Health, and Monash University, Melbourne, Victoria, Australia; ^bToshiba Medical Systems Corporation, Otawara, Japan; ^cToshiba Corporation, Kawasaki, Japan; ^dToshiba Medical Australia, North Ryde, Australia; ^eDepartment of Cardiovascular Medicine, Juntendo University Graduate School of Medicine, Tokyo, Japan; and the ^fDepartment of Diagnostic Imaging, Monash Medical Centre, Monash Health, Melbourne, Clayton, Victoria, Australia. Drs. Ko and Wong are funded by the National

- 42 Patients
- FFR invasive en référence
- 30 minutes de calcul en local

CT-FFR: WIP



VOIR. DIAGNOSTIQUER. TRAITER.

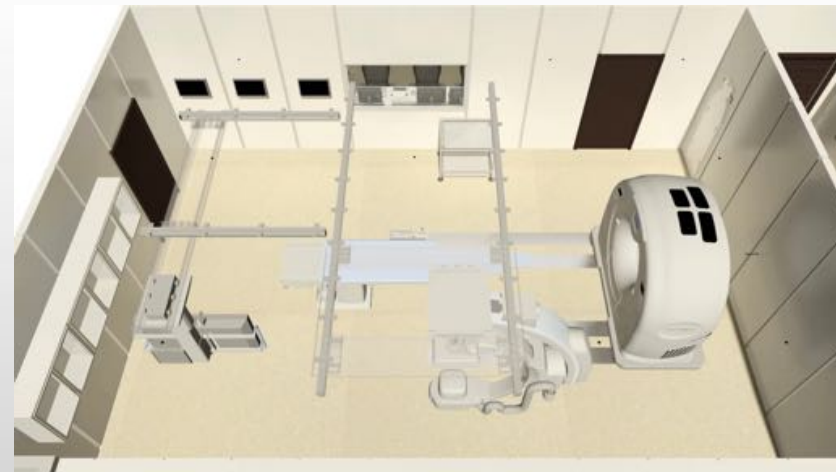
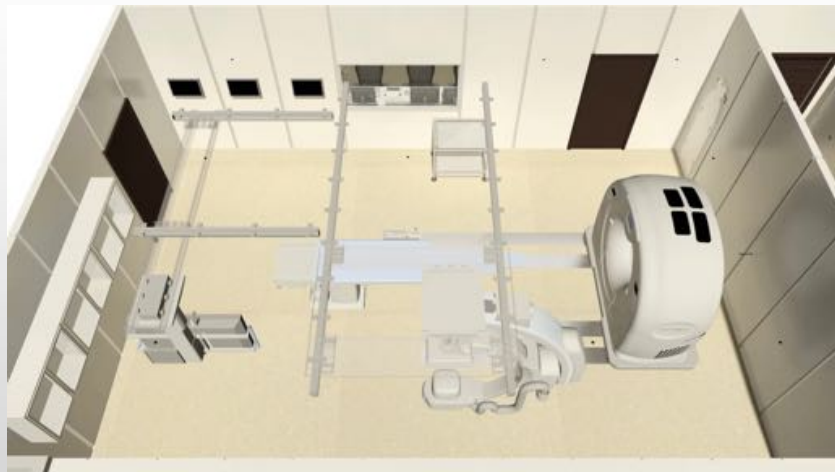


Infinix ^{4D}CT

**TOSHIBA
MEDICAL**

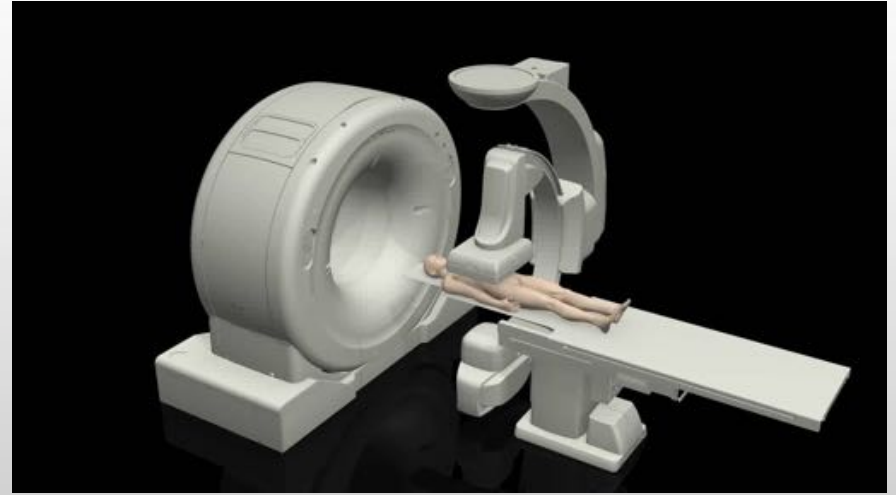
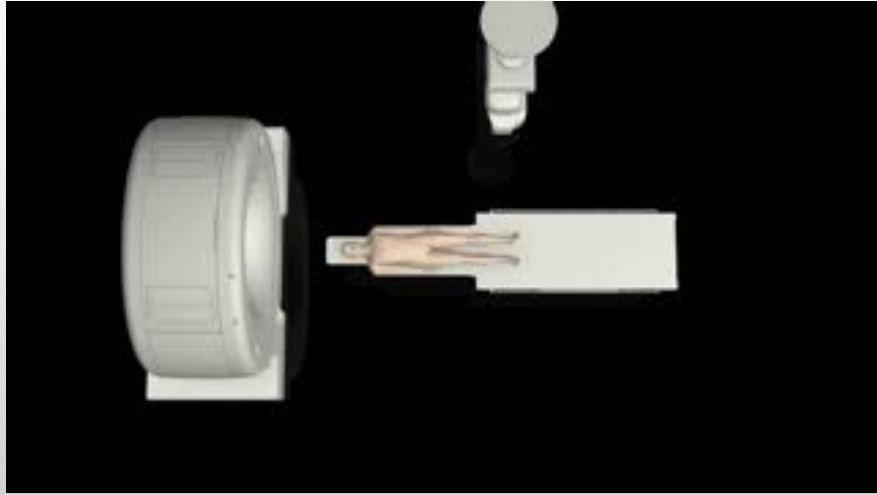
Interface commune et synchronisation des volumes

VOIR. DIAGNOSTIQUER. TRAITER. *Infinix 4D CT*



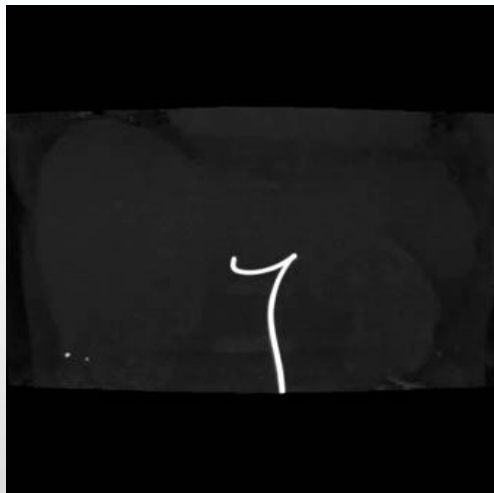
Infinix 4D CT

VOIR. DIAGNOSTIQUER. TRAITER. *inix* 4^DCT



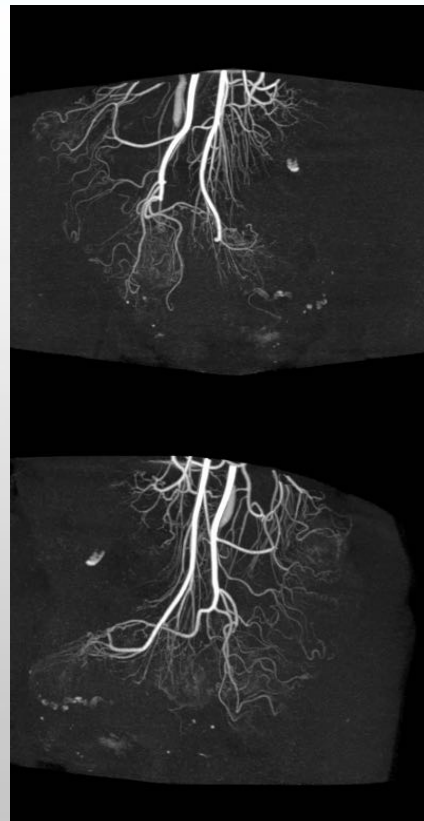
Infinix 4^DCT

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CT avec injection intra- artérielle

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- » Augmenter la précision pour les poses de TAVI , TMVR
- » Ablations cardiaques - Planification
 - Contrôle pendant procédure
- » Prise en charge des douleurs thoraciques atypiques
- » Contrôle per/post angioplastie sous scanner



Urgences | Polytraumatisés

Recommandations SFR et G4: Accès simplifié au scanner et à la salle d'angiographie dans tous les services d'urgence ayant plus de 30.000 passages par an.

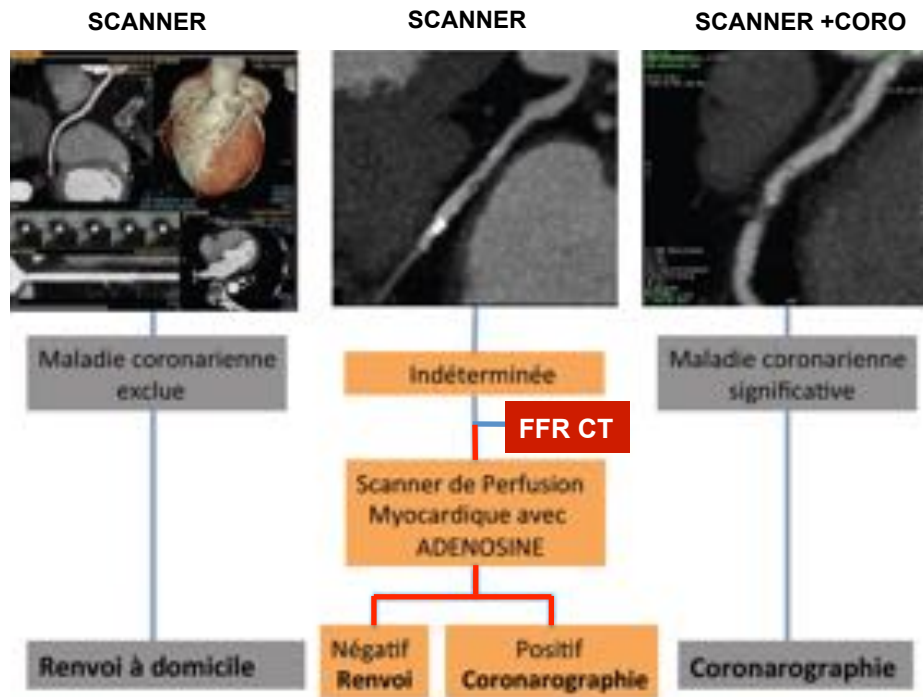
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➤ Impact sur la prise en charge des patients



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