

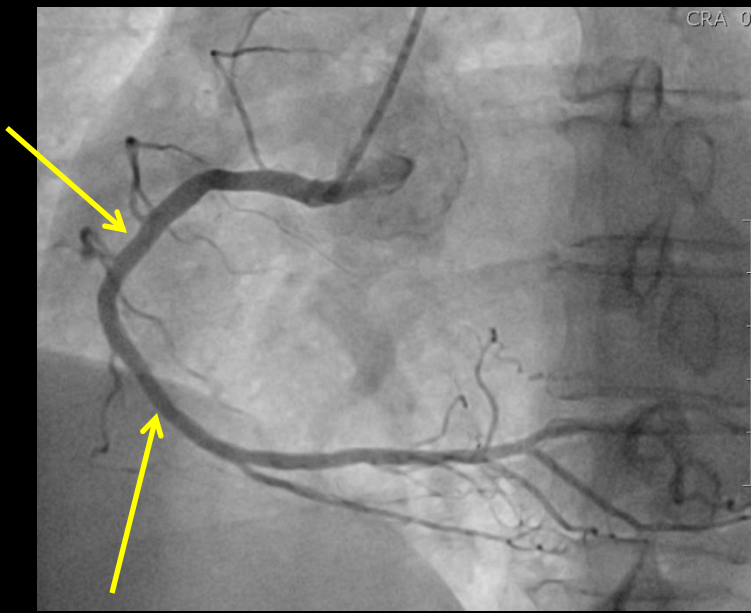
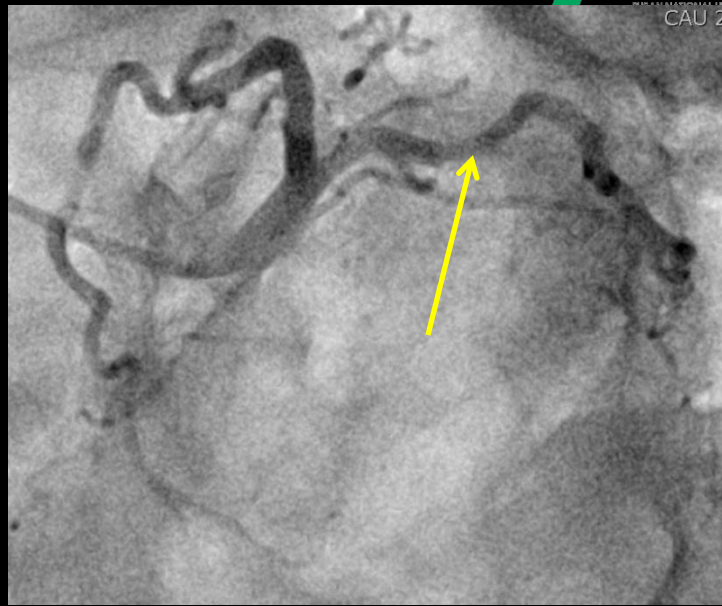
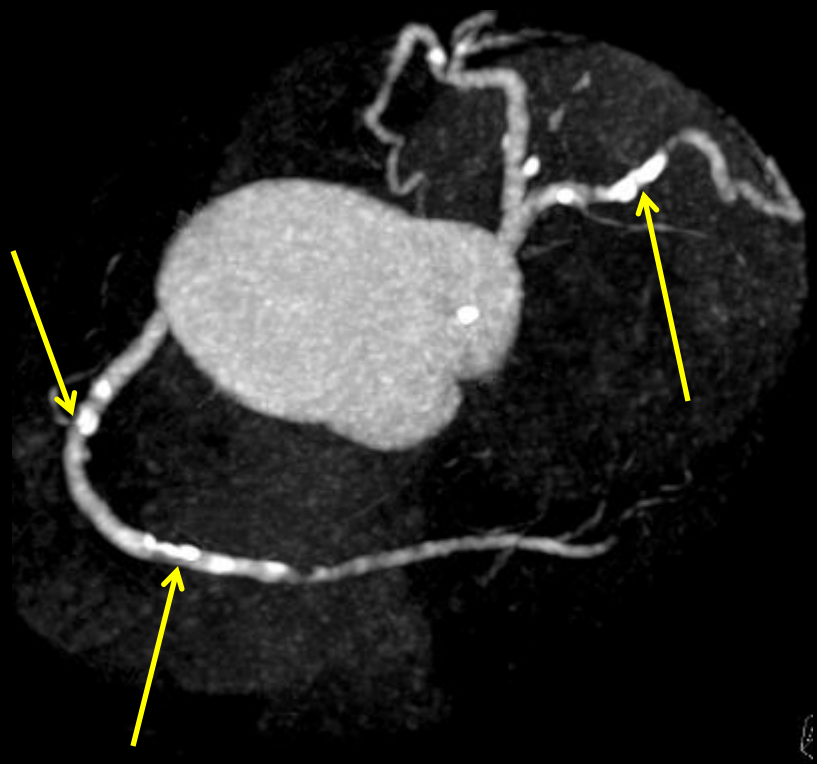
Stress CT myocardial perfusion imaging

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Introduction

- ◆ Coronary CT angiography (CCTA) has been known as good modality for the detection of coronary artery disease (CAD)

Author	Journal	Sen	Spe	PPV	NPV	
Mollet NR	<i>Circulation</i> 2005	99%	95%	76%	99%	
Leschka S	<i>EJH</i> 2005	94%	97%	87%	99%	
Pugliese F	<i>Eur Radiol</i> 2005	99%	96%	78%	99%	per segment
		100%	90%	96%	100%	per patient
Raff GL	<i>JACC</i> 2005	86%	95%	66%	98%	per segment
<i>Including high heart rate & < 1.5 mm diameter</i>		91%	92%	80%	97%	per artery
		95%	90%	93%	93%	per patient



Myocardial perfusion imaging (MPI)

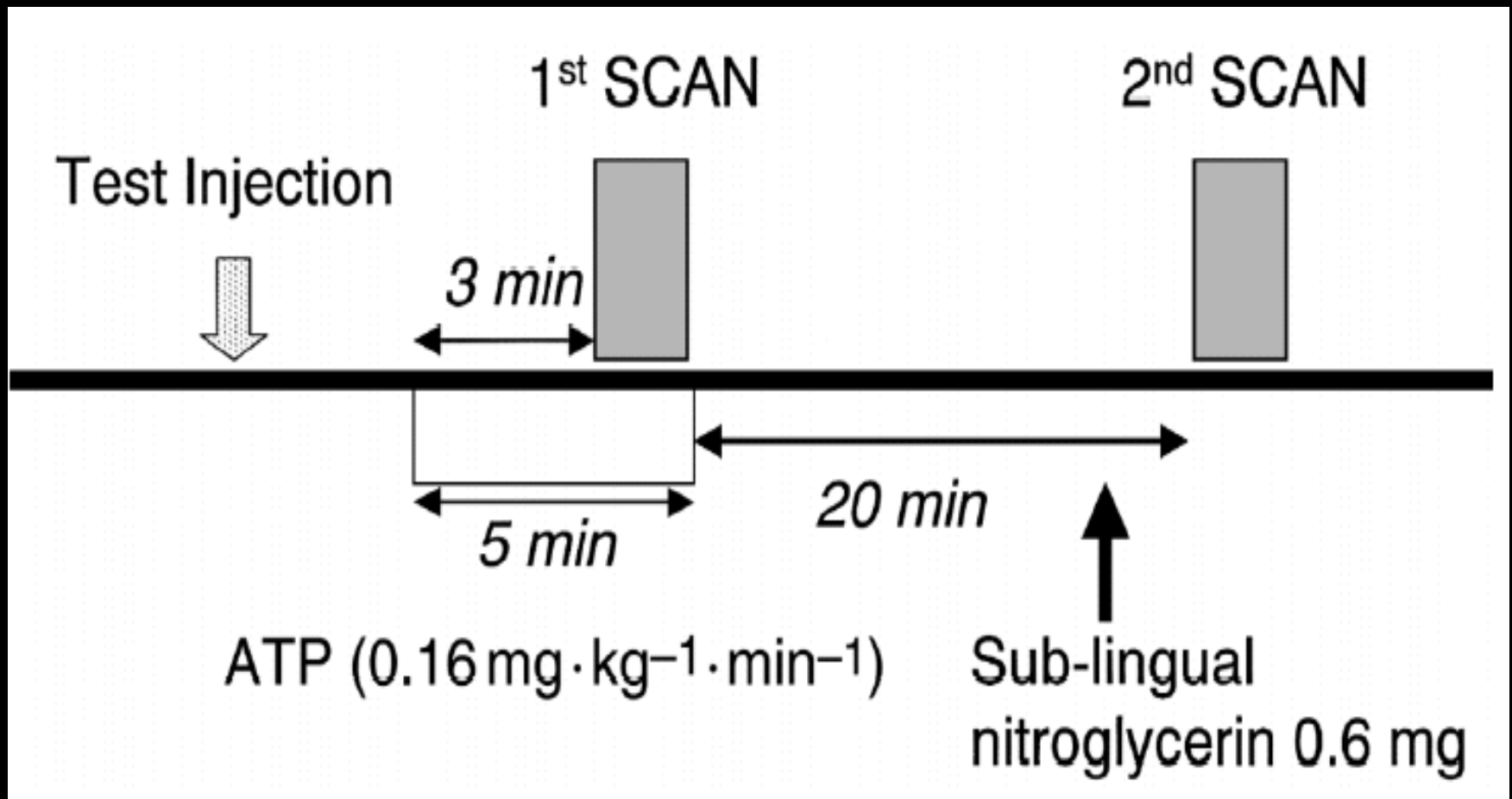
- ◆ Single photon emission computed tomography (SPECT)
- ◆ Positron emission tomography (PET)
- ◆ Magnetic resonance imaging (MRI)

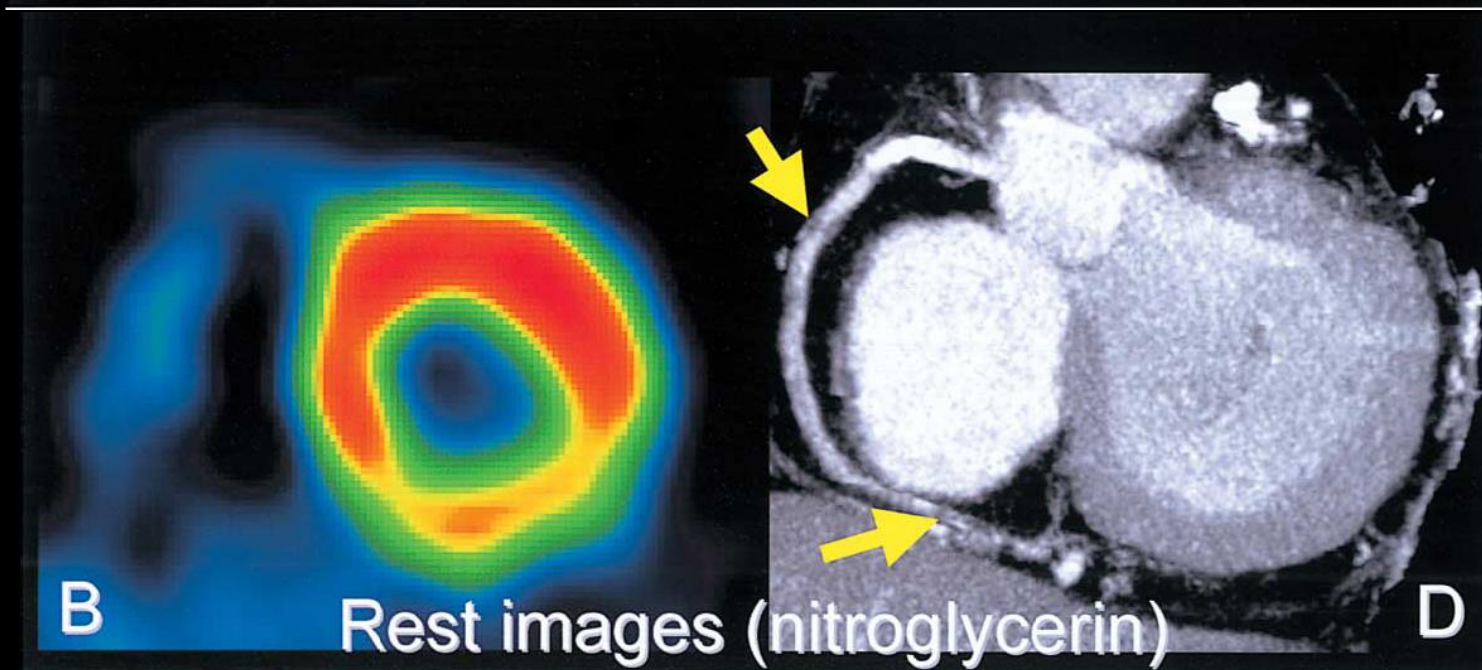
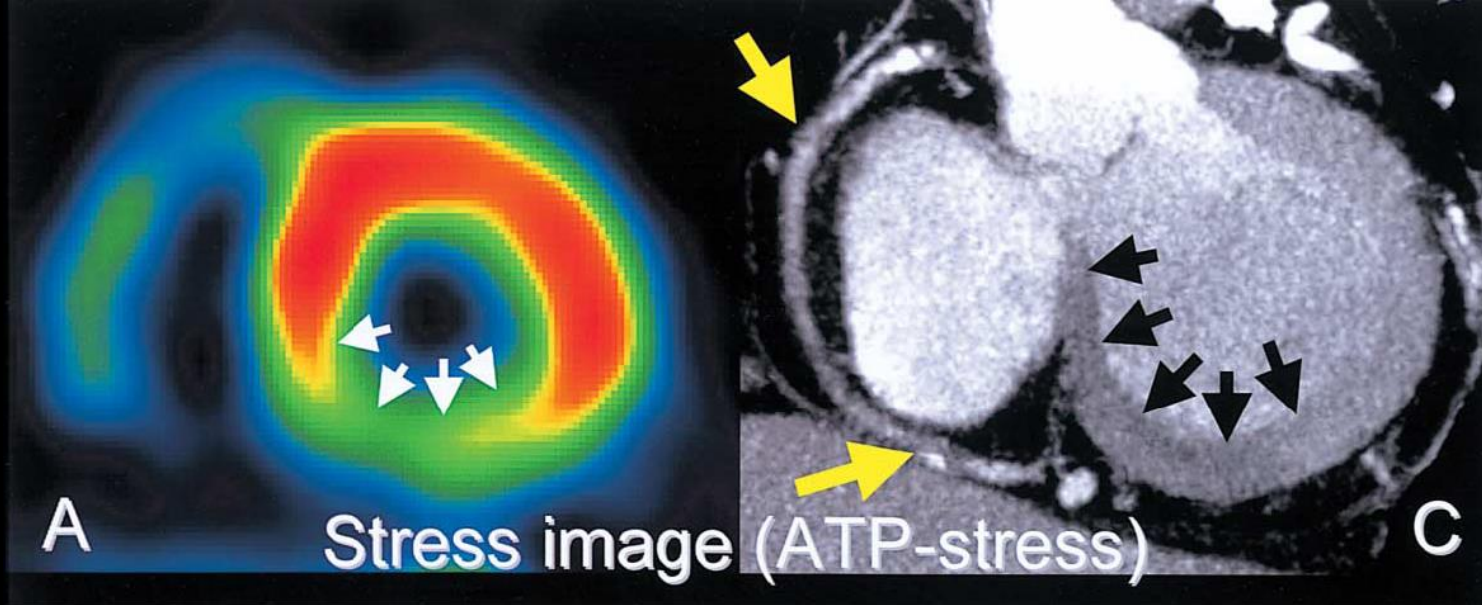
CT myocardial perfusion

- ◆ Single Energy with adenosine stress
- ◆ Dual Energy
 - Without adenosine stress
 - With adenosine stress

CT myocardial perfusion

Kurata A, et al; Circ J 2005; 69: 550 - 557





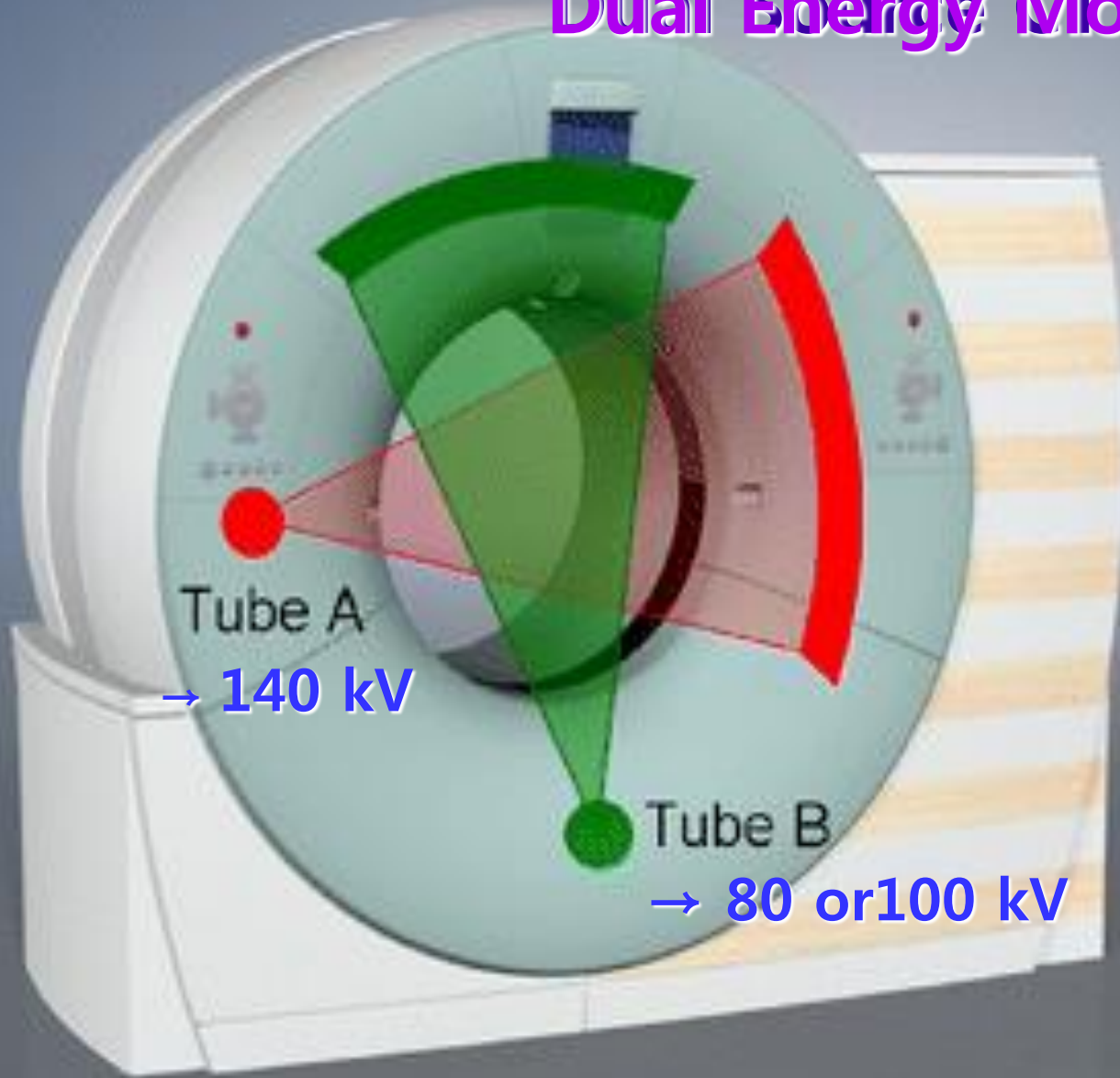
The agreement between MDCT and
MPS was 83% ($p < 0.05$).

MPS: myocardial perfusion scintigraphy

Assessability in CT coronary angiography

Resting vs stress (89% vs 48%, $p < 0.05$)

Dual Energy Mode

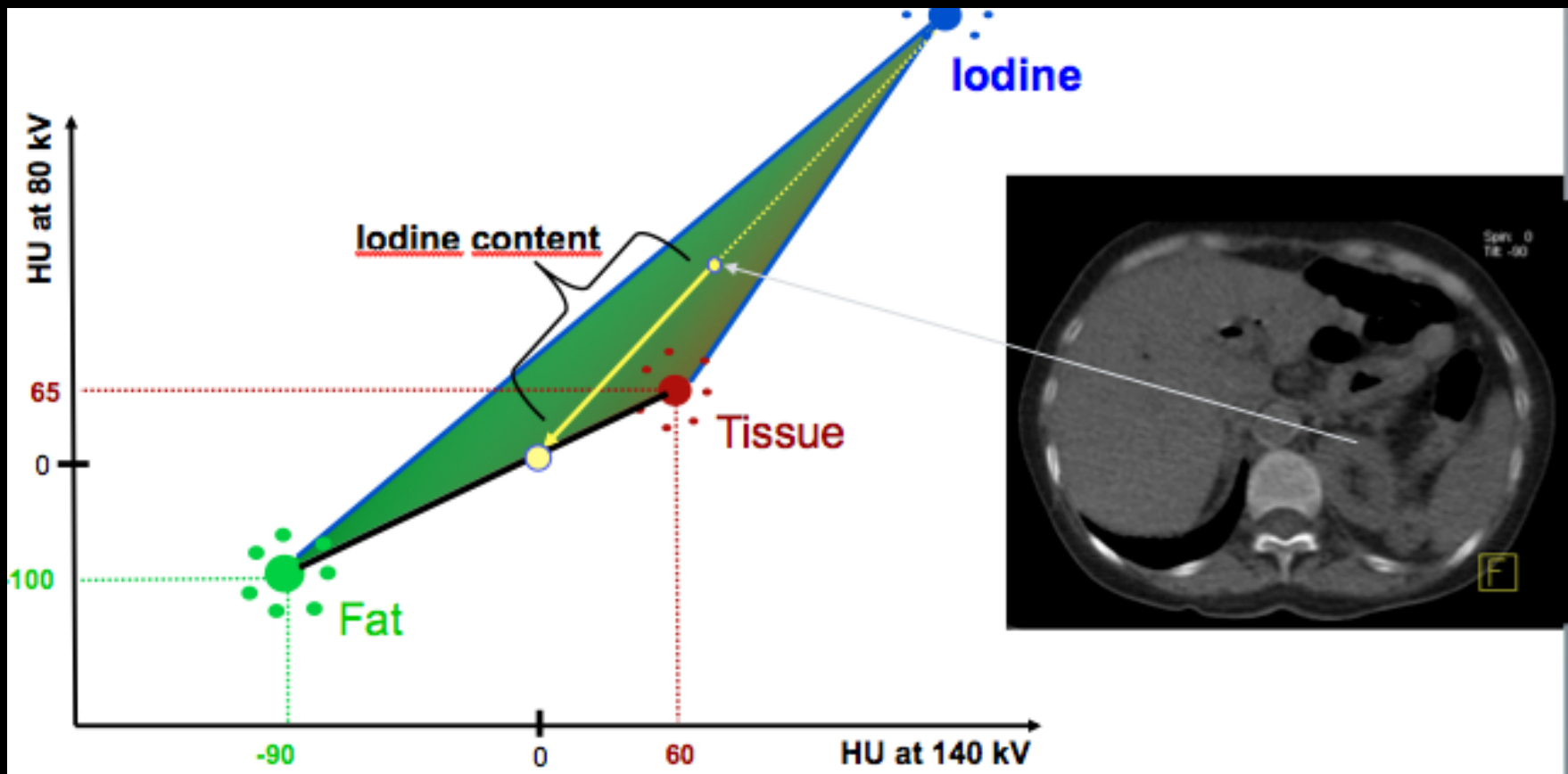


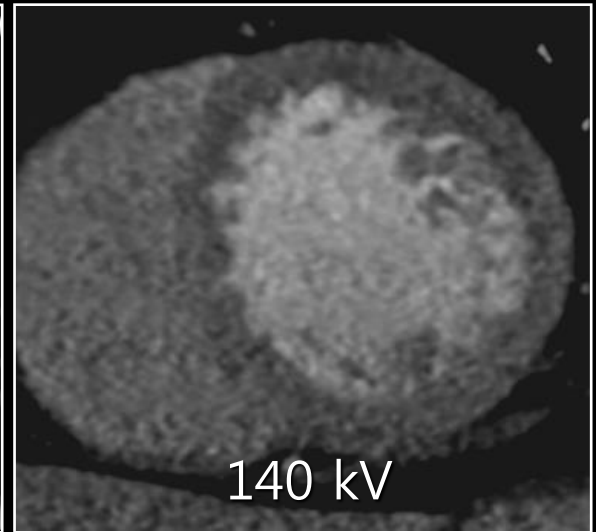
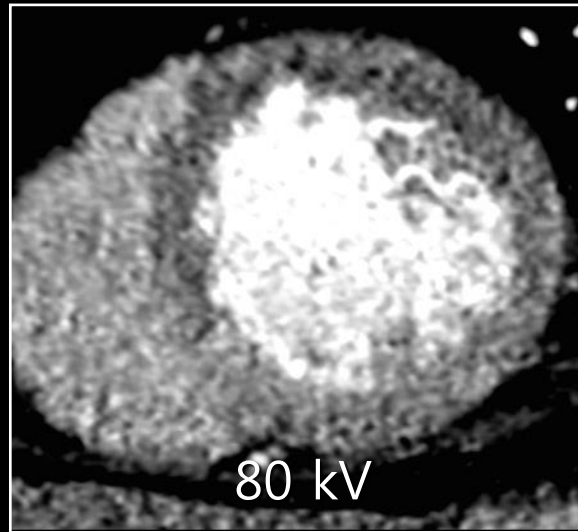
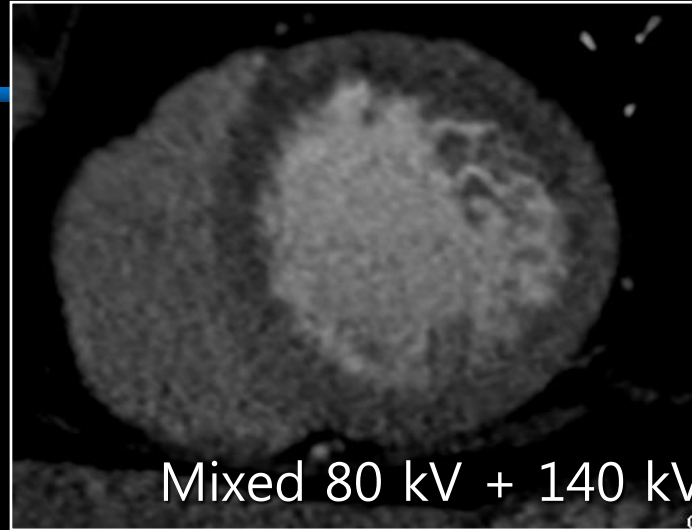
Tube A
→ 140 kV

Tube B
→ 80 or 100 kV

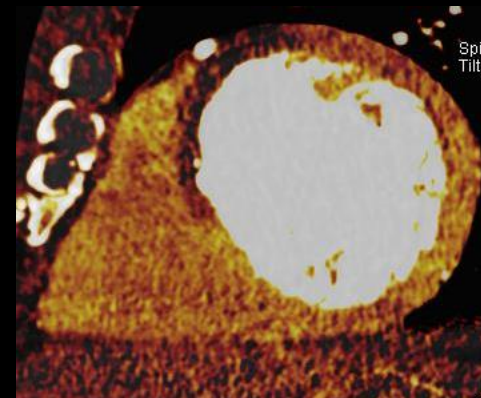
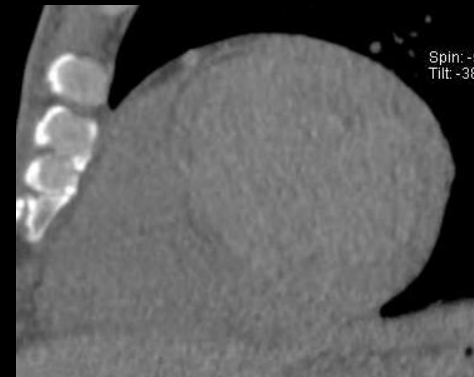
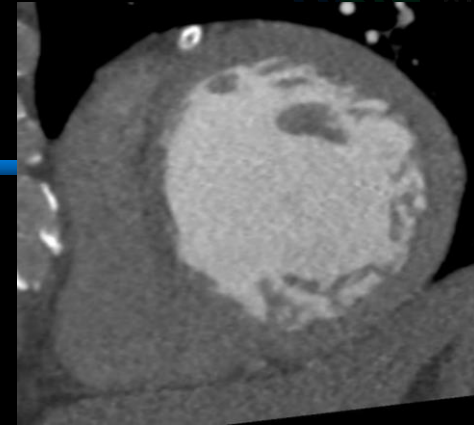
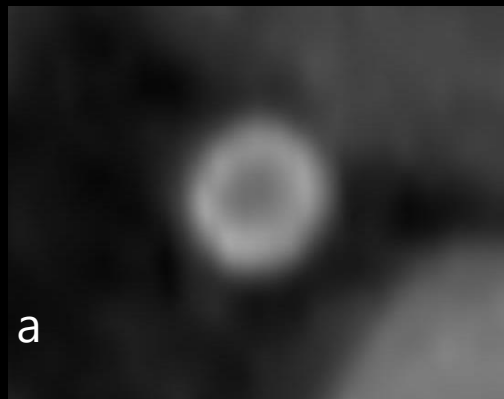
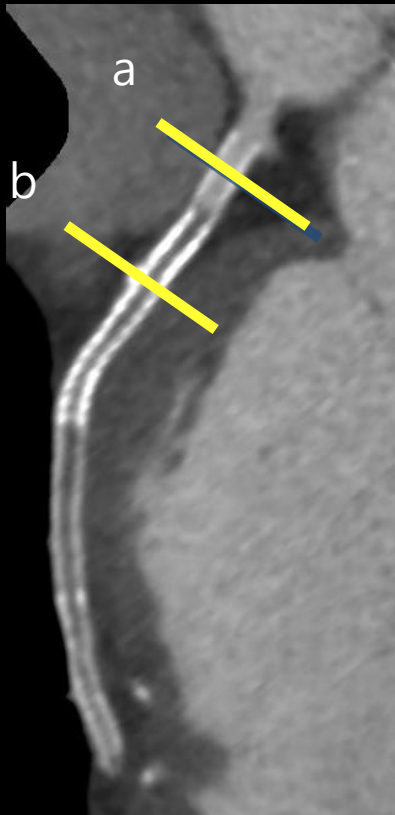
Principle of DECT

Three material decomposition: quantification of iodine





64 yrs / M



Sung Min Ko
Jin Woo Choi
Meong Gun Song
Je Kyoum Shin
Hyun Kun Chee
Hyun Woo Chung
Dong Hun Kim

**Myocardial perfusion imaging using
adenosine-induced stress dual-energy
computed tomography of the heart:
comparison with cardiac magnetic
resonance imaging and conventional
coronary angiography**

MR: sensitivity (89%), specificity (78%)
CCA: sensitivity (89%), specificity (83%)

Single scan adenosine-induced stress low dose CT myocardial perfusion imaging using 128 slice dual source MDCT: Comparison with fraction flow reserve

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Jun Kim¹, Jung Soo Kim¹, Sung Kuk Song¹, Dong Chul Han¹,
Soo Jin Lim²

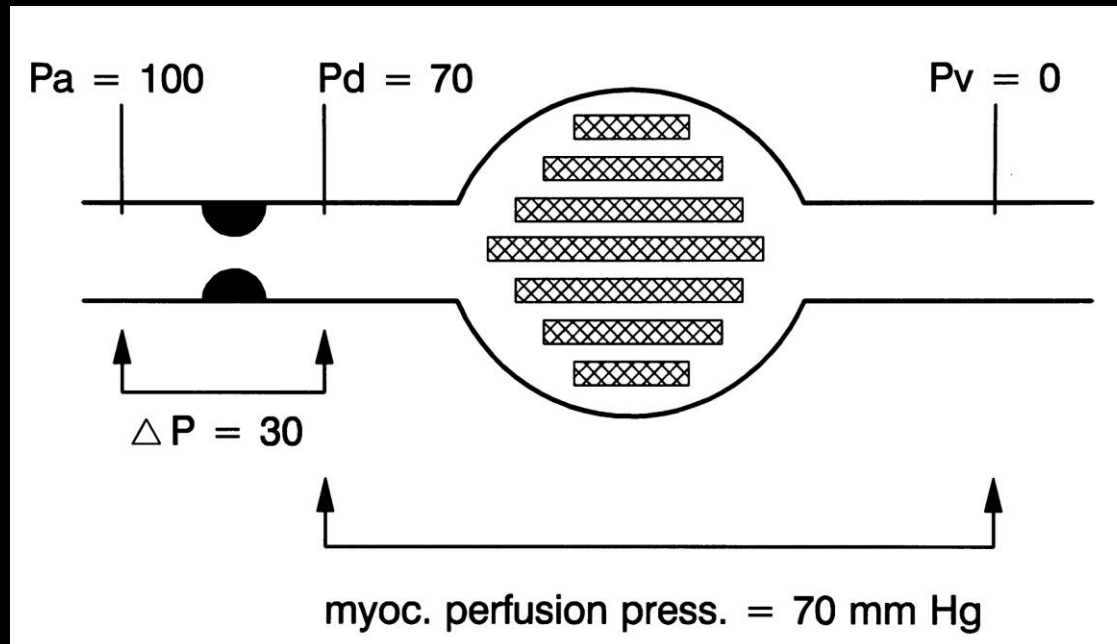
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Fractional Flow Reserve

◆ $FFR = (P_d - P_v) / (P_a - P_v)$

if, central venous pressure ≈ 0 (negligible)
 (mean RA pressure)
 = P_d / P_a



Introduction

- ◆ CCTA incorporating resting and stress MPI together with dual-64 slice MDCT has an important potential role in MPI for detection of myocardial ischemia.
- ◆ High radiation dose: 11.2 mSv

J Am Coll Cardiol 2009:1072-1084

- ◆ Dual-128 slice MDCT with very high temporal resolution and low radiation dose technique was developed and it is supposed that dual-128 slice MDCT indicate myocardial perfusion status and coronary artery anatomy simultaneously

Purpose

- ◆ To investigate the feasibility of single scan adenosine-induced stress low dose CT myocardial perfusion imaging (MPI) using 128 slice dual-source MDCT for diagnosis of ischemic heart disease (IHD)

Material and method

Approved in IRB
chest pain in consecutive 95 pts. with low to intermediate
probability of CAD.
Underwent low dose stress MDCT

28 pts. (more than 50% stenosis on CCTA)
underwent CAG and measured FFR

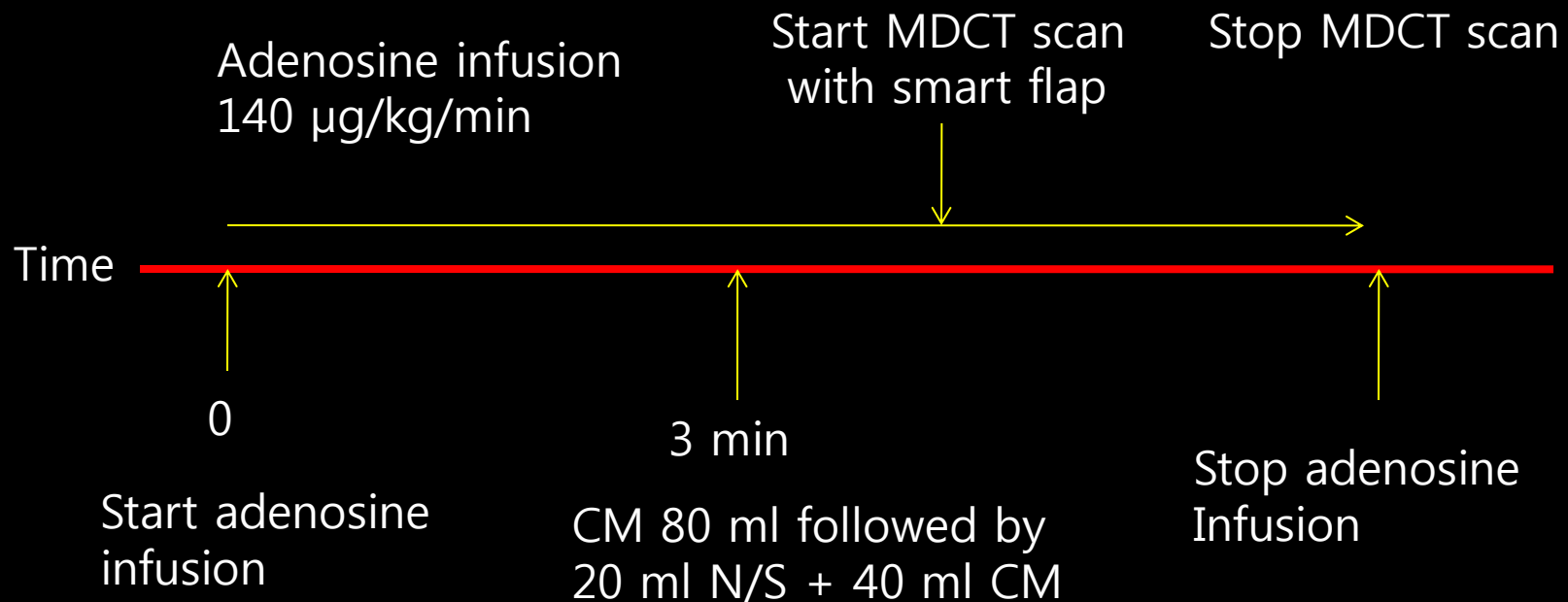
Compare FFR with CCTA and CTMPI

Patients

◆ Exclusion criteria

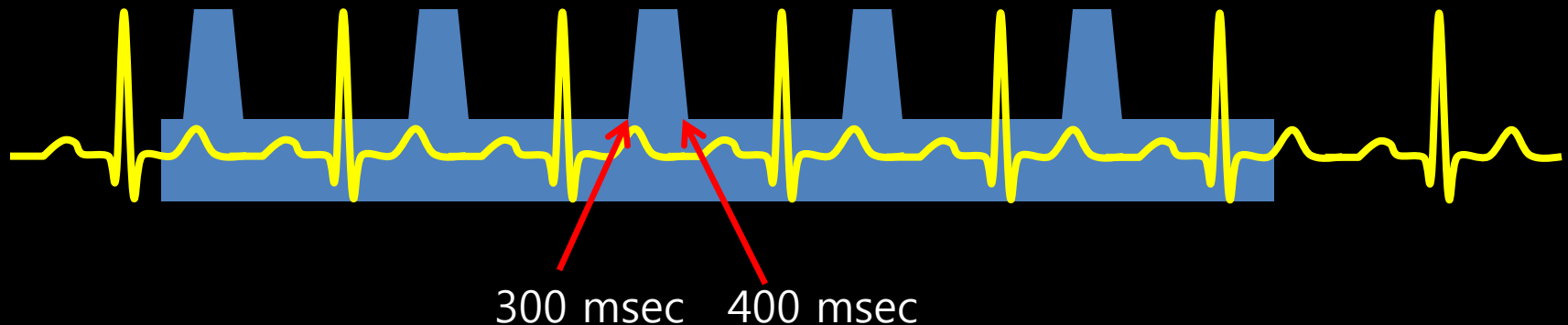
- Myocardial infarction Hx
- Stent, bypass graft Hx
- Atrial flutter or fibrillation
- A-V block (>1)
- Severe obstructive pulmonary disease, bronchial asthma
- Valvular heart ds.
- Impaired renal function, pregnancy, hyperthyroidism
- Known allergy to iodinated contrast
- Severe LV dysfunction or heart failure

Adenosine stress CT MPI protocol



MDCT protocol

- ◆ Dual 128-slice MDCT (Siemens medical solution, Germany) with ECG dependent tube current modulation for radiation saving



Interpretation

◆ CCTA

- Read by one radiologist and cardiologist with consensus
- MIP series (short axis, 2, 4 chamber, curved)
- VR
- Per vessel analysis
- > 50% stenosis: +

Interpretation

◆ CTMPI

- Read by one radiologist and cardiologist with consensus
- 10 mm thick short axis MPR
- Window width: 200, level: 100
- 17- segment model

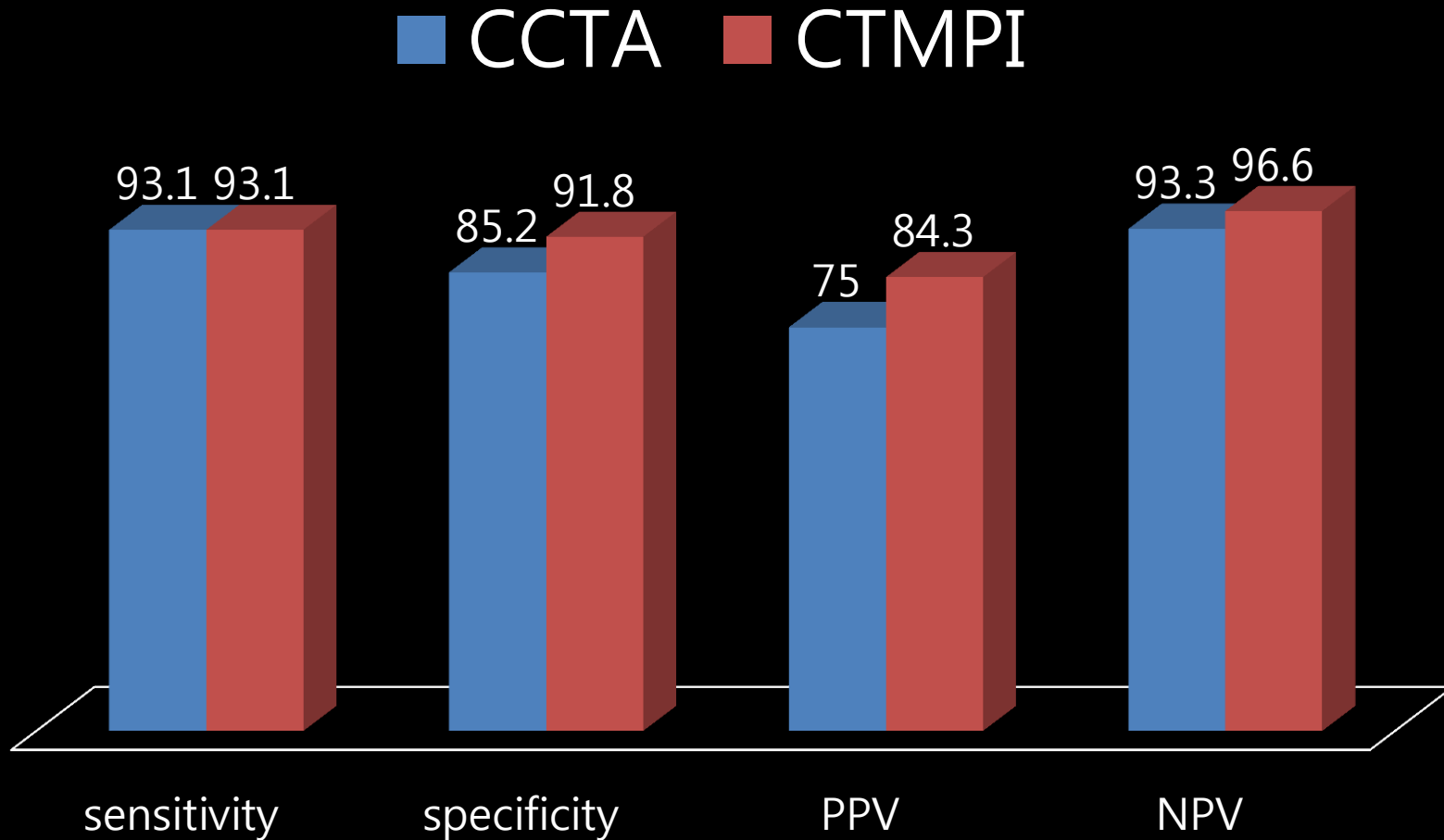
FFR

- ◆ vessel with $> 50\%$ luminal stenosis on CCTA or CAG
- ◆ < 0.75 cut off value
 - < 0.75 : positive
 - > 0.75 or $< 50\%$ luminal stenosis on CAG : negative

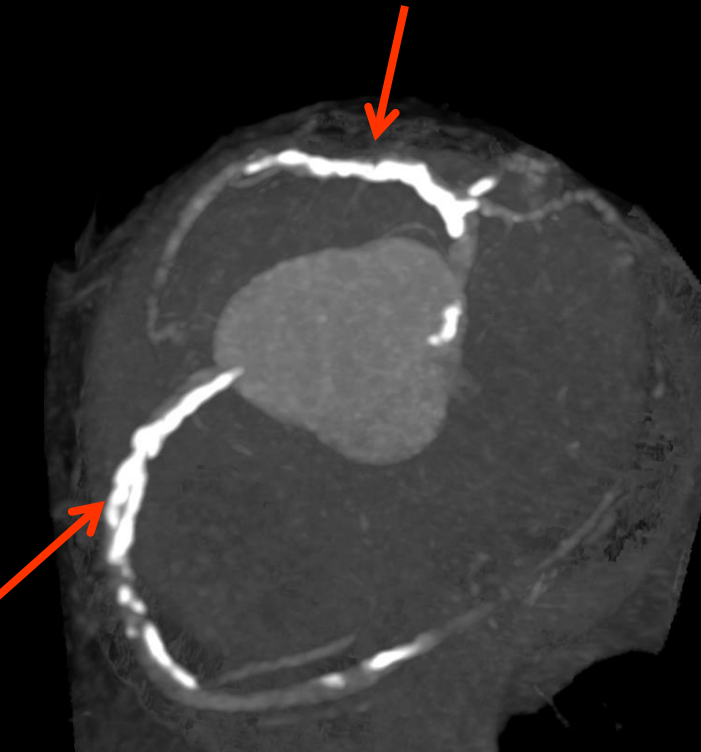
Result

- ◆ FFR was measured in 40 vessels of 28 patients
- ◆ male: 18, mean age: 61.7 ± 20.5 , mean heart rate: 74.6 ± 2.8 bpm
- ◆ Diagnostic acceptable image quality of CCTA and CTMPI was obtained in all 28 patients
- ◆ The effective radiation dose was 4.63 ± 2.57 mSv

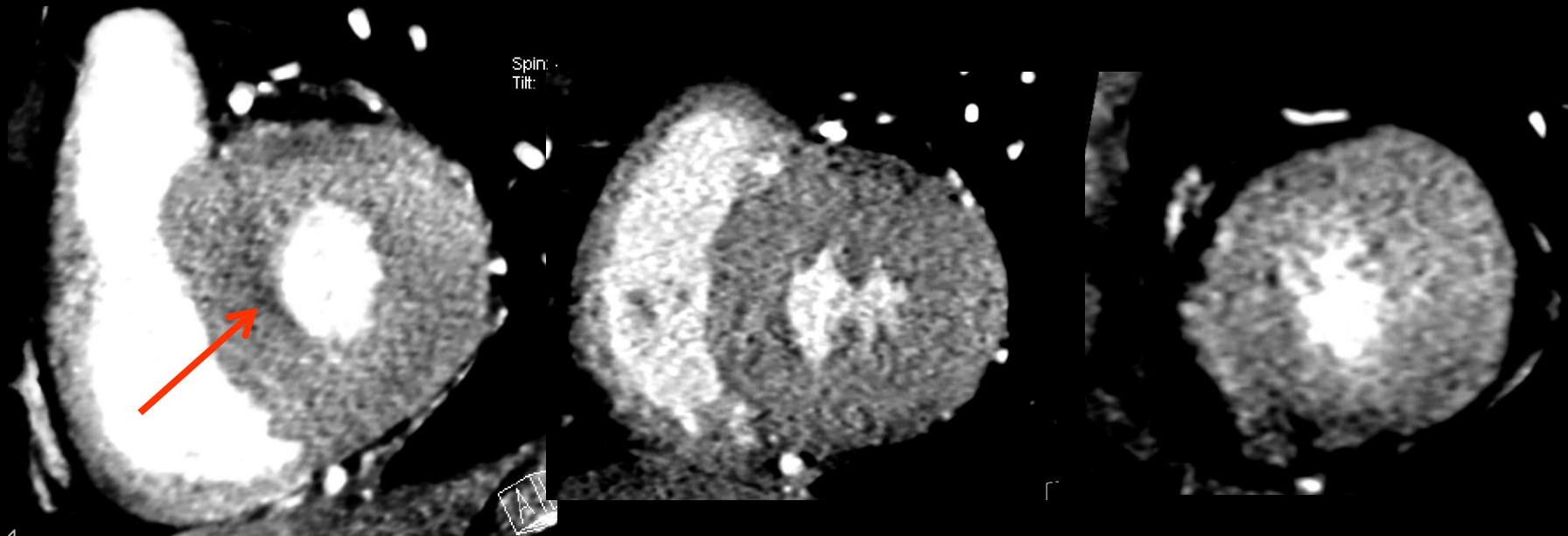
Diagnostic accuracy



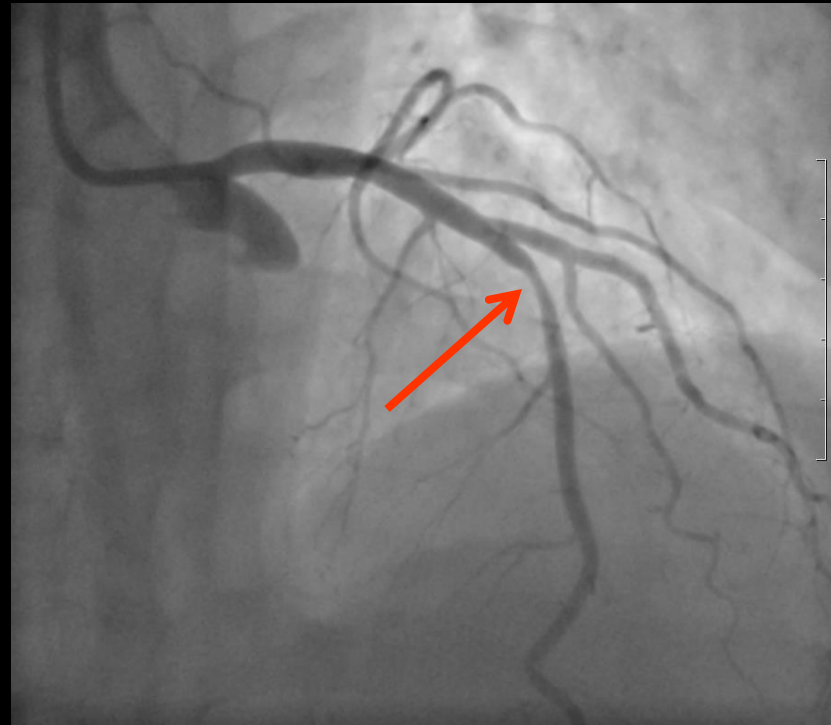
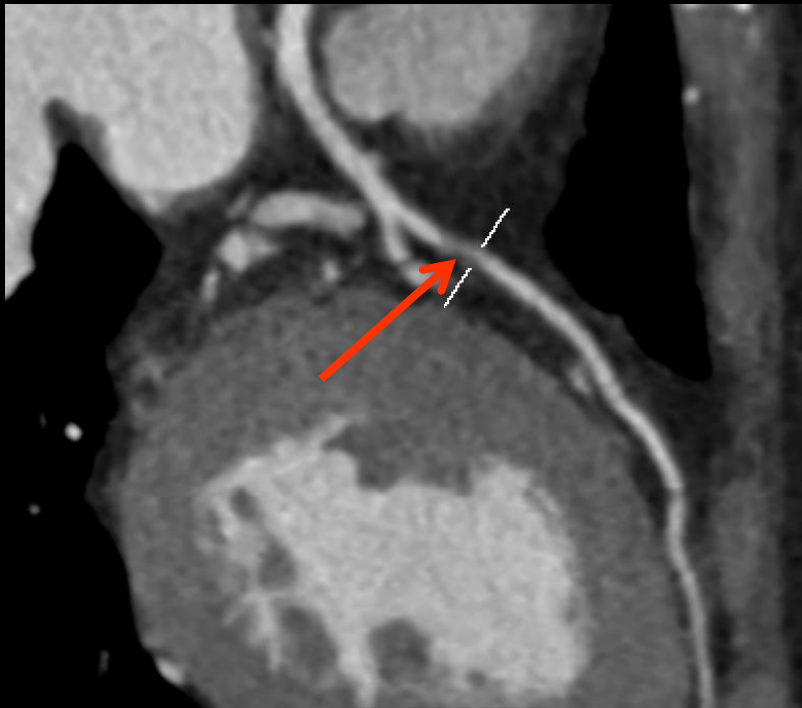
CCTA(+/+), CAG (-/-)



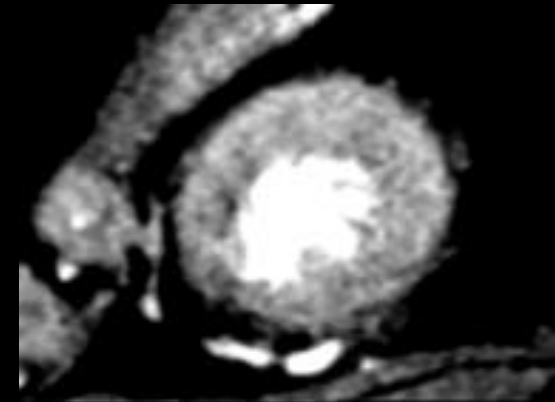
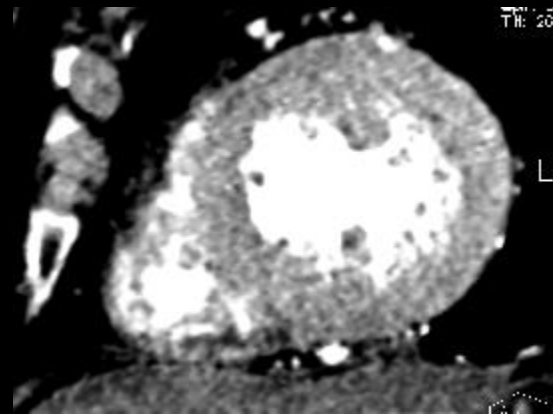
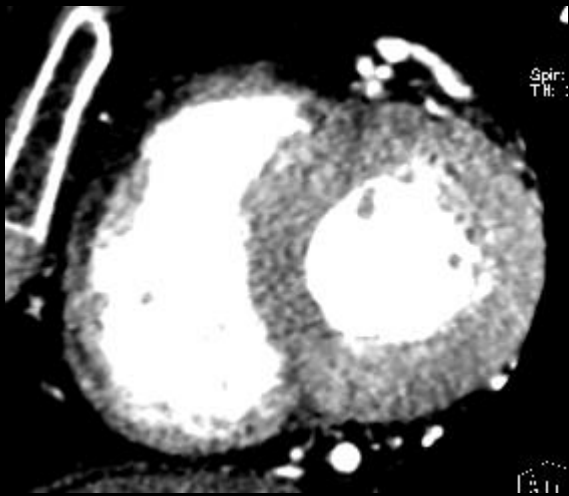
CTMPI (+/-), FFR (+/-)



CCTA(+), CAG(+)



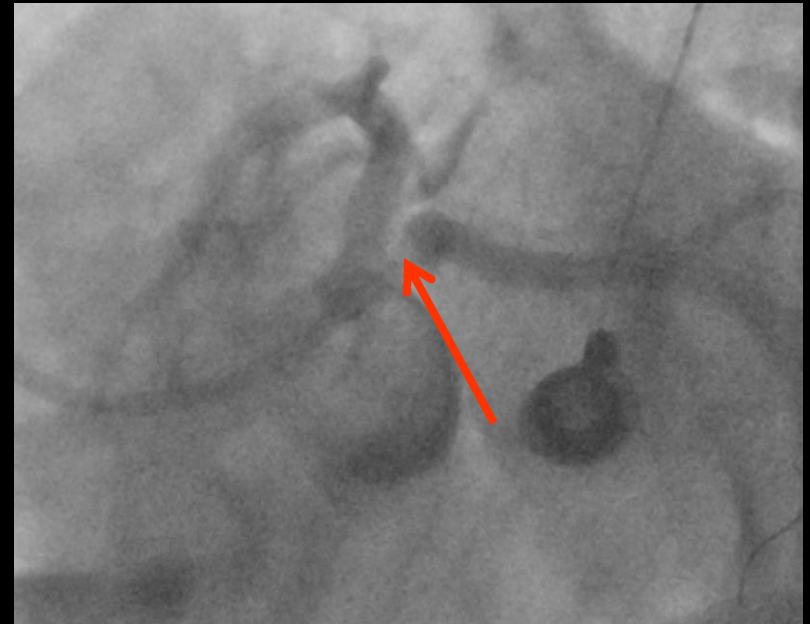
CTMPI(-), FFR (-)



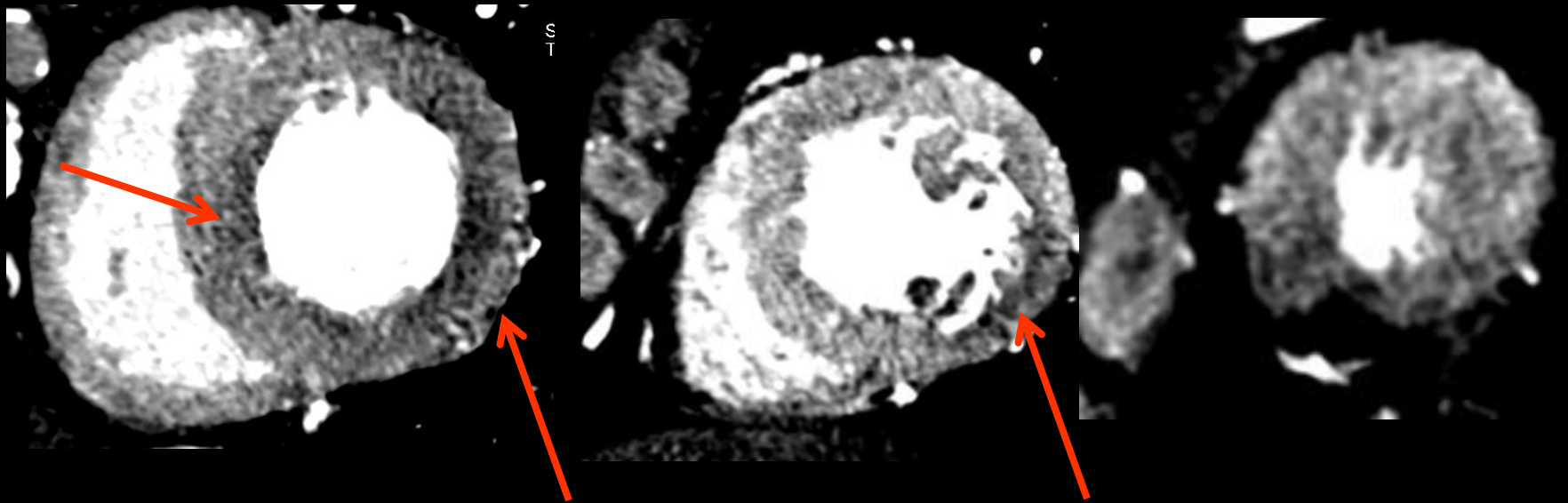
CCTA(+), CAG(+)



15X135



CTMPI (+), FFR (+)



Conclusion

- ◆ Single scan adenosine-induced stress low dose CTMPI using 128 slice dual-source MDCT could provide more specific information on myocardial perfusion than CCTA alone with low radiation dose

Thank you ...

