

# **A Pitfall of Fractional Flow Reserve for Intermediate Coronary Artery Stenosis with Elevated Microvascular Resistance**

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***Department of Internal Medicine***

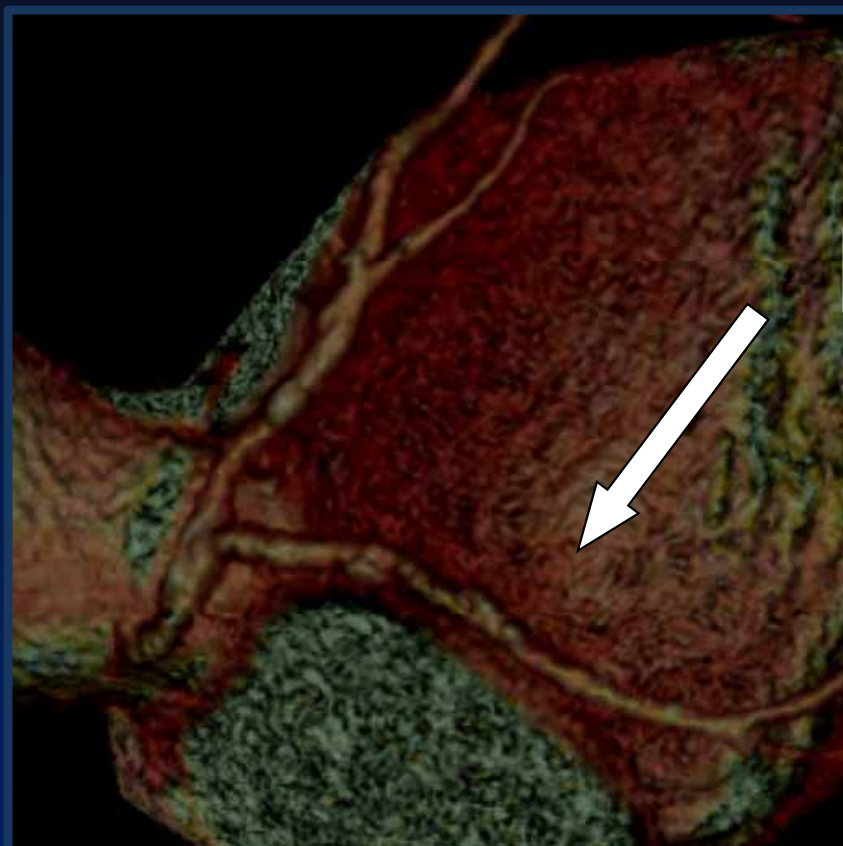
***INHA University Hospital***

# Case summary

61-year male

- ***Chief complaint***  
: chest pain , CCS II (O: 3month ago)
- ***Cardiovascular risk factor***  
: hypertension, hyperlipidemia

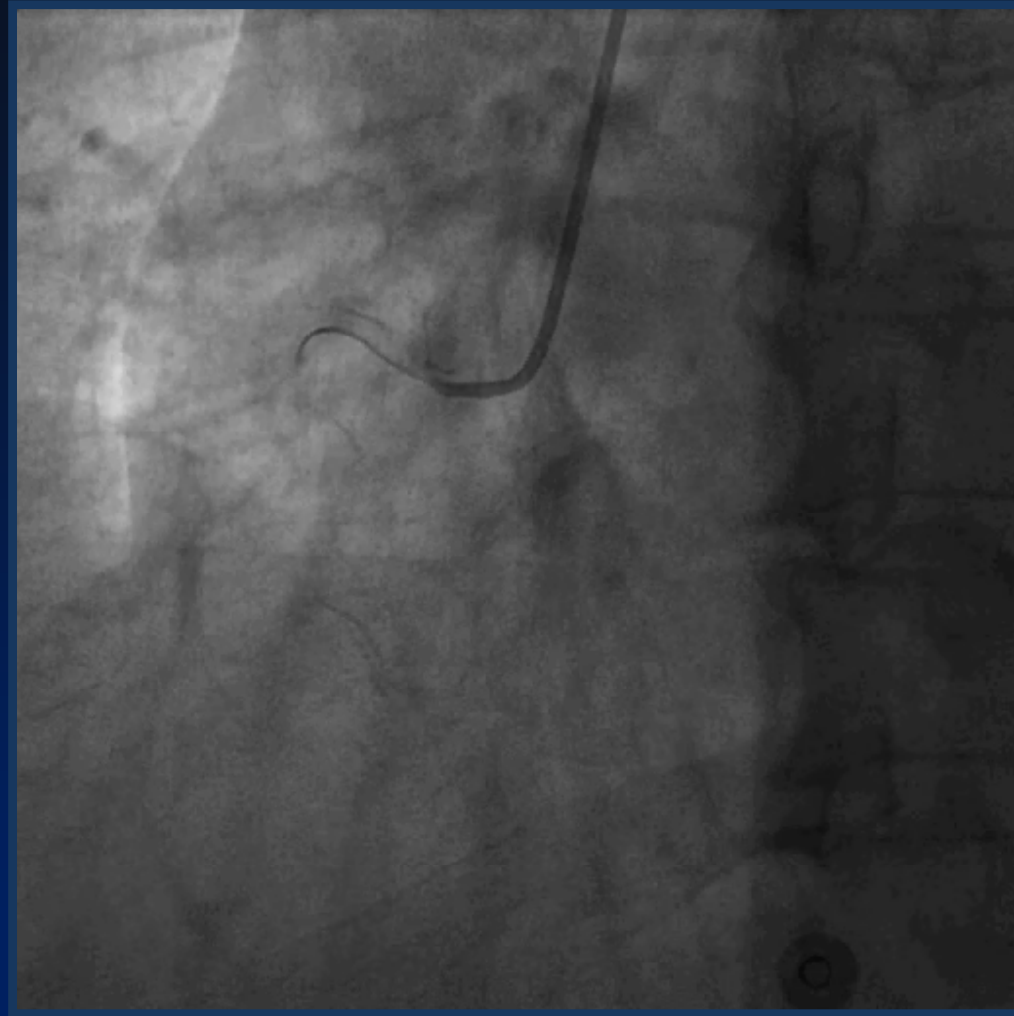
# Coronary angio CT at other hospital



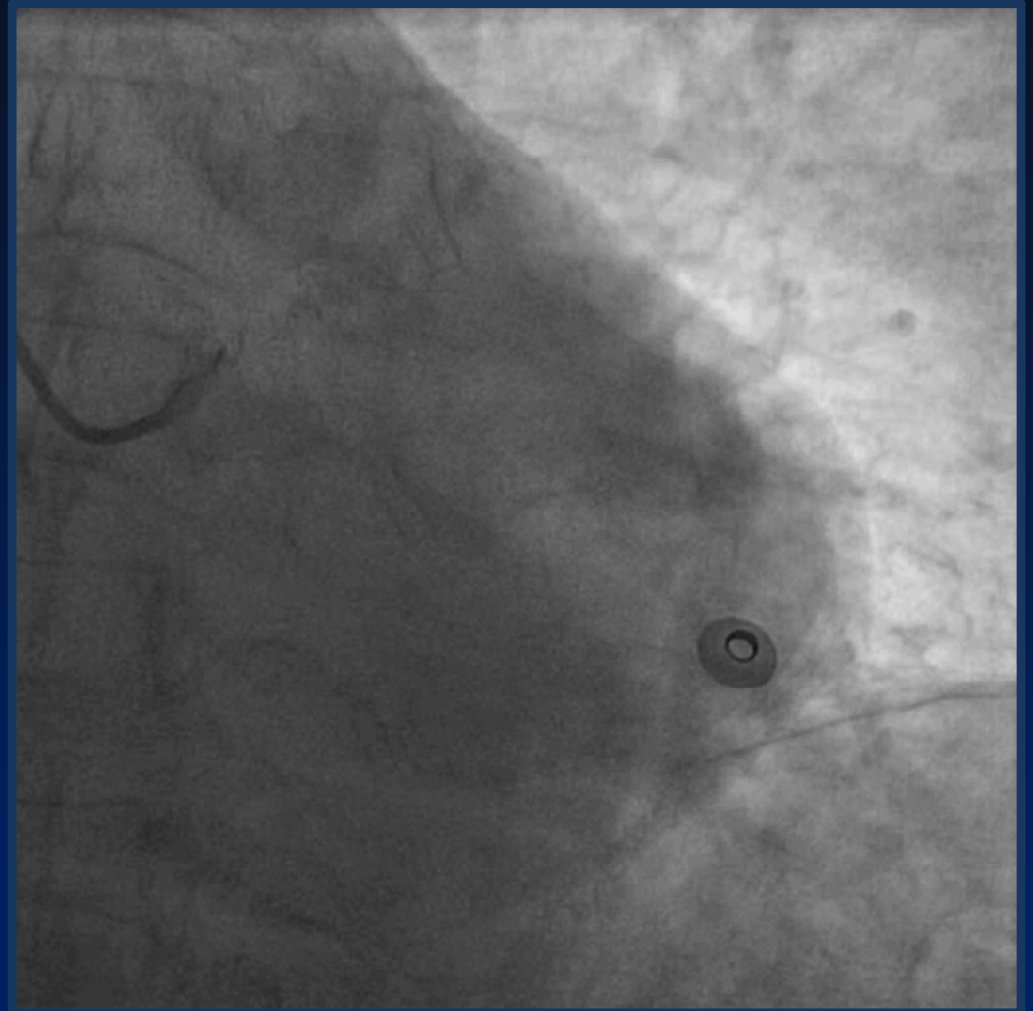
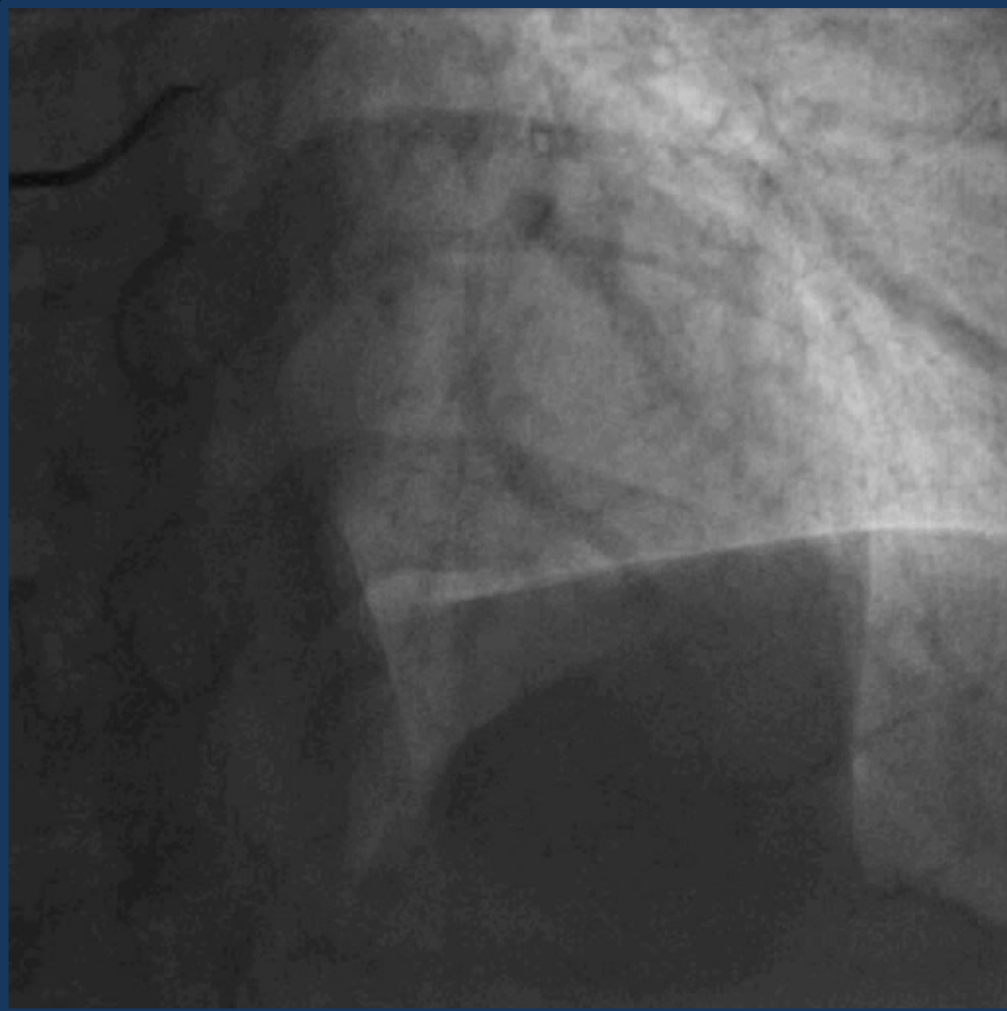
LCX



# Coronary angiography



# Coronary angiography



# Functional assessment

## FFR on LCX lesion

✓ adenosine 140mcg/kg/min through antecubital vein



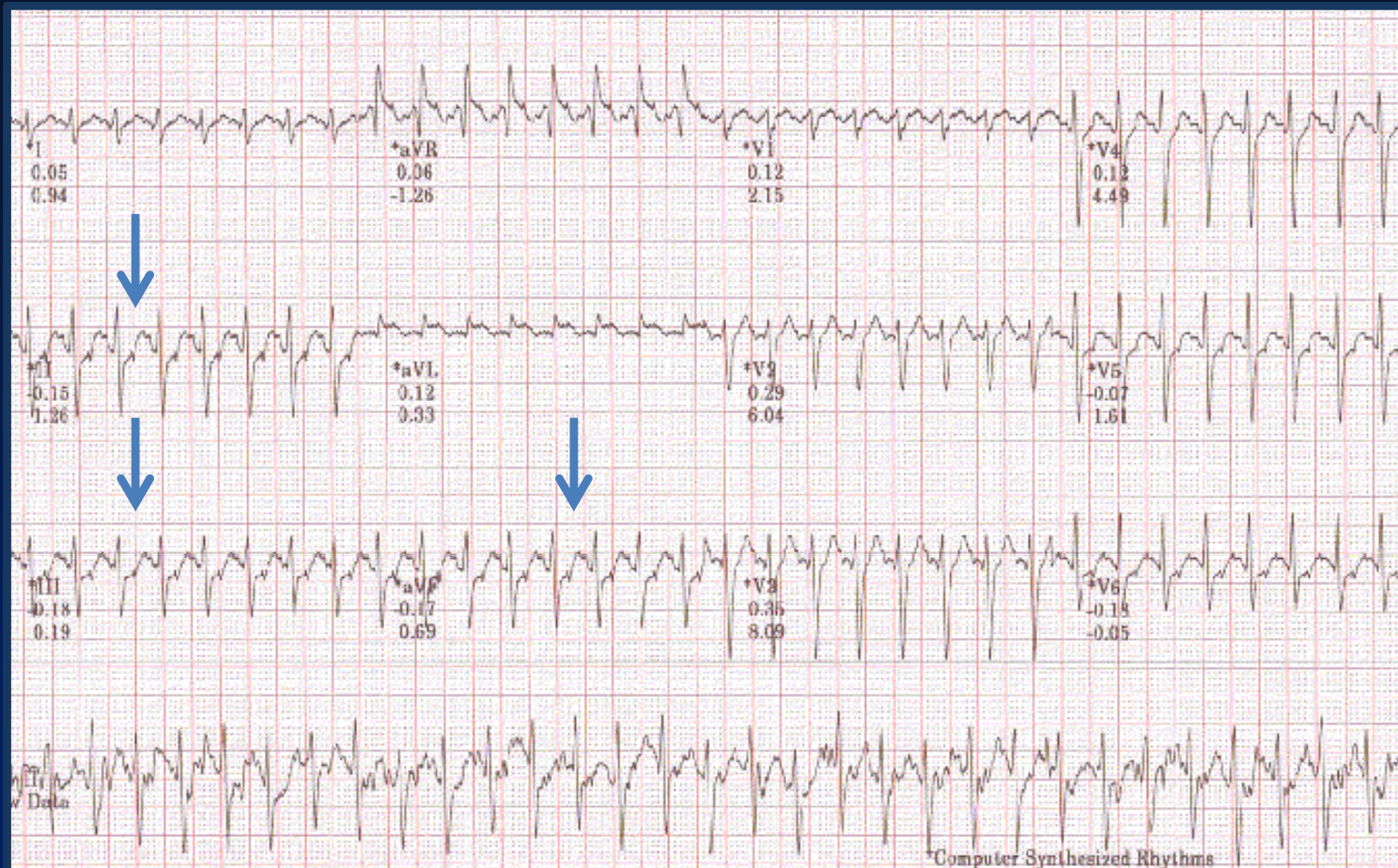
→ defer

discharge  
Aspirin  
bisoprolol  
atorvastatin

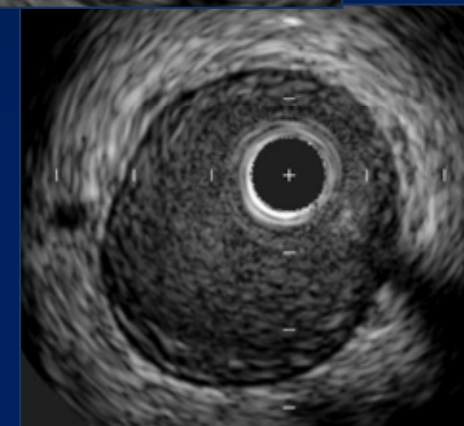
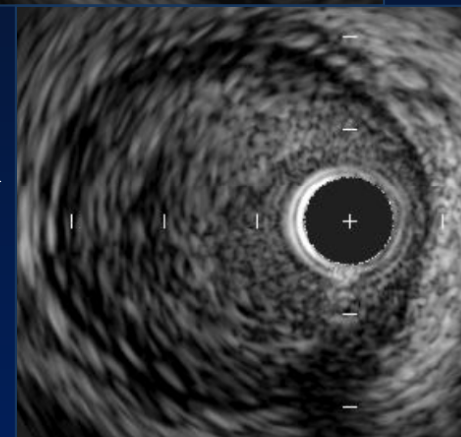
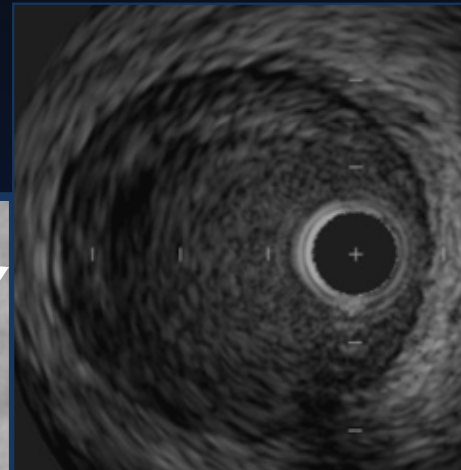
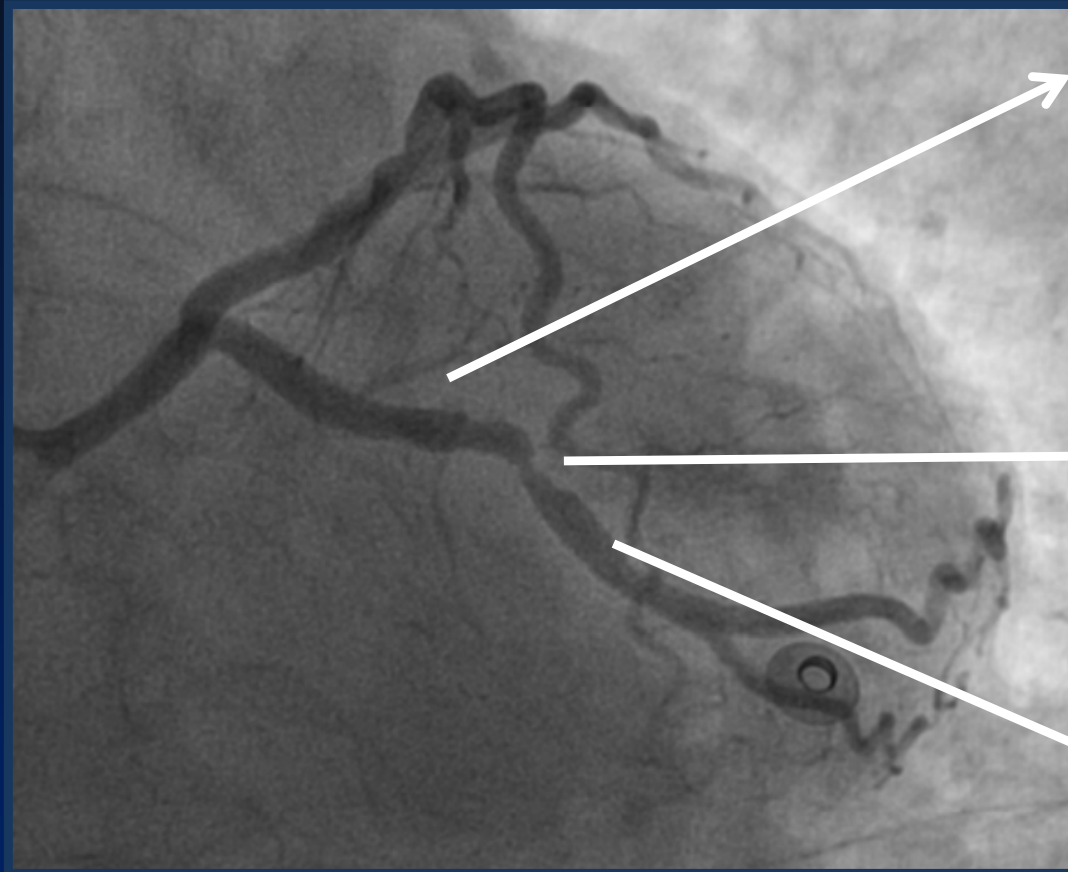
# Treadmill test

*d/t recurrent exertional chest pain*

## Stage IV



# IVUS on LCX lesion



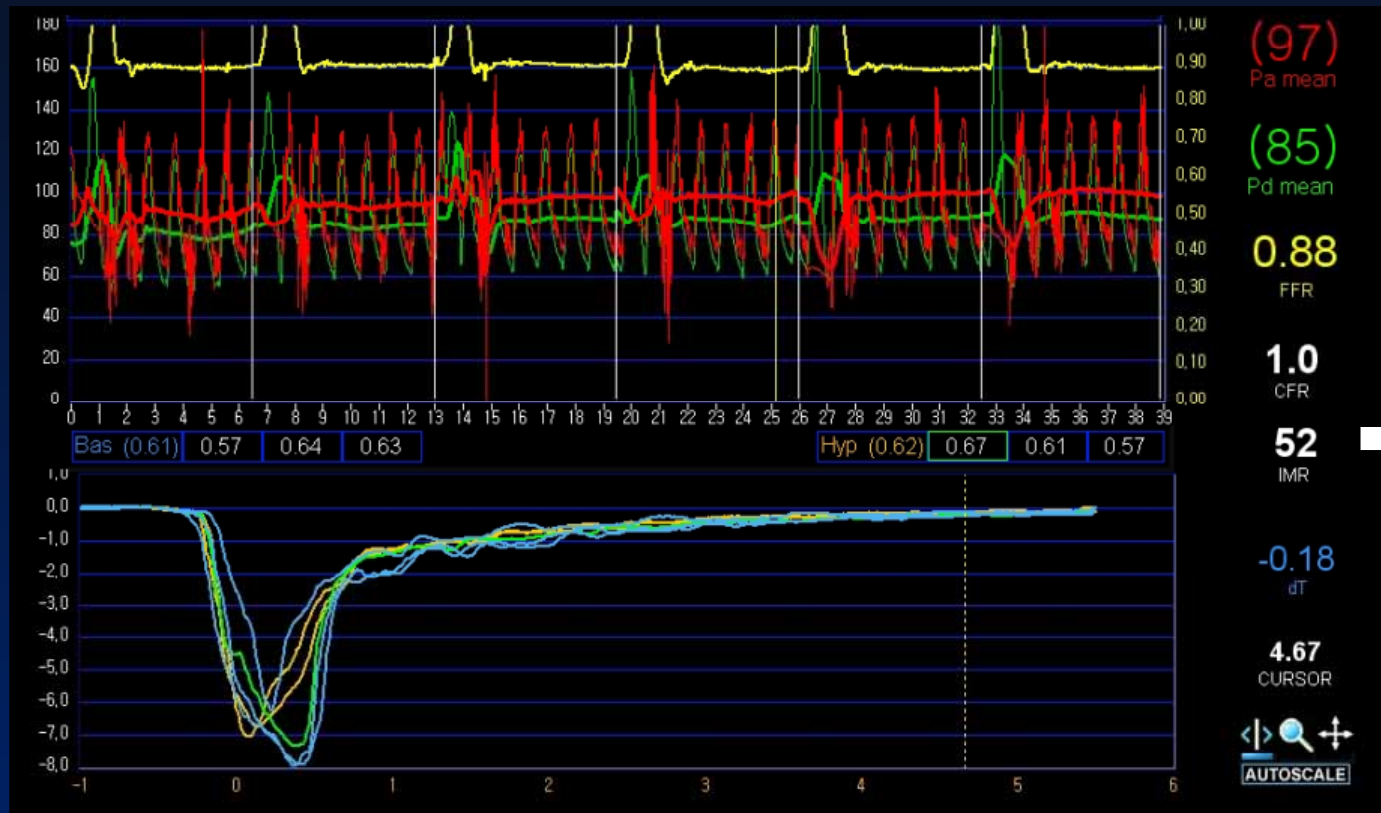
**MLA**  
**3.0 mm<sup>2</sup>**



# Functional assessments

## FFR & IMR on LCX lesion

✓ adenosine upto 180mcg/kg/min through antecubital vein



**FFR 0.83**

**High IMR  
52 U**

**Impaired  
microcirculation**

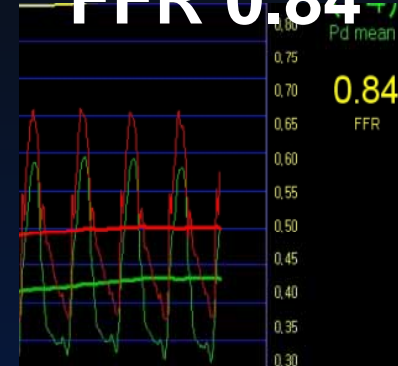
# Visual

DS 67%



# Functional

FFR 0.84



**Mismatch**

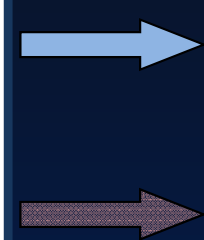
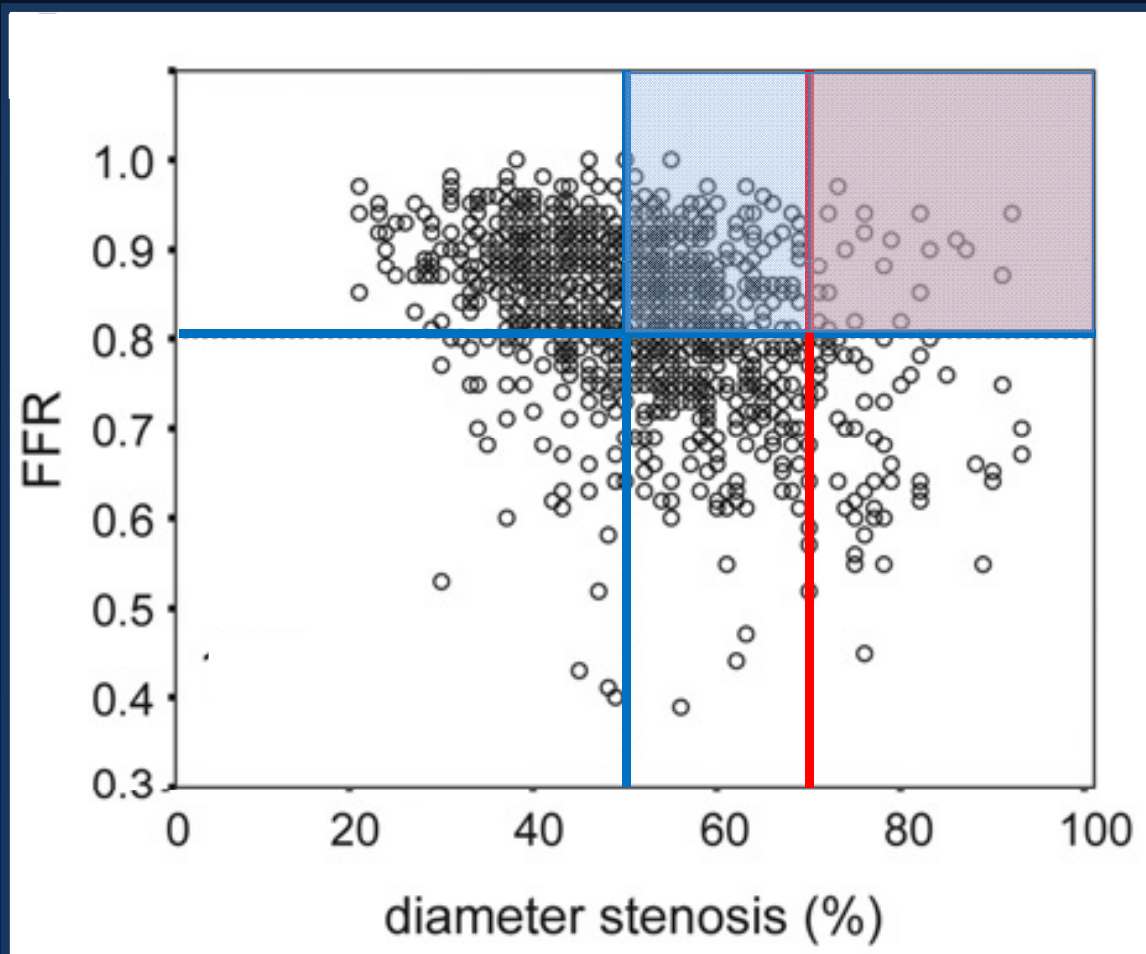
**Documented myocardial  
ischemia on TMT**

**Combined  
MVD**

**Underestimated  
FFR**

# Mismatch between visual & functional

## *FFR vs QCA*



**57%**

**2%**

*Park SJ. Jacc Cardiovascular Interv. 2012*

# FFR against non-invasive test

## *meta analysis of 31 studies*

- *Comparison of FFR against non-invasive test*  
→ *273 lesions*

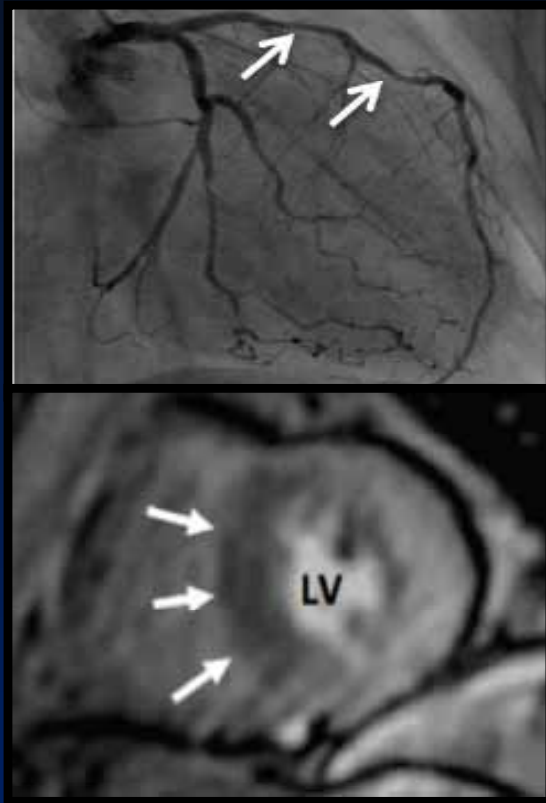
Study	TP	FN	FP	TN
Pijls et al <sup>2</sup>	12	1	9	23
	10	0	9	22
Meuwissen et al <sup>15</sup>	36	16	30	99
Yanagisawa et al <sup>16</sup>	72	20	28	74
De Bruyne et al <sup>5</sup>	38	5	9	5
Abe et al <sup>17</sup>	20	4	0	22
Bartunek et al <sup>7</sup>	41	1	13	20
Tron et al <sup>19</sup>	24	14	15	17
Pekdemir et al <sup>20</sup>	3	0	2	13
Seo et al <sup>21</sup>	11	9	1	4
Jimenez-Navarro et al <sup>22</sup>	3	0	4	16
Morishima et al <sup>23</sup>	9	0	3	8
Caymaz et al <sup>24</sup>	20	2	0	18
Kobori et al <sup>27</sup>	10	15	15	58
Erhard et al <sup>28*</sup>	10	5	6	26
	11	5	5	26
Rieber et al <sup>33†</sup>	10	7	5	23
	7	2	8	25
	9	4	4	26
Hacker et al <sup>34</sup>	14	4	3	29
Kruger et al <sup>35</sup>	17	2	3	20

**Overall**  
**Sensitivity 82%**  
**Specificity 74%**

*Cristou MA. Am J Cardiol. 2007*

# Myocardial perfusion CMR vs. FFR

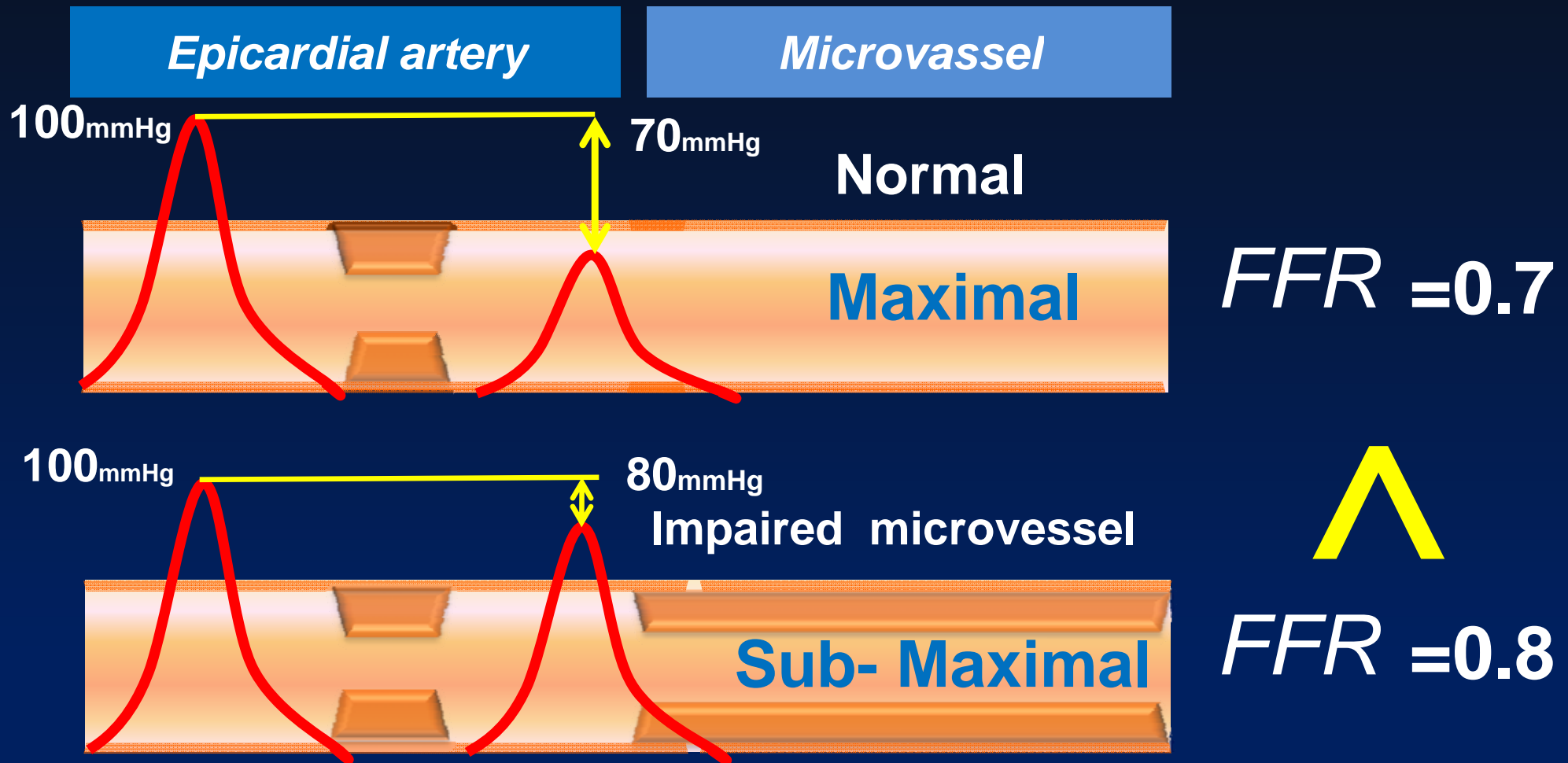
## ➤ Myocardial ischemia on CMR (72 lesions)



*Ebersberger. EHJ Cardiovascular imaging. 2013*

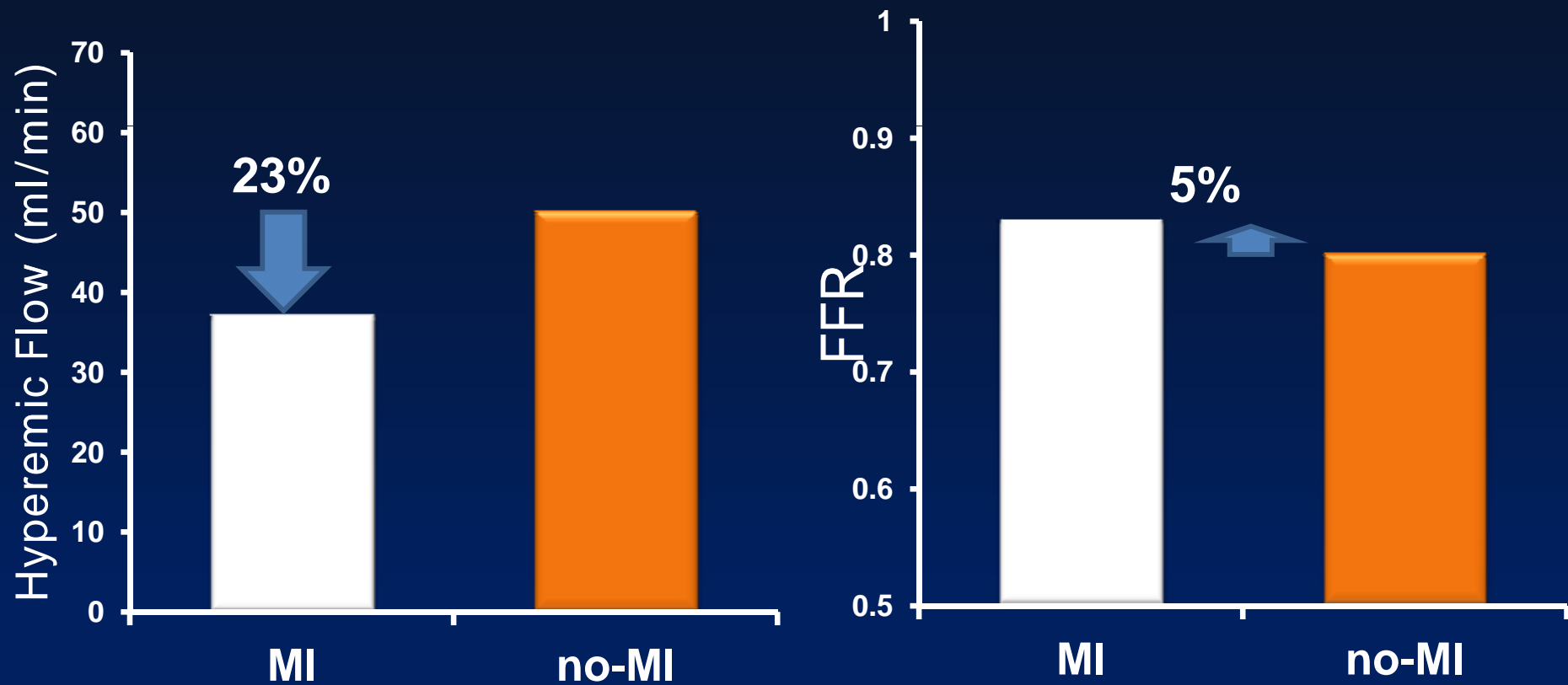
➤ **FFR** myocardial ischemia ?

# Hyperemic blood flow and pressure : *impaired microvascular resistance*



# Hyperemic coronary flow and FFR : *myocardial infarction*

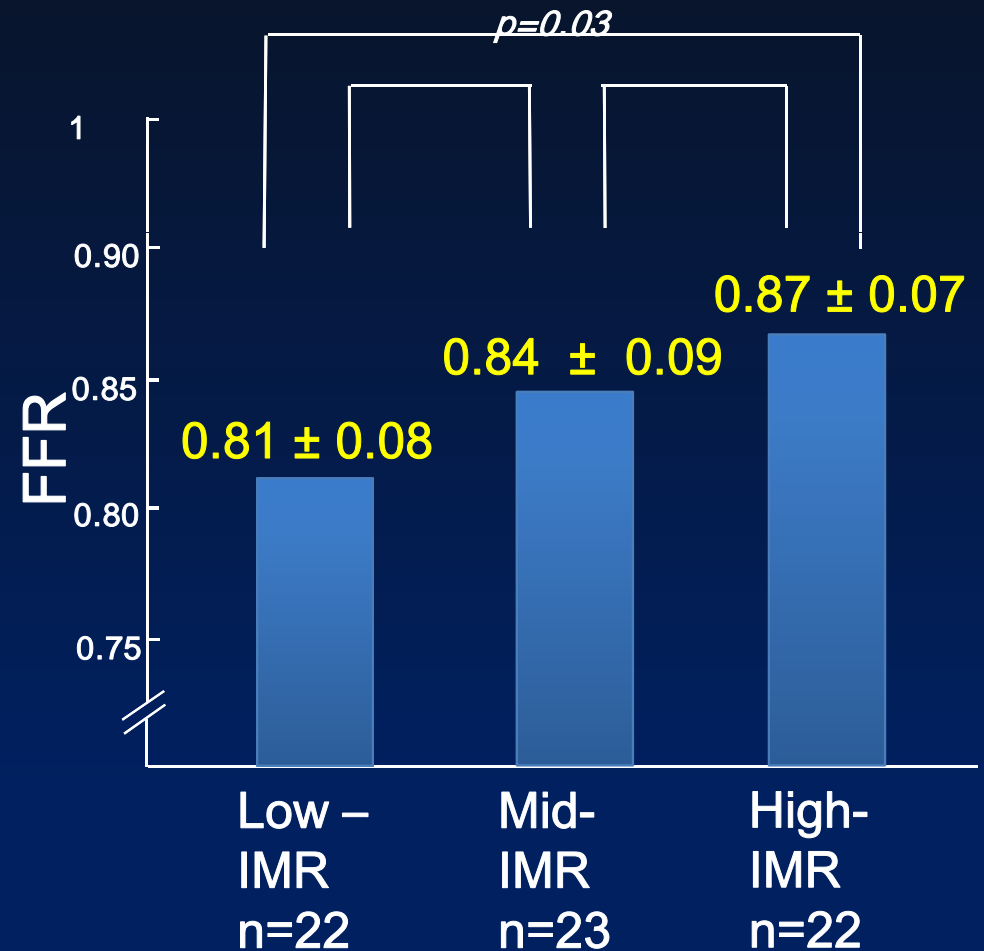
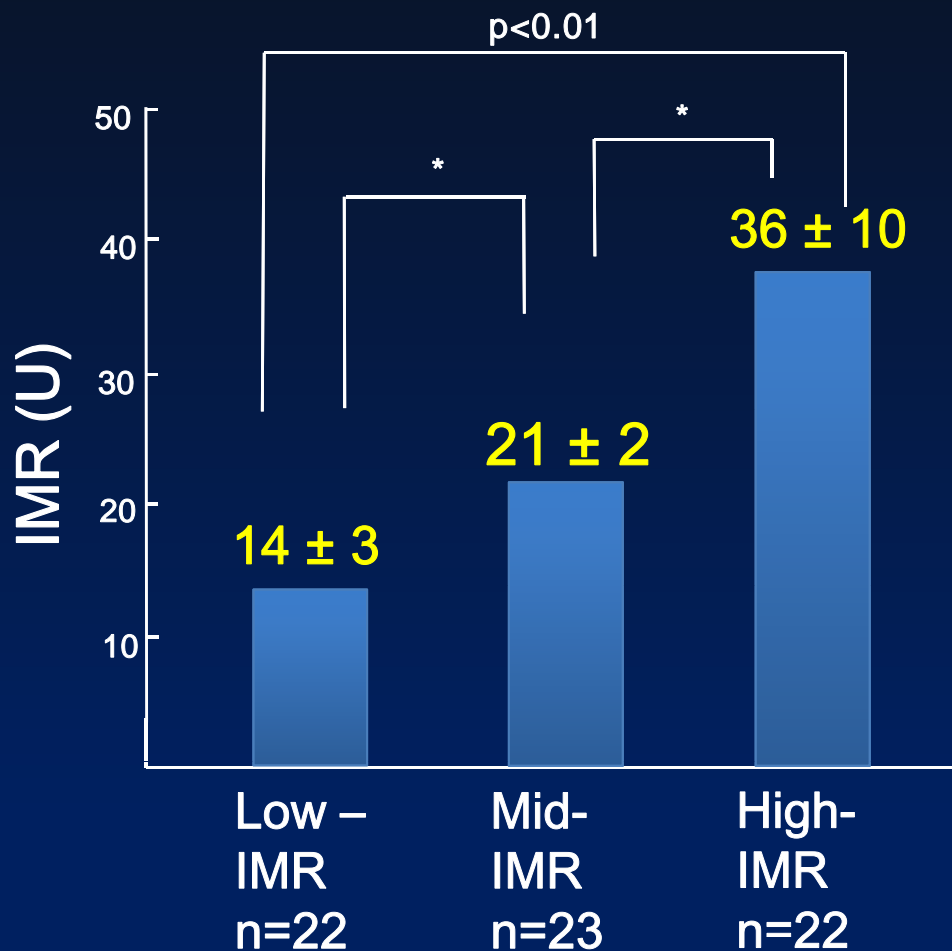
➤ *Intermediate lesion w or w/o myocardial infarction*



*Claeys MJ, Catheter Cardiovasc Interv.2001 Dec*

# Comparison of functional severity : FFR in three group

➤ *intermediate stenosis w/o previous MI*



SD park, KSC 2013



# PCI on LCX lesion

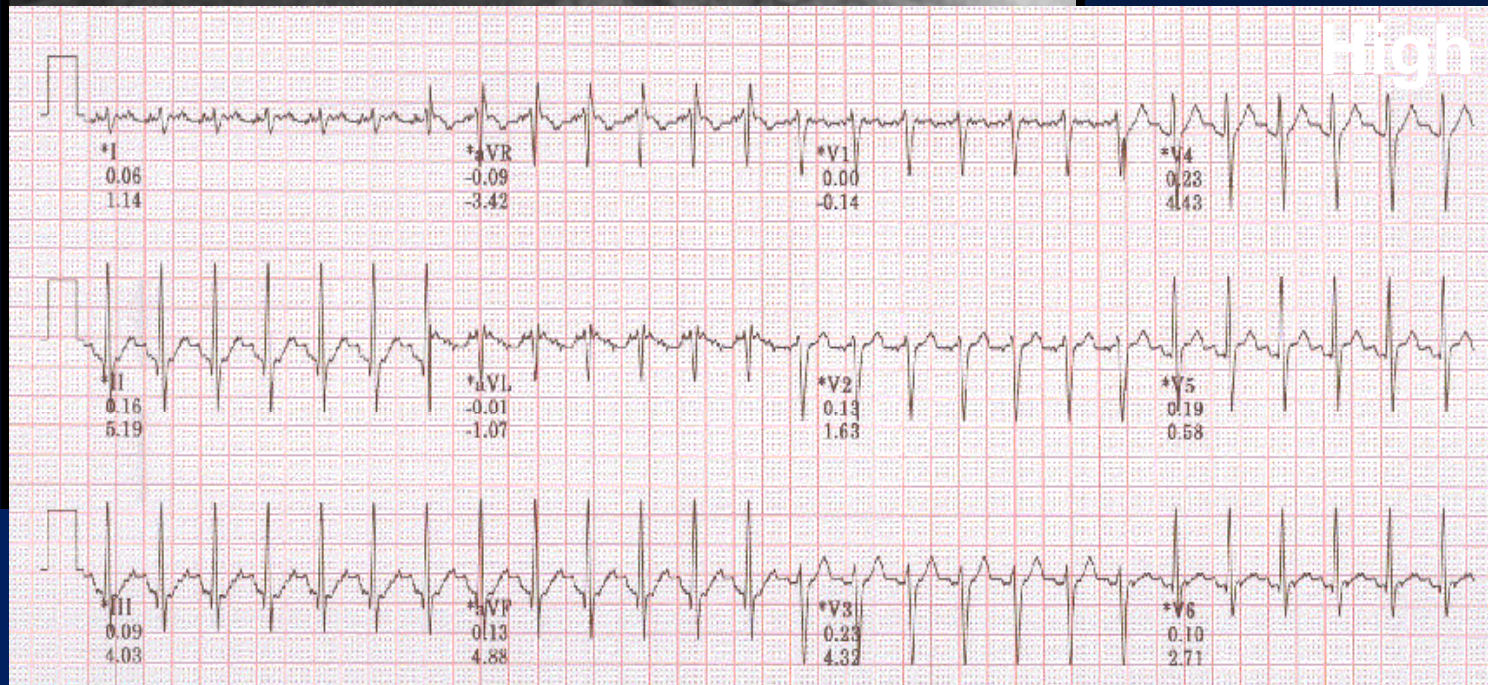


angina symptom  
intermediate lesion

TMT (+)

FFR >0.8

High IMR



Myocardial ischemia

# Visual

DS 67%



# Functional

FFR 0.84



**Mismatch**

Documented myocardial  
ischemia on TMT

**Combined  
MVD**

**Underestimated  
FFR**

**Assess the microcirculation !**