State-of-the-Art Lecture

LATEST ISSUES & FUTURE DIRECTIONS IN FFR-GUIDED ANGIOPLASTY

Seoul, Korea, december 6th, 2014

CATHARINA-ZIEKENHUIS

Nico H. J. Pijls, MD, PhD
Catharina Hospital,
Eindhoven, The Netherlands

catharina ziekenhuis

Disclosures:

- Dr Pijls received institutional research grants from St Jude Medical and Maquet and is consultant for St Jude Medical

- Dr Pijls has equity interest in Philips, General Electric, and Heartflow

LATEST ISSUES / FUTURE DIRECTIONS IN FFR

- further improvement of ***equipment***, logistics, software/hardware, hyperemic stimuli
- non-hyperemic or partially hyperemic indices: Pd/Pa at rest, iFR, ***contrast FFR*** (cFFR)
- role of ***non-invasive FFR***
- recent, ***ongoing, and future studies***
- new players in the market
- what is the optimum way to go ?

LATEST ISSUES / FUTURE DIRECTIONS IN FFR

- **further improvement of *equipment*, logistics, software/hardware, hyperemic stimuli**
- non-hyperemic or partially hyperemic indices: Pd/Pa at rest, iFR, ***contrast FFR*** (cFFR)
- role of ***non-invasive FFR***
- recent, ***ongoing, and future studies***
- new players in the market
- what is the optimum way to go ?

EASY to use means ***READY to use*** :

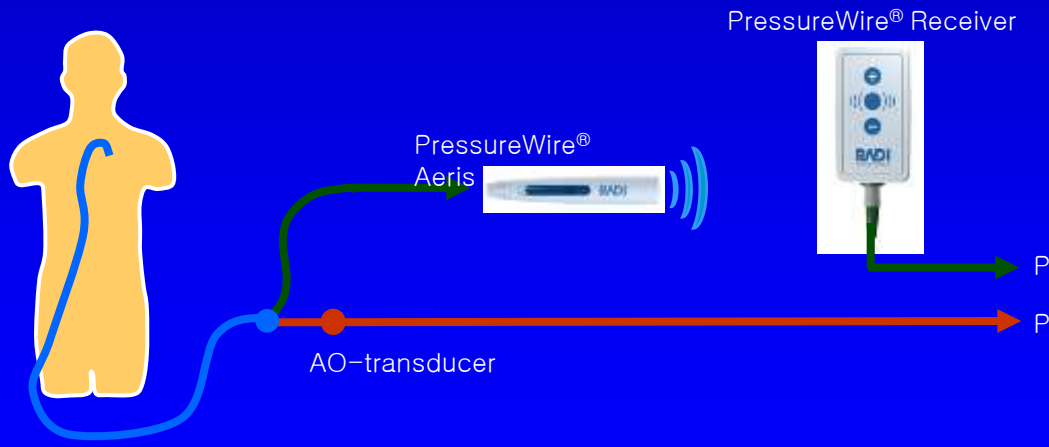
- Design the ***logistics and configuration*** in your cath.lab in an optimum way to enable immediate use of the PressureWire if the case demands it

PressureWire® Aeris

Wireless transmission (Aeris Wire)

True FFR Integration

- Receiver connects directly to any hemodynamic recording system.
- Used directly in the cathlab with no additional instrumentation.
- Utilizes the standard blood pressure transducer ports without any extra cabling.
- Requires FFR software upgrade from cathlab manufacturers General Electric, Philips, etc
- No calibration, ready in 1 second



Hemodynamic recording system

users friendly, “quiet” interface

Practical logistics in the cath lab: *Keep it simple*

easy hyperemia

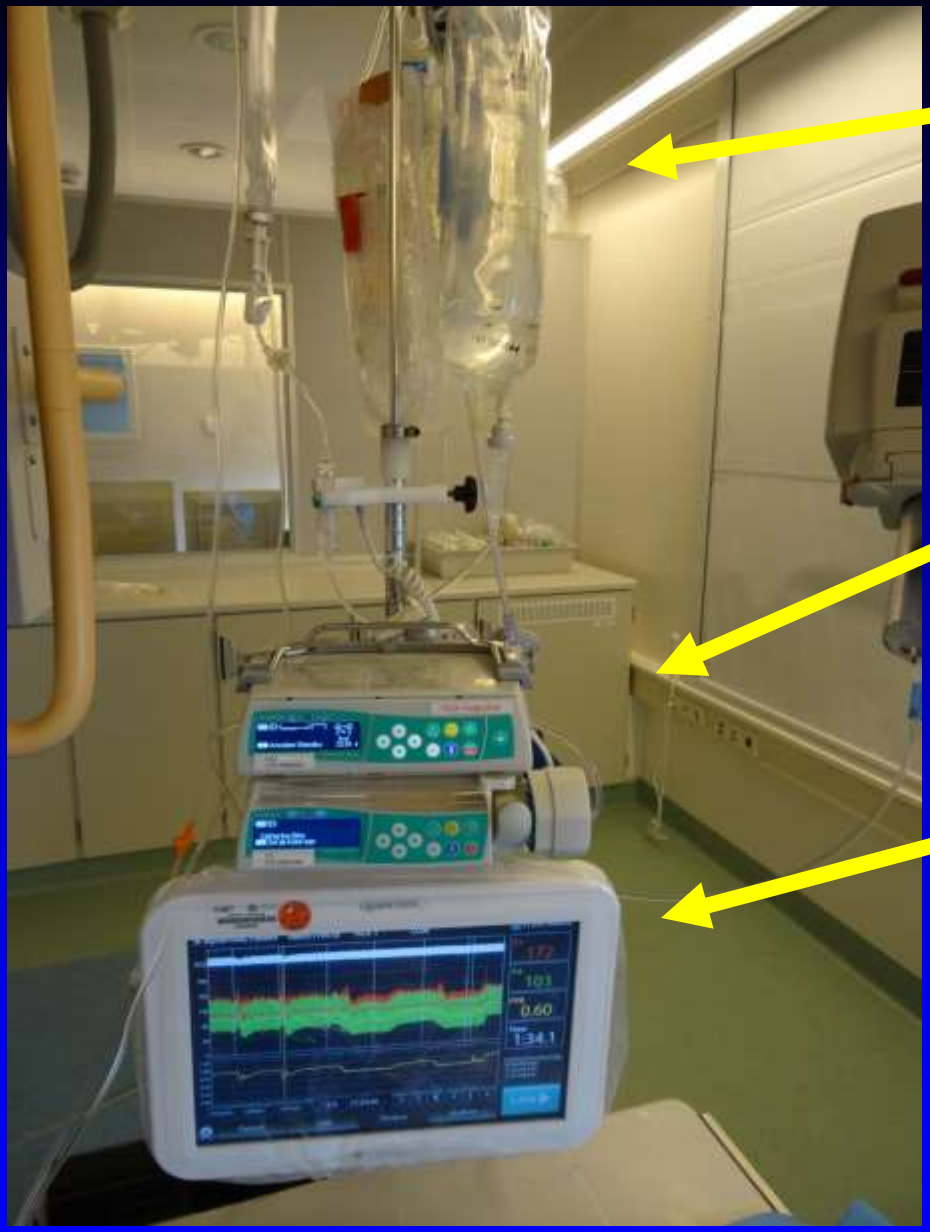
Adenosine for i.v. infusion

(standard bag 200 mg = 100 ml)

price: Euro 2,= per bag

prepared by hospital pharmacy

manifacturing protocol available at carias@cze.nl



adenosine

Infusion pump

Quantien

- *cheap*
- *no preparation in the lab*
- *no difficult calculations*
- *no risk of dosage error*
- *no loss of time*

HOW TO STREAMLINE FFR LOGISTICS IN YOUR LAB

cooperation of your nurses is of paramount importance !

- preparing the equipment, cables, pressure wire
- taking care of hyperemic stimulus
  (keep it simple)
- anticipate to the procedure, remind you to measure
- willingness to spend some extra time, if needed

therefore, train your nurses and make them understand the principles, practice, and great advantages of FFR

Similar for fellows and colleagues !

LATEST ISSUES / FUTURE DIRECTIONS IN FFR

- further improvement of equipment, logistics, software/hardware, hyperemic stimuli
- non-hyperemic or partially hyperemic indices: Pd/Pa at rest, iFR, ***contrast FFR*** (cFFR)
  → *presentations later this morning*
- role of ***non-invasive FFR***
- recent, ***ongoing, and future studies***
- new players in the market

LATEST ISSUES / FUTURE DIRECTIONS IN FFR

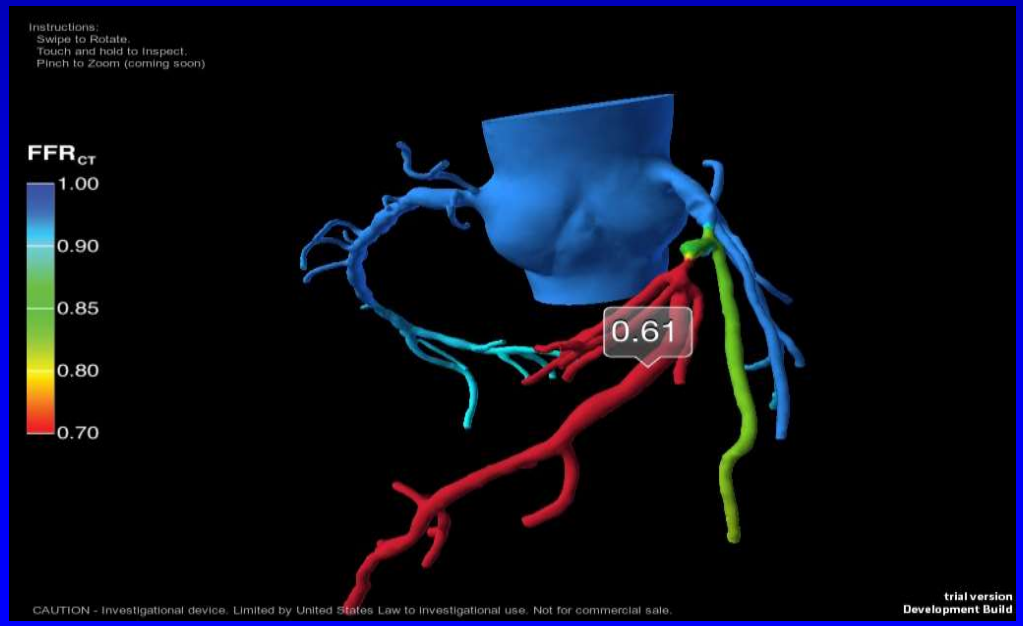
- further improvement of ***equipment***, logistics, software/hardware, hyperemic stimuli
- non-hyperemic or partially hyperemic indices: Pd/Pa at rest, iFR, ***contrast FFR*** (cFFR)
- ***role of non-invasive FFR***
- recent, ***ongoing, and future studies***
- new players in the market
- what is the optimum way to go ?

NON-INVASIVE FFR:

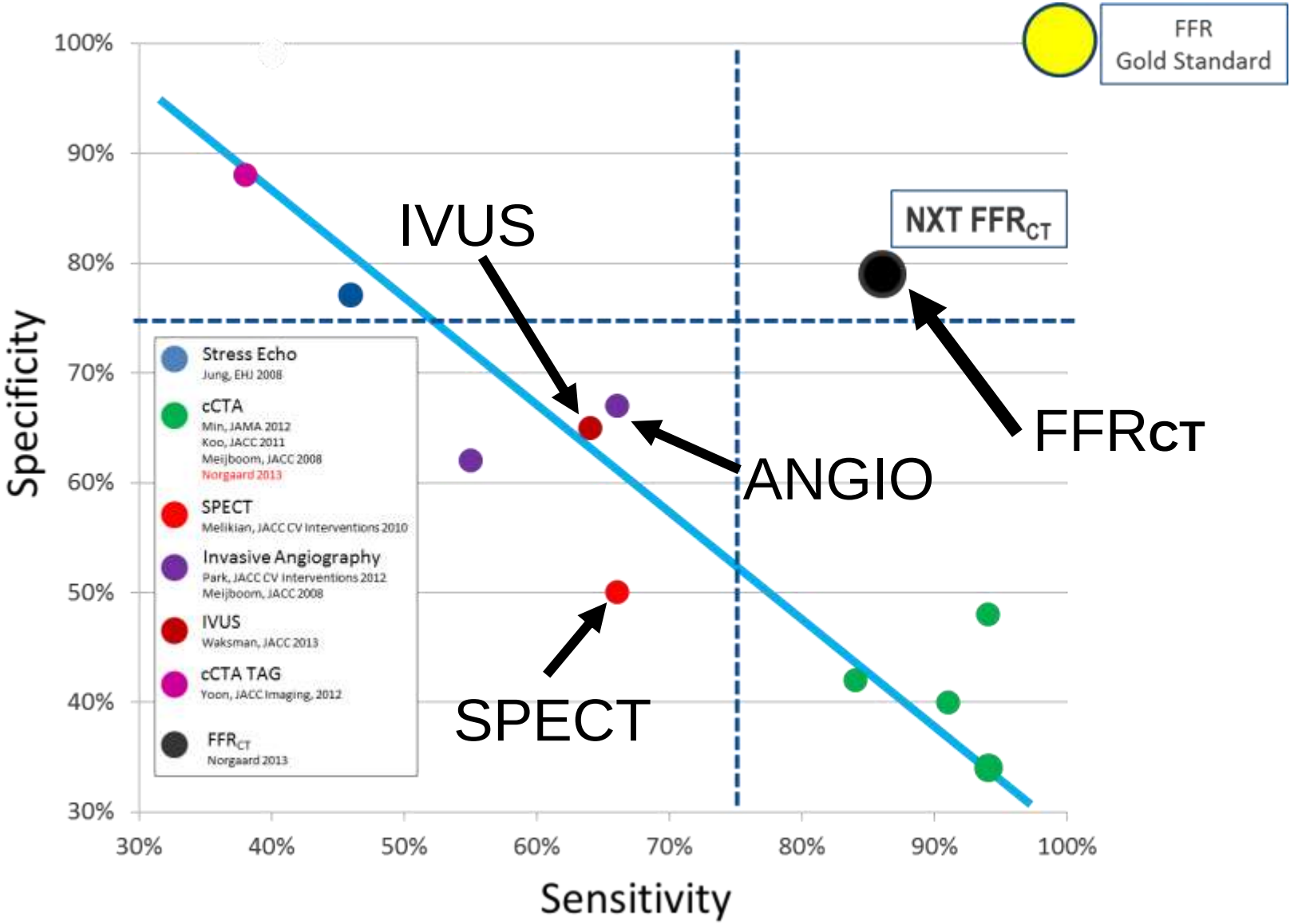
Fact or fiction ?? Complementary or substitution??

several presentations later this morning
(Dr Koo, Dr Kim, Dr Okutsu)

→



Diagnostic performance of Coronary diagnostic tests for functional significant (FFR ≤ 0.80) disease



LATEST ISSUES / FUTURE DIRECTIONS IN FFR

- further improvement of ***equipment***, logistics, software/hardware, hyperemic stimuli
- non-hyperemic or partially hyperemic indices: Pd/Pa at rest, iFR, ***contrast FFR*** (cFFR)
- role of ***non-invasive FFR***
- ***recent, ongoing, and future studies***
- new players in the market
- what is the optimum way to go ?

FAME 2 Study:
FFR-guided PCI vs Medical Treatment

→ *Presentation later this morning*

FAME 3 Study:
FFR-guided PCI vs CABG in 3-V disease

→ ***Recently started***
Including centers: ASAN, Aalst, Eindhoven,Stockholm, Stanford (presentation by Dr Fearon)

FAME 4 Study: FFR guided PCI in LM

FAME 5 Study: FFR in STEMI

MAYO REGISTRY
Very long-term follow up of FFR guided PCI

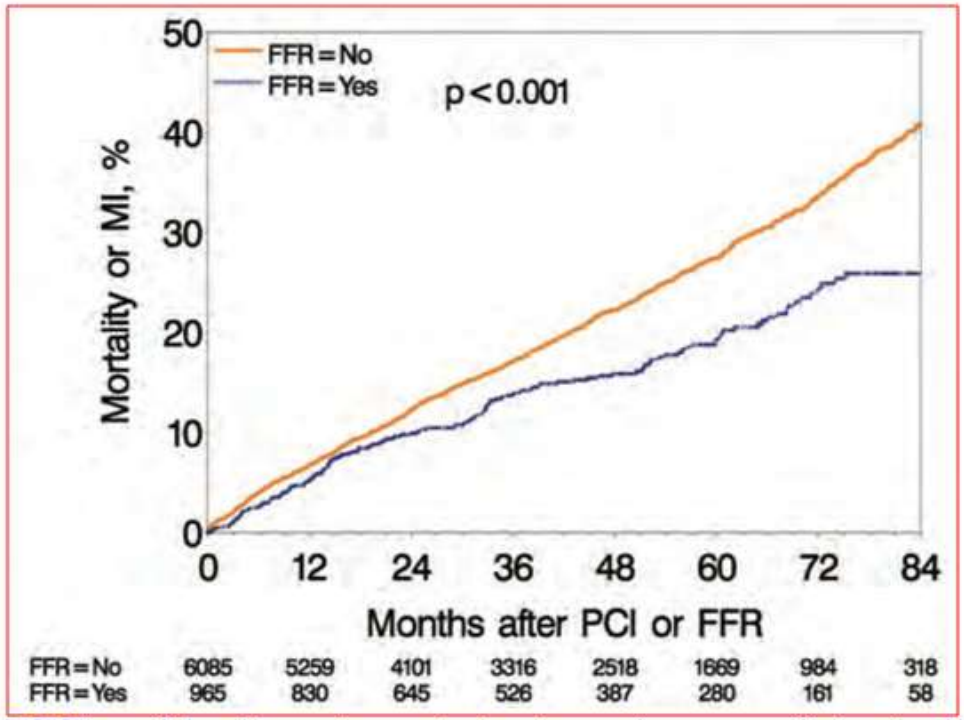
FAME 5 y follow-up:
underway (PCR)

DEFER 15 y follow up:
underway (PCR); glimps presented yesterday

Change of Strategy Studies: Park SJ, Curzen N, e.a.

Cardiovascular Center Aalst

Mayo Clinic Experience



www.cardio-aalst.be

FFR-guided treatment strategy is associated with a favourable long-term outcome

Shanghai, CIT March 2014

Li J et al Eur Heart J 2013

FFR-guided PCI decreases mortality and MI rate, also on the very long-term follow-up (7 years)

Li et al, Europ Heart J 2013

Change of Decision to Perform or Not to Perform PCI When Using FFR on Routine Basis

Sant'Ana 2007
Tonino, NEJM 2009
Toth, EHJ 2013
Park , EHJ 2013
Curzen 2014

} More than 10.000 patients:

discordance between angio and FFR in ~ 35 %

35 % wrong decisions with angio alone !

LATEST ISSUES / FUTURE DIRECTIONS IN FFR

- further improvement of ***equipment***, logistics, software/hardware, hyperemic stimuli
- non-hyperemic or partially hyperemic indices: Pd/Pa at rest, iFR, ***contrast FFR*** (cFFR)
- ***role of non-invasive FFR***
- recent, ***ongoing, and future studies***
- ***new players in the market***
- what is the optimum way to go ?

LATEST ISSUES / FUTURE DIRECTIONS IN FFR

Founders of Pressure Wire and FFR equipment:

- **RADI** ⟶ **St Jude Medical**

Follower : **Volcano**

New players on the market:

- **Opsens:** *fiberoptic, on the market in Japan*
- **Acist:** *monorail hypocatheter, to be validated*
- **Boston Sc:** *fiberoptic, expected 2015*
- **Nanosensor:** *experimental & animal testing*

FUTURE DIRECTIONS IN PHYSIOLOGY-GUIDED PCI

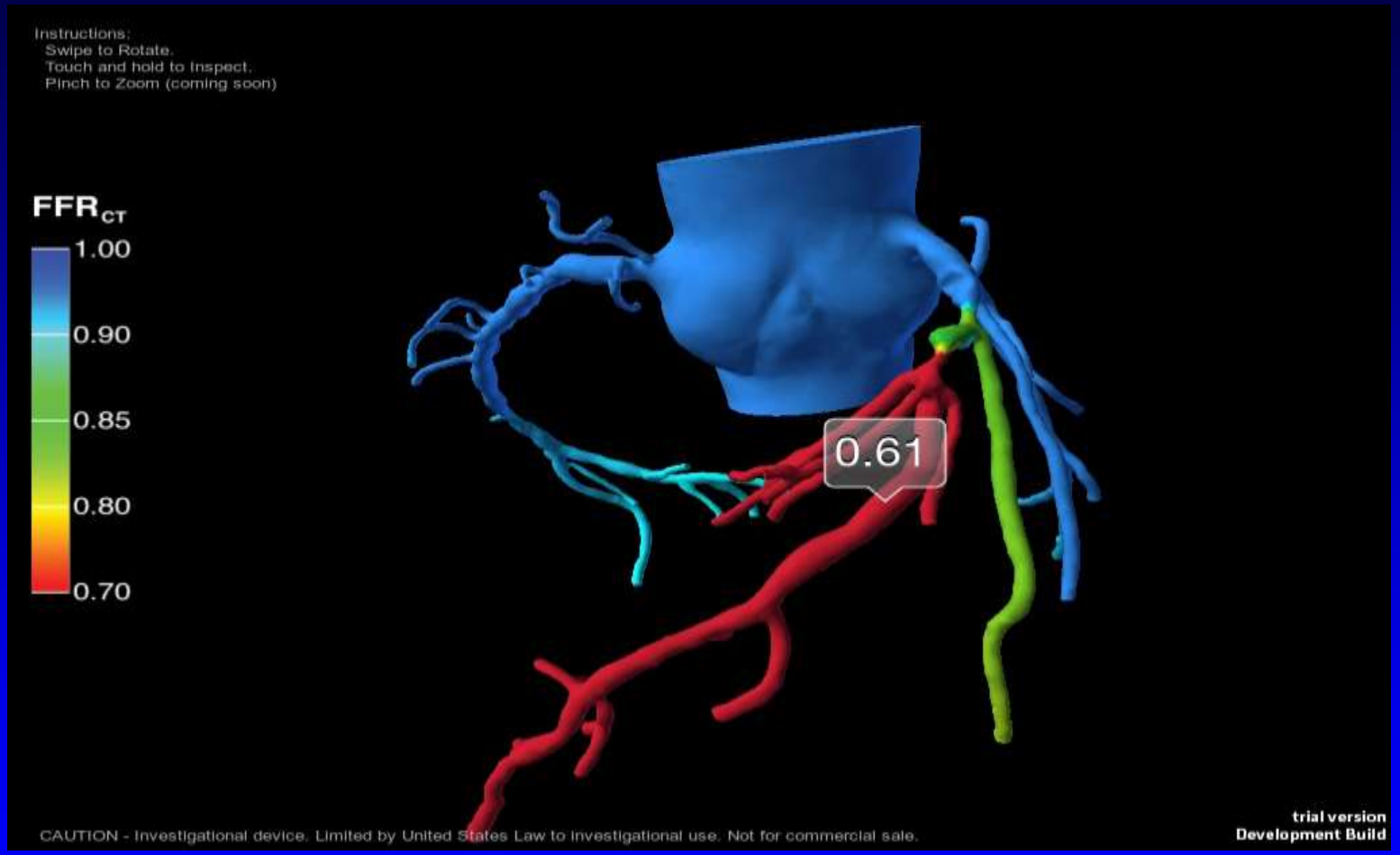
- further improvement of equipment, logistics, software/hardware, hyperemic stimuli
- non-hyperemic or partially hyperemic indices: Pd/Pa at rest, iFR, cFFR
- role of non-invasive FFR
- recent, ongoing, and future studies
- ***what is the optimum way to go ?***

→ End of this session

EINDE

EINDE

FFR_{CT} : Complementary or Substitution?



When performing FFR_{CT}, ***maximum hyperemia*** is assumed and simulated by the calculation algorithms.

FUTURE DIRECTIONS IN PHYSIOLOGY-GUIDED PCI

what is the optimum way to go ?

→ **my personal view**

OF HIER EINDIGEN (JA!)

Personal view evt na laatste pres.

FUTURE DIRECTIONS IN PHYSIOLOGY-GUIDED PCI: *my personal view (1)*

- *Coronary Angiography* alone to guide decisions in the catheterization laboratory for performing (or deferring) PCI, is a *fundamentally flawed approach*

- Therefore, in many patients, (estimated to be 60-80% of the elective PCI), the *need for Physiologic Guidance is undisputable*

FUTURE DIRECTIONS IN PHYSIOLOGY-GUIDED PCI: *my personal view (2)*

Fractional Flow Reserve (FFR) is the index of choice because:

- it is the only independently validated index vs a true gold standard *(NEJM 1996)*
- it has been validated extensively in almost all clinical and angiographic conditions
- it is the only index which has been proven to improve clinical outcome *(FAME studies, Mayo, others)*
- the only index not dependent on hemodynamic variations and has the best reproducibility in a myriad of studies

FUTURE DIRECTIONS IN PHYSIOLOGY-GUIDED PCI: *my personal view (3)*

- Leaving away (full) hyperemia, means decrease of accuracy and false decision making in 10-20% of patients.

- *Does a few minutes of extra work and a very moderate saving of money for a hyperemic drug justify a wrong decision in 1 out of every 10 patients ?*

For us, PCI might be routine….

…..for the patient, it is a big deal!

FUTURE DIRECTIONS IN PHYSIOLOGY-GUIDED PCI: *my personal view (4)*

- *Without hyperemia, no meaningful pullback recording* can be made, which implicates that you loose much information, especially in complex disease

- If, nevertheless, you chose to abandon (full) hyperemia, *contrast induced FFR (cFFR)* has my strong preference *(most simple and closest to true FFR)*

FUTURE DIRECTIONS IN PHYSIOLOGY-GUIDED PCI: *my personal view (4a)*

Largest threat for physiology-guided PCI:

All those new and less reliable indices may be confounding and negatively affect the trust in physiology-guided PCI !!

FUTURE DIRECTIONS IN PHYSIOLOGY-GUIDED PCI: *my personal view (5)*

- *Non-invasive FFR by CT* enhances the specificity of coronary CT scanning and will result in *screening* of larger populations.

Largest chance for physiology-guided PCI:

- FFR by CT *will not replace invasive FFR but boost it* and make the concept of physiology-guided PCI (and of the importance of ischemia in general) more widely known among non-invasive cardiologists, internists, radiologists, and nuclear specialists

FUTURE DIRECTIONS IN PHYSIOLOGY-GUIDED PCI: *my personal view (6)*

Physiology Guided Functional Angioplasty…….

- *is the future standard of PCI and a prerequisite:*
- *to maintain the position of PCI as excellent treatment of coronary artery disease*
- *to justify resources from health care insurers and society*
- *to remain credible to ourselves and to our patients*

…….provided that we use it in an optimum way !!