

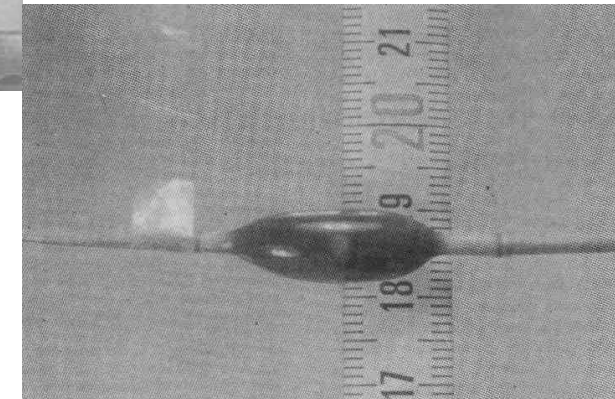
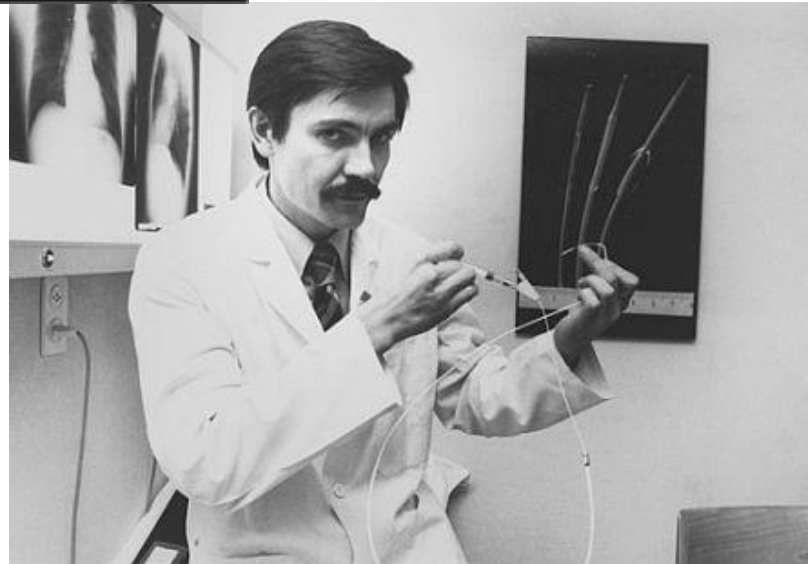
# intervenční kardiologie

Petr Kala

Brno, 14.5.2019



# >40 let od první PCI, od vzniku intervenční kardiologie



# 1. KORONÁRNÍ INTERVENCE

## AKS, stabilní ICHS, koronární imaging a fyziologie

# Akutní koronární syndrom

## Ruptura a eroze aterosklerotického plátu

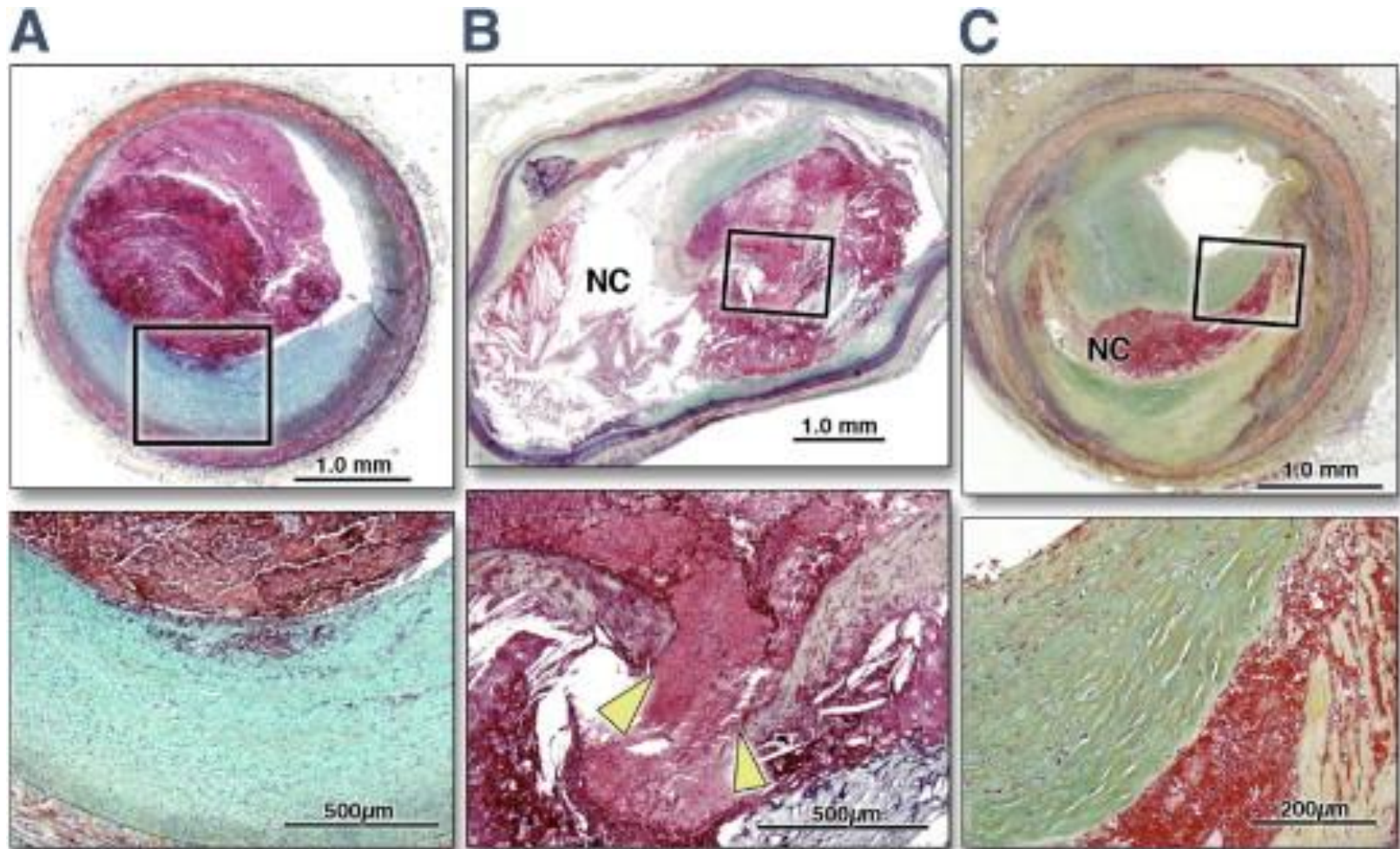
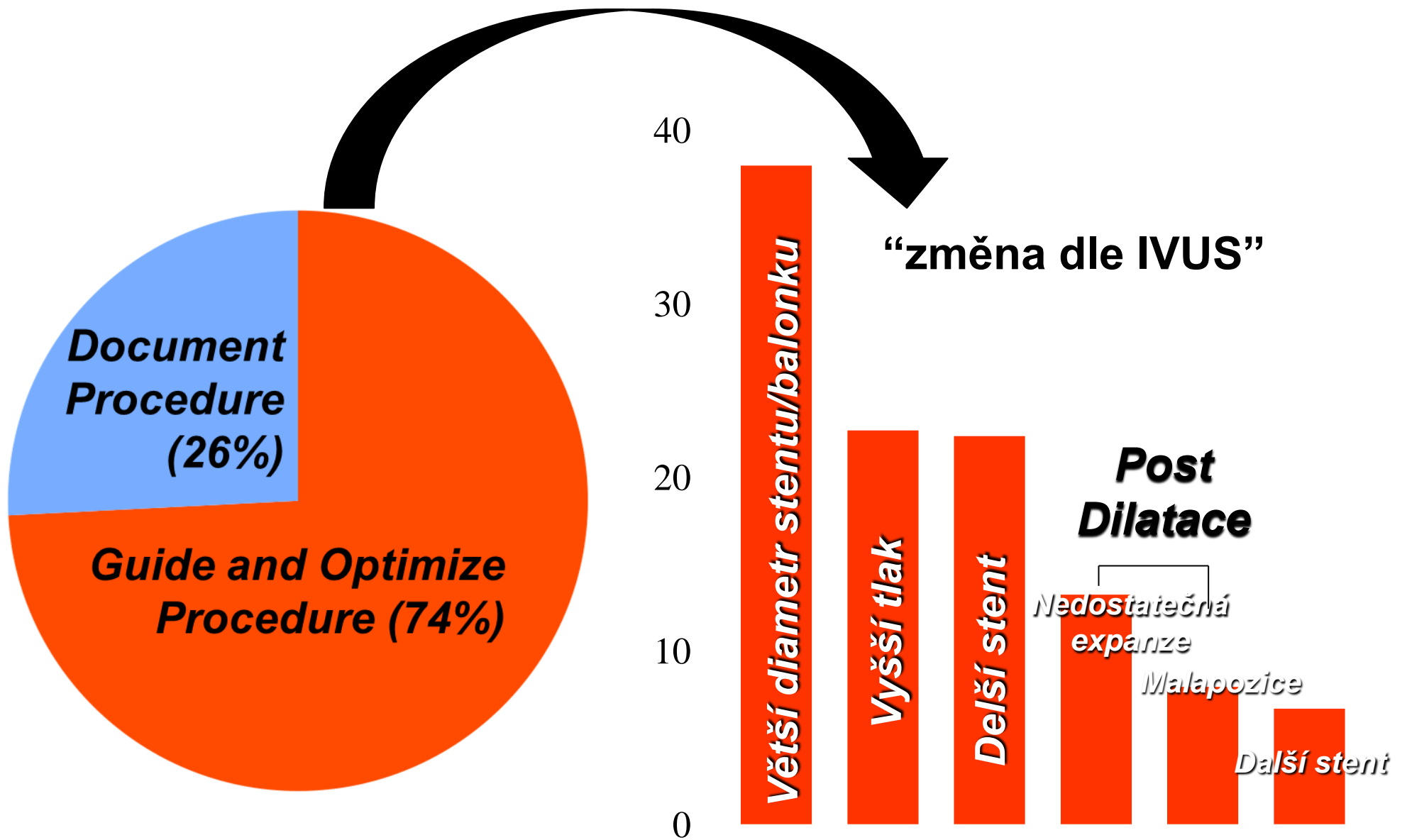


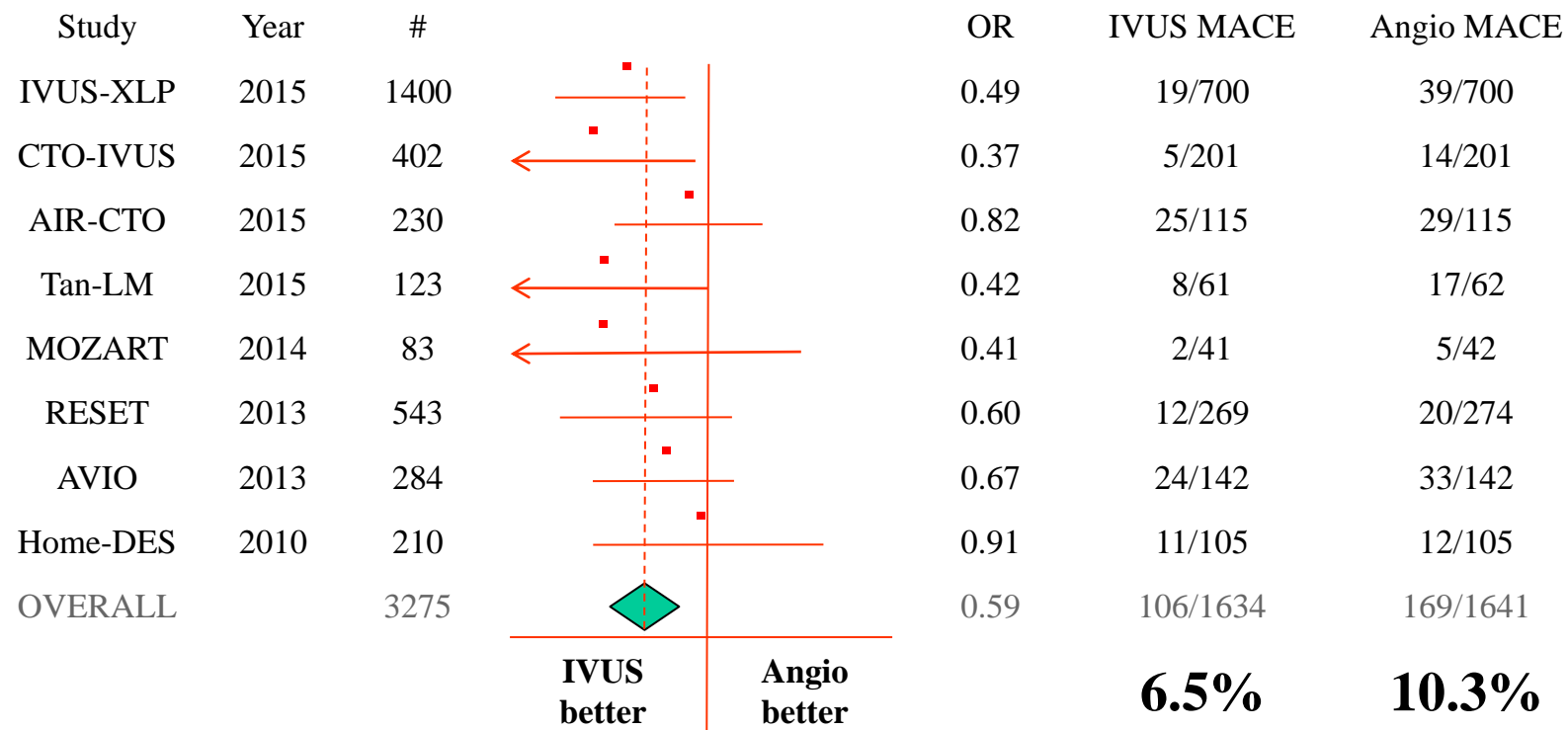
Figure 1 Histomorphological Characteristics of Plaque Erosion, Plaque Rupture, and a Stable Plaque Cross-sectional images of 2 culprit coronary plaques obtained from the patients with acute coronary syndromes (A,B) and a stable unrelated plaque (C) fr...

## DETEKCE NESTABILNÍHO (VULNERABILNÍHO) PLÁTU?

# ADAPT-DES: využití IVUS

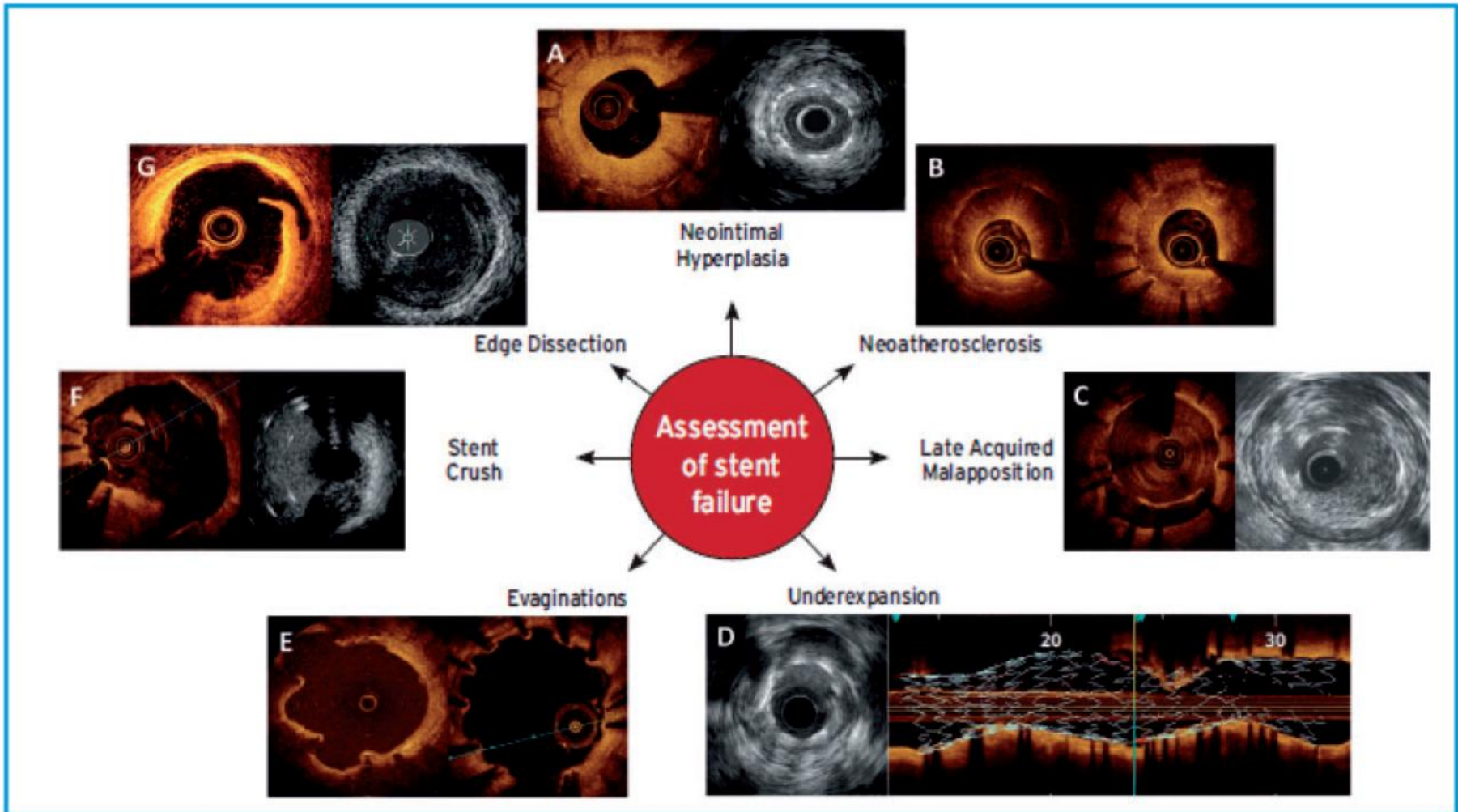


# Metaanalýza 8 randomizovaných studií IVUS vs Angio-vedená implance DES



Event	IVUS events	Angio events	OR	95% CI	P-value
MACE	6.5%	10.3%	0.59	0.46-0.76	<0.0001
CV mortality	0.5%	1.2%	0.46	0.21-1.00	0.05
MI	0.9%	1.6%	0.58	0.30-1.11	0.10
TLR	4.1%	6.6%	0.60	0.43-0.84	0.003
TVR	5.5%	8.7%	0.61	0.41-0.91	0.02
ST	0.6%	1.3%	0.49	0.24-0.99	0.04

# Intrakoronární imaging při selhání stentingu



©ESC 2018

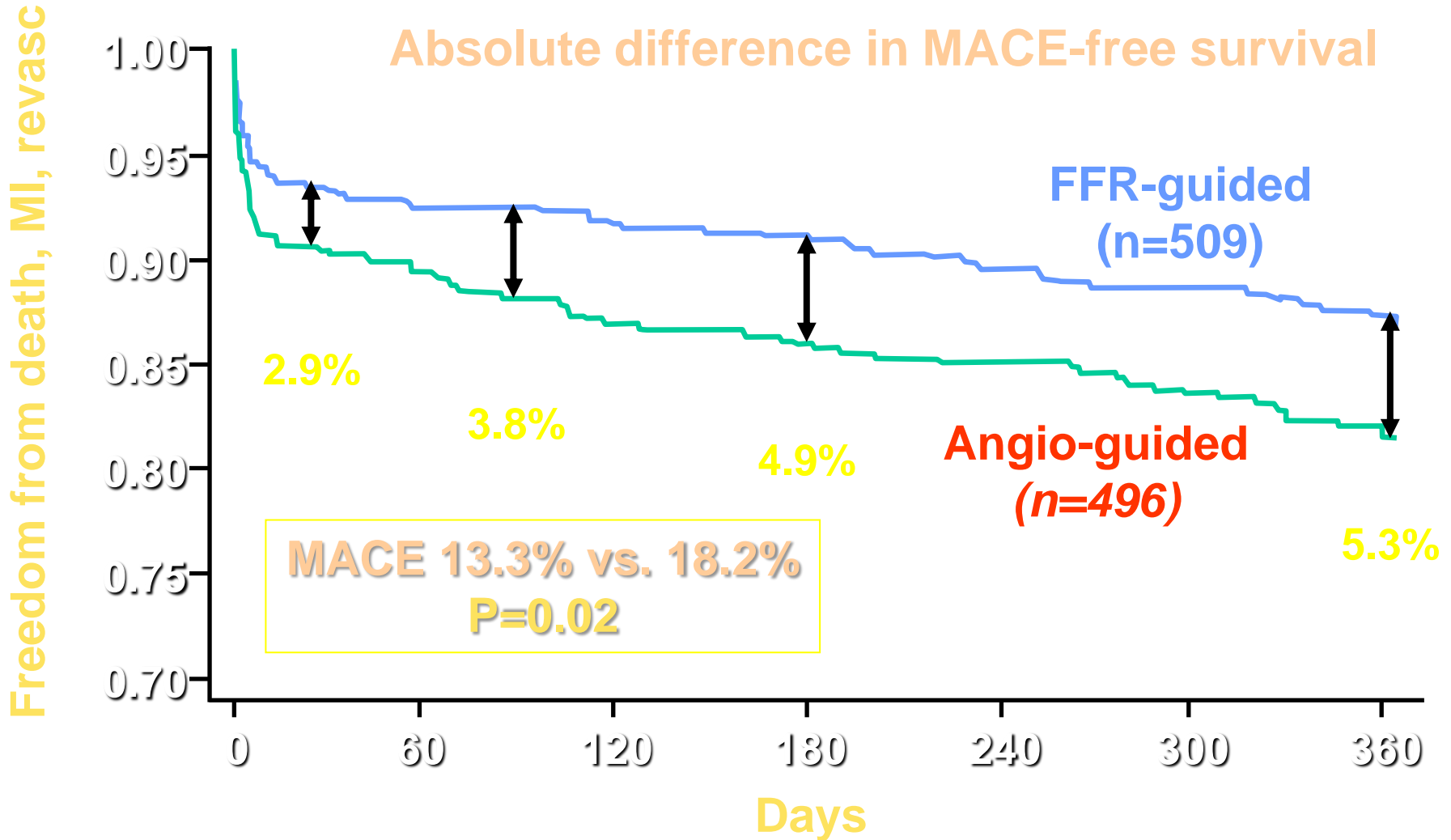
Examples of intravascular imaging findings (IVUS or OCT) in patients with stent failure. **Panel A** displays OCT (left) and IVUS (right) examples of in-stent restenosis due to excessive neointimal hyperplasia. **Panel B** displays two OCT examples of in-stent restenosis due to neoatherosclerosis. **Panel C** displays OCT (left) and IVUS (right) examples of late acquired malapposition. **Panel D** displays IVUS (left) and longitudinal OCT reconstruction (right) images of stent underexpansion. **Panel E** displays two OCT examples of in-stent evaginations, a typical finding of delayed arterial healing. **Panel F** displays OCT (left) and IVUS (right) examples of stent crush. **Panel G** displays an OCT (left) and IVUS (right) case of coronary dissection at the stent edge.

IVUS = intravascular ultrasound; OCT = optical coherence tomography.

Intracoronary images for this figure were kindly provided by Drs Nicolas Amabile, Fernando Alfonso, and Gennaro Sardella.

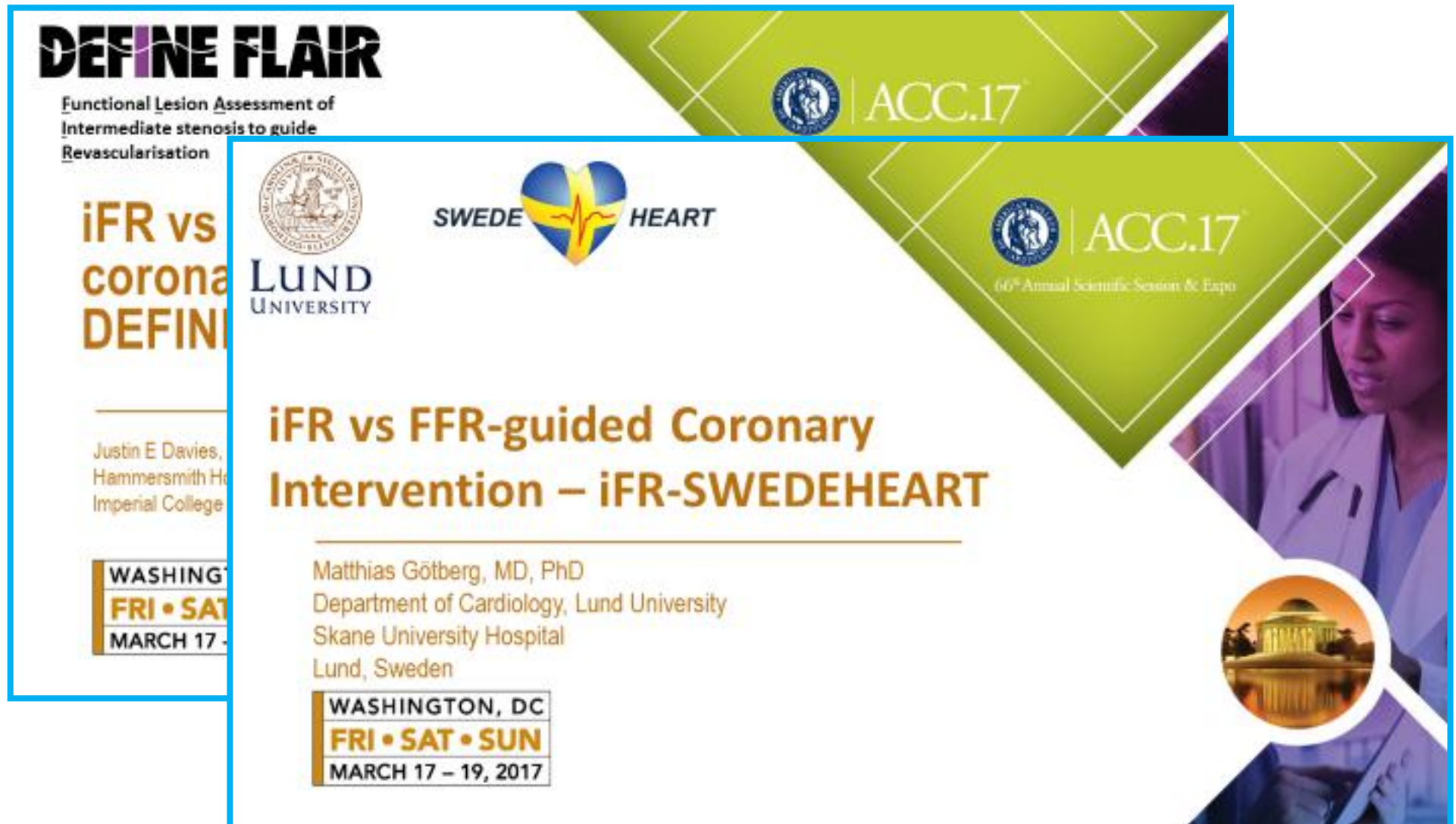
# FAME: Primární endpoint

1005 pac. s MVD - PCI + DES  
FFR-guided vs. angio-guided PCI





# iFR non-inferiorní k FFR (MACE během 12 měsíců)



**DEFINE FLAIR**  
Functional Lesion Assessment of Intermediate stenosis to guide Revascularisation

**iFR vs corona DEFINI**

Justin E Davies,  
Hammersmith Ho  
Imperial College

**WASHINGTON, DC**  
**FRI • SAT • SUN**  
MARCH 17 - 19, 2017

**LUND UNIVERSITY**

**SWEDE HEART**

**iFR vs FFR-guided Coronary Intervention – iFR-SWEDEHEART**

Matthias Götzberg, MD, PhD  
Department of Cardiology, Lund University  
Skane University Hospital  
Lund, Sweden

**WASHINGTON, DC**  
**FRI • SAT • SUN**  
MARCH 17 – 19, 2017

**ACC.17**  
66<sup>th</sup> Annual Scientific Session & Expo

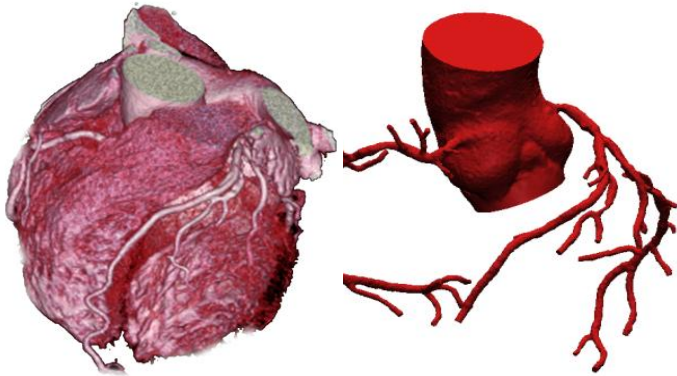
The poster features a green and white geometric design with a circular inset image of the Jefferson Memorial in Washington, DC. The text is arranged in a structured layout with various logos and event information.

# Intrakoronární techniky funkčního a morfologického zobrazení

- **FFR**
- **iFR, (RFR)**
- **IVUS**
- **RF-IVUS (VH-IVUS, iMAP, IB-IVUS)**
- **OCT**
- **NIRS**
- **kombinace**

# Neinvazivní FFR<sub>CT</sub>

## 3D Computational Model based on coronary CTA



### **Physiologic models:**

- Myocardial mass
- Morphometry-based boundary conditions
- Effect of adenosine on microcirculation

## CFD Blood Flow Solution

*Blood flow equations solved on supercomputer*

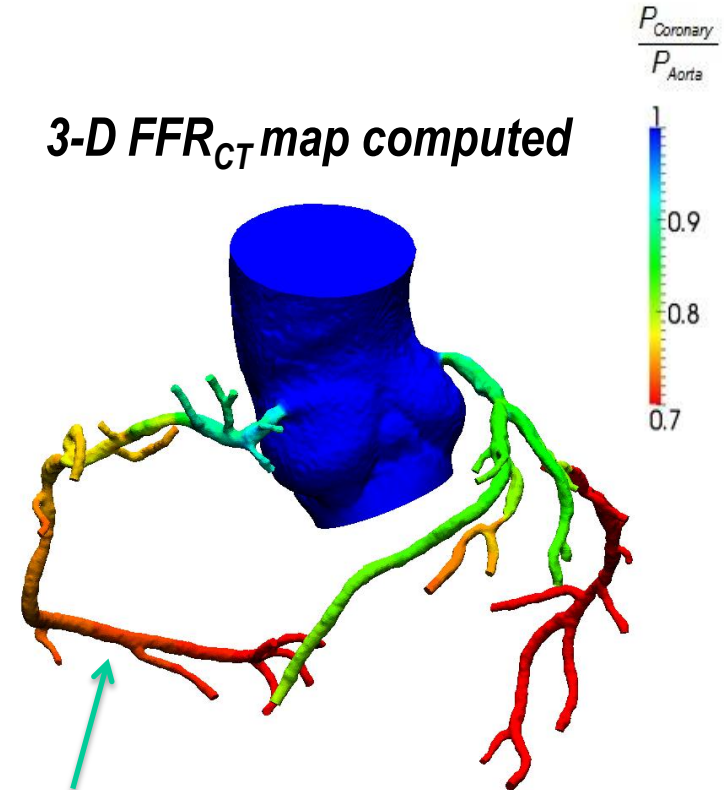
$$\rho \bar{v}_{,t} + \rho \bar{v} \cdot \nabla \bar{v} = -\nabla p + \nabla \cdot \bar{\tau}$$

$$\nabla \cdot \bar{v} = 0$$



## Calculate FFR<sub>CT</sub>

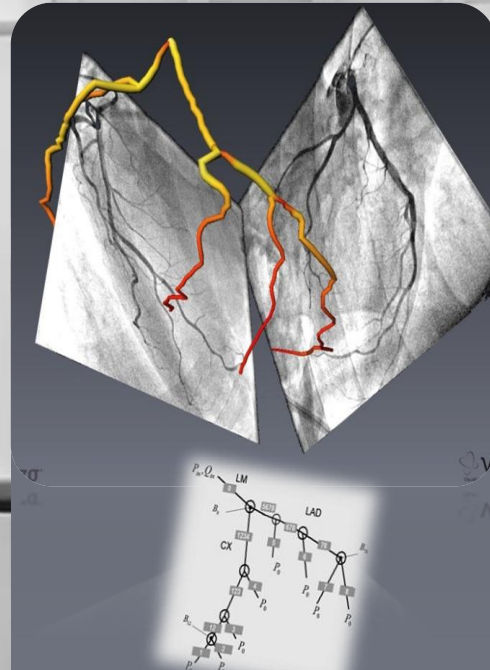
**3-D FFR<sub>CT</sub> map computed**



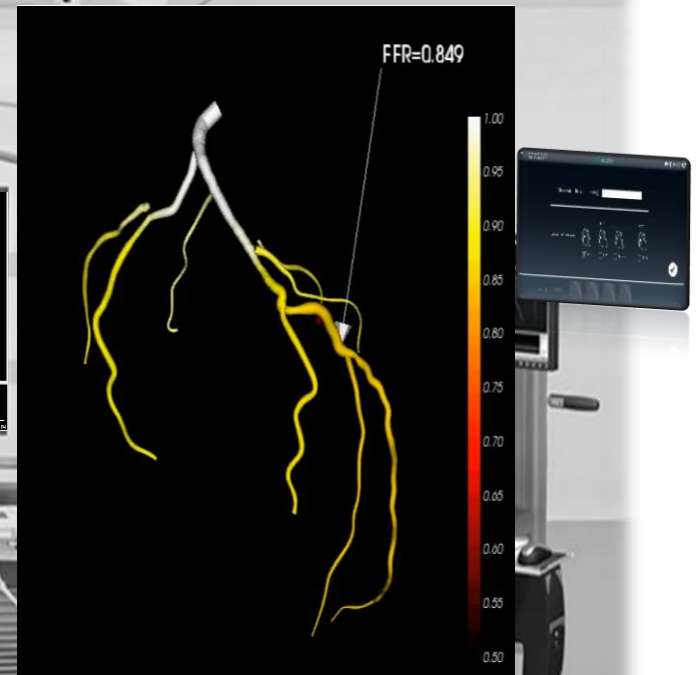
# CATHWORKS: "Wireless" Angiography FFR



Routine  
angiograms



3D tree & Flow  
analysis

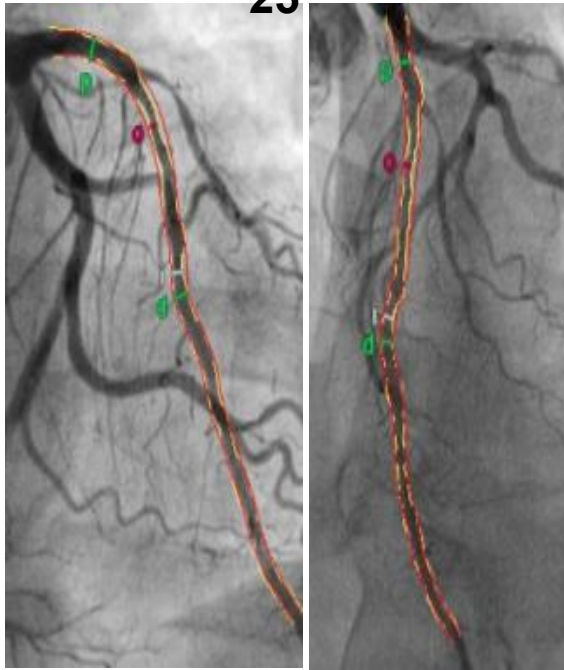


FFR  
Angio

# Quantitativní Flow Ratio (QFR)

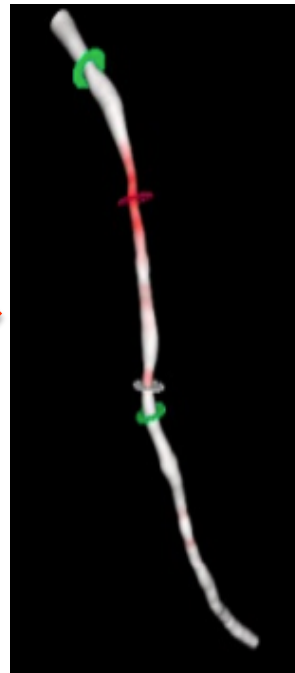
## 1: 3D rekonstrukce

2 projections separated >  
25°

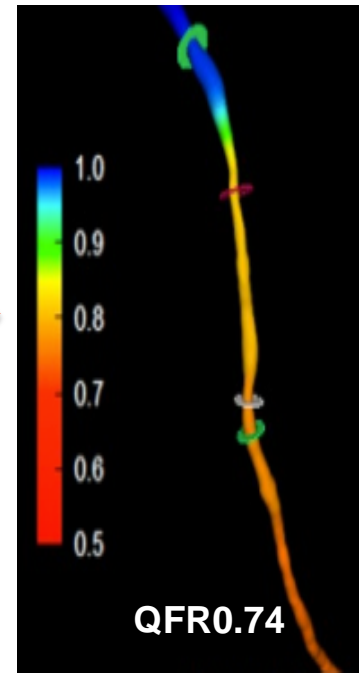


## 2: 3D-QCA + Fluid dynamics

3D Model

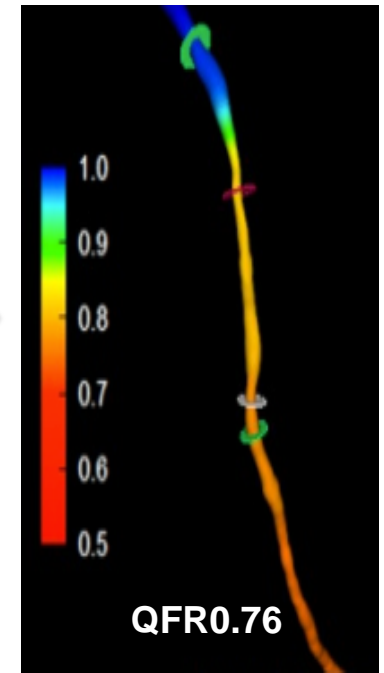


Fixed-QFR

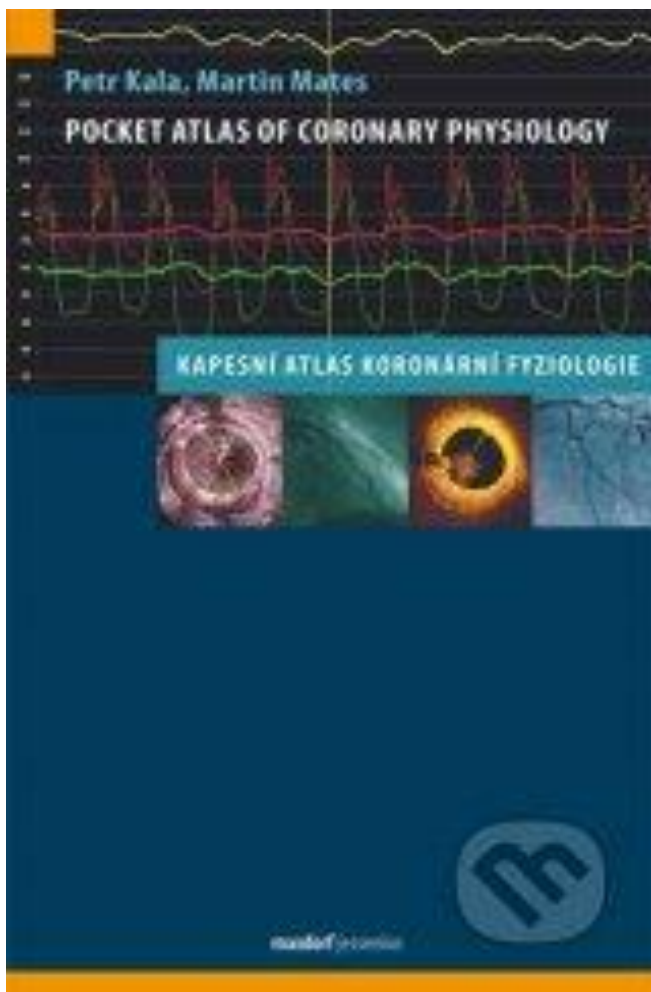


## 3: Hyperemické flow (z TIMI-fc)

contrast-QFR



# Funkční revaskularizace

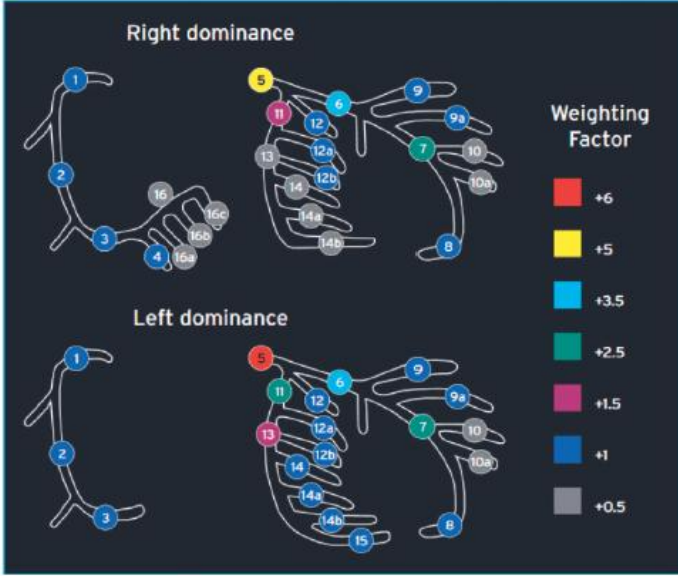


Budoucí role neinvazivních hybridních technik – PET-MR, SPECT-CT aj.

## 2. SKÓROVACÍ SYSTÉMY - výběr

# Syntax skóre

**Table 6** Guide for calculating the SYNTAX score

Steps	Variable assessed	Description
Step 1	Dominance	The weight of individual coronary segments varies according to coronary artery dominance (right or left). Co-dominance does not exist as an option in the SYNTAX score.
Step 2	Coronary segment	The diseased coronary segment directly affects the score as each coronary segment is assigned a weight depending on its location, ranging from 0.5 (i.e. the posterolateral branch) to 6 (i.e. left main in case of left dominance). <div style="text-align: center;">  </div>
Step 3	Diameter stenosis	The score of each diseased coronary segment is multiplied by two in case of a stenosis 50–99% and by five in case of total occlusion. In case of total occlusion, additional points will be added as follows: <ul style="list-style-type: none"> <li>• Age &gt;3 months or unknown +1</li> <li>• Blunt stump +1</li> <li>• Bridging +1</li> <li>• First segment visible distally +1 per non-visible segment</li> <li>• Side branch at the occlusion +1 if &lt;1.5 mm diameter +1 if both &lt;1.5 mm and ≥1.5 mm diameter +0 if ≥1.5 mm diameter (i.e. bifurcation lesion)</li> </ul>
Step 4	Trifurcation lesion	The presence of a trifurcation lesion adds additional points based on the number of diseased segments: <ul style="list-style-type: none"> <li>• 1 segment +3</li> <li>• 2 segments +4</li> <li>• 3 segments +5</li> <li>• 4 segments +6</li> </ul>

DOWNGRADES	
Distal protection devices for PCI of SVG lesions	
Bivalirudin for PCI in NSTEMI-ACS	
Bivalirudin for PCI in STEMI	
PCI for MVD with diabetes and SYNTAX score <23	
Platelet function testing to guide antiplatelet therapy interruption in patients undergoing cardiac surgery	
EuroSCORE II to assess in-hospital mortality after CABG	

Class I	Class IIa
Class IIb	Class III

Continued

celkem 11 kroků/1 lézi ☺



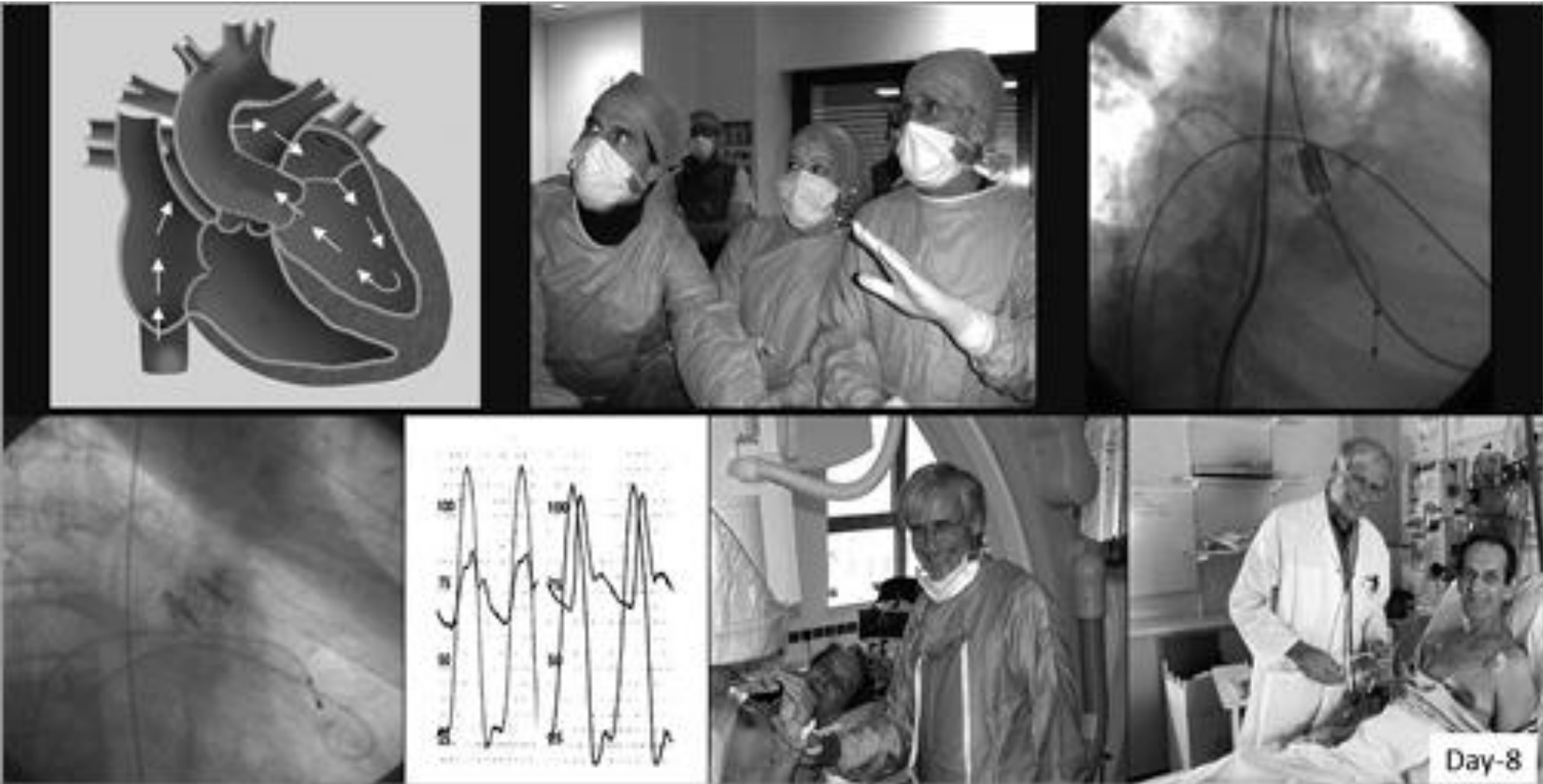
# Risk scores validated for dual antiplatelet therapy duration decision-making

	PRECISE-DAPT score	DAPT score	
Time of use	At the time of coronary stenting	After 12 months of an eventful DAPT	
DAPT duration strategies assessed	Short DAPT (3–6 months) vs. Standard/long DAPT (12–24 months)	Standard DAPT (12 months) vs. Long DAPT (30 months)	
Score calculation	<p>HB <math>\geq 2</math> 11-5 11 10-5 <math>\leq 10</math></p> <p>WBC <math>\leq 5</math> 8 10 12 14 16 18 <math>\geq 20</math></p> <p>Age <math>\leq 50</math> 60 70 80 <math>\geq 90</math></p> <p>CrCl <math>\geq 100</math> 80 60 40 20 0</p> <p>Prior Bleeding No <input type="checkbox"/> Yes <input type="checkbox"/></p> <p>Score Points 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30</p>	<p>Age <math>\geq 75</math> -2 pt</p> <p>65 to &lt;75 -1 pt</p> <p>&lt;65 0 pt</p> <p>Cigarette smoking +1 pt</p> <p>Diabetes mellitus +1 pt</p> <p>MI at presentation +1 pt</p> <p>Prior PCI or prior MI +1 pt</p> <p>Paclitaxel-eluting stent +1 pt</p> <p>Stent diameter &lt;3 mm +1 pt</p> <p>CHF or LVEF &lt;30% +2 pt</p> <p>Vein graft stent +2 pt</p>	
Score range	0 to 100 points	-2 to 10 points	
Decision making cut-off suggested	Score $\geq 25$ → Short DAPT Score <25 → Standard/long DAPT	Score $\geq 2$ → Long DAPT Score <2 → Standard DAPT	
Calculator	<a href="http://www.precisedaptscore.com">www.precisedaptscore.com</a>	<a href="http://www.daptstudy.org">www.daptstudy.org</a>	

# 3. NEKORONÁRNÍ INTERVENCE

# 2002 – FIM TAVI

**A. Cribier, H. Etchaninoff, Rouen, Francie**

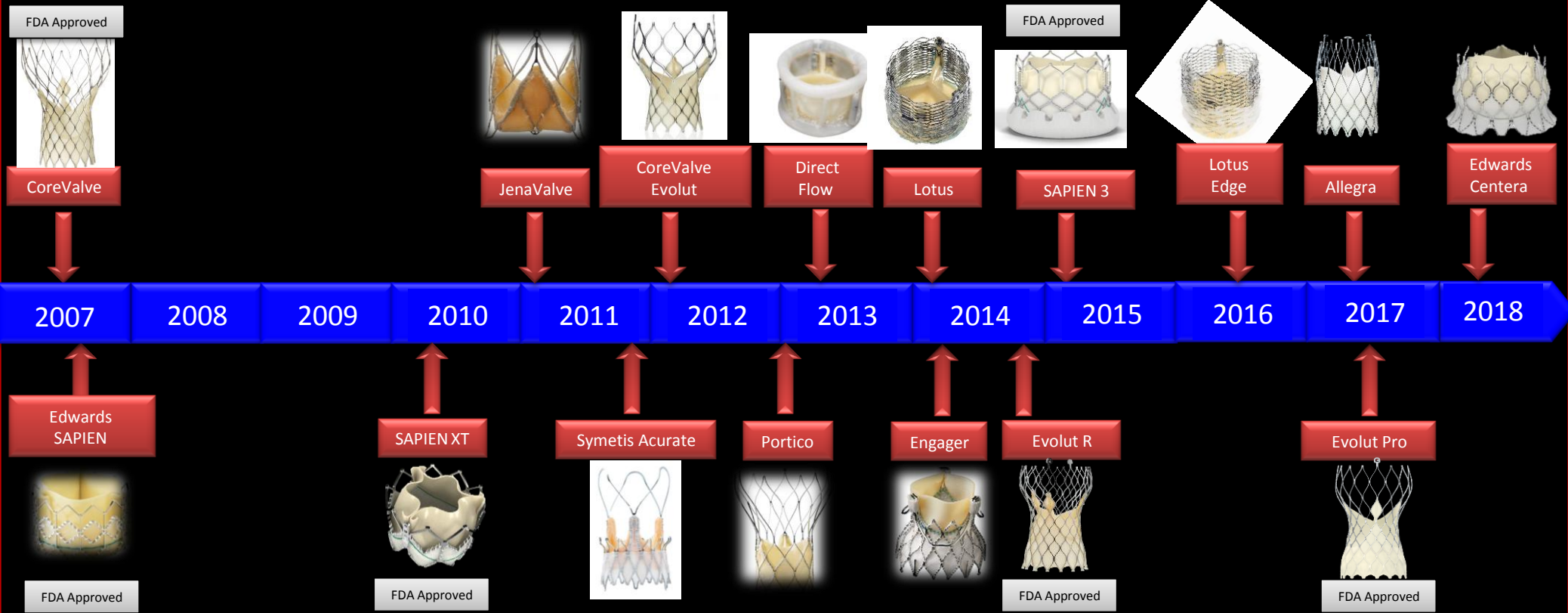


**Zdroj:  
PCRonline.com**

# 2012 - nejvyšší ocenění Francie, Legion of Honor A. Cribier, Rouen



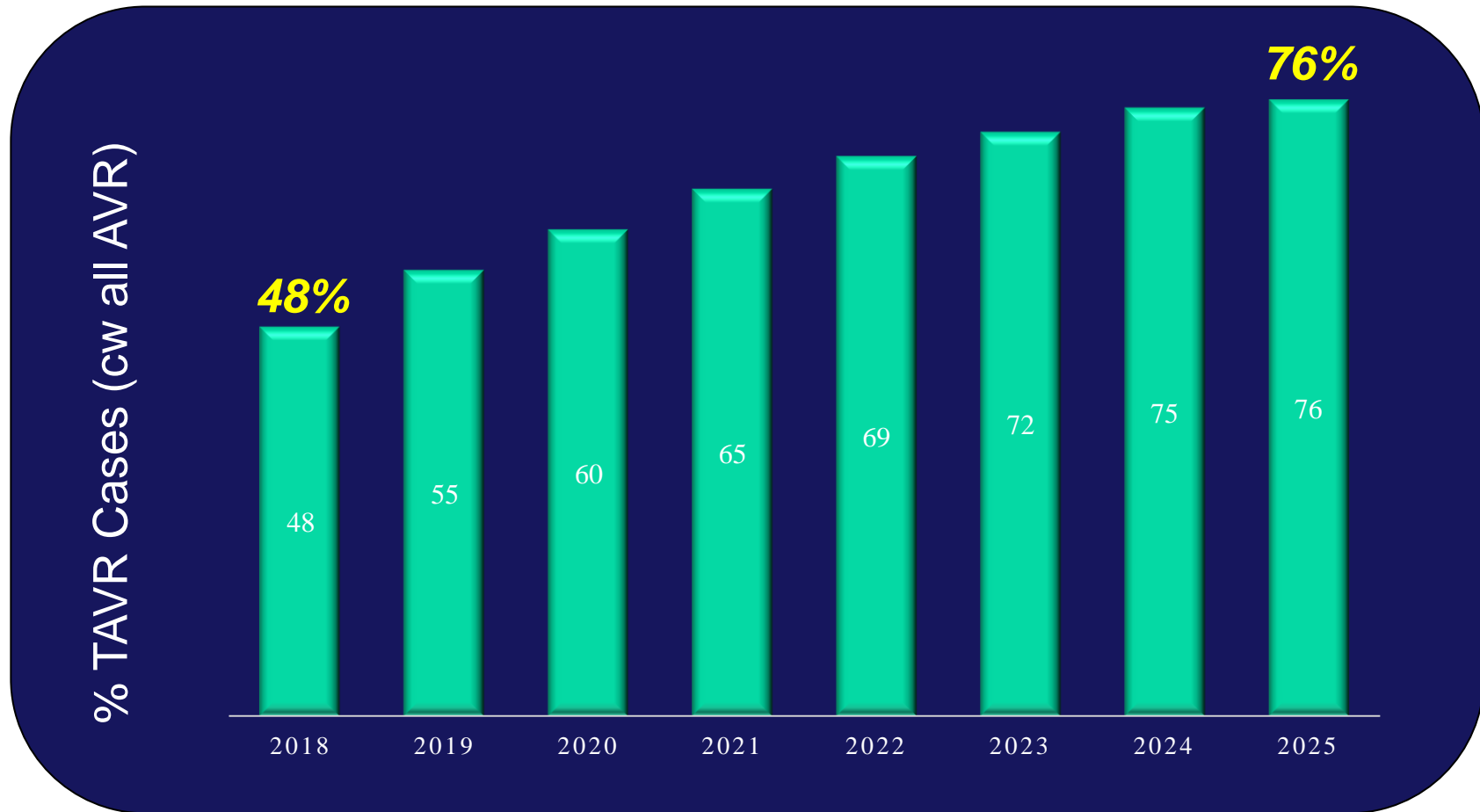
## Conformité Européene (CE) Mark TAVR Systems



## Non-Approved TAVR Systems

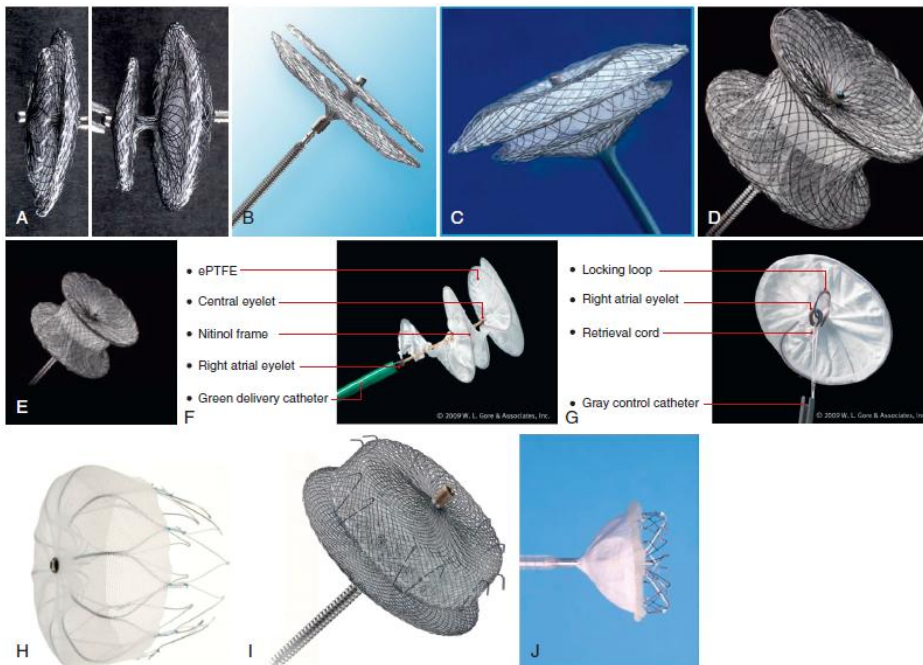


# Předpokládaný vývoj TAVR v USA

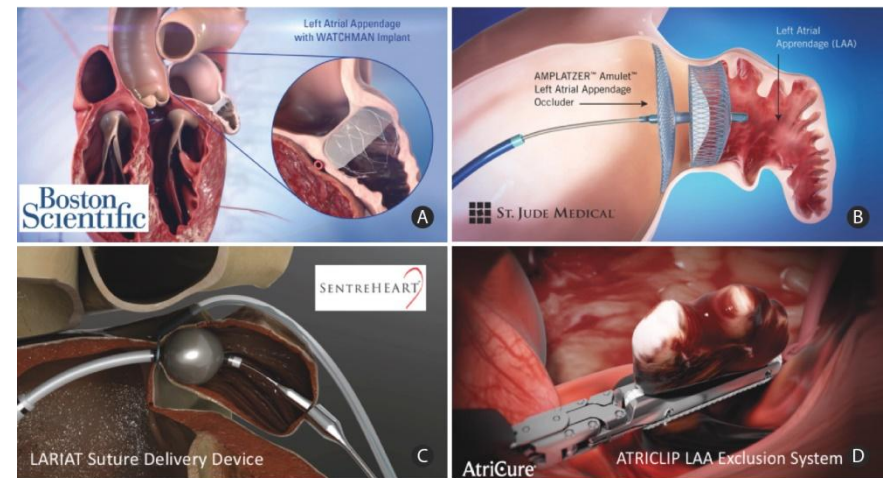


Current (2018) Market Projections

# Běžné strukturální intervence uzávěry PFO, ASD + narůstající počet LAAC



**FIGURE 32-3** Devices for transcatheter closure of patent foramen ovale (PFO), atrial septal defect, left atrial appendage (LAA), and ventricular septal defect (VSD) closure discussed in this chapter. **A**, Amplatzer PFO occluder. **B**, Amplatzer multifenestrated “cribriform” occluder. **C**, Amplatzer septal occluder. **D**, Amplatzer muscular VSD occluder. **E**, Amplatzer post-myocardial infarction VSD occluder. **F, G**, Helix septal occluder. **H**, Watchman LAA occluder. **I**, Amplatzer cardiac plug. **J**, Coherex WaveCrest device.



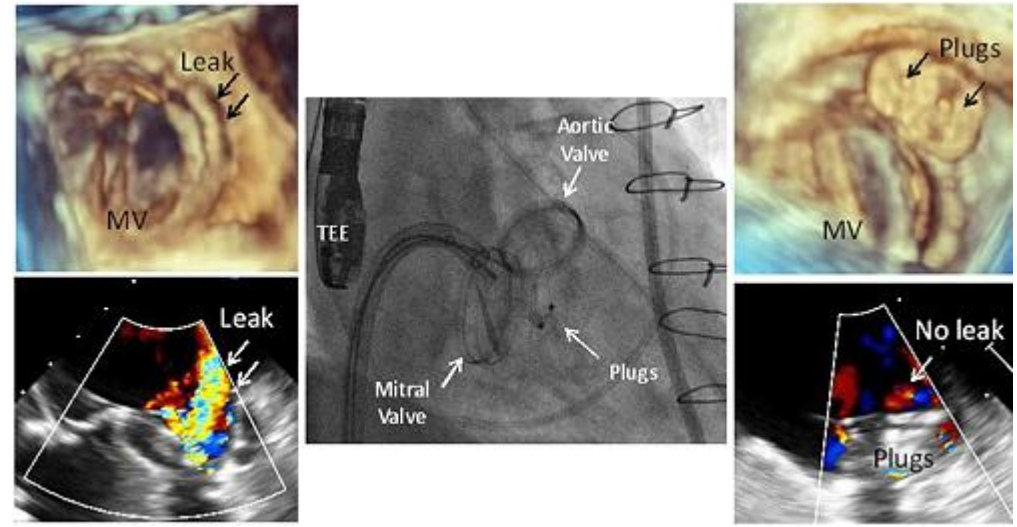
**Figure 1.** Left atrial appendage (LAA) closure devices and schematics of their deployment. Different types of LAA closure devices are seen. Endocardial devices

zdroj: Semantic Scholar

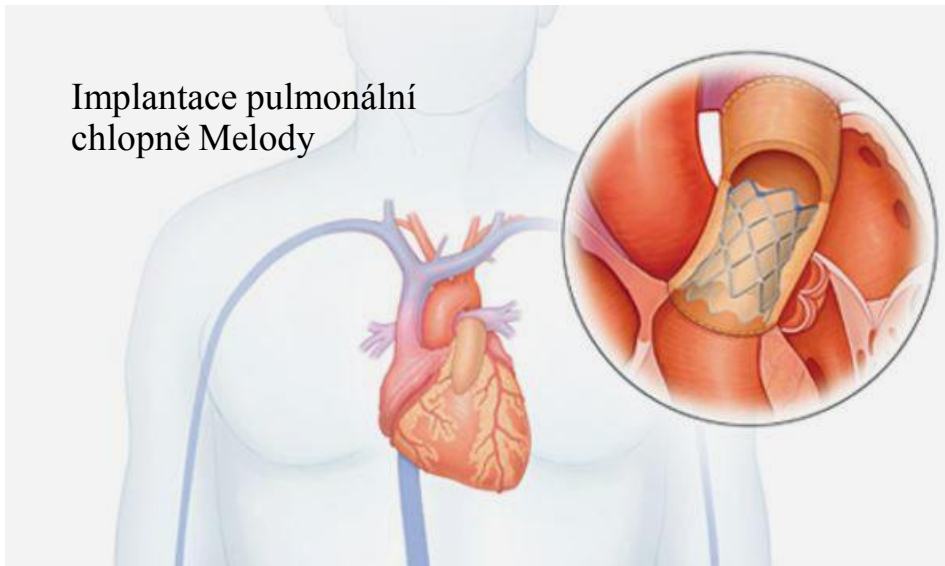
courtesy: prof Aydinalp



How the device works zdroj: IJN.com



zdroj: Cleveland Clinic



zdroj: TCTMD.com

...intervence valve-in-valve,  
valve-in-ring, vrožené vady,  
hybridní výkony aj.



# Shrnutí

## ..Mění a budou se měnit standardy..

- Komplementární a komplexní posouzení koronární cirkulace - její morfologie i funkce (invazivní+neinvazivní) s komplexními intervencemi a optimalizací strategie i výsledku pomocí i.c. imaging.
- Individualizace léčby s využitím rizikových skóre.
- TAVI v léčbě hemodynamicky významné aortální stenózy.
- Strukturální intervence od jednoduchých po komplexní.
- Výuka a výcvik nových intervenčních kardiologů – první simulátor pro kardiovaskulární intervence v ČR instalován ve FN Brno a jste zváni 😊

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- [dolezalova.radka@fnbrno.cz](mailto:dolezalova.radka@fnbrno.cz)

