

**Endovascular Symposium II
Session VIII
Carotid and Cerebral Intervention**

**A Pioneer's View of the Carotid World:
*What are the Remaining
Questions?***

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Disclosure Statement of Financial Interest


I, Klaus Mathias, DO NOT have a financial interest/arrangement or affiliation with one or more organizations that could be perceived as a real or apparent conflict of interest in the context of the subject of this presentation.

A Pioneer's View of the Carotid World

... first publication 36 years ago...

Sonderdruck aus **FORTSCHRITTE DER MEDIZIN** 95. Jg., Nr. 15 vom 21. 4. 1977, S. 1007—1011

Ein neuartiges Katheter-System zur perkutanen transluminalen Angioplastie von Karotisstenosen



Von *K. Mathias*

Aus der Abteilung für Röntgendiagnostik des Zentrums Radiologie
(Direktor: Prof. Dr. med. *W. Wenz*) der Universität Freiburg/Br.

... no enthusiastic reaction!

Carotid Artery Disease

We still have to answer many open questions!

- Do we already have the ideal stent for each lesion?
- What is the optimal cerebral protection?
- Should we treat acute ICA occlusions?
- Should we treat carotid dissections?
- Should we treat carotid aneurysms?
- Do we need stents in FMD?
- Should we treat asymptomatic ICA stenosis?
- How much experience do you need for a good outcome of CAS

Stents

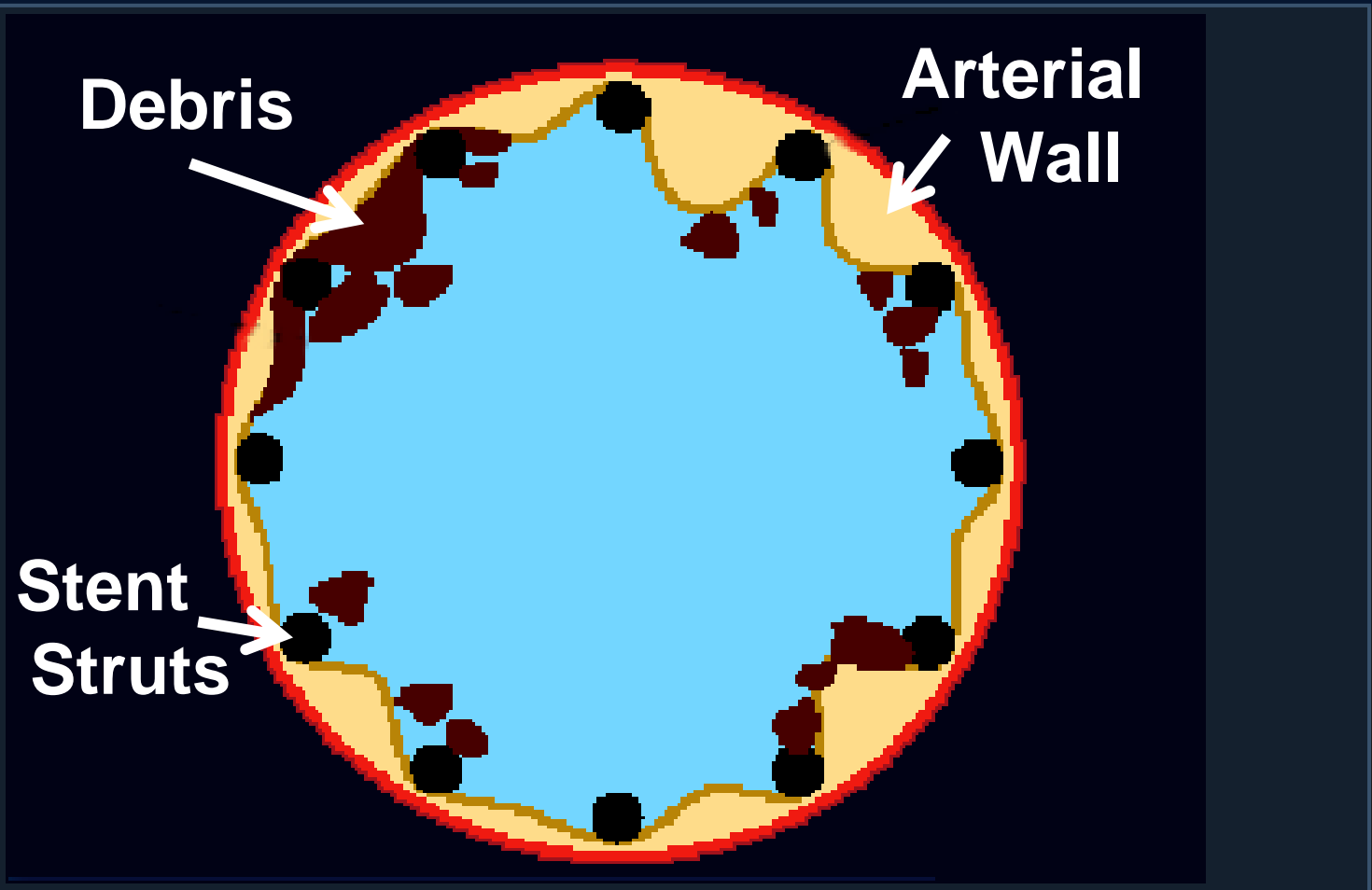
We have many differing properties of stents

- Cell size - scaffolding
- Radial force
- Tapering
- Plaque protrusion
- Late events - day 1-30



Stents

Plaque protrusion may lead to late events.

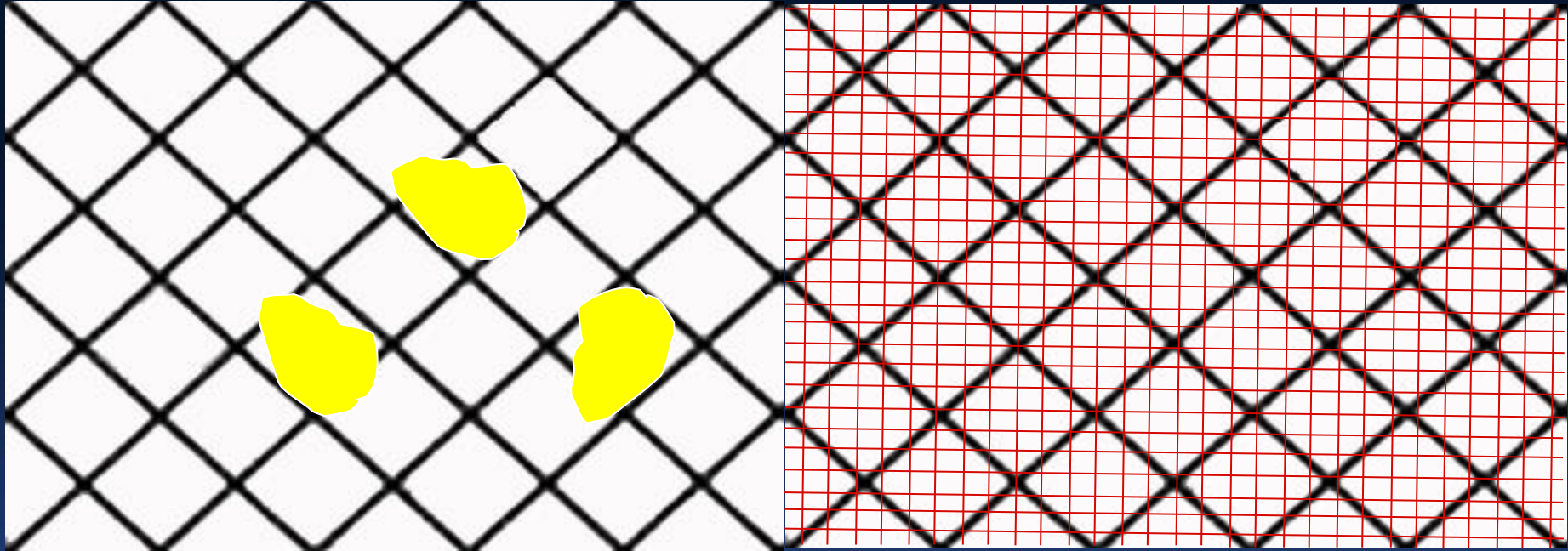


Stents

Under Investigation

- **Hybrid Stent**
 - = combination of nitinol stent and fine meshwork
 - = should prevent plaque prolaps
 - = should prevent late embolic events

Stents



**plaque prolaps through
stent meshes**

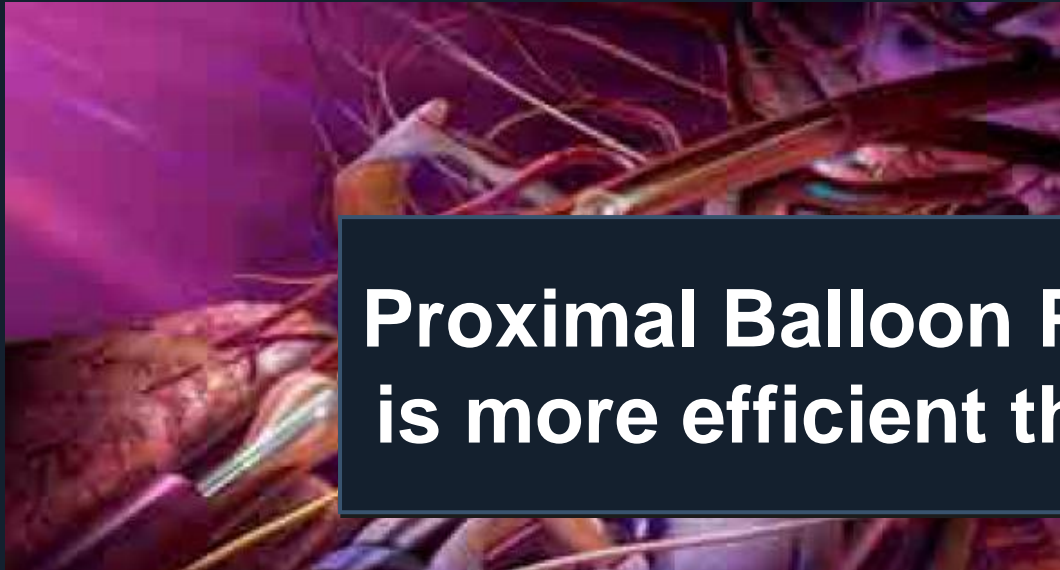
**fine meshwork prevents
plaque prolaps**

Cerebral Protection

Filters & Proximal Balloon Protection

- We should always use CP
- Proximal balloon protection is more effective than filters
- Lesions with little plaque burden in asymptomatic patients are well suited for filters
- Proper use of devices required
 - Filters must be well apposed to arterial wall
 - Aspiration before injection always necessary

Cerebral Protection



**Proximal Balloon Protection
is more efficient than filters**

Flow Blockage



Flow Reversal

Cerebral Protection

European Trial Flow Reversal

Enrolled pts.	122	100%
Minor stroke	1	0.8%
Major stroke	1	0.8%
Death	0	0.0%
Total subjects with MAE	2	1.6%

Cerebral Protection

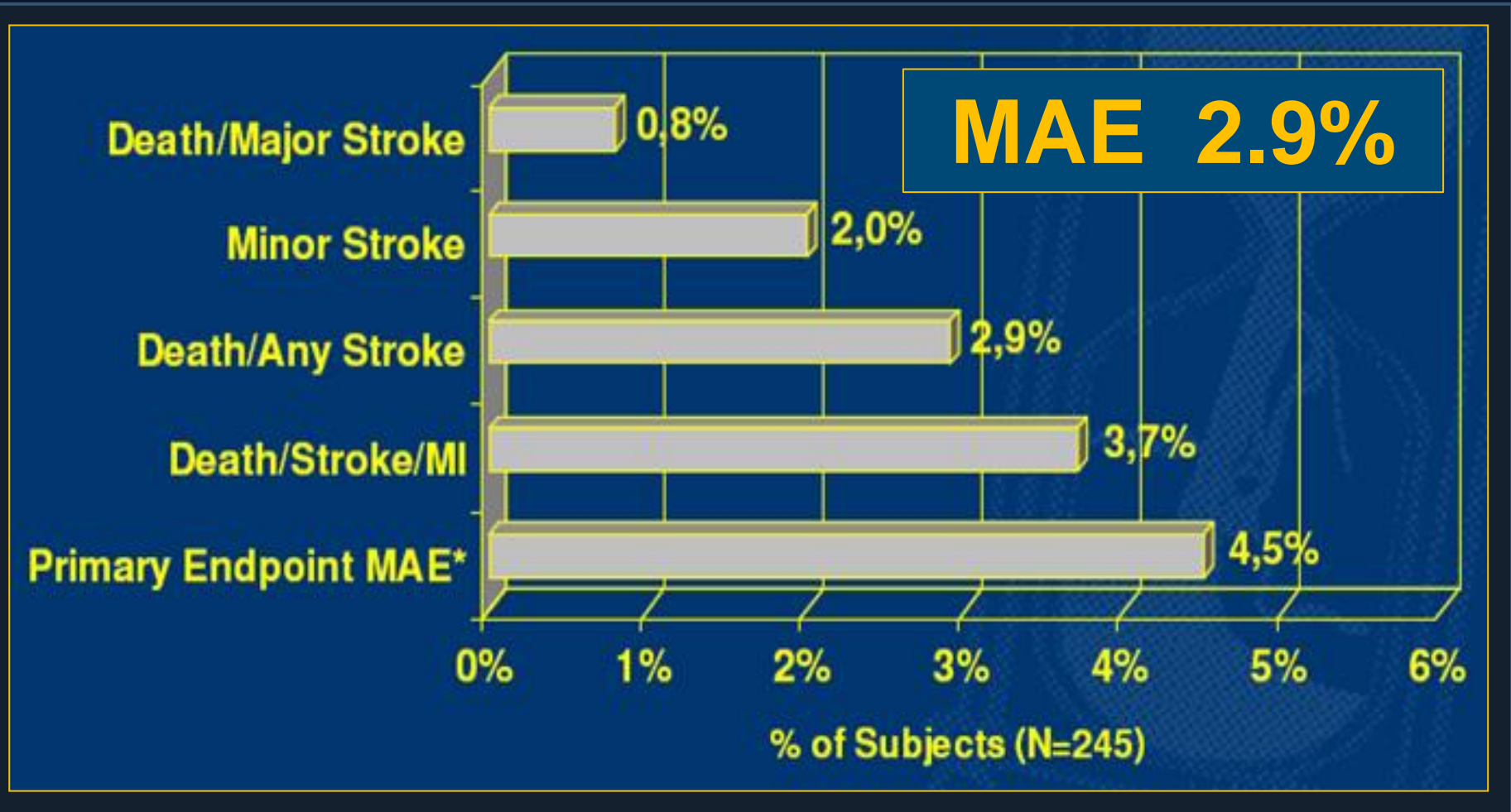
European MO.MA Trial

Enrolled pts.	157	100%
Minor stroke	3	1.8%
Major stroke @ 30 days	1	0.6%
Death	1	0.6%
Total subjects with MAE	4	3.0%

A. Cremonesi, Charing Cross 2004

Cerebral Protection

EMPIRE (*Em*bolic *P*rotection with *R*everse Flow)



Cerebral Protection

Improvements of CP have made CAS a safe procedure!

MAE today 1 - 3%

Acute ICA Occlusion

Bad results of IVT and CEA!

- **Thrombolysis too slow**
- **CEA inefficient in carotid T occlusions**
- **Organization essential for acute stroke management**

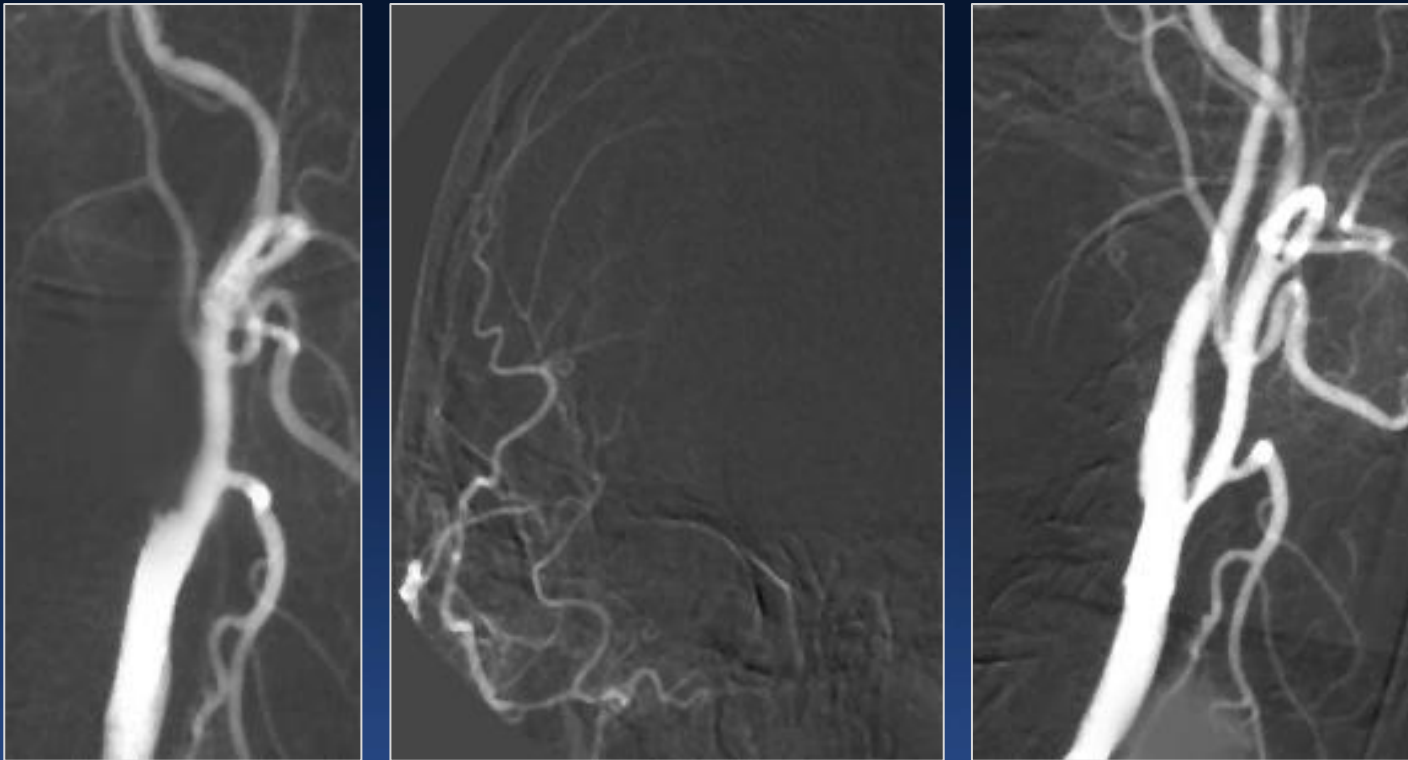
Acute ICA Occlusion



**D.E. f-62 Hemiplegic for 4 hours
CTA right ICA & MCA occluded**

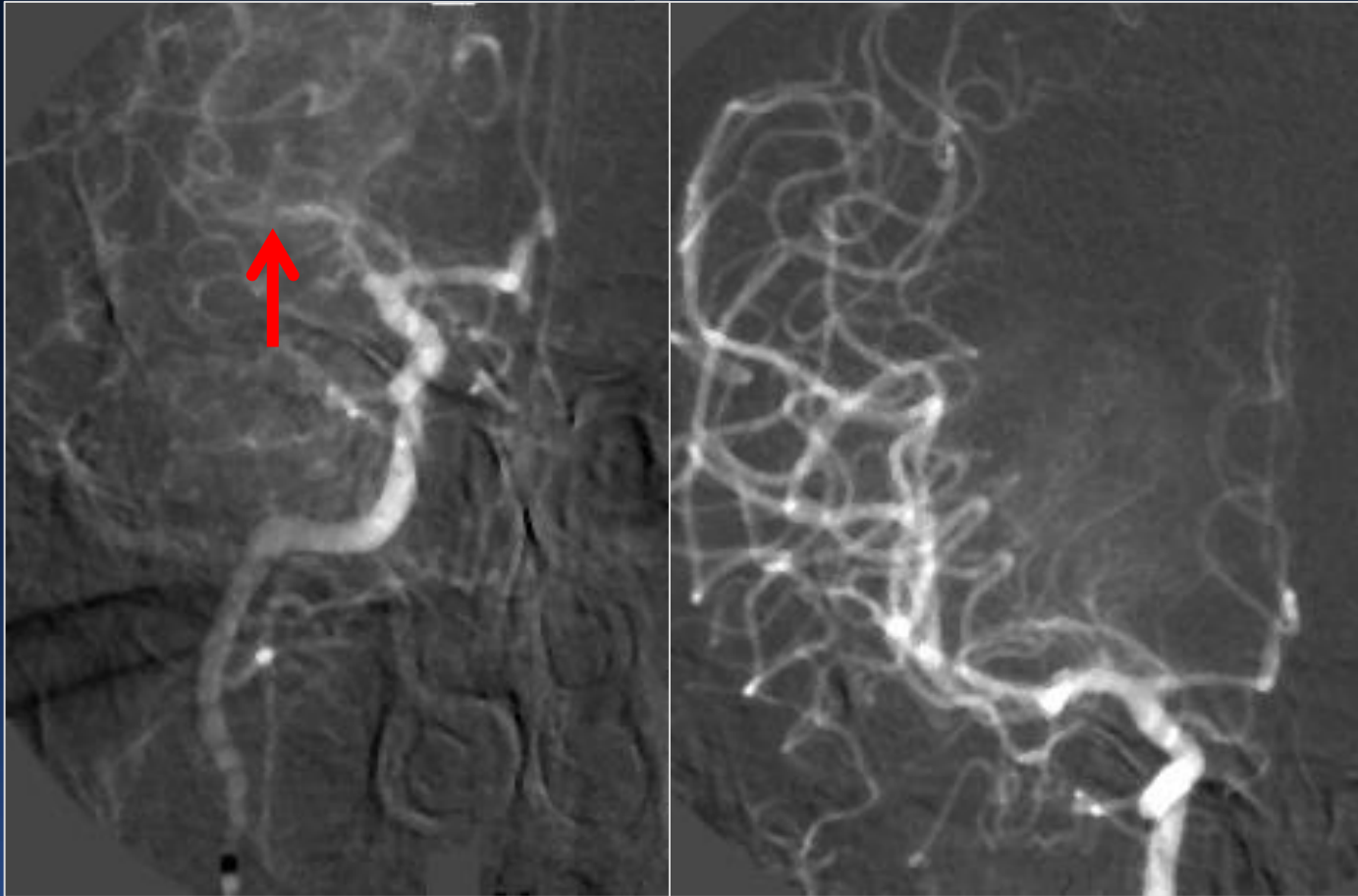
Acute ICA Occlusion

Bifurcational disease or carotid-T occlusion ?



D.E. f-62 Hemiplegic for 4 hours

Acute ICA Occlusion



Some thrombus also in MCA - stent retriever cleaned it.

Acute ICA Occlusion



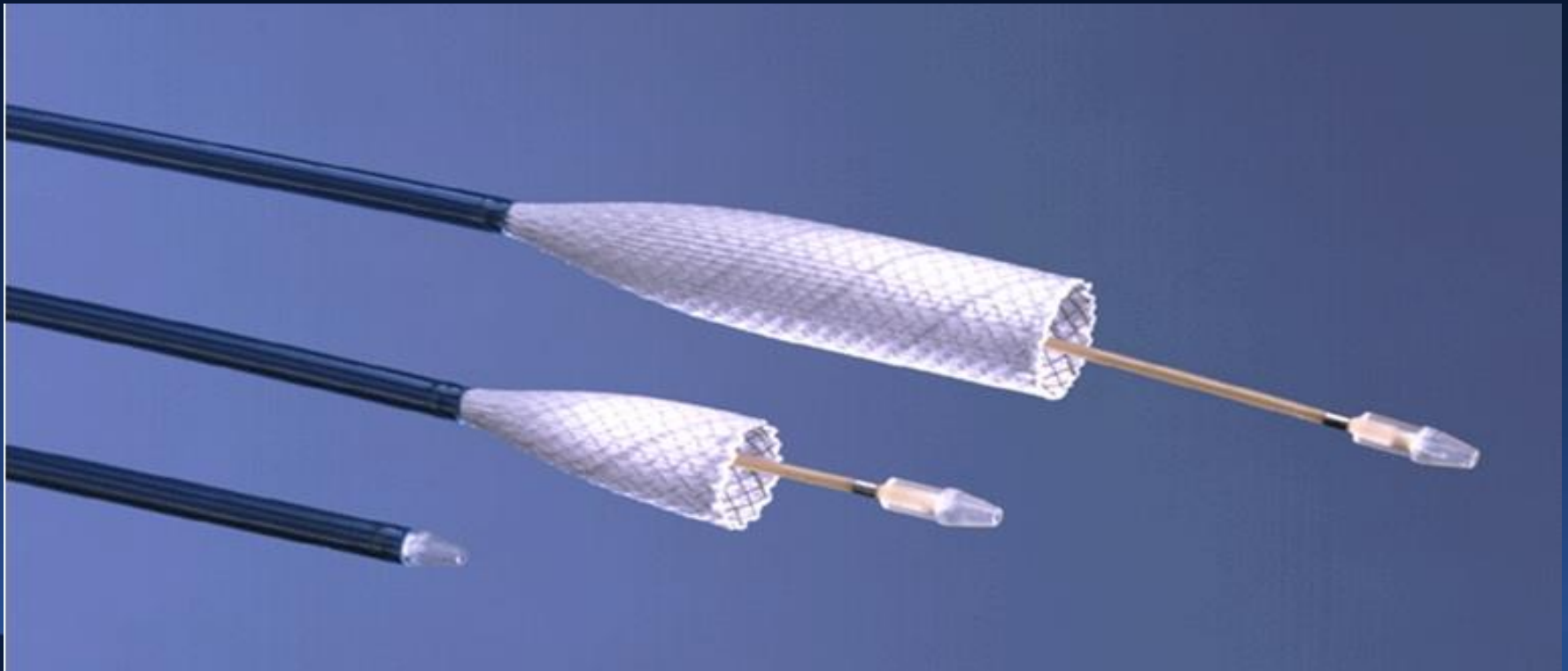
Carotid Artery Aneurysm

Endovascular Tx best choice!

- **Effective independent of the cause of aneurysm**
 - **atherosclerosis**
 - **chronic dissection**
 - **injury**
 - **tumor erosion**

Self-expandable Covered Stents

Aneurysms of CCA and ICA can be treated - also surgically inaccessible lesion close to the skull base.



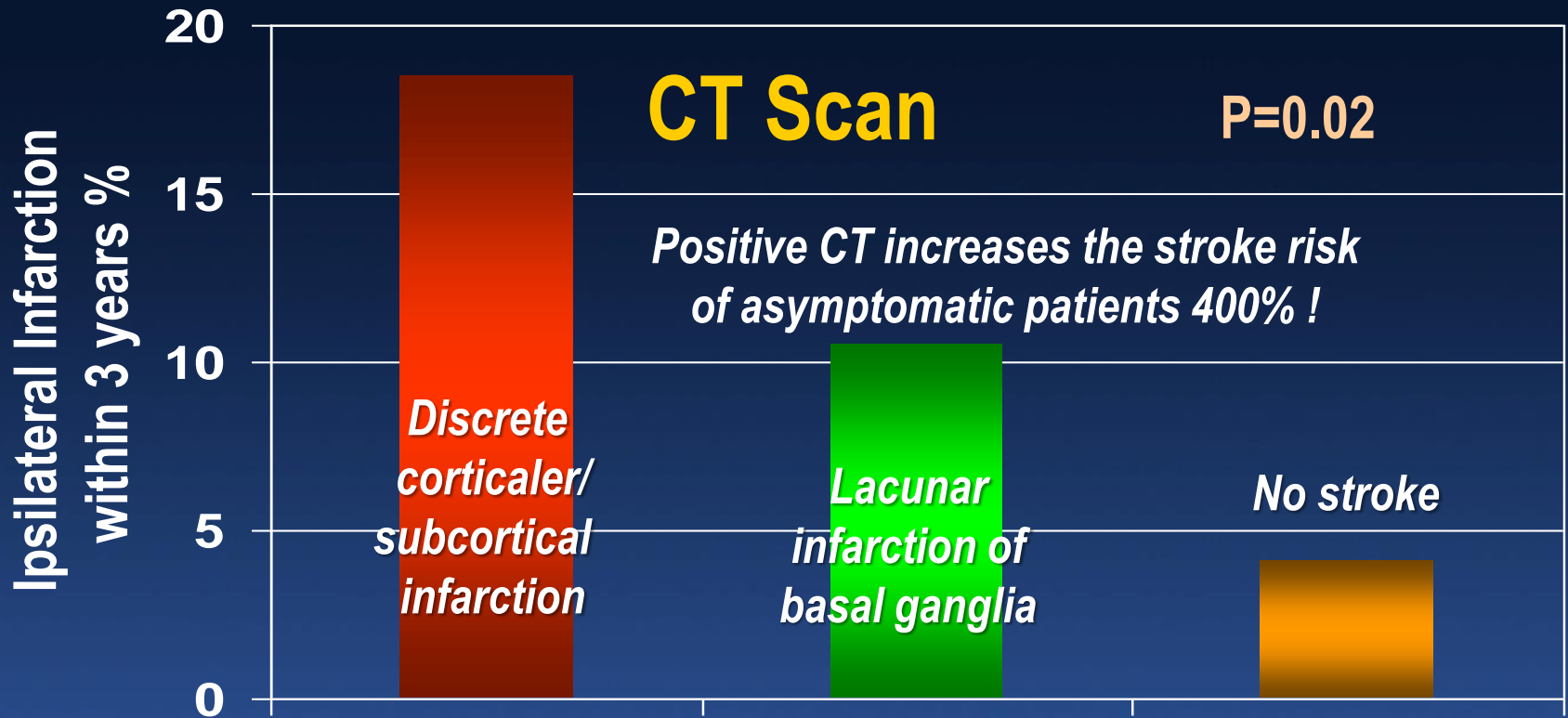
Carotid Artery Aneurysm

*AM 44 J. (m)
spontaneous dissection
exclusion of both
aneurysms
with Wallgraft 6 mm
for 5 years free of
symptoms*

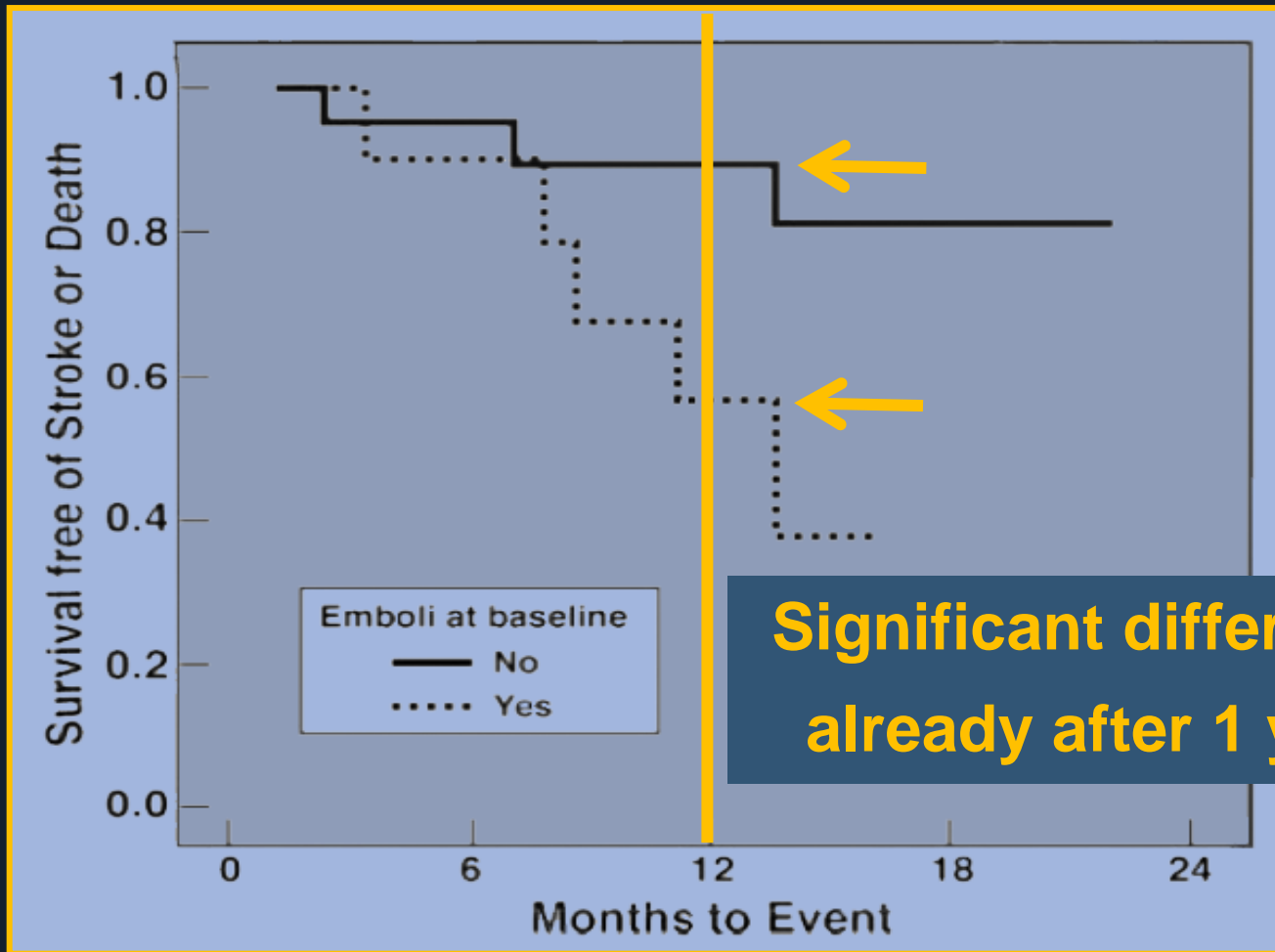


Asymptomatic Stenosis

Silent Infarctions? - Stroke Risk Increased !



Asymptomatic Stenosis



Experience of Interventionalist

4/5 of the trials allowed minimal expertise of 10 CAS and tutoring

CAVATAS ⁴¹ ○	Training in <u>neuroradiology</u> and angioplasty (but not necessarily in the carotid artery) required. <u>Tutor-assisted</u> procedures allowed.○
SAPPHIRE ⁴⁰ ○	Procedures submitted to an executive review committee; CAS periprocedural death or stroke rate had to be <6%.¶ <u>No tutor-assisted procedures allowed.</u> ○
SPACE ^{42, 51} ○	At 25 successful CAS or <u>assistance of a tutor</u> for interventionalists having performed at least 10 CAS.○
EVA-3S ⁴³ ○	≥ 12 CAS cases or ≥ 5 CAS and ≥ 30 cases of endovascular treatment of supra-aortic trunks. <u>Tutor-assisted CAS</u> allowed for centers not fulfilling minimal requirements.○
ICSS ⁴⁴ ○	A minimum of 50 total stenting procedures, of which at least 10 should be in the carotid artery. <u>Tutor-assisted</u> procedures allowed for interventionalists with insufficient experience.○

Experience of Interventionalist

Cerebrovascular
Diseases

Special Topic Section

Cerebrovasc Dis 2004;19:69-74
DOI: 10.1161/01.CD.0000128111.35555.5E

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That is nonsense!

International Carotid Stenting Study
for a Randomized Trial

**It is unethical to conduct a trial
on that basis!**

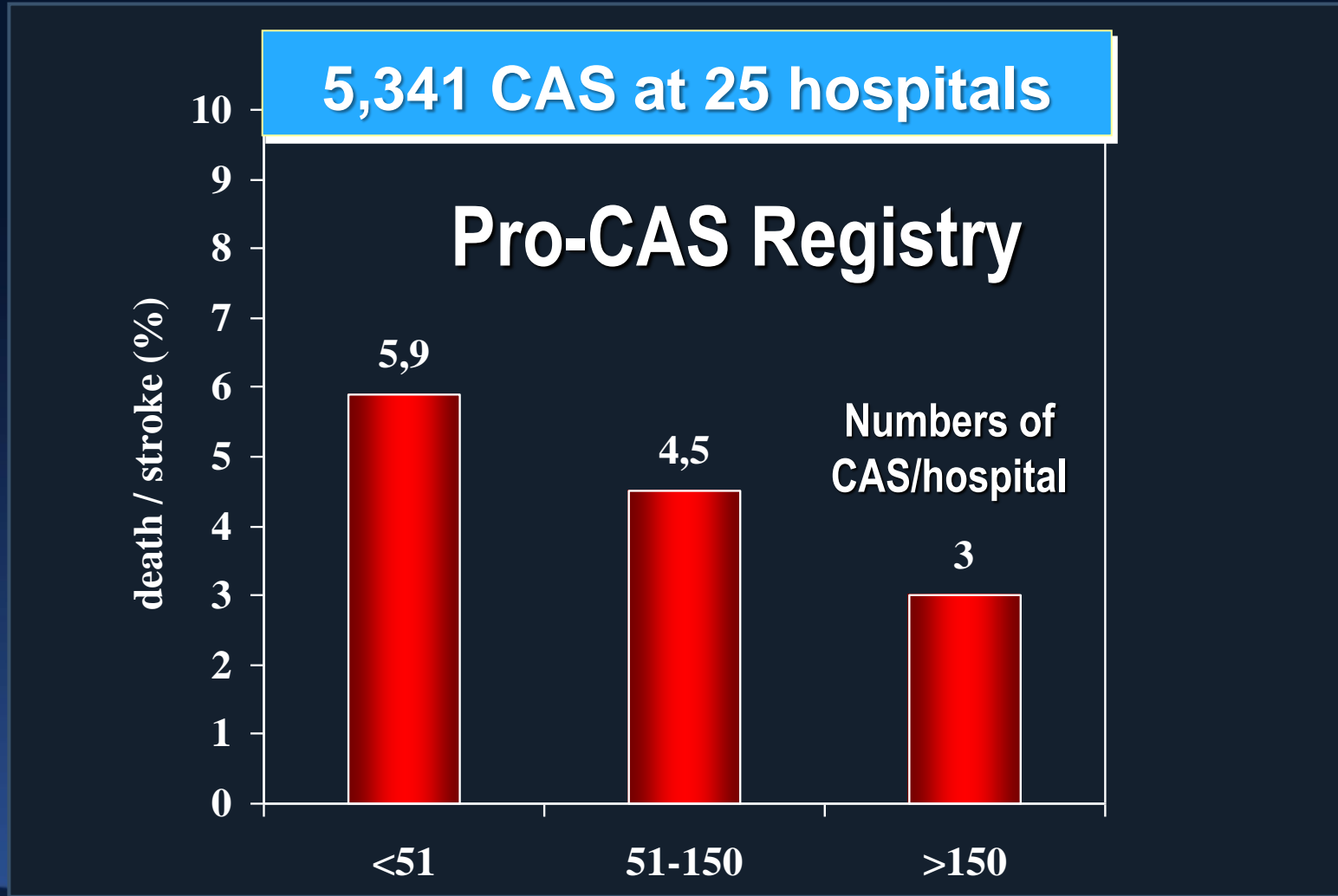
Probationary Centres

The trial protocol recognises that many centres may lack the necessary experience of carotid stenting. Centres fulfilling the other requirements for entry but where interventionalists (or surgeons) have insufficient experience of carotid stenting (or endarterectomy) may join the ICSS for a probationary period.

Experience of Interventionalist

- European trials with poor outcome due to unexperienced interventionalists
 - **EVA-3S** → CAS not reimbursed in France & Belgium
 - **SPACE**
 - **ICSS**
- Better results of **CREST** in the last 2 years of the study - no stroke at all!

Experience of Interventionalist



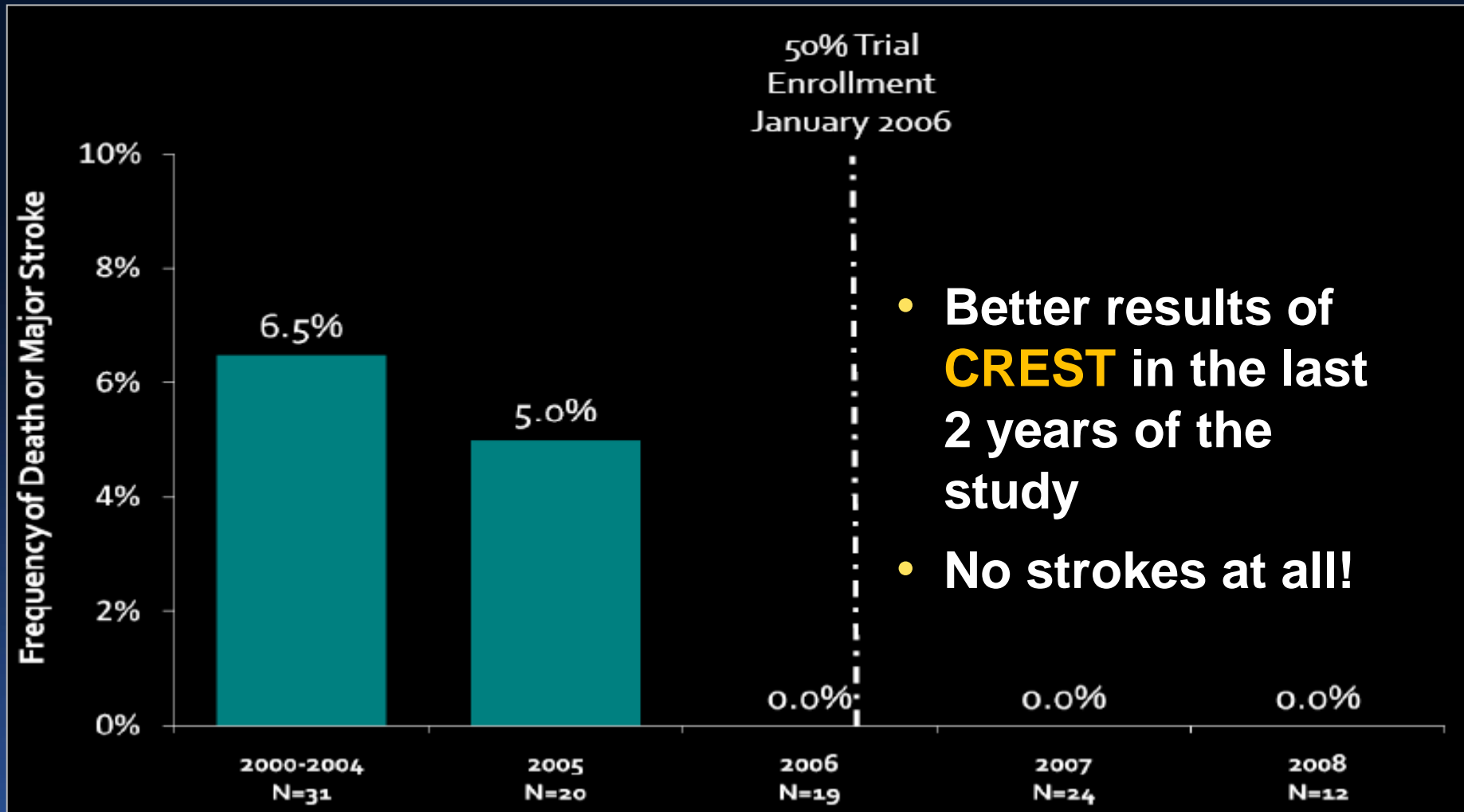
Experience of Interventionalist

Multivariate Analysis of Predictors of CAS Events*

Experience	OR (95% CI)	p-value
≤ 50 vs. $>150/J.$	1,77 (1,1-2,8)	0,017
50-61 vs $>150/J.$	1,48 (1,0-2,1)	0,034

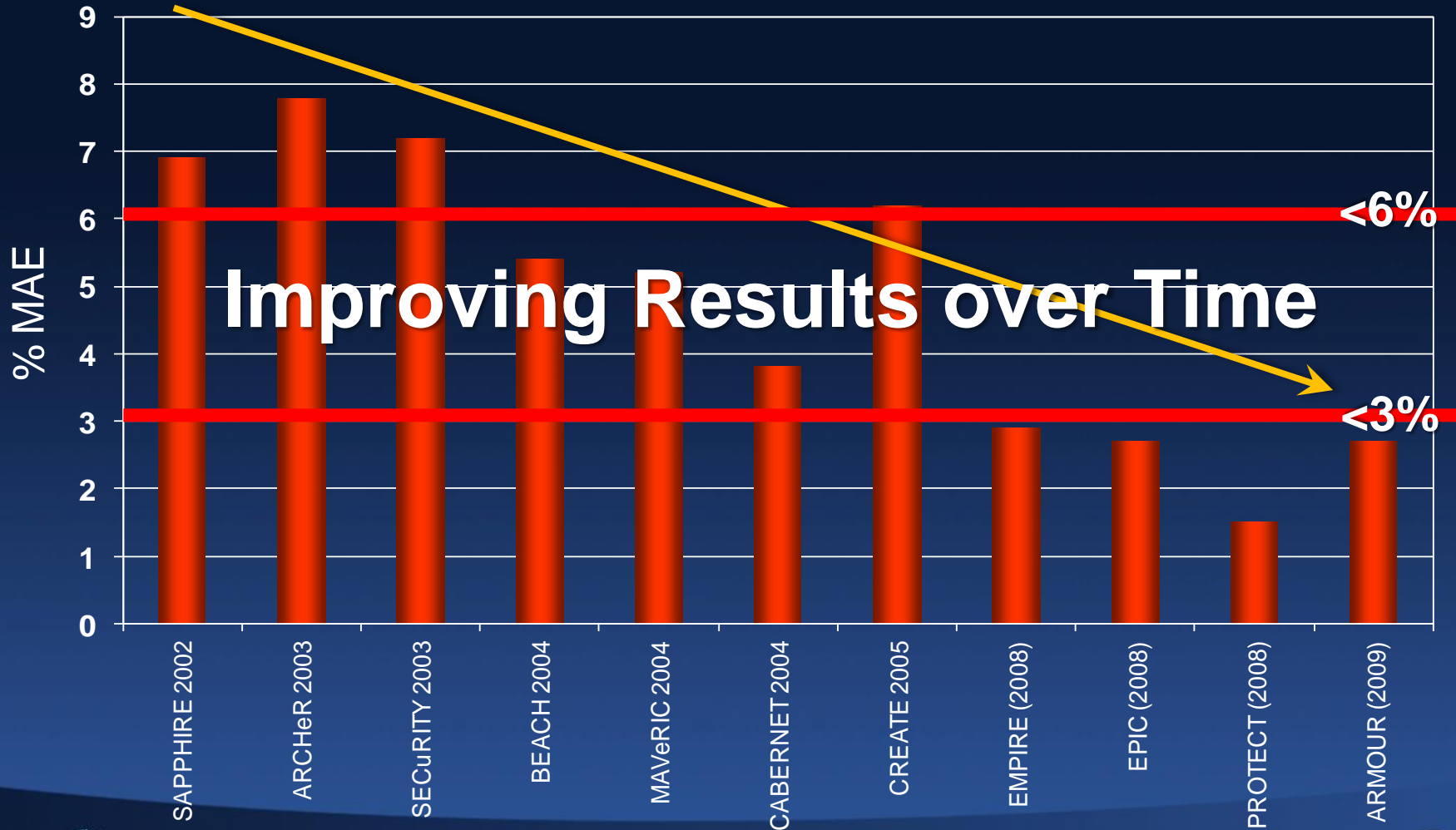
*Data from the ProCAS Registry

Experience of Interventionalist



Experience of Interventionalist

MAE in high risk carotid stent IDE trials: 2002-2009 (n>4000)



CAS - Mature for General Use?

Yes, when the own CAS results are independently controlled and meet the AHA criterions!

Bad trials damage good methods!!!

Regulated
CEA!