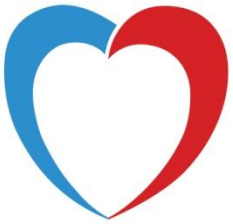
Karotický stenting

Kulhavý standard dobré péče

Josef VESELKA

Kardiologická klinika 2. LF UK a FN Motol



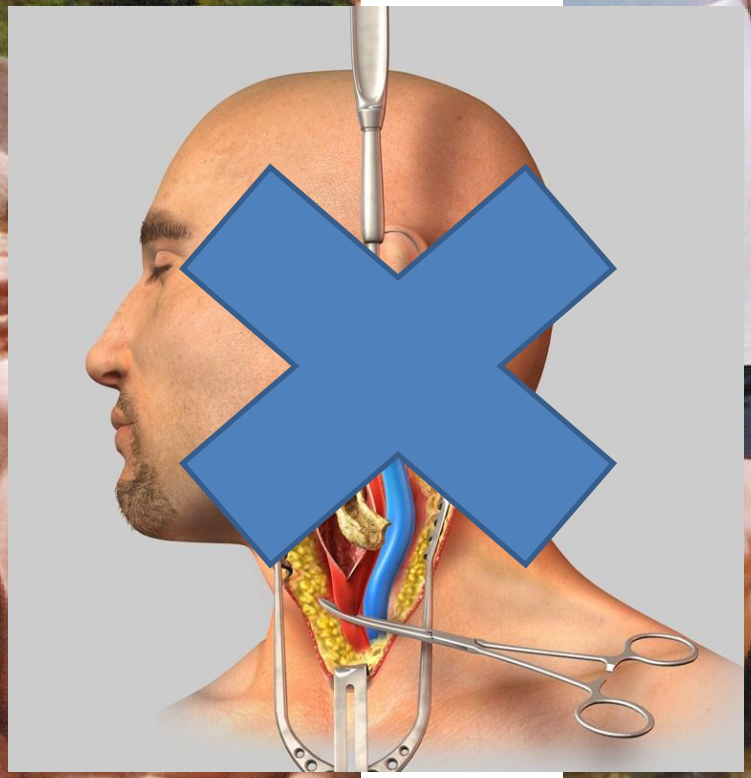
DEPARTMENT OF CARDIOLOGY
MOTOL UNIVERSITY HOSPITAL, 2nd MEDICAL SCHOOL,
CHARLES UNIVERSITY, PRAGUE, CZECH REPUBLIC

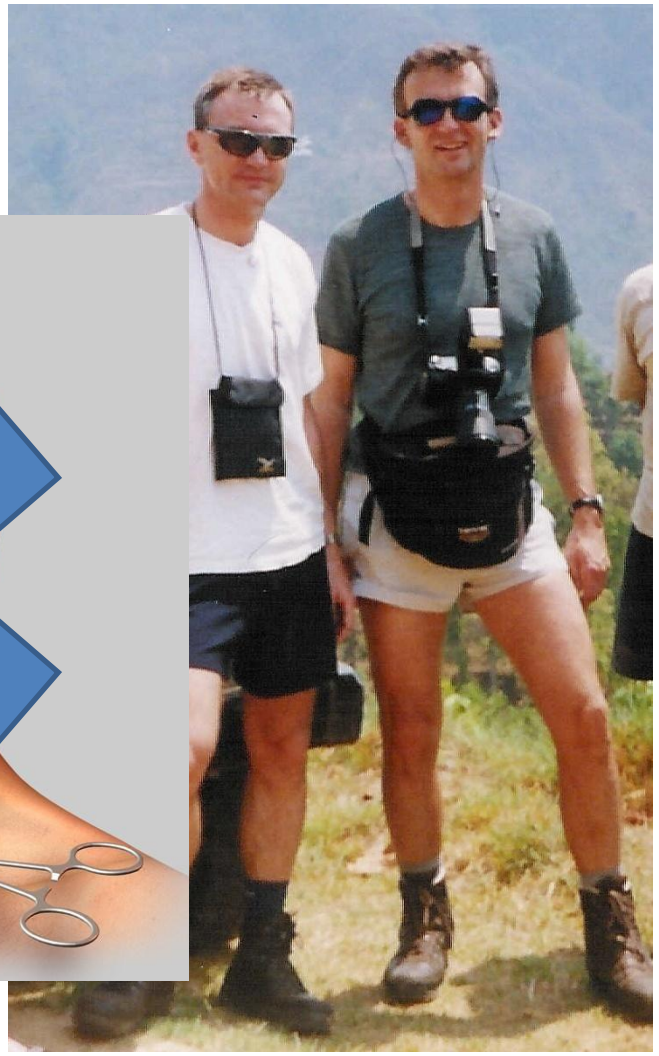
Motto:

„Neničte můj mozek, je to můj druhý nejoblíbenější orgán.“

Woody Allen


Endarterektomie
PTA + stent
2018



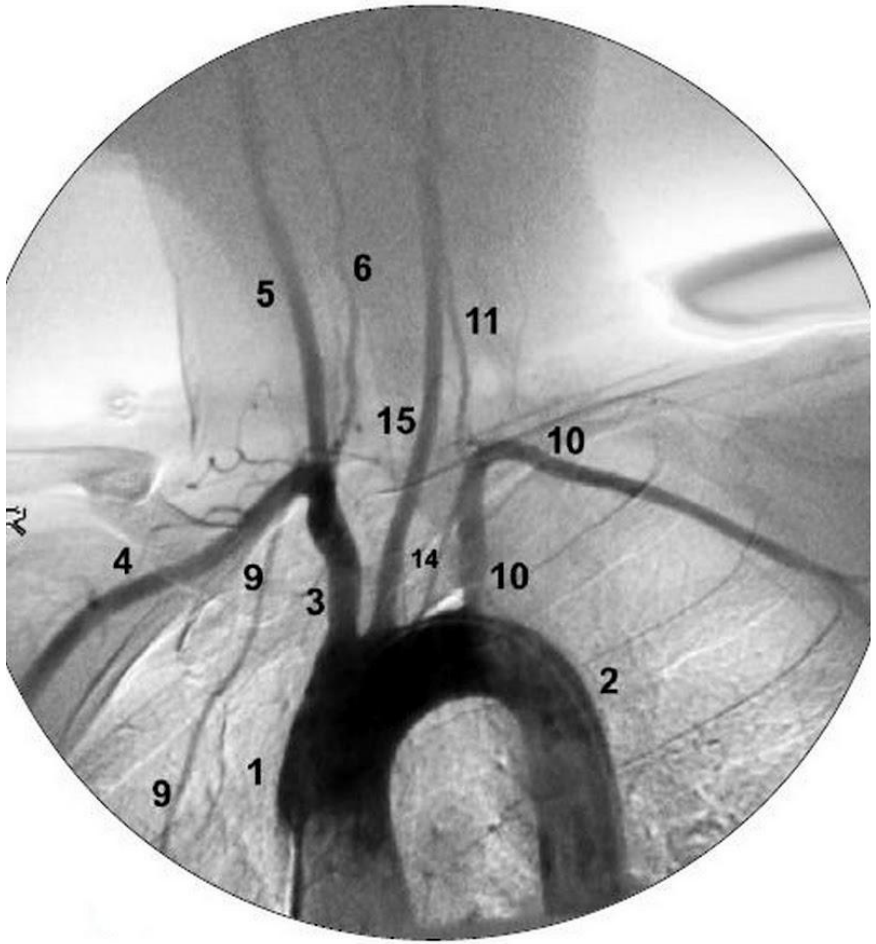


Obsah

- Anatomie
- Současná evidence a její kvalita
- Složení plátu rozhoduje o jeho chování
- Tři dobré rady
- Jak na to
- Nejdůležitější faktory klinického rozhodování

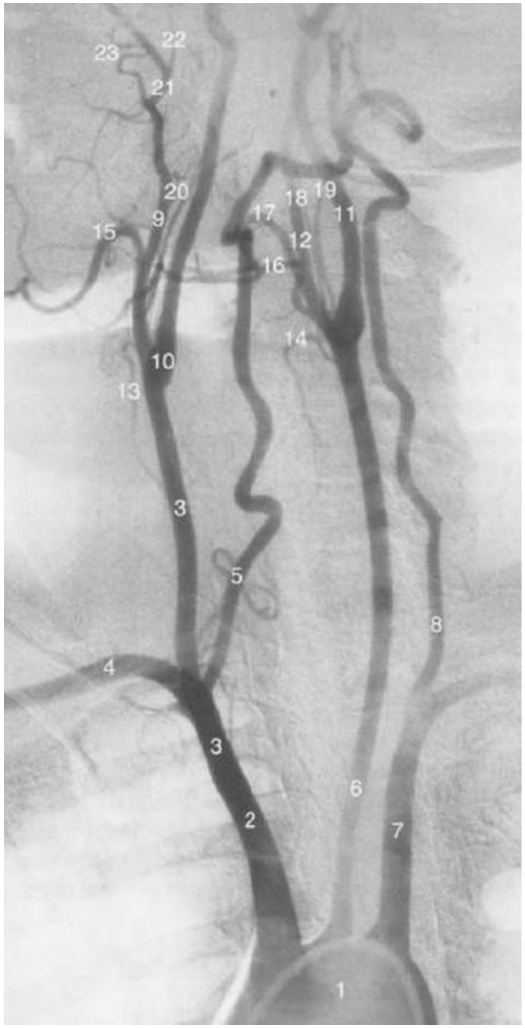
Anatomie

Anatomie



1 ascending thoracic aorta
2 descending thoracic aorta
3 innominate artery
4 right subclavian artery
5 right common carotid artery
6 right vertebral artery
9 right internal mammary artery
10 left subclavian artery
11 left vertebral artery
12 left thyrocervical trunk
14 left internal mammary artery
15 left common carotid artery

Anatomie



Arch Aortogram:
1. Arch of aorta
2. Brachiocephalic trunk
3. Right common carotid artery
(Superimposed upon the subclavian artery)
4. Right subclavian artery
5. Right vertebral artery
6. Left common carotid artery
7. Left subclavian artery
8. Left vertebral artery
9. Right external carotid artery
10. Sinus of right internal carotid artery
11. Left internal carotid artery
12. Left external carotid artery
13. Right superior thyroid artery
(Arising from the external carotid artery)
14. Left superior thyroid artery
(Arising from common carotid artery)
15. Right lingual artery
16. Left lingual artery
17. Left facial artery
18. Left ascending pharyngeal artery
19. Left posterior auricular artery
20. Right posterior auricular artery
21. Right maxillary artery
22. Middle meningeal artery
(Branch of right maxillary artery)
23. Right superficial temporal artery

Současná evidence a její kvalita

CREST

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Stenting versus Endarterectomy for Treatment of Carotid-Artery Stenosis

Thomas G. Brott, M.D., Robert W. Hobson, II, M.D.,* George Howard, Dr.P.H., Gary S. Roubin, M.D., Ph.D., Wayne M. Clark, M.D., William Brooks, M.D., Ariane Mackey, M.D., Michael D. Hill, M.D., Pierre P. Leimgruber, M.D., Alice J. Sheffet, Ph.D., Virginia J. Howard, Ph.D., Wesley S. Moore, M.D., Jenifer H. Voeks, Ph.D., L. Nelson Hopkins, M.D., Donald E. Cutlip, M.D., David J. Cohen, M.D., Jeffrey J. Popma, M.D., Robert D. Ferguson, M.D., Stanley N. Cohen, M.D., Joseph L. Blackshear, M.D., Frank L. Silver, M.D., J.P. Mohr, M.D., Brajesh K. Lal, M.D., and James F. Meschia, M.D., for the CREST Investigators†

NEJM 2010

CREST is the largest RCT comparing CAS vs CEA

- Largest, most rigorous, prospective randomized trial and shows the two therapies are safe and effective
- 108 US and 7 Canadian sites, 2502 pts.
- PE: stroke, MI, death; ipsilateral stroke up to 4 years

Clinical Trial	# of Patients	# of Sites
CREST	**2,502**	**117**
ICSS	1,710	53
SPACE*	1,183	35
EVA-3S*	520	30
SAPPHIRE*	334	29

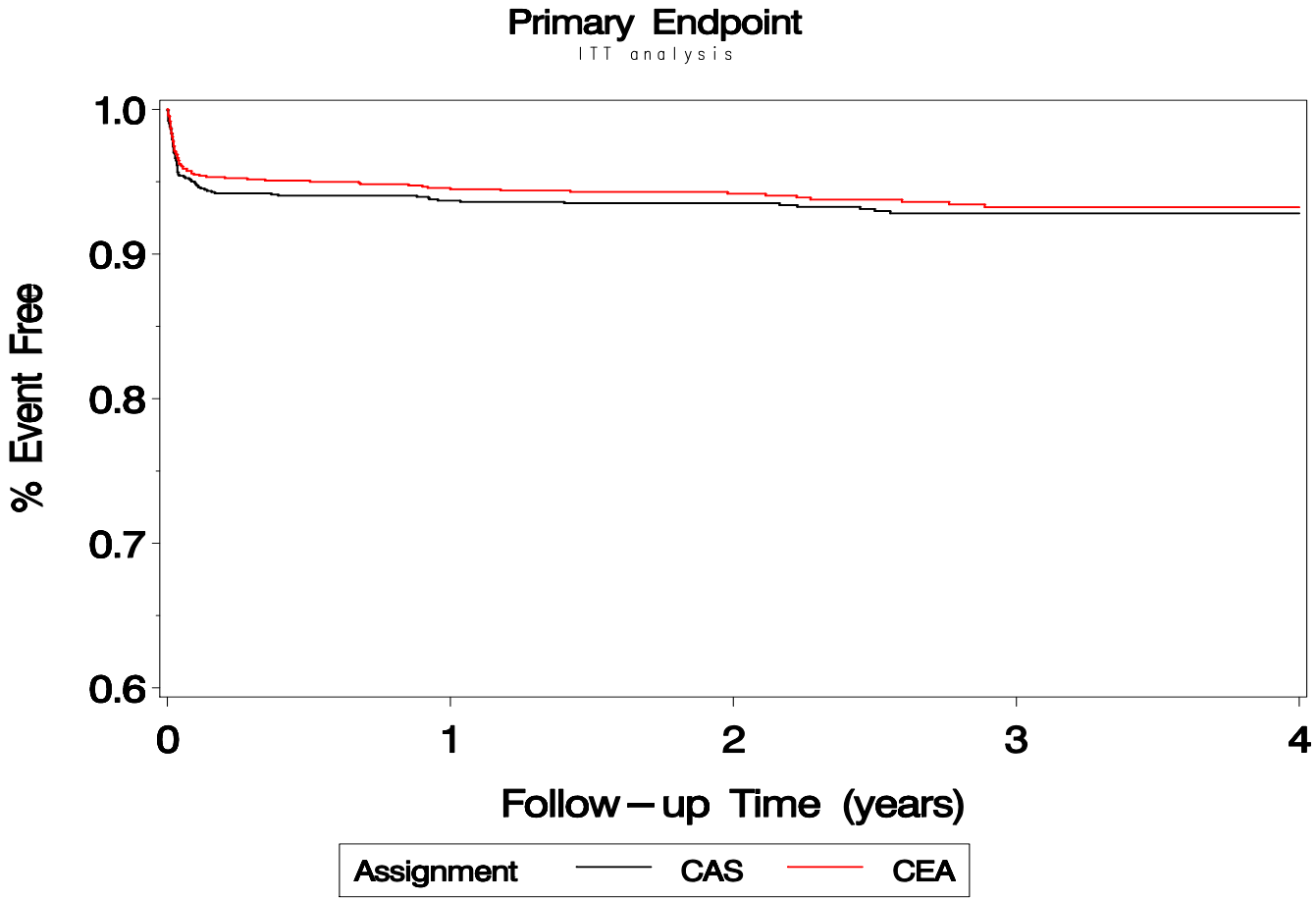
* Trials stopped prematurely

Primary endpoint:

Both stenting and surgery are equally safe and effective

Any death, stroke or MI within the perioperative period plus ipsilateral stroke out to 4 years.

CAS	CEA	Hazard Ratio	P-value
7.2%	6.8%	HR:1.11; 95% CI: 0.81-1.51	0.51



Primary Endpoint: Perioperative Components

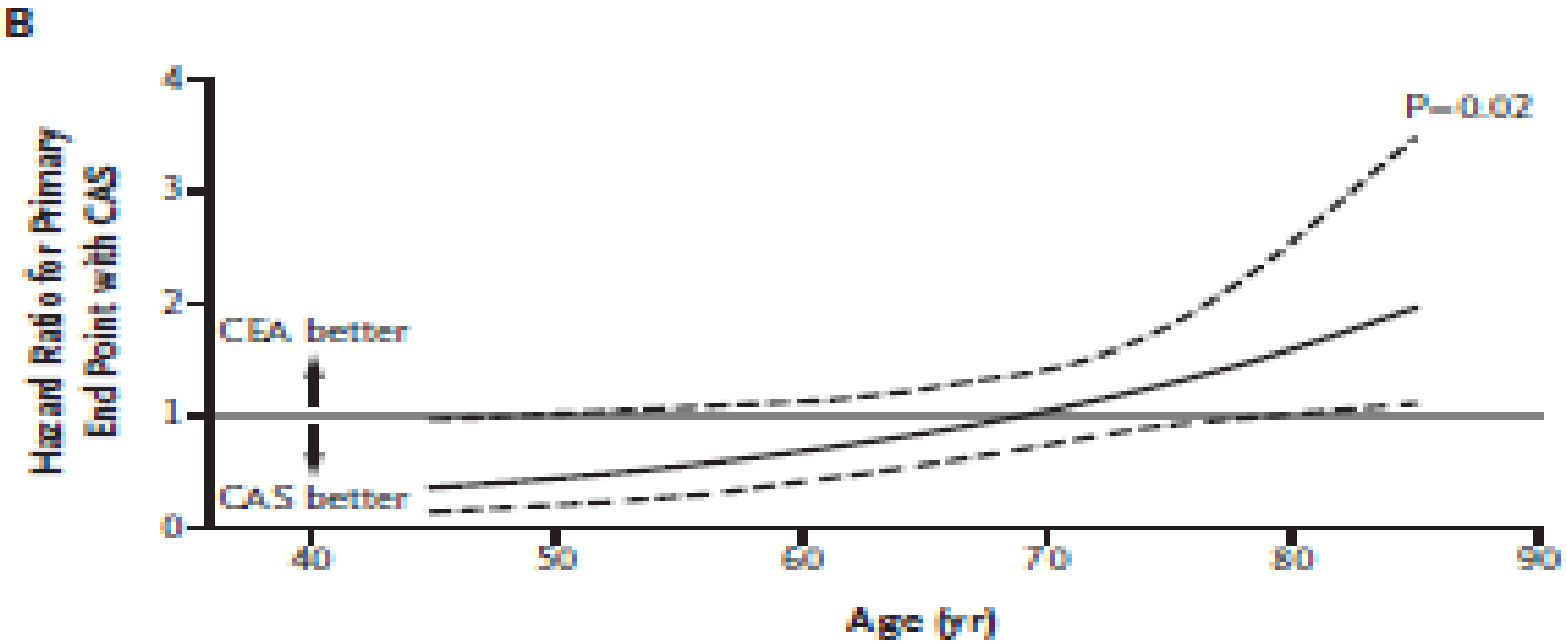
	CAS	CEA	HR
All Stroke	4.1%	2.3%	HR = 1.79; 95% CI: 1.14-2.82
MI	1.1%	2.3%	HR = 0.5; 95% CI: 0.26-0.94

- The Primary Endpoint shows no superiority for either treatment
- Similarity in the Primary Endpoint driven by differences in perioperative stroke and MI
  - **More MI's after CEA**
  - **More strokes after CAS**
- Both therapies showed a very low stroke rate

Age and peri-procedural results

- Statement from NIH Press Release:

  "The study also found that the age of the patient made a difference. **At approximately age 69 and younger, CAS results were slightly better with a larger benefit for stenting the younger the age of the patient. For patients older than 70, surgical results were slightly superior to stenting with** a larger benefit for surgery the older the age of the patient."



Peri-procedural Cranial Nerve Palsies

	CAS	CEA	HR	P-value
Cranial Nerve Palsies	0.3%*	4.8%	HR = 0.07; 95% CI: 0.02-0.18	<0.0001

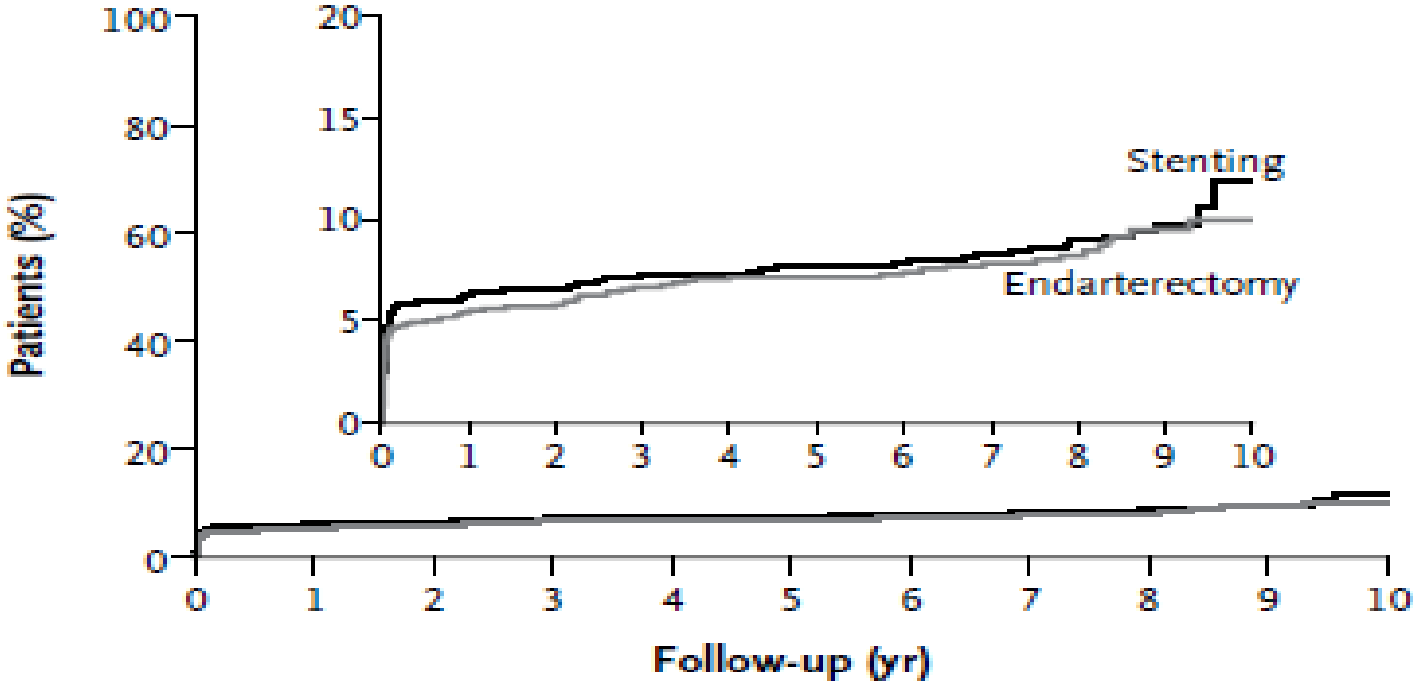
- Signs and symptoms of cranial nerve palsy are similar to minor stroke, including:
  - Difficulty in swallowing
  - Vocal cord paralysis
  - Facial weakness
  - Loss of feeling
  - Hoarseness

* Represents patients randomized to CAS but crossed over to CEA

Long-Term Results of Stenting versus Endarterectomy for Carotid-Artery Stenosis

CREST, NEJM 2016

Over 10 years of follow-up, we did not find a significant difference between patients who underwent stenting and those who underwent endarterectomy with respect to the risk of periprocedural stroke, myocardial infarction, or death and subsequent ipsilateral stroke. The rate of postprocedural ipsilateral stroke also did not differ between groups. (Funded by the National Institutes of Health and Abbott



Operator experience:
Many bad and useless studies

Study name	30-day event rate	Operator experience
CREST [1]	MACCE CEA—4.5% CAS—5.2% ($P = 0.38$)	CAS—20[a] CEA—50
SAPPHIRE [2,48]	MACCE CEA—9.8% CAS—4.8% ($P = 0.09$)	CAS—median 64 cases/year (20–700) CEA—median 30 cases/year (15–100)
EVA-3S [33]	Death/stroke CEA—3.9% CAS—9.6% ($P < 0.01$)	CAS—12[b] or 5[b] if experience with 30 noncarotid supra-aortic stenting CEA—25
SPACE [34]	Death/stroke CEA—6.3% CAS—6.8% ($P_{\text{noninferiority}} = 0.09$)	CAS—10[b] (perform or assist) CEA $\geq$ 25
ICSS [35]	Death/stroke CEA—4.0% CAS—7.4% ($P < 0.01$)	CAS—10[b] CEA—50

Závěry evidence

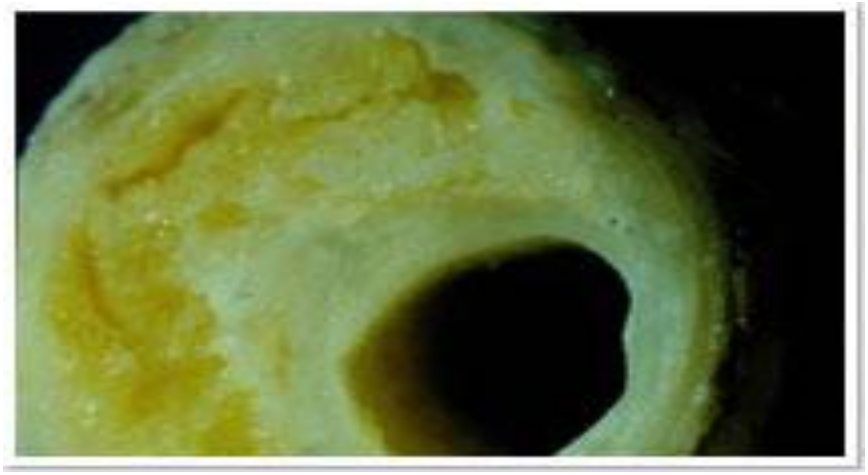
Nedostatek kvalitních dat ve vztahu CAS vs CEA.

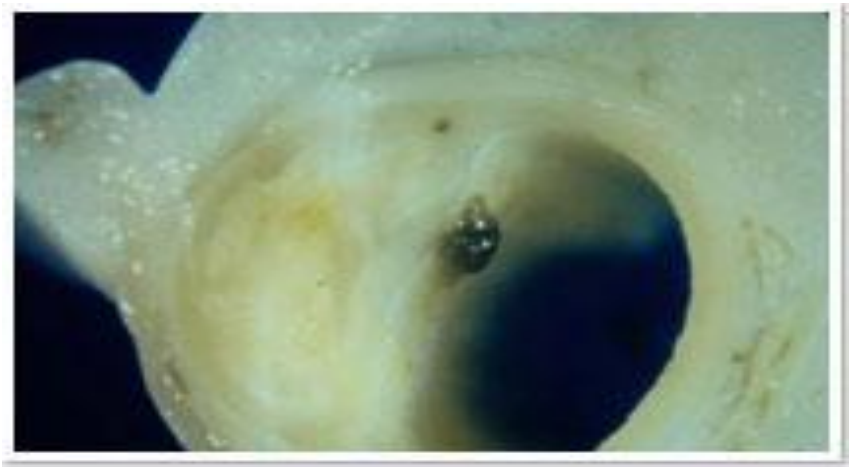
Výborné výsledky ve zkušených rukou.

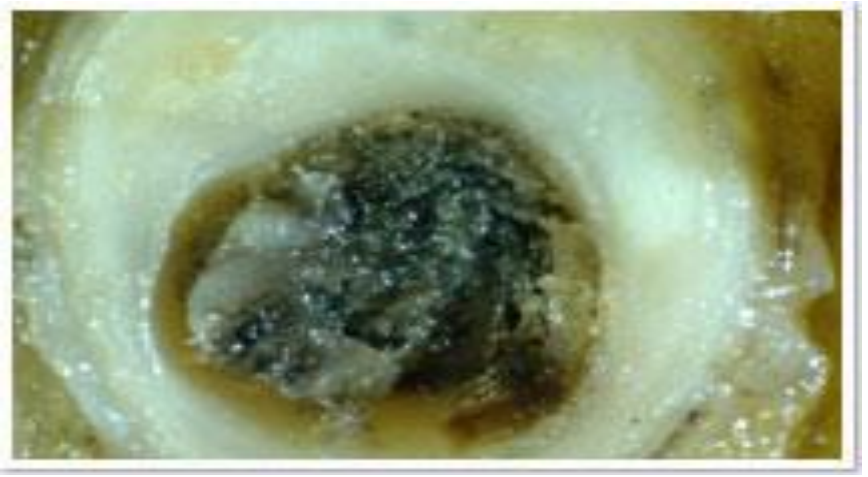
Nejistota stran CAS vs CEA vs OMT.

Aterosklerotický plát

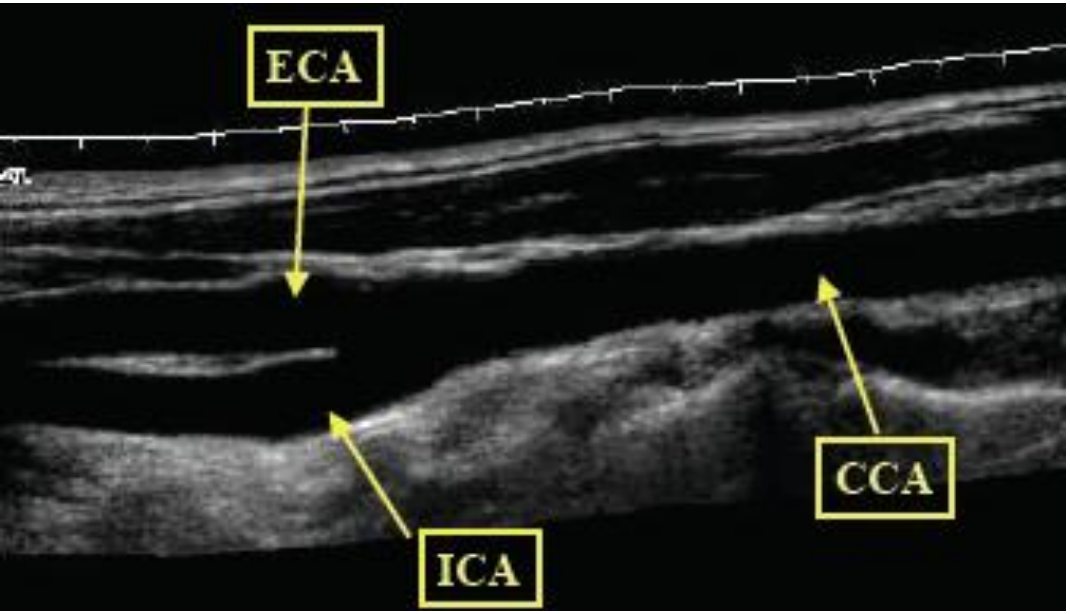
Nestabilní plát a jeho ruptura

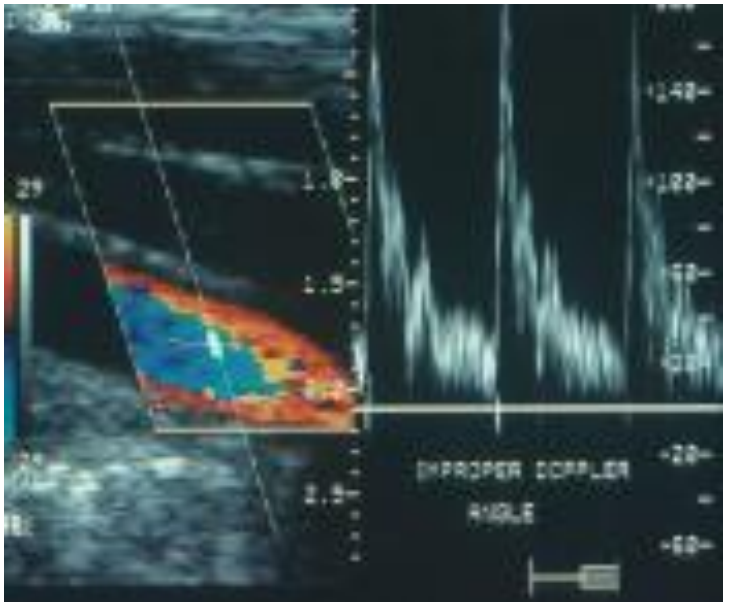




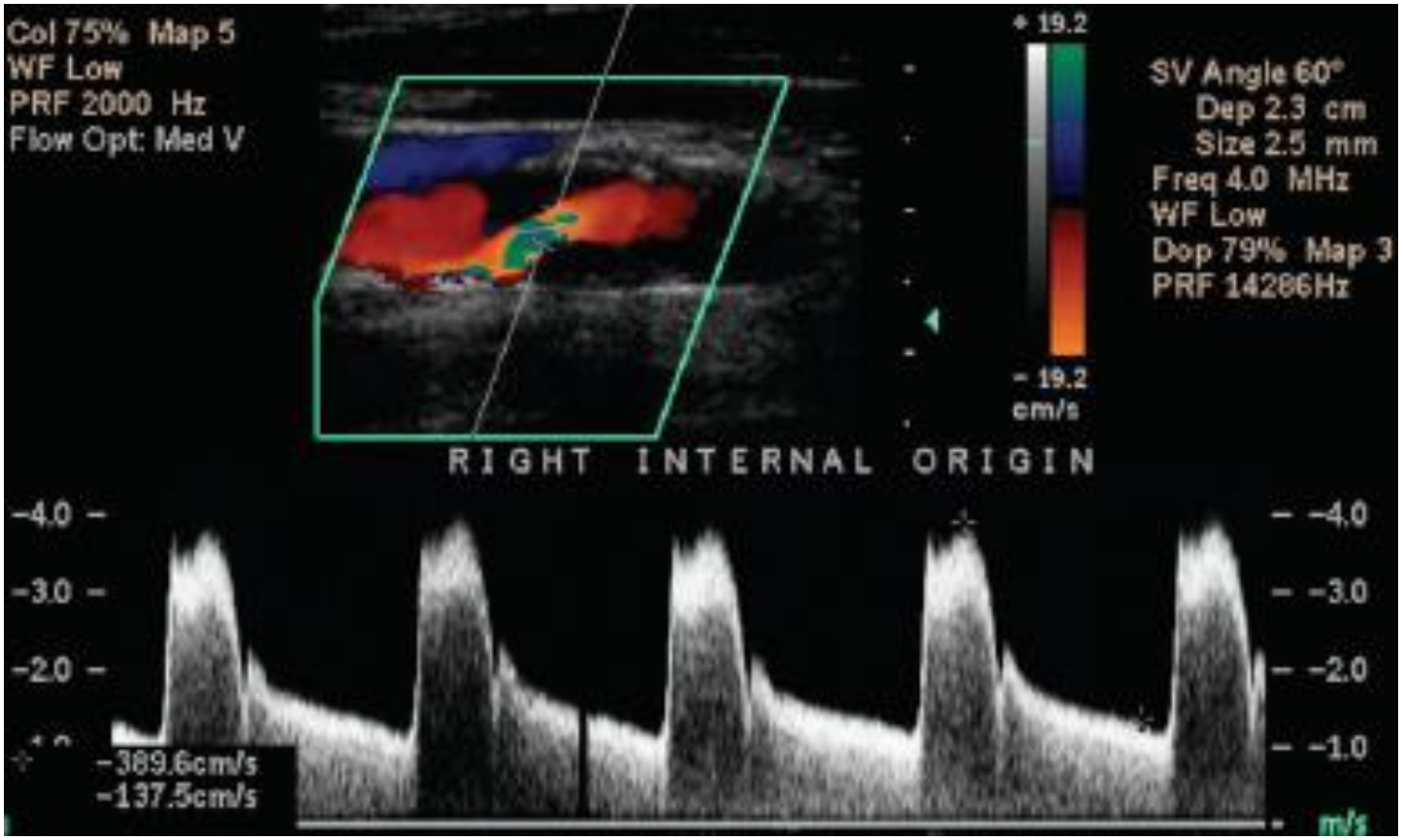


DUS





Významná stenosa ICA



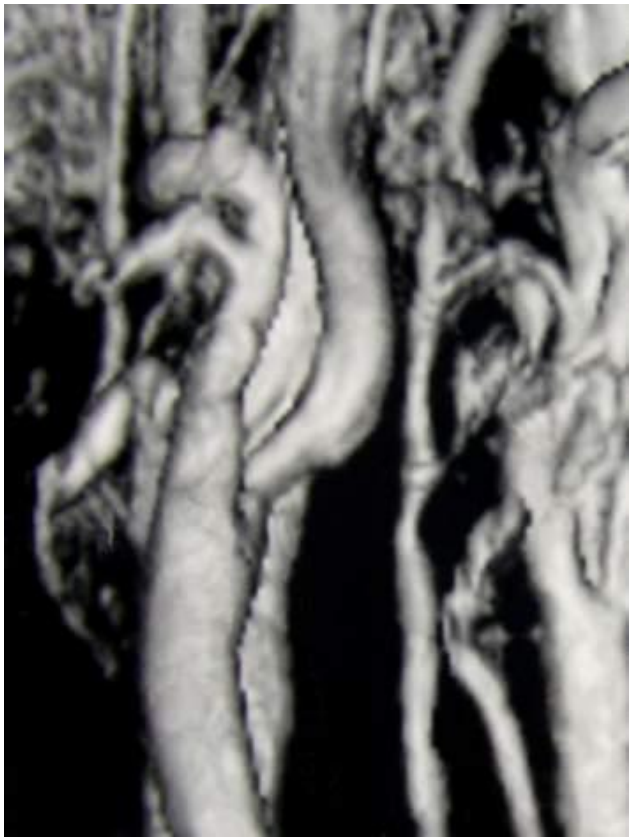
Kriteria pro hodnocení stenosy ICA dle DUS

Consensus Panel Gray-Scale and Doppler US Criteria for Diagnosis of ICA Stenosis

Degree of Stenosis (%)	Primary Parameters		Additional Parameters	
	ICA PSV (cm/sec)	Plaque Estimate (%)*	ICA/CCA PSV Ratio	ICA EDV (cm/sec)
Normal	<125	None	<2.0	<40
<50	<125	<50	<2.0	<40
50–69	125–230	≥50	2.0–4.0	40–100
≥70 but less than near occlusion	>230	≥50	>4.0	>100
Near occlusion	High, low, or undetectable	Visible	Variable	Variable
Total occlusion	Undetectable	Visible, no detectable lumen	Not applicable	Not applicable

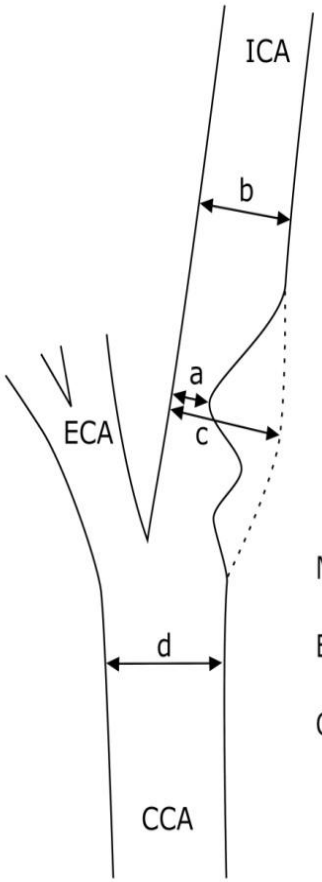
Radiology 2003;229:340-6.

MR angiografie



CT angio

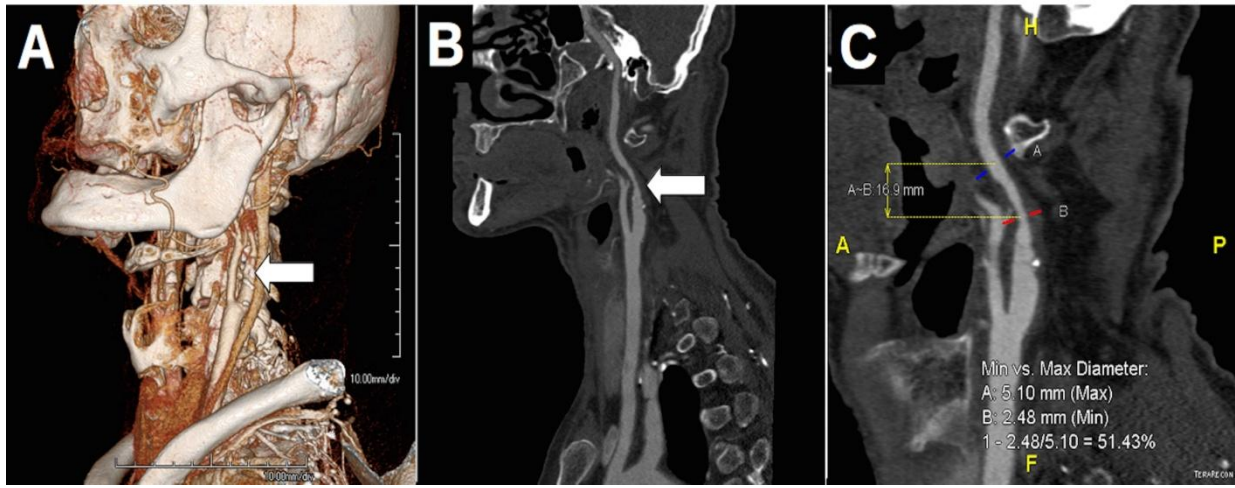
Stenosis evaluation (DUS, CT, AG)

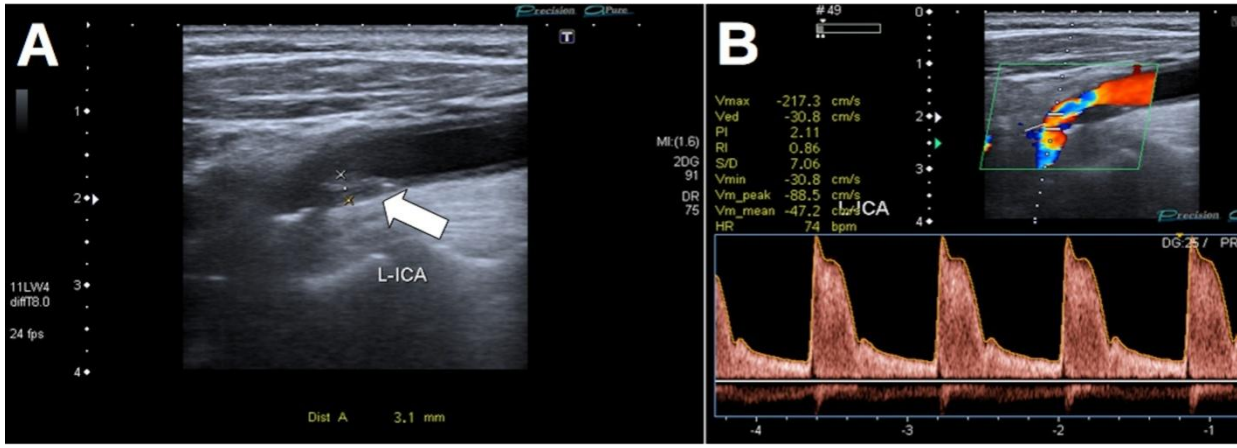


NASCET = ((b-a)/b) x 100 [%]

ECST = ((c-a)/c) x 100 [%]

CC = ((d-a)/d) x 100 [%]





Suggested features associated with increased risk of stroke in patients with asymptomatic carotid stenosis treated medically

Clinical[a]	• Contralateral TIA/stroke[121]
Cerebral imaging	• Ipsilateral silent infarction[122]
Ultrasound imaging	• Stenosis progression (> 20%)[123] • Spontaneous embolization on transcranial Doppler (HITS)[124] • Impaired cerebral vascular reserve[125] • Large plaques[b126] • Echolucent plaques[96] • Increased juxta-luminal black (hypoechogenic) area[127]
MRA	• Intraplaque haemorrhage[128] • Lipid-rich necrotic core

ESC guidelines 2017

Near-infrared spectroscopy combined with intravascular ultrasound in carotid arteries

Cyril Štěchovský[1] · Petr Hájek[1] · Martin Horváth[1] · Miloslav Špaček[1] · Josef Veselka[1]

Int J Cardiovasc Imaging
DOI 10.1007/s10554-015-0729-4

ORIGINAL PAPER

Beyond stenotic degree assessment in carotid atherosclerotic lesions: single catheter near-infrared spectroscopy and intravascular ultrasound

Sasan Partovi[1] · Brian B. Ghoshhajra[2] · T. Gregory Walker[2]

Intravascular Near-Infrared Spectroscopy: A Possible Tool for Optimizing the Management of Carotid Artery Disease

Martin Horváth, MD[1] Petr Hájek, MD, PhD[1] Cyril Štěchovský, MD[1] Jakub Honěk, MD[1] Josef Veselka, MD, PhD[1]

[1] Department of Cardiology, Charles University in Prague, 2nd Faculty of Medicine and Motol University Hospital, Prague, Czech Republic

Address for correspondence [1]Josef Veselka, MD, PhD, Department of Cardiology, Motol University Hospital, V Úvalu 84, 150 06, Praha 5, Czech Republic (e-mail: veselka.josef@seznam.cz).

Int J Angiol 2015;00:1–8.

The role of near-infrared spectroscopy in the detection of vulnerable atherosclerotic plaques

Martin Horvath, Petr Hajek, Cyril Stechovsky, Jakub Honek, Miloslav Spacek, Josef Veselka

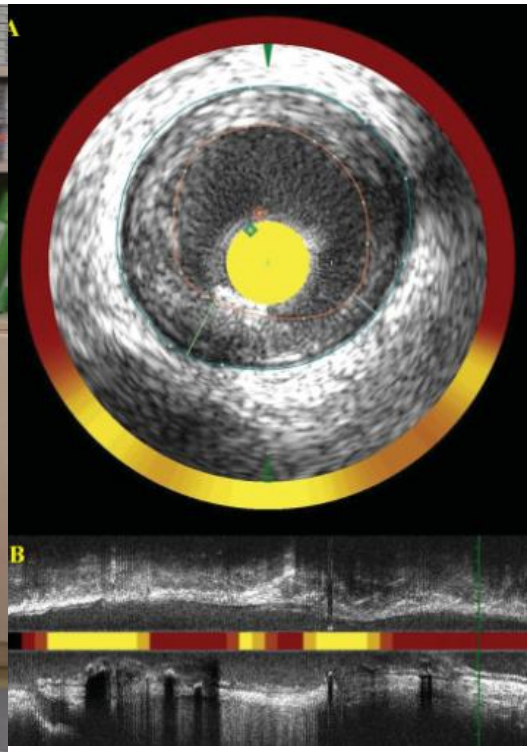
Intravascular Near-Infrared Spectroscopy: A Possible Tool for Optimizing the Management of Carotid Artery Disease

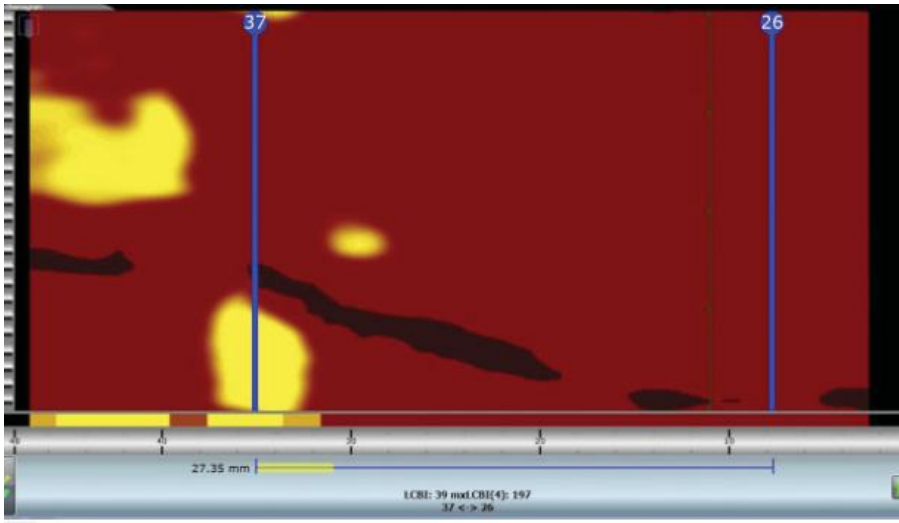
Martin Horváth, MD[1] Petr Hájek, MD, PhD[1] Cyril Štěchovský, MD[1] Jakub Honěk, MD[1] Josef Veselka, MD, PhD[1]

[1] Department of Cardiology, Charles University in Prague, 2nd Faculty of Medicine and Motol University Hospital, Prague, Czech Republic

Address for correspondence Josef Veselka, MD, PhD, Department of Cardiology, Motol University Hospital, V Úvalu 84, 150 06, Praha 5, Czech Republic (e-mail: veselka.josef@seznam.cz).

Int J Angiol 2015;24:198–204.

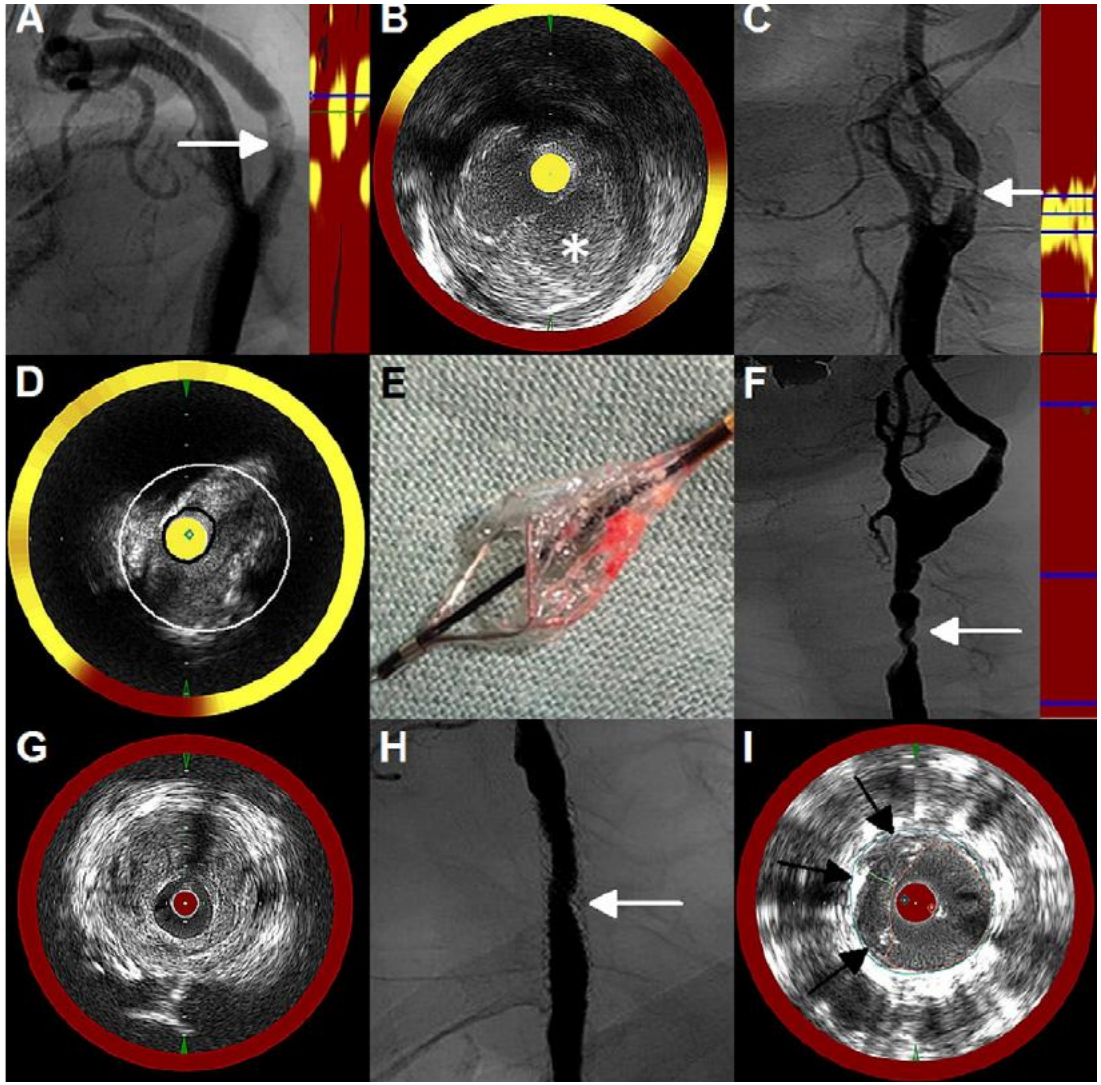




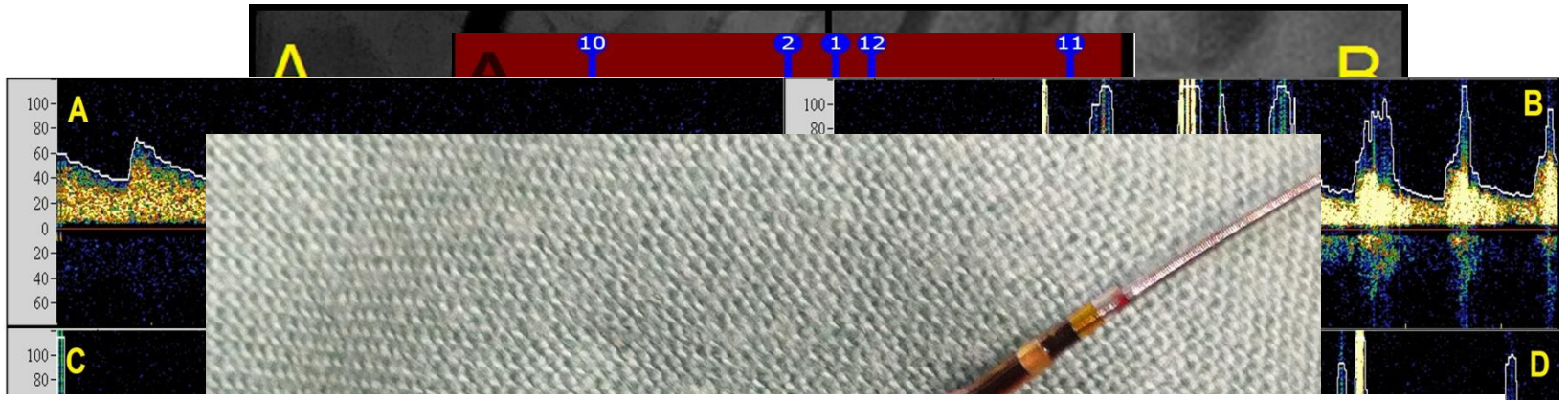
Composition of carotid artery stenosis and restenosis: A series of patients assessed with intravascular ultrasound and near-infrared spectroscopy

Cyril Štěchovský *, Petr Hájek, Martin Horváth, Miloslav Špaček, Josef Veselka

Department of Cardiology, 2nd Medical School, Charles University, University Hospital Motol, Prague, Czech Republic



IJC 2015

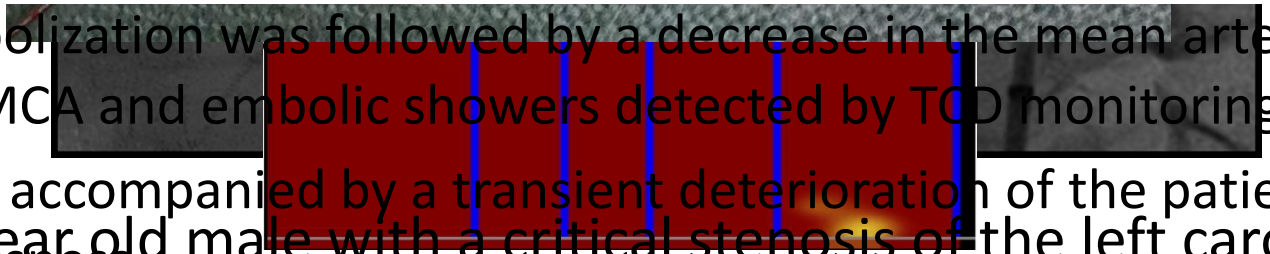


Atherosclerotic Plaque Composition Is Still an Almost Unrecognized Factor of Risk Stratification in Patients with Carotid Artery Disease

Josef Veselka, MD, PhD, FICA[1]

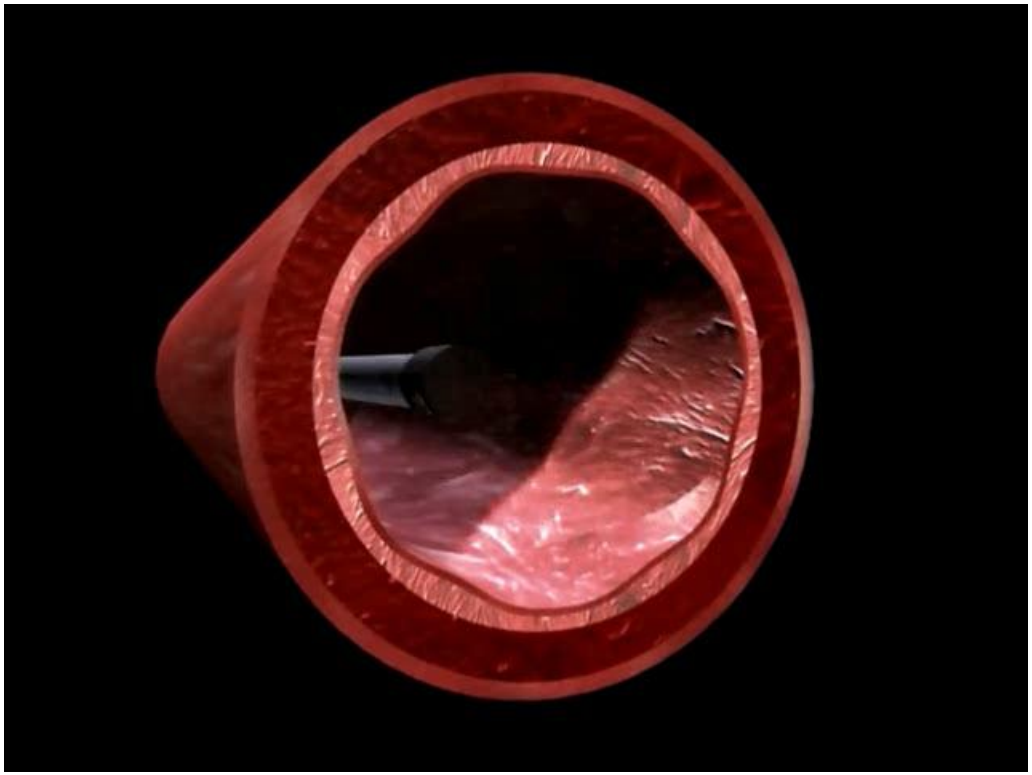
[1] Department of Cardiology, 2nd Medical School, Charles University, Motol University Hospital, Prague, Czech Republic

Int J Angiol 2015;24:155–156.



- The embolization was followed by a decrease in the mean arterial flow in MCA and embolic showers detected by TCD monitoring.
- This was accompanied by a transient deterioration of the patients consciousness
- Some debris was then found in the distal protection filter
- The procedure was monitored by TCD and NIRS-IVUS
- A 62 year old male with a critical stenosis of the left carotid artery underwent CAS at our institution
  - NIRS proved an embolization of a lipid core plaque

NIRS / IVUS



Take-home messages

- Složení aterosklerotického plátu v karotidě je zřejmě důležitější než významnost stenózy.

- NIRS-IVUS může hrát roli v detekci lipidového plátu a způsobu jeho léčby.

Neškodit

Ne všechny „atraktivní“ stenosy je třeba ošetřit.

Tři dobré rady

Dobrá rada č. 1
SELEKCE PACIENTŮ

75-85 LET

ASYMPTOMATICKÁ LÉZE

OPAKOVANÁ CMP

SNÍŽENÁ CV REZERVA

SNÍŽENÁ KVALITA ŽIVOTA

BUDE PROFITOVAT ???

Criteria for CAS high-risk procedure

(Any 2 of the following = High Risk)

AGE ≥ 75

Excessive Tortuosity
Aortic Arch type III

Low Cerebral Reserve
History of Stroke

Concentric calcification
Long lesion
Diffuse disease

Dobrá rada č. 2
SELEKCE LÉZE

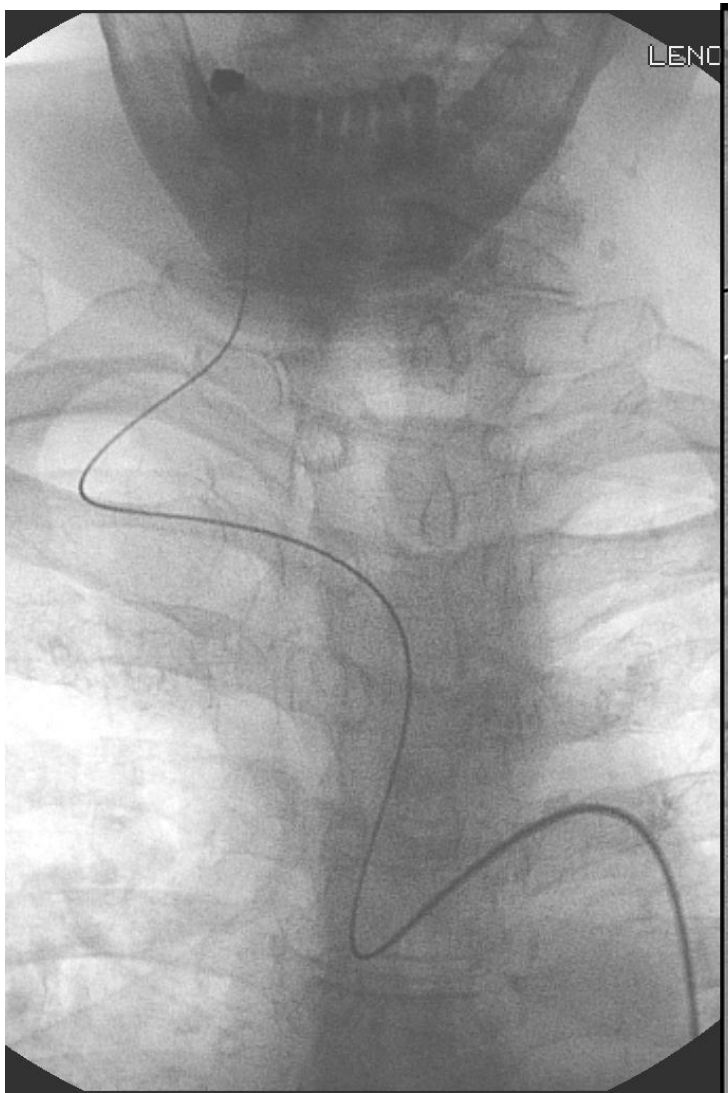
TORTUOSITY

KALCIFIKACE

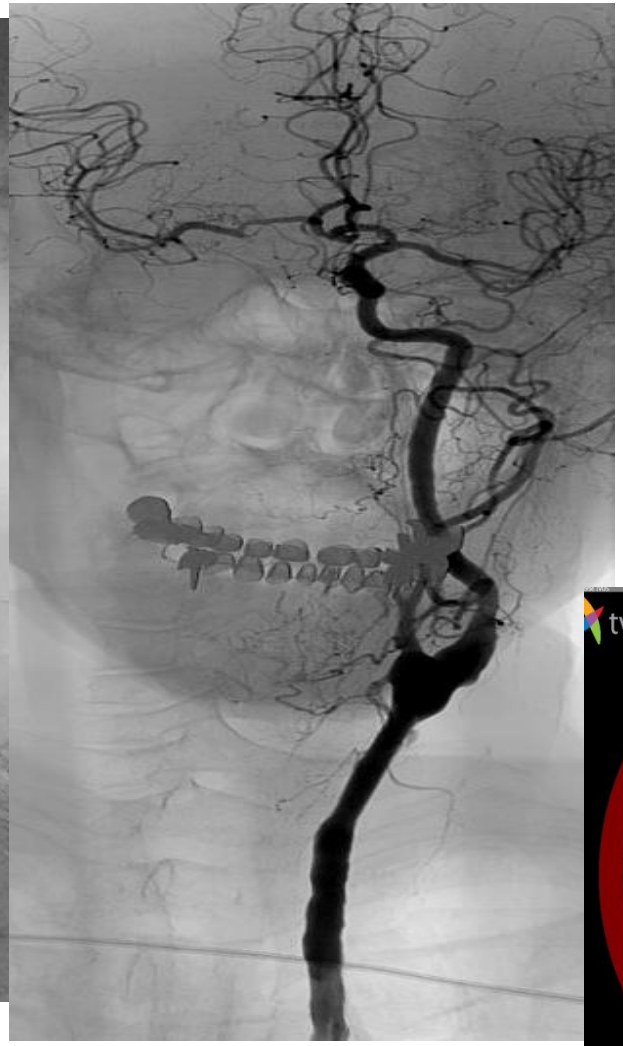
TYP OBLOUKU

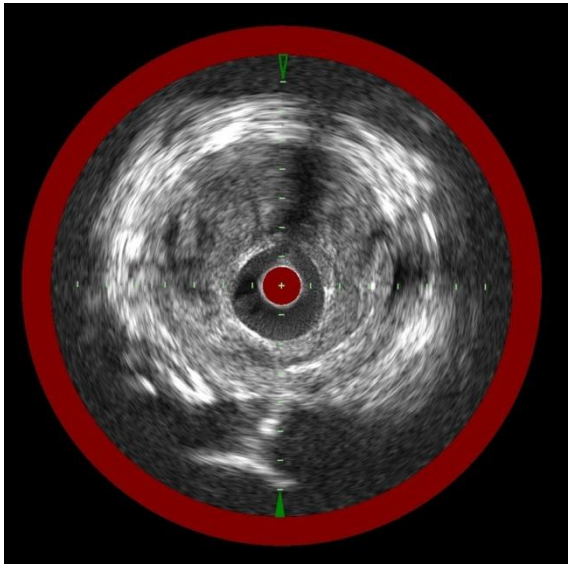
TROMBUS

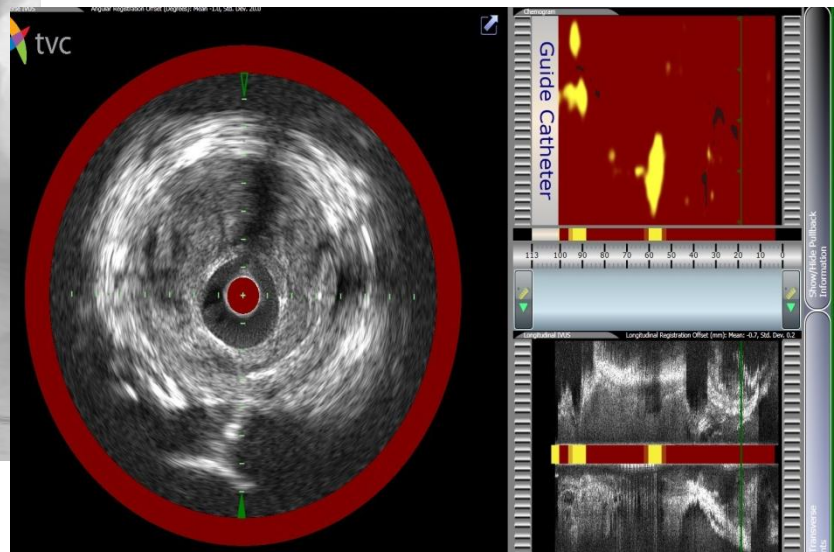
LIPIDOVÉ JÁDRO?



Be agressive in post-radiation stenoses

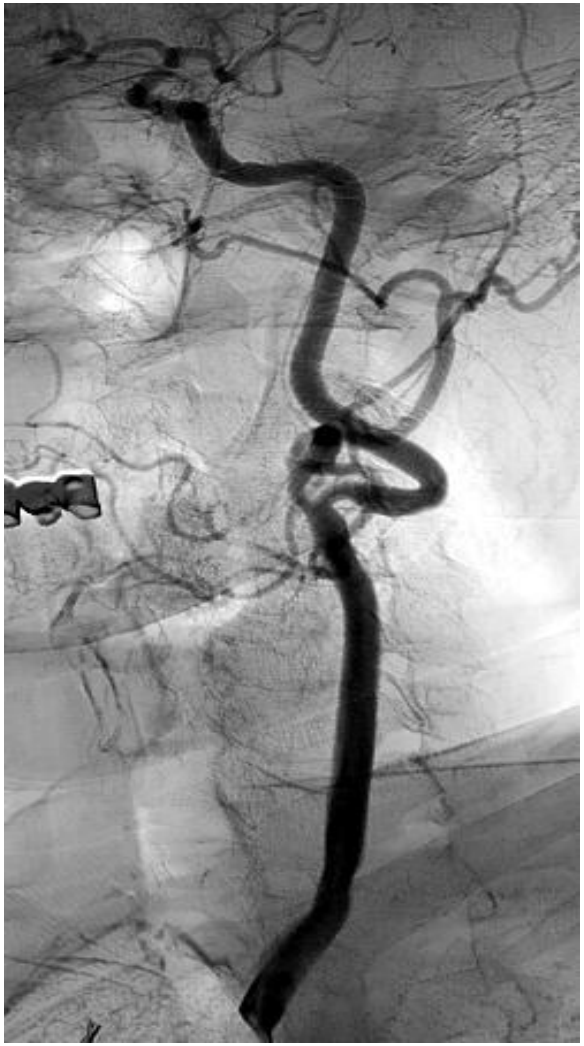






Avoid pts. with extreme calcifications

Avoid pts. with carotid artery tortuosity



Avoid long lesions

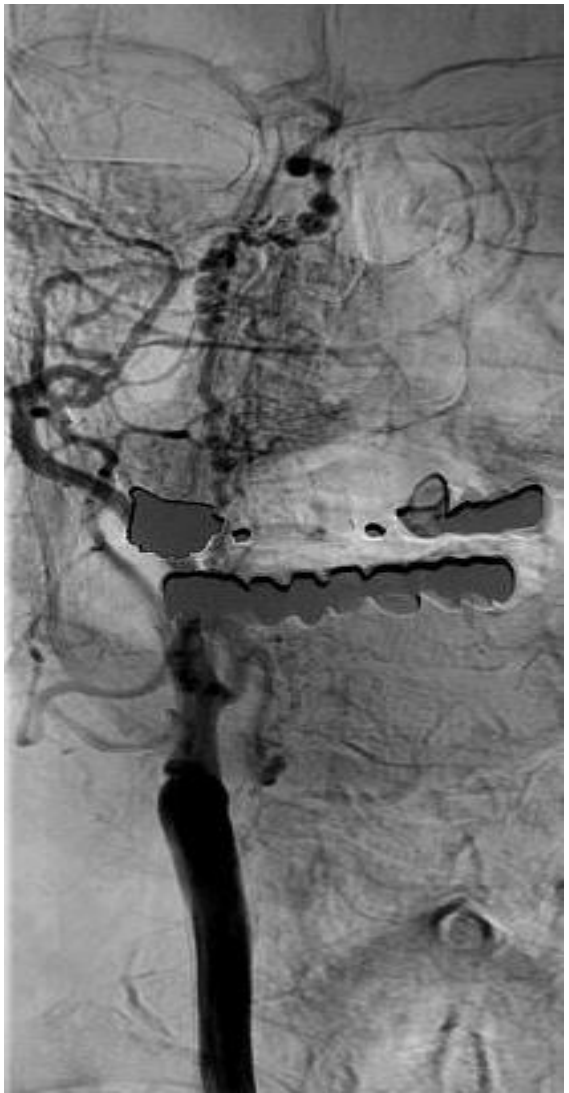
Long

Short

Moore et al. CREST angiographic analysis. JVS 2015

Be careful in string sign

Some (FMD) cases are not treatable



Dobrá rada č. 3
SELEKCE LÉKAŘE

LEARNING CURVE

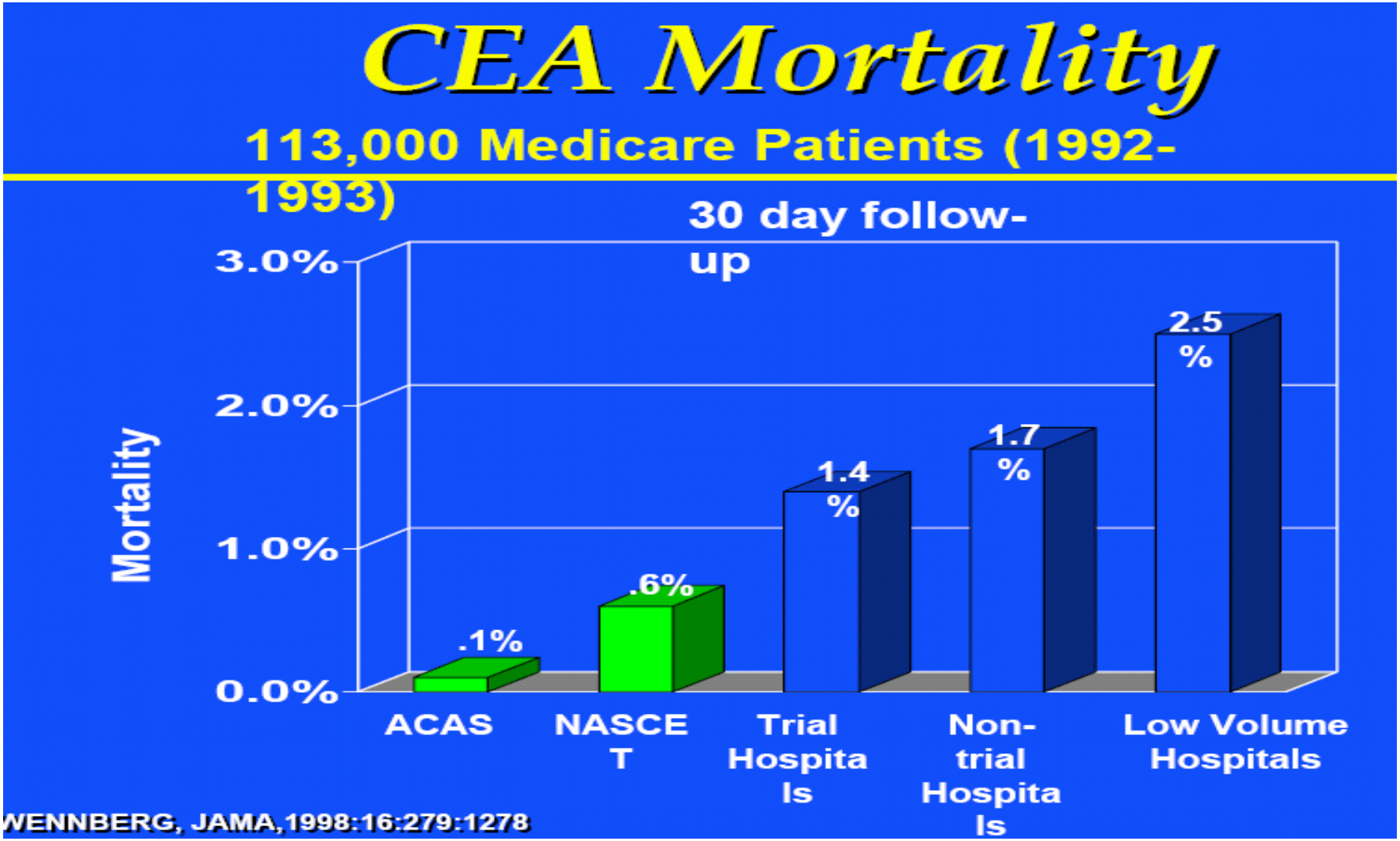
VLASTNÍ VÝSLEDKY

MEZIOBOROVÁ SPOLUPRÁCE

TÝMOVÁ SPOLUPRÁCE

REGISTR

Practice makes difference



Maintenance of competency

- Sites performed >150 CAS have fewer complications than those with ≤50.
  - Theiss et al. Stroke 2008

- A total of 72 CAS were necessary to achieve 30-day M/M <3% in asymptomatic non-octogenerian pts.
  - Gray WA et al. JACC Intv 2011

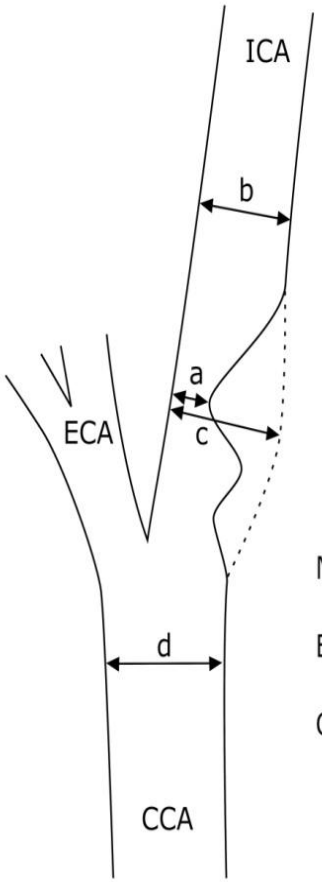
CAS volume vs early mortality

- **19 724 patients** (Medicare) undergoing CAS by 2045 physicians in 729 hospitals.
- Median past-year CAS volume was 9 for physicians and 23 for hospitals. **M risk 1.8%.**
- Conclusions - Among Medicare patients, an **inverse relationship** exists between physician and hospital CAS volumes and hospital non-CAS stenting volume and 30-day mortality, even after adjusting for all pertinent patient- and hospital-level factors.

Jalbert et al. Circ Cardiovasc Qual Outcomes 2015

Jak na to

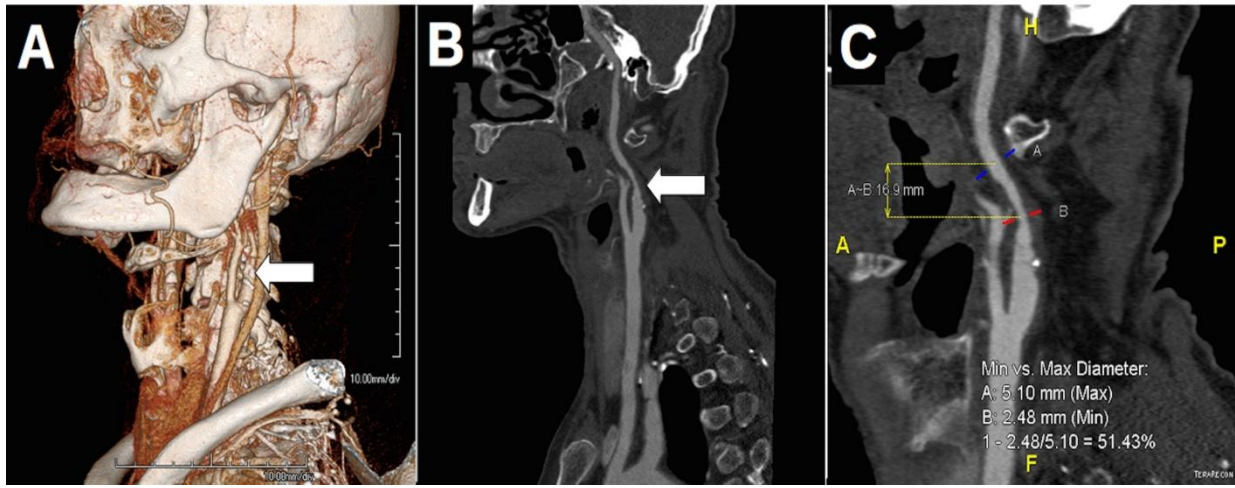
Stenosis evaluation (DUS, CT, AG)

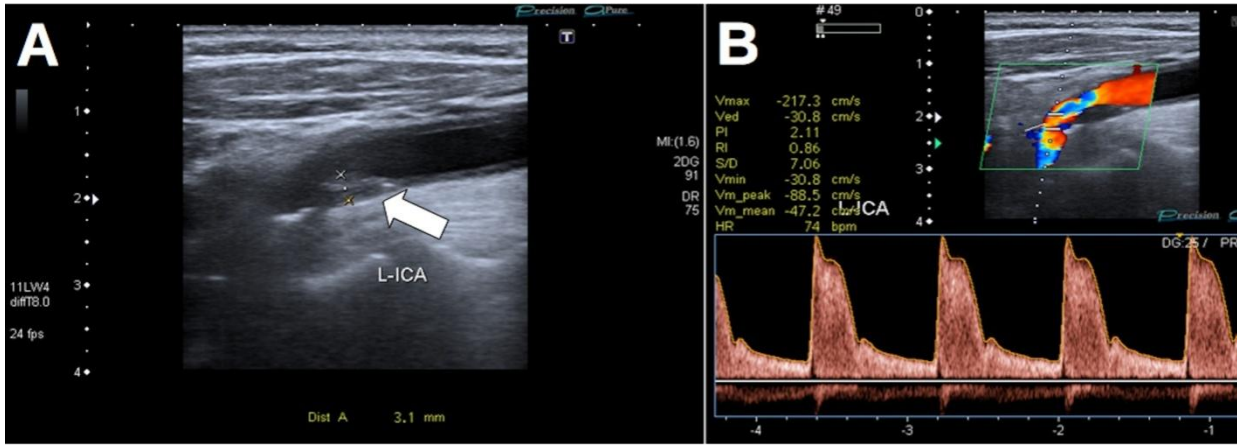


NASCET = ((b-a)/b) x 100 [%]

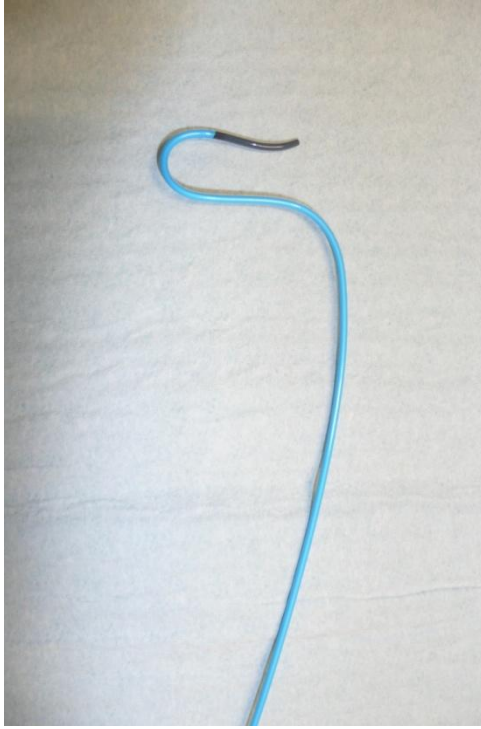
ECST = ((c-a)/c) x 100 [%]

CC = ((d-a)/d) x 100 [%]





Vitek (VTK) catheter



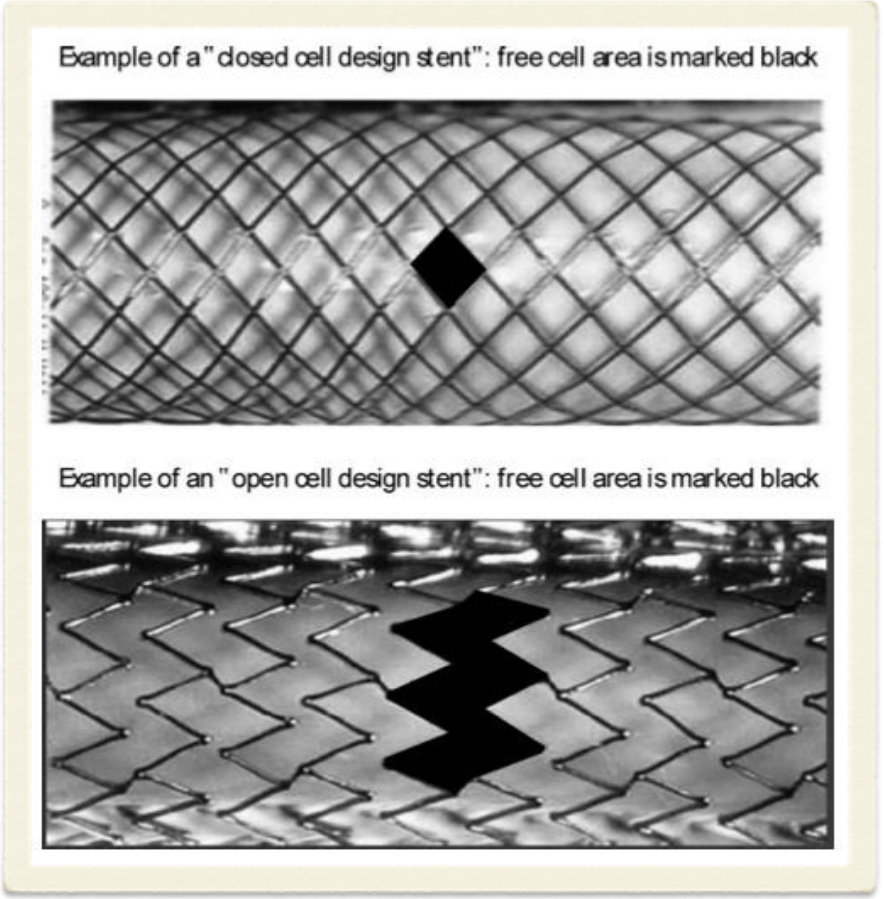
- Decades of experience!
- Minimal manipulation.
- Easy to “reconfigure” in the arch.
- Coaxial orientation.
- Very easy access in “easy arch” and reliable access in “tougher anatomy” (1/3-1/2 of cases).

Type of stent

Open vs. Closed cell

- Lower risk of subacute neurological events in patients treated with closed-cell design stents. (Bosiers et al. 2007).

- No superiority of either type of stent in a large scale study of 1684 patients. (Schillinger et al. 2008)

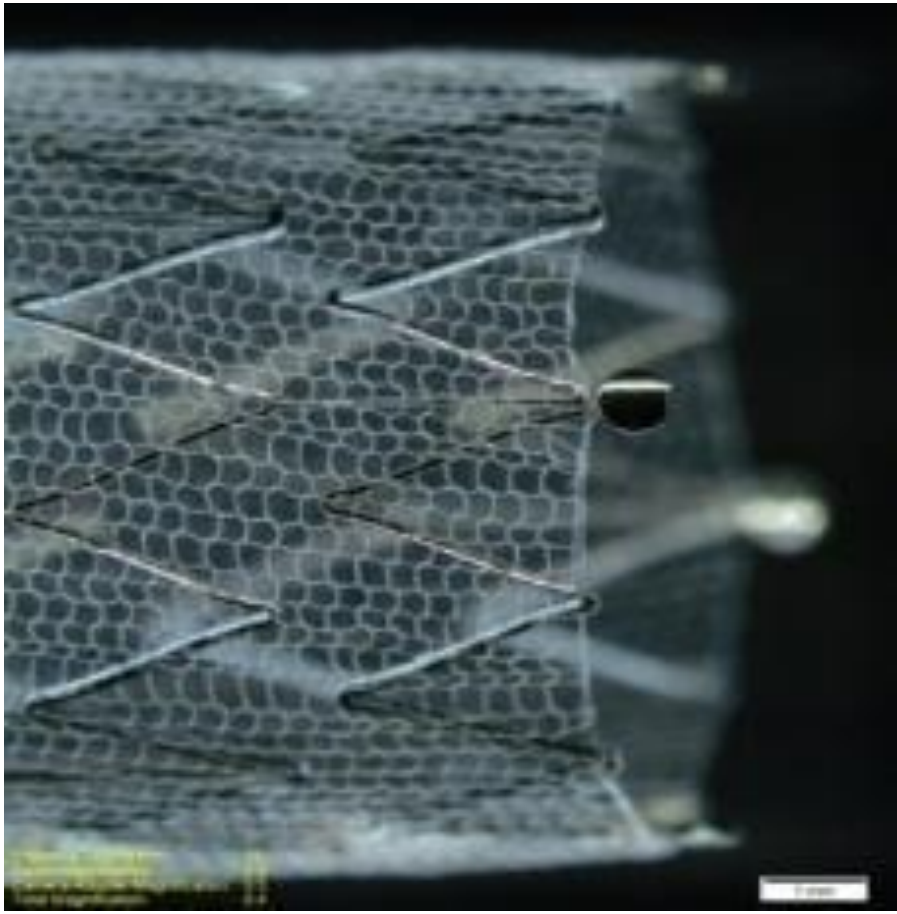


C-Guard

Stent type: Nitinol, self-expanding

Micronet aperture size: 150-180 um

Diameter: 6-10 mm

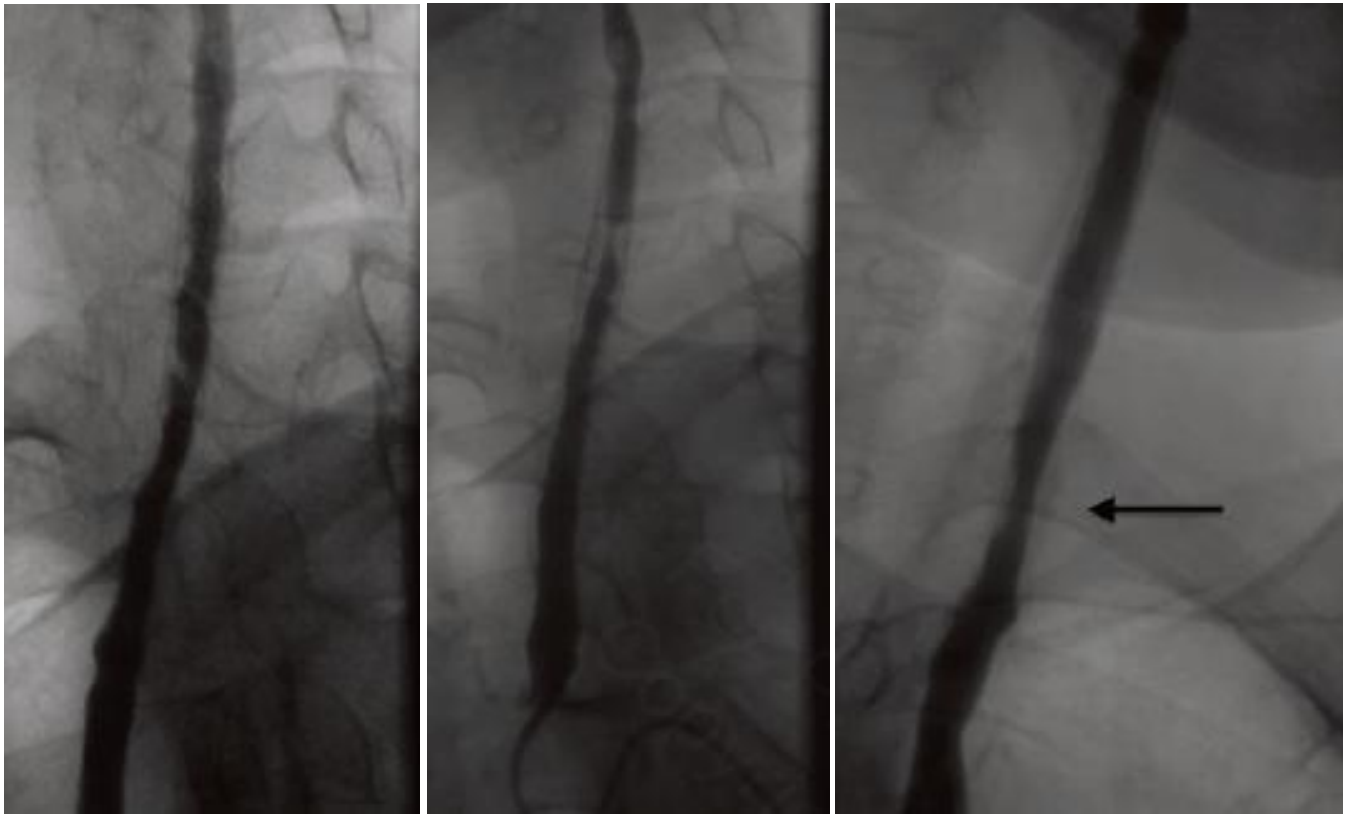


Drug eluting stent (balloon)

Takayasu Arteritis: Use of Drug-Eluting Stent and Balloon to Treat Recurring Carotid Restenosis

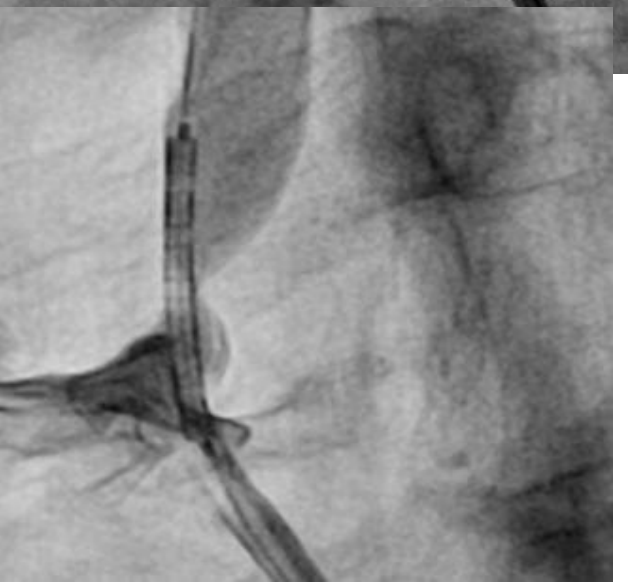
Miloslav Spacek, MD, Petra Zimolova, MD, Josef Veselka, MD, PhD

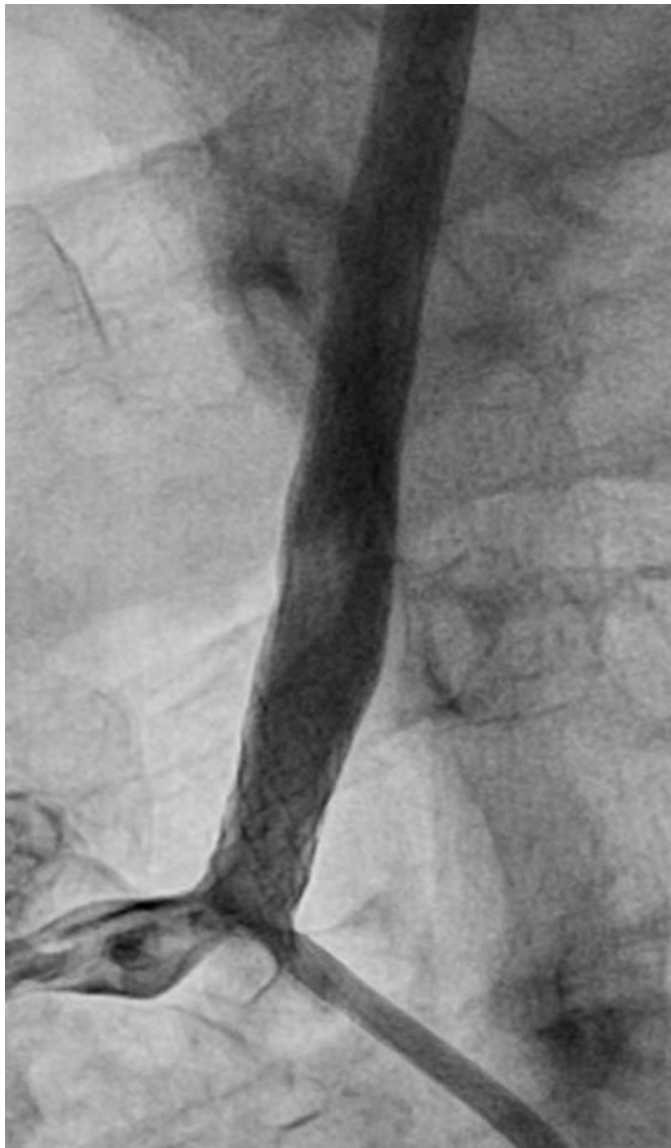
J INVASIVE CARDIOL 2012;24(9):E190-E192



Aorto-ostial stenosis (LCCA)

Balloon-expandable stents

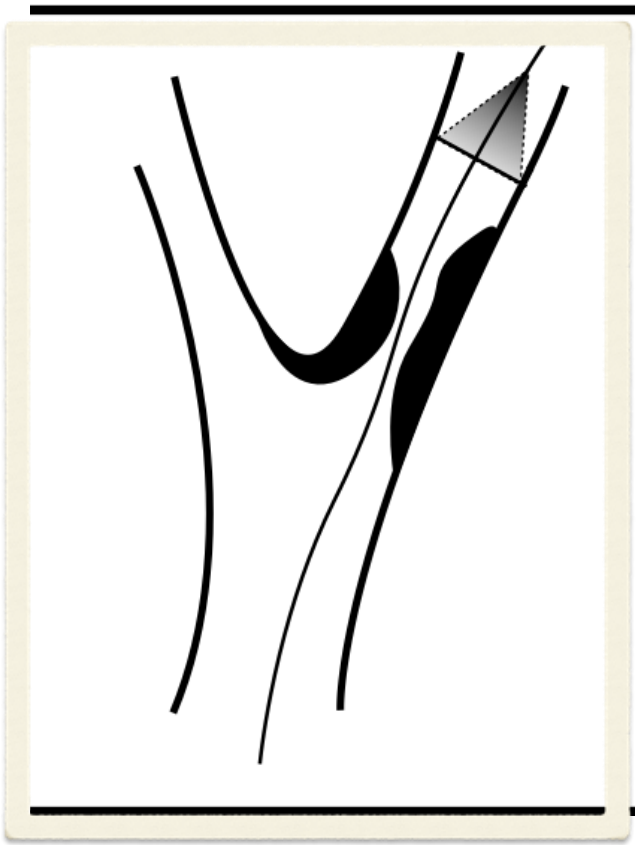




Protektivní systémy

Distal filters

- By far the most widely used EPD.
- Preserves blood flow during intervention and allows direct visualization.
- Retains particles larger than 100 µm.

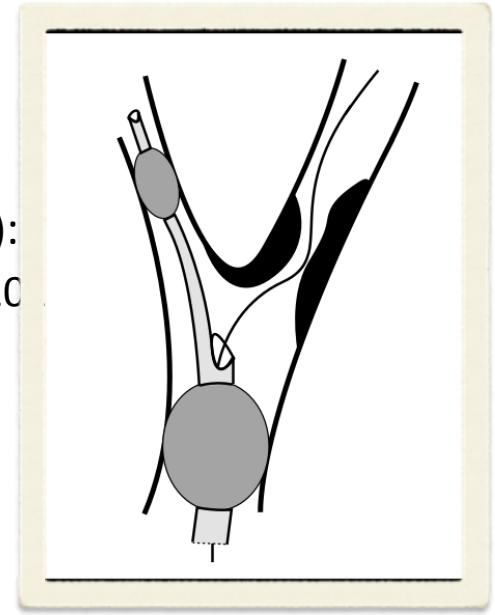


Keep it simple. Do not touch the lesion.

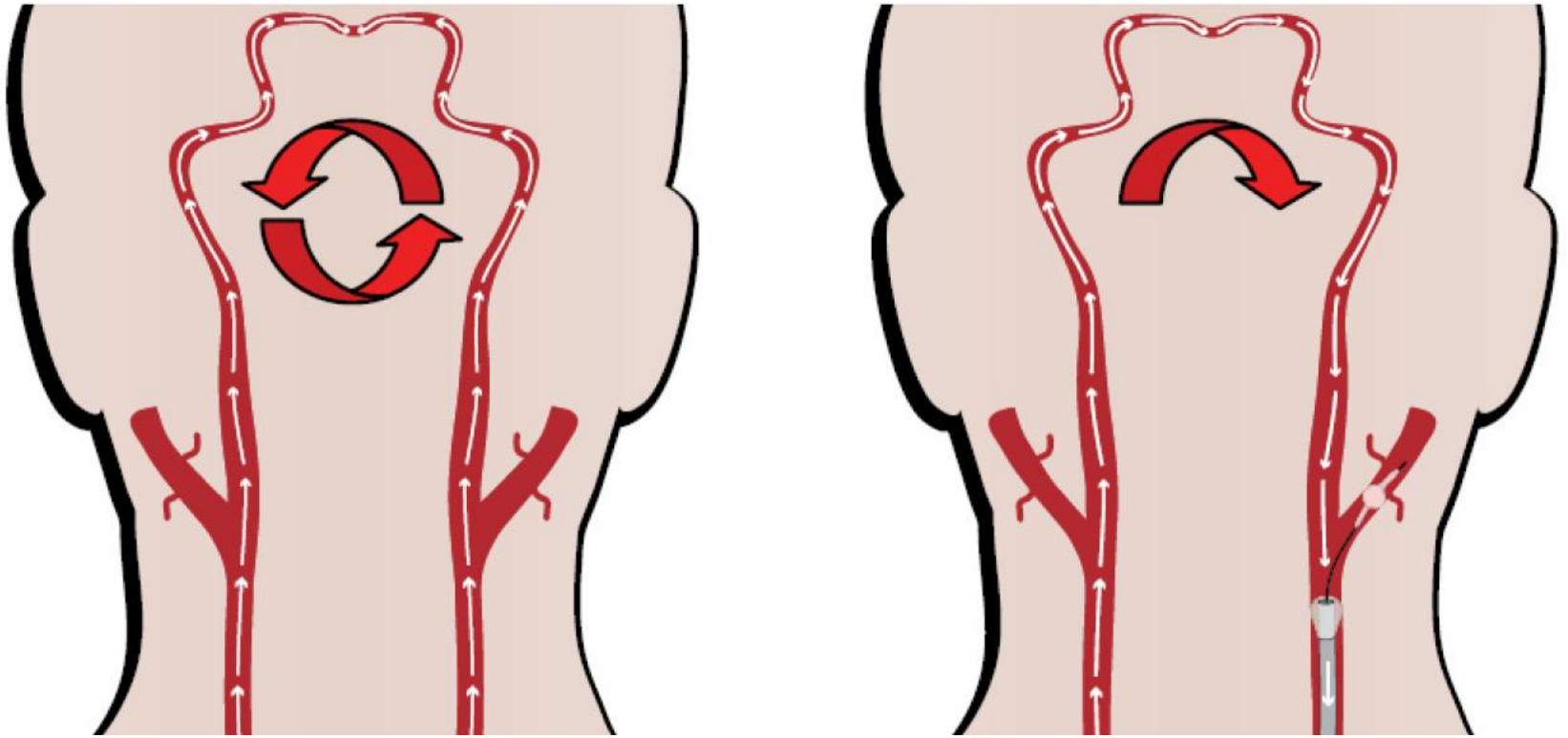
Proximal protection

- MO.MA:
  ARMOUR (2010): (30-d S/D/MI 2.7%; S 0,9%). Ansel et al., Catheter Cardiovasc Interv 2010

- GORE: EMPiRE (2011): 2.9%). Clair et al., Catheter Cardiovasc Interv 20



Proximal protection



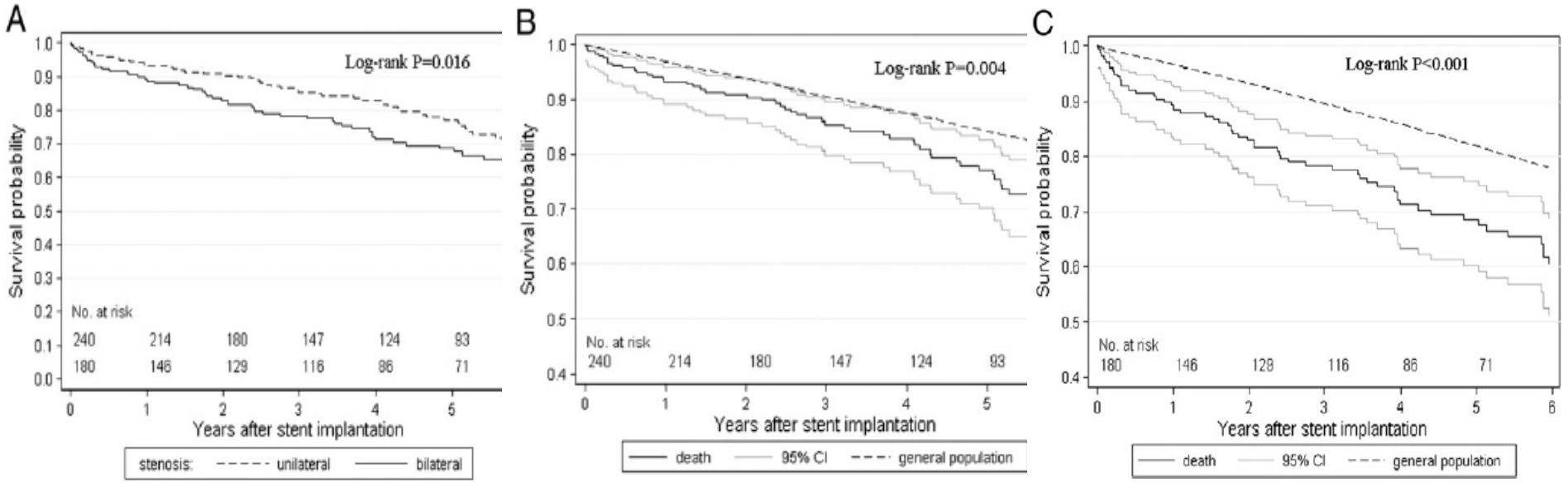
Důležité faktory klinického rozhodování

Carotid patients have worse prognosis

Impact of single versus double vessel carotid disease on long-term survival in patients treated with carotid stenting ☆

Josef Veselka *, Miloslav Špaček, Petr Hájek, Martin Horváth, Cyril Štěchovský, Petra Zimolová

International Journal of Cardiology 176 (2014) 1299–1300



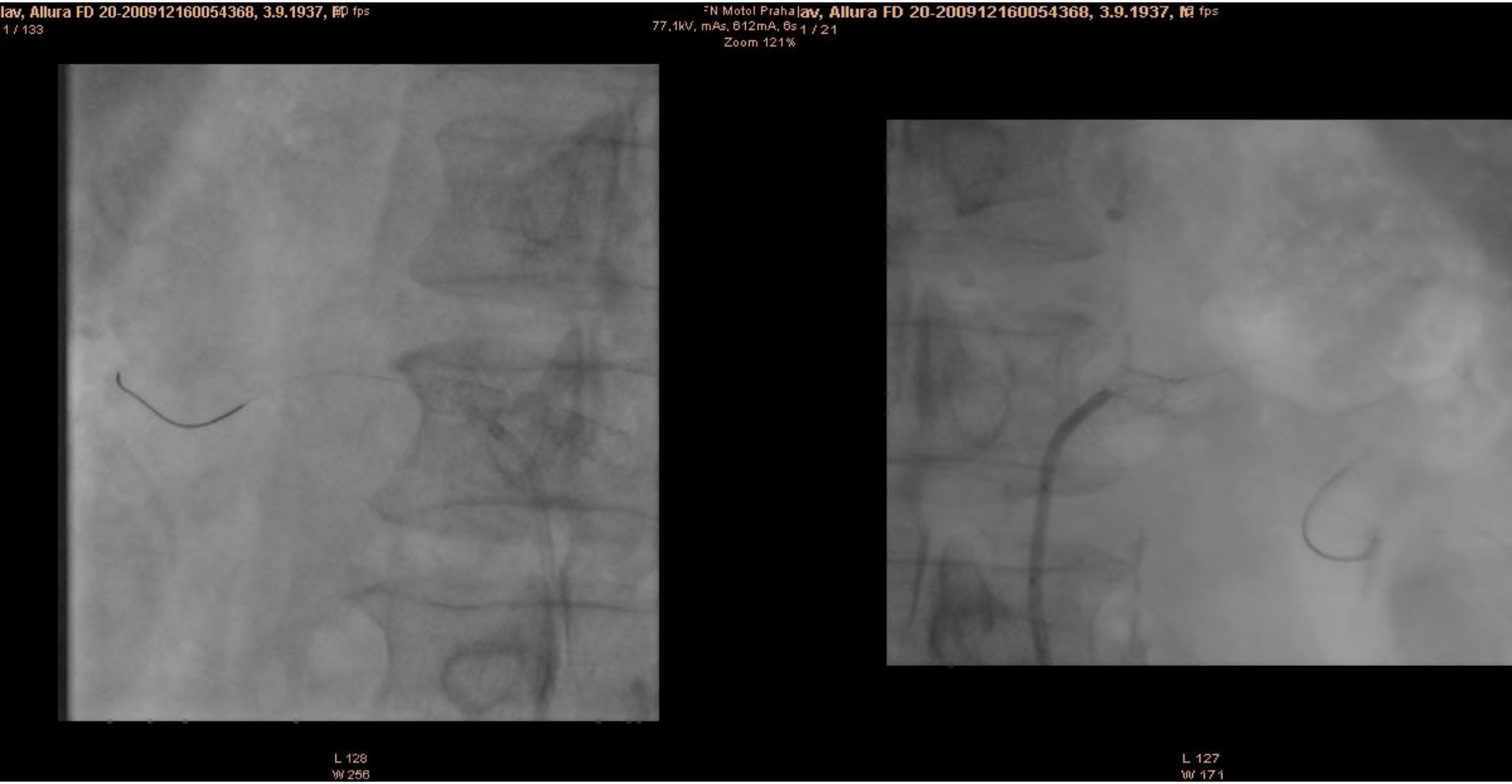
Nevyhnete se komplexním intervencím

Complex revascularization

(result)

Complex revascularization

(result)



Take-home messages

- Konzervativní indikace
- Selekce pro CAS vs CEA
- Pouze vysokoobjemová centra
- Být připraven na komplexní intervence

Pouze s rozmyslem