



# *Vertebral artery stenting – Tips and tricks*

Prof. Piotr Pieniazek MD PhD

John's Paul II Hospital / Collegium Medicum Jagiellonian University Krakow,  
Poland

# DISCLOSURE STATEMENT OF FINANCIAL INTEREST

Within the past 12 months, I or my spouse/partner have had a financial interest/arrangement or affiliation with the organization(s) listed below

## AFFILIATION/FINANCIAL RELATIONSHIP

- Grant/Research Support
- **Consulting Fees/Honoraria**
- Major Stock Shareholder/Equity
- Royalty Income
- Ownership/Founder
- Intellectual Property Rights
- Other Financial Benefit

## COMPANY

- Balton, Terumo, Boston, Medtronic, Abbott

# 2017 PAD Guidelines?

A problem greater than the place in the recommendations !!!

## 6.2 Vertebral artery disease

### 6.2.1 Definition and natural history

Up to 20% of ischaemic cerebrovascular events involving the posterior circulation are related to vertebral artery disease.<sup>156</sup> For further details see [Web addenda 6.2.1](#).

Recommendations for management of vertebral artery stenoses

Recommendations	Class <sup>a</sup>	Level <sup>b</sup>
In patients with symptomatic extracranial vertebral artery stenoses, revascularization may be considered for lesions $\geq 50\%$ in patients with recurrent ischaemic events despite optimal medical management. <sup>159,160,162</sup>	<b>IIb</b>	<b>B</b>
Revascularization of asymptomatic vertebral artery stenosis is not indicated, irrespective of the degree of severity.	<b>III</b>	<b>C</b>

## Vertebral Artery Stenosis, etiology by localization:

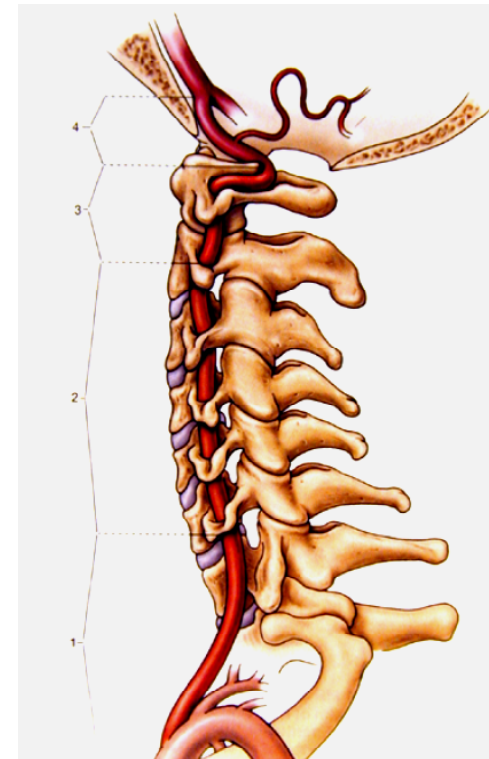
**atherosclerosis** V1, basilar artery

spontaneous **dissection** (up to 10%!) usually V1 (young pts)

**compression** (vertebral degeneration) V2, V3

**inflammation** (usually giant cell) V1-V4

fibrous banding (usually **radiation-induced**)



## Symptoms related to vertebral insufficiency

- Can affect the brain stem, occipital and temporal lobes
- The occasional presence of the following symptoms:
  1. Motor and/or sensory disorders occurring bilaterally during the same attack
  2. Imbalance or limb ataxia
  3. Diplopia
  4. Speech disorders and dysphagia
  5. Cortical blindness
  6. “Drop attacks” – syncope
  7. Transient complete amnesia
  8. Tinnitus

# Why the true incidence of VAStenosis is difficult to estimate:

- cerebral stroke is usually attributed to lesions in the cervical arteries
- patients after brain stem stroke – often “too ill for the diagnostics”
- minor symptoms – often underestimated
- the symptoms from the “posterior cerebral circulation” are poorly defined
- the symptoms are **commonly attributed to degenerative lesions** in the cervical spine

# Surgery for Vertebral Artery Stenosis

- vertebral artery re-implantation (SA or CCA anastomosis)
- endarterectomy
- venous patch angioplasty
- bypass implantation

mortality 0.6 – 4.2 %  
complications ca. 30% (!)

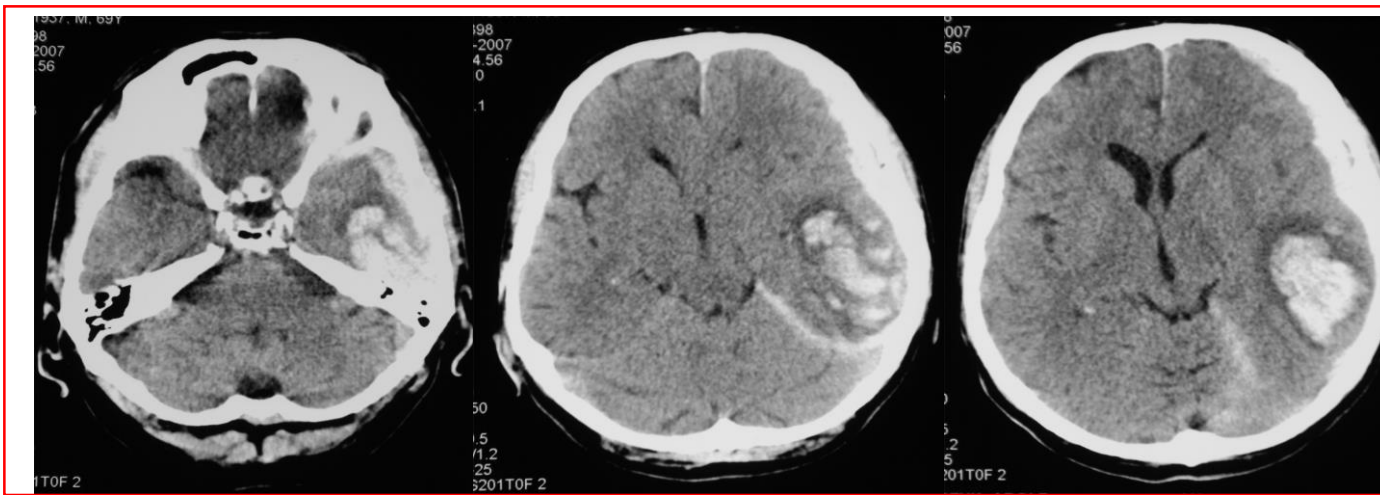
- |                                    |       |
|------------------------------------|-------|
| • <i>laryngeus recurrens</i> palsy | 2 %   |
| • Horner syndrome                  | 15 %  |
| • lymphocele                       | 4 %   |
| • chylothorax                      | 5 %   |
| • TIA                              | 2 %   |
| • vertebral artery thrombosis      | 1-9 % |

# Consequences of undiagnosed symptomatic VA Stenosis...

...can be fatal !

Patient AA, 69 years

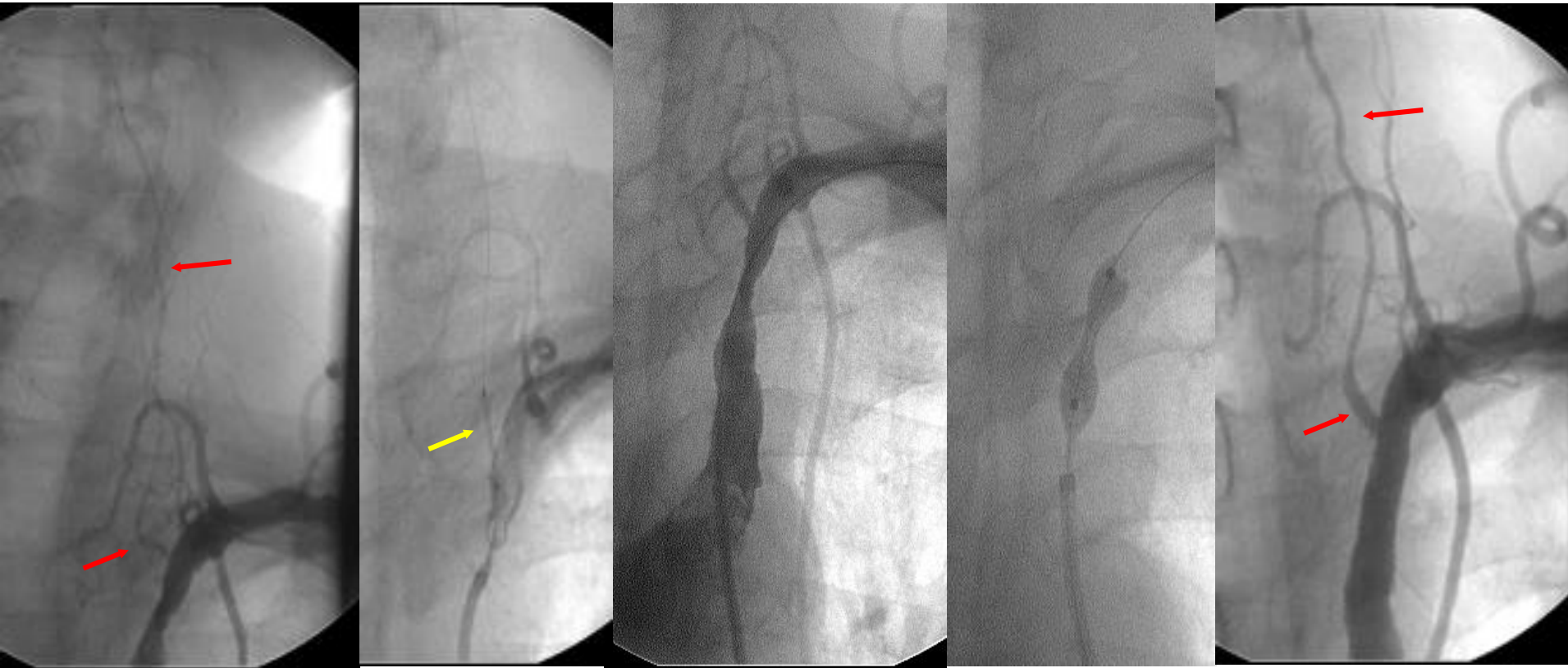
- ! several episodes of *sudden syncope* – cardiac reasons sought – admitted to the cardiology dept. for diagnostics.
- !! treated at the neurology department for *recurrent syncope with retrograde amnesia*
- !!! sudden LOC and *severe* head trauma requiring neurosurgical treatment - craniotomy in neurosurgery department – 3 months rehabilitation.



Intracranial  
haematoma



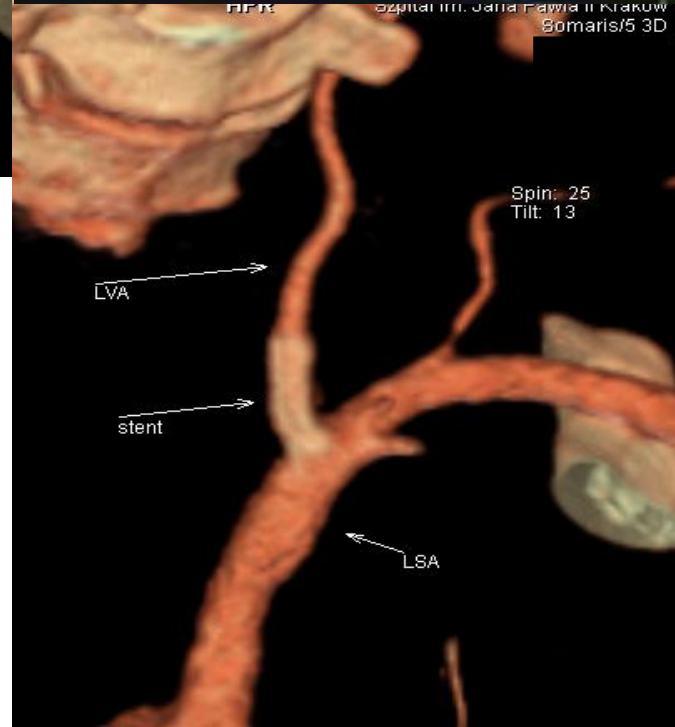
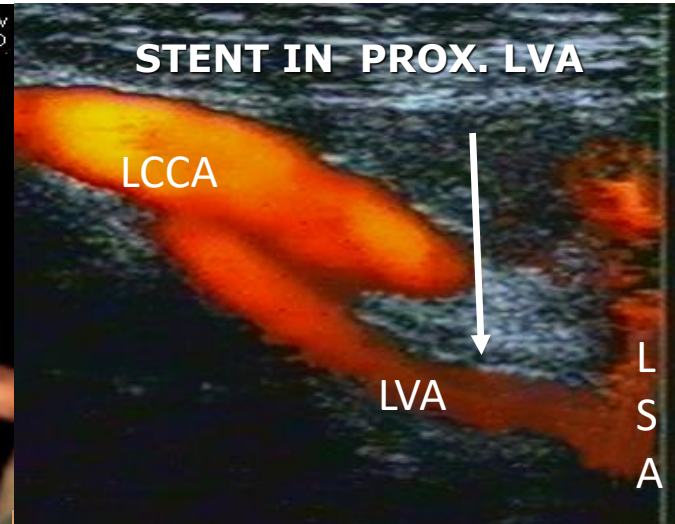
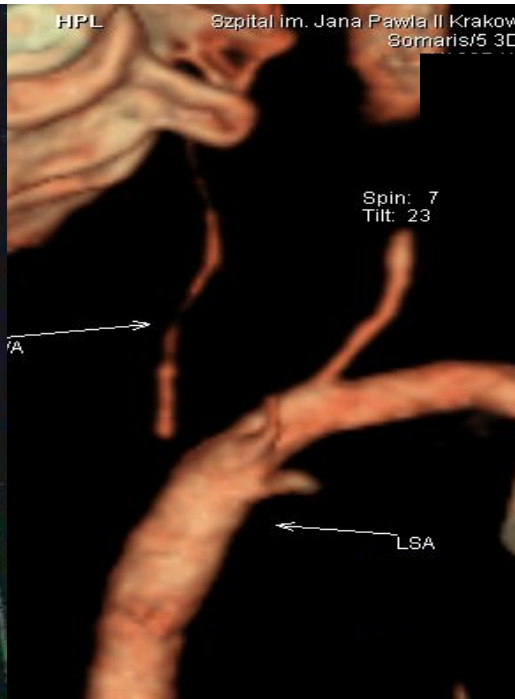
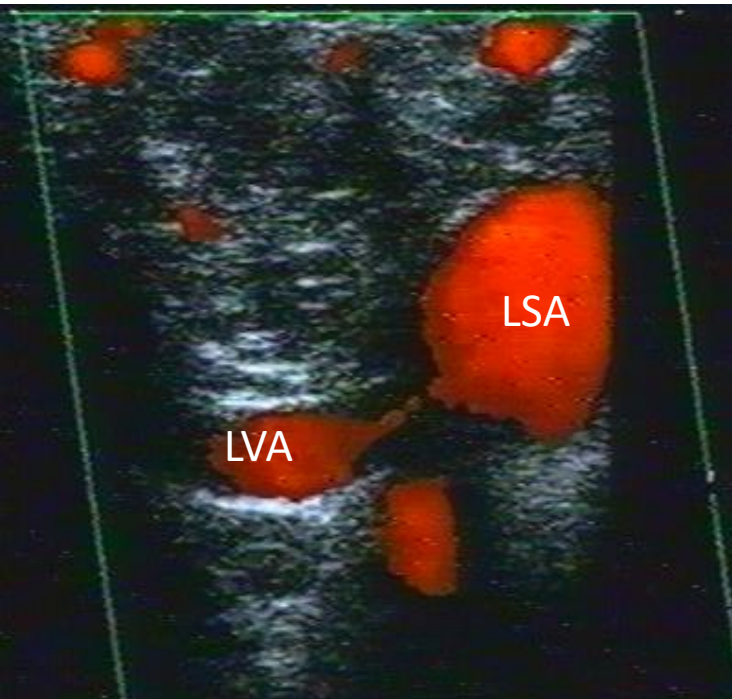
This patient (AA), admitted to our Department 9 months after first symptoms & after recover from surgically-treated intracerebral and subdural haematoma with **continuing recurrent syncope and dizziness**



Pressure gradient in LSA - 60 mmHg

- Discharged on the 2<sup>nd</sup> day after PTA
- Over 36 months follow-up - a **complete** resolution of the neurological symptoms

# Non-invasive imaging methods



- diagnostics, stenosis severity assessment
- morphological assessment of atheromatous plaque (obstruction)
- efficient in complication detection
- monitoring long-term outcomes

# VAS stenosis: era of POBA

...is definitively finished !

- often significant „recoil”
- often spasm after balloon angioplasty
- vertebral artery dissection
- unacceptable restenosis rate  
(10-90% in literature )

=>

Angioplasty  
**Always with**  
stent implantation !

# Indications for intervention treatment of the vertebral arteries

- Symptomatic bilateral stenosis  $> 50\%$  not responding to pharmacotherapy

**NO INTERVENTION INDICATED**

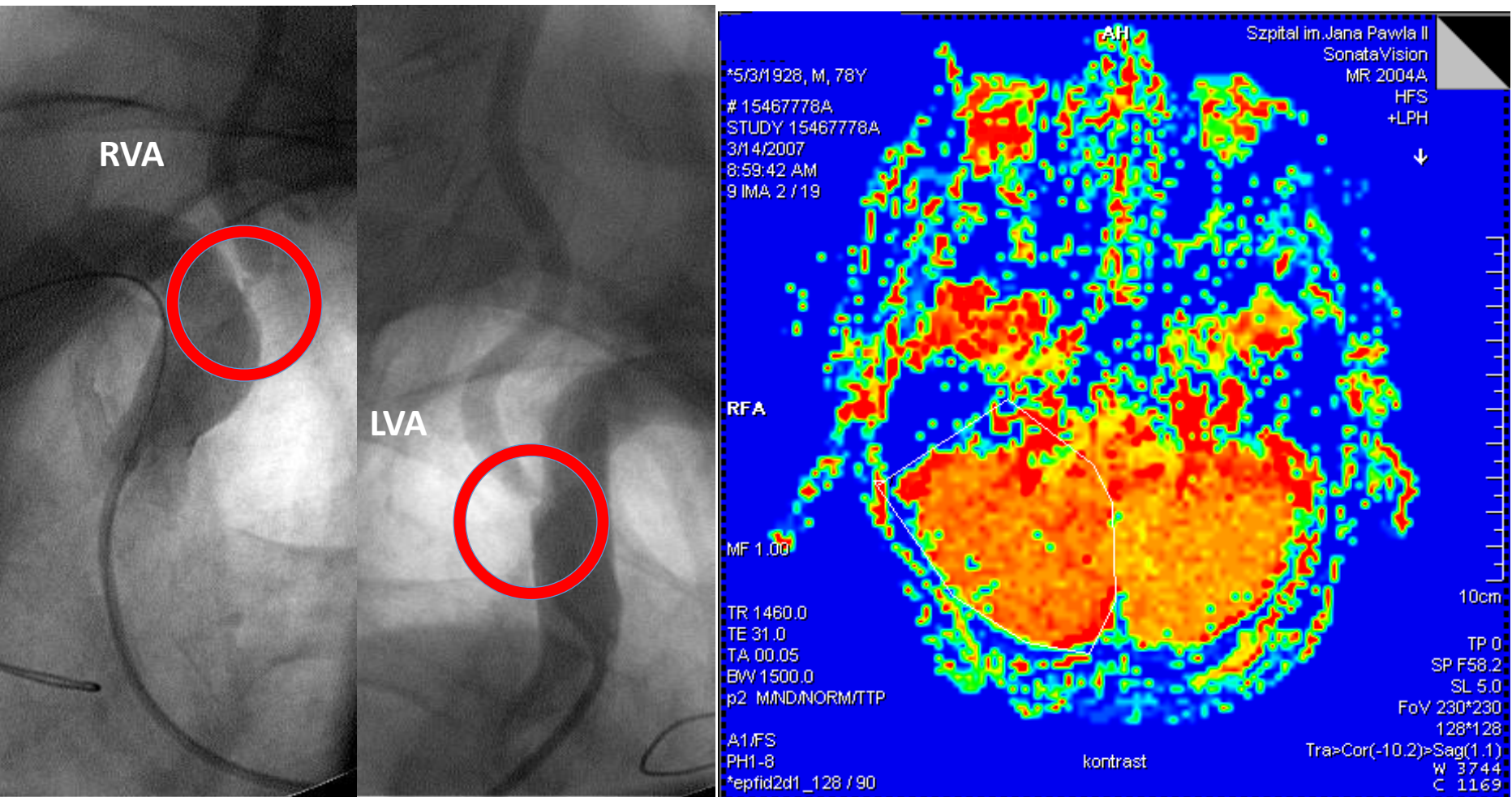
**IN ACCIDENTALLY-DETECTED VAS stenosis**

**(US, ANGIO-CT, MRI, ANGIOGRAPHY)**

- When stenosis can be associated with thromboembolic events in the posterior segment of the arterial circle of the brain

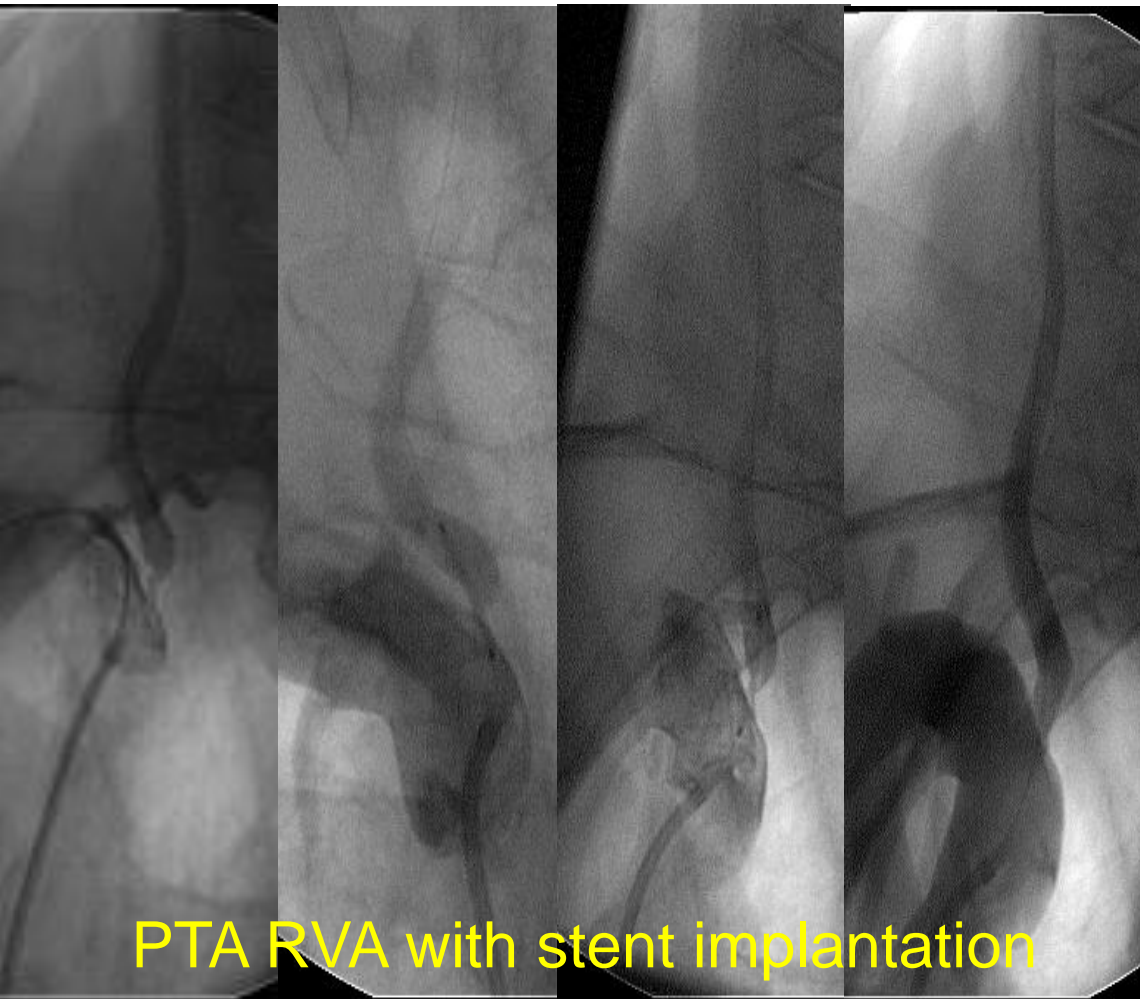


# A symptomatic patient with bilateral stenosis of the vertebral arteries.

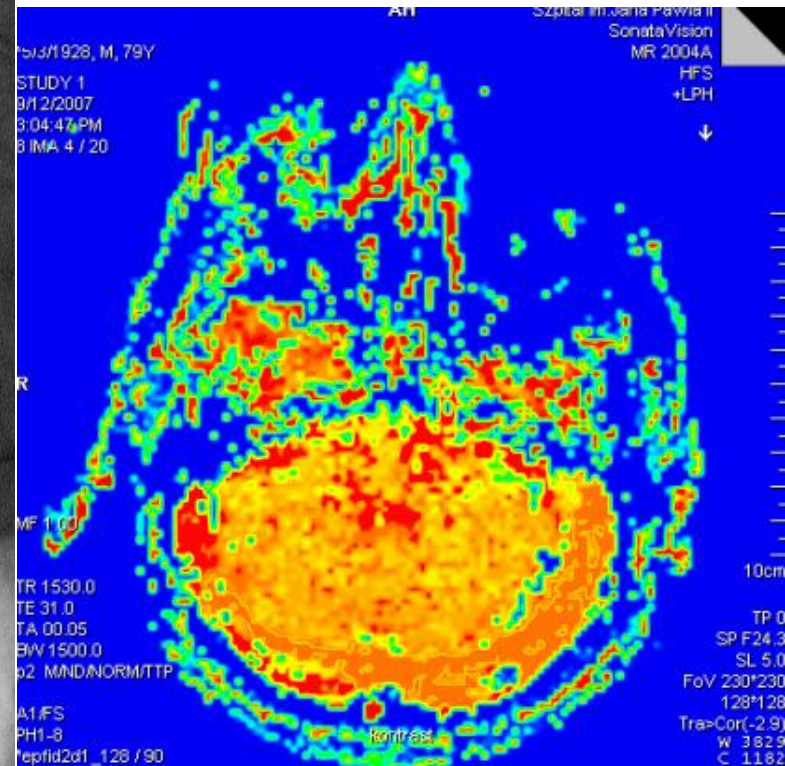


Brain perfusion scan can be very helpful with decision making regarding the side of intervention. Cooperation with radiologist is mandatory

A symptomatic patient with bilateral stenosis of the vertebral arteries. CT brain perfusion indicate RVA-stenting.

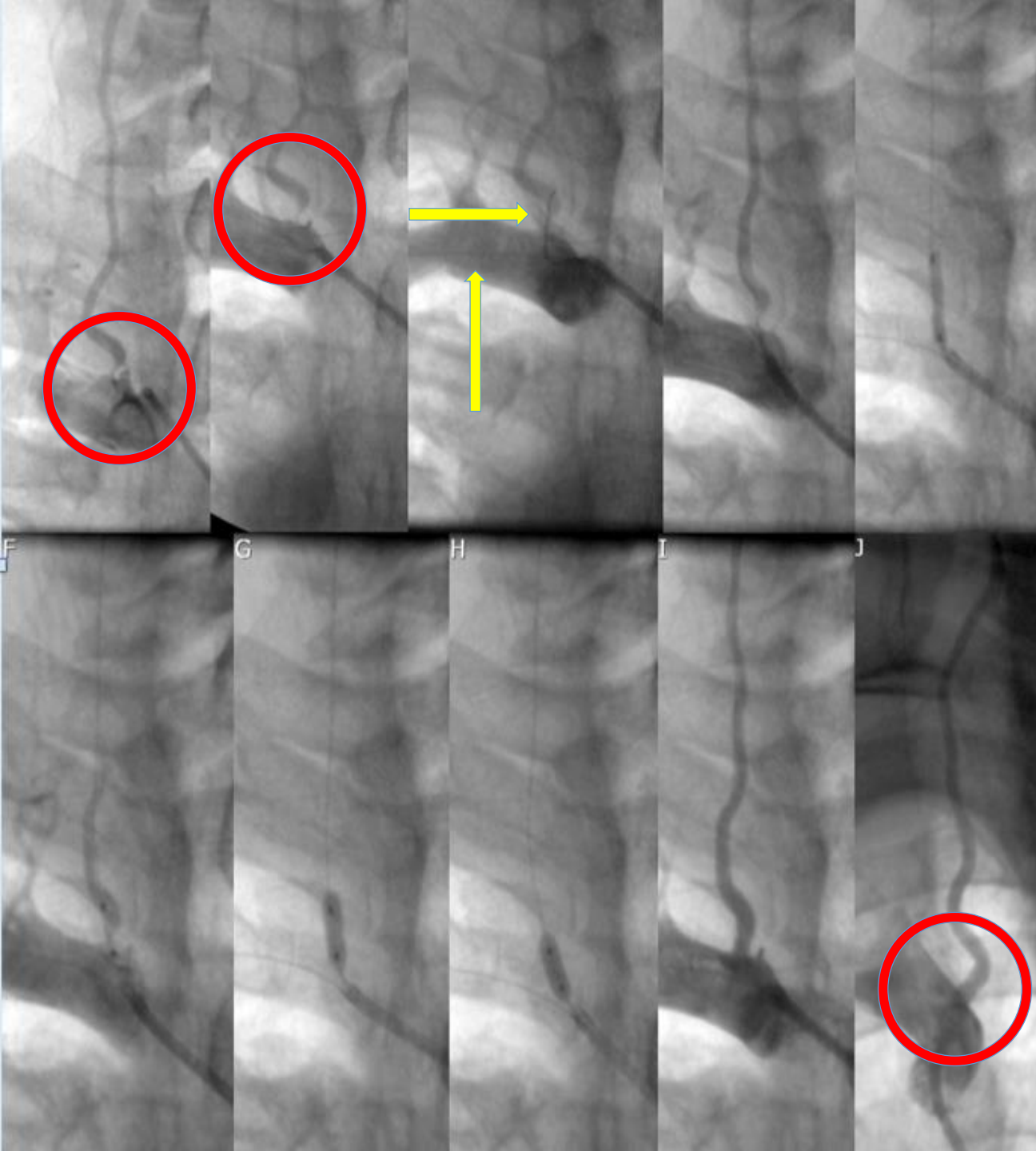


PTA RVA with stent implantation



Brain perfusion  
in magnetic resonance imaging  
after PTA RVA





Standard VASenting in symptomatic pts. Tight stenosis

Generally two wire technic.

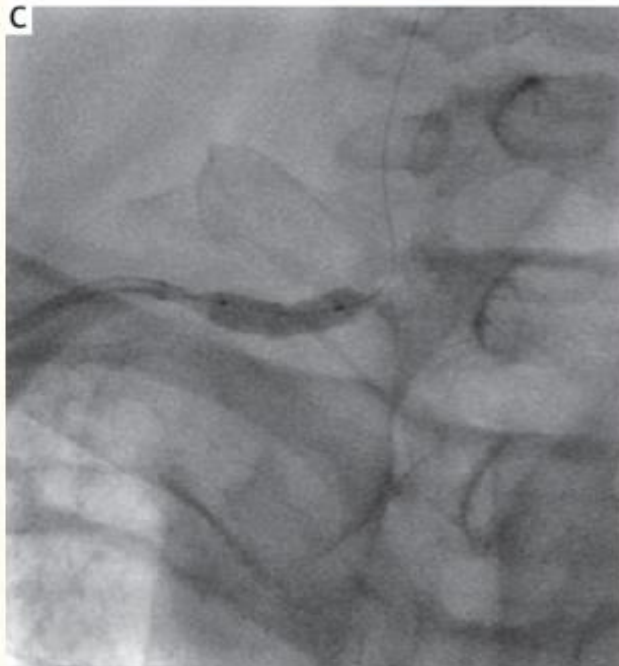
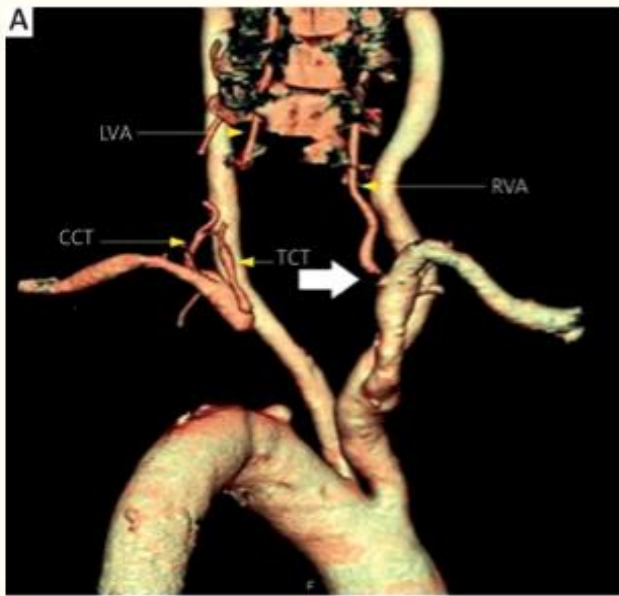
V-18 in SA for Vertebral Artery-Ostium protection.

0.014" coronary guide wire for lesion crossing.

Direct stenting 70% of cases

Small stent protrusion too SA is mandatory.

Rigorous follow-up

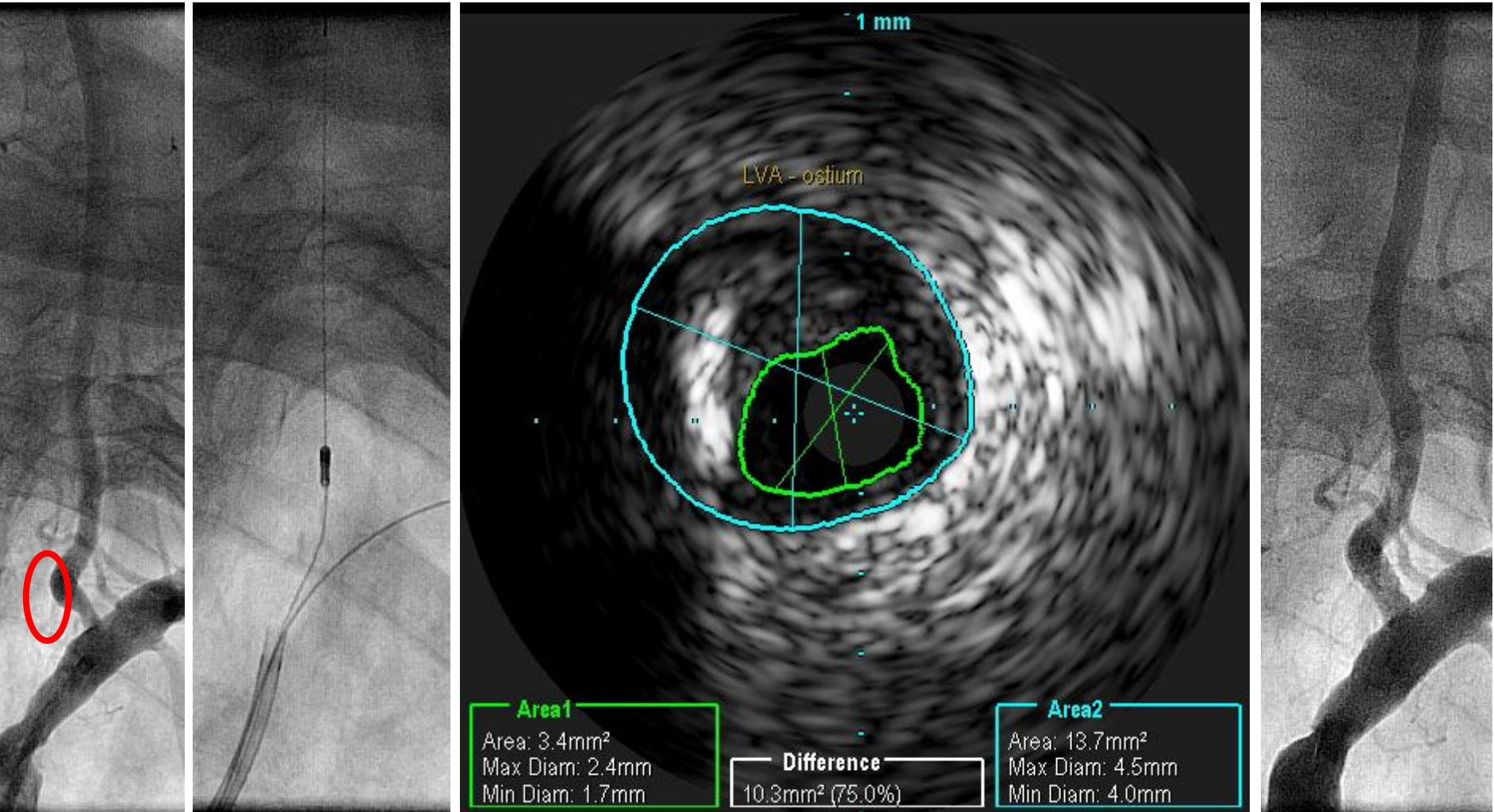


Radial access for VASenting is easy and feasible and 6 F guiding catheter can be always used.

## Transradial approach for vertebral artery stenting

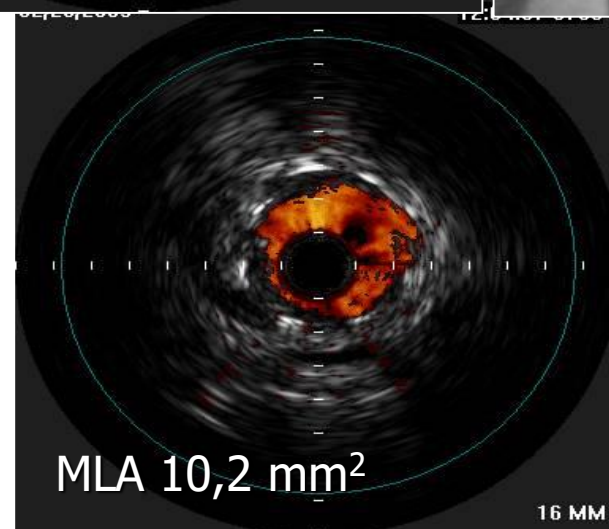
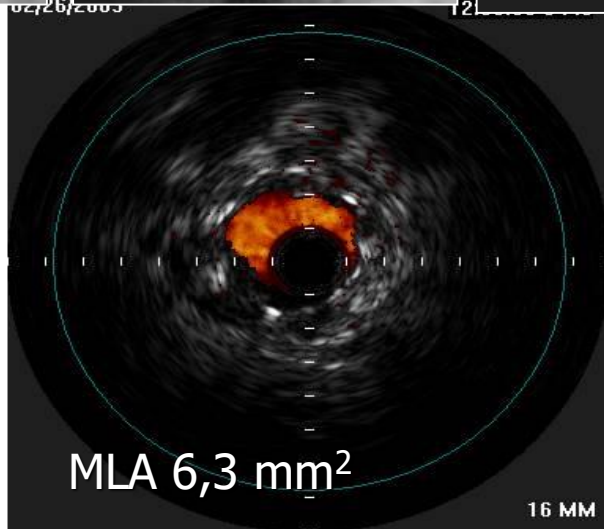
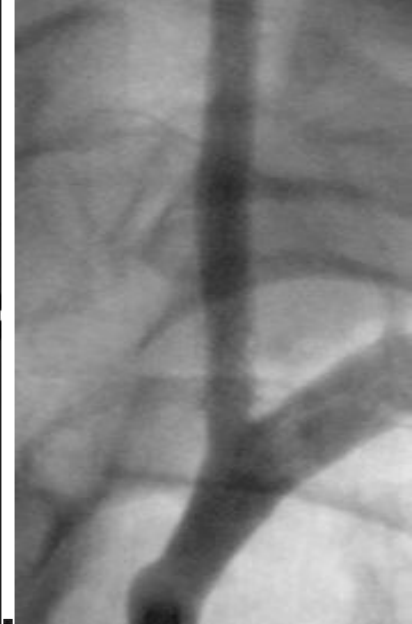
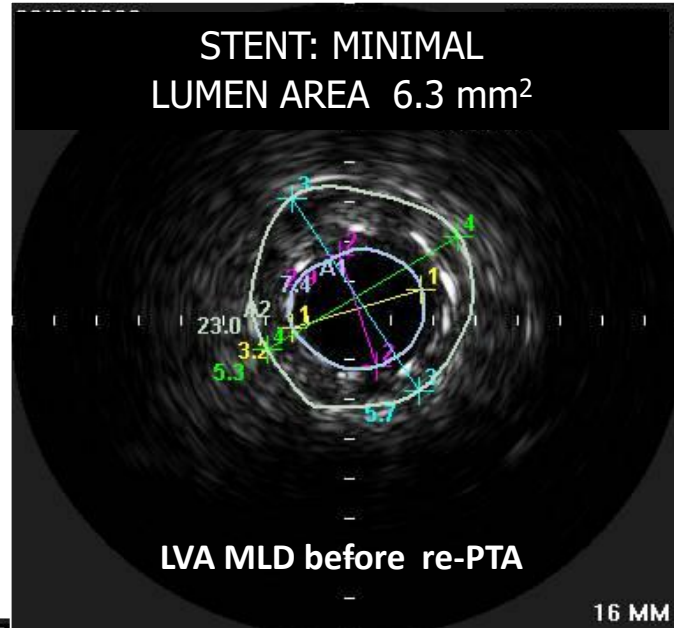
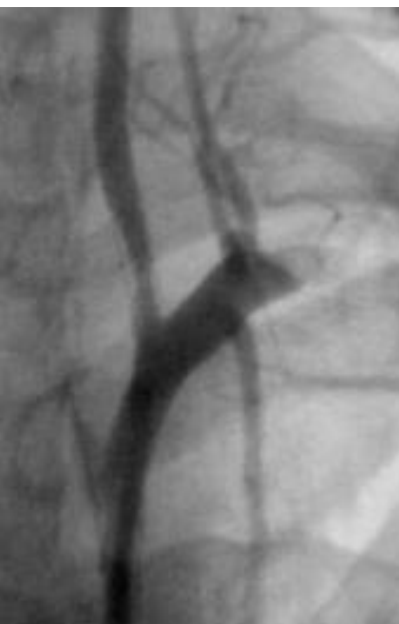


# Patient age 55 with severe vertigo and balance disorders



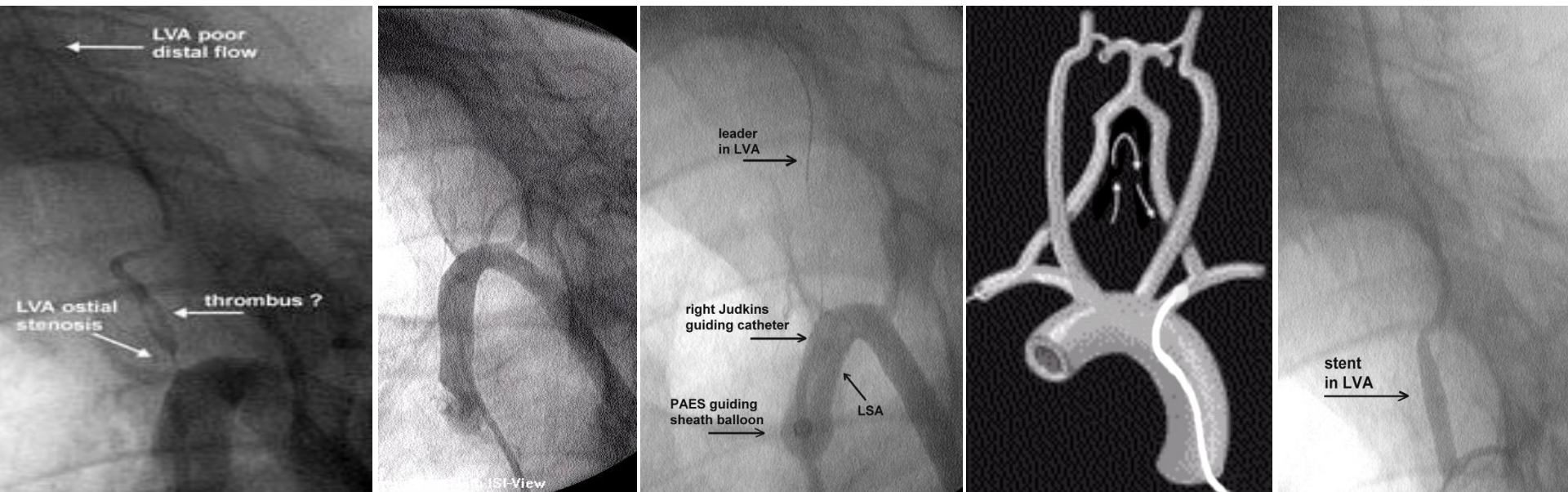
IVUS verification after LVA - stenting complete symptoms restoration.

*IVUS for in-stent restenosis evaluation:  
neointima proliferation – under expanded stent*

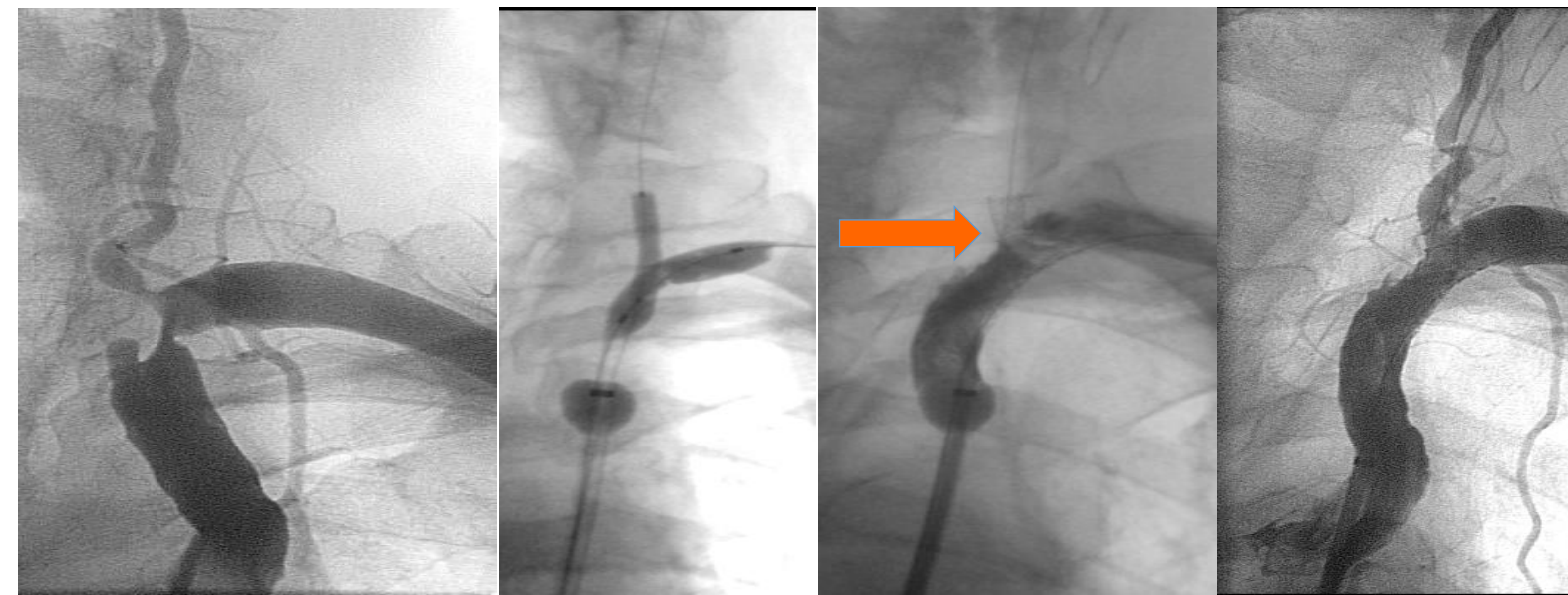




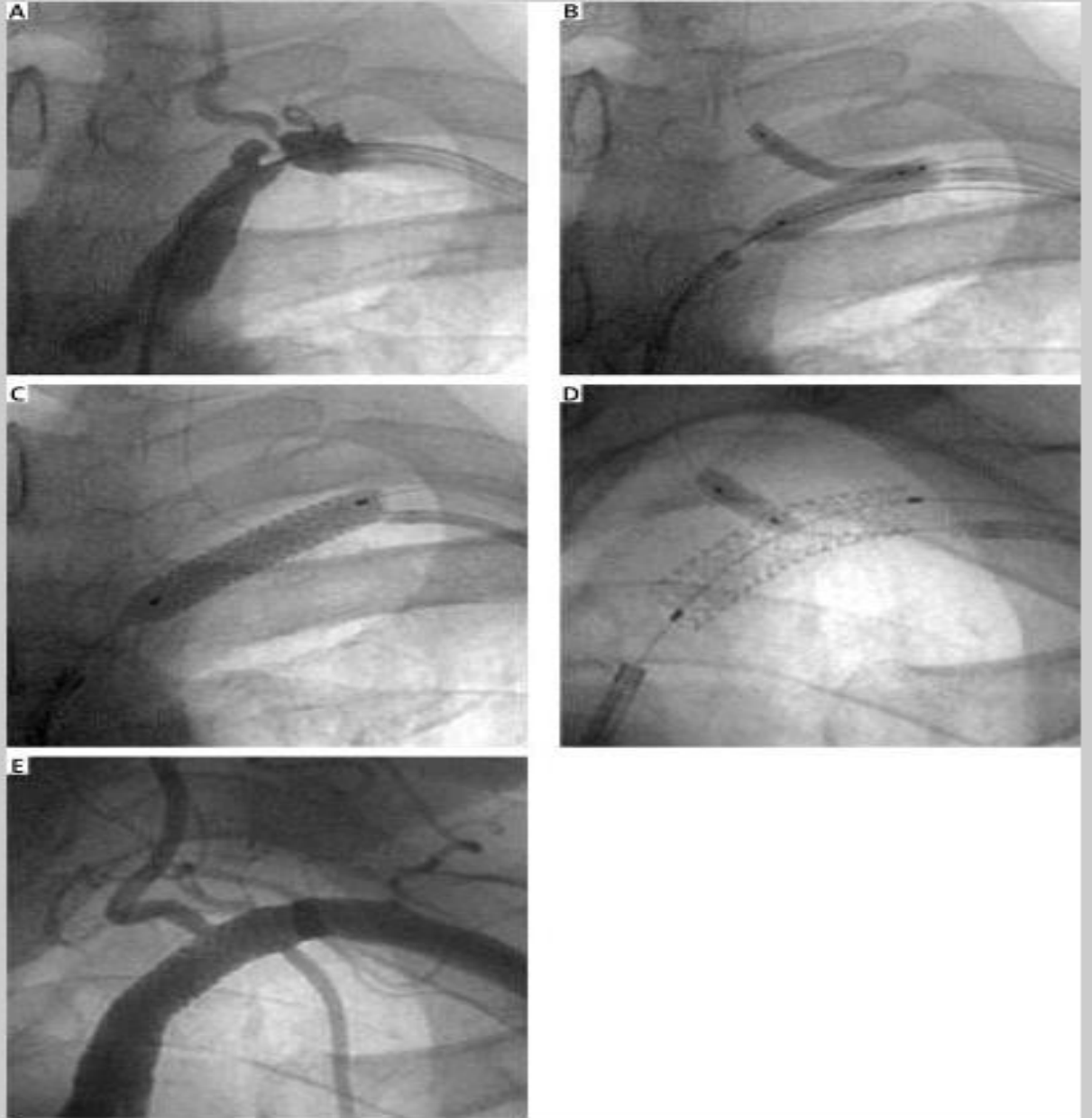
# Temporary brain protection in high risk VAStenting – temporary flow reversal by SA occlusion ( Mo.Ma Cellio cath.)



*P.Pieniazek et al. J Endovasc Ther: 2004;4:511-516*



Retrograde blood flow protected the brain from intracranial embolization (arrow !!!)



Great challenge for operator

Simultaneous vertebral &

Subclavian stenting from

Femoral & Radial access.

Simultaneous vertebral and subclavian artery stenting

[Damian R. Maciejewski, Łukasz Tekieli, Roman Machnik, Anna Kabłak-Ziembicka, Tadeusz Przewłocki, Piotr Paluszek, Mariusz Trystuła, Robert Musiał, Karolina Dzierwa, and Piotr Pieniżek](#)

[Advances in Interventional Cardiology. 2017; 13\(2\): 142–149.](#)

# What kind of stent we need do use for VAStenosis

## Comparison of drug-eluting and bare metal stents for extracranial vertebral artery stenting.

[Maciejewski D](#), [Pieniazek P](#), [Tekieli](#), at all :

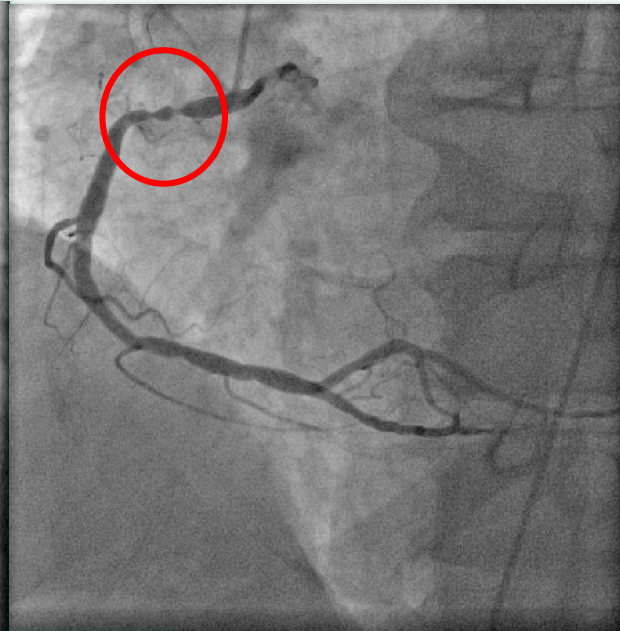
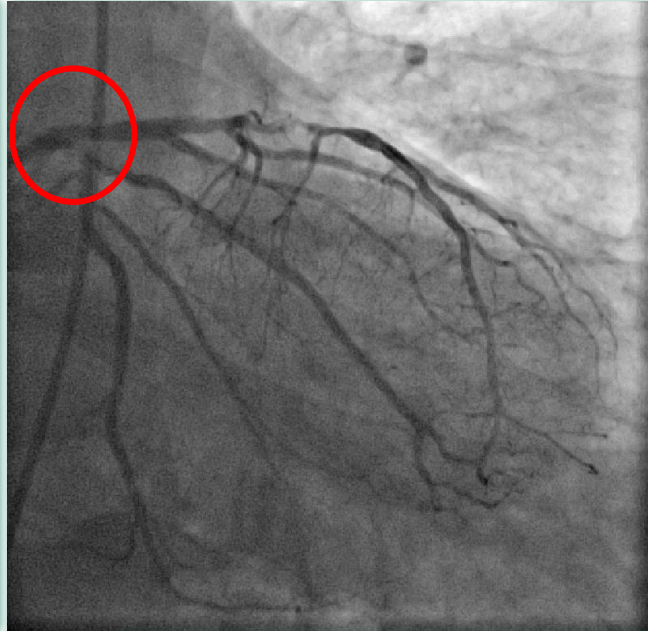
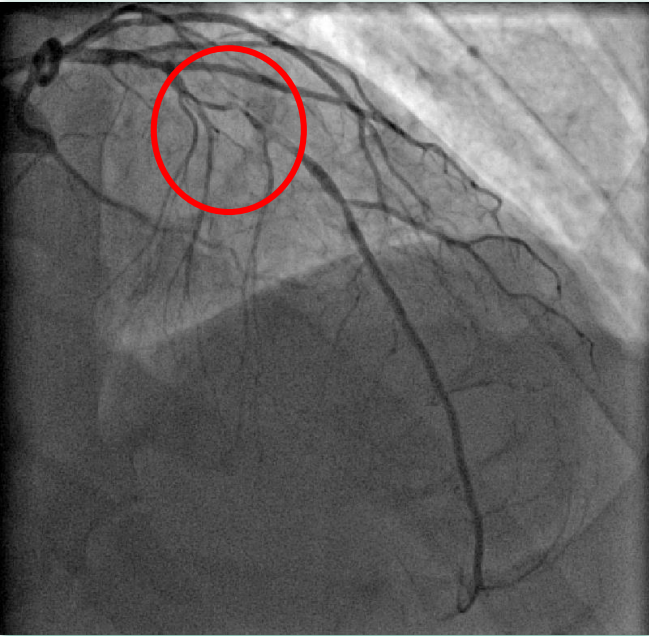
**Methods:** During 13-year study period (2003-2016), 392 consecutive patients underwent VAS angioplasty in 428 arteries, including implantation of 148 DESs (DES I:21; DES II:127 lesions), and 280 BMSs.

**Results:** The technical success rates for DES and BMS groups were 96.7% and 94.6% ( $p=0.103$ ), with similar periprocedural complication rates (1.4% vs 2.2%;  $p=0.565$ ). VAS degree was reduced from  $86\pm9.7$  to  $2.7\pm5.0\%$  in DES ( $p<0.001$ ) and from  $84.1\pm9.4$  to  $4.3\pm6.9\%$  in BMS ( $p<0.001$ ). Angiography confirmed in-stent restenosis/occlusion (ISR/ISO) 50-99% in 53 (14.2%) and 21 (5.6%) out of 373 patients (409 arteries) with at least 6 month follow-up. ISR/ISO rates were similar in **DES vs BMS (22.8% vs 19.4%;  $p=0.635$ )**, as well as in **DES I vs DES II (6/19; 31.6% vs 25/92; 27.2%,  $p=0.325$ )**. Stainless steel (24/135; 17.8%) and cobalt-chromium (23/121; 19%) BMSs had significantly lower incidence of ISR/ISO, as compared to platinum-chromium (7/18; 38.9%),  $p=0.034$ . ISR/ISO was associated with age ( $p=0.01$ ) and CRP level  $>5\text{mg/l}$  ( $p=0.043$ ), while higher stent length was associated with ISR only in DES group ( $p=0.024$ ).

**Conclusion:** Our results do not support significant differences in ISR/ISO rates between DES and BMS, although differences between particular stent types and ISR rates require further investigation.



CAD with III vessels disease require by-pass surgery with severe vertigo due to Right Vertebral Artery occlusion and Left Vertebral Artery stenosis.



Huge logistic &  
therapeutic problem

First stage VASenting

Second stage CABG!

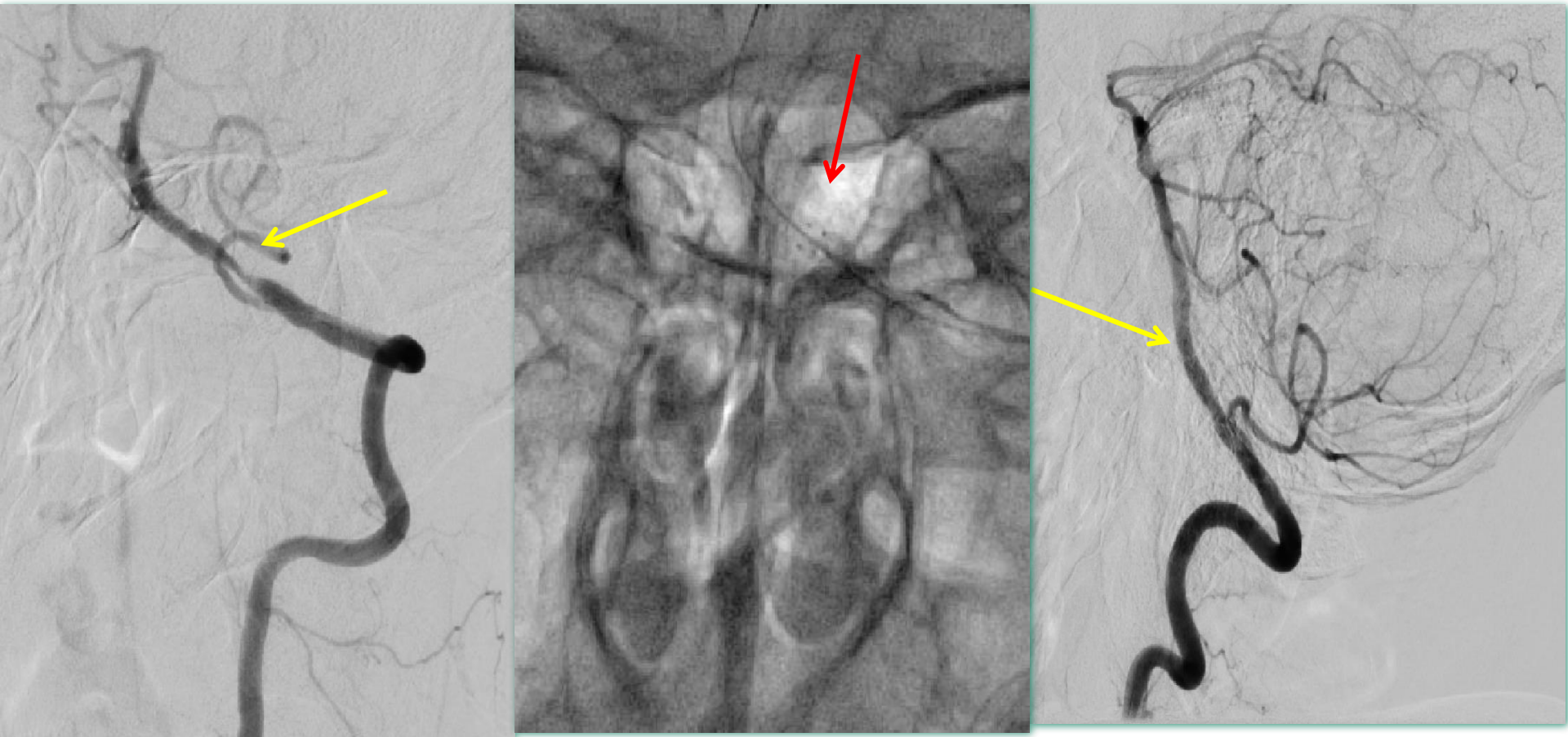




COOPERATION WITH NEURORADIOLOGIST IS REQUIRED



Self expanding stent implantation dedicated to intracranial  
circulation WINGSPAN after gently suboptimal  
predilatation  
Tight stenosis of LVA before Basilar Artery



RED arrow - the markers of WINGSPAN SELF EXPANDING STENT



# Conclusions

- Symptomatic **vertebral artery stenosis** is associated with a **risk of death / cerebral stroke**
- The use of BMS or DES in VA-PTA is **safe & feasible**
- The angiographic restenosis rate of **aprox. 20%**  
- is confirmed in a larger sample and is **acceptable**
- Our initial findings from a large cohort of patients indicate that new generation of DES versus BMS had similar incidents of in-stent restenosis however new **large stents DES for LM** should be tested in VA area !!