



Cerebrovascular diseases

- 2nd most often reason of death and the most often reason of disability,
- every year - 16.9 millions new strokes and a 5.9 millions of death
- Disability-Adjusted Life Years and Death in relations to strokes
- 1990 vs 2013
- From 3,54% to 4,62%
- From 9,66% to 11,75%,



Epidemiology

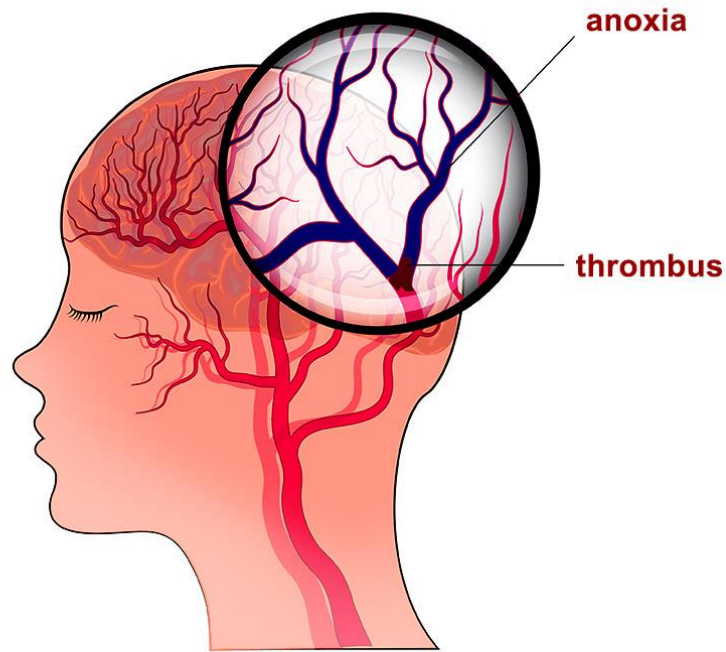
- **Incidence** – 125 – 446/100 000 inhabitants (*Feigin V.L. et al., Lancet Neurol, 2009*)
- **SLOVAKIA**
- **Mortality: 100-200/100 000**
- **Incidence: 224/100 000**



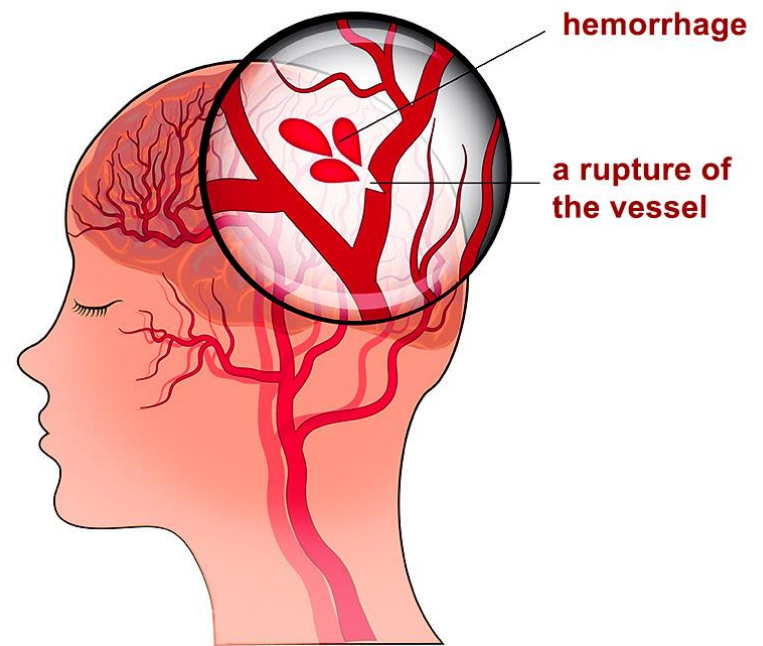
Cerebrovascular diseases

- Diseases with sudden onset, or rapid development of focal cerebral dysfunction as the consequence of lesion of cerebral arteries. There are 2 types:
 - Brain ischemia (stroke) or
 - Brain haemorrhage

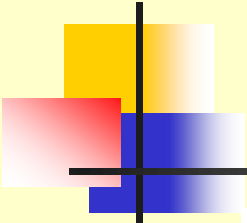
Two Types of Stroke



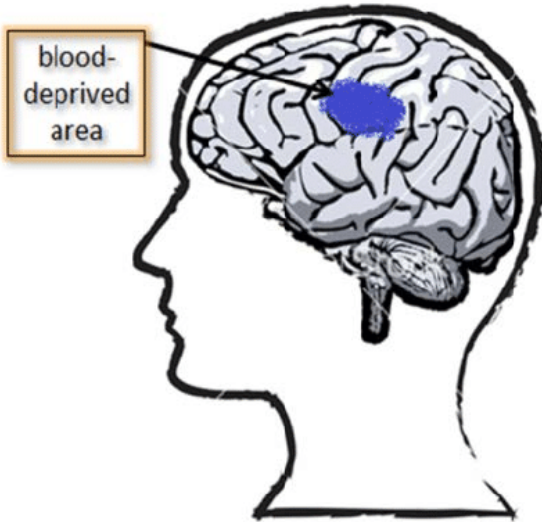
Ischemic Stroke



Hemorrhagic Stroke

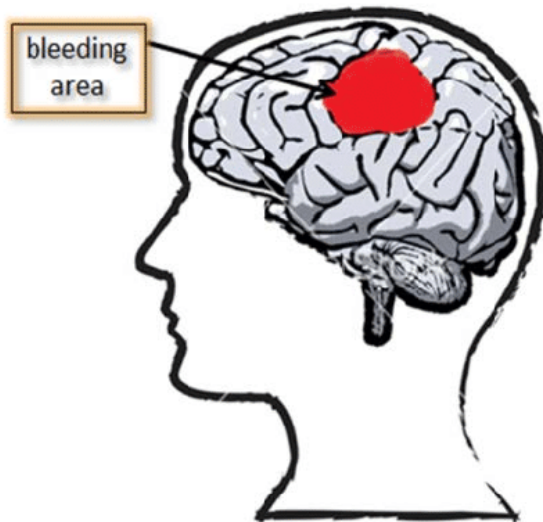


Ischemic Stroke

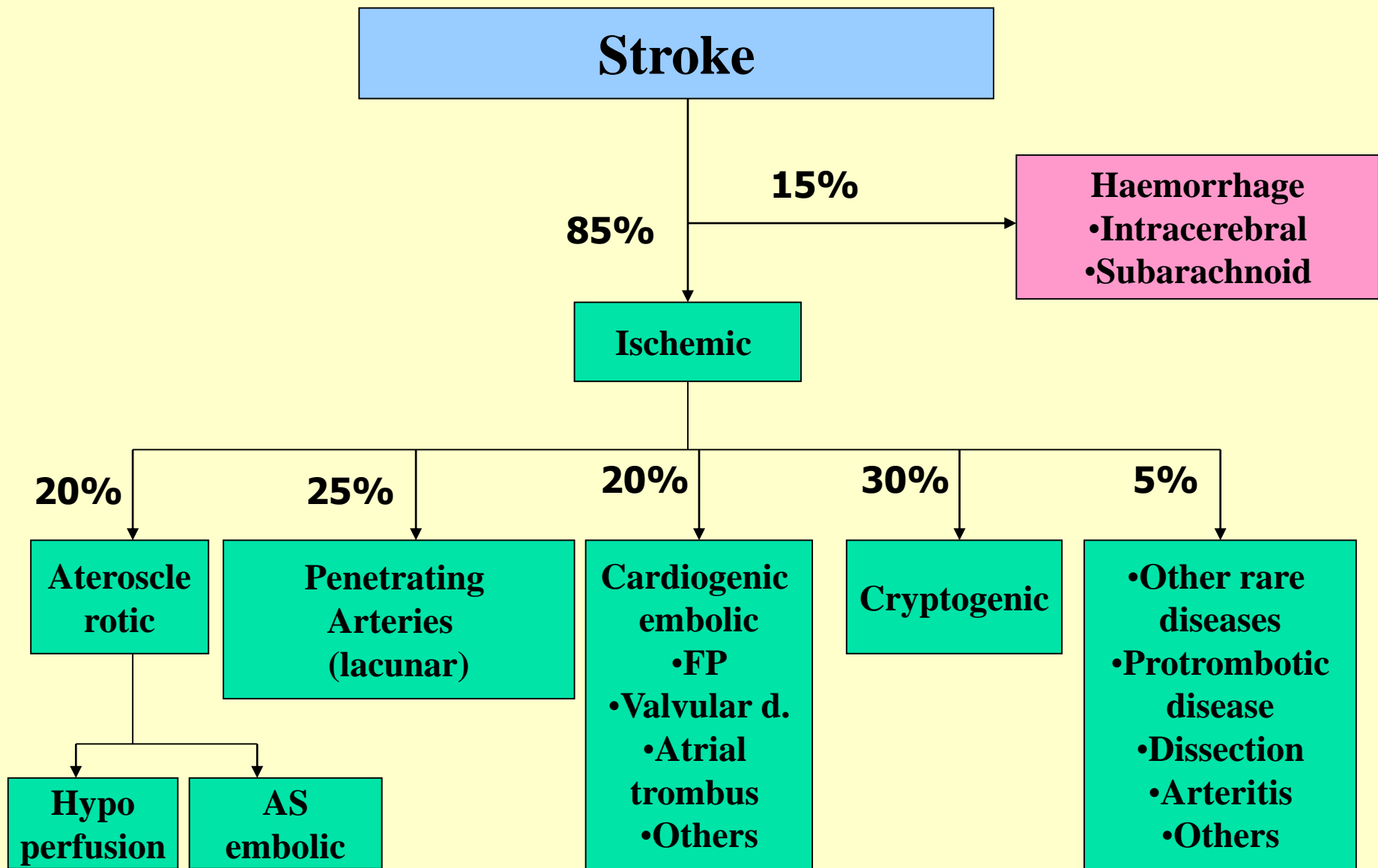


blood flow is obstructed

Hemorrhagic Stroke



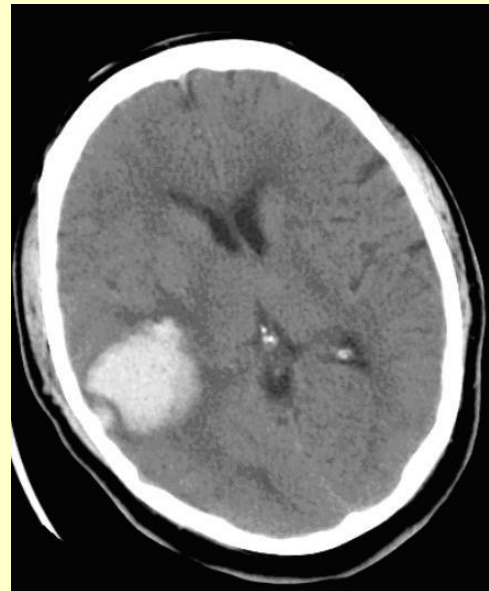
a ruptured blood vessel leaks blood into brain



Cerebrovascular diseases



Brain ischemia

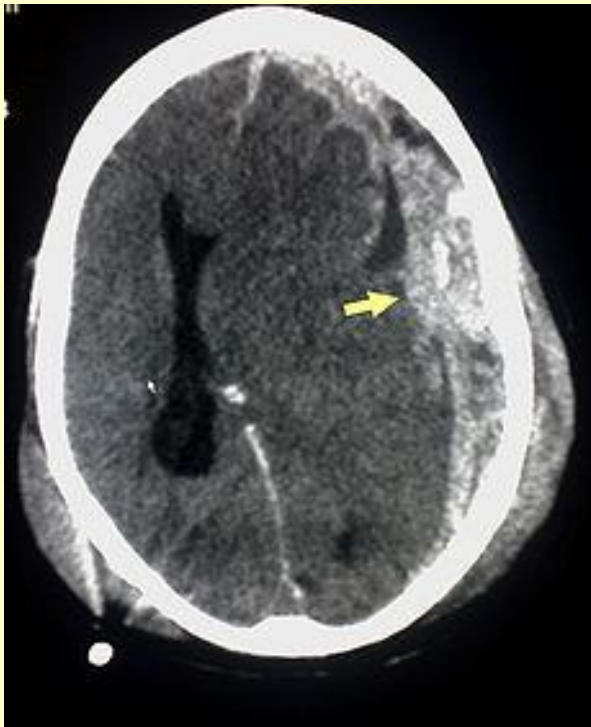


Brain haemorrhage



**Subarachnoid
haemorrhage**

Head injury, **NO** stroke

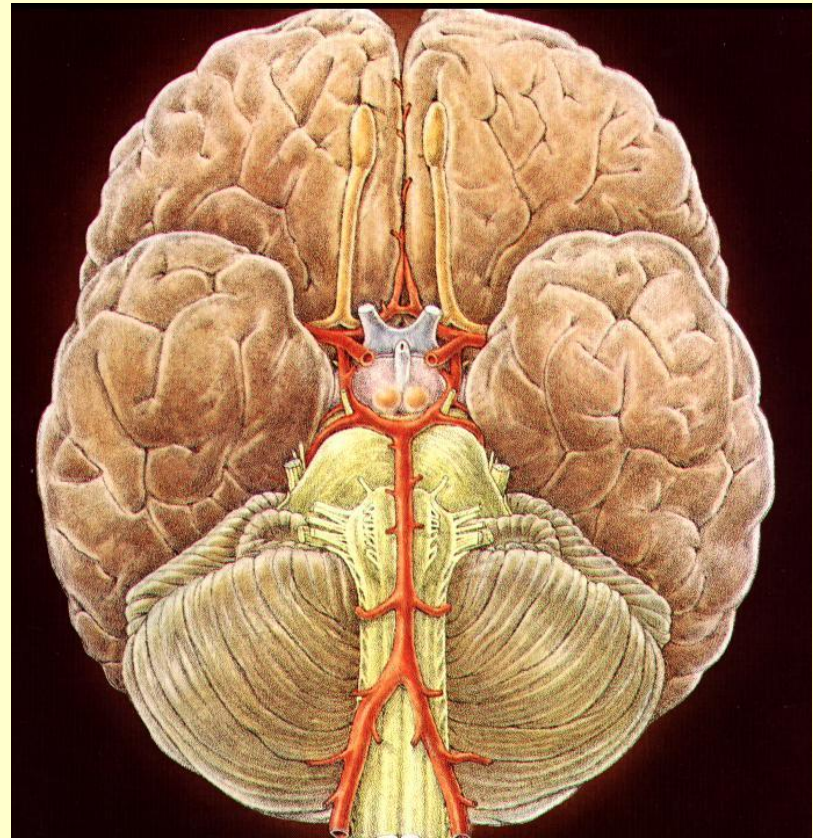
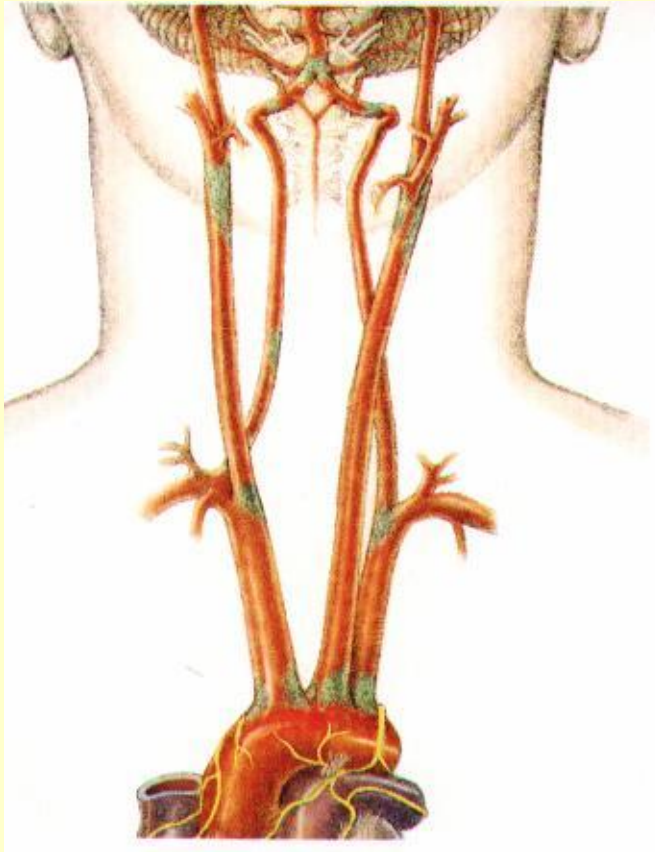


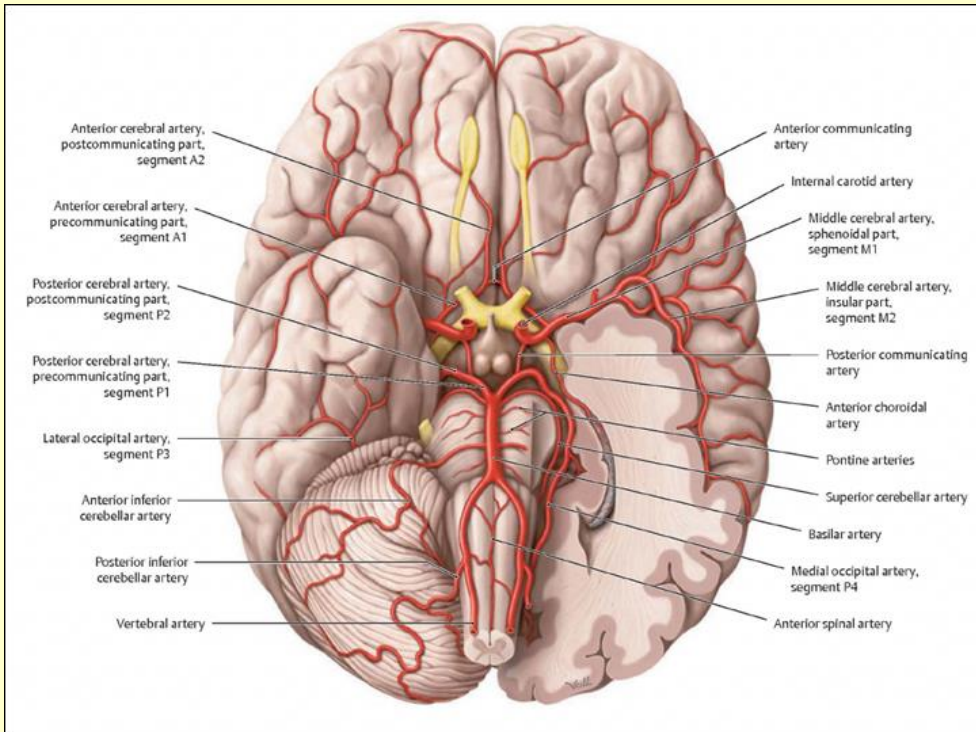
Subduralny hematoma



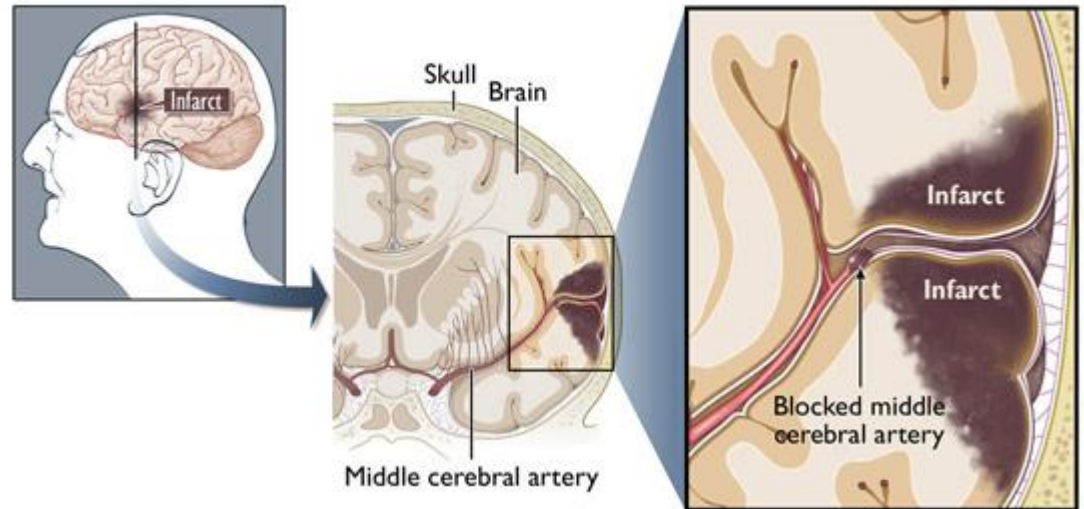
Epidural hematoma

Anatomy of cerebral arteries

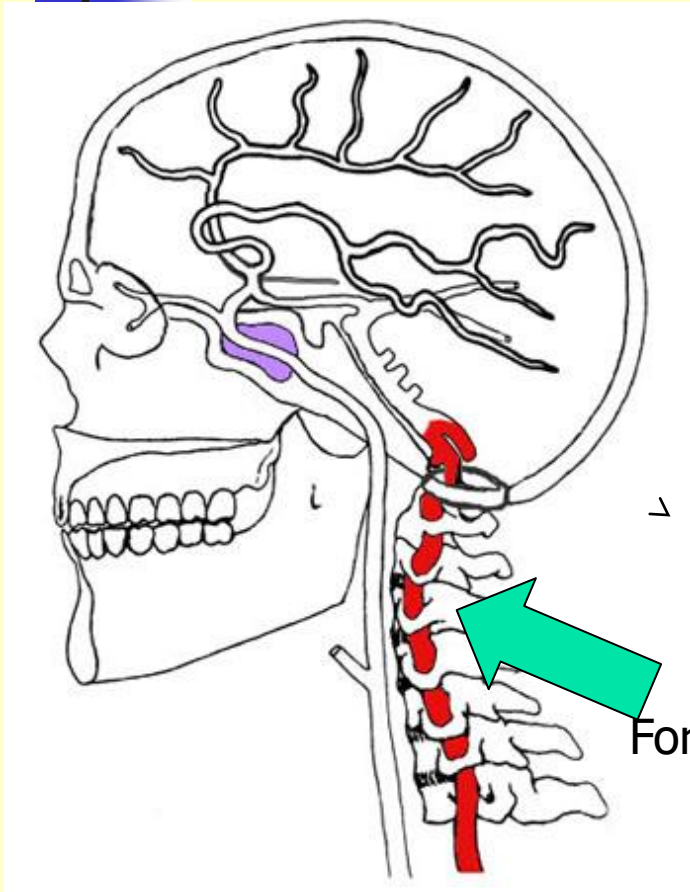




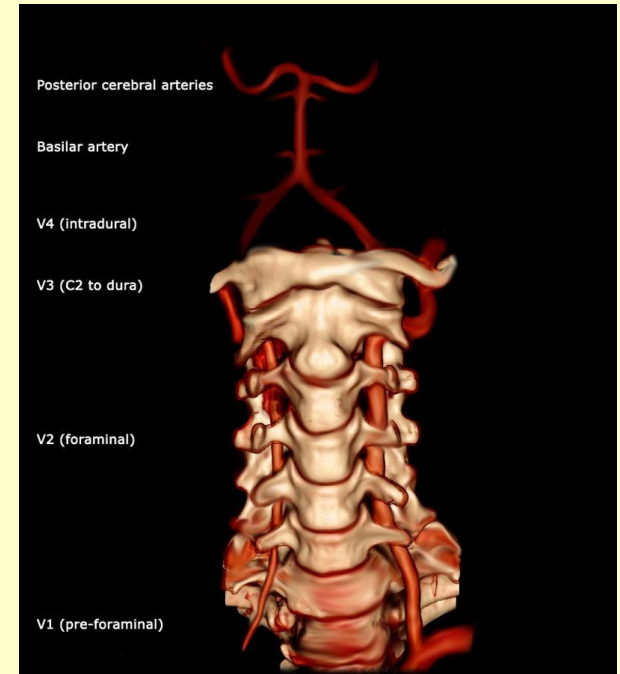
Large ischemic stroke in the brain



Vertebral arteries

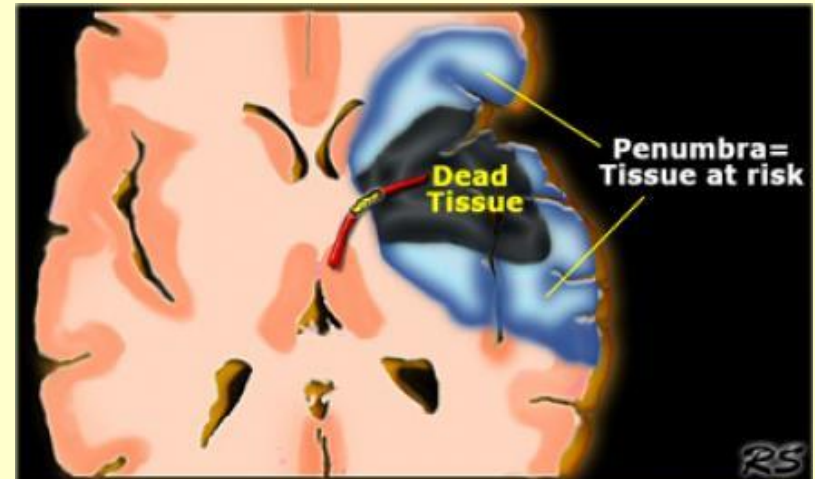
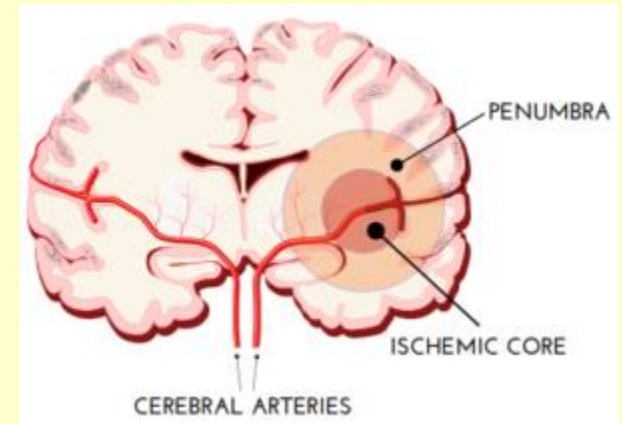


Foramina transversaria

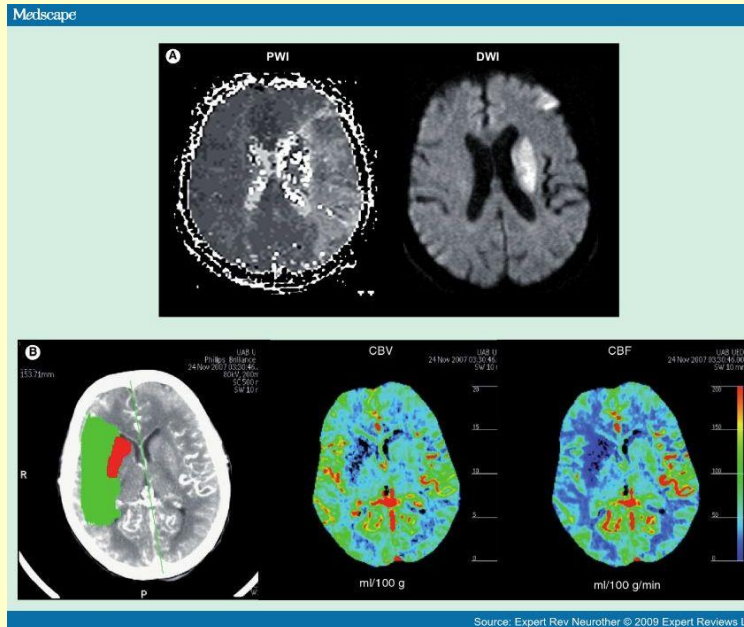
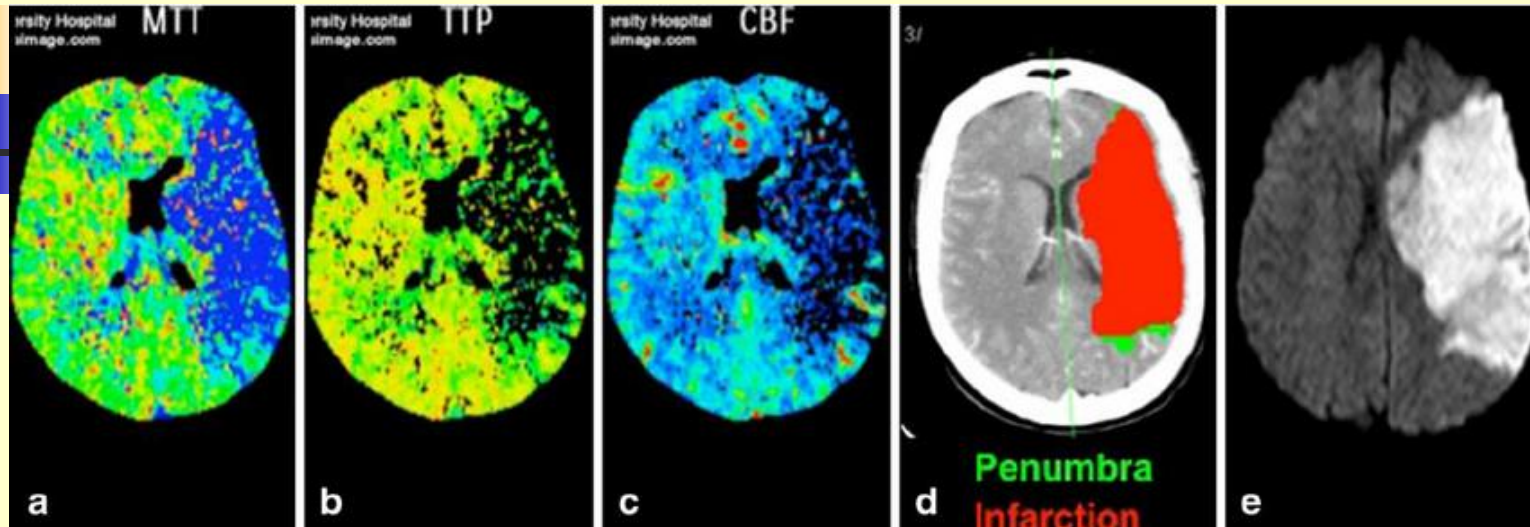


Regulation of cerebral circulation

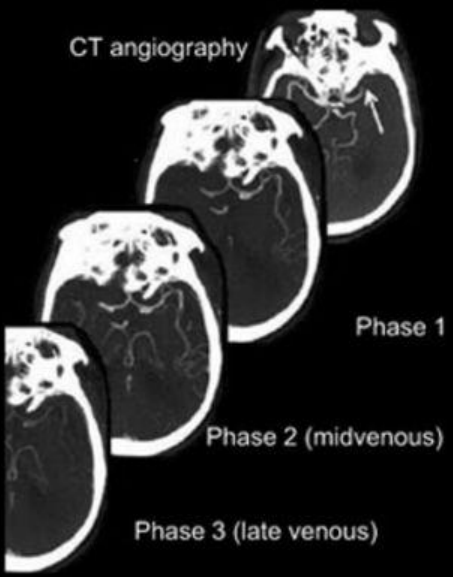
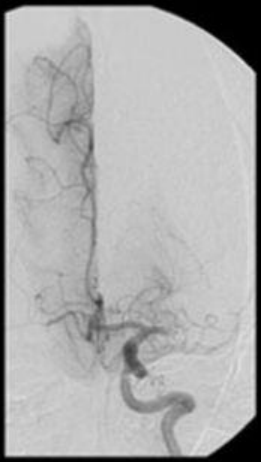
- **Blod flow - 50 – 60 ml/100 g** of brain tissue/min.
- **Blod flow below 20 ml/100 g/min.**
– functional changes of neurons – reversible dysfunction (few hours) – **Penumbra (4,5 – 8 hours)**
- **Blod flow below 12, or 10 ml/100 g/min structural changes**
irreversible changes – brain infarct



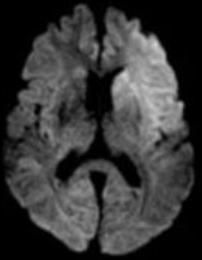
Penumbra



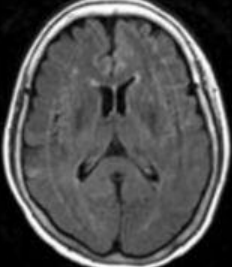
Patient with poor collaterals



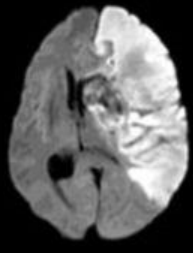
Multiphasic map (ESCAPE trial)



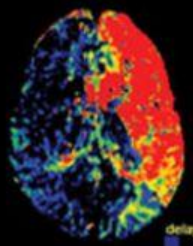
DWI



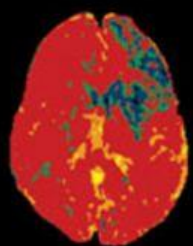
FLAIR



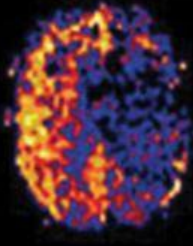
Day 7 DWI



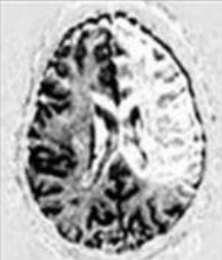
Tmax



CBV



ASL CBF



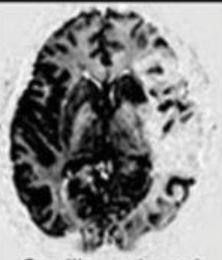
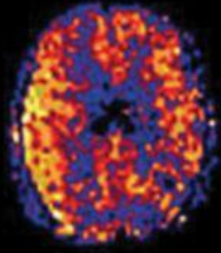
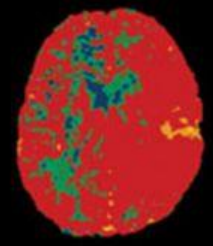
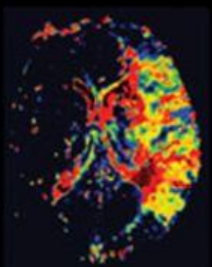
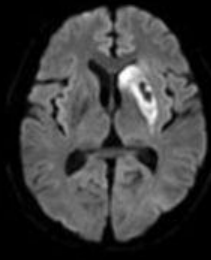
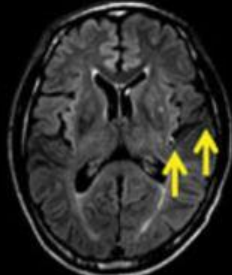
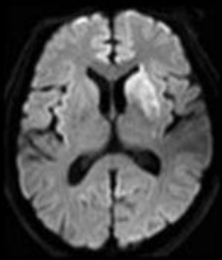
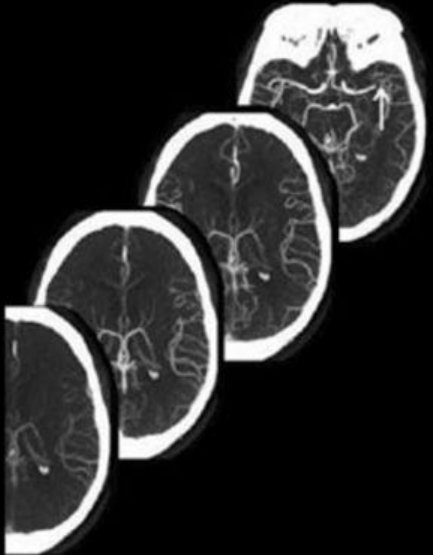
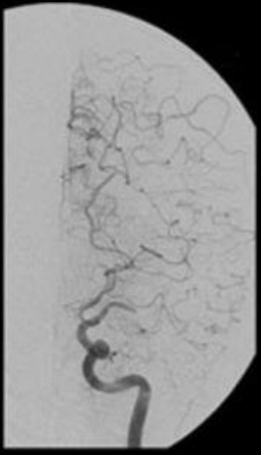
Capillary phase*



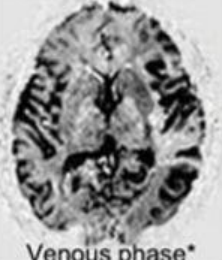
Venous phase*

Collateral map (MRP-based)

Patient with good collaterals



Capillary phase*

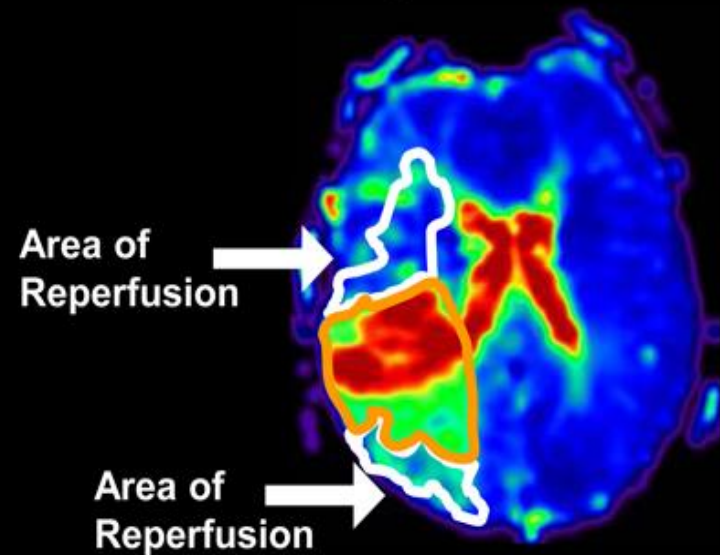
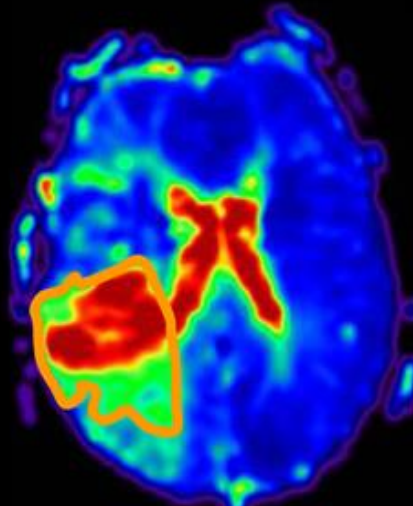
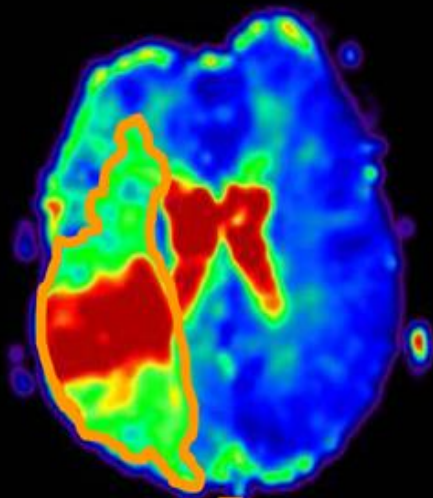


Venous phase*

**MTT tp1
2:45 hours**

**MTT tp2
6:00 hours**

**Regions of
Reperfusion**



**Prolonged
MTT tp1**

**Prolonged
MTT tp2**



Absolute Reperfusion = Prolonged MTT tp1 – Prolonged MTT tp2

Relative Reperfusion = Absolute Reperfusion / Prolonged MTT tp1



Risk factors of stroke

→ Non modifying RF

- Age
- Sex
- Genetics

→ Modifying RF

- Hypertension
- Atrial fibrillation
- Smoking
- Hypercholesterolemia
- Alcohol
- Asympt. stenosis A/C
- Diabetes mellitus

*Sacco, Neurology 1998, 51
(Suppl 3), S27-S30*

Nontreated arterial hypertension



A – at admission

B – hours after admission



Arterial hypertension

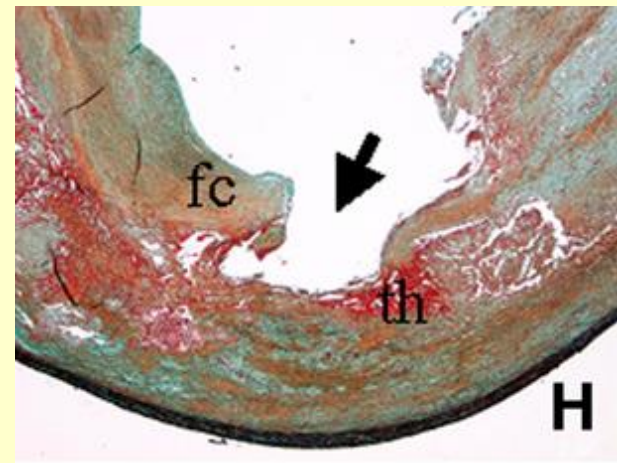
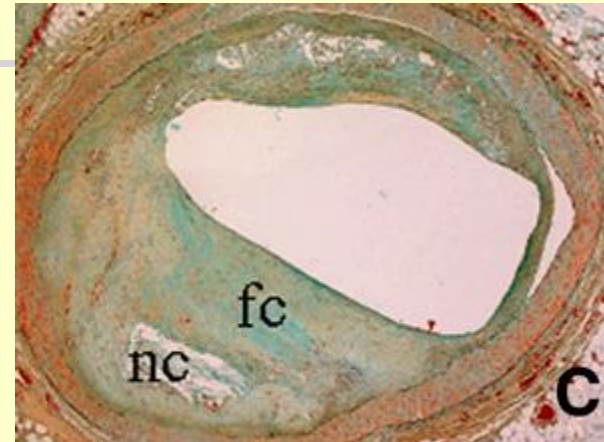
- The most severe risk factor for stroke
- Recommendation of „International Society on Hypertension“ – target values
 - - 135/85 Torr in patients without organs damage,
 - - 130/80 Torr in patients with organs damage, in correlation with AHA, ACC recommendations
- According „National Heart, Lung, and Blood Institute-appointed“ panel for older people recommendation is:
 - Target value –
 - < 150/90 mm Hg for patients > 60 years of age
 - < 140/90 mm Hg for younger patients

Meschia JF et al. Guidelines for the primary prevention of stroke. A statement for the healthcare professionals from the American heart Association/American Stroke Association. Stroke 2014;45:3754-3832.

Feigin VL et al. Neuroepidemiology 2015;45:161–176; Feigin VL et al., Lancet Neurol 2009;8:355-369.

Atherosclerosis

- Risk of embolism, hypoperfusion

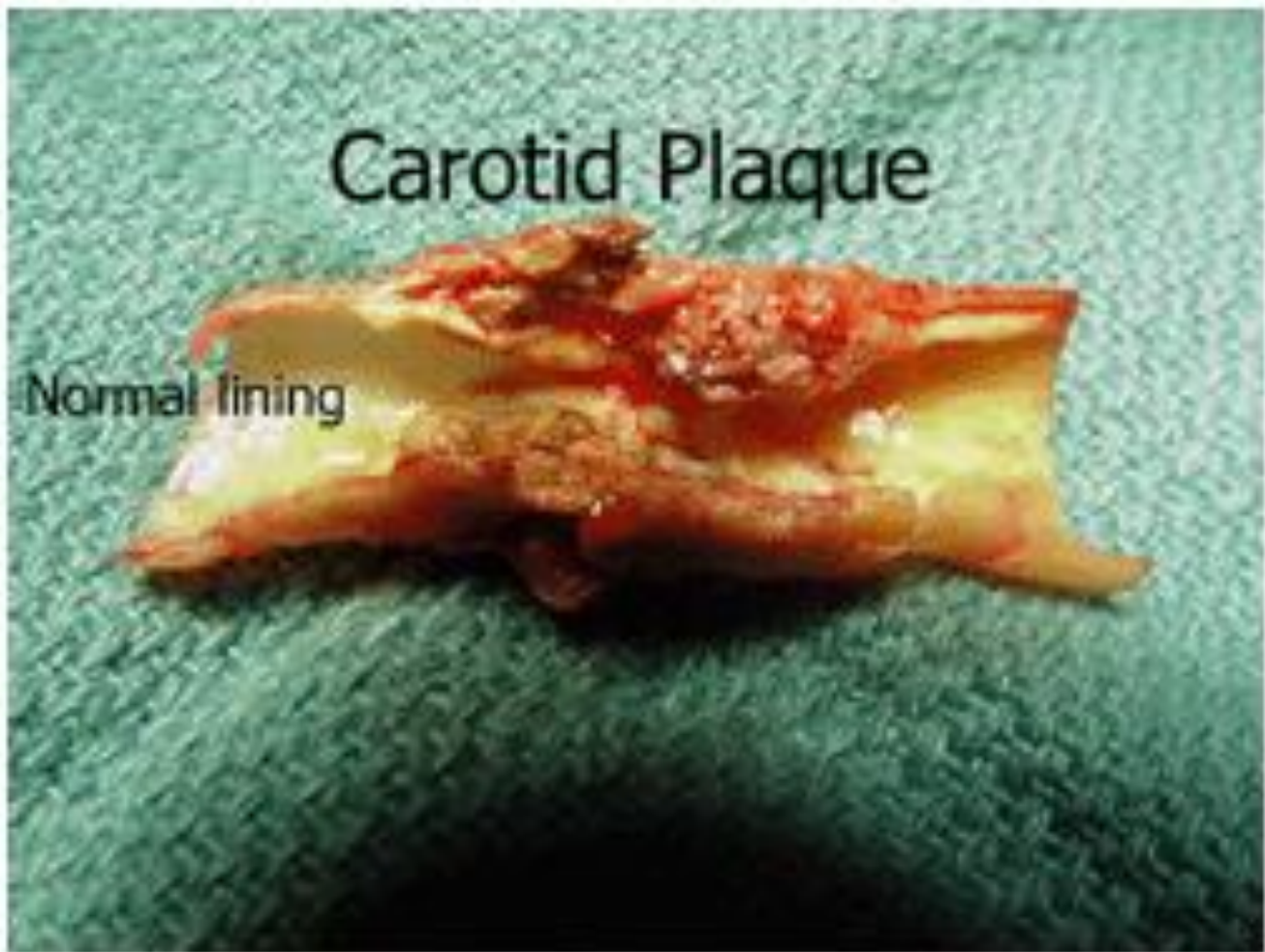


Secondary prevention

Optimal management of vascular risk factors

Recommendations

- It is recommended that blood pressure be checked regularly. Blood pressure lowering is recommended after the acute phase, including in patients with normal blood pressure (Class I, Level A).
- It is recommended that blood glucose should be checked regularly. It is recommended that diabetes should be managed with lifestyle modification and individualized pharmacological therapy (Class IV, GCP).
- In patients with type 2 diabetes who do not need insulin, treatment with pioglitazone is recommended after stroke (Class III, Level B).
- **Statin therapy is recommended in subjects with non-cardioembolic stroke (Class I, Level A).**
- It is recommended that cigarette smoking be discouraged (Class III, Level C).
- It is recommended that heavy use of alcohol be discouraged (Class IV, GCP).
- Regular physical activity is recommended (Class IV, GCP).



Carotid Plaque

Normal lining

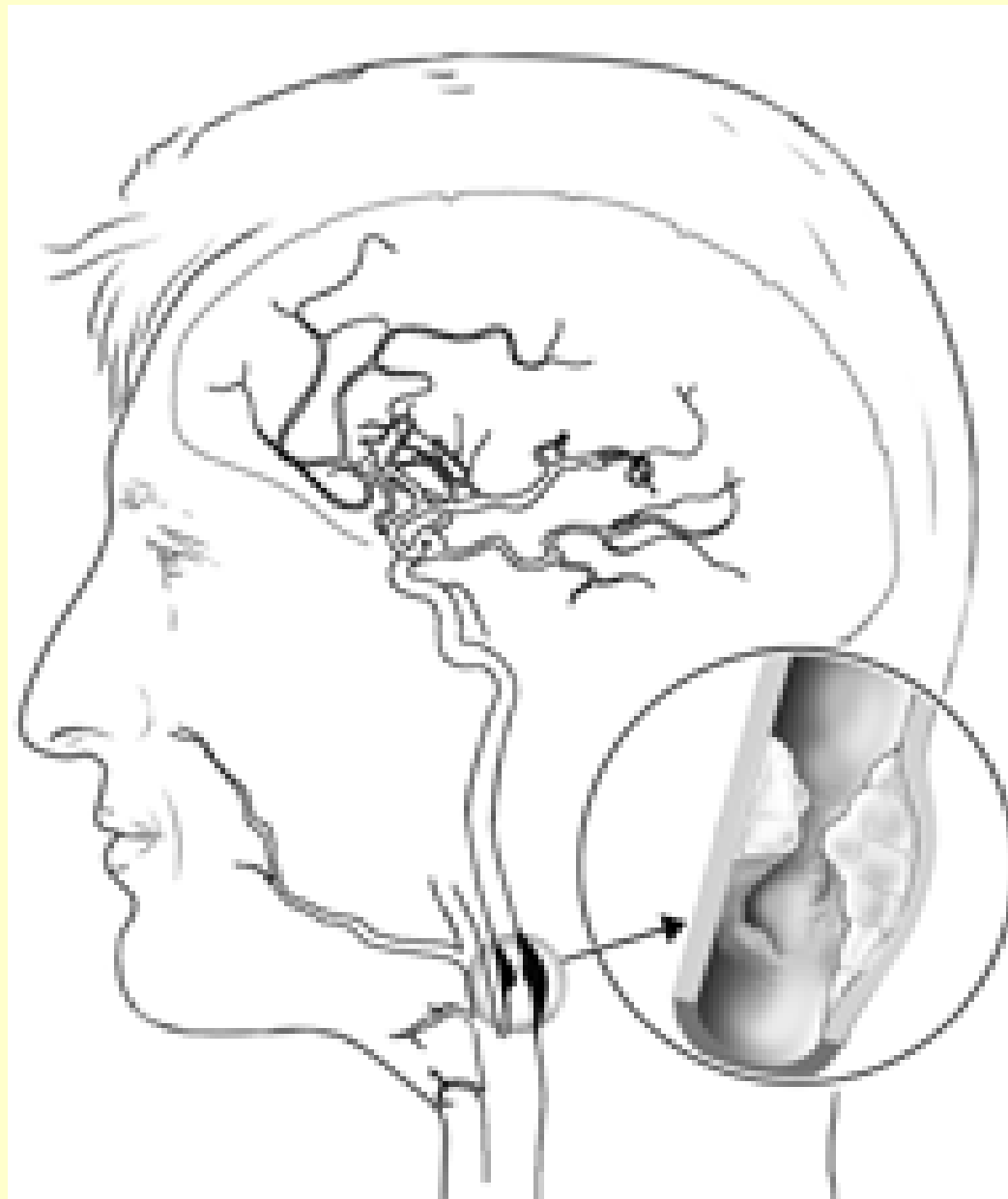
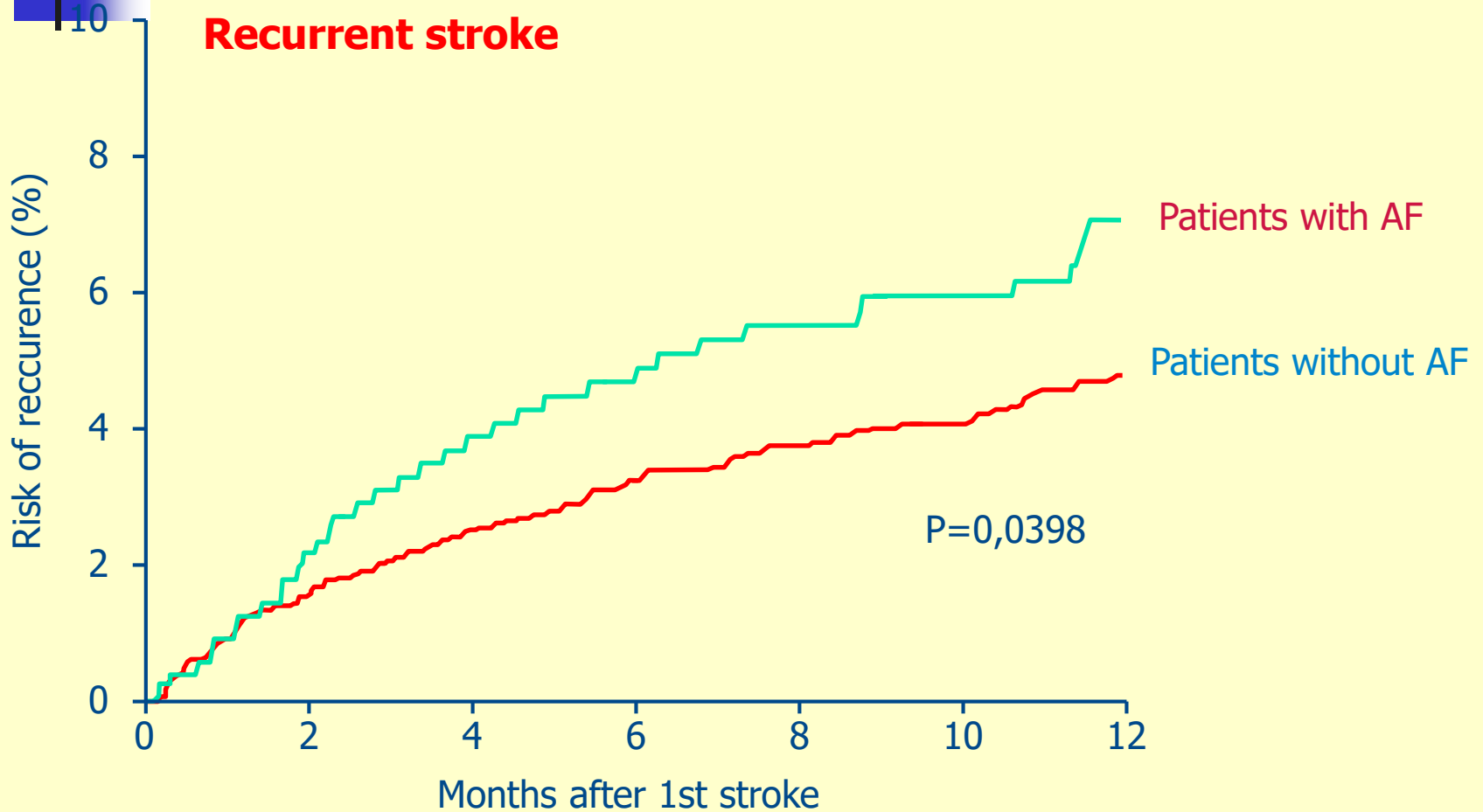


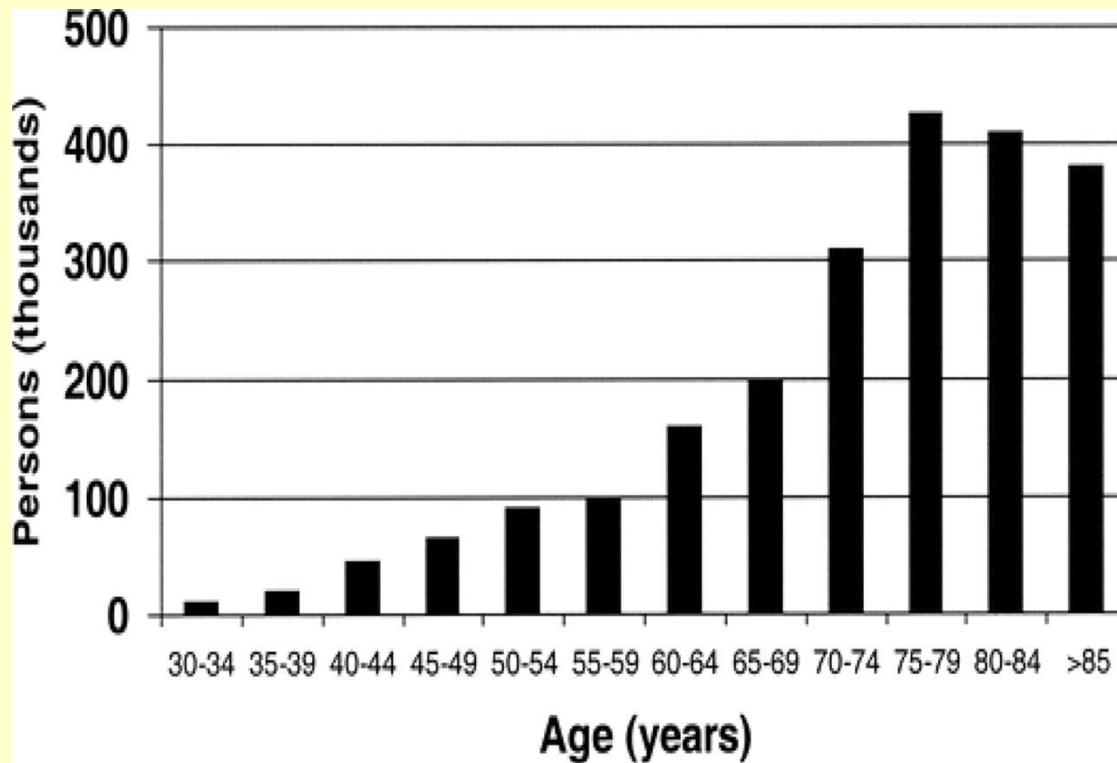
Fig 1: blockage in the carotid artery

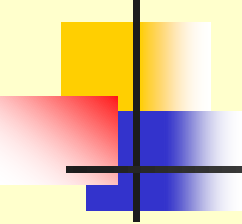
Atrial fibrillation 5-times increased risk of stroke

y



AF depending on age





Kardiálne ochorenia

Fibrilácia predsiení

- **Warfarin vs Aspirin**
- redukcia RR – 39% (*ESC guidelines, Europace, 2010*)
- BAFTA – redukcia RR - 52% (INR: 2-3) (*Mant J. et al., Lancet, 2007*)
- WASPO – nežiadúce účinky – 6% vs 33% (*Hart R.G. et al., Ann Intern Med, 2007*)
- Riziko krvácania – **INR: 3,5 – 4,0**
- HAS-BLED – skóre rizika krvácania ≥ 3 – **vysoké riziko**



Atrial fibrillation

- Risk of stroke
- CHADS₂ – (cardiac insufficiency, hypertension, age, diabetes, stroke)
 - ≥ 2 – high risk
- NOACs - trombin inhibitor - Dabigatran, inhibitors factor Xa – Rivaroxaban, Apixaban, Edoxaban
- HAS-BLED – risk of bleeding ≥ 3 – high risk
- Risk of bleeding – INR: 3,5 – 4,0

Recommendations for stroke prevention in patients with atrial fibrillation

Recommendations	Class ^a	Level ^b	Ref ^c
Oral anticoagulation therapy to prevent thromboembolism is recommended for all male AF patients with a CHA ₂ DS ₂ -VASc score of 2 or more.	I	A	38, 318-321, 354, 404
Oral anticoagulation therapy to prevent thromboembolism is recommended in all female AF patients with a CHA ₂ DS ₂ -VASc score of 3 or more.	I	A	38, 318-321, 354, 404
Oral anticoagulation therapy to prevent thromboembolism should be considered in male AF patients with a CHA ₂ DS ₂ -VASc score of 1, considering individual characteristics and patient preferences.	IIa	B	371, 375-377
Oral anticoagulation therapy to prevent thromboembolism should be considered in female AF patients with a CHA ₂ DS ₂ -VASc score of 2, considering individual characteristics and patient preferences.	IIa	B	371, 376, 377

Recommendations for secondary stroke prevention

Recommendations	Class ^a	Level ^b	Ref ^c
Anticoagulation with heparin or LMWH immediately after an ischaemic stroke is not recommended in AF patients.	III (harm)	A	477
In patients who suffer a TIA or stroke while on anticoagulation, adherence to therapy should be assessed and optimized.	IIa	C	
In patients who suffer a moderate-to-severe ischaemic stroke while on anticoagulation, anticoagulation should be interrupted for 3–12 days based on a multidisciplinary assessment of acute stroke and bleeding risk.	IIa	C	
In AF patients who suffer a stroke, aspirin should be considered for prevention of secondary stroke until the initiation or resumption of oral anticoagulation.	IIa	B	485
Systemic thrombolysis with rtPA is not recommended if the INR is above 1.7 (or, for patients on dabigatran, if aPTT is outside normal range).	III (harm)	C	472, 474
NOACs are recommended in preference to VKAs or aspirin in AF patients with a previous stroke.	I	B	363, 482
After TIA or stroke, combination therapy of OAC and an antiplatelet is not recommended.	III (harm)	B	486
After intracranial haemorrhage, oral anticoagulation in patients with AF may be reinitiated after 4–8 weeks provided the cause of bleeding or the relevant risk factor has been treated or controlled.	IIb	B	483, 484, 487

71 years old man



- Isch heart disease
- AF
- AH
- TIA in history
- Hypercholesterolemia
- CHADS₂ = 3
- Treatment – ASA 100 mg, Corvitol, Dicardin, Rasilez

TIA – transient ischemic attack

71 years old man



- iv thrombolysis
- Thrombectomy
- mRS – 4 points

mRS – modified Rankin scale

79 years old woman




- Isch heart disease
- AF
- 1 month after TEP
- **CHADS₂ = 3**
- Treatment – **LMWH from TEP,** Isoptin, Digoxin, Furosemid, Cardilan, Zyllt

79 years old woman



- Prefrontal syndrome, apathy, weakness of left lower extremity,
- Out of time window – no IVT, no TE
- mRS – 4 → 5 → 6 (after 2M)

Implementing the Proclamation of Stroke and Potentially Preventable Dementias

Vladimir Hachinski¹ , Detlev Ganten², Daniel Lackland³, Reinhold Kreutz⁴, Konstantinos Tsioufis⁵ and Werner Hacke⁶; on behalf of the World Stroke Organization, the World Heart Federation, the World Hypertension League and the European Society of Hypertension

International Journal of Stroke
2018, Vol. 13(8) 780–786
© 2018 World Stroke Organization
Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/1747493018799965
journals.sagepub.com/home/wso



Brain health plays a central role in wellbeing and in the management of chronic diseases. Stroke and dementia pose the two greatest threats to brain health, but recent developments suggest the possibility that preventing stroke may also prevent some dementias: 1. A large population study showed a 32% decrease in the incidence of stroke and a concomitant 7% reduction in the incidence of dementia; 2. Treatment of atrial fibrillation resulted not only in stroke reduction, but a 48% decrease in dementia; 3. A hypothesis free analyses has shown that the first phase of Alzheimer disease

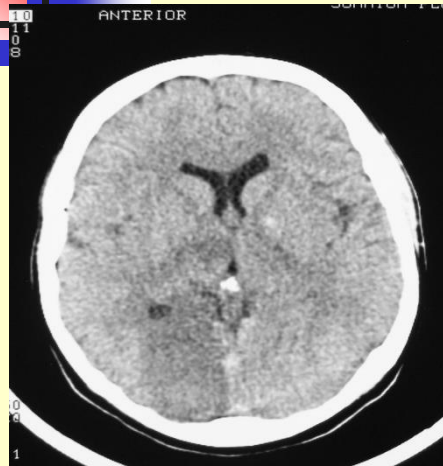


Diabetes mellitus (DM)

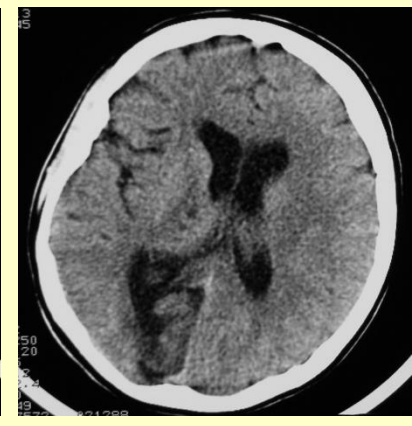
- Risk of atherotrombotic strokes, lacunes, dementia

Trombophilia

Z.K., female, 25 years



- 3 days after delivery
- Posit. familial history
- **Deficit AT III**





Cryptogenic stroke

- Stroke with Unknown etiology
- AF – 4,9-9,2%
- Better detection – AF cca 25%
- What is the best method – Holter 24 hours, 2 weeks, longer?
- Duration of AF – 30 sek? 6 min?

77-years old woman

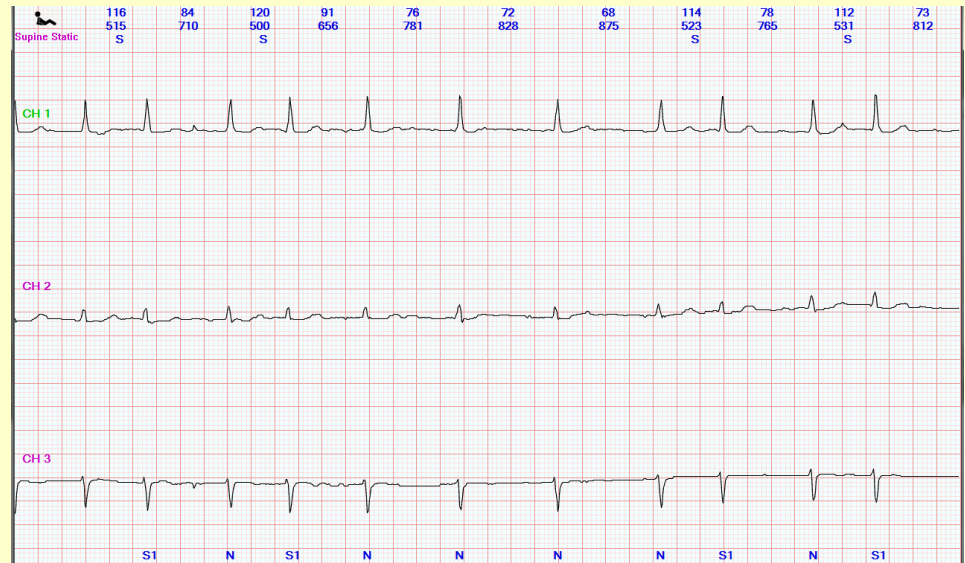
History – arrhythmia, no AF,
Holter – negat., AH

TO: headache, weakness of
right upper extremity, speech
problem

Brain CT: Hypodensity P a T
region on the left side

EKG holter: sinus rhythm, in
the last part of Holter – **atrial
fibrillation about 2 hours**

Conclusion: paroxysmal atrial
fibrillation





Transient ischemic attack

- brief episode of neurological dysfunction caused by loss of blood flow (ischemia) in the brain, spinal cord, or retina, without tissue death (infarction).
- Risk of stroke in 1 month - 8%
- Recommended exam: – Duplex ultrasound of brain arteries, brain CT + CT AG, brain MRI, ECHOCardiography, Holter monitoring, TEE?



Transient ischemic attack

- **Dg of TIA – prognostic value**
- Early risk of stroke (in 7 days) after TIA + positive imaging (TSI - transient symptoms with infarction) is 15-times higher than risk after stroke.
- 7- days risk of stroke after TSI - 4-16%
- 7- days risk of stroke after stroke - 1-3%

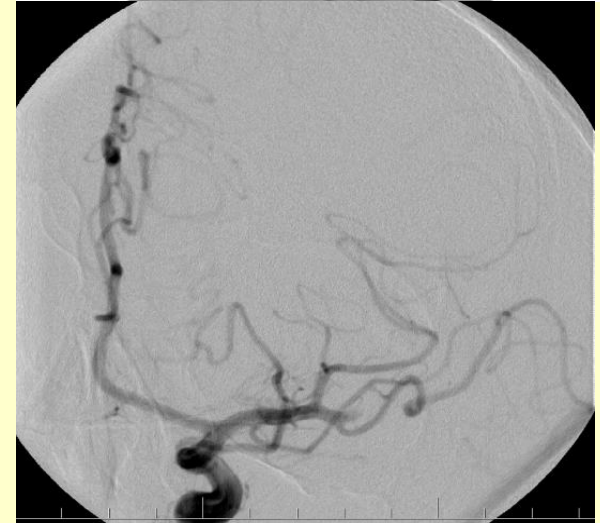
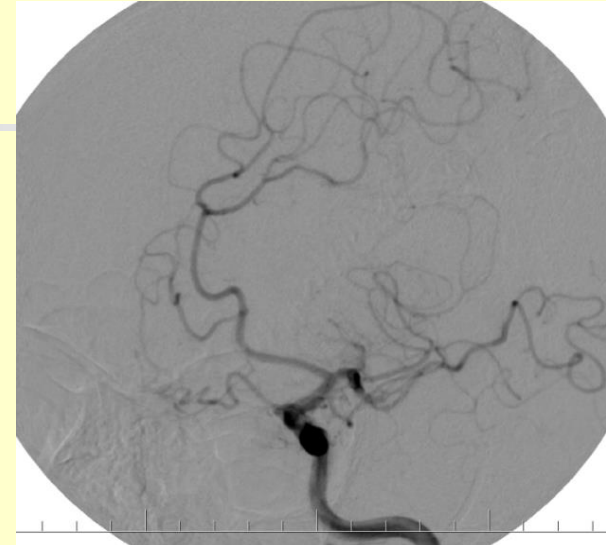


Transient ischemic attack

- Neurological examination, pulsation, blood pressure
- Laboratory tests
- Duplex ultrasound of extracranial arteries
- Brain CT, CT AG, if negat. Brain MRI
- Holter monitoring, screening of AF
- Right-left shunt
- ECHOCardiography (TTE, p.p. TEE)
- Internal exam., cardiology
- Hematological examination – screening of trombophilia (< 60y)
- Antithrombotic treatment (antiplatelet, or anticoagulants – AF), CEA, STENT
- Dispensarisation

42-years old man

- Aphasia 30 minutes
- Brain CT negat., **CTAG – not done**
- Cca after 2 hours – again aphasia
- CTAG – MCA I.sin. stenosis
- DSA – occlusion M2 MCA I.sin.

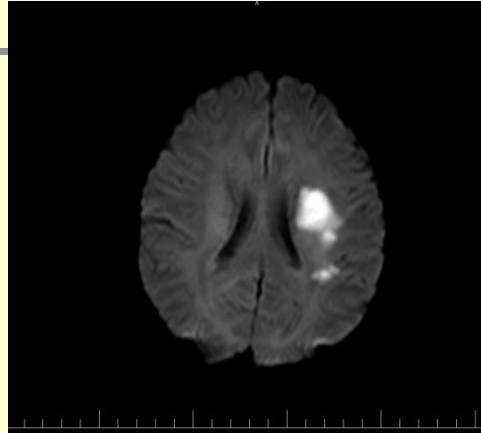


42-years old man

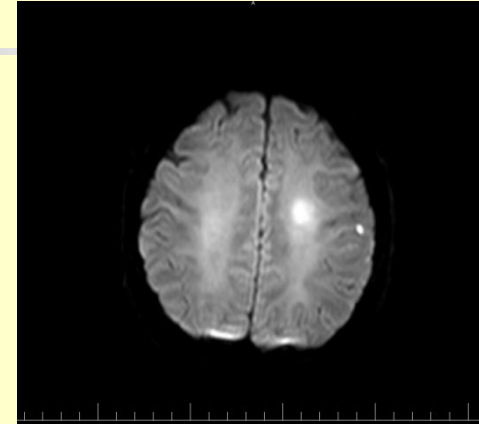
- Brain MRI – ischemia in MCA l.sin territory TE
- MTE – not done

- **Doplnené**
- Duplex US
- RL shunt
- Holter monitoring
- TEE
- Hematological exam.
- Conclusion: **ESUS – embolic stroke of undetermined source**

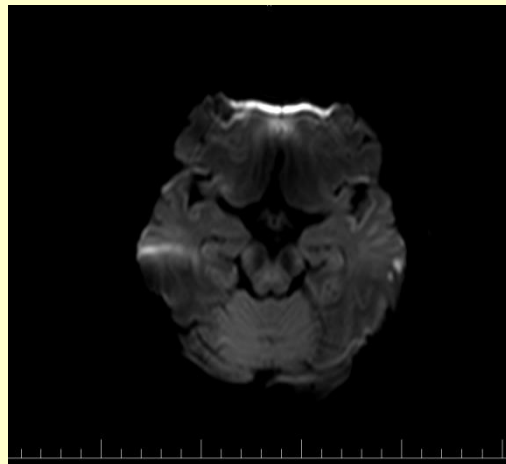
DWI MRI



DWI MRI

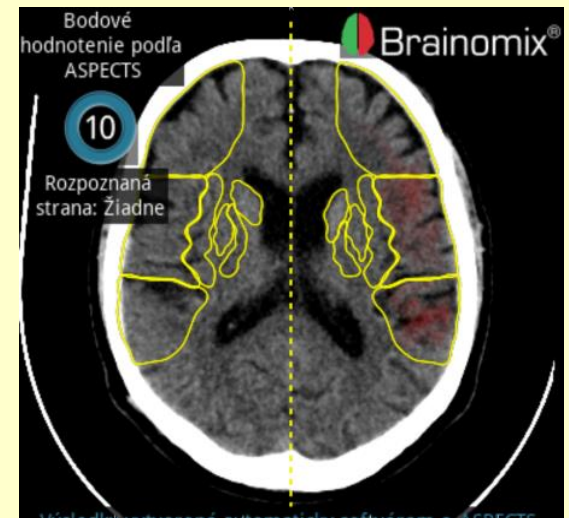


DWI MRI



67-years old man

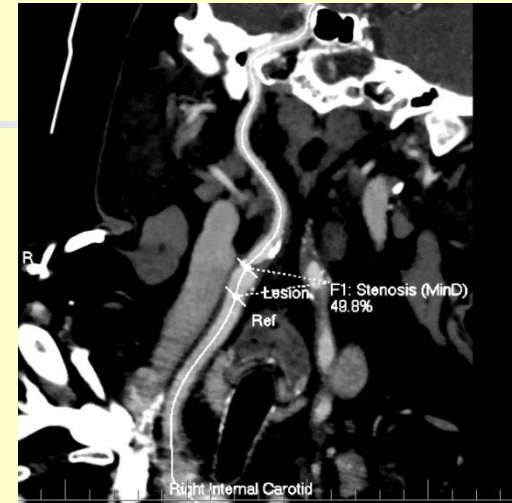
- History: DM, AH, urinary bladder ca, stroek 3 months ago. 3 months paresthesia of right extremities.
- **31.12. 2019 at 11:40** dysphagia, aphasia - 5-6 minutes. Emergency department at hospital - 12:38 without speech problems. Blood presuer: 214/115 Torr.
- Brain CT - 13:00 – older ischemic lesion



67-years old man

- CT AG – subtotal stenosis of ICA l.sin., cca 50% stenosis of ICA l.dx.
- Additional anamnesis – in december 2019 in VÚSCH – duplex US: occlusion of ICA l.sin., endarterectomy not indicated
- Patient transferred to VÚSCH 1.1.2020 at 01.00

ICA l.dx



ICA l.sin

DSA – ICA I.sin. a I.dx.



ICA I.sin

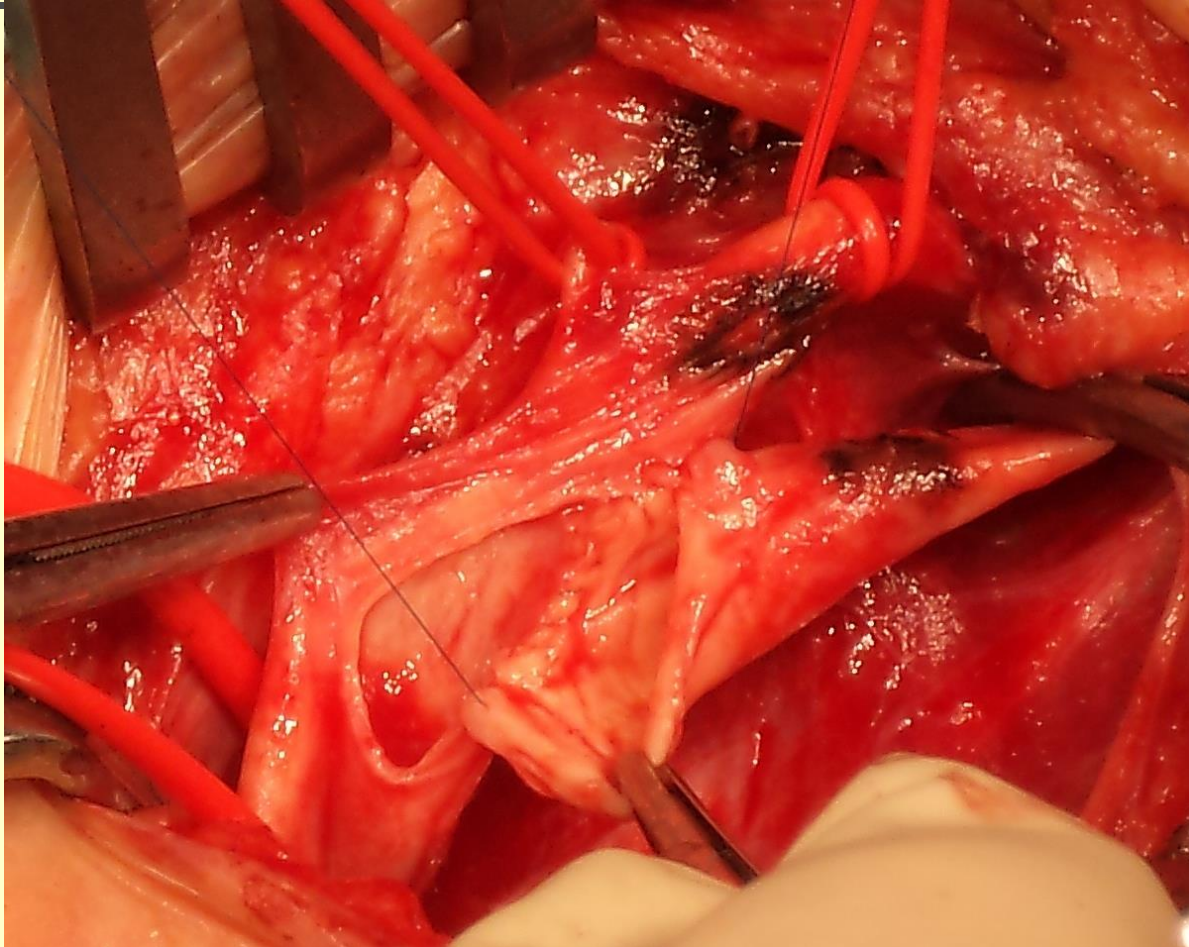


ICA I.dx

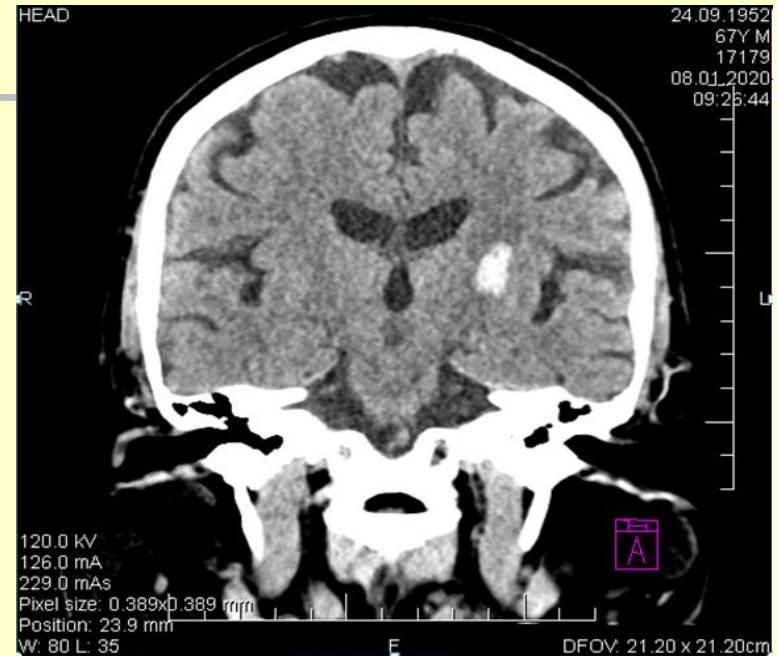
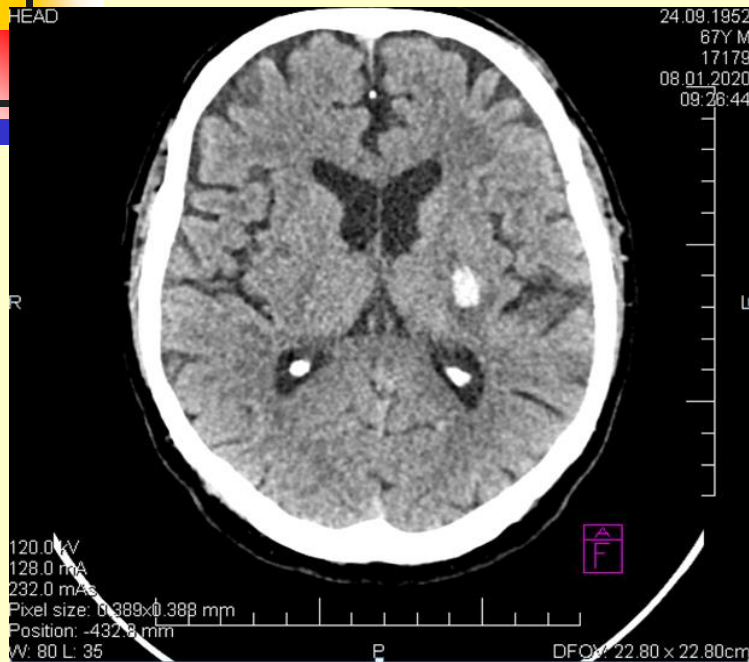
Endarthrectomy



ACC after endarterectomy



Brain CT after CEA

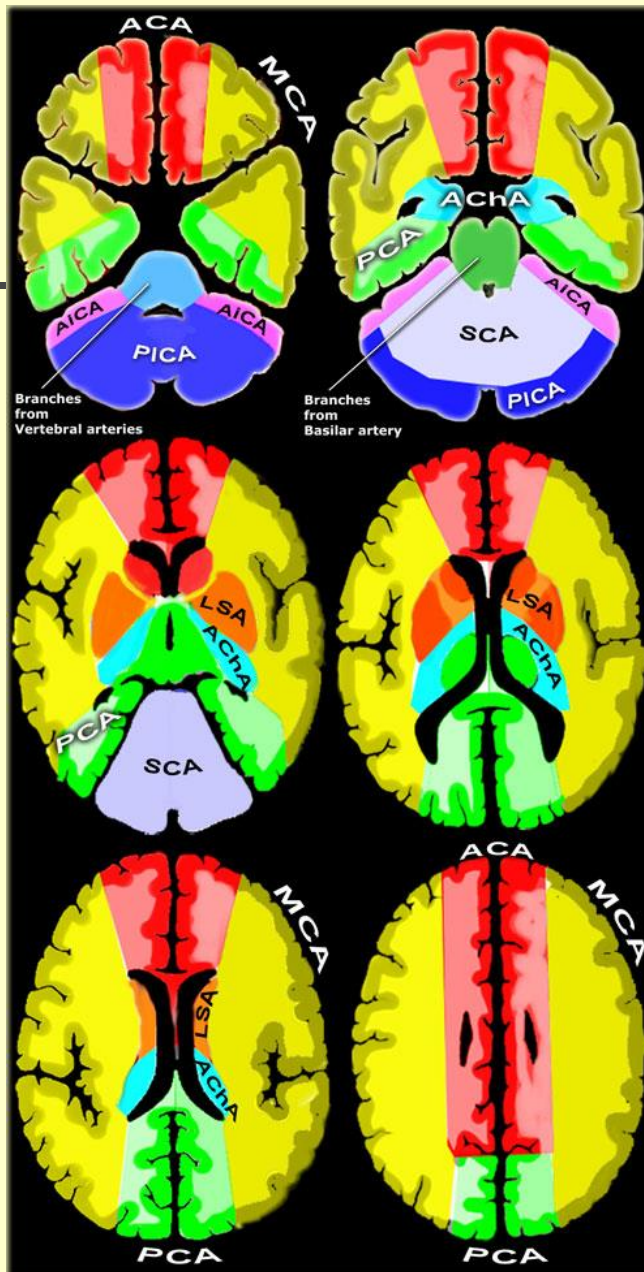


- Small bleeding to ischemic lesion in patient with poorly corrected hypertension
- After 2 weeks - mRS 0-1



Classification of stroke II.

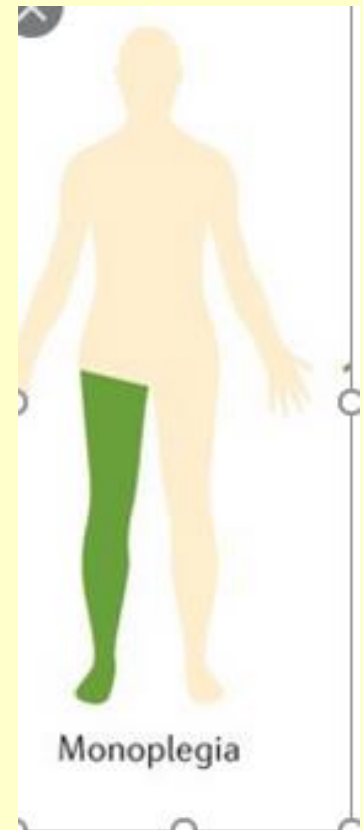
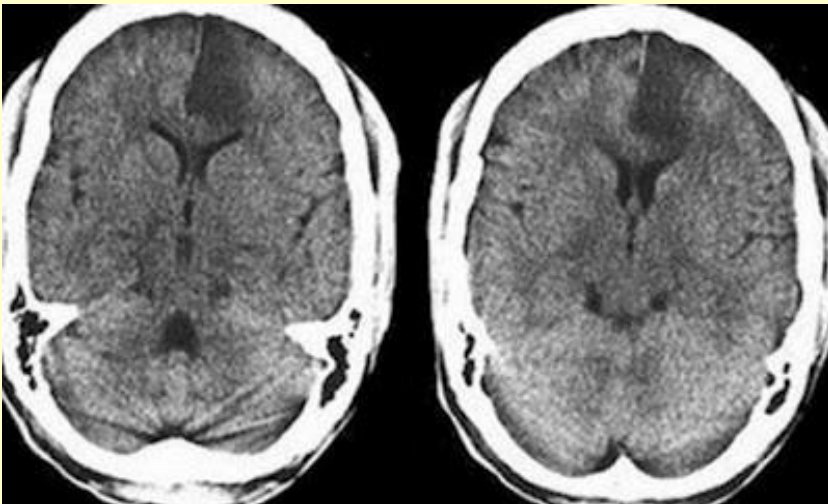
- **Territory of a. cerebri media**
- **Territory of a. cerebri anterior**
- **Territory of a. cerebri posterior**
- **Territory of a. bazilaris (vertebrobasilar)**
- **Territory of a. carotis interna**
- **Territory of a. carotis communis**



ACA – arteria cerebri anterior,
MCA – arteria cerebri media,
PCA – arteria cerebri posterior,
AChA – arteria chorioidea anterior,
SCA – arteria cerebelli superior,
AICA – arteria cerebelli anterior inferior,
PICA – arteria cerebelli inferior posterior,
LSA – lentikulostriatálne artérie.

ACA territory

- Central paresis of lower extremity
- Disorders of behaviour – prefrontal SY



PCA territory

- **Visual field disorders – homonymous hemianopsia**





BA territory

- **Dizziness, diplopia, nystagmus, hemiparesis or kvadruparesis, hemiplegia alternans, cranial nerves lesions, problems with deglutination and speech**



Classification of stroke III.

- **Brain infarct**
- **Lacunar infarct – diameter less than 1,5 cm**



Diagnosics of stroke

- **Clinical feature**
- **Brain CT**
- **Laboratory tests – RBC, SR, coagulation, fibrinogen, Na, K, sugar, urea, kreatinin, cholesterol, triglycerids, **CRP**, **TPIT****
- **Duplex US of carotid arteries**
- **ECHO cardiography**

Patient with stroke – brain CT – basis for treatment decision

Brain hemorrhage



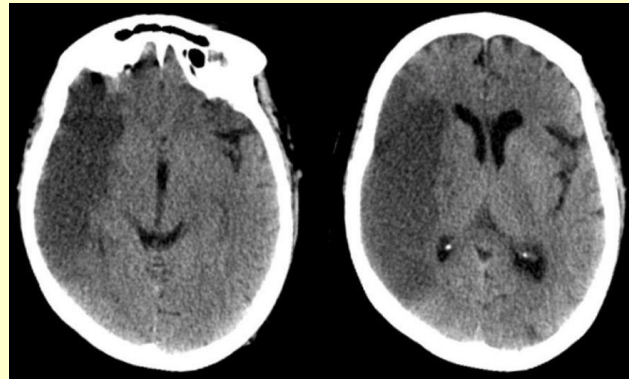
Ischemic stroke – CT AG !!!



a/ negative CT, b-c/ early signs of ischemia – a-c/ we can do IVT, c/ + indication for thrombectomy

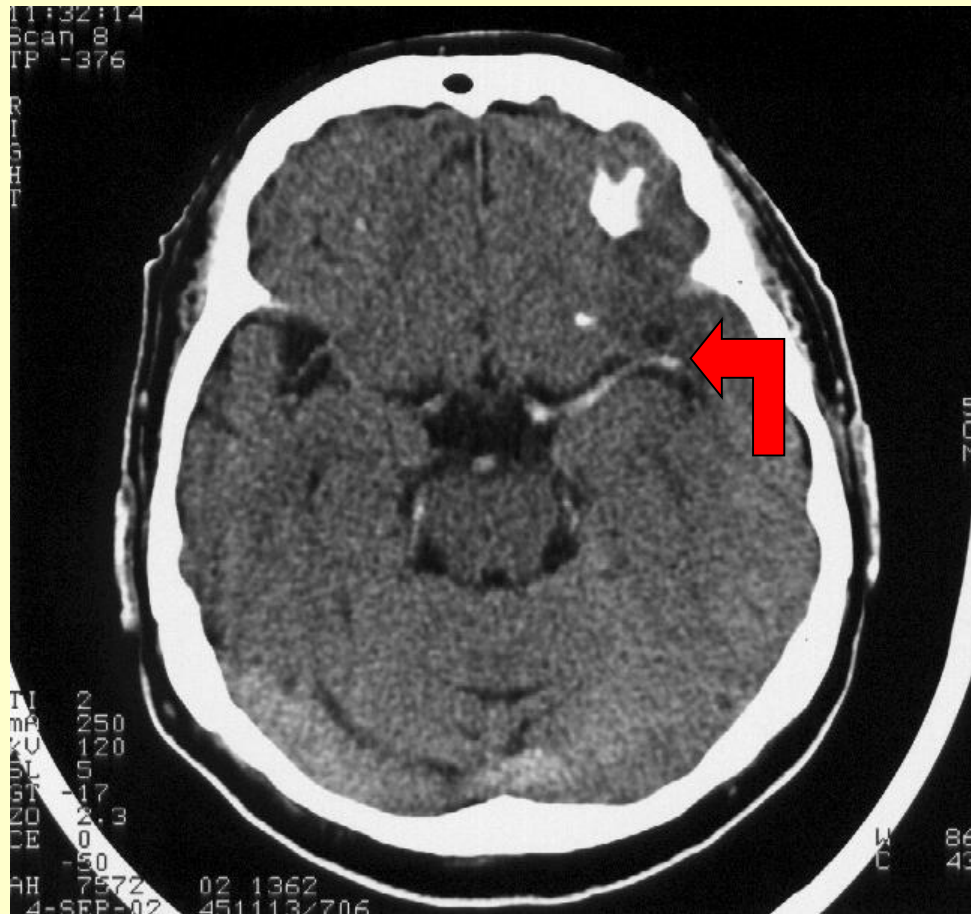


Subarachnoid hemorrhage
CT AG !!!

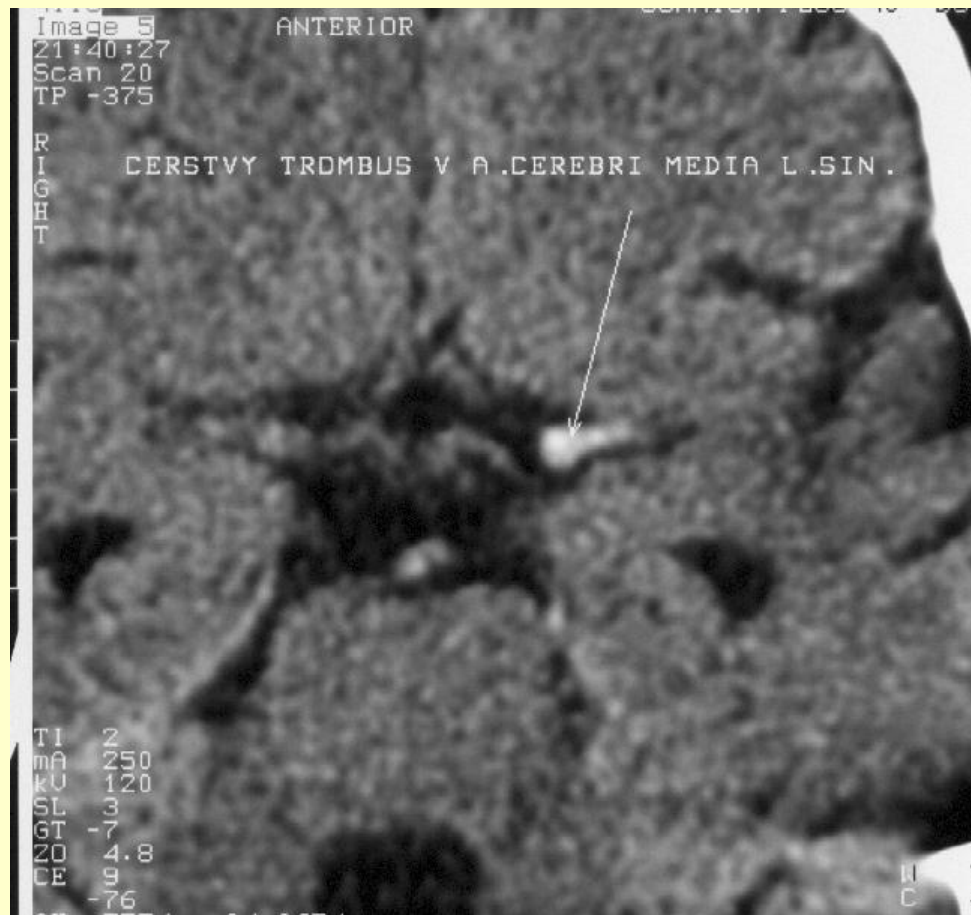


Ischemic stroke – big, old lesion – we cannot do IVT

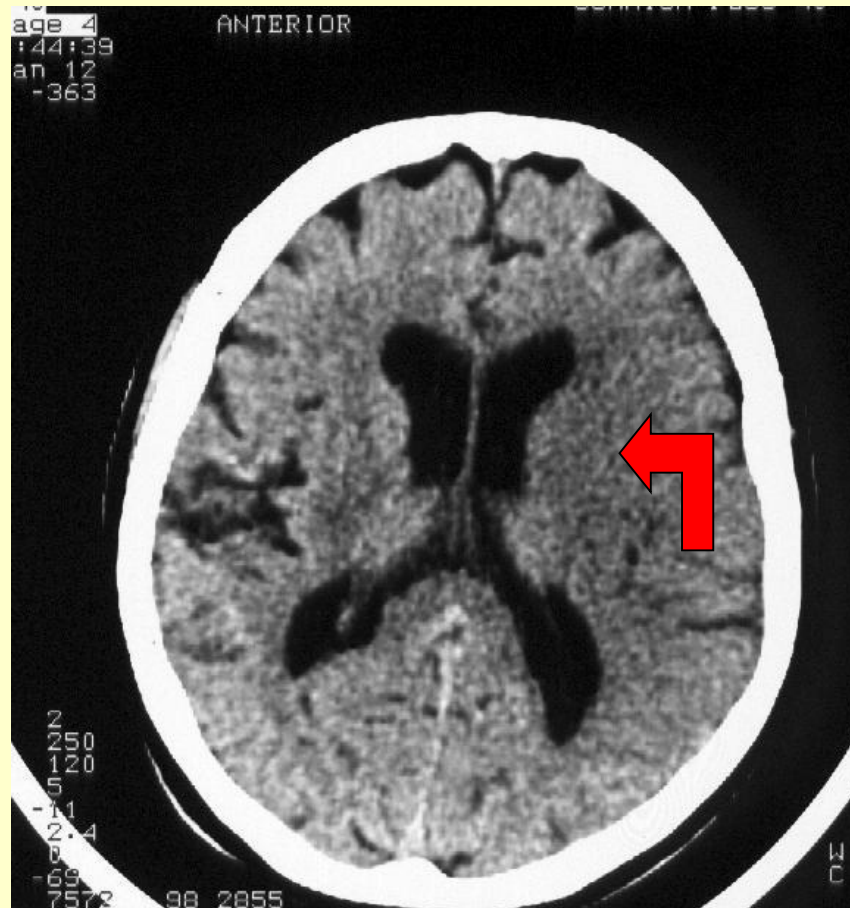
Brain CT – early signs of ischemia



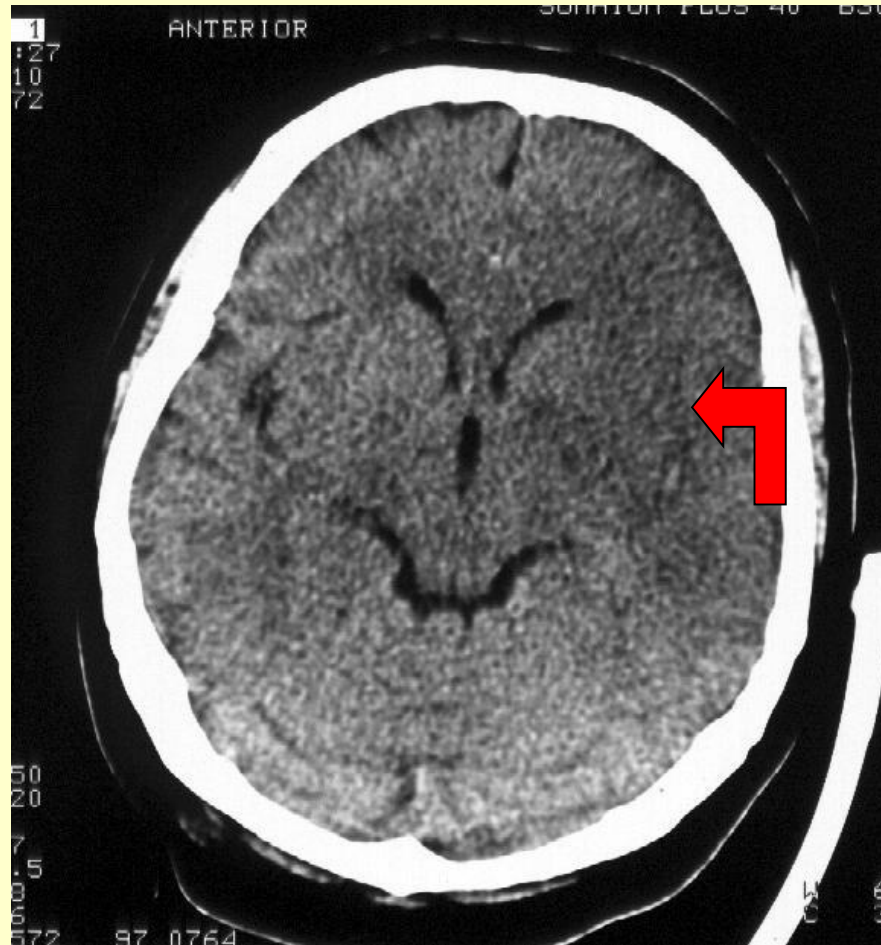
Brain CT – early signs of ischemia



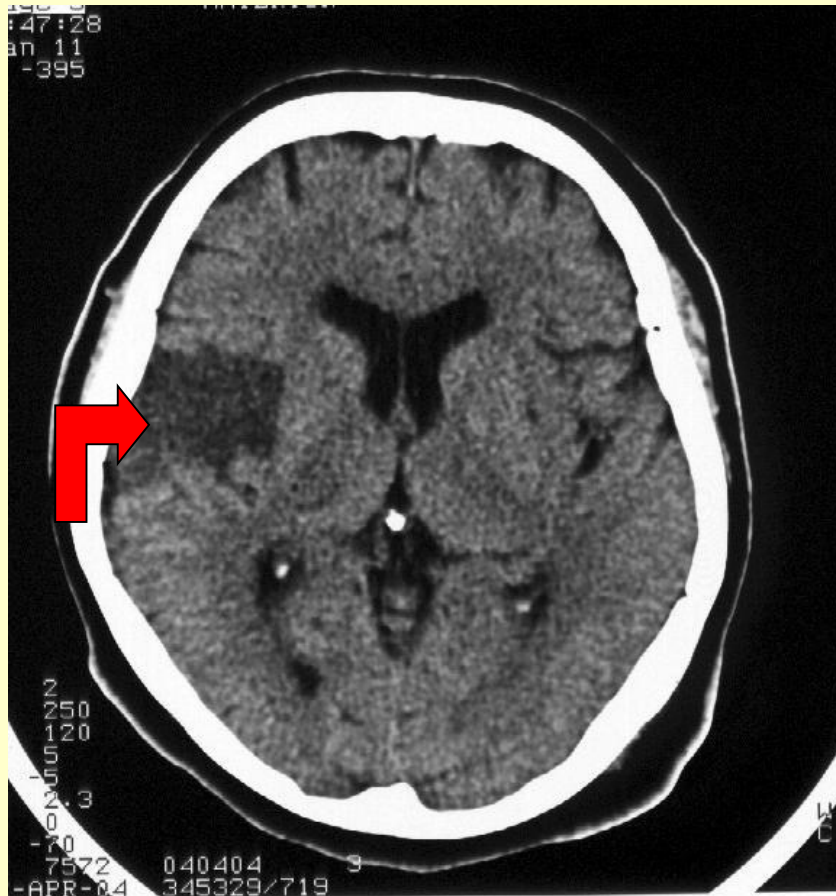
Brain CT – ischemia



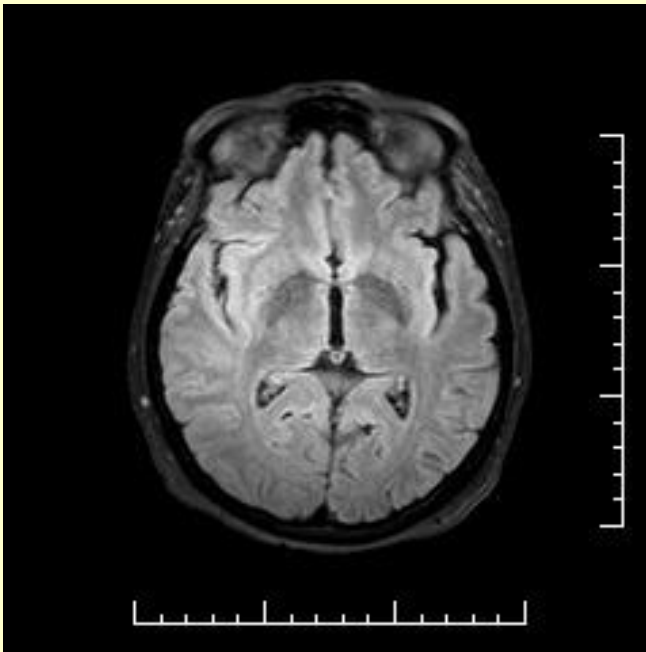
Brain CT – ischemia



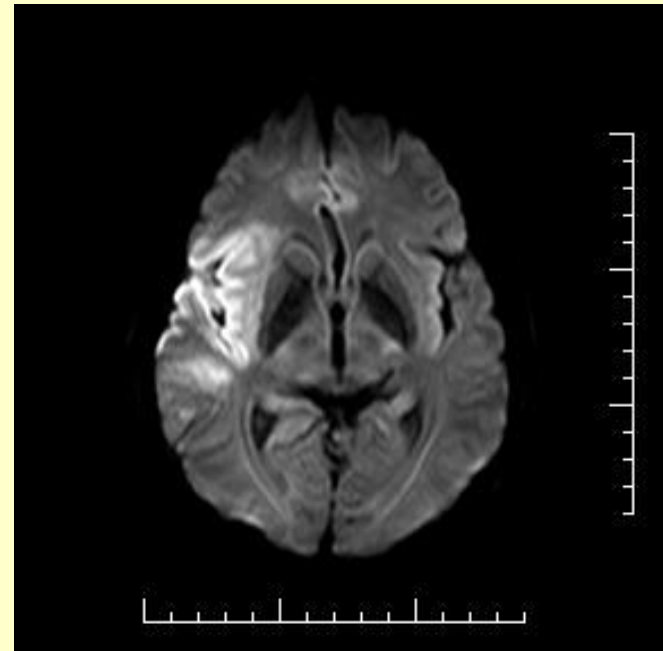
Brain CT – ischemia



„Wake-up stroke“



Brain MR – FLAIR



Brain MR – DWI



Stroke therapy

- **Acute**

1/ Thrombolysis - rt-PA (recombinant tissue plasminogen activator)
- **≤ 4.5 hours after first symptoms!**

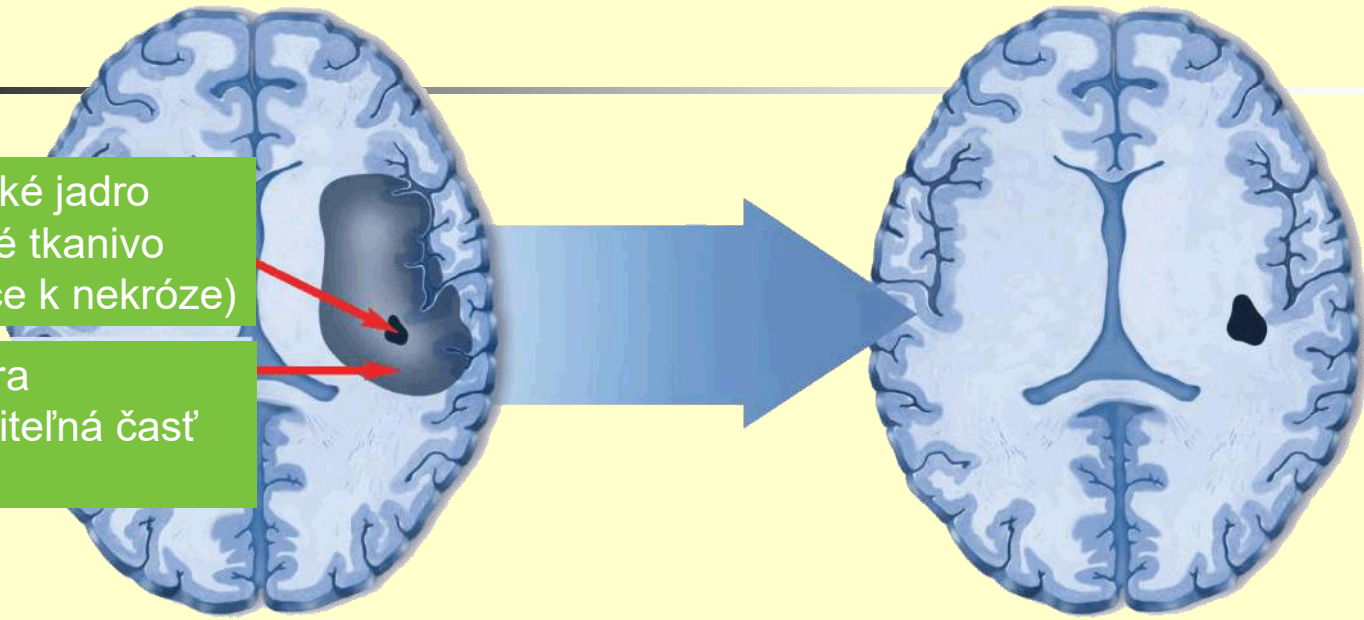
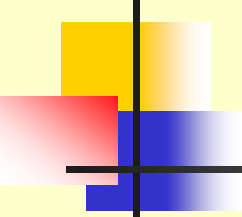
2/ Thrombectomy

≤ 6 hours after first symptoms!

3/ ASA – 325 mg – later than 6 hours

- **1/ - i.v. rt-PA 0,9 mg/kg**

- **Brain CT – negative, early signs of ischemia**



Ischemické jadro
(mozgové tkanivo
smerujúce k nekróze)

Penumbra
(zachrániteľná časť
mozgu)

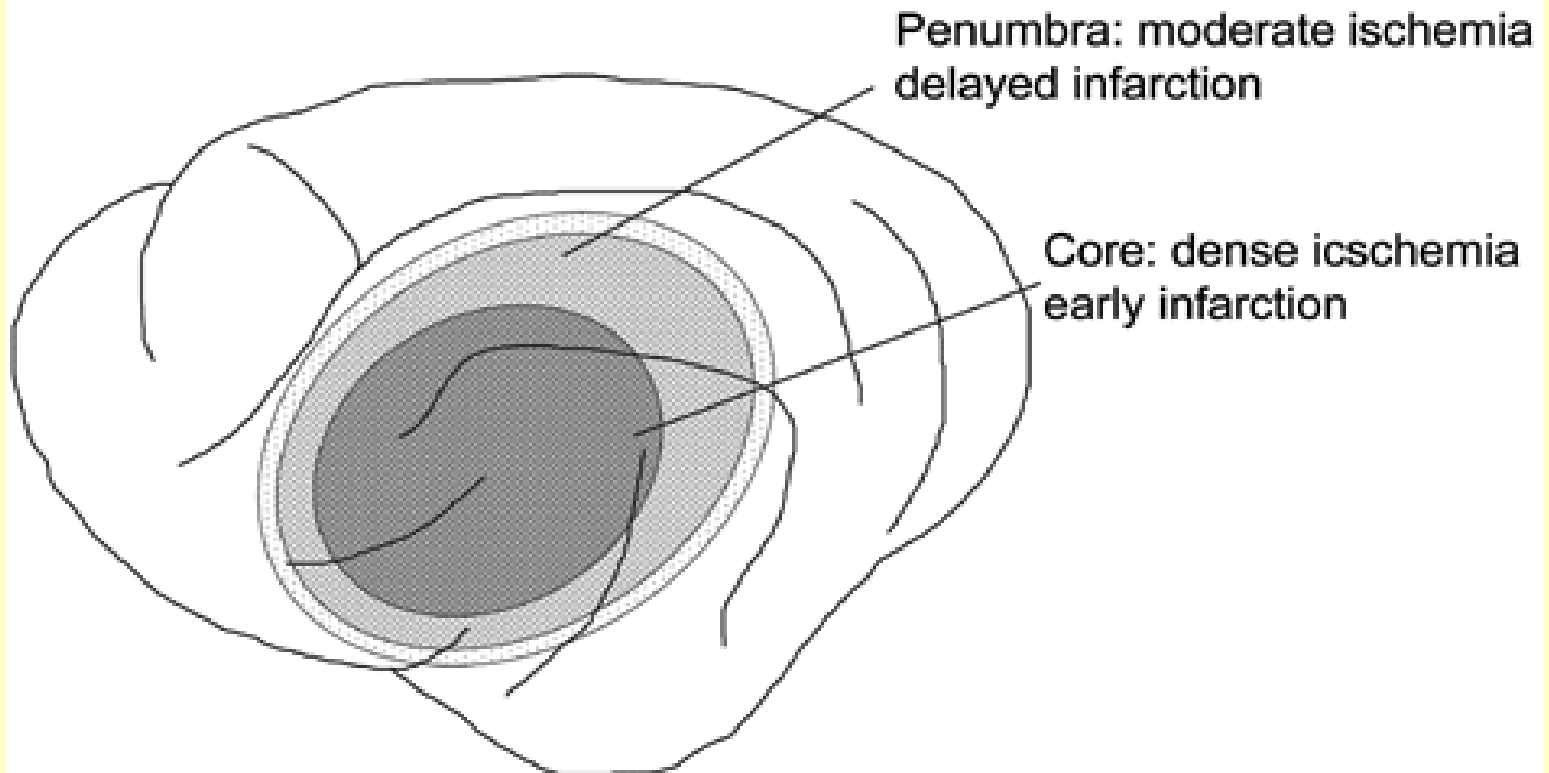
Neliečny pacient stráca v
ischemickej oblasti
približne 1,9 milióna
neurónov každú minútu

Reperfúzia ponúka
možnosť redukcie rozsahu
ischemického poškodenia

Saver. Stroke 2006;37:263-266.
González. Am J Neuroradiol 2006;27:728-735.
Donnan. Lancet Neurol 2002;1:417-425.

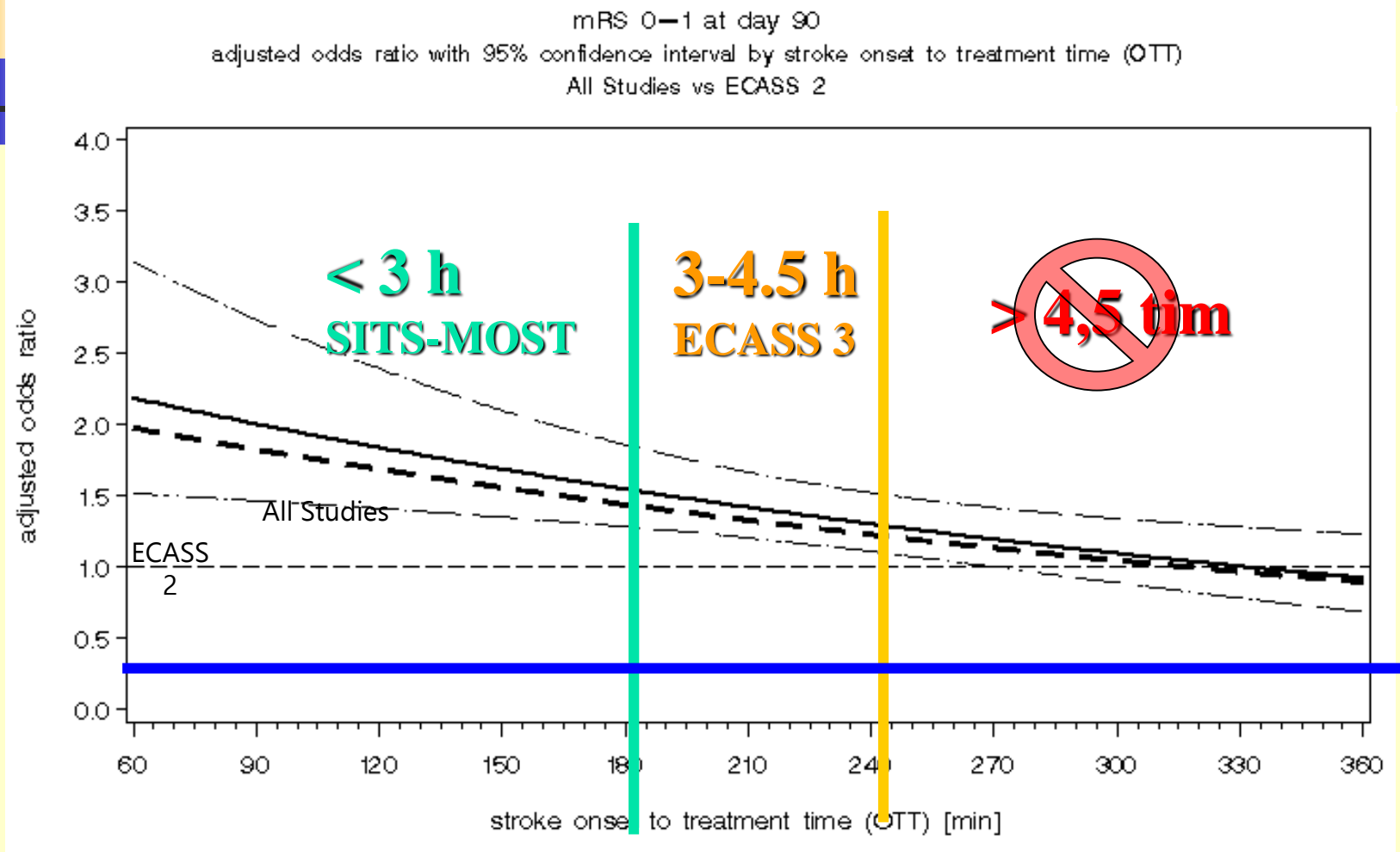
The goal of therapy

Compartments of Infarct Development



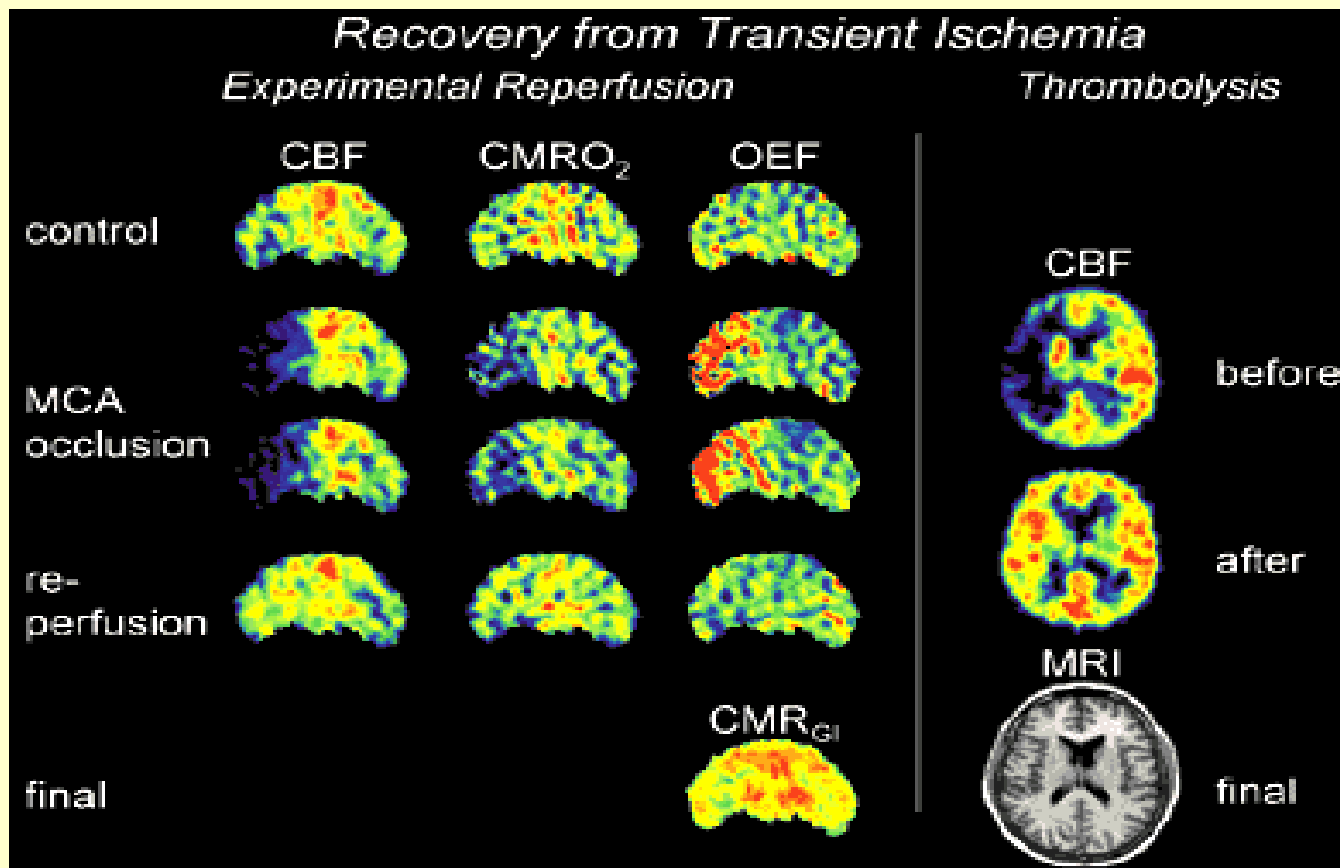
ECASS III – Clinical Benefits

ECASS III



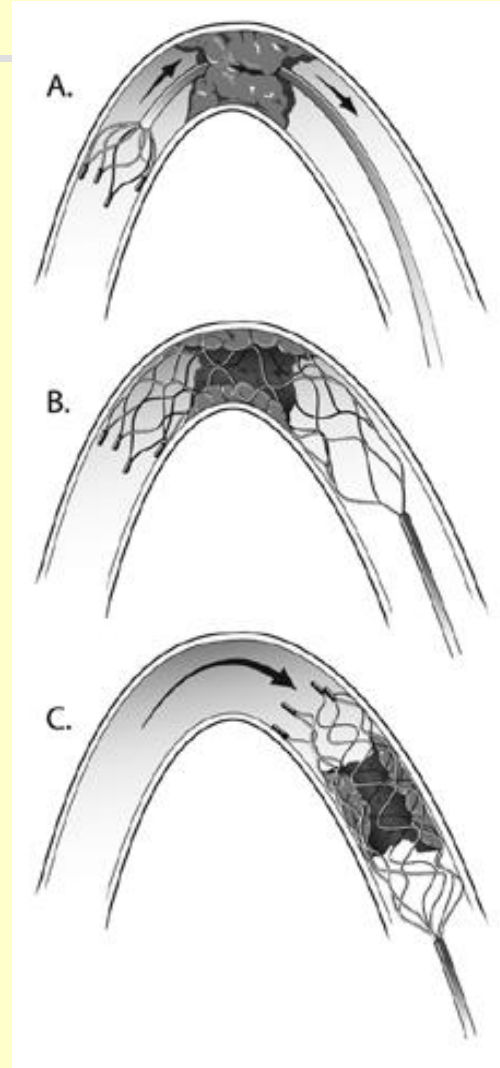
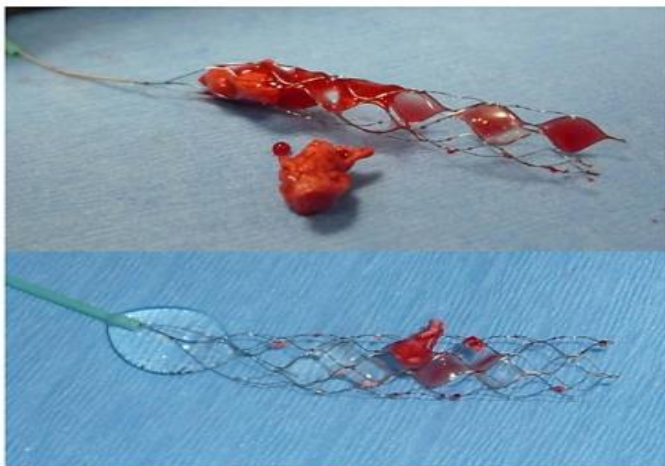
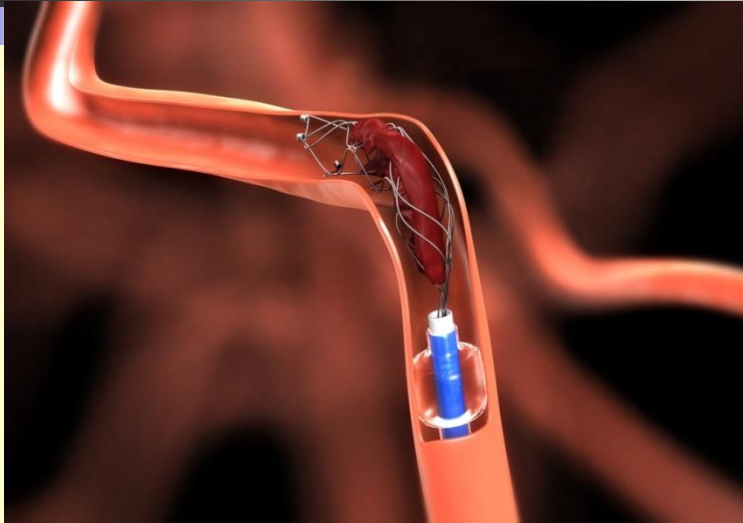
NNT – 4-5/90 min., 9/3h, 14/3-4.5h

Trombolysis

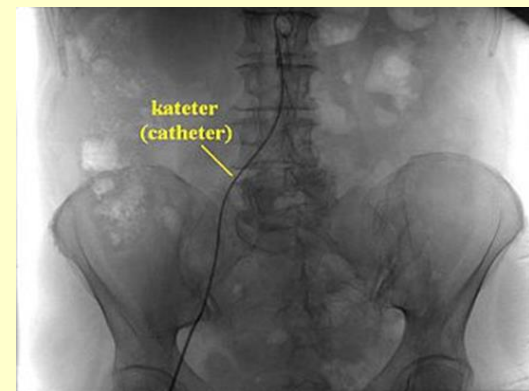
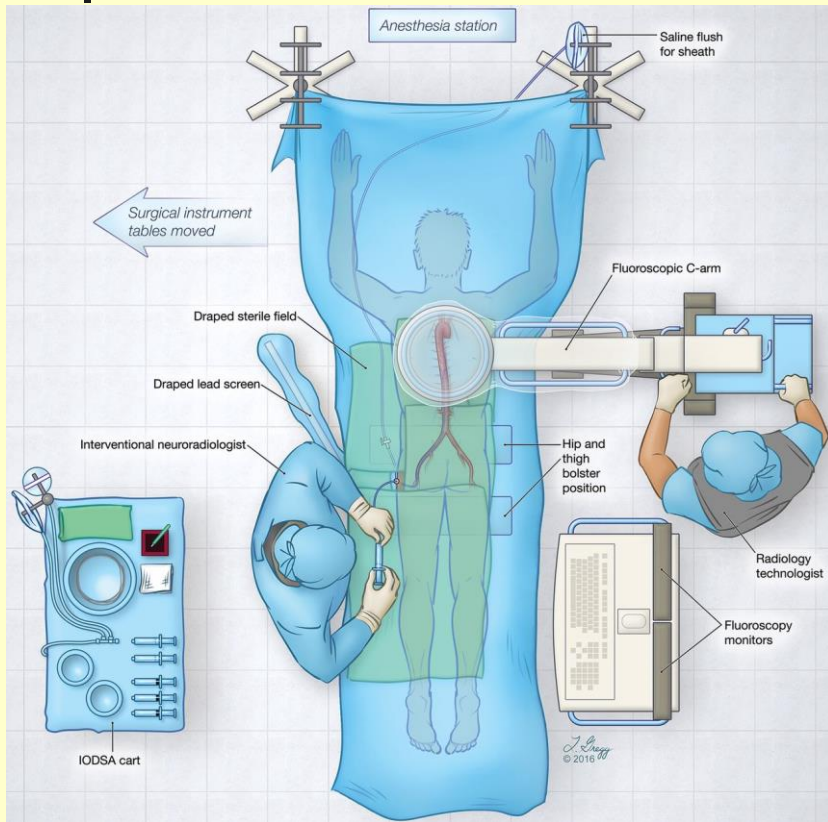


Endovascular treatment

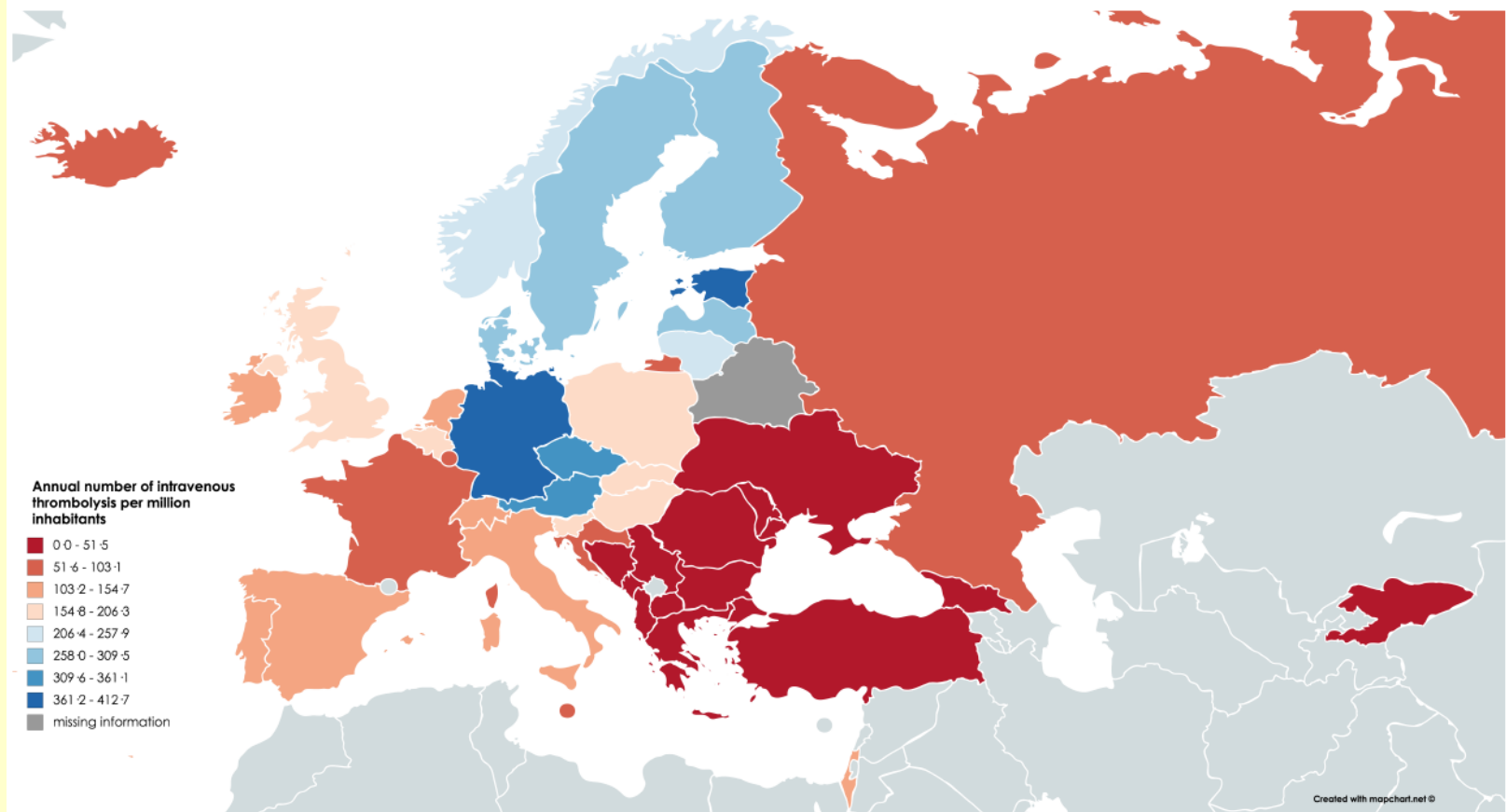
Solitaire retriever, Trevo pro retriever



Digital subtraction angiography

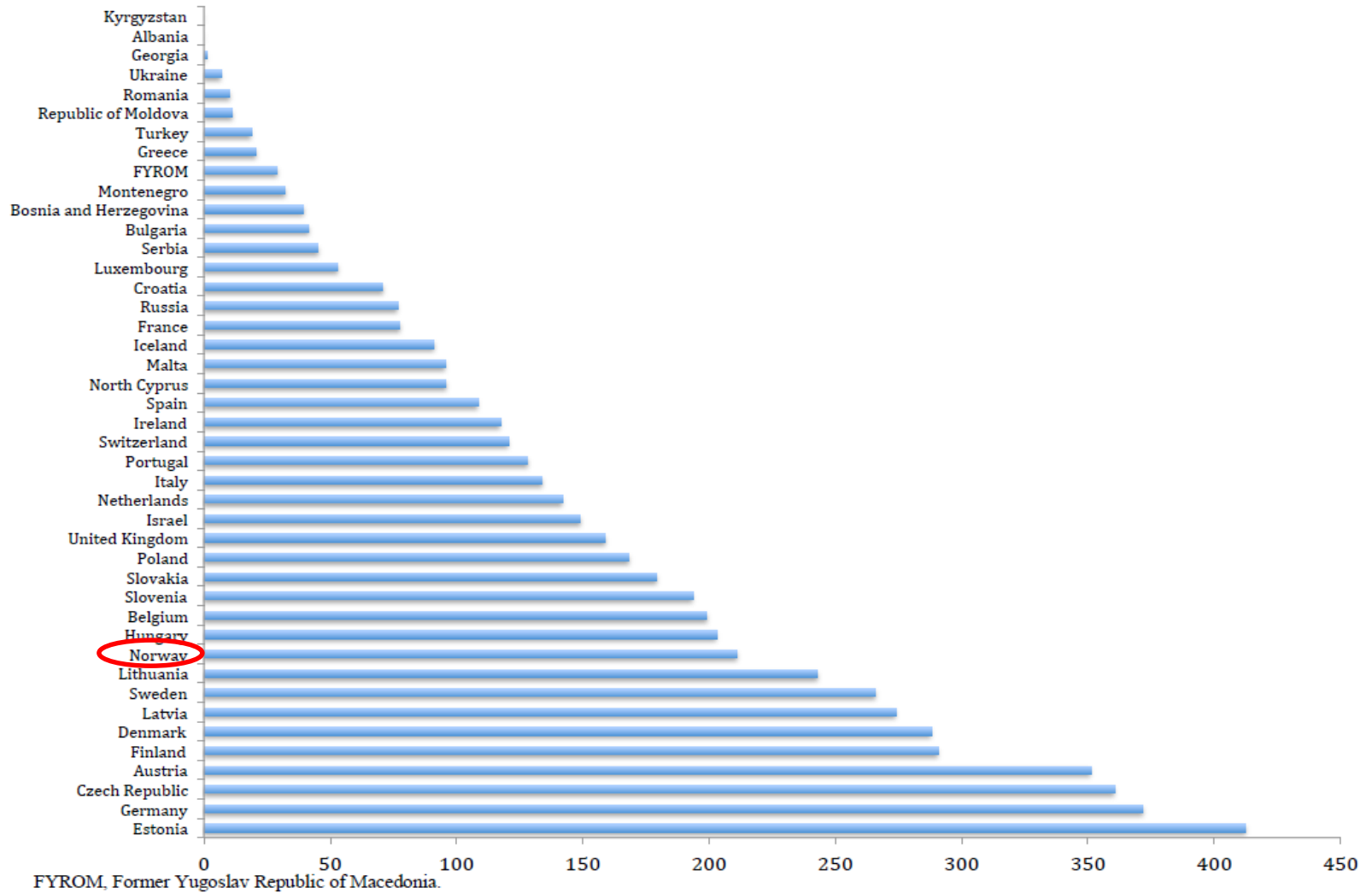


Intravenous thrombolysis/million inhabitants



deSousa DA, Fischer U et al., survey from 43 countries, zaslané do tlače

Figure 6: Contemporary annual rates of intravenous thrombolysis (IVT) per million population in 42 European countries



Endovascular treatments/million inhabitants

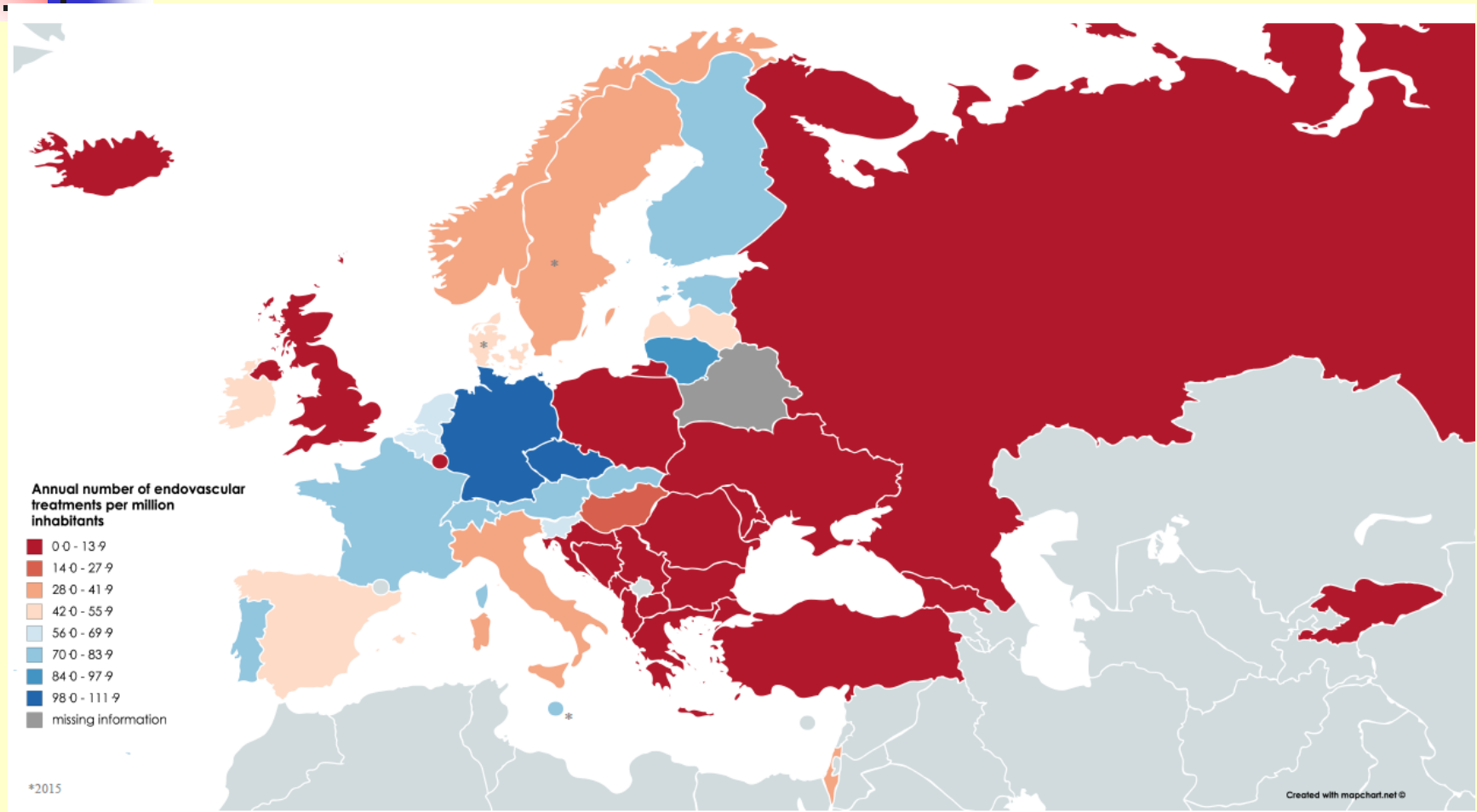
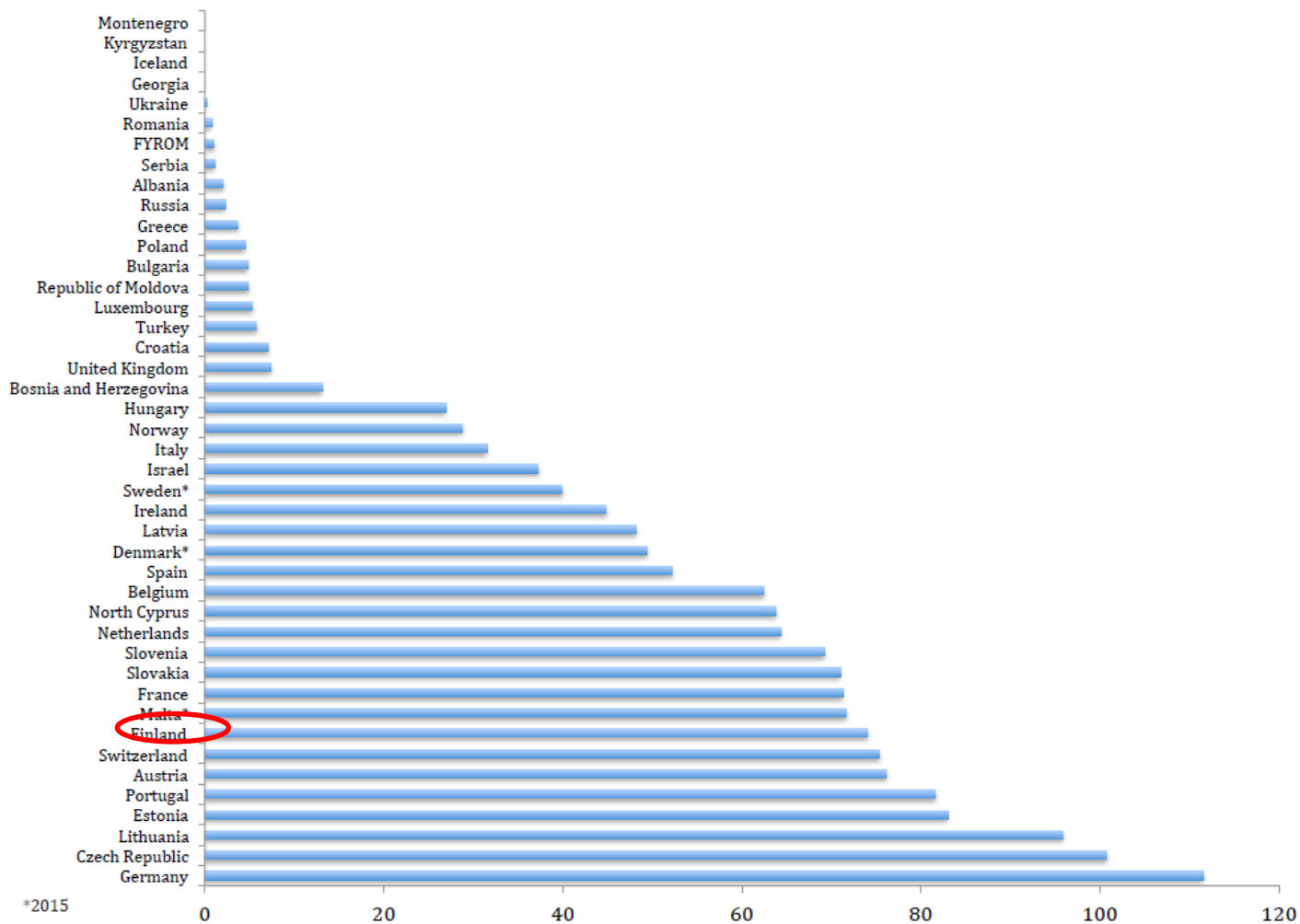


Figure 7: Contemporary annual rates of endovascular treatments (EVT) for ischaemic stroke per million population in 43 European countries



FYROM, Former Yugoslav Republic of Macedonia.

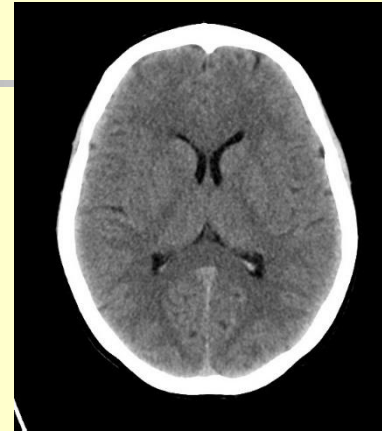


New guidelines in Slovakia

- Network of hospitals for IVT and ET – 24/7 hours
- Recommendations for collaboration with emergency service

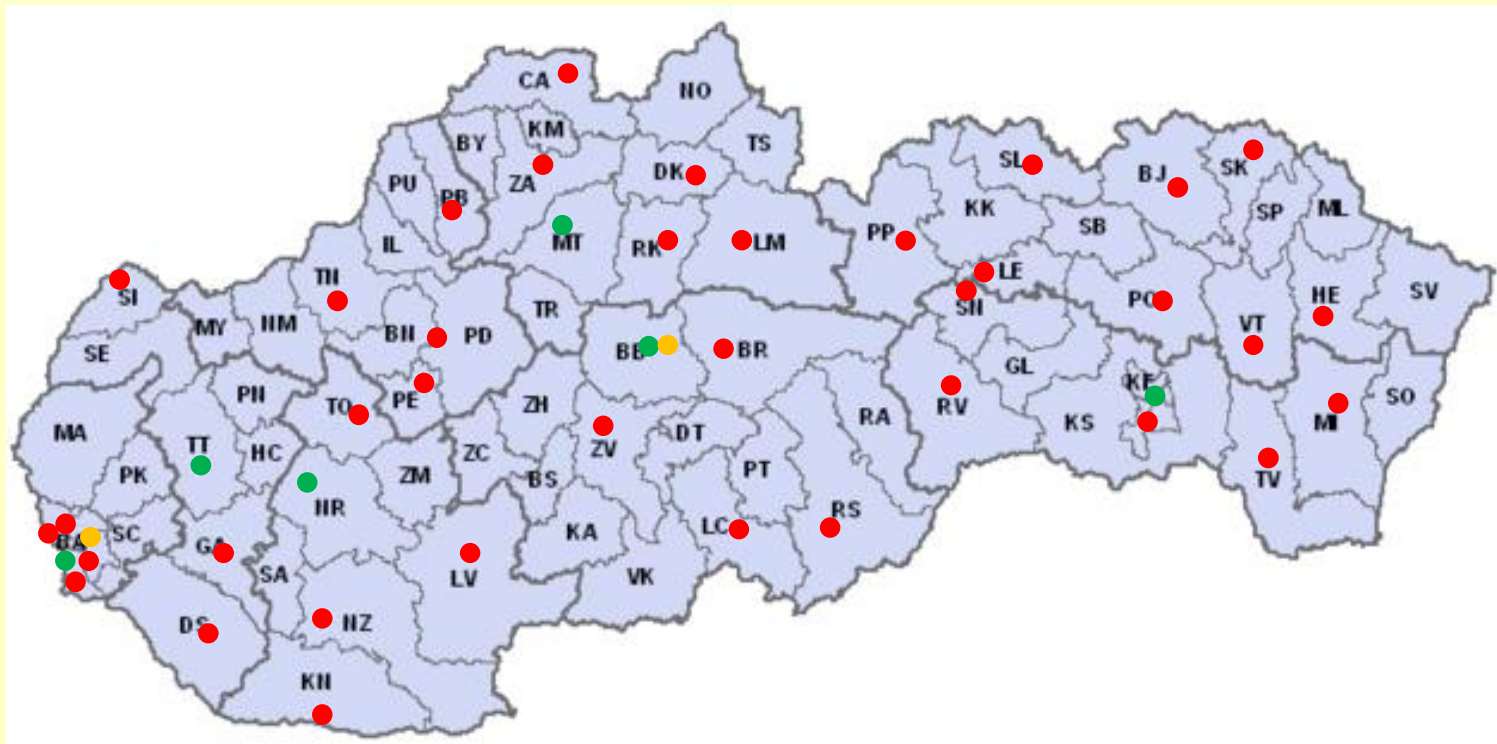
CTA/MRA

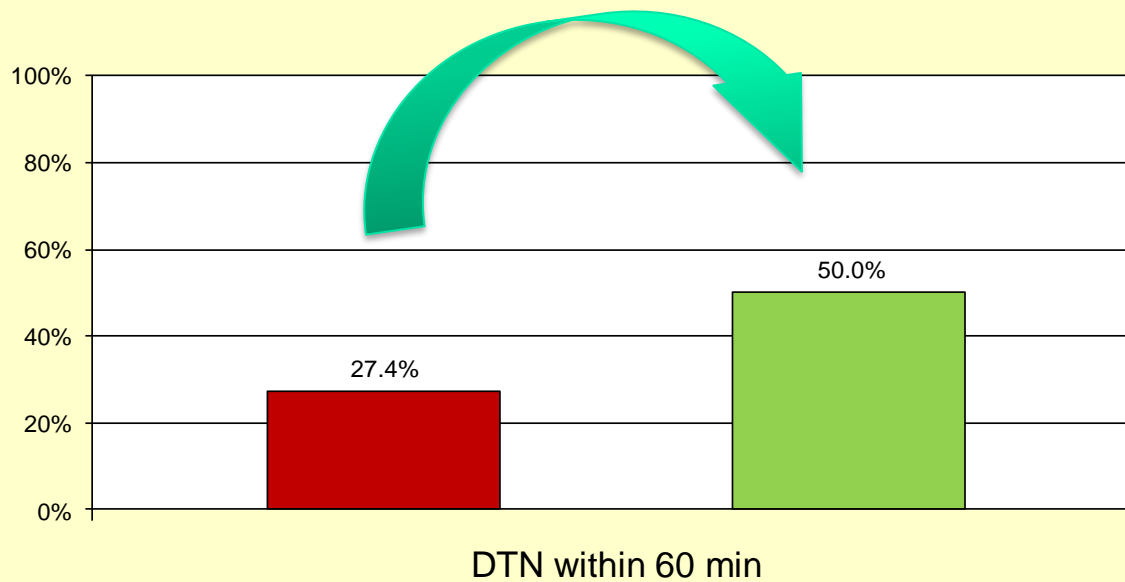
- Brain CT and CT AG
- Sugar
- aPTT, PT (INR), - in patients with anticoagulant therapy
- Mild neurological deficit, age > 80 years, epileptic seizure - not contraindication



Network of hospitals

- Poskytovaná rekanalizačná liečba – trombolytická liečba (43)
- Poskytovaná rekanalizačná liečba – trombolytická aj trombektomická liečba (6)
- Poskytovaná rekanalizačná liečba – trombektomická liečba (2)

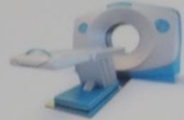




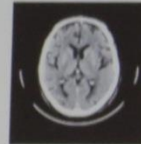
New goals after thrombectomy trials



T=0
Suspected
stroke patient
arrives at
stroke unit



≤ 20 min
Patient evaluated
on CT table
CT & labs (INR POC)
interpreted



≤ 30 min
rt-PA bolus
given (if patient
is eligible) in the CT



≤ 60- 90 min
Groin puncture
if patient
is eligible

O.R. 52-years old woman



- Wake up - 5.45, she felt down, aphasia, right side hemiparesis
- Emergency
- 6.50 – hospital, NIHSS - 11
- 7.05 – brain CT
- 7.45 – rTPA
- 9.05 – DSA, trombektomy

O.R. 52-years old woman



DSA before TE



DSA after TE

O.R. 52-years old woman



- Brain CT after 24 hours
- mRS – 0 at time of discharge



„Wake-up stroke“

Brain MRI

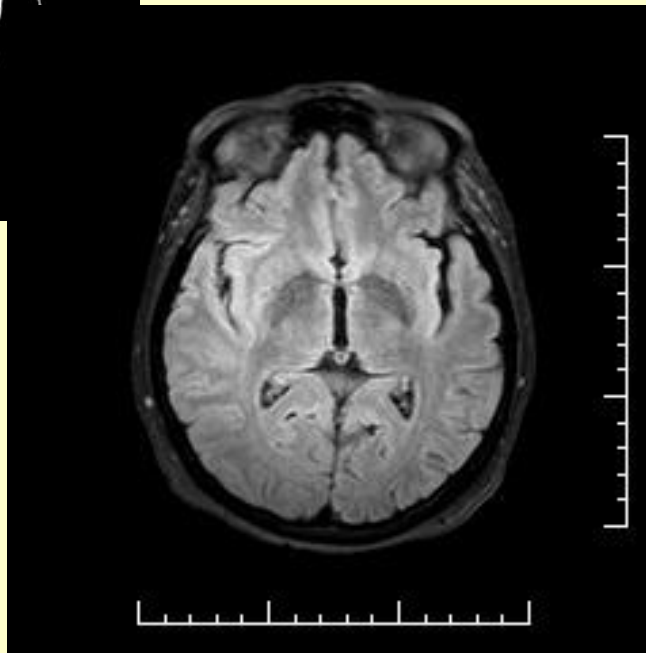
*67-y, waked-up at 5.30 – left side
hemiparesis, NIHSS – 10 bodov*

Recanalisation TICI2b

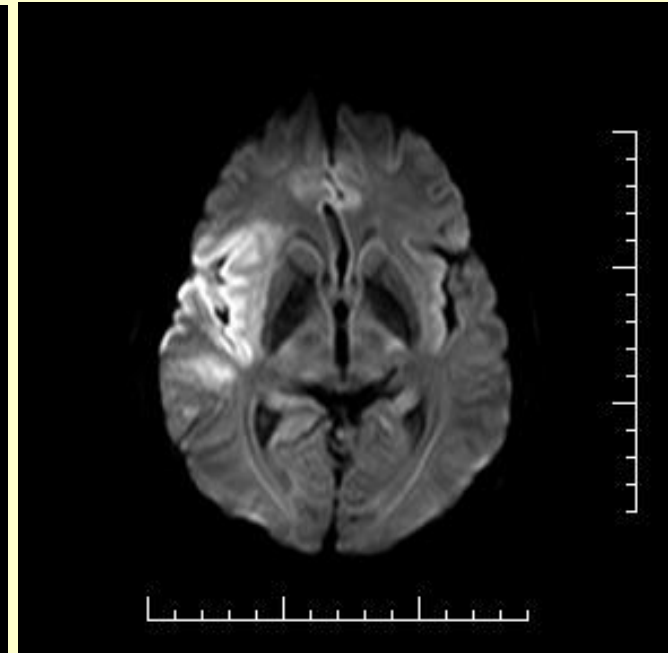
mRS – 1, after 3 months - 0



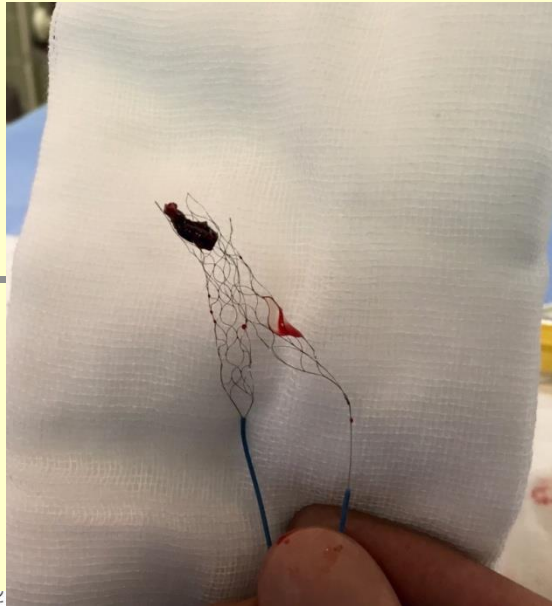
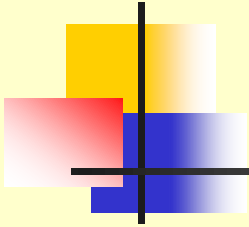
Brain CT



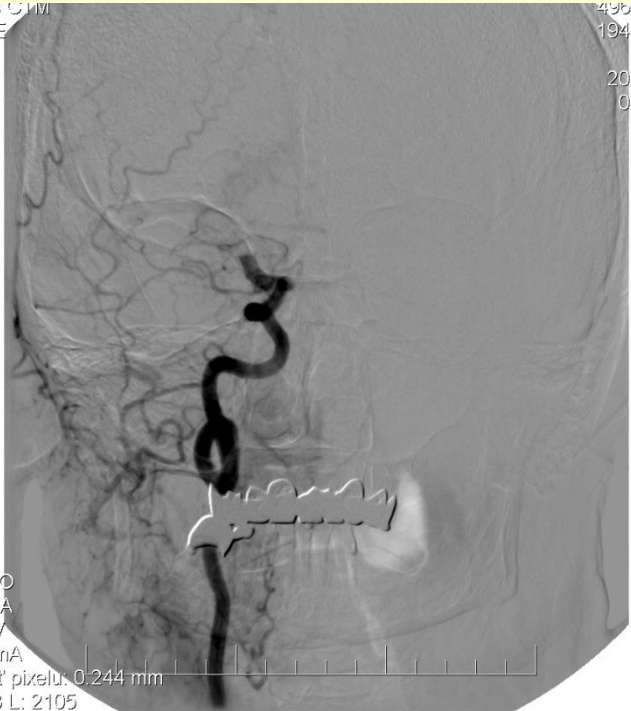
Brain MRI FLAIR



Brain MRI DWI



Carotis CTM
IODINE



4962
1949/12/10
65Y F
2015/4/24
08:35:57

0.1 RAO
0.1 CRA
93.0 kV
234.0 mA
Veikrost' pixelu: 0.244 mm
W: 713 L: 2105

Carotis CTM
IODINE



496210334
1949/12/10
65Y F
2015/4/24
08:35:57

0.1 LAO
9.3 CRA
94.0 kV
230.0 mA
Veikrost' pixelu: 0.244 mm
W: 607 L: 2096

Nový čas pre ženy – 11/2017

Marta Ivaňáková (67) z Košíc:
„Žijem bez následkov, no stačila chvíľa a všetko by bolo inak.“

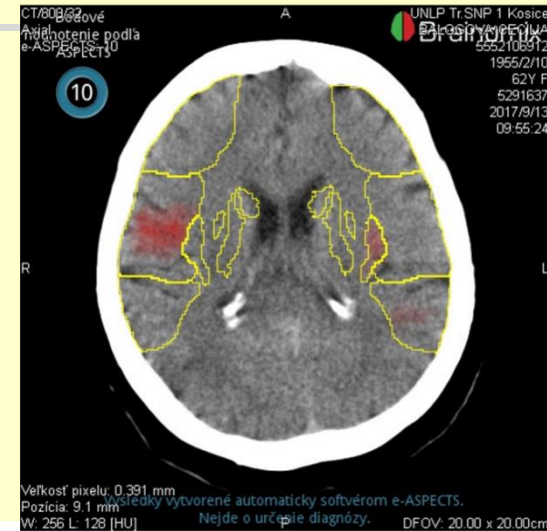
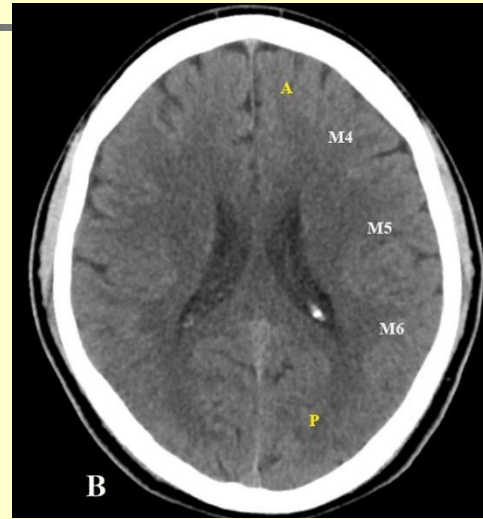
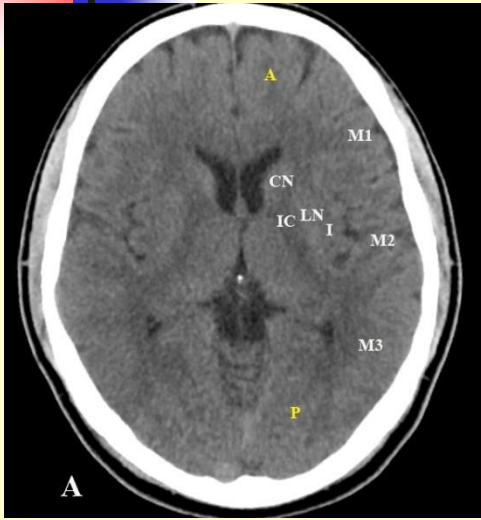


Pani Marta prekvapila mŕtvica na jar pred dvomi rokmi. „Ráno o pol siestej ma zobudila, že potrebujem ísť na záchod. Postavila som sa a spadla. Buchla som do skrine, počul to manžel, no už ma nepostavil. Ja som mu hovorila: Nezapísať deti. A je nevedela som, že mi nerozumie. Netušil, čo sa deje, tak naboso utekal k susedom.“ Susedka – učiteľka zdravotného krúžku, ihneď zavolała záchranku. „Počula som, ako hovorila, že je to cieľna príhoda.“ Lekári všetko zorganizovali tak, aby podstúpila modernú liečbu tromboektómiou. Hoci sa pani Marta nevedela priestorovo zorientovať aj počas operácie vnímala záuhy. „Počula som, ako pán doktor povedal: ‚Dofrasa, utiel mi trombus! Rozpíchl sa na tri kusy.‘ Po chvíli skríkol: ‚Mám ťa! Lekári nezistili príčinu, preto sa zrazena vytvorila. ‚Nemám k tomu genetický sklon a ani cievy nemám upchaté.‘ Jediné jej ťať kosti boli bolesti hlavy a kolísavý tlak, na ktorý sa liečila. Mŕtvica zobrala zabáňku z plnej práce a aktívneho života. ‚Nikdy mi ani len nenapadlo, že by to mohlo postihnúť práve mňa. Bola som vitálna a zrazu som sa nevedela sama obliecť či zobrať si cukor z korenia. Chodila aj napríklad som pomaly, unikali mi písmenká.‘ Po fyzickej stránke pomohla rehabilitácia, po psychickej krátke návrat do práce. Mozgová príhoda vystrašila celú rodinu, najmä jej manžela. „Keď mu



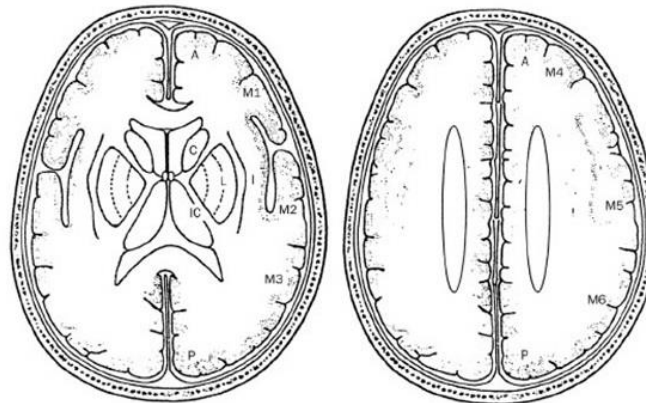
v nemocnici odovzdali mój prešiel a retiazku, rozplakal sa. V nás oboch to zanechalo strach. Doma máme stacionárny bicykel, ktorý skĺbi akoveňák a teraz šliapeme a kontrolujeme jeden druhého. Prešlo dlhé obdobie, kým sme sa odvážili ísť niekam každý zvlášť.“ Pani Marta dnes nemá takmer žiadne následky, dokonca šoféruje. „V ústach mám viac sily a ľavú nohu mám stále slabšiu, ale nijako ma to neobmedzuje.“ Za svoje zotavenie vďačí lekárom, no mala aj šťastie. „Mój manžel v ten večer prišiel po troch dňoch z chalupy. Pomoc existuje, len ju treba rýchlo vyhľadať a dá sa z toho vyviesť aj bez následkov.“ ■

ASPECTS



C		M2	
I		M3	
L		M4	
IC		M5	
M1		M6	

Celkem _____



Normal – 10

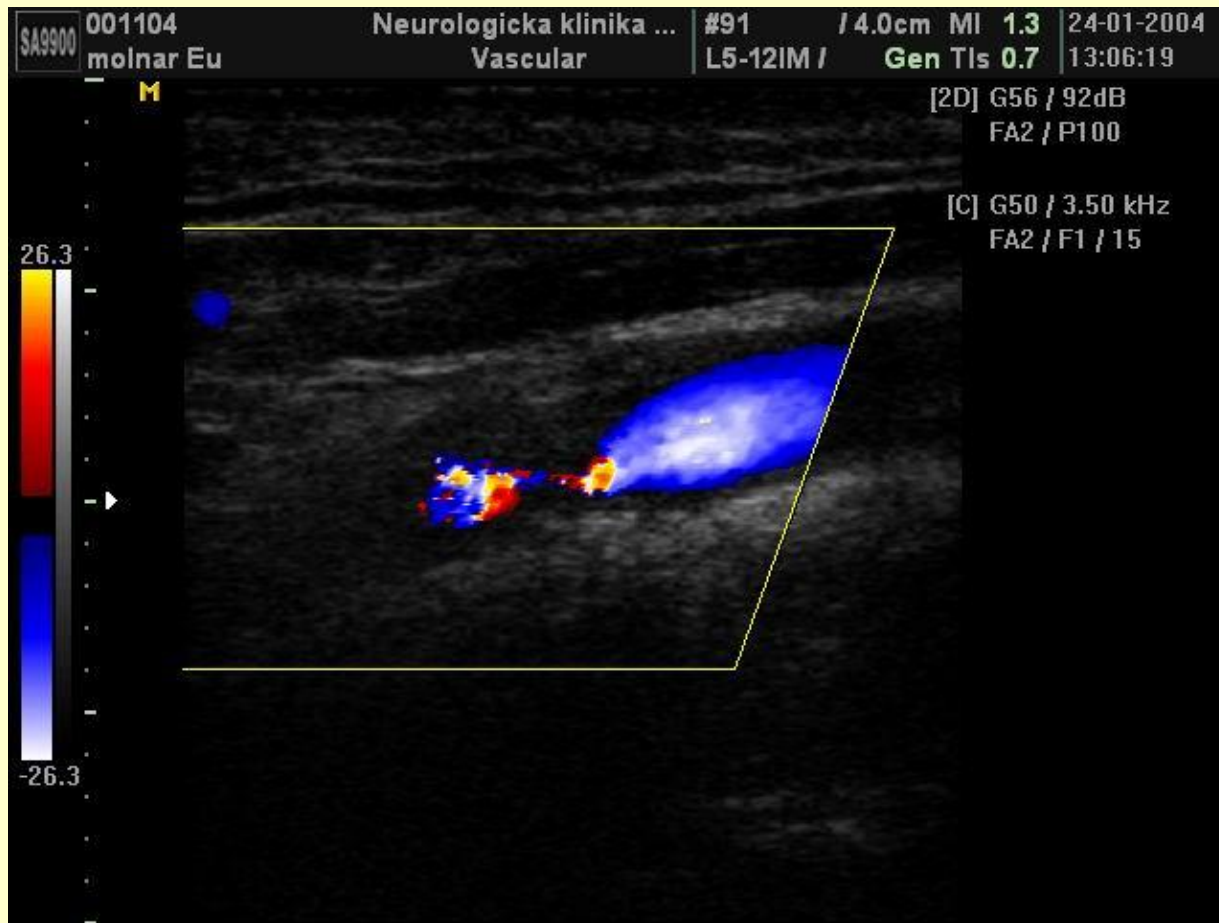
Ischemia – 1 point

Score \geq 7 better prognosis

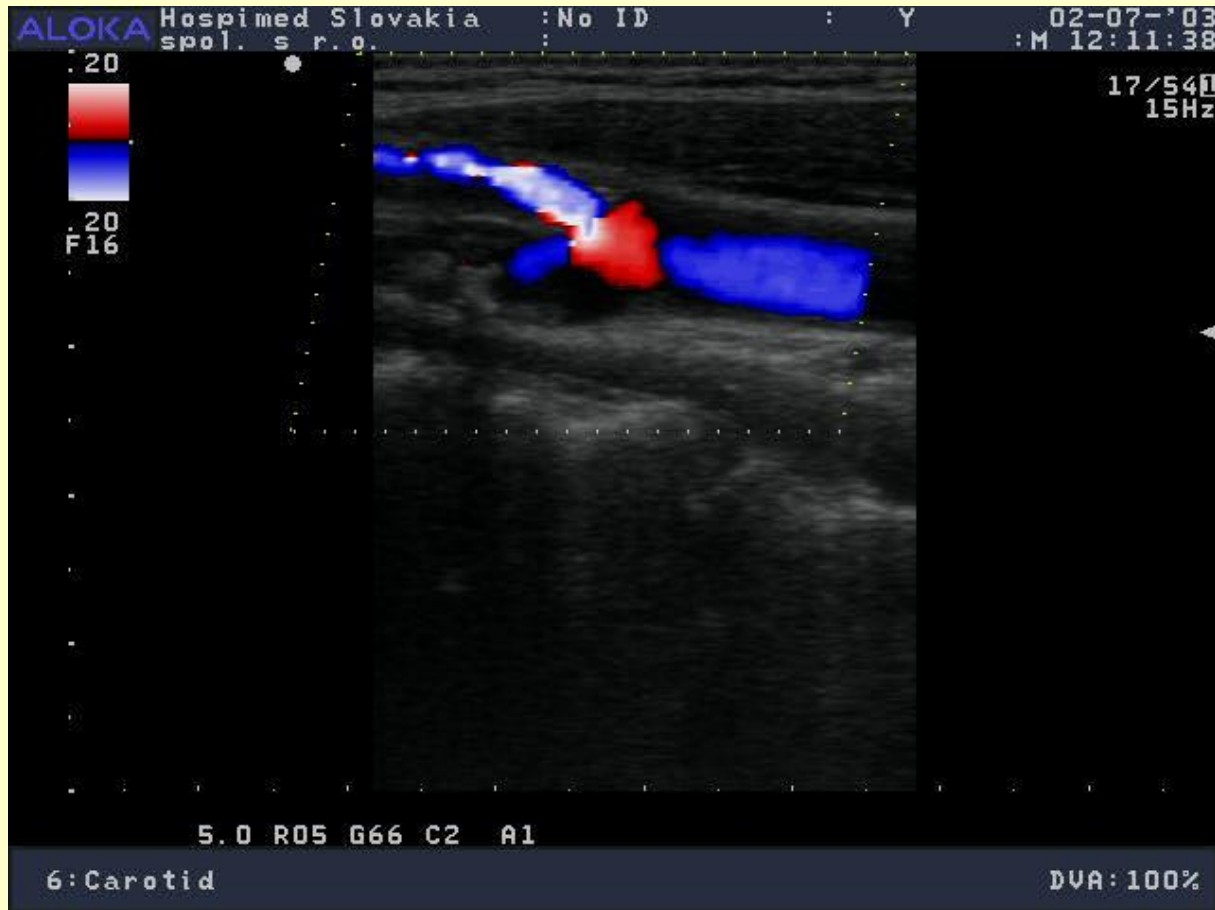
ICA stenosis



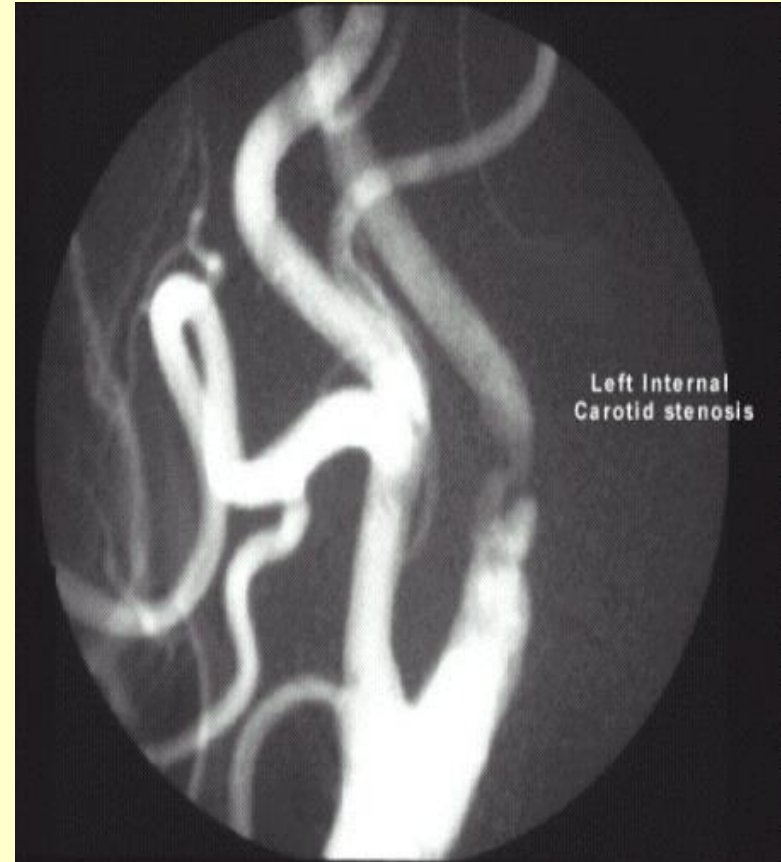
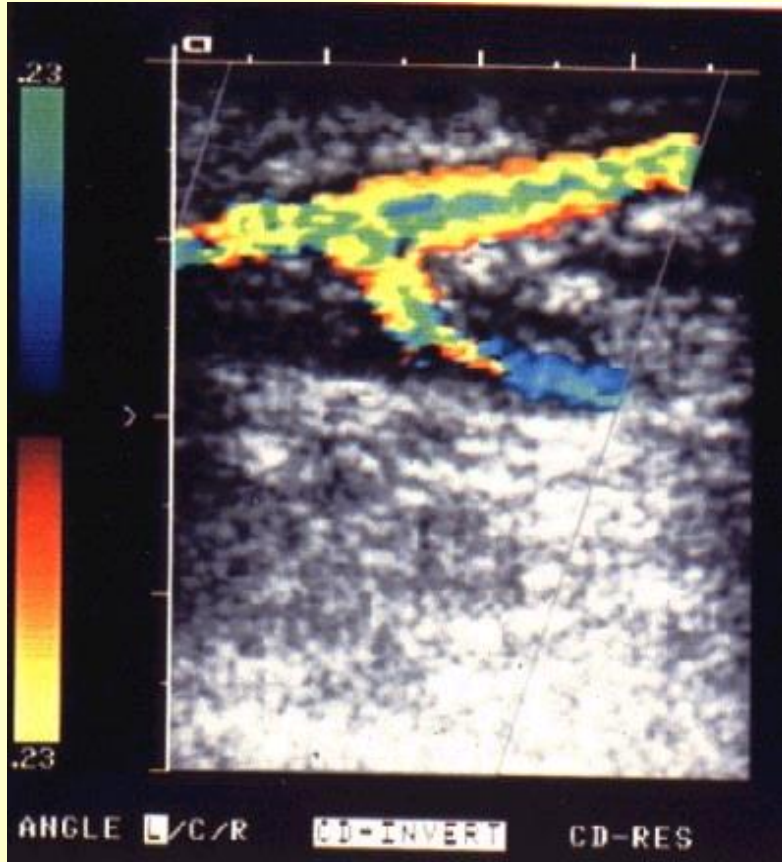
ICA stenosis



ICA stenosis



Duplex of carotid arteries and AG





Therapy after acute stroke

- **Therapy of risk factors – prevention**
- **Antithrombotics**
- **Anticoagulants**
- **Endarterectomy (CEA)**
- **STENT**
- **Rehabilitation**



Guidelines for antiagregants

- **Antithrombotics**
- **Non cardioembolic strokes**
- **ASA, 50 – 325 mg 1xD**
- **Combination ASA and dipyridamol 200 mg 2xD**
- **Clopidogrel 75 mg 1xD**



Indications for anticoagulants in patients with stroke and AF

- CHADS₂ – (congestive heart failure, hypertension, age ≥ 75 , diabetes, **stroke**)
 ≥ 2 – high risk
- Warfarin – INR 2,0-3,0
- Direct oral anticoagulants – are recommended instead of warfarin – safety
- Direct inhibitor of thrombin – Dabigtran
- Inhibitors of Xa – Apixaban, Rivaroxaban, Edoxaban

RELY - ARISTOTLE - ROCKET AF

Charakteristika štúdií	RELY dabigatran	ROCKET AF rivaroxaban	ARISTOTLE apixaban
Mechanizmus účinku	Ila	Xa	Xa
Počet pacientov	18 113	14 264	18 201
Dávkovanie	150 mg 2x/ day 110 mg 2x/ day	20mg 1x/ day (15mg 1x/ day)	5mg 2x/ day 2,5 mg 2x/ day
Dizajn	PROBE	Double blind	Double blind
Priemer CHADS ₂	2,1	3,5	2,1
Priemer TTR	64%	55%	62%
Medián TTR	67%	58%	66%
Prerušenie liečby (Warfarín)	21,2% (16,6)	23,9% (22,4)	25,3% (27,5)

Connolly SJ *et al.* *N Engl J Med* 2009; **361**:1139–1151. Connolly SJ *et al.* *N Engl J Med* 2010; **363**:1875–1876 (letter to editor).

SPC Pradaxa tvrdé tobolky 110/150 mg, 8/2011;

Granger CB *et al.* *NEJM* 2011; 10..1056/NEJMoal 1107039. NEJM.org; Patel MR *et al.* *NEJM* 2011;10.1056/NJMoal1009638.NEJM.org.

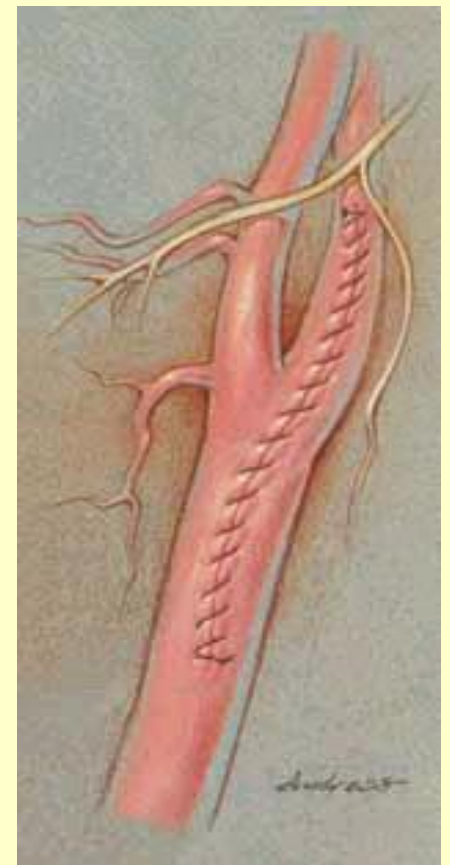
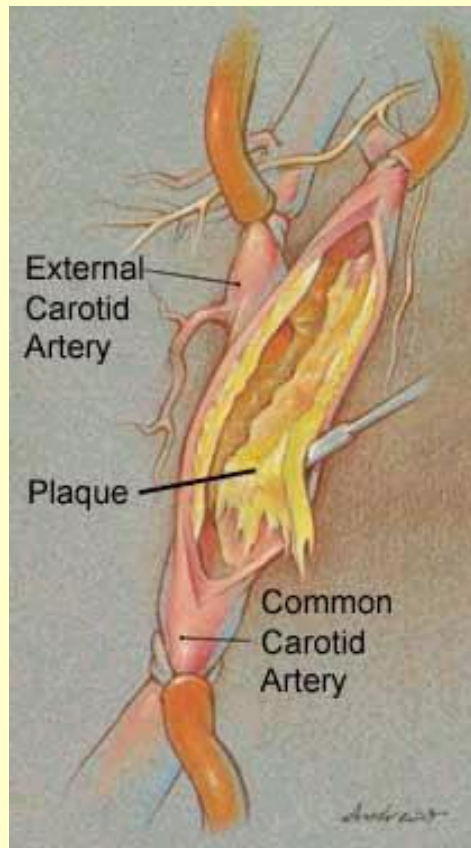
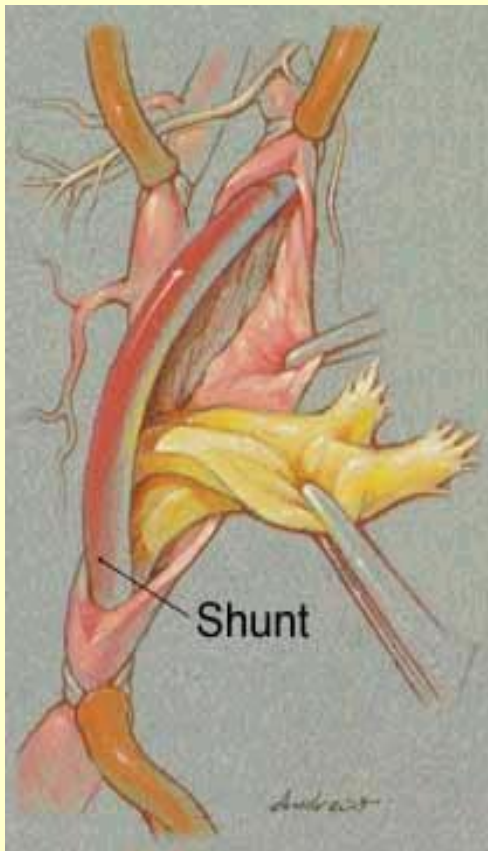
https://www.dcri.org/news-publications/slides-presentations/ROCKET-AF-LBCT_FINAL.ppt/view?searchterm=rocket



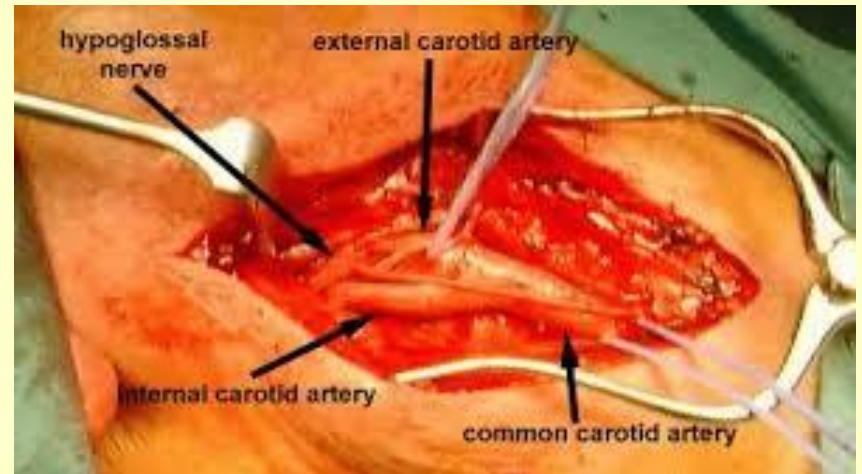
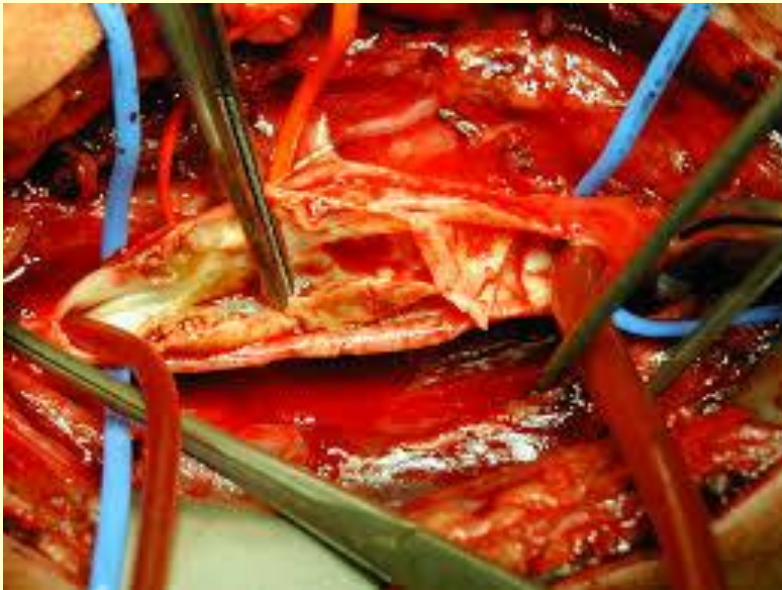
Endarterectomy ICA

- **Indications**
- **ACI stenosis > 70% (in ulcerating AS plaques – risk of embolisation – > 60%)**
- **Brain CT**
- **After TIA – 2 days, small infarct within 2 weeks, others – 6 weeks after stroke**

Endarterectomy

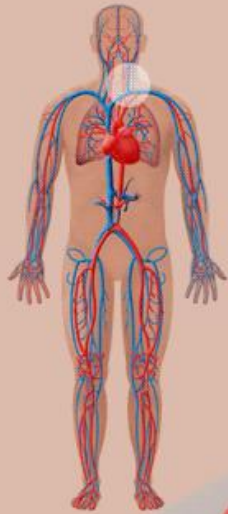


Endarterectomy



Carotid Stenting

Internal Carotid Artery



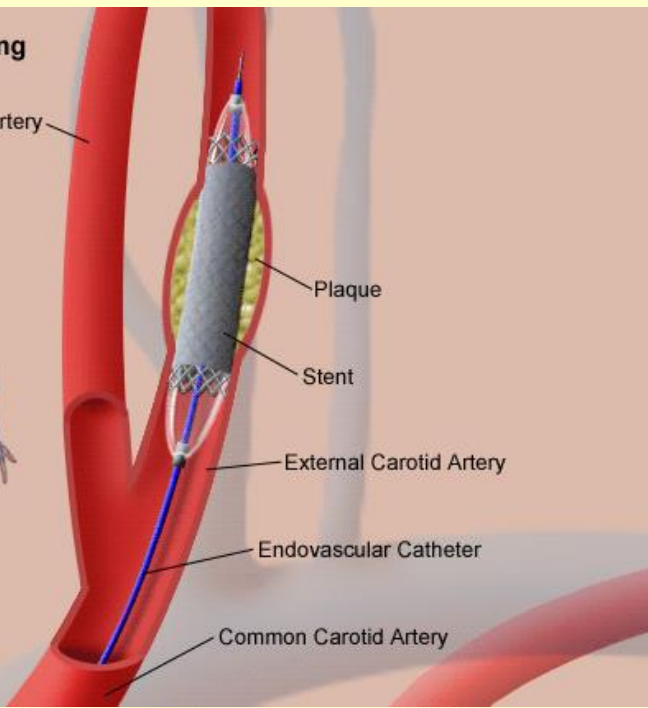
Plaque

Stent

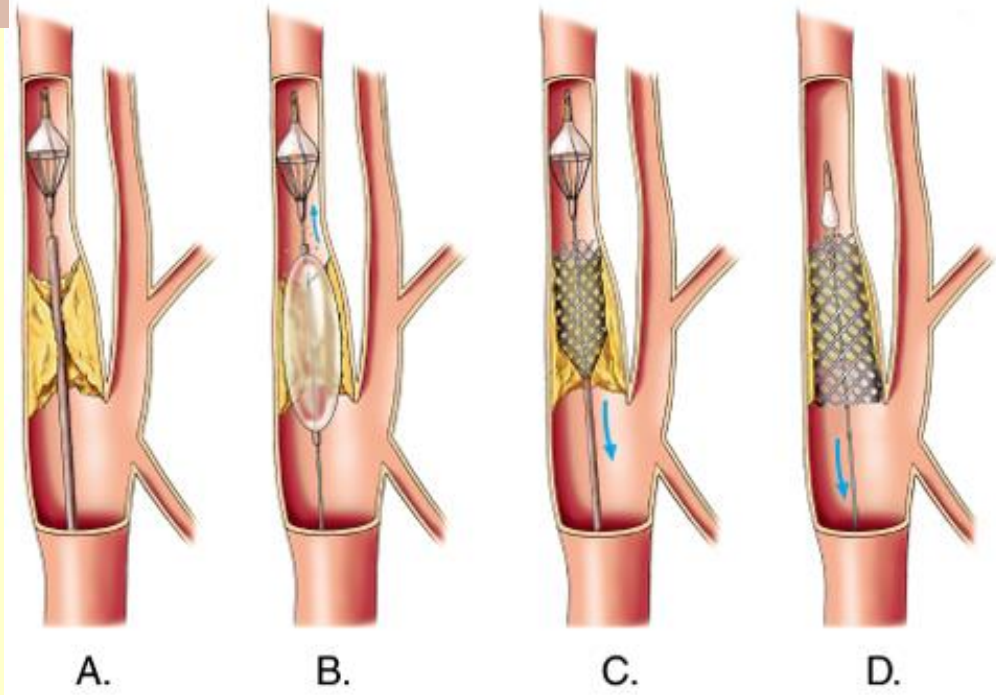
External Carotid Artery

Endovascular Catheter

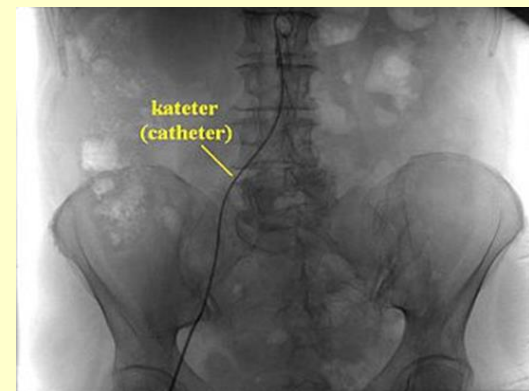
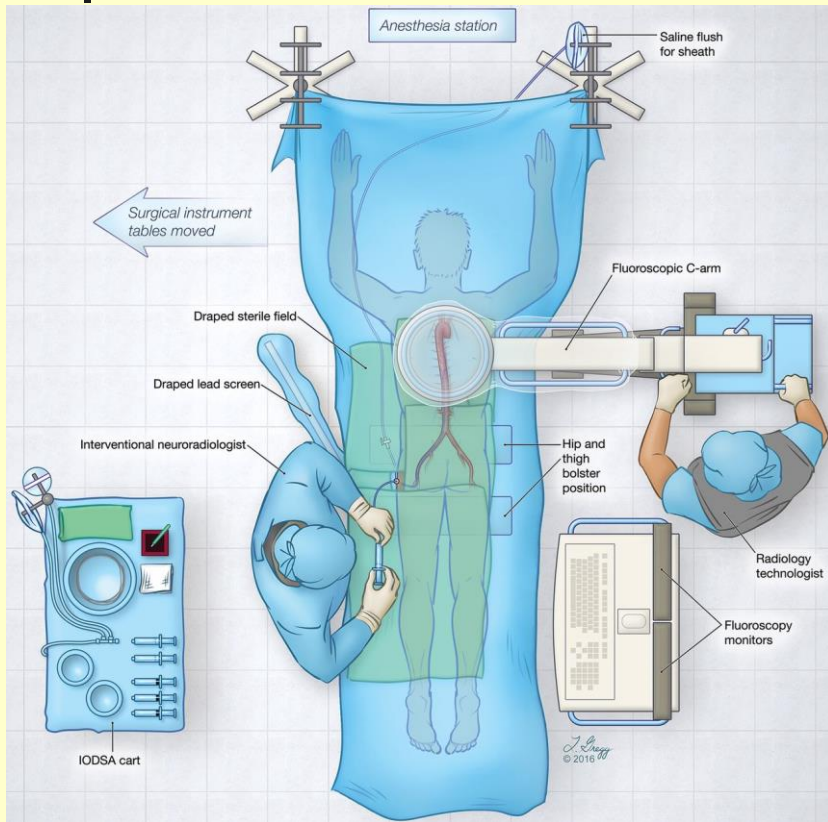
Common Carotid Artery

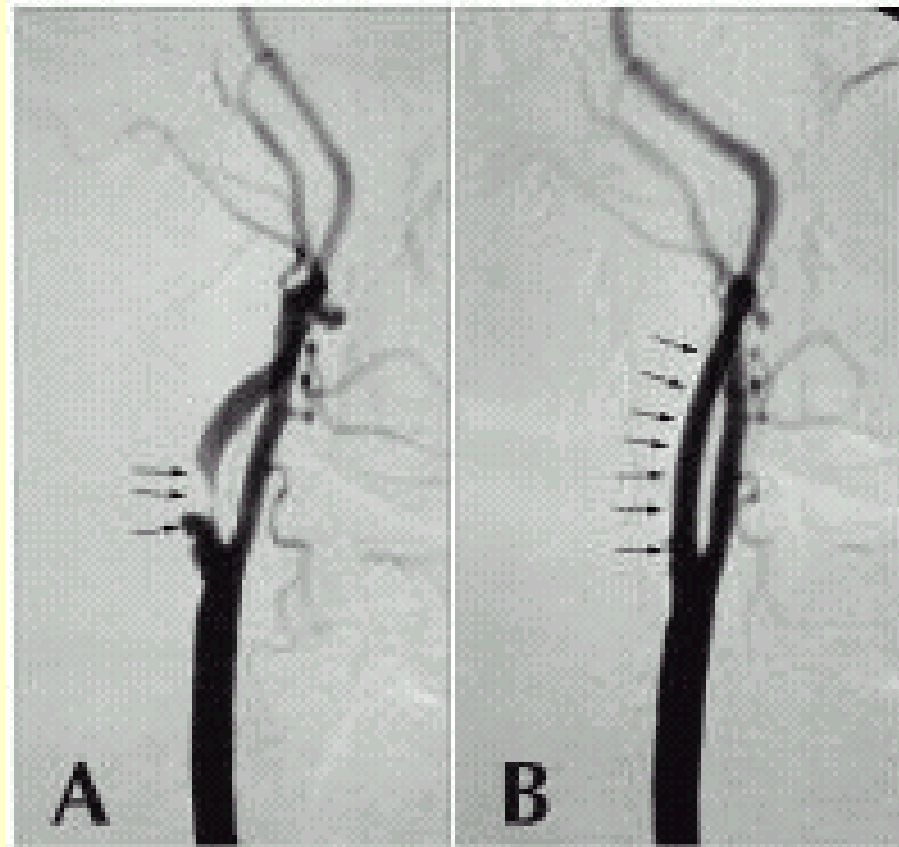


STENT

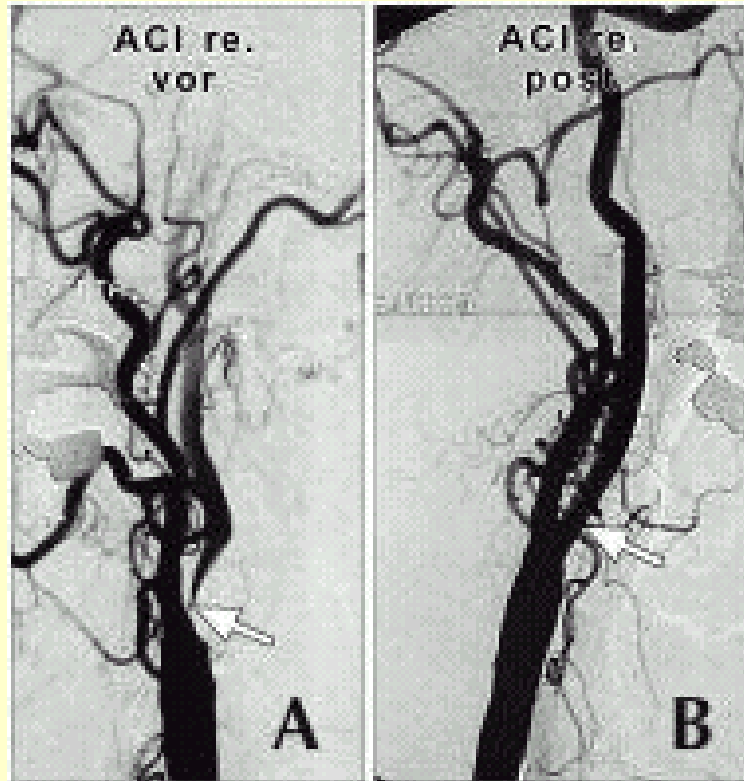


Digital subtraction angiography

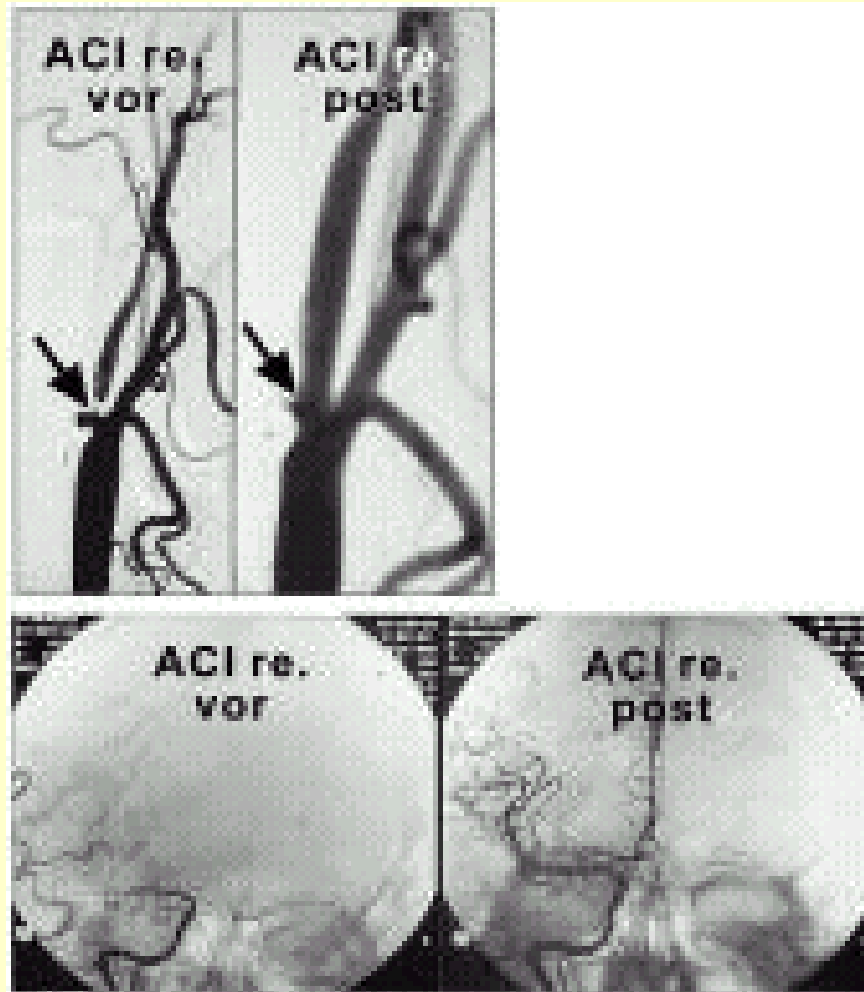




ICA
High grade stenosis - Stent



ICA
High grade stenosis - Stent



ICA
High grade stenosis - Stent



Indications of STENT

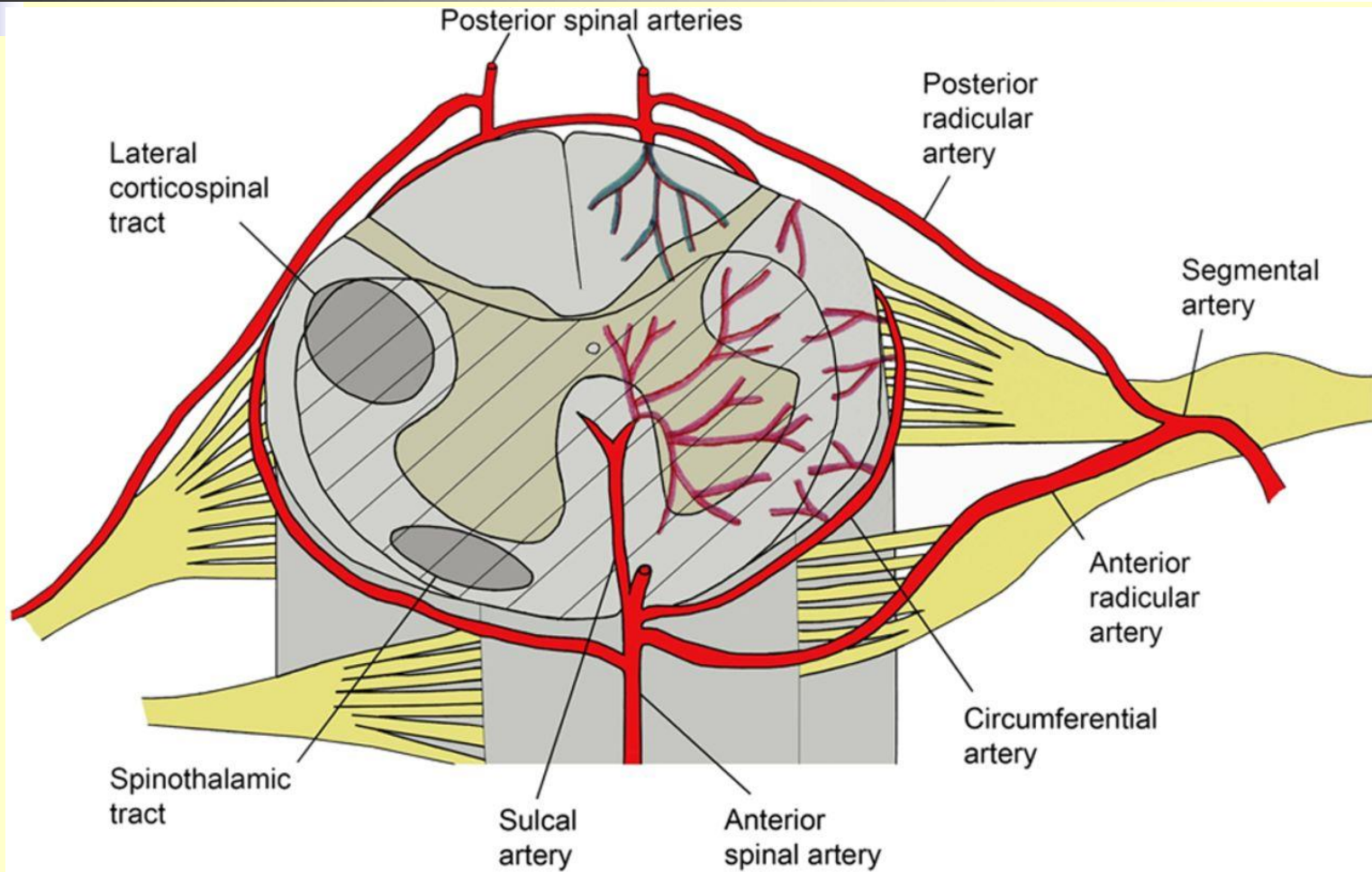
- **Patients with**
 - **operation risk**
 - **older patients**
 - **risk of anaesthesia**
 - **changes on the neck**
- **Restenosis after CEA**



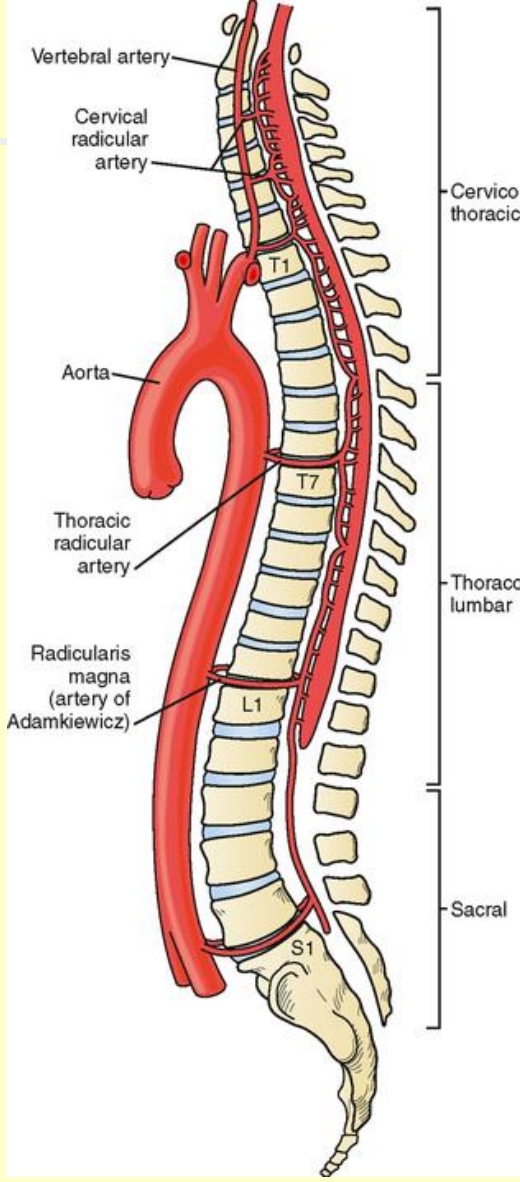
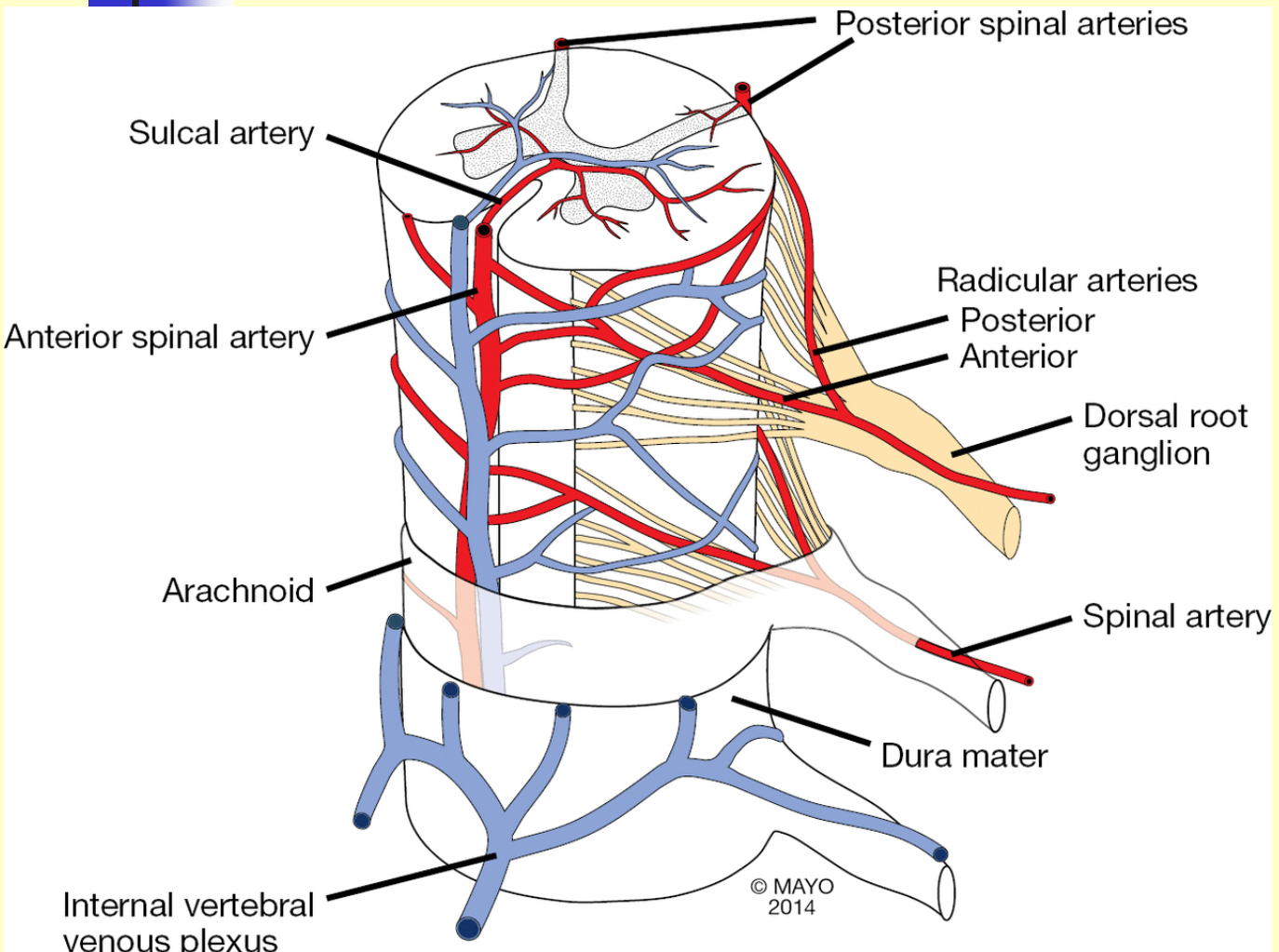
Advantages of STENT

- **Less invasive method**
- **Less patients with restenosis**
- **Shorter hospitalization**
- **Smaller risk of wound complications**

Blood supply of spinal cord



Blood supply of spinal cord





Acute spinal cord ischemia

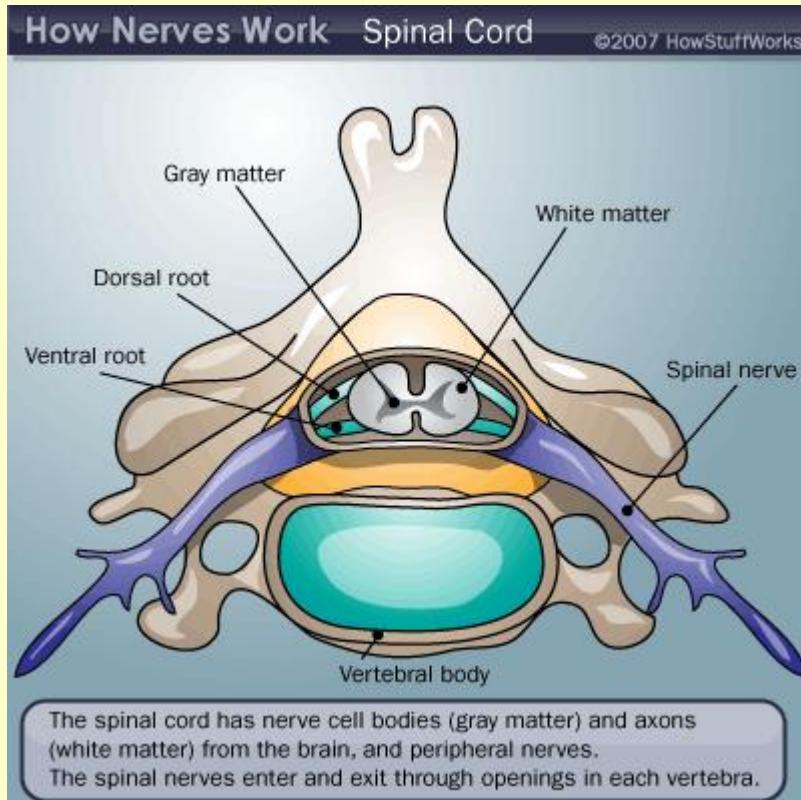
- Represents only 5-8% of acute myelopathies and <1% of all strokes
- The majority of patients developed symptoms quickly, with **maximal symptomatology reached within 12 hours for >50%** of patients and within 72 hours for the vast majority of patients
- Initial symptoms include severe back pain (60-70%), loss of bladder control (60%) and bowel control (40%).



Clinical feature

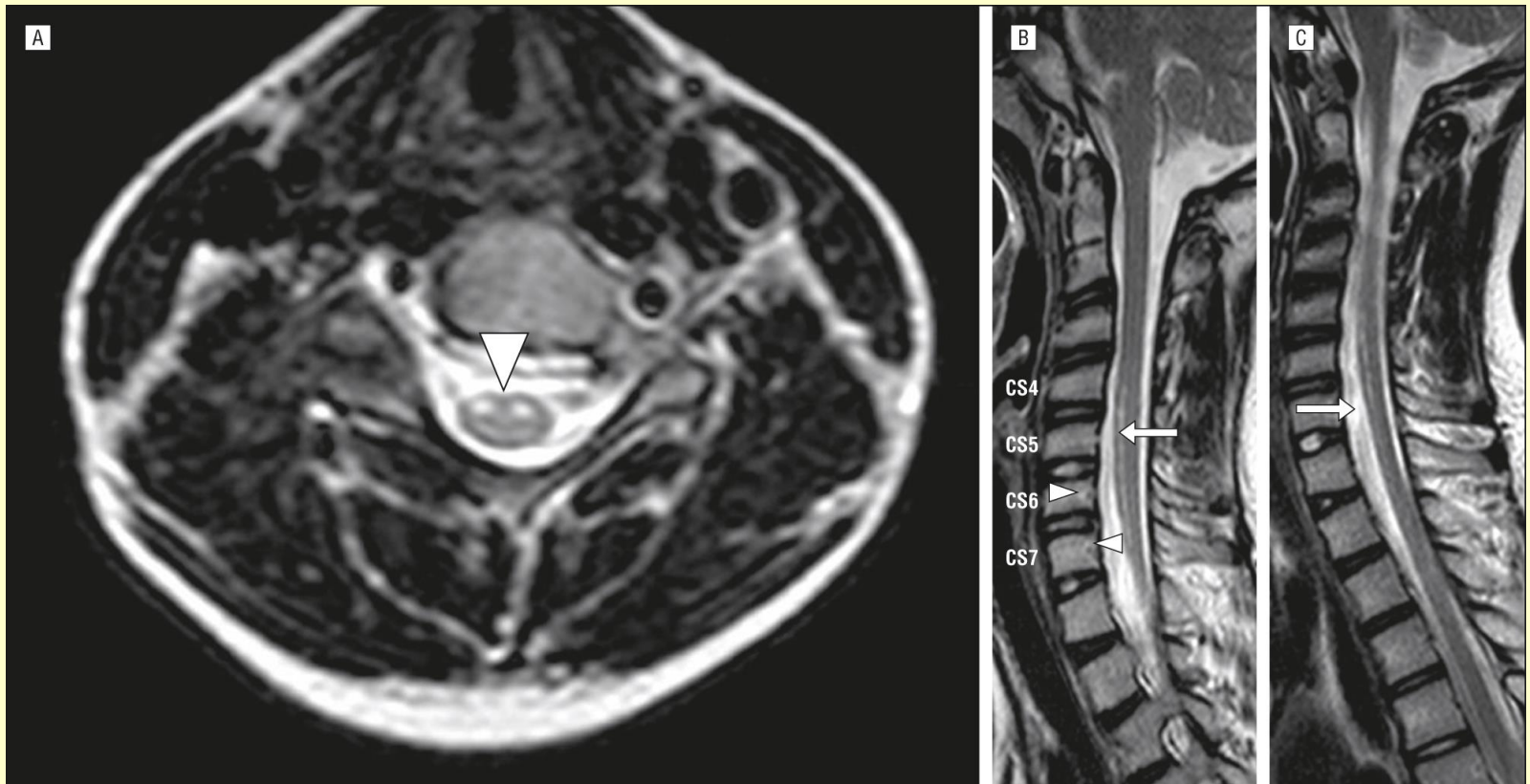
- anterior spinal artery syndrome
- paralysis below affected level (initially flaccid; later spastic)
- pain and temperature sensory loss
- relative sparing of proprioception and vibration (dorsal columns)
- posterior spinal artery syndrome
- complete sensory loss at the level of injury
- proprioception and vibration loss below level
- minimal, typically transient, motor symptoms

MRI



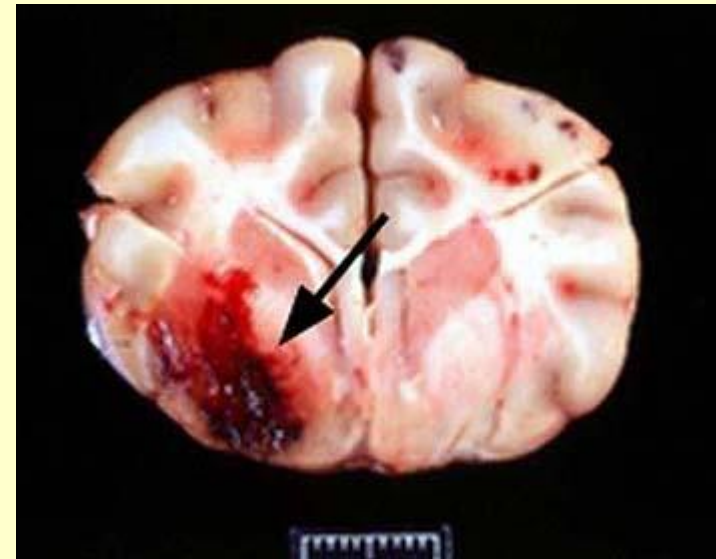
T2-wieghted MRI

Owl's Eye in Spinal Magnetic Resonance Imaging

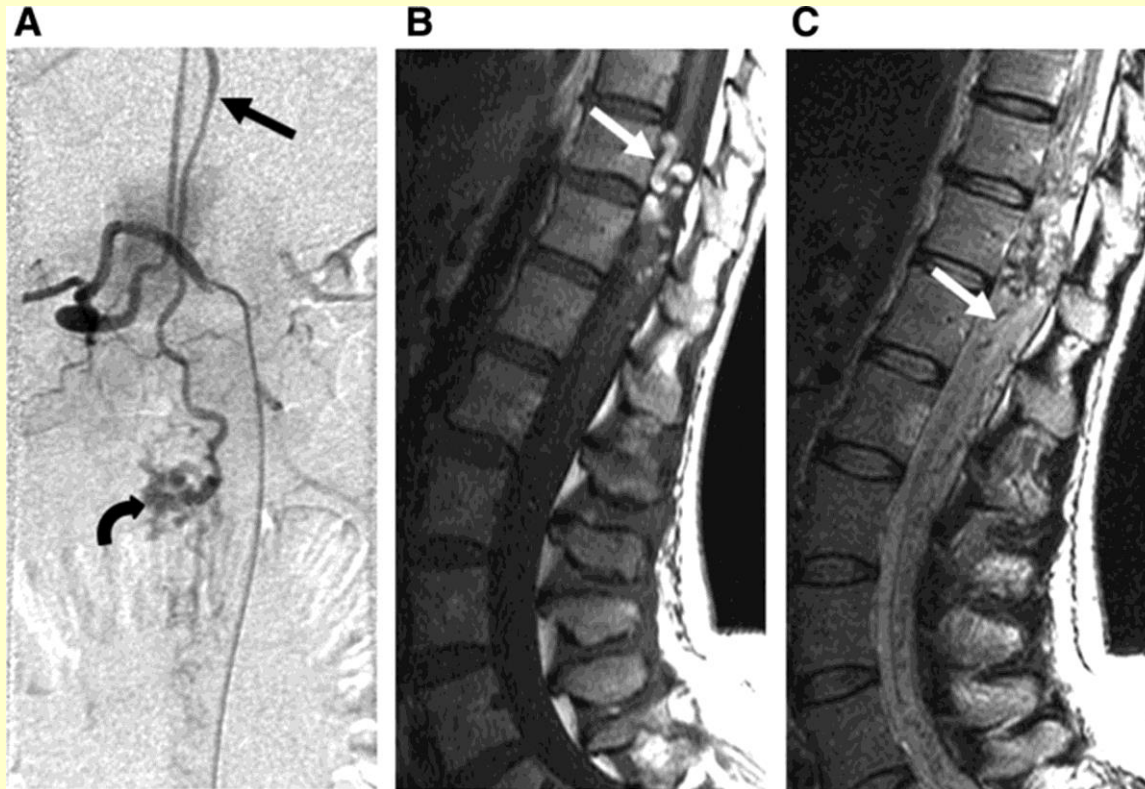


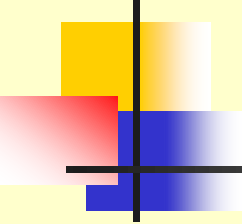
Haematomeylyia

- Bleeding to spinal cord
- Etiology
 - AVM
 - Anti-coagulant therapy
 - Coagulopatias
 - Injury



Haematomeylyia - etiology

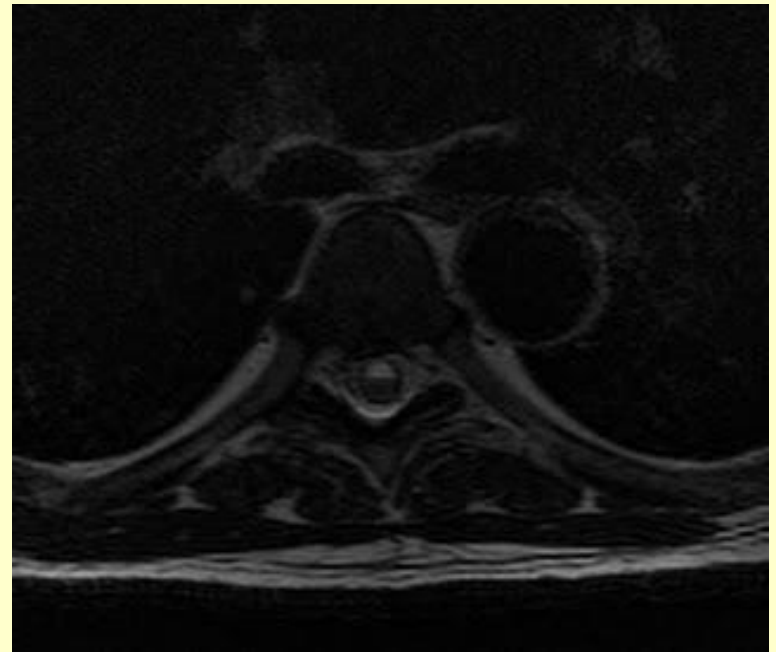


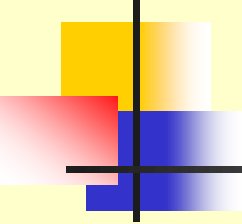


Hematomyelia – clinical feature

- Pain
- Symptoms similar as in ischemia
- Diagnosis – MRI
- Treatment – conservative, surgery

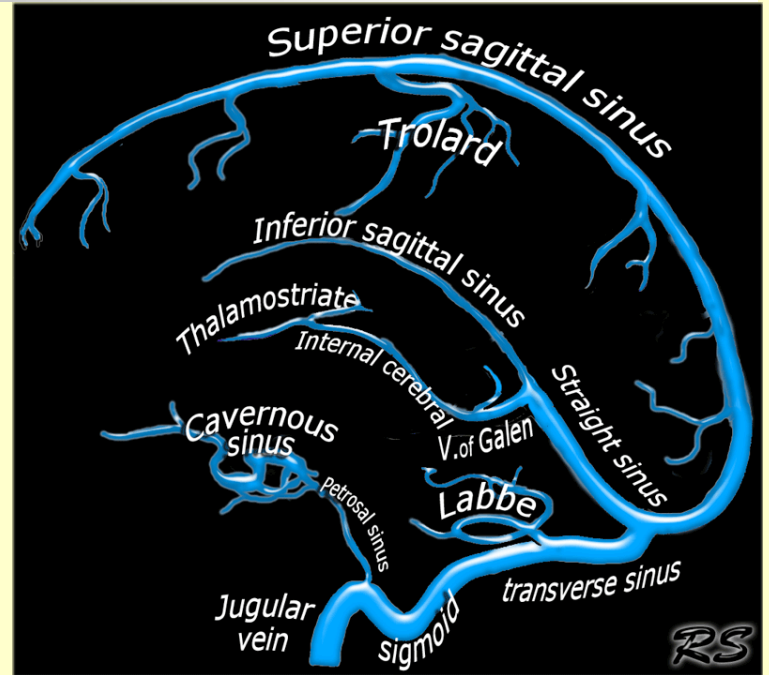
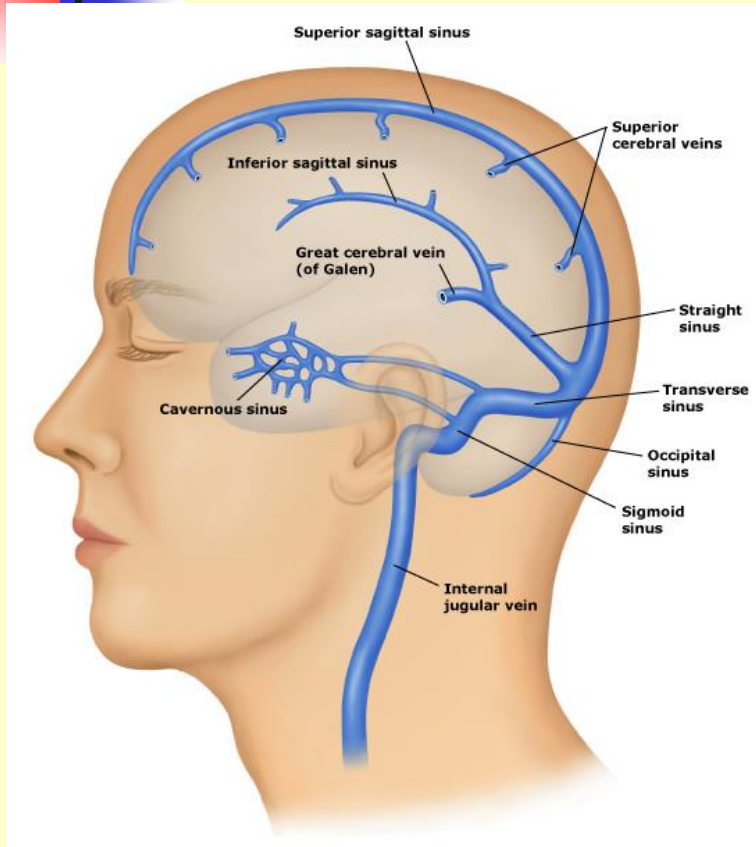
Hematomyelia - MRI

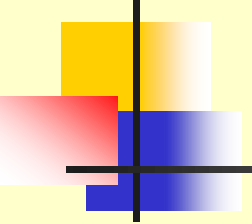




Cerebral venous thrombosis (CVT)

- Rare type of stroke
- Thrombosis occurs in the venous side of the brain circulation
- Occlusion of one or more cerebral veins nad dural venous sinus.
- Incidence – 1/100 000 inhabitants
- The most frequent – children and young adults, more often in women





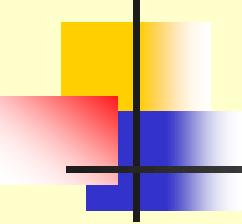
Cerebral venous thrombosis (CVT)

- **Etiology**
- Infections (in 70 % - Staphylococcus aureus, than Streptococcus pneumoniae, gramnegative bacterias, Aspergillus).
 - Focal infections on the head – sinusitis, meningitis, malignancy, otitis, tonsilitis, furunkul, penetrating head injury
 - Generalized infections – endokarditis, tuberkulosis, pneumonia, hepatitis, AIDS.
 - Lumbal puncture



Cerebral venous thrombosis (CVT)

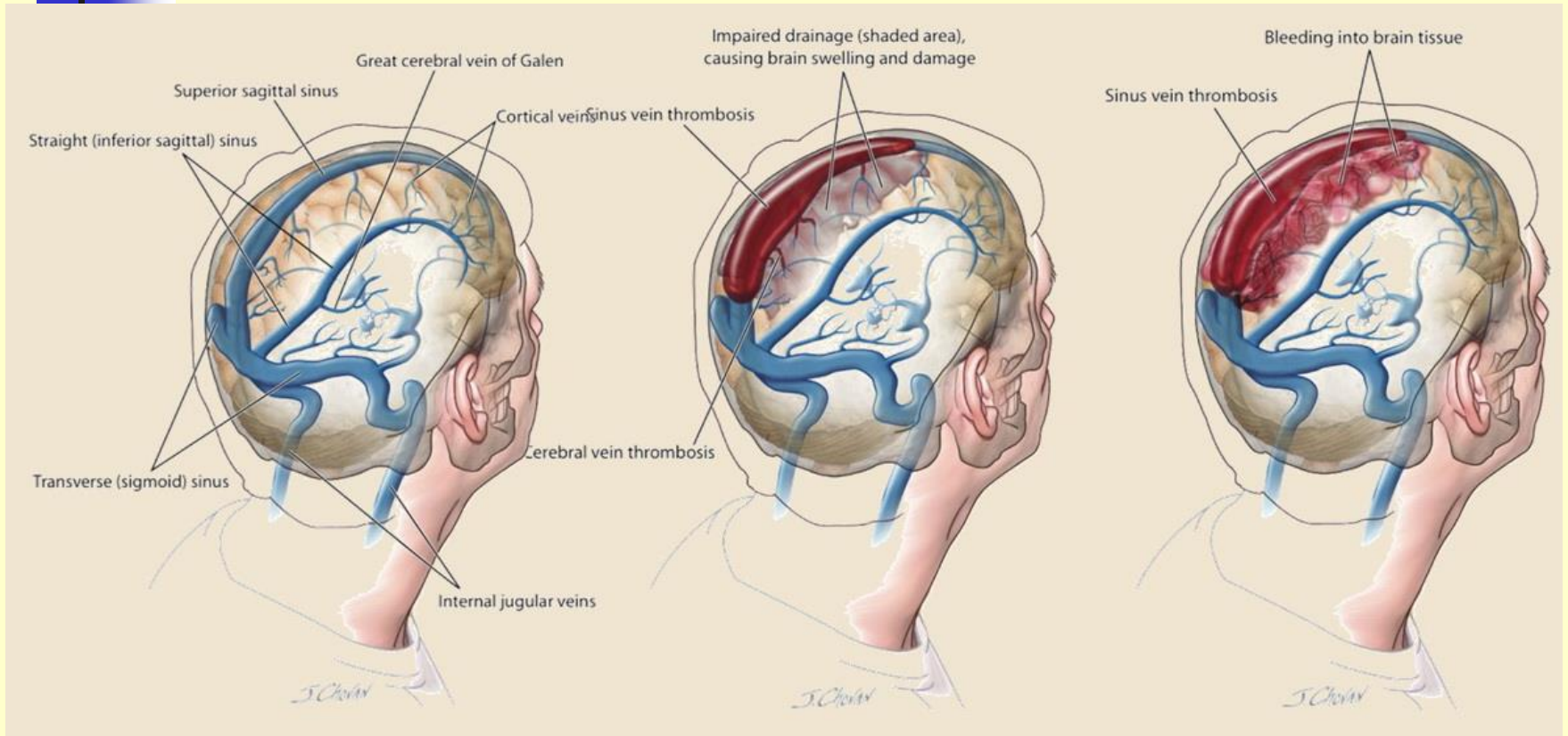
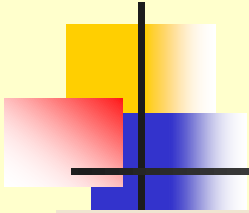
- Non infectious risk factors
 - Oral contraceptives,
 - Drugs with protrombotic effect
 - Pregnancy, pueprerium
 - Thrombophilic disorders,
 - Antiphospholipid syndrome
 - Malignancies

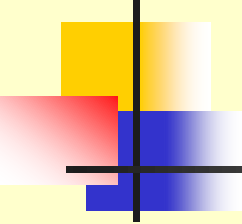


Cerebral venous thrombosis

Clinical feature

- Subacute beginning
- Different neurological symptoms
- Later – hemorrhagic transformation
- Cefalea, nauzea, vomitus
- Hemiparézis, paraparesis (sinus sagitalis superior),
- Aphasia,
- ataxia, chorea, hemianopsia,



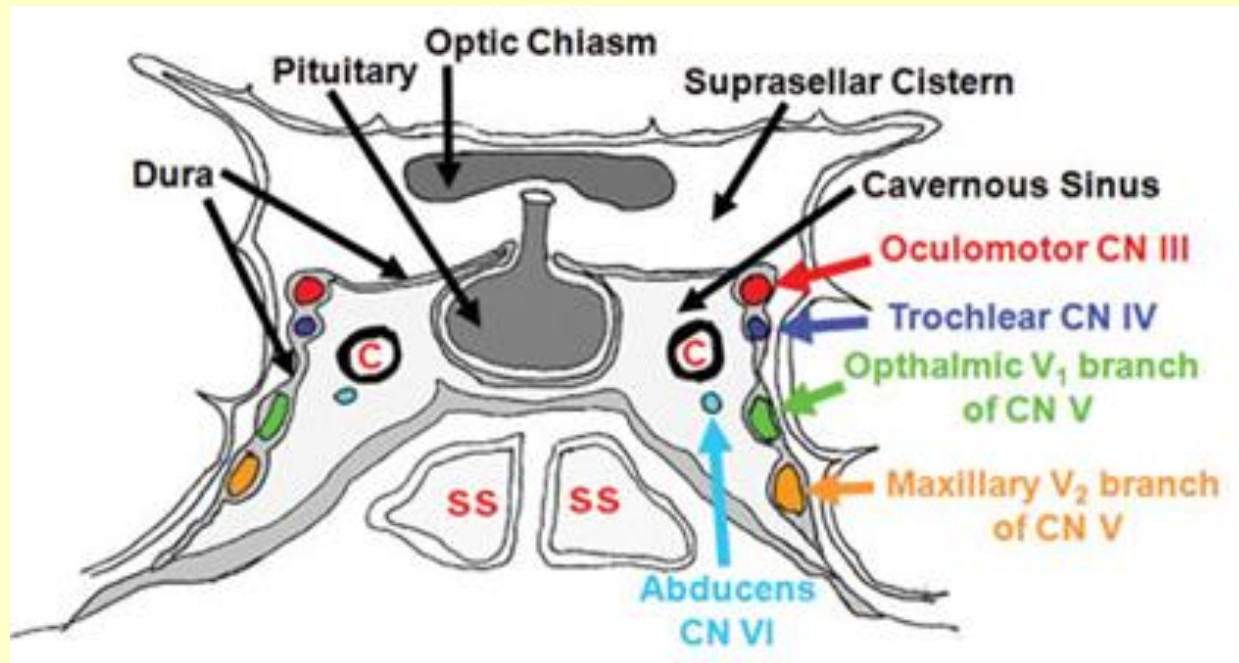


Cerebral venous thrombosis

Clinical feature

- Epileptic seizure
- Papil oedema
- Cranial nerve lesions - (n. VI, n. VII, n. VIII).
- syndrom foramen jugulare (n. IX – XII.)

Sinus cavernosus thrombosis (SC)

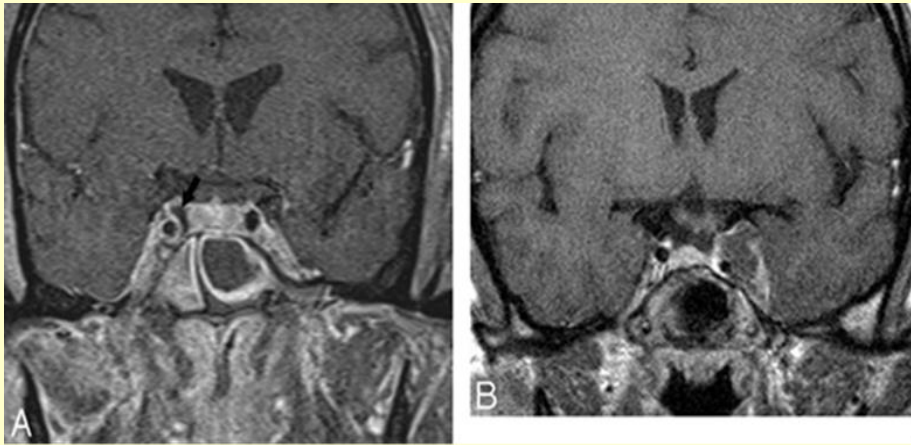


Sinus cavernosus thrombosis (SC)

- very rare, life-threatening condition that can affect adults and children.
- **Symptoms**
- Severe headache
- Swelling, redness, or irritation around one or both eyes
- Drooping eyelids
- Inability to move the eye
- High fever
- Pain or numbness around the face or eyes
- Fatigue
- Vision loss or double vision
- Seizures

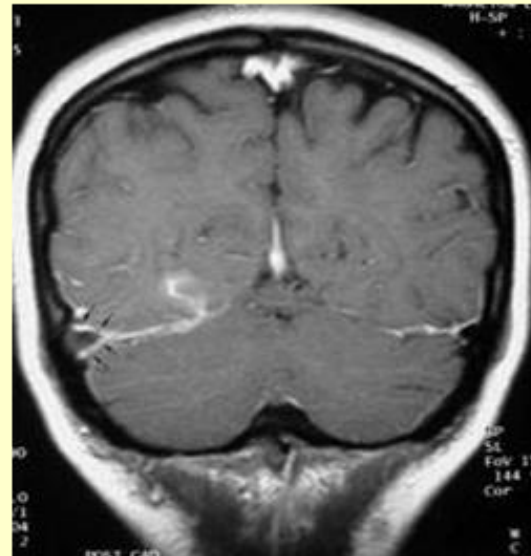


Sinus cavernosus thrombosis - MRI



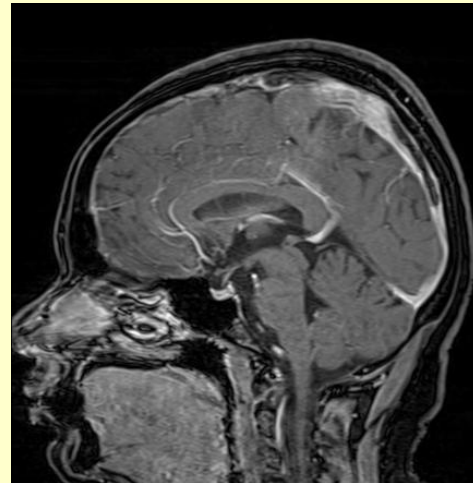
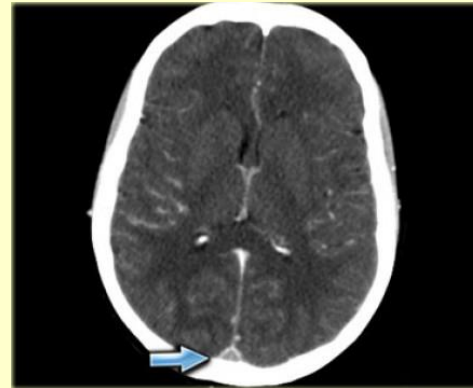
Sinus transversus thrombosis

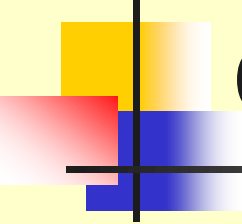
- Sy intracranial hypertension
-
- a temporal symptomatology



Sinus sagitalis superior thrombosis

- Spastic monoparesis of lower extremity
- Or spastic paraparesis of lower extremities
- Or unilateral hemiparesis





Cortical vein thrombosis

- Clinical feature
- Focal deficit – aphasia, hemiparesis, hemianopsy, hemianopsy,



Diagnosis

- Clinical feature – SIH
- Diagnosis – MRI with contrast
- CSF - proteino-cytologic association, in 10 % - CSF negative
- Etiology



Treatment

- Anticoagulants iv, or sc (heparin, alebo LMWH)
- After stabilization – p.o. anticoagulants (Warfarin) INR 2,0 – 2,5 for 6 months, when thrombophilia is present – long lasting
- When there is no effect of heparin – rTPA
- Antibiotics (ceúhalosporins)
- Symptomatic treatment (antiedematous treatment, antiepileptics)