

Neuroradiologische Diagnostik und Therapie

Zerebrale Ischämien

Neuroradiologie



Konventionelles
Röntgen



Computertomographie

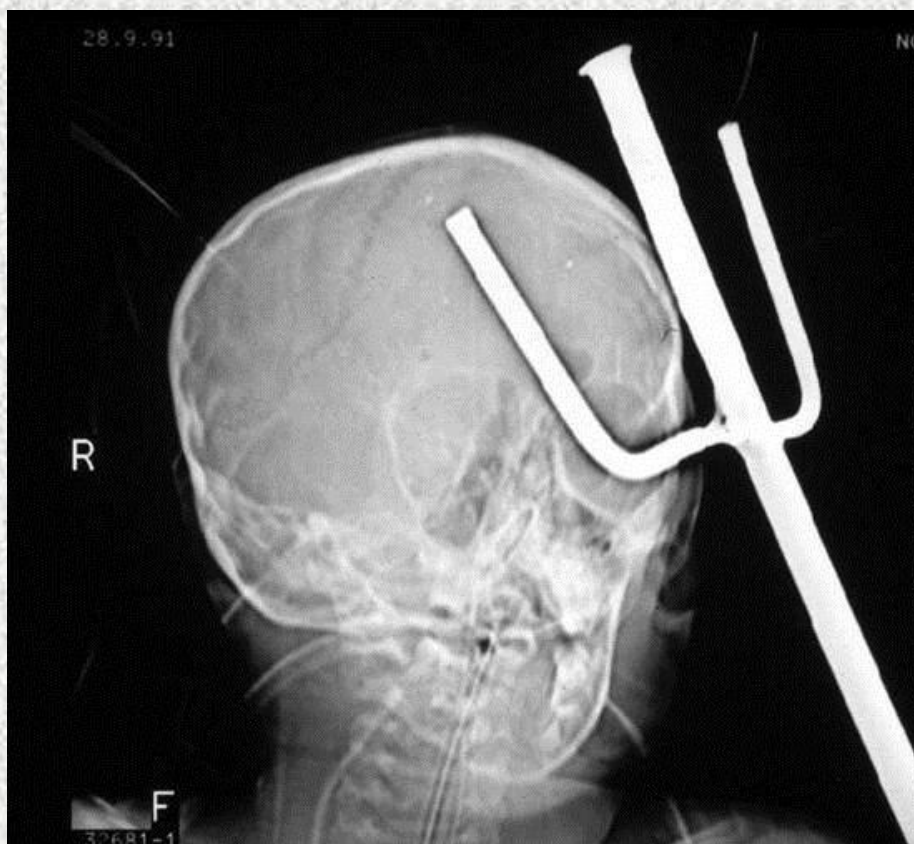


Magnetresonanztomographie



Digitale Subtraktions-
angiographie

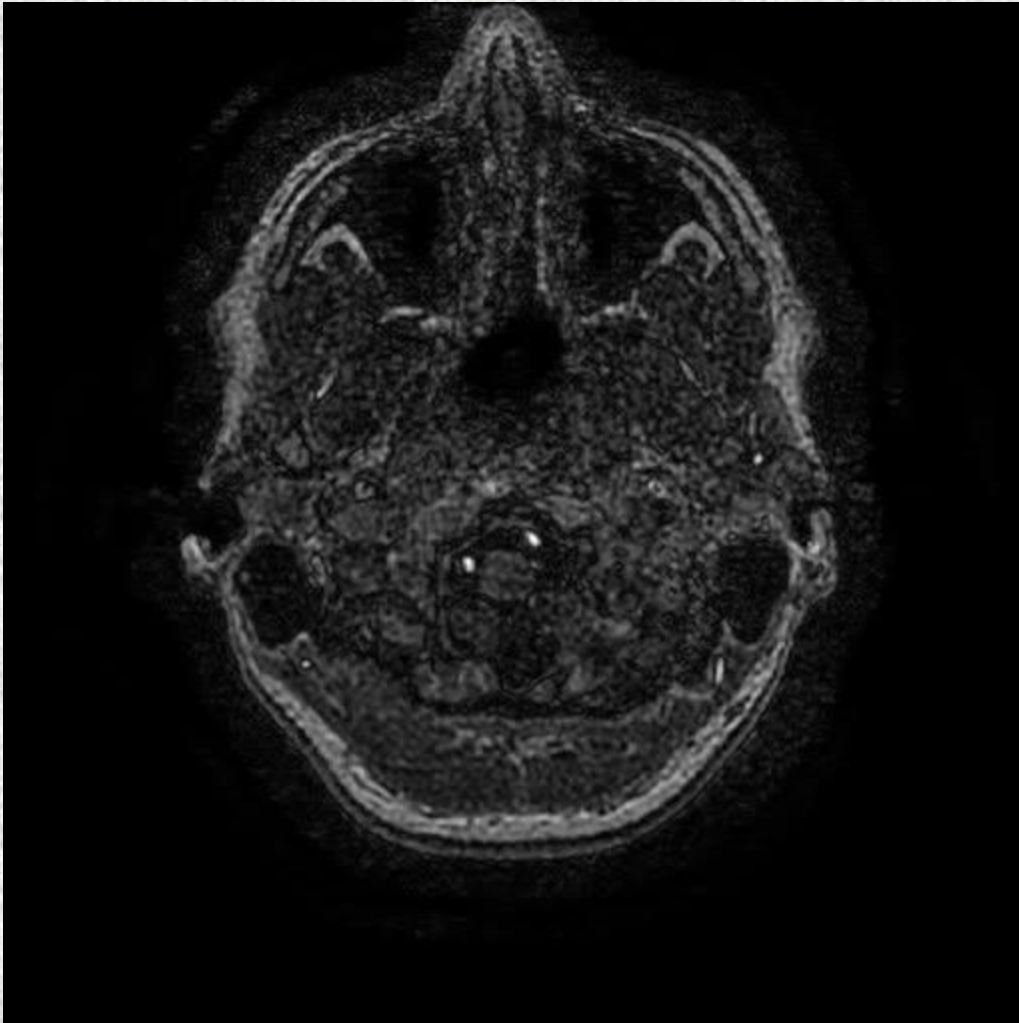
Warum kein „konventionelles“ Röntgen ?



Transorbital eingedrungene
Baustellen-Halterung bei Skateboardfahrer

Peter Schramm, Institut für Neuroradiologie

Neuroradiologie



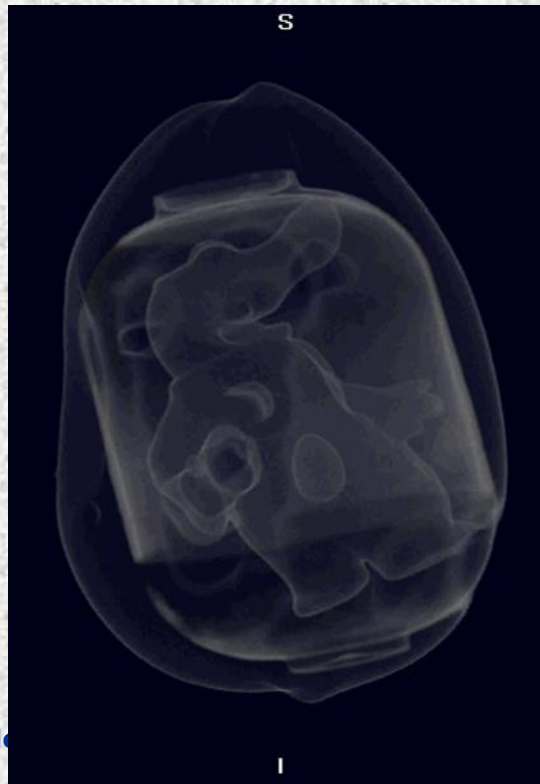
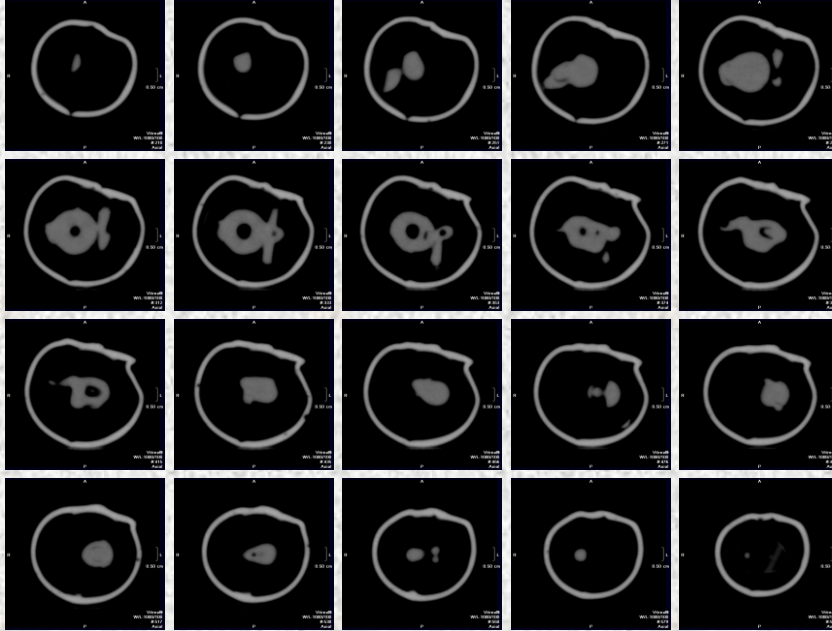
Schnittbildverfahren:

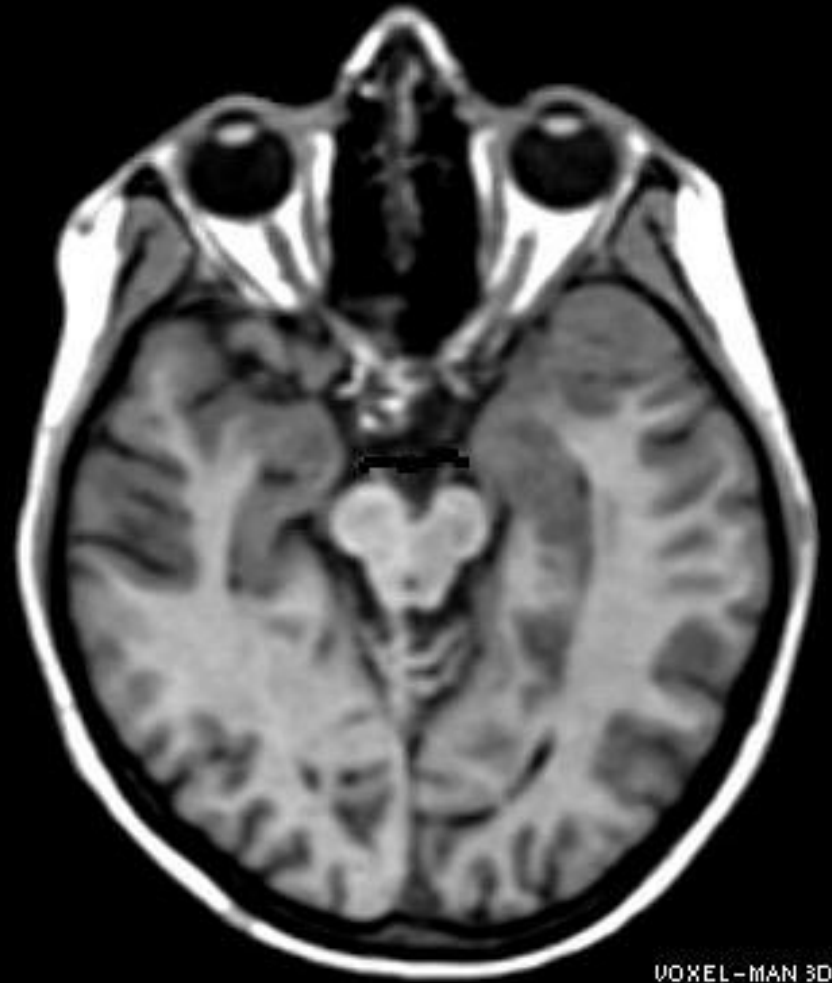
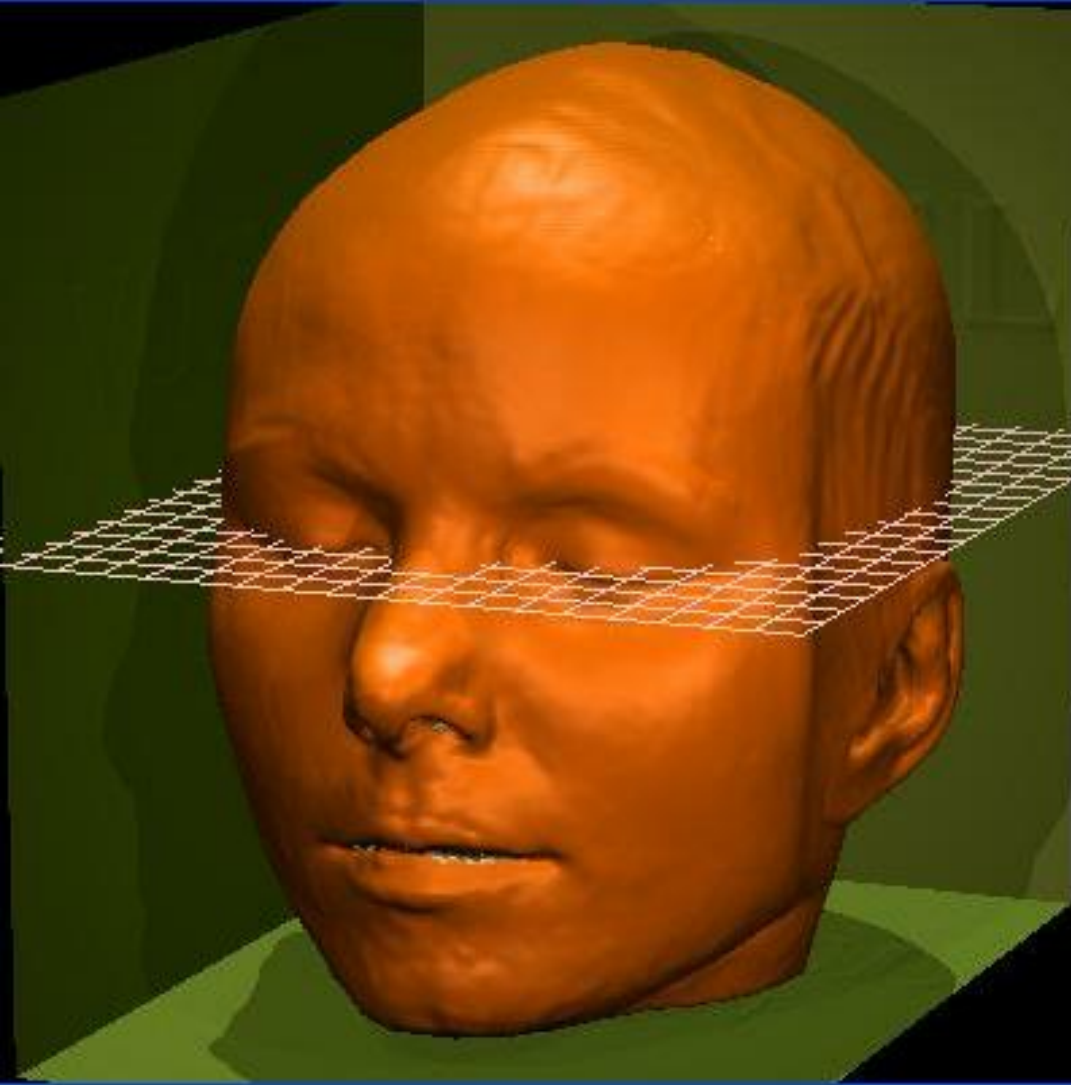
CT

MRT



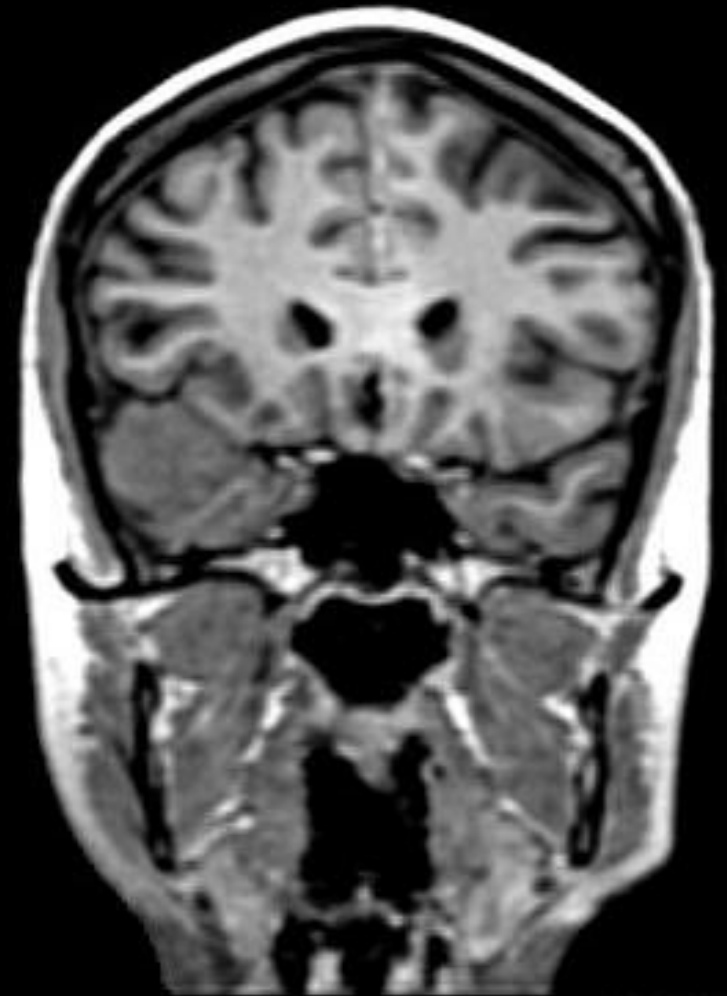
3D-Bilddatensätze



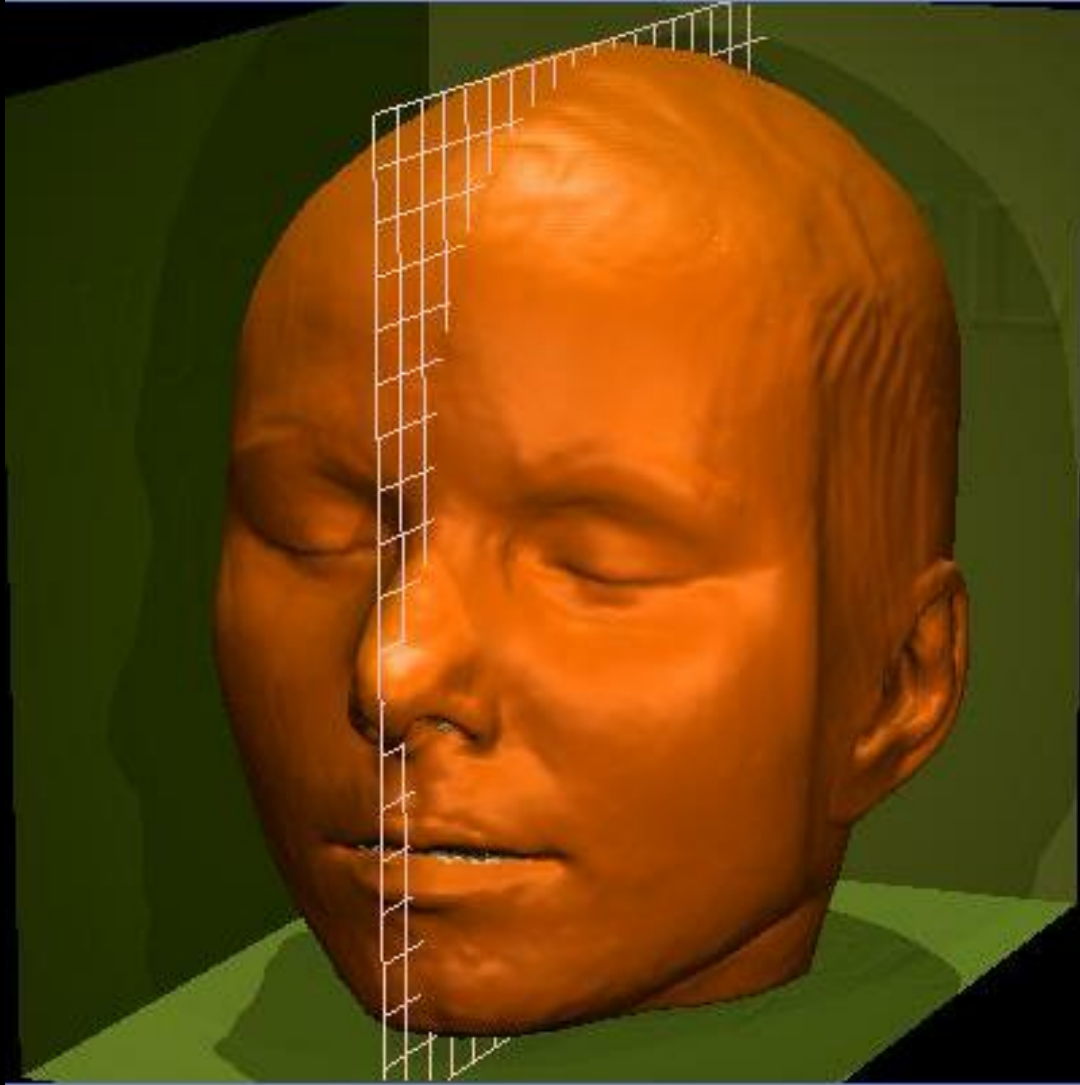


VOXEL-MAN 3D-Navigator

„axial“ oder „transversal“



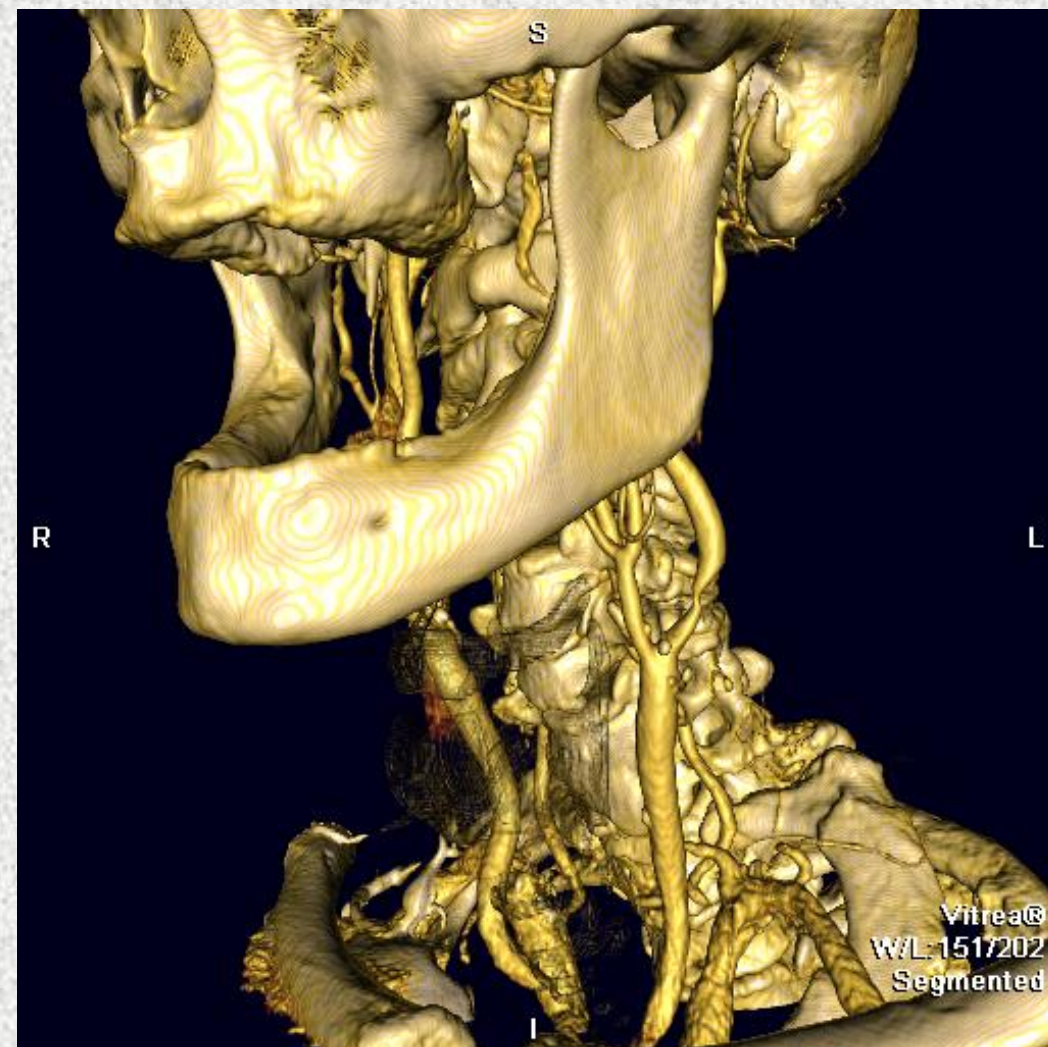
„coronar“

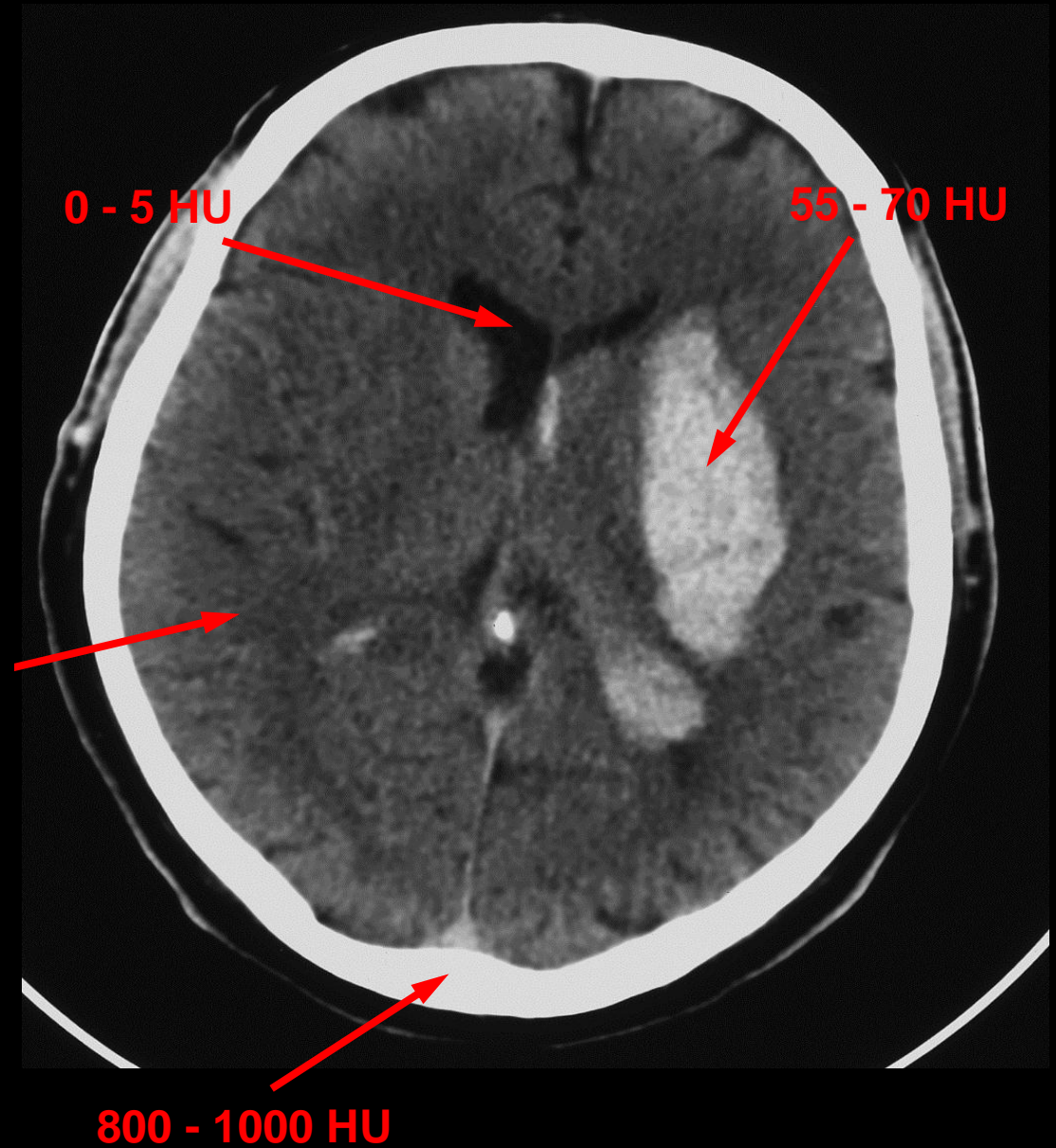
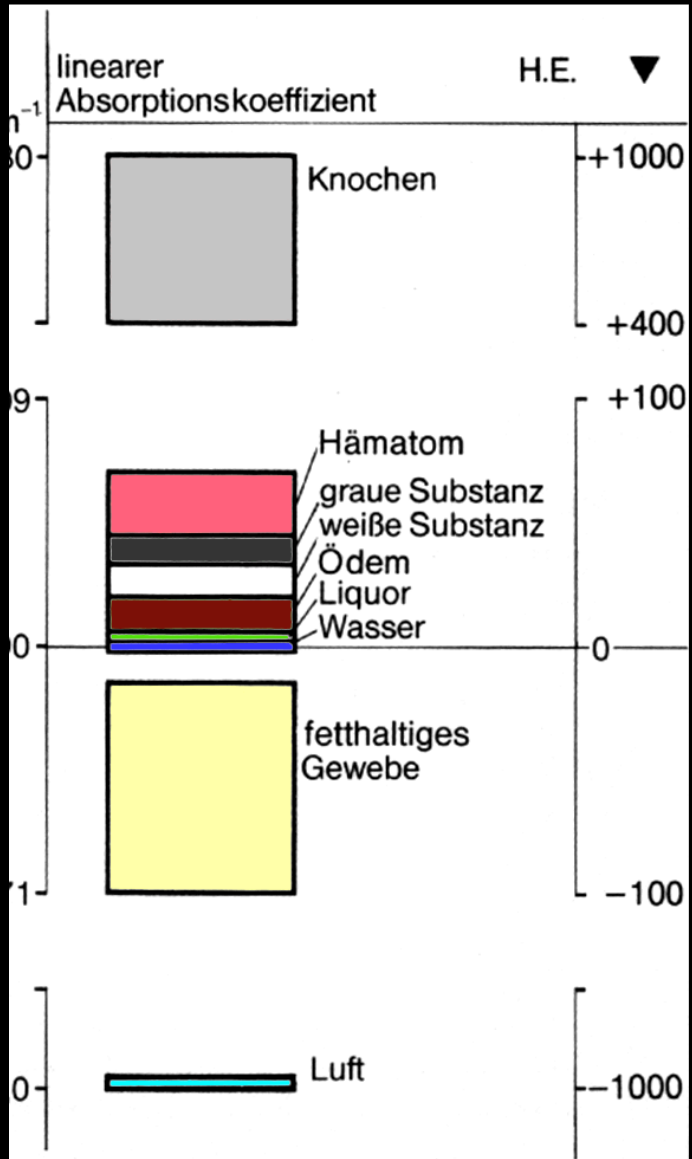


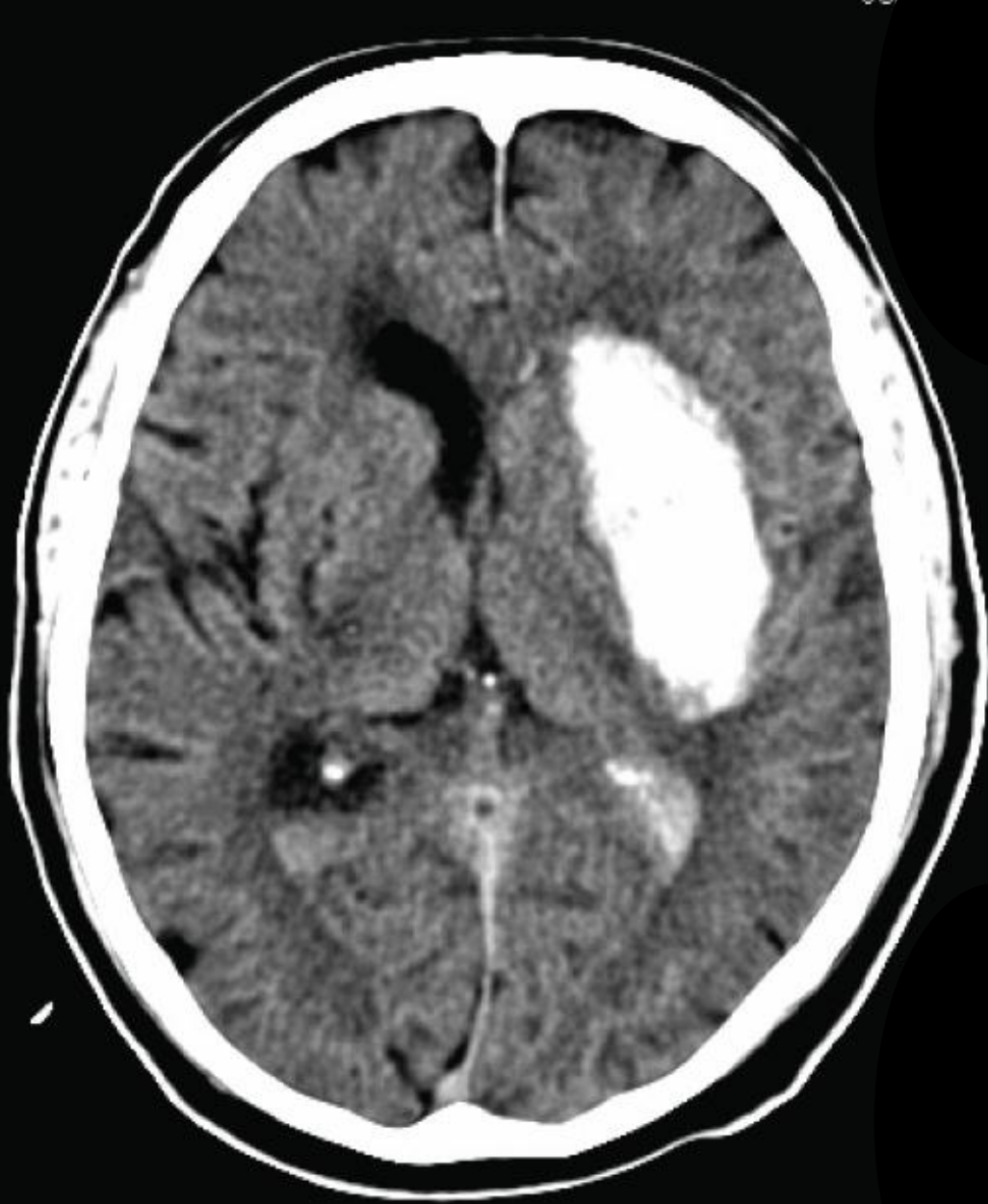
„sagittal“

3D-Rekonstruktionen

- zur Befunderstellung
- zur Befundveranschaulichung/-kommunikation



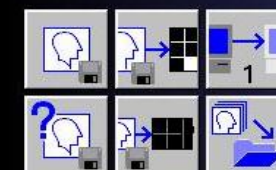
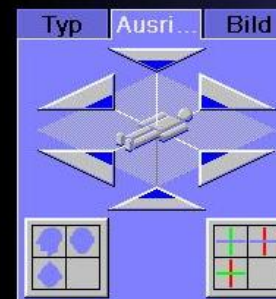
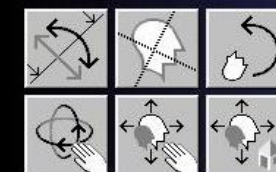
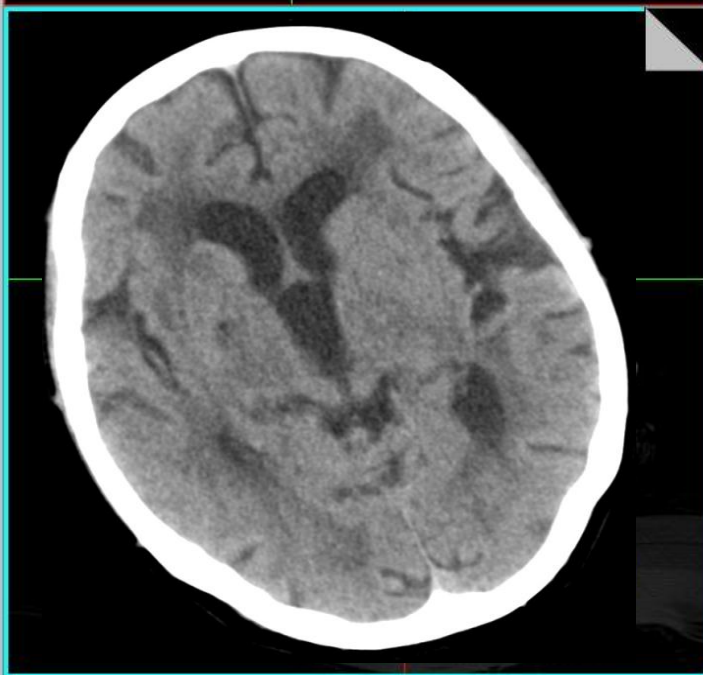
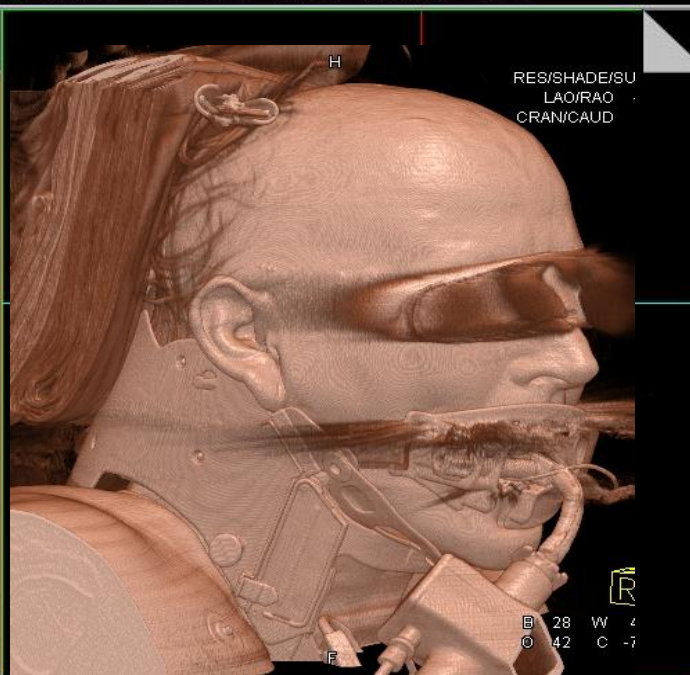




„hyperdens“



„hypodens“



Viewer

Filmen

3D

MRT: Grundliegende Signalphänomene

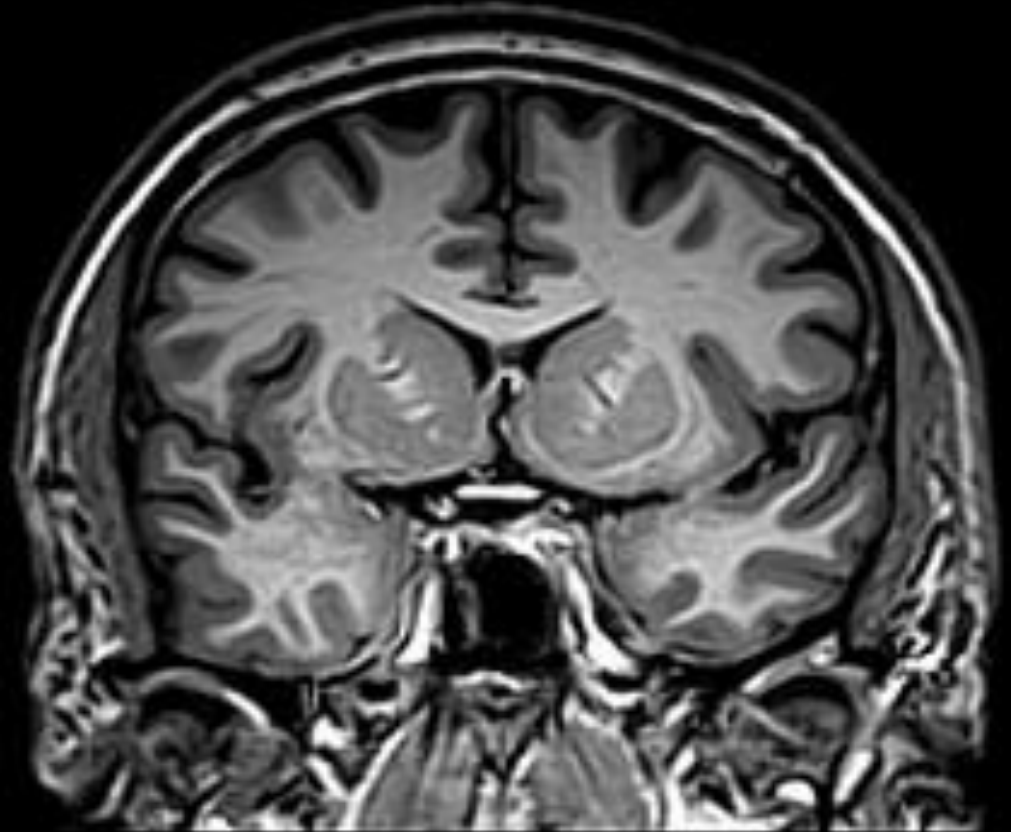
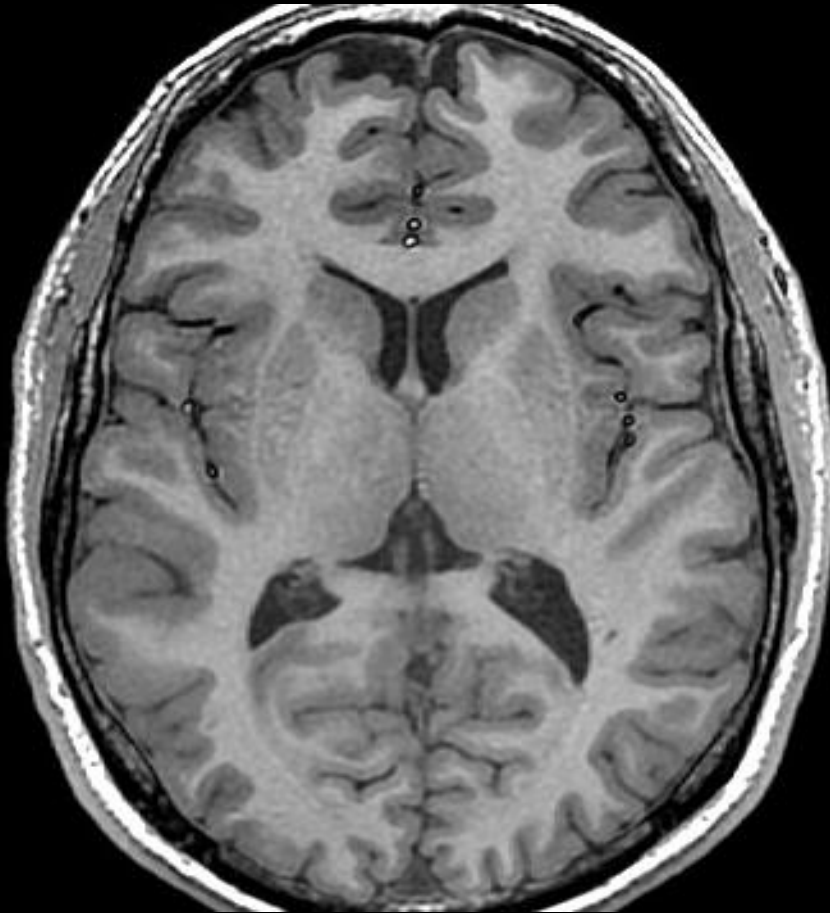


UNIVERSITÄT ZU LÜBECK

	T1	T2
Hohes Signal = <i>hyper</i> intens	Fett KM-Enhancement Methämoglobin	Liquor Ödem Methämoglobin
Niedriges Signal = <i>hypo</i> intens	Liquor	Kalk Luft Hämosiderin

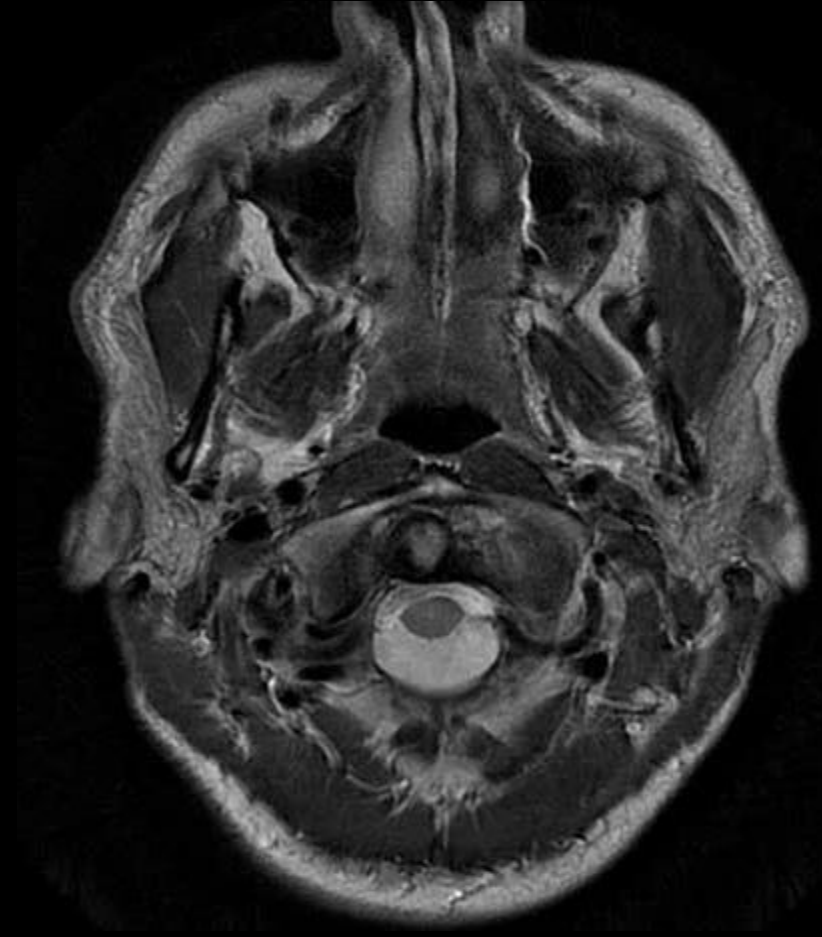
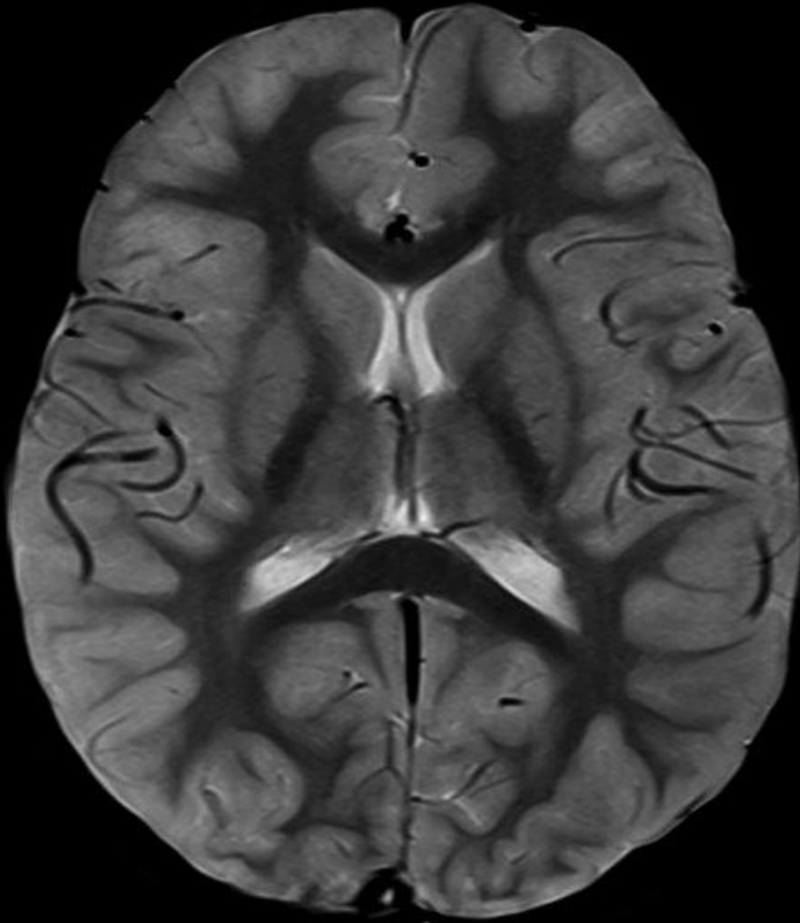
MRT: Sequenzen

T1



MRT: Sequenzen

T2



Niemals vergessen !

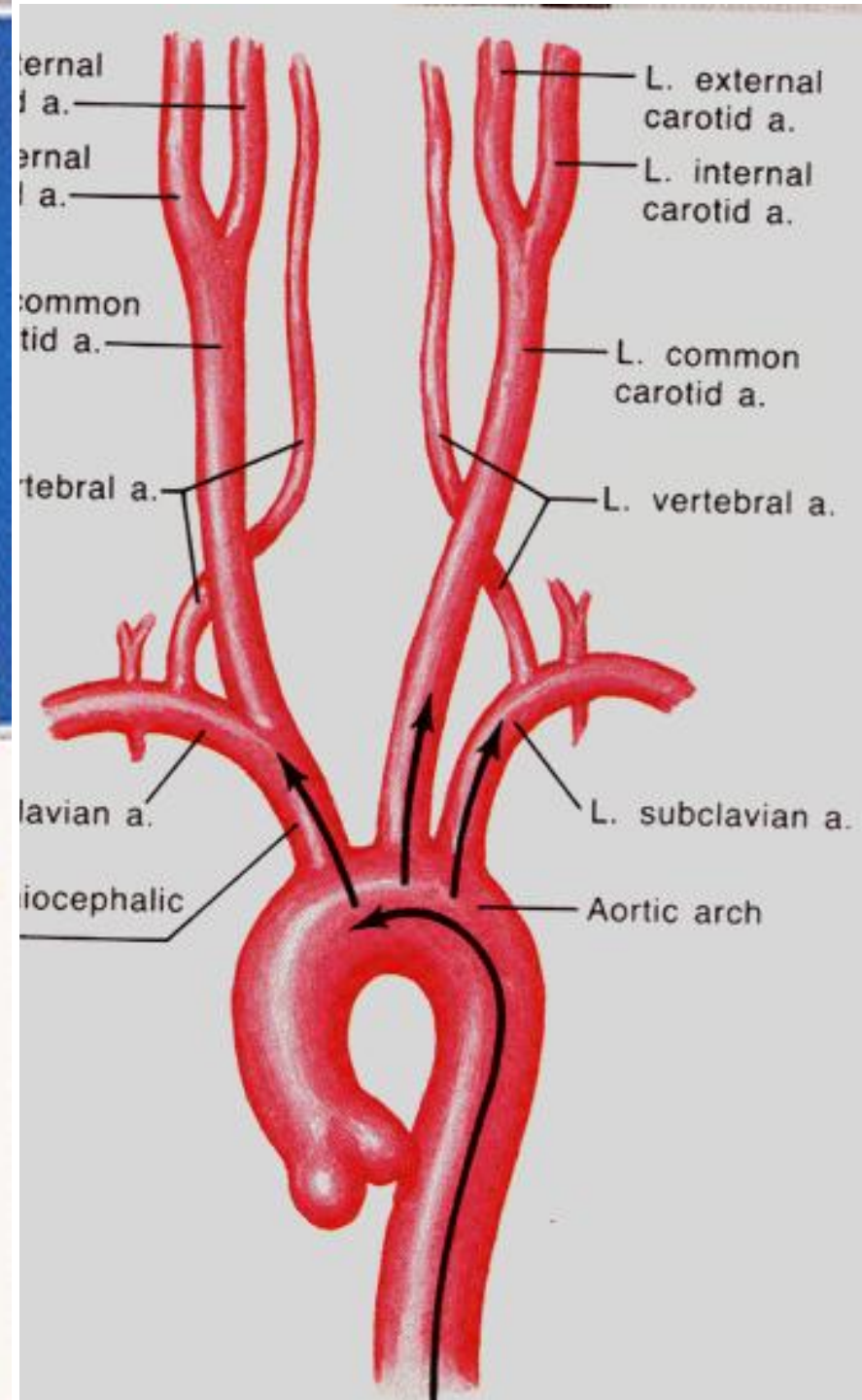
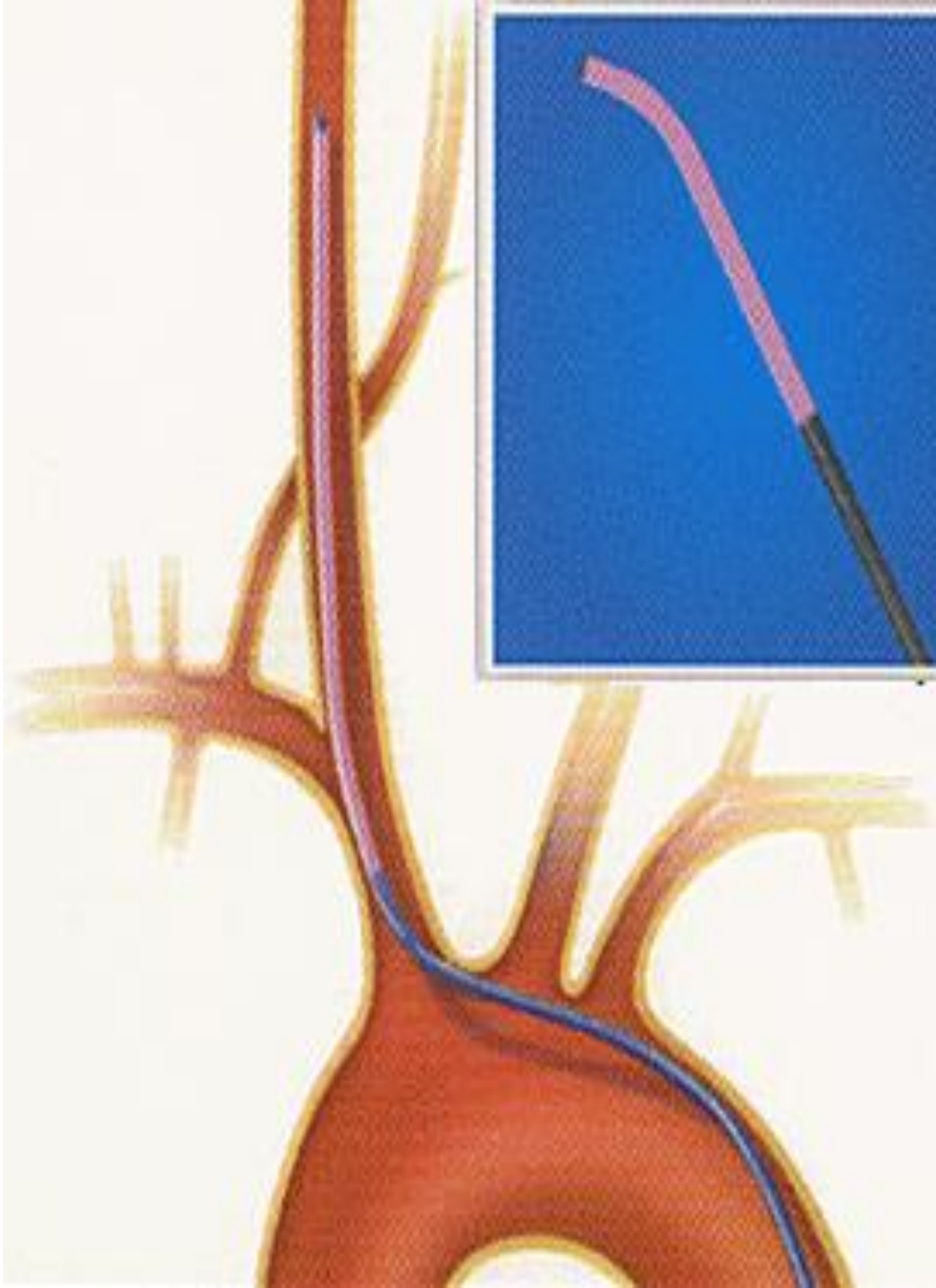


Das statische Magnetfeld B_0 ist IMMER angeschaltet !!!

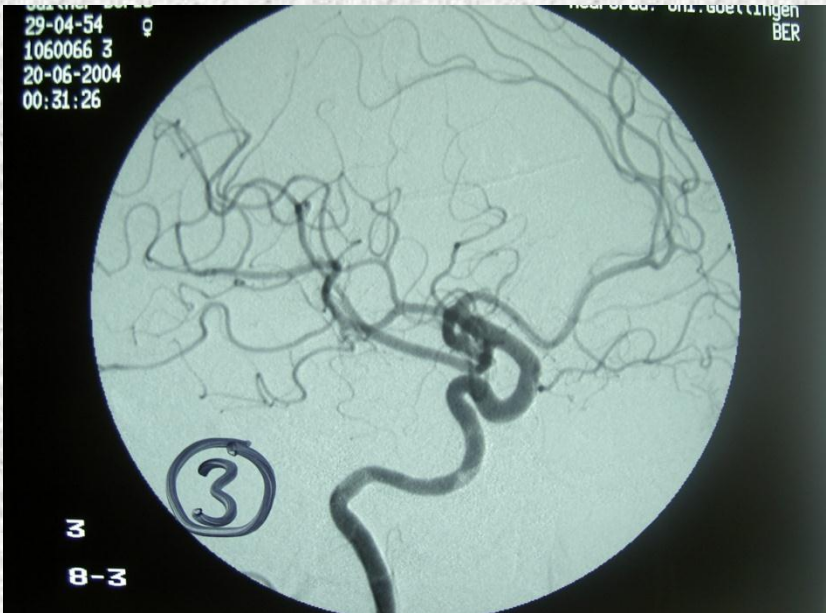
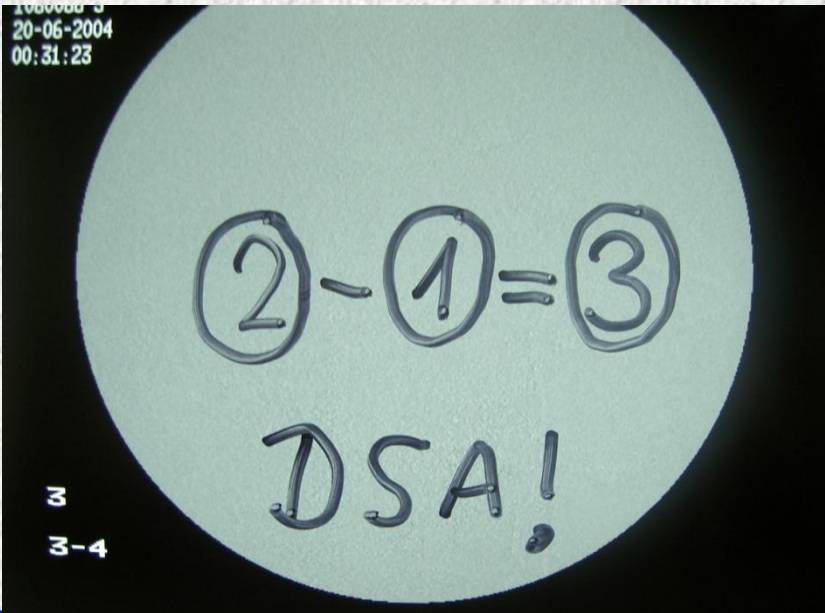
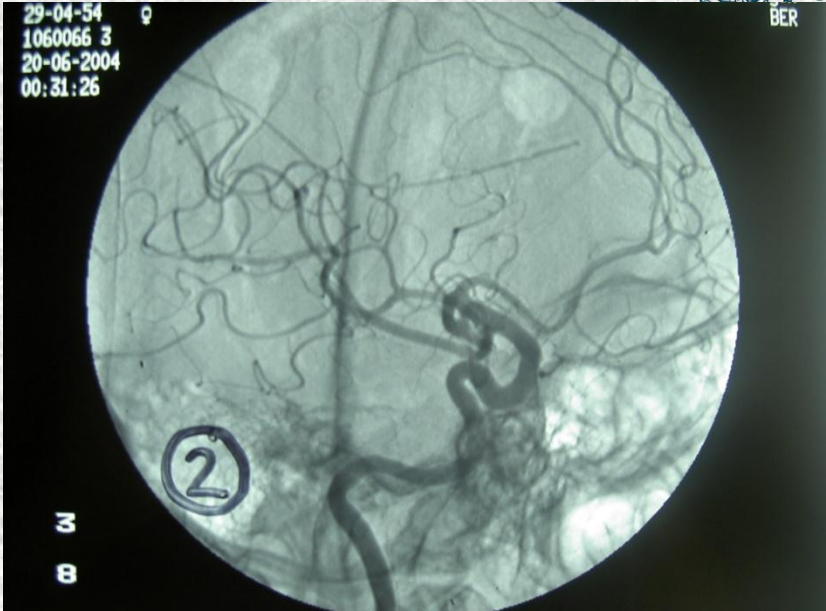
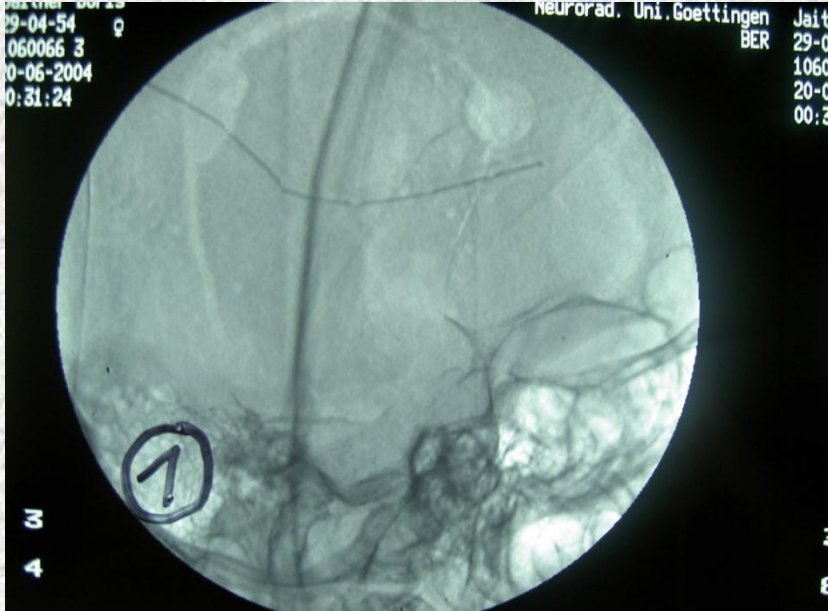
Digitale Subtraktionsangiographie

- Invasives diagnostisches Verfahren
- Basis für interventionelle neuroradiologische Therapien





Digitale Subtraktionsangiographie



Aortenbogen-Darstellung



Darstellung bei Injektion
der A. carotis communis





A. carotis interna

Peter Schramm, Institut für Neuroradiologie



A. vertebralis

Zerebrale Ischämie

Schlaganfall: Pathophysiologie



- Lage / Dauer des Verschlusses
- Ausmaß der Flussreduktion
- Anastomosen

Penumbra minderperfundiertes aber noch vitales Gewebe

Kerninfarkt irreversibel geschädigtes Gewebe

CBF > 20 ml / 100 g / min

CBF zwischen 10 und 20 ml / 100 g / min

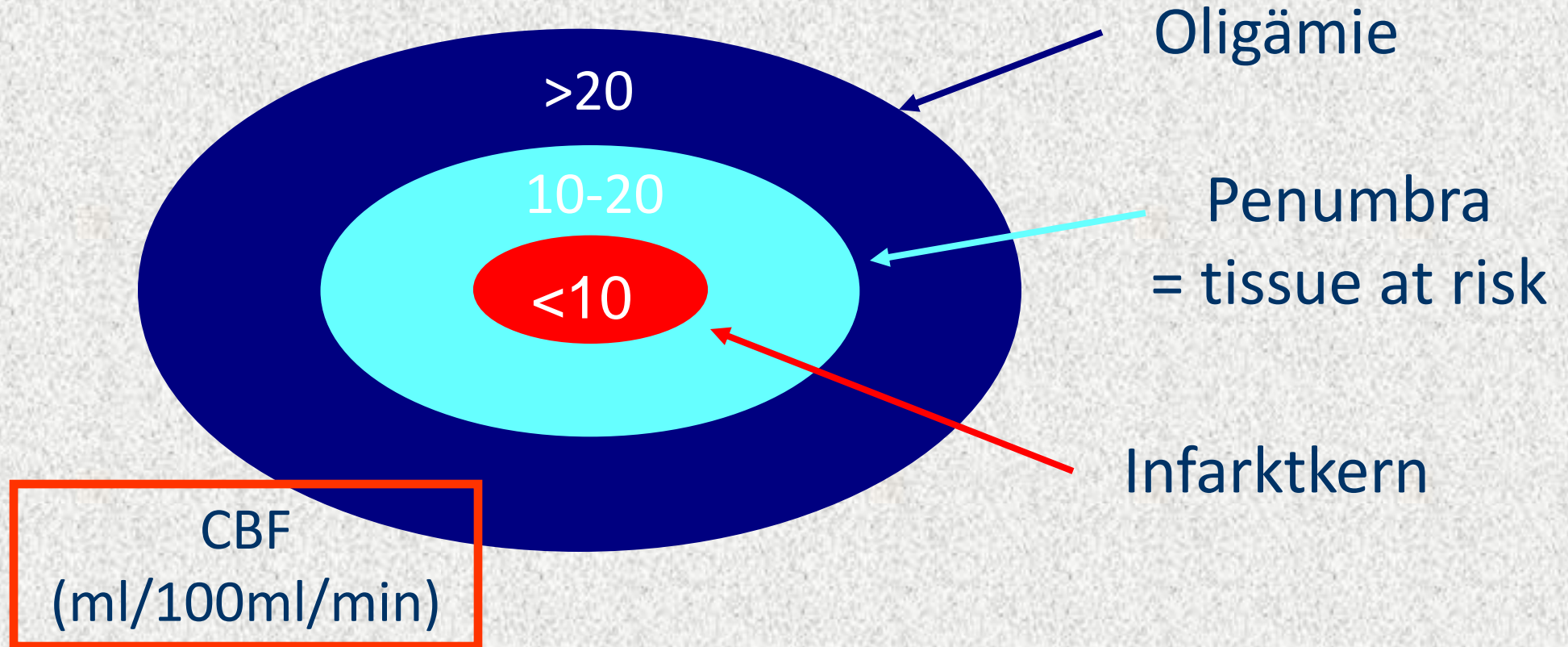
CBF < 10 ml / 100 g / min

Normal

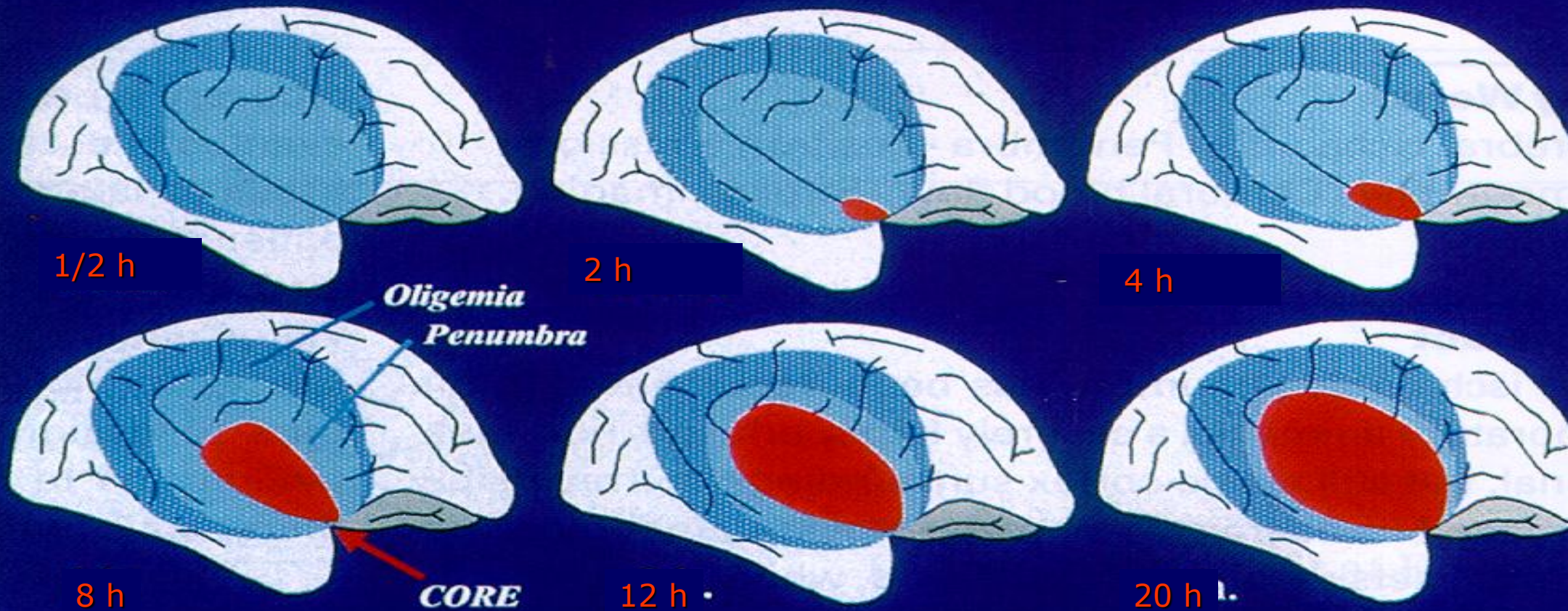
Penumbra

Kern

Das Penumbra-Konzept



Das Penumbra-Konzept

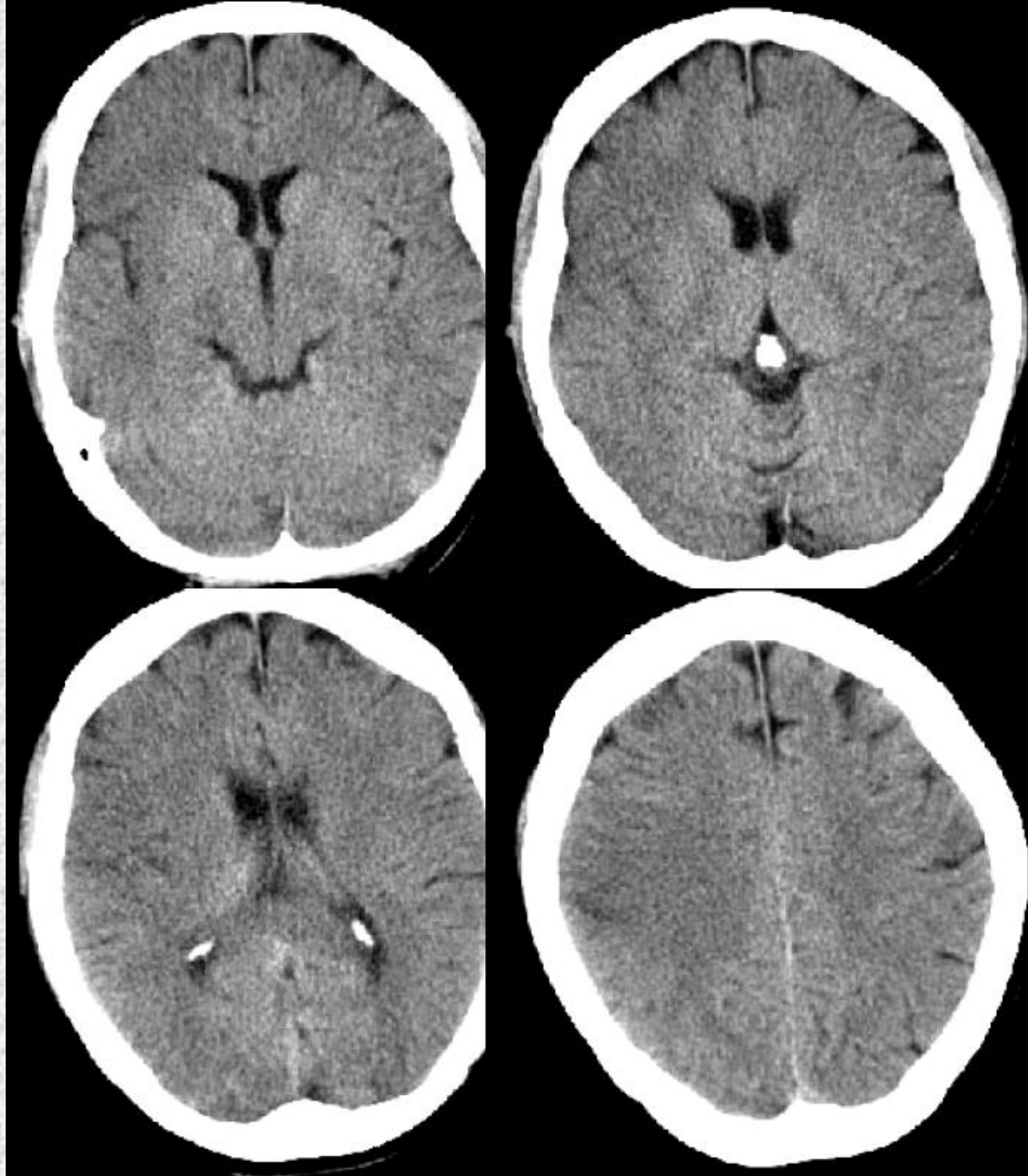


Baron, Cerebrovasc Diseases 1999

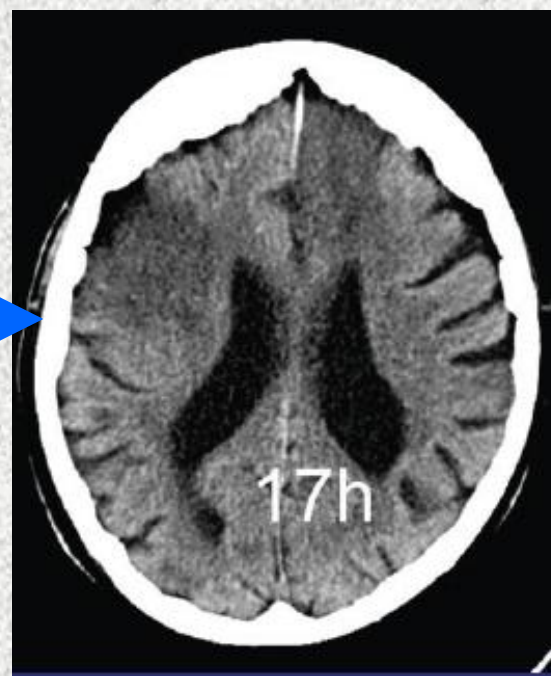
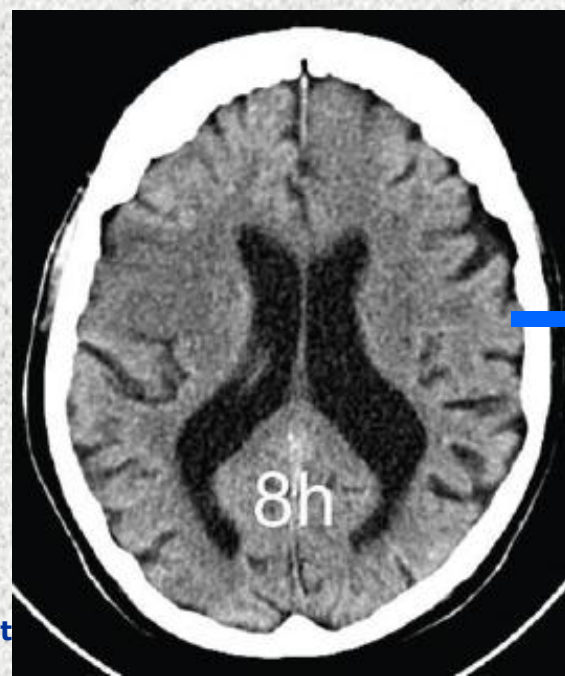
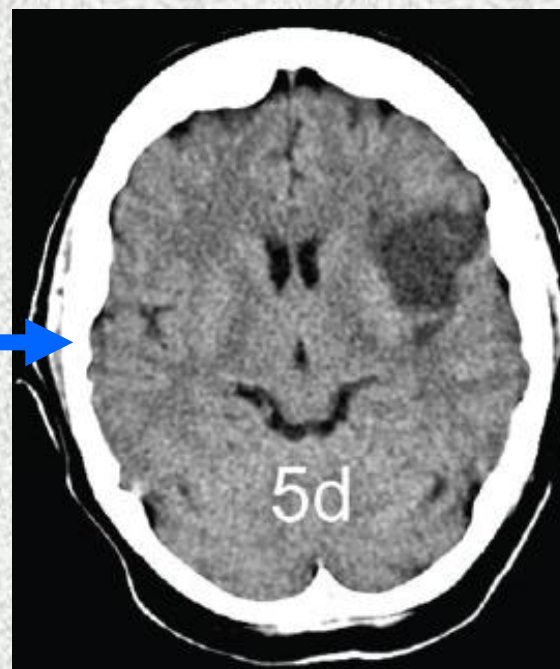
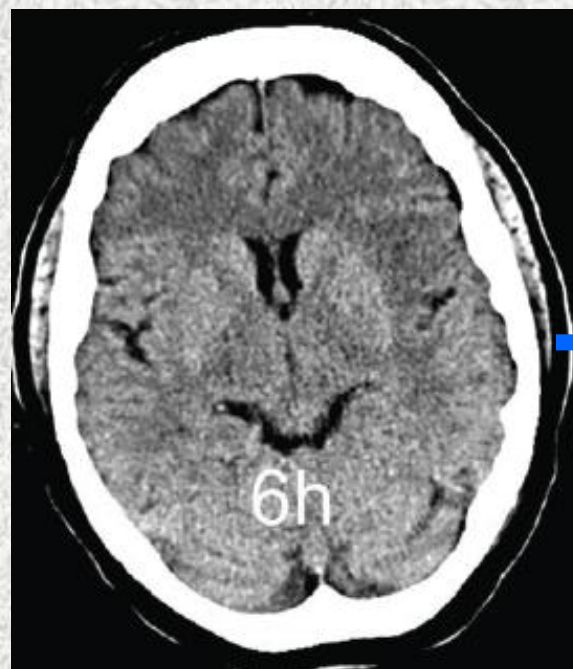
CT-Frühzeichen des Hirninfarktes

- hyperdenses Gefäßzeichen
- Hypodensität der grauen Substanz
- verstrichene Furchen

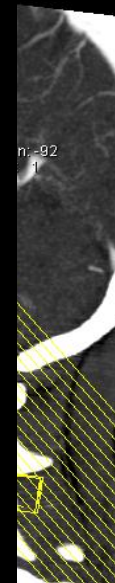
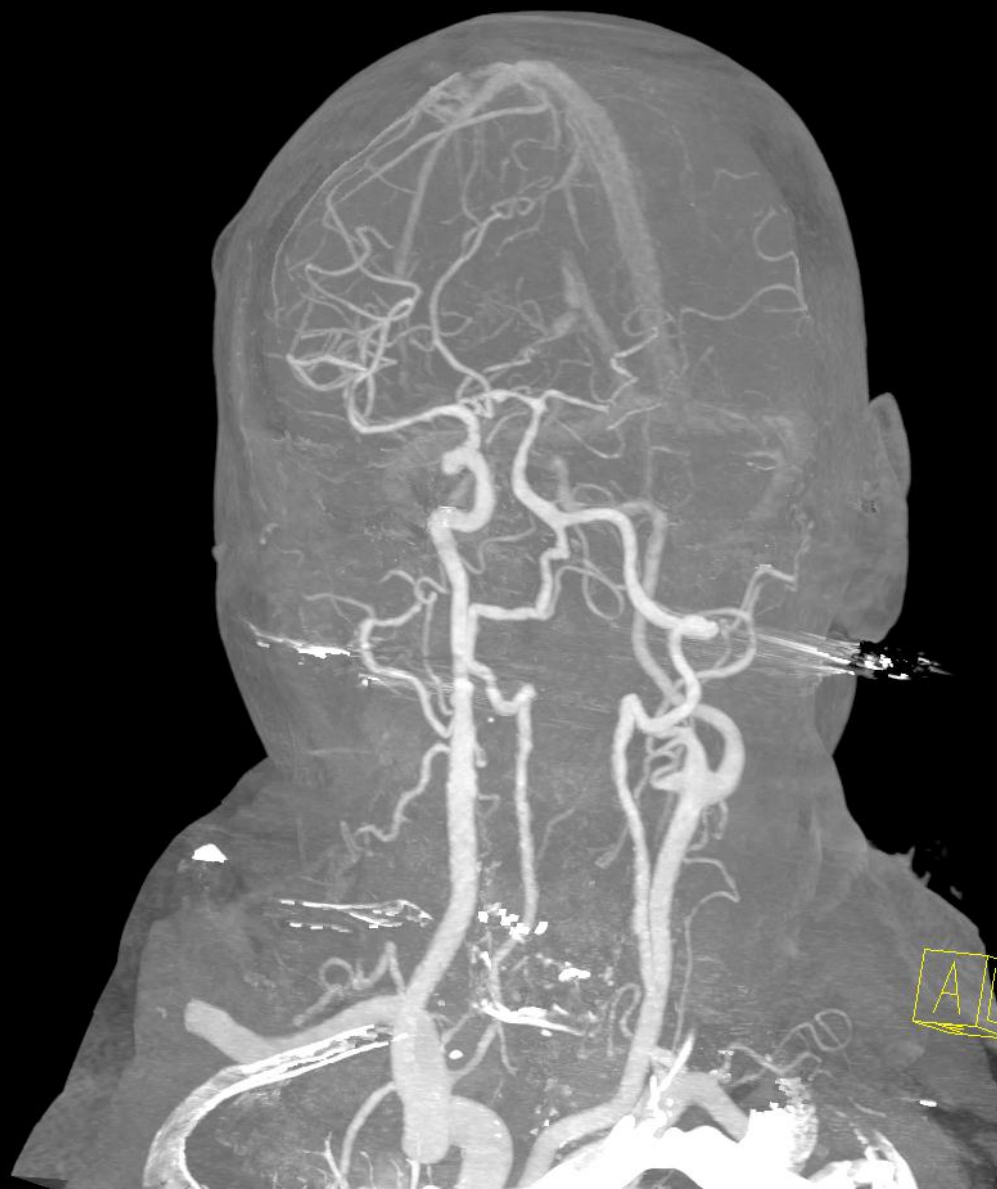
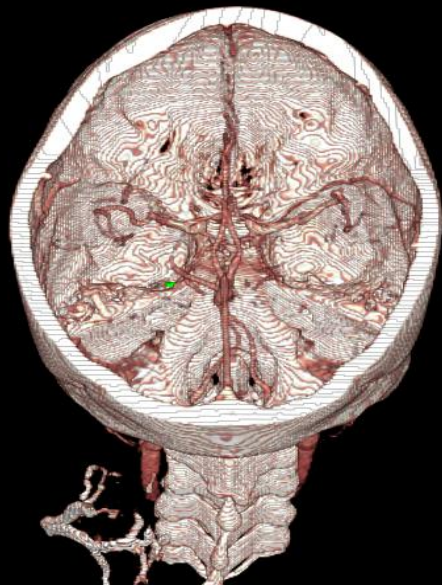




Frühzeichen: Wo ist der Schlaganfall?



CT-Angiographie der intrakraniellen Arterien



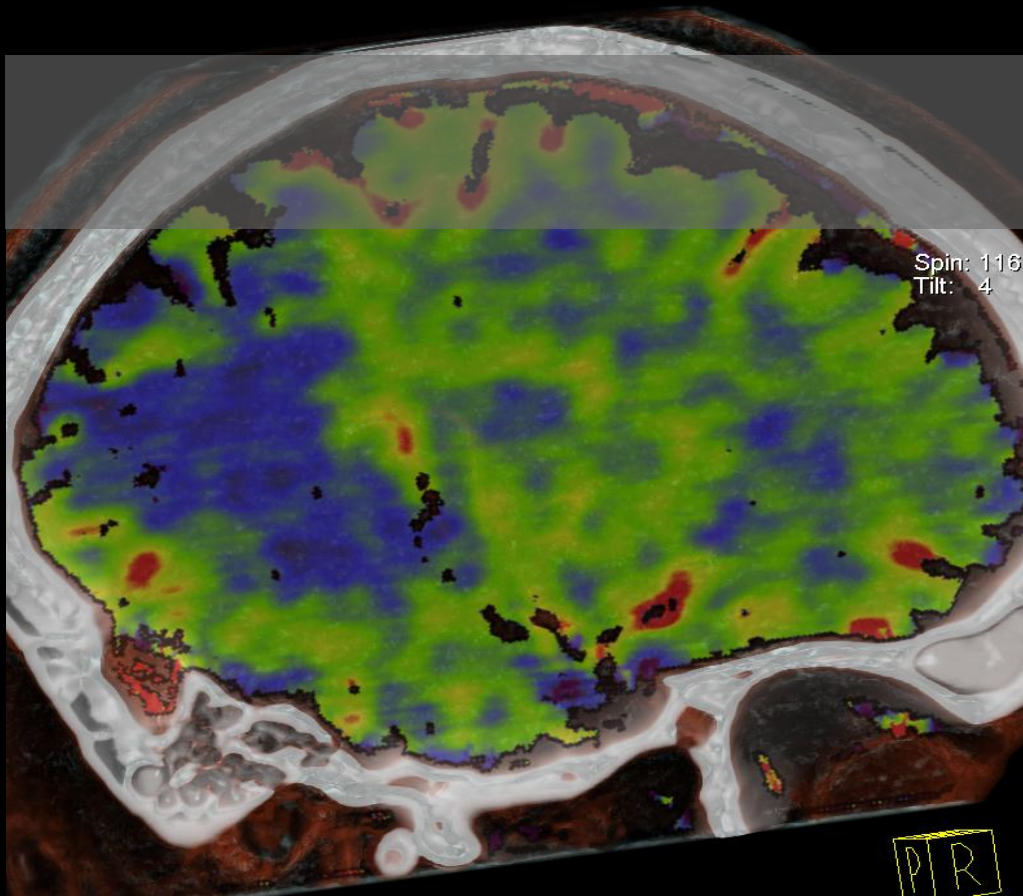
in: -92
t: -42

A/L

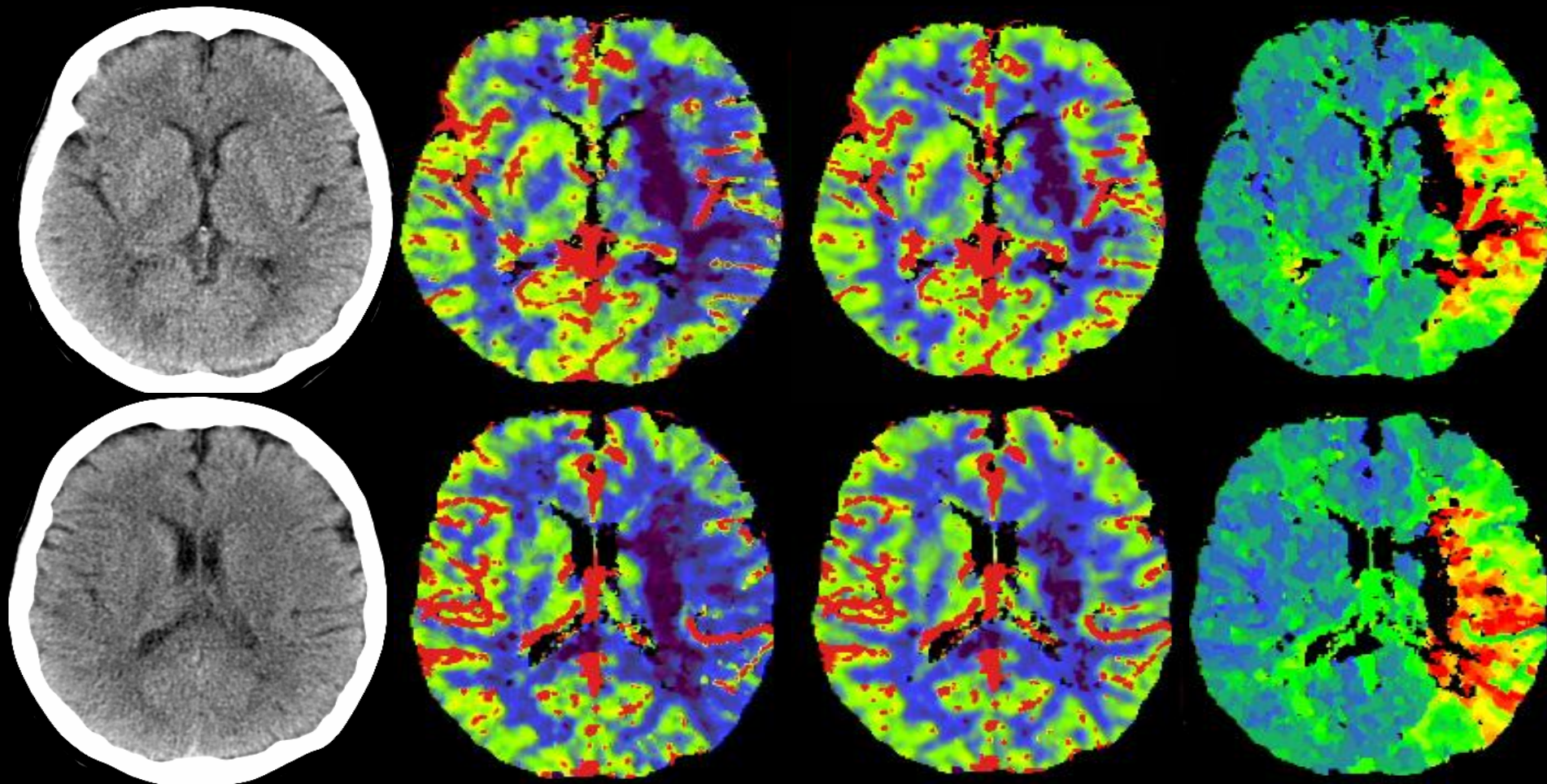


4D-Spirale zur Messung der zerebralen Perfusion

Darstellung des gesamten Gehirns



61j, HP rechts seit 3 h

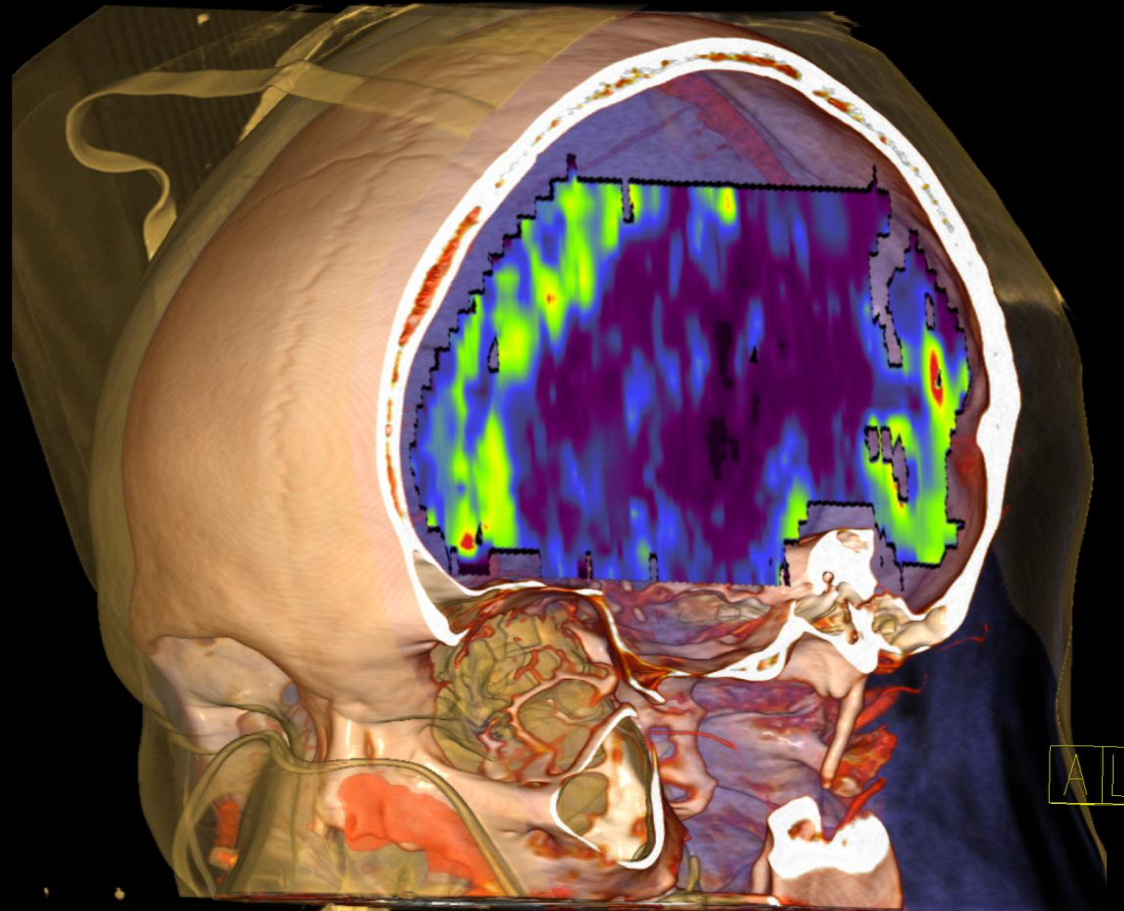
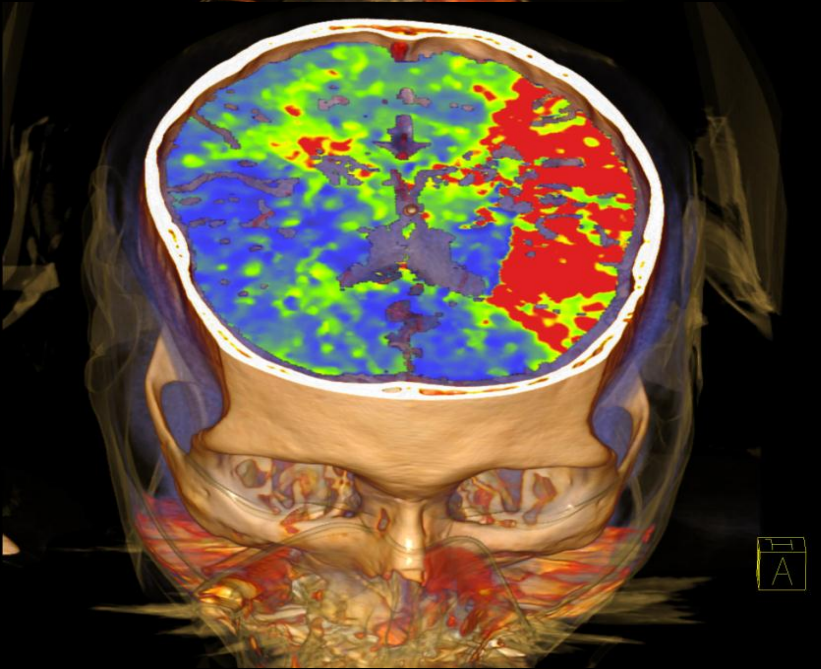
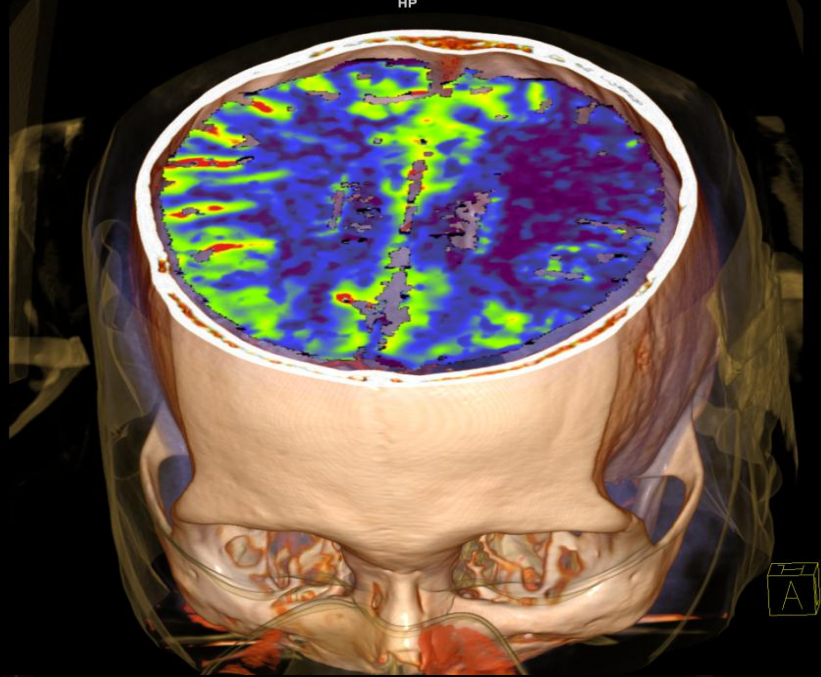


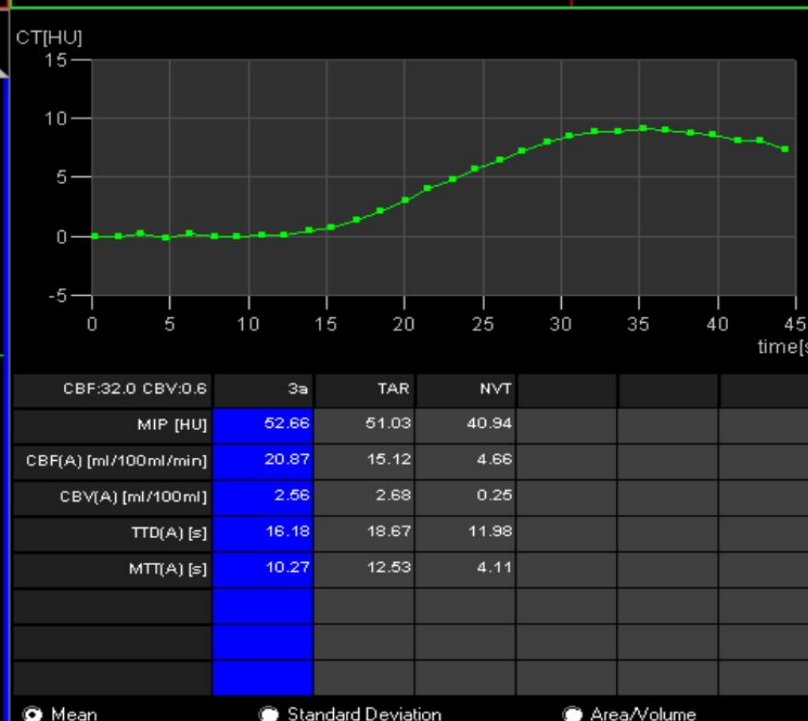
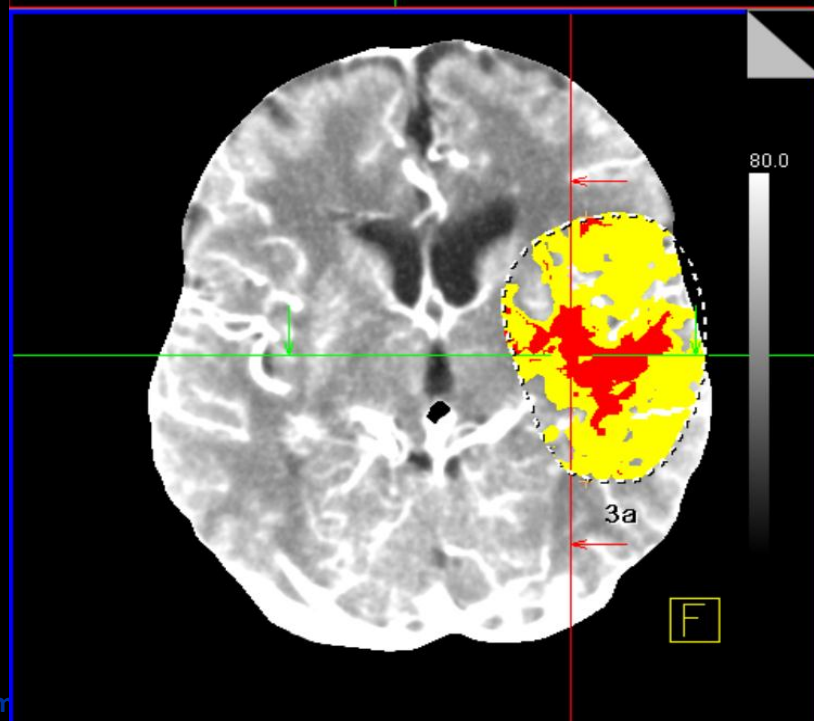
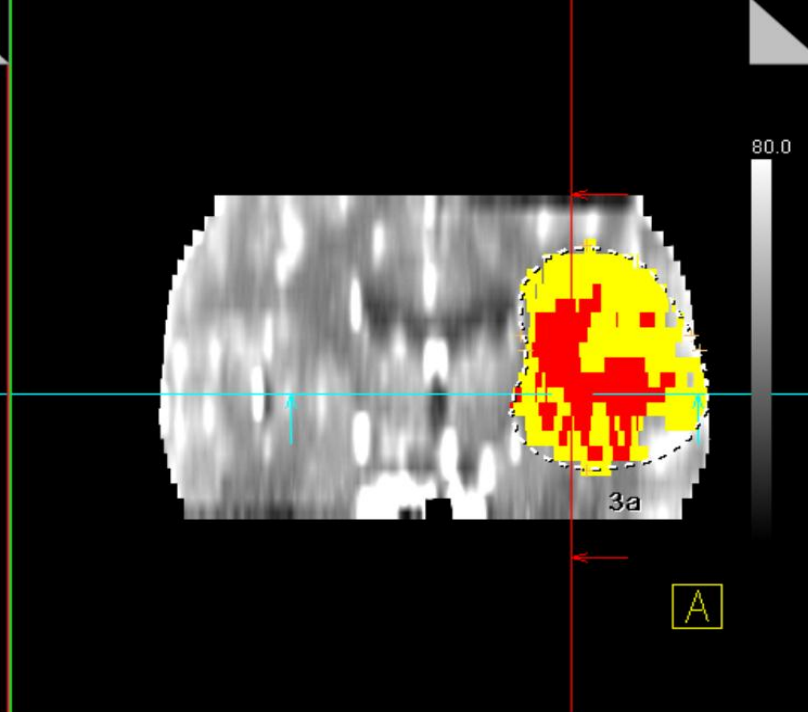
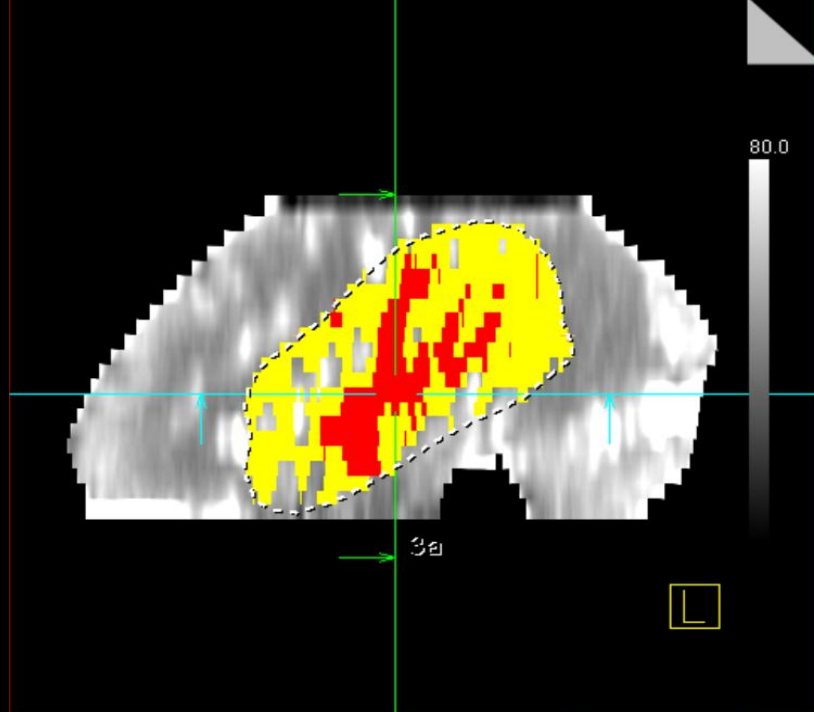
NECT

PCT CBF

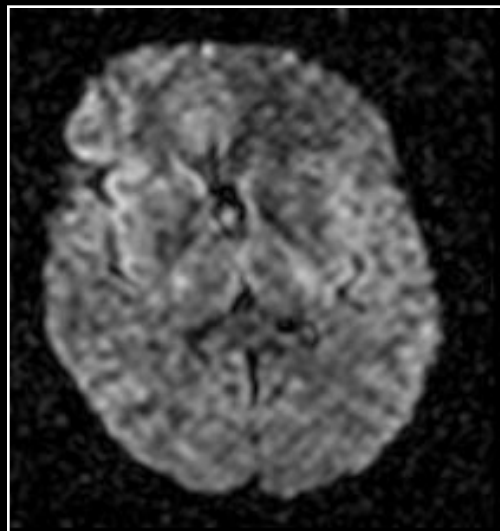
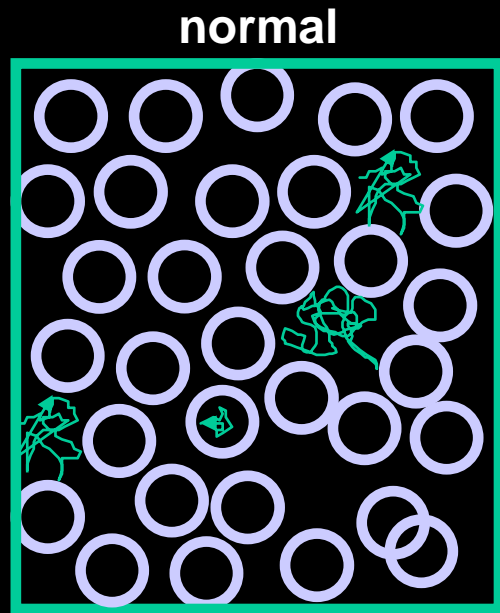
PCT CBV

PCT TTP





Diffusionsgewichtetes MRT (DWI):

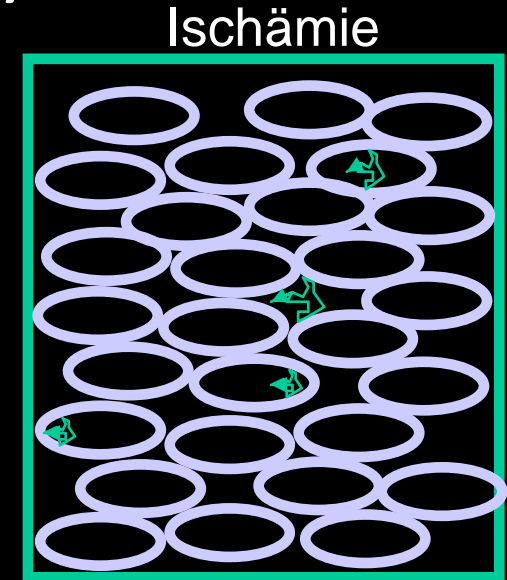


Ischämie
↓
**Zytotoxisches Ödem;
Wassereinstrom in Zelle**

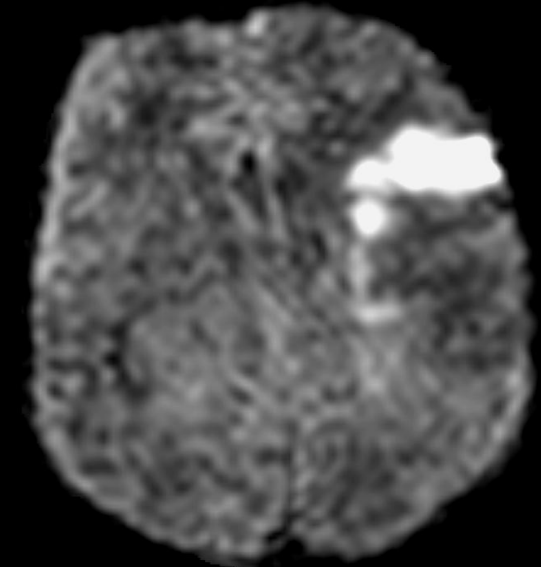
IZR ↑ EZR ↓

**Extrazelluläre Brownsche
Molekularbewegung**

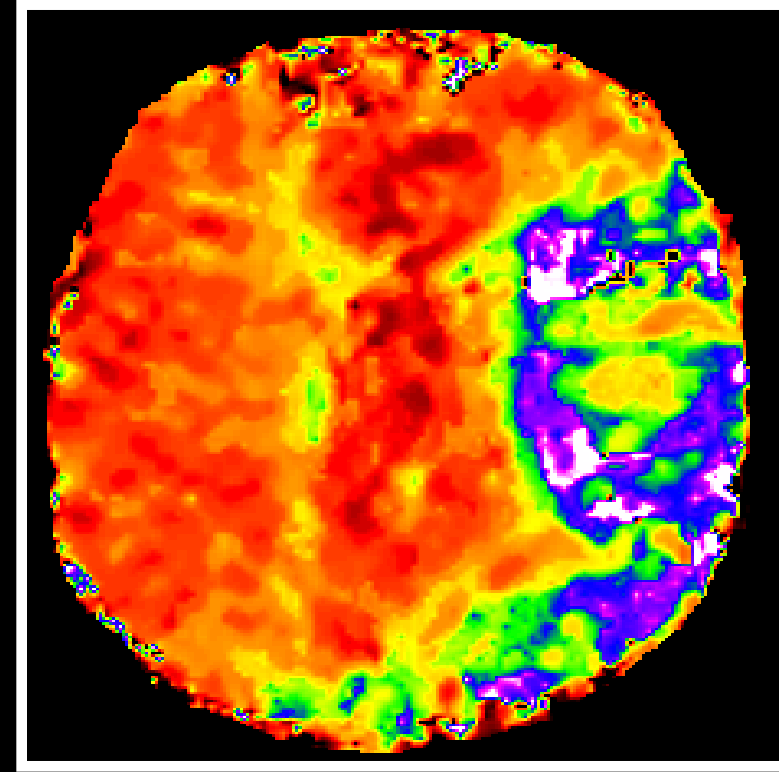
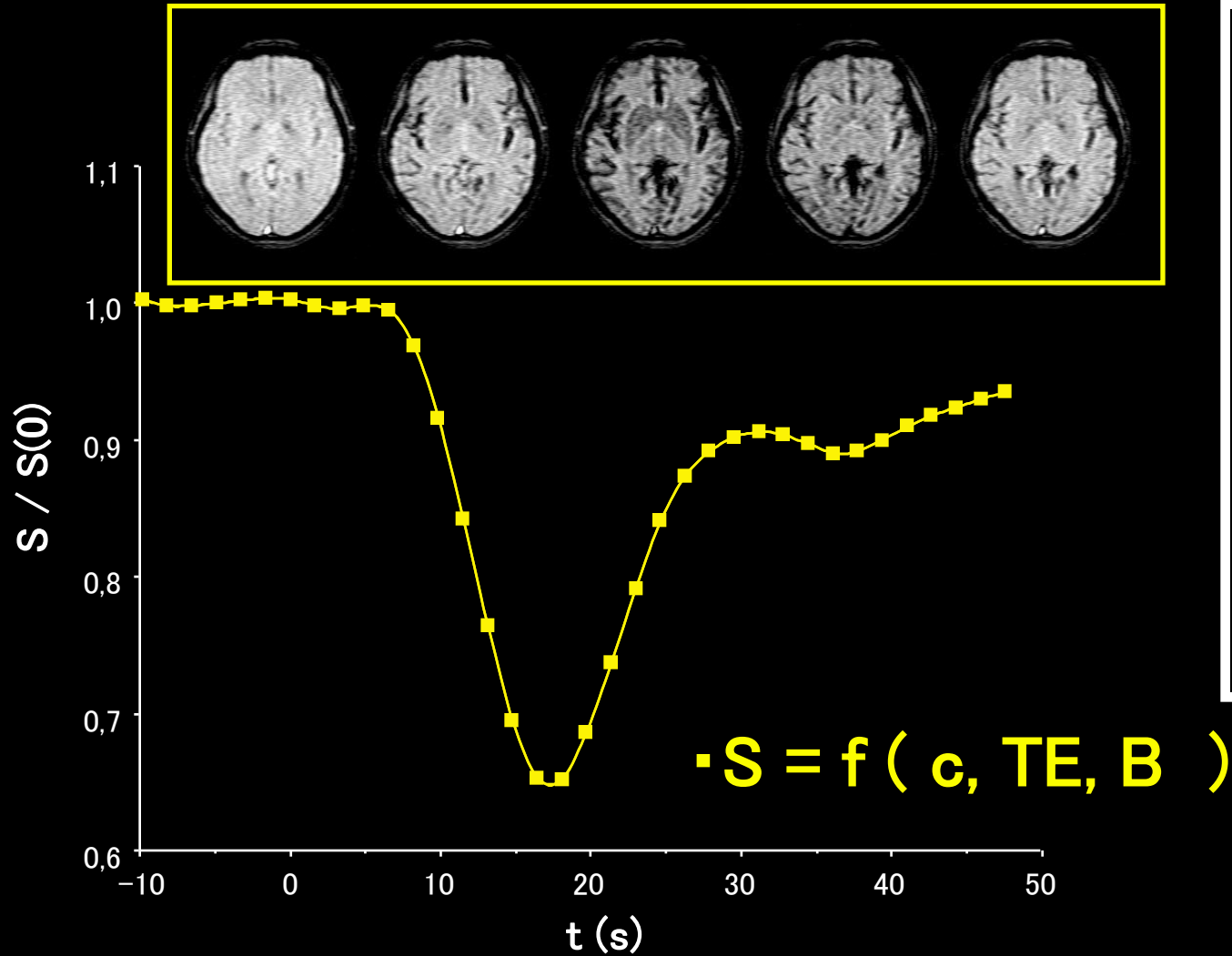
**Diffusions-
einschränkung**



Diff. eingeschränkt
DWI: hell

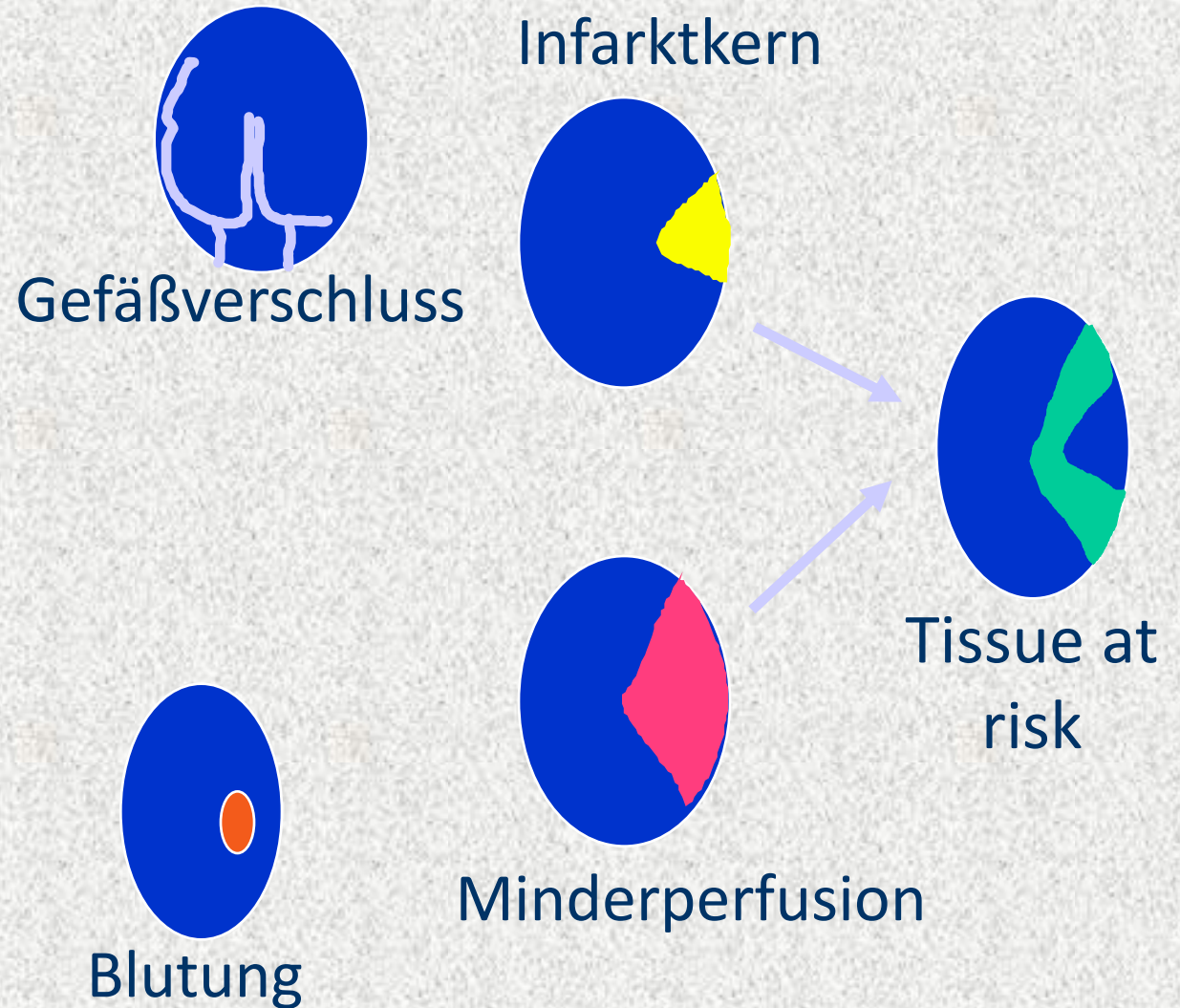


Perfusionsgewichtetes MRT (PWI):

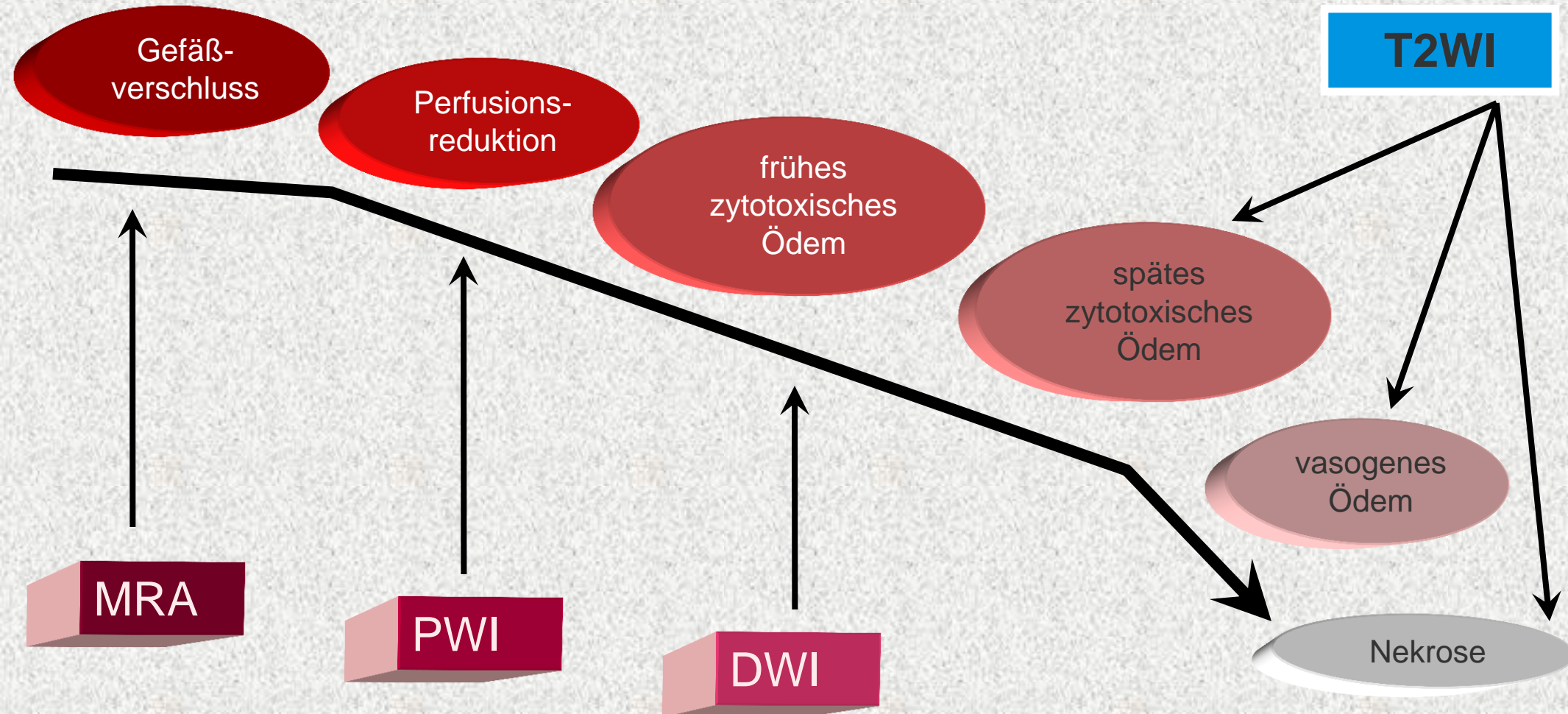


Das Schlaganfall-MRT

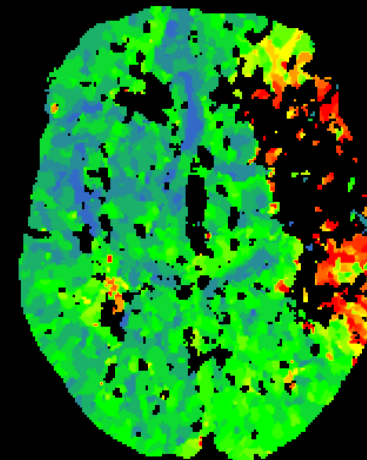
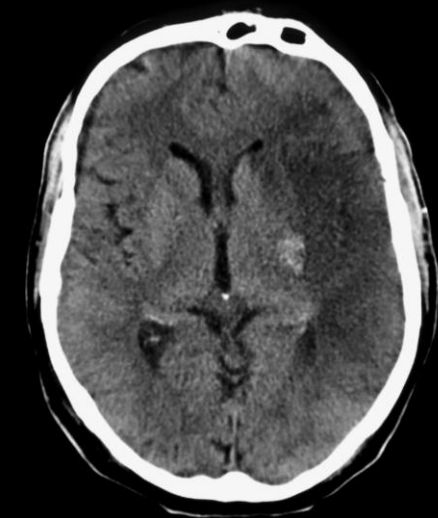
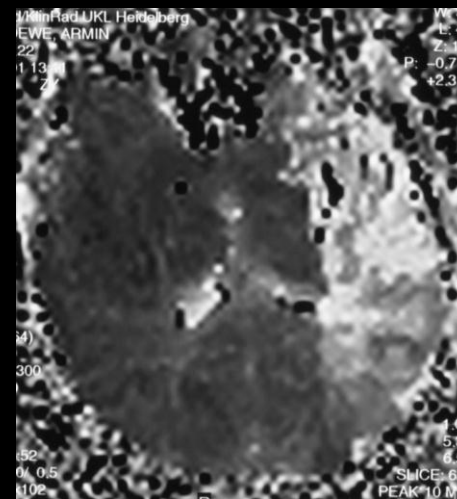
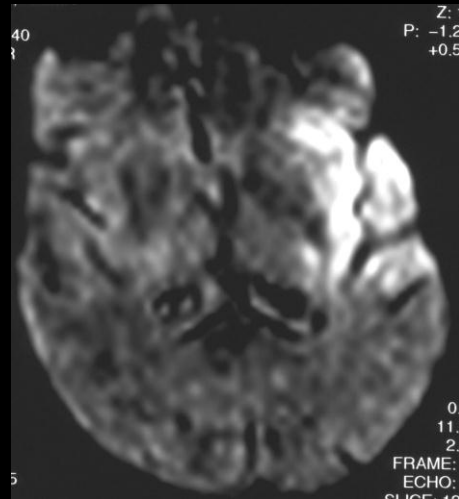
- MRA
- DWI (Diffusion)
- PWI (Perfusion)
- T2*

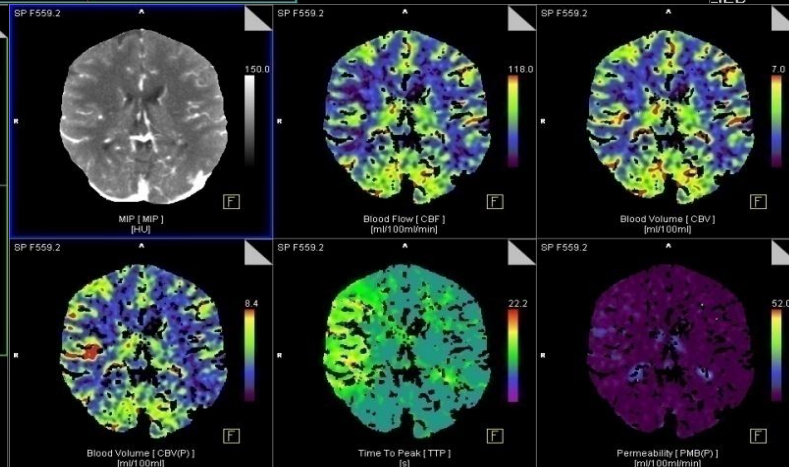
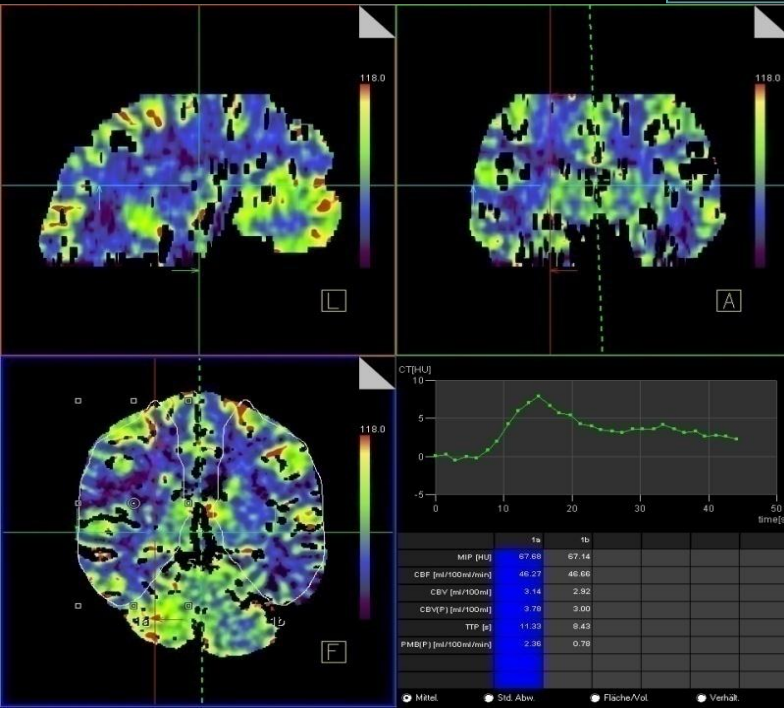
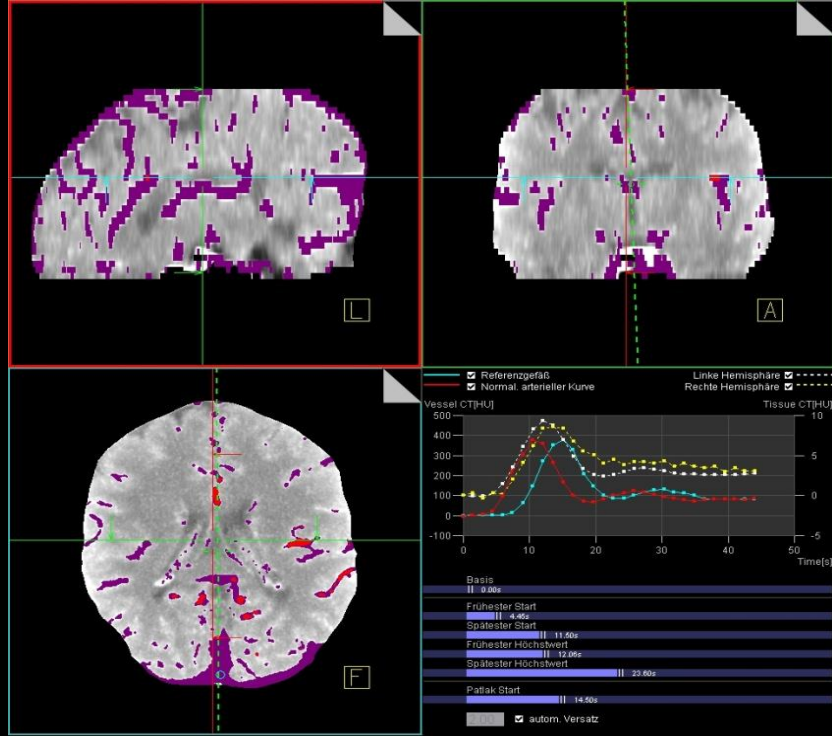


Sequenzielle MRT-Erfassbarkeit der Pathophysiologie der akuten zerebralen Ischämie



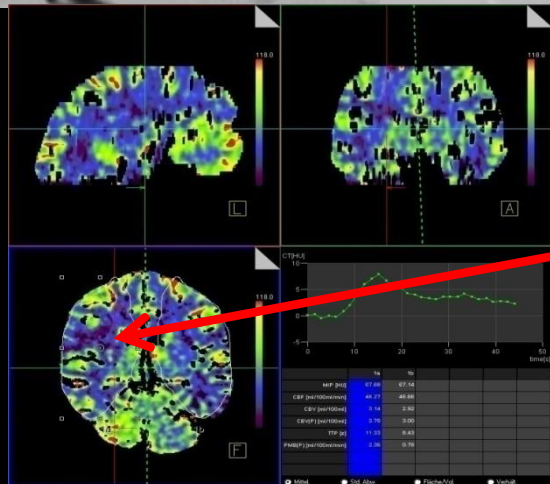
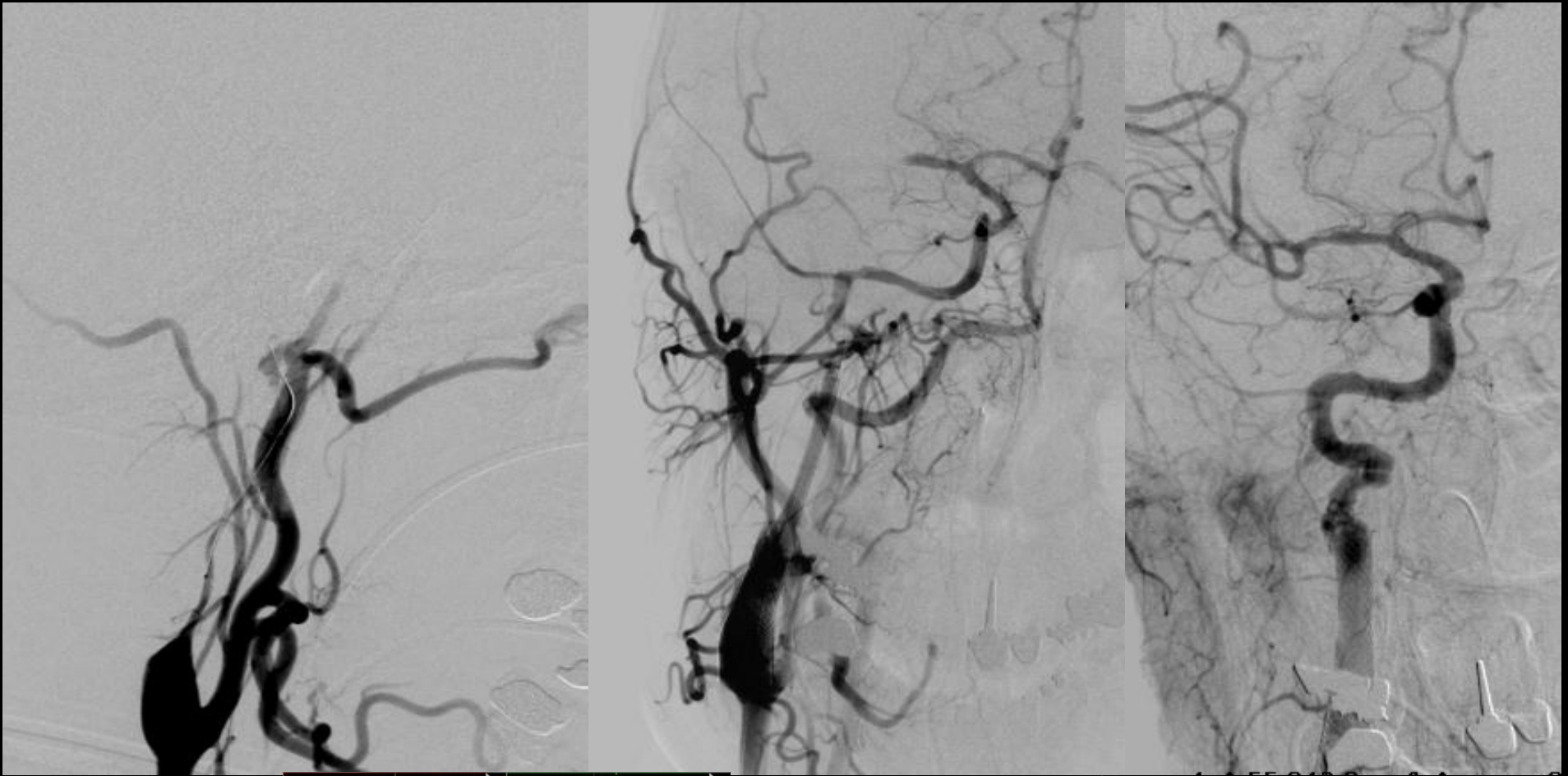
79 J, NIHSS-score 19

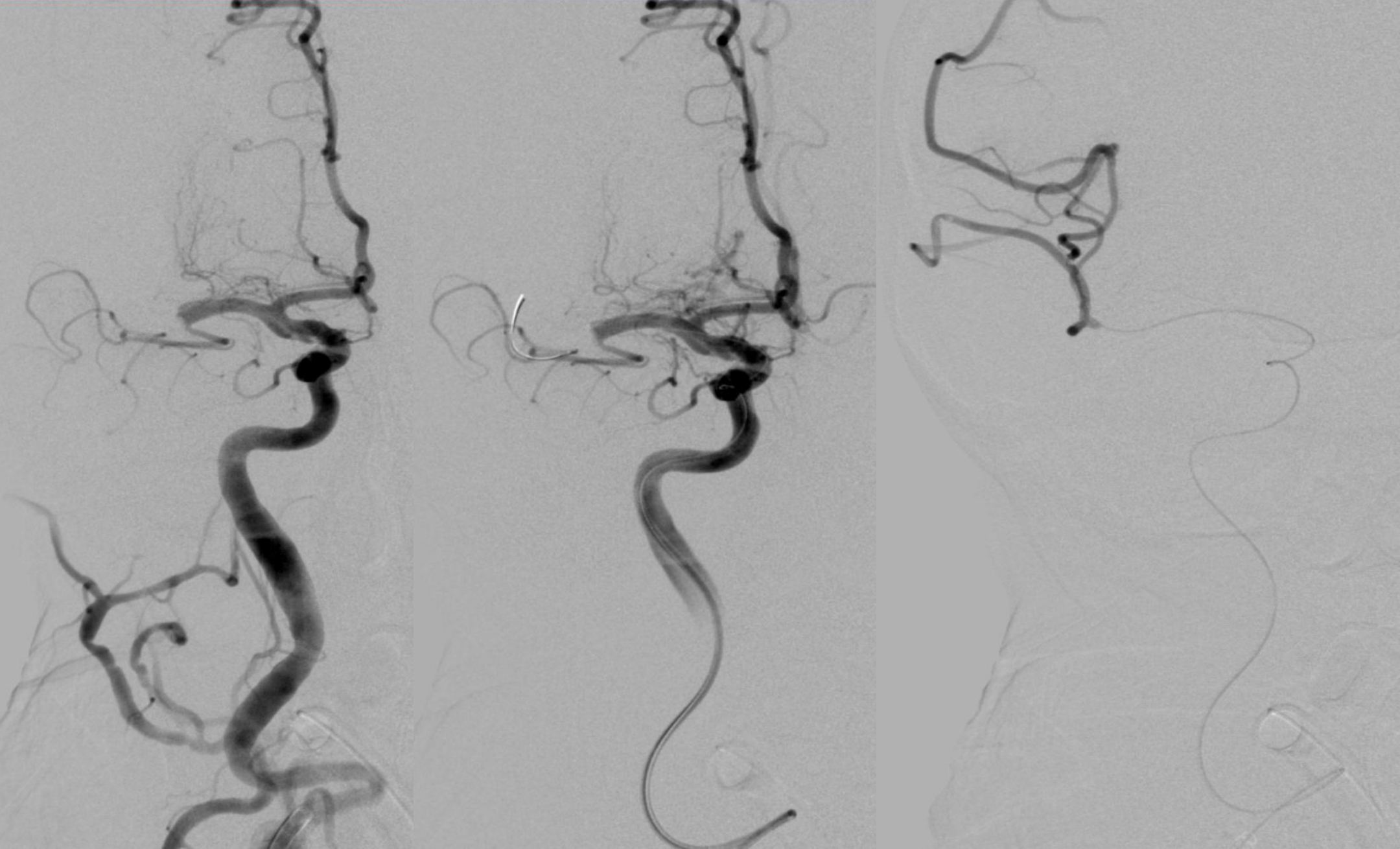


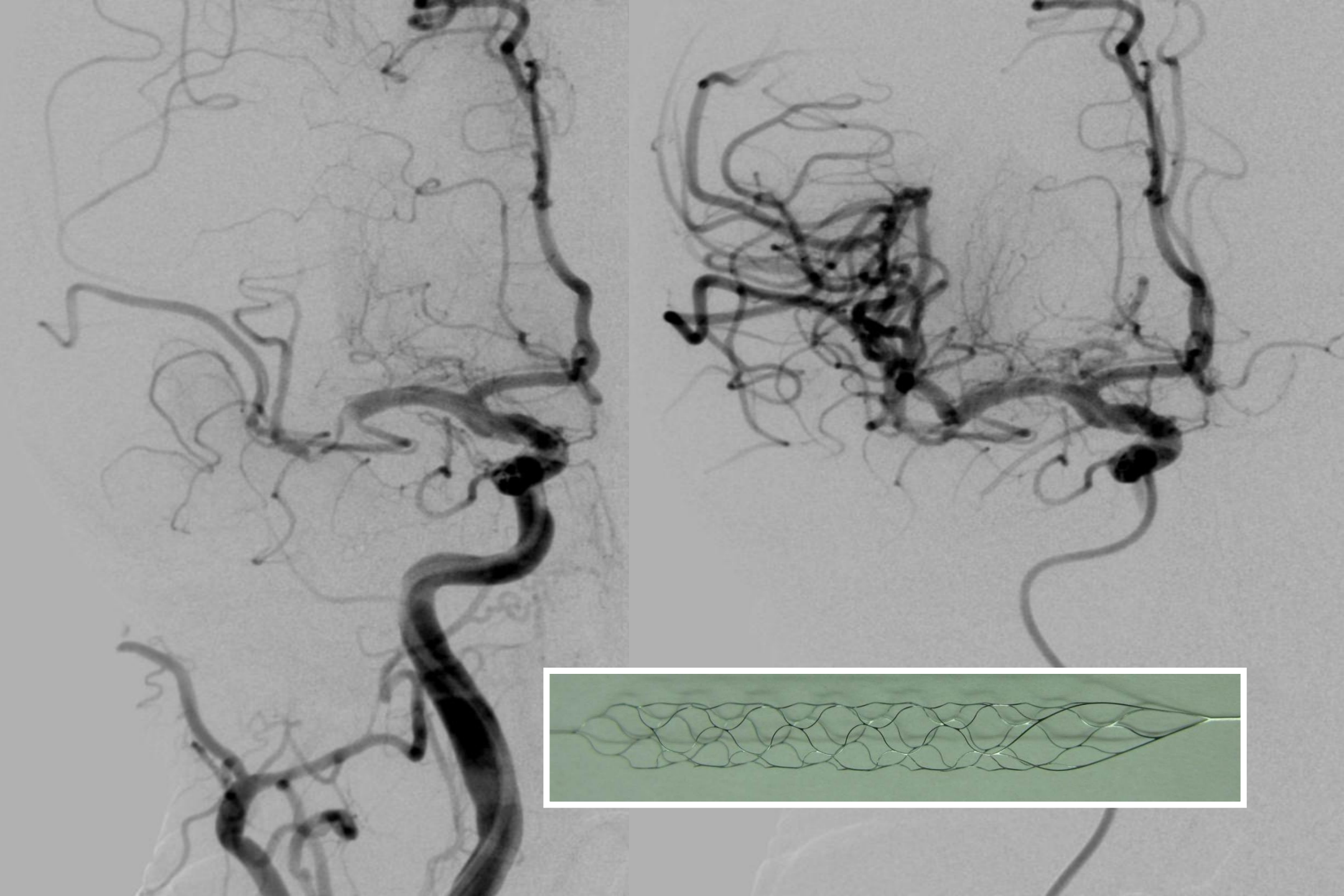


46 J, Hemiplegie links:
ACI + ACM Verschluss









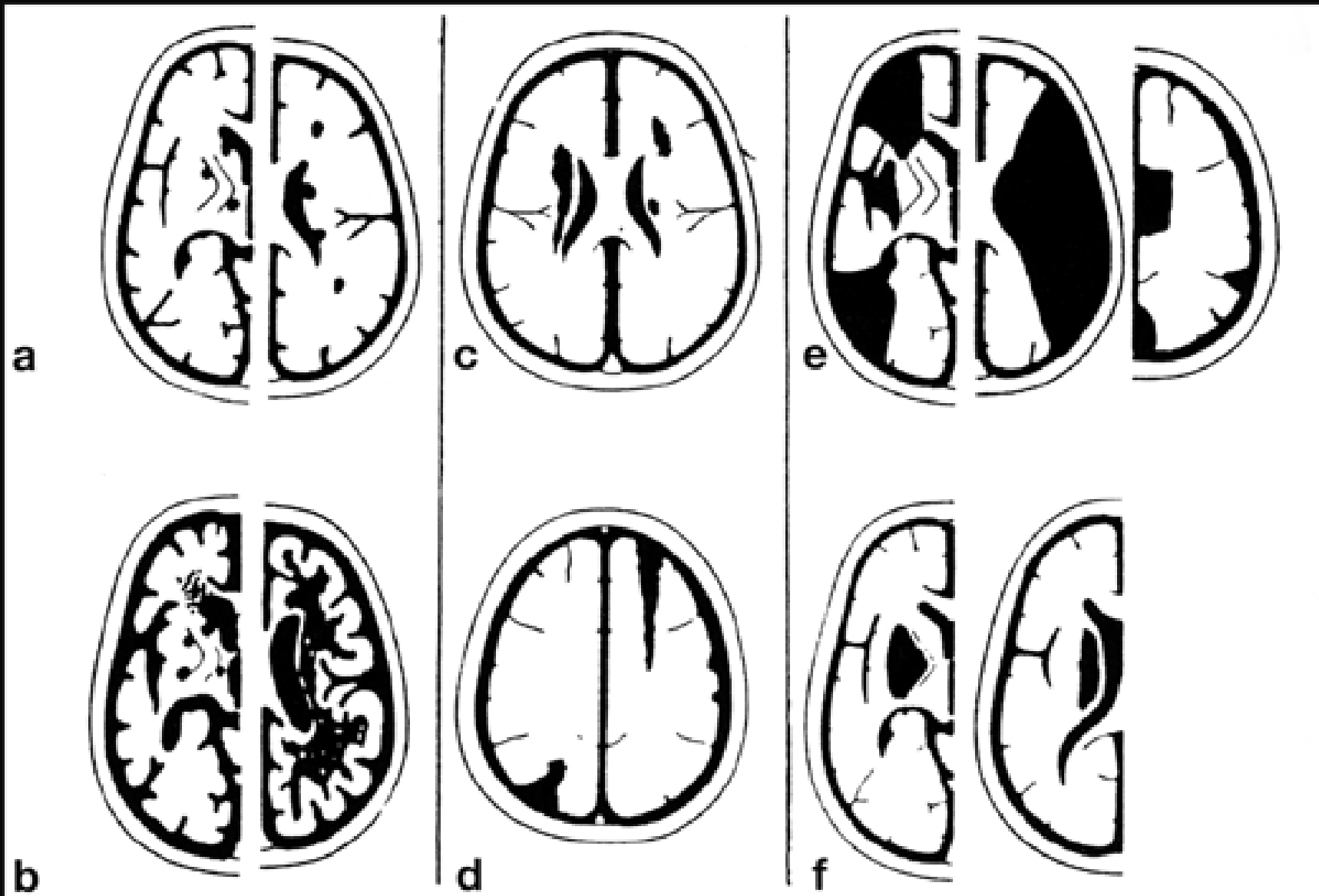
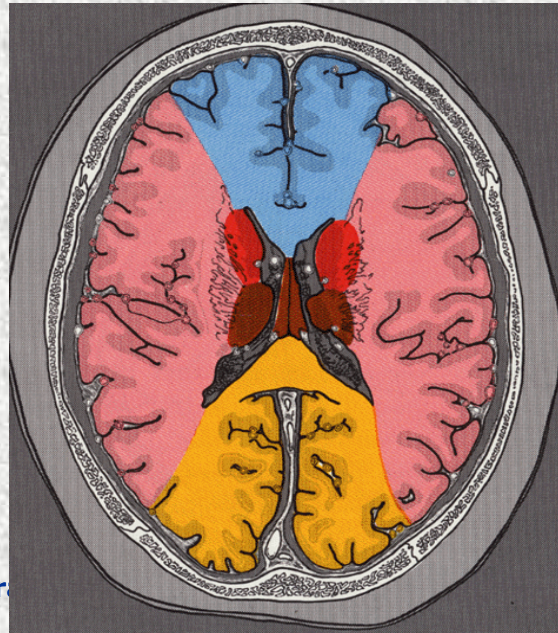
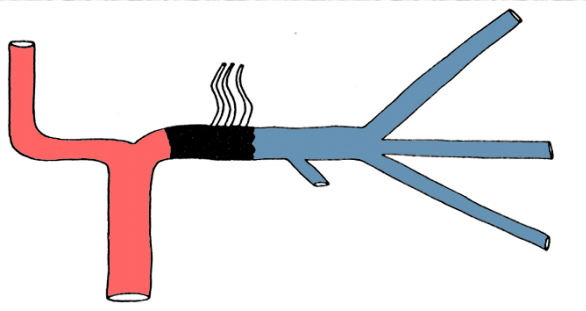


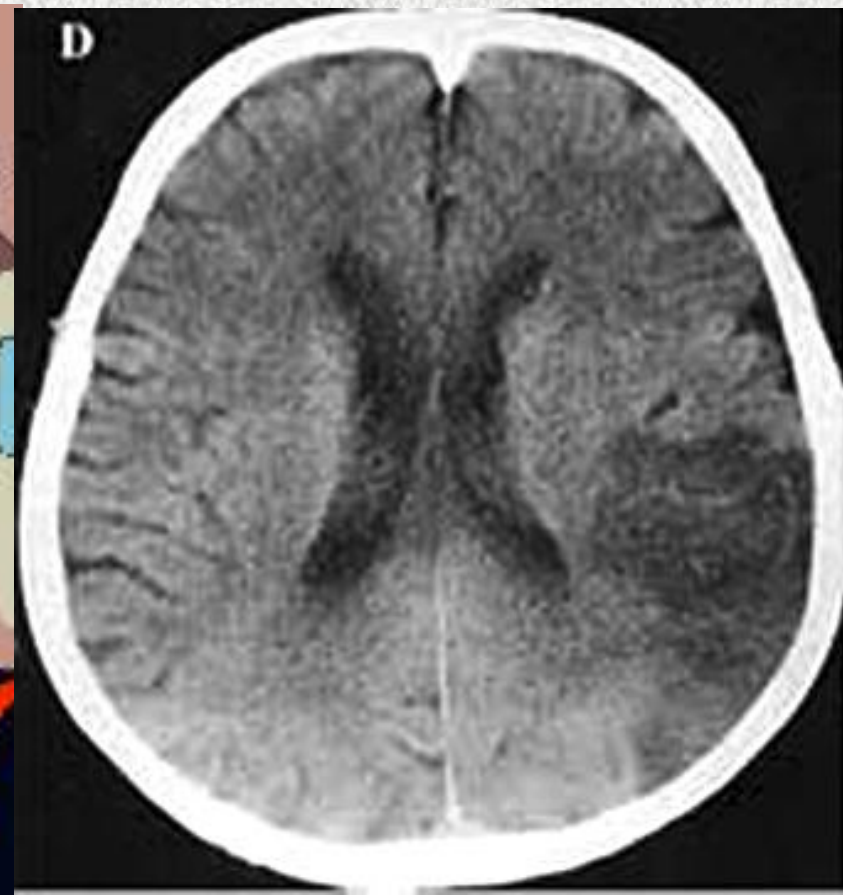
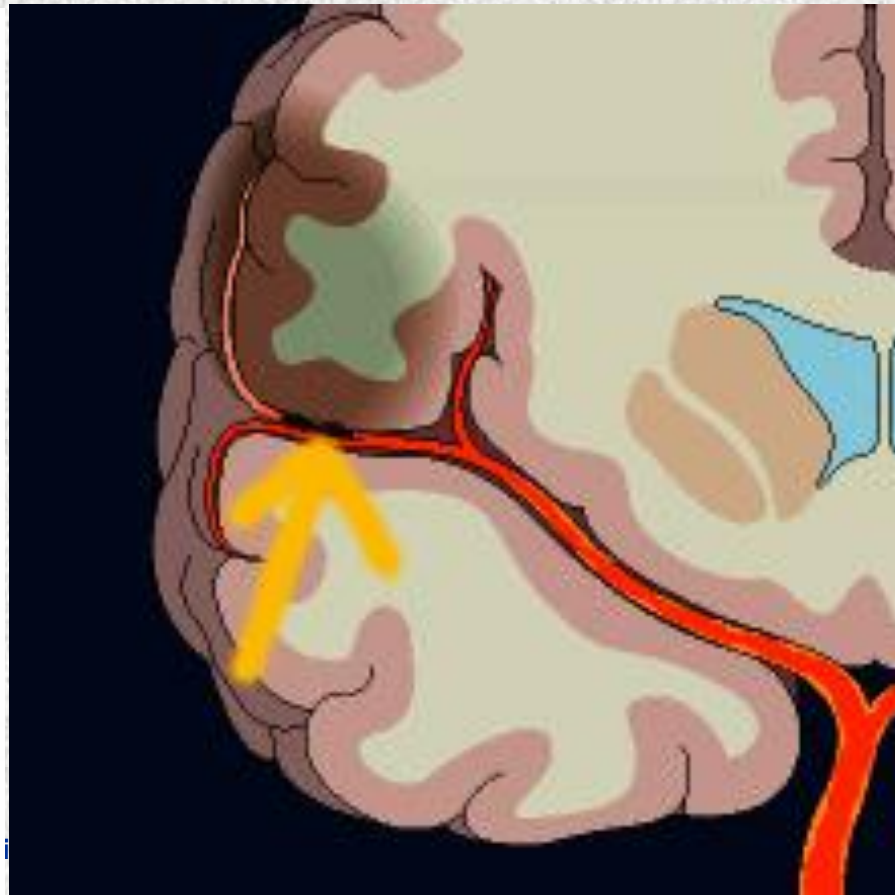
Abb. 1a–f. Schematische Darstellung der Infarkttypen im CT nach Ringelstein et al. [24]. Befunde bei zerebraler Mikroangiopathie (**a, b**), hämodynamisch verursachte Infarkte (**c, d**), Territorialinfarkte (**e**), Linsenkerninfarkte (**f**)

Territorialinfarkt

- Oft keilförmig (GM und WM)
- betrifft Gebiet und nicht Grenze
- muss nicht ganzes Territorium sein

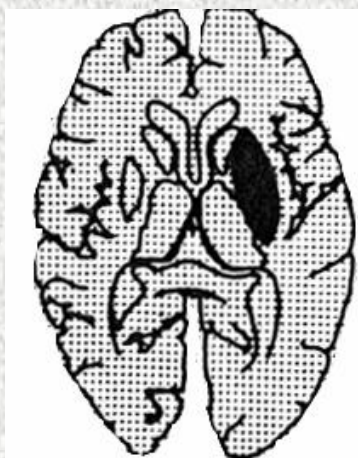
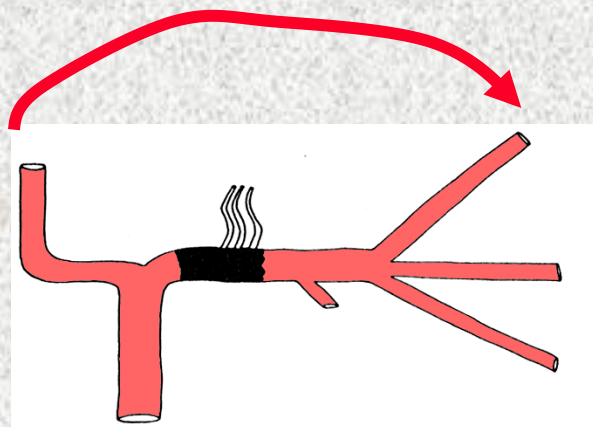


Territorialinfarkt

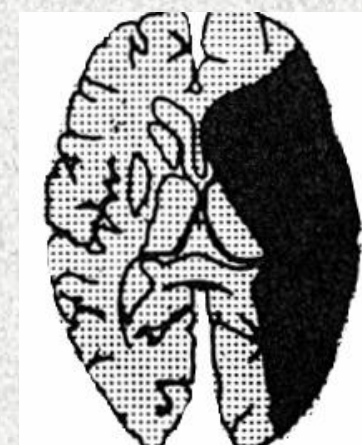
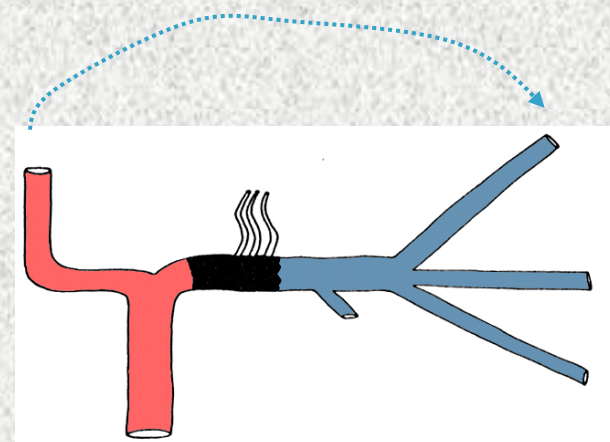


Territorialinfarkt








- Auch bei gleichem Verschlusstyp unterschiedliche Ausdehnung möglich
- Kollateralisierung

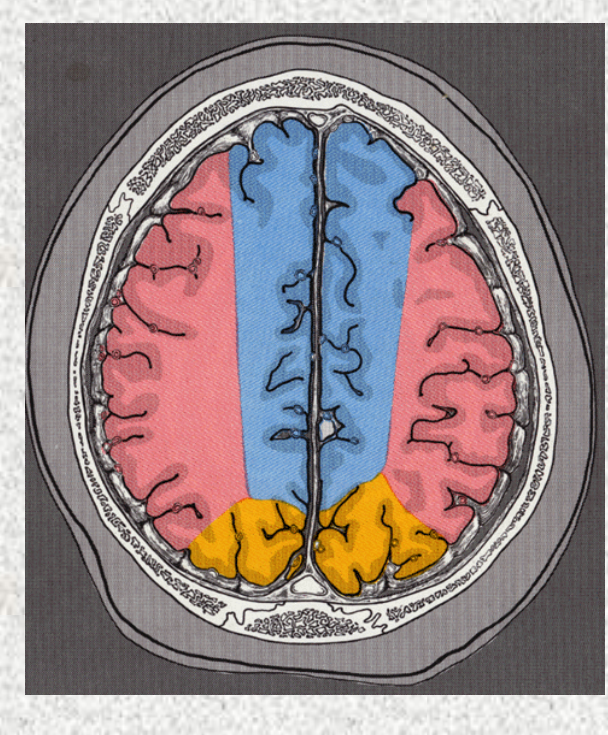
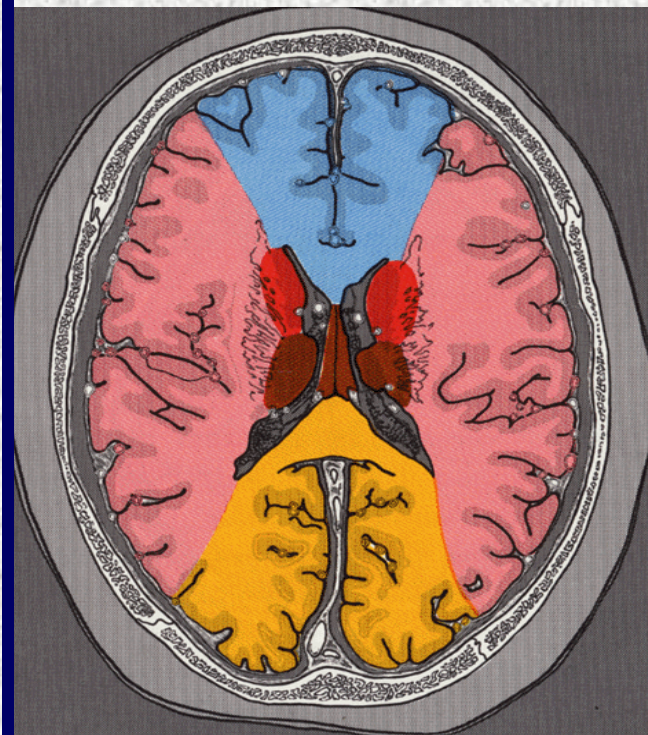
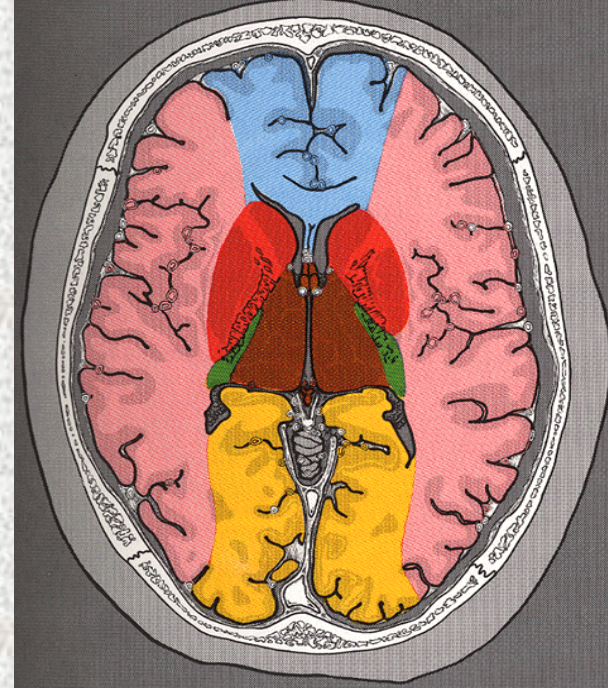
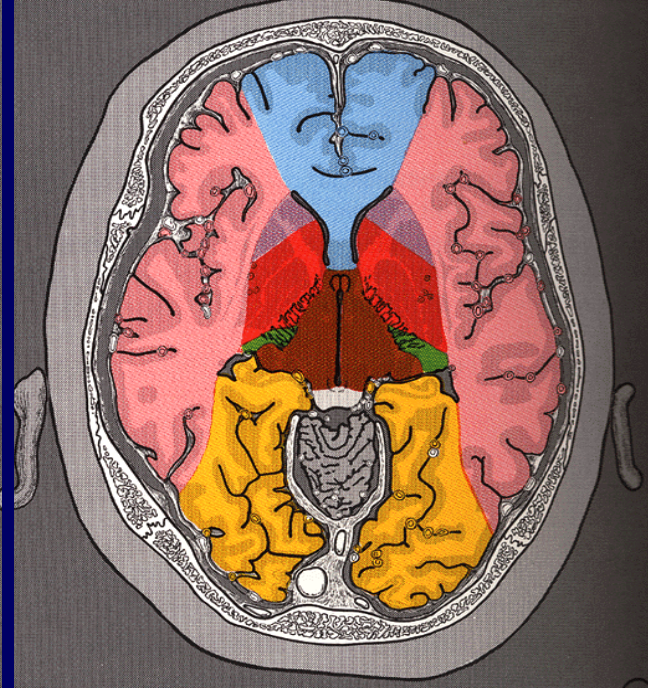


gute Kollateralisation

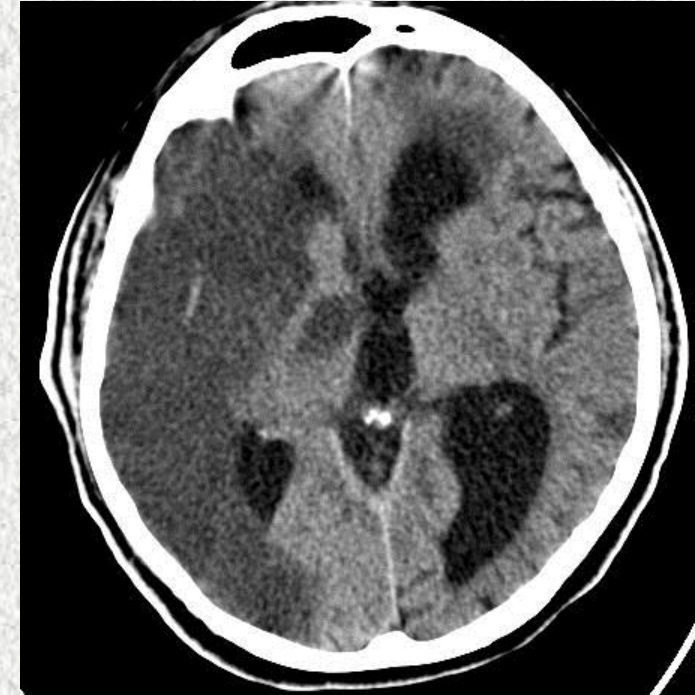
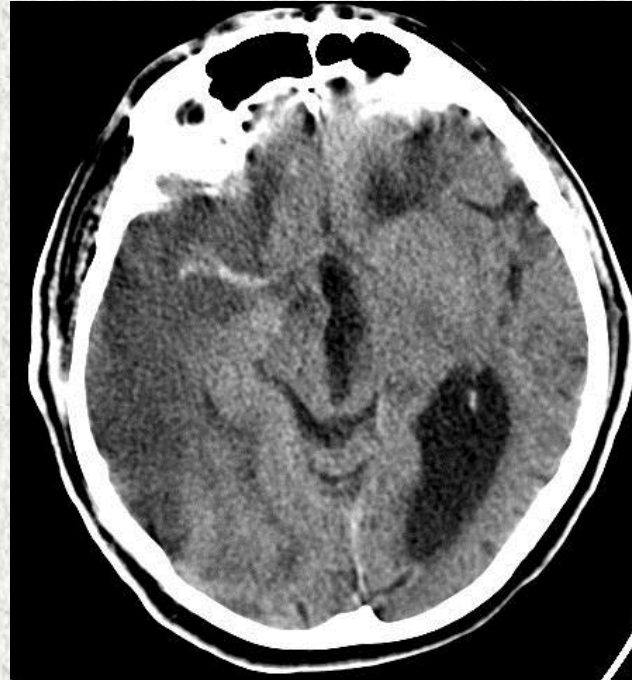
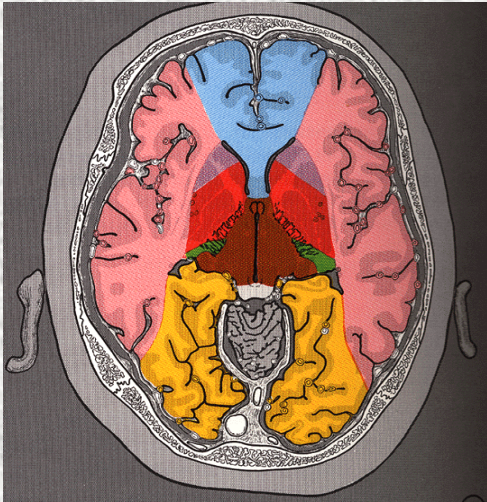


Keine Kollateralisation

-  terminale Äste der A. cerebri anterior
-  terminale Äste der A. cerebri media
-  terminale Äste der A. cerebri posterior
-  zentrale Äste der A. cerebri anterior
-  zentrale Äste der A. cerebri media
-  zentrale Äste der A. cerebri posterior und der penetrierenden Äste der A. communicans posterior
-  A. choroidea anterior



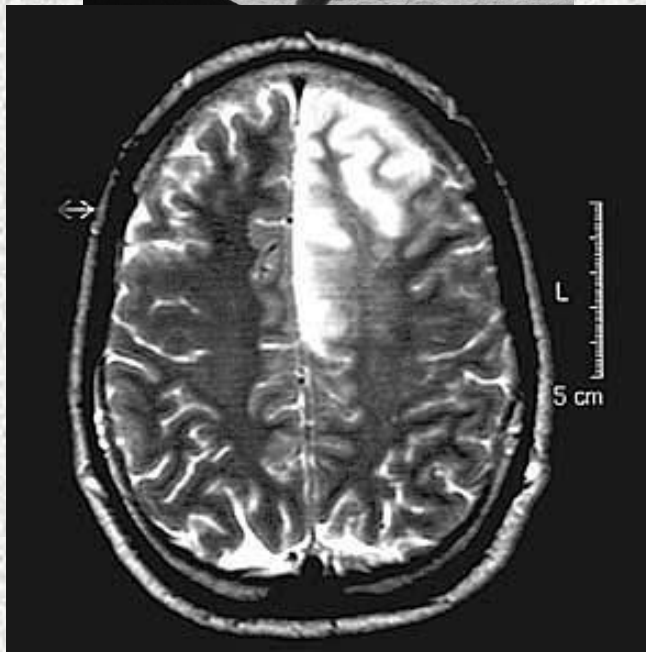
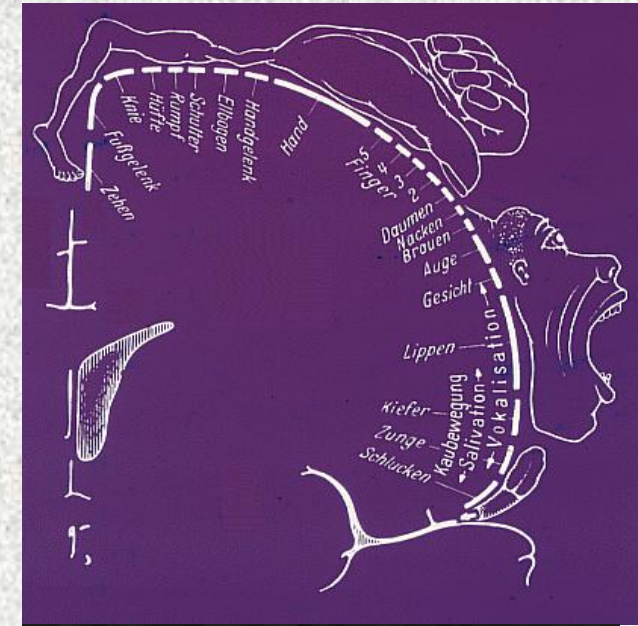
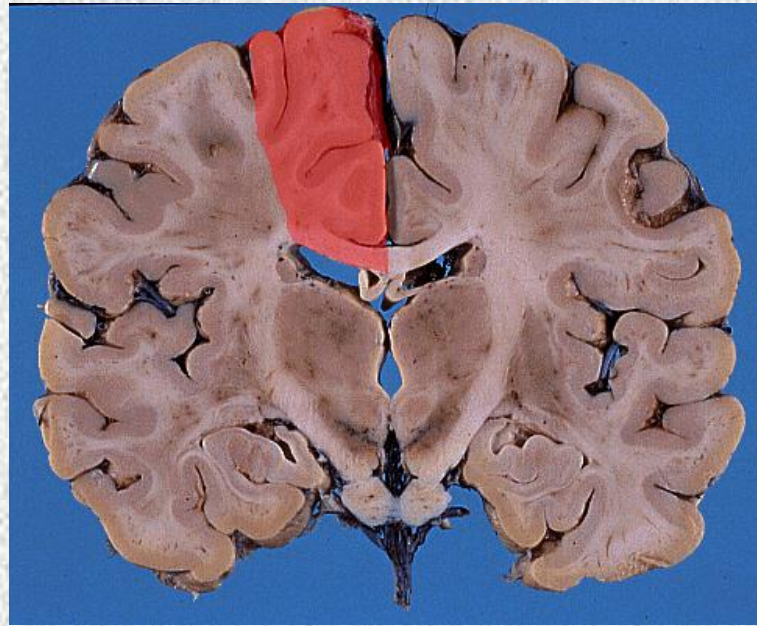
Ein paar Klassiker der Territorialinfarkte



Mediainfarkt



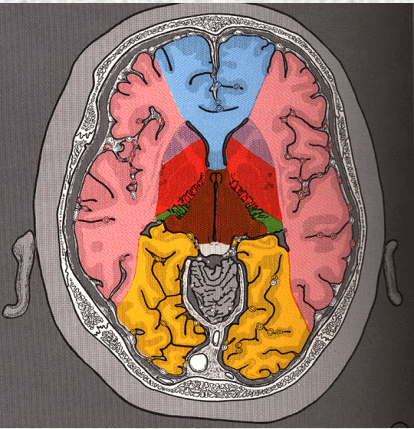
Ein paar Klassiker der Territorialinfarkte



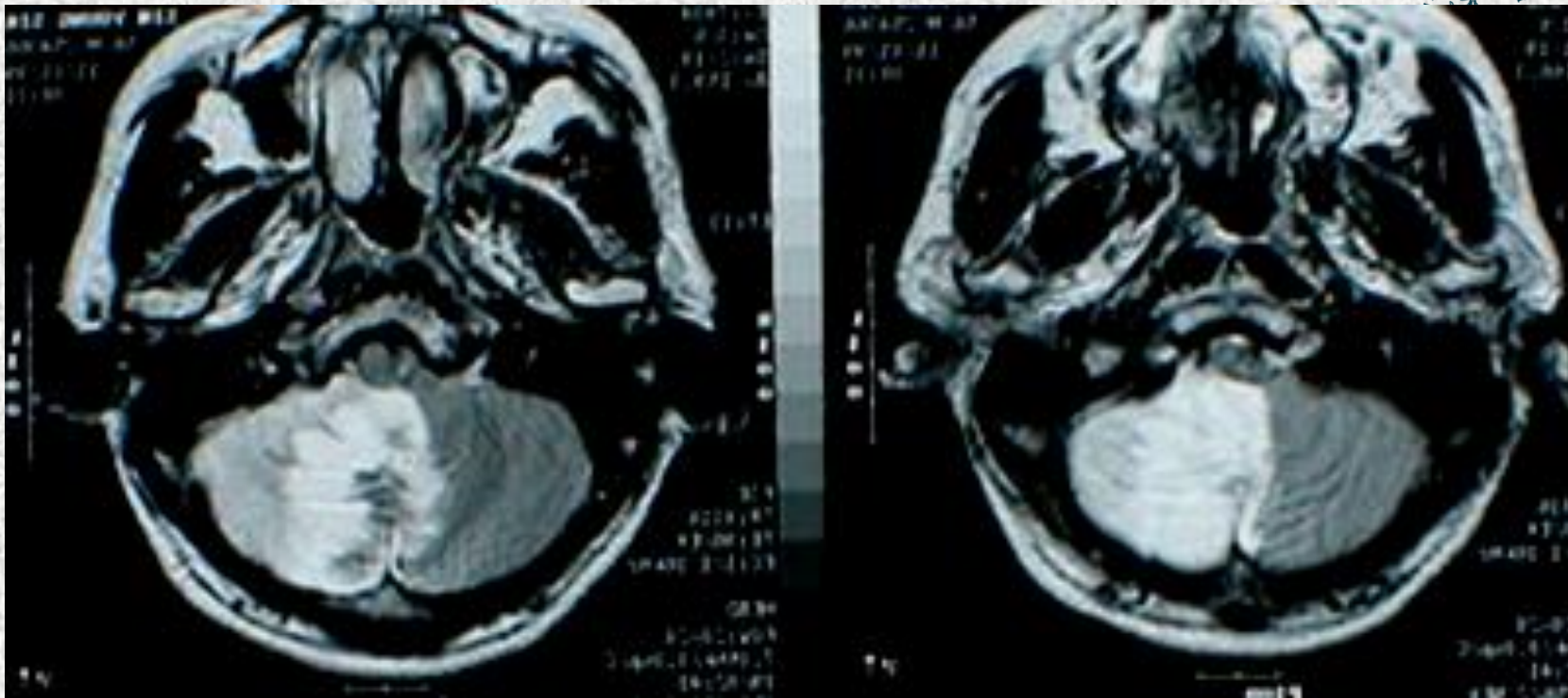
Anterior-
Infarkt



Ein paar Klassiker der Territorialinfarkte

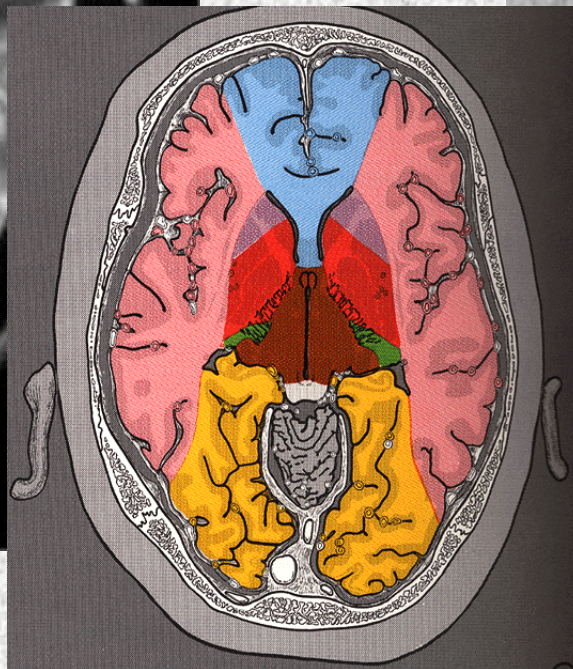


Posteriorinfarkt



PICA-Infarkt

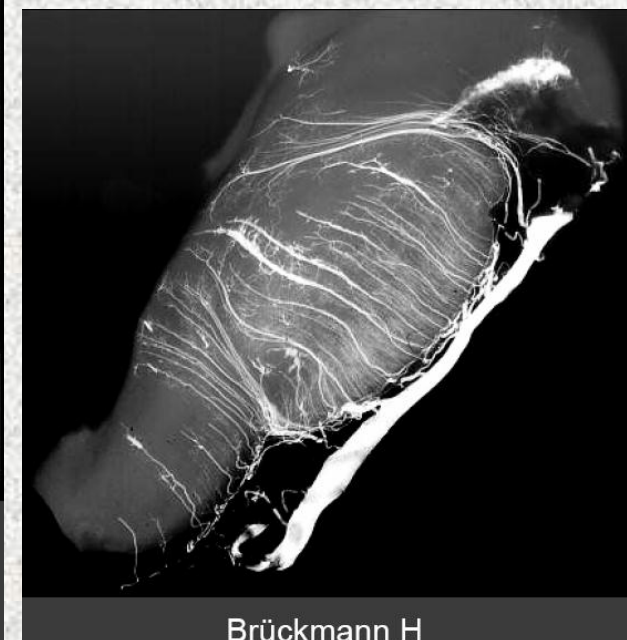
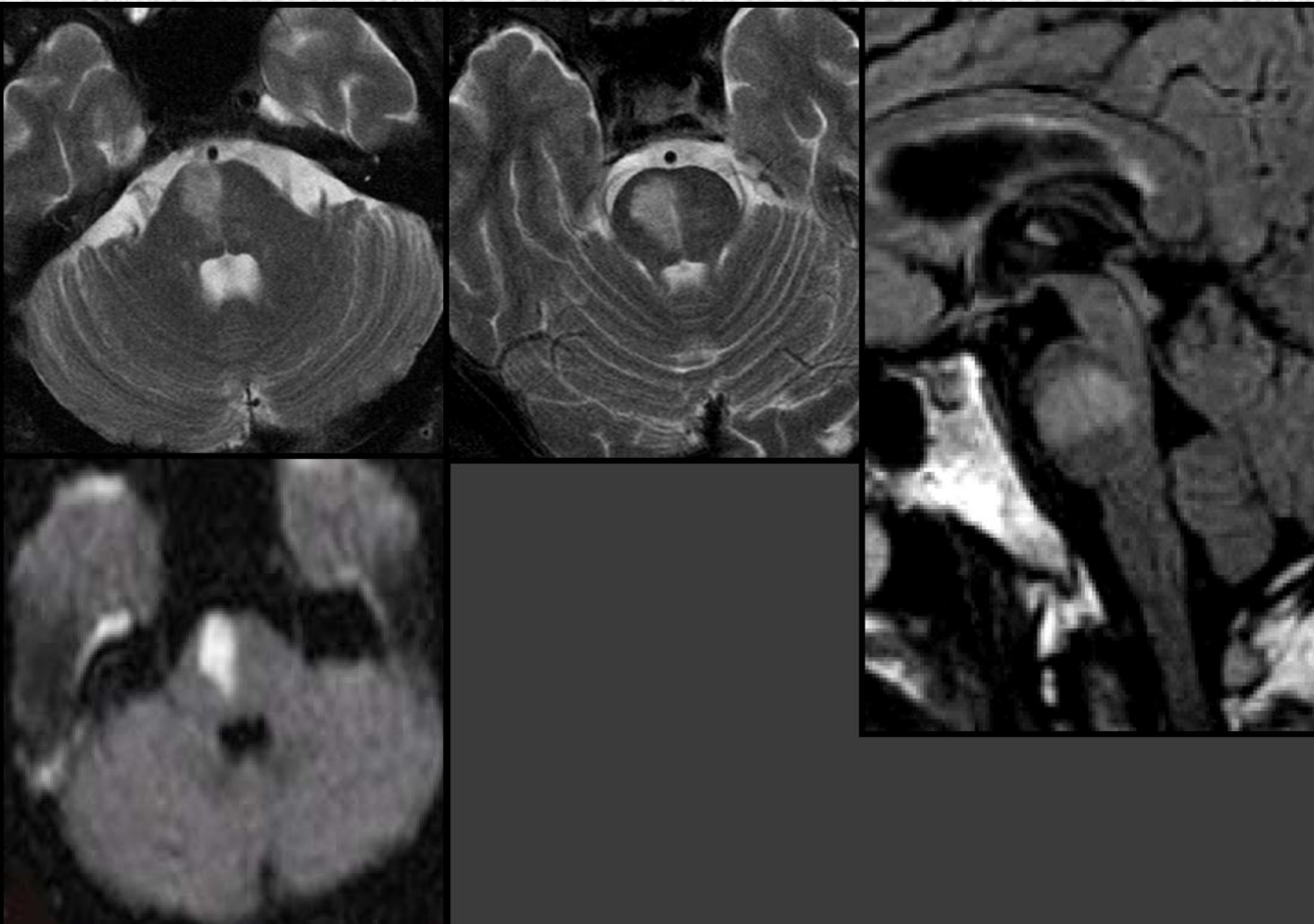
A. cerebelli posterior inferior



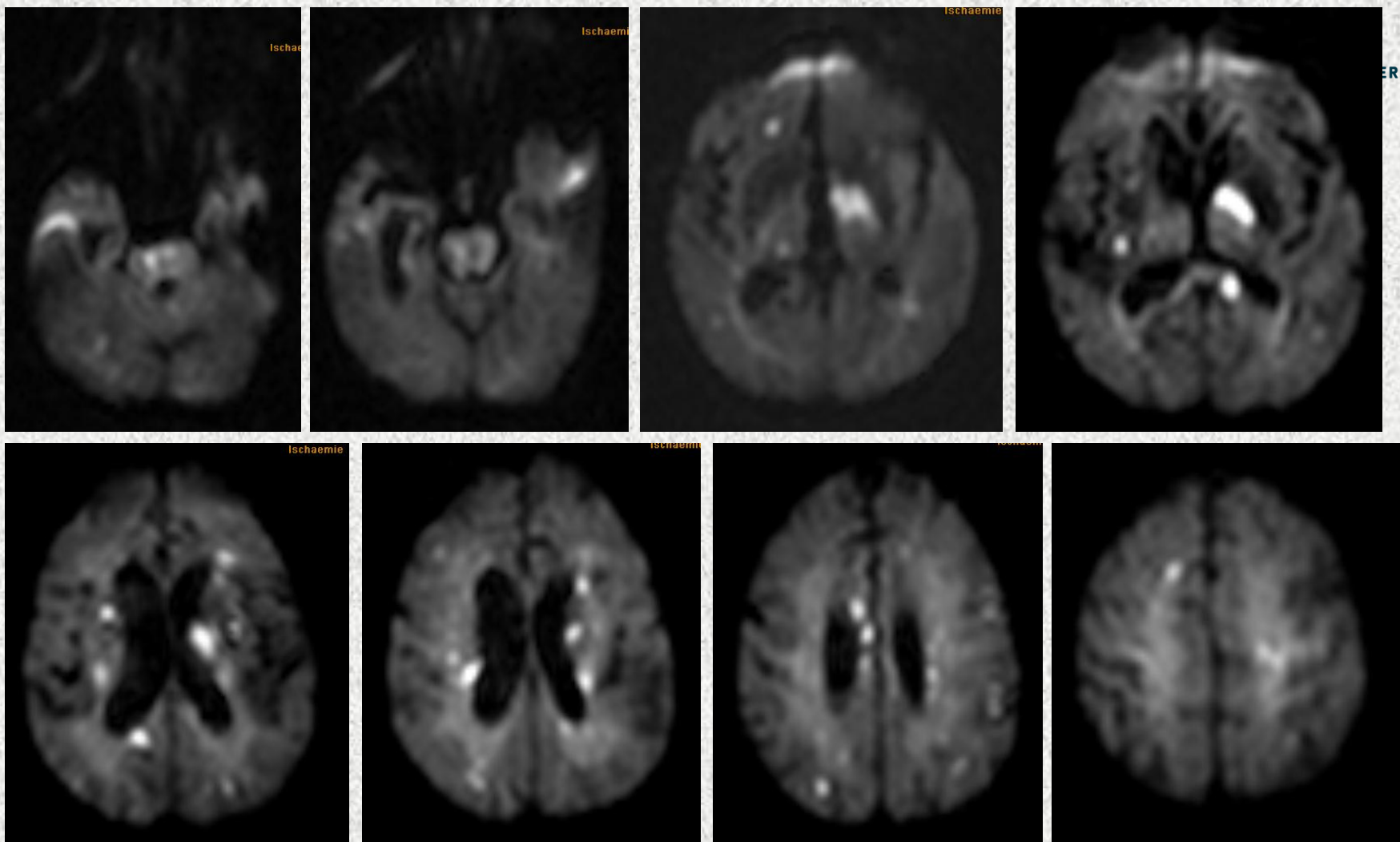
Basilarisspitzen- Embolie

Paramedianer Ponsinfarkt

- Perforierende Äste aus A. basilaris



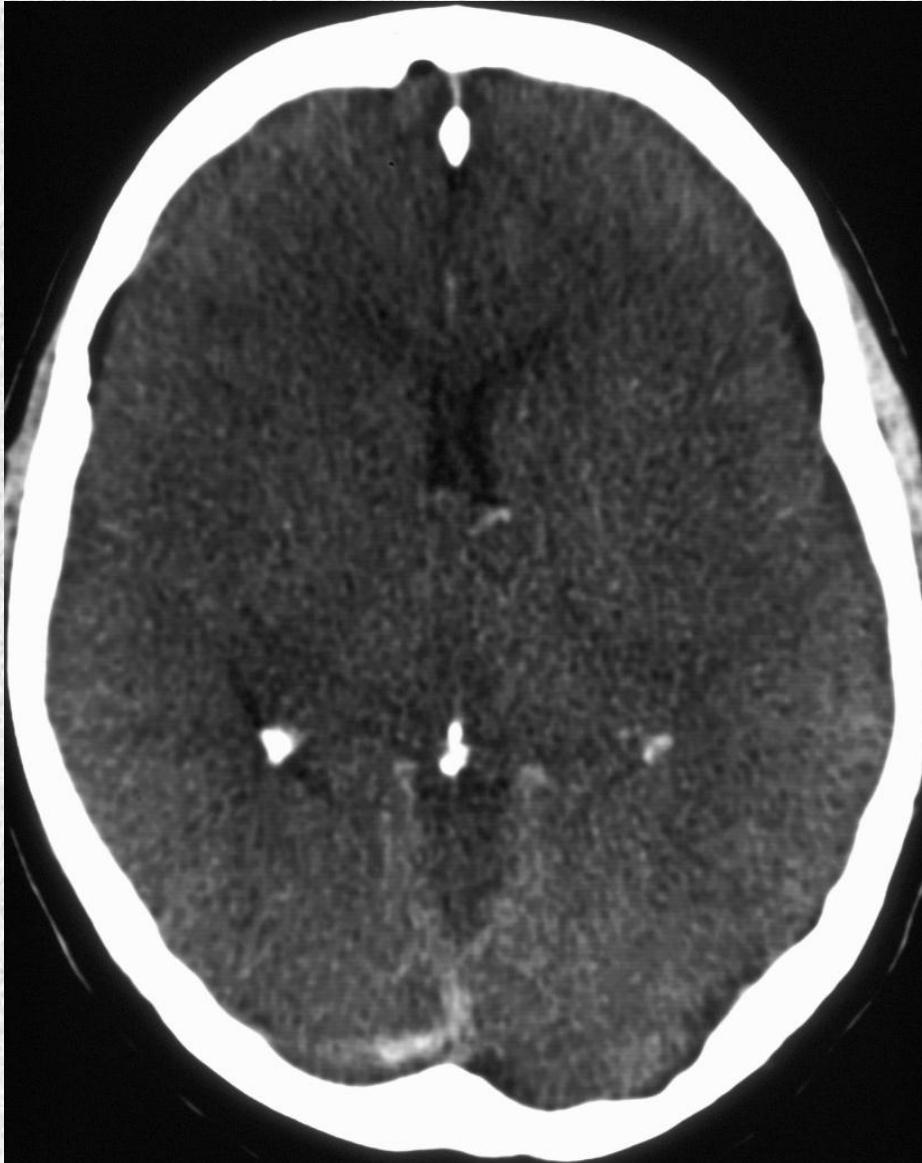
Brückmann H



70 J., w., multipel frisch, in allen Territorien, supra- und infratent.

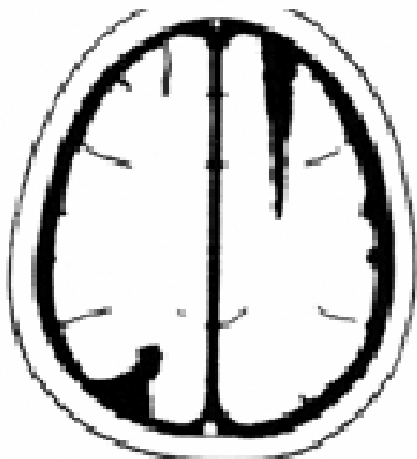
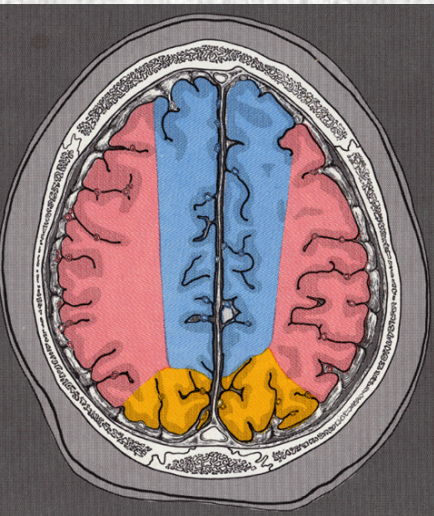
Kardiogene Embolien, „Embolieschauer“

Globaler hypoxischer Hirnschaden

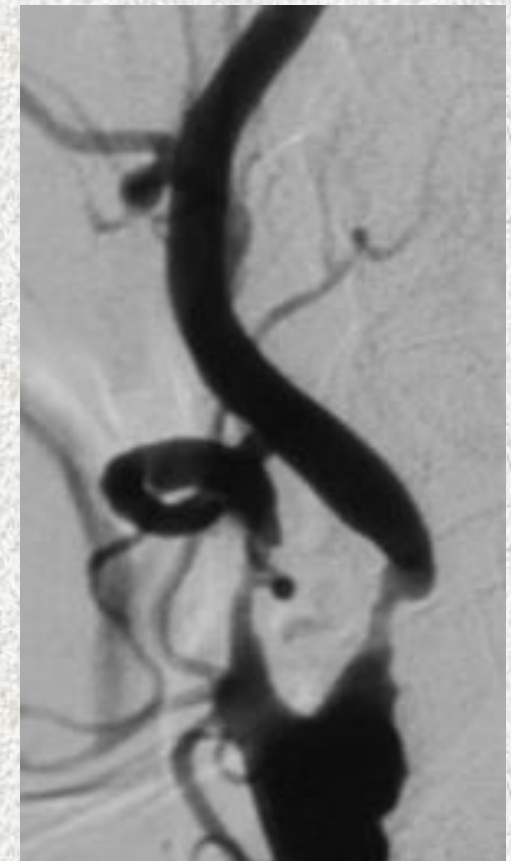
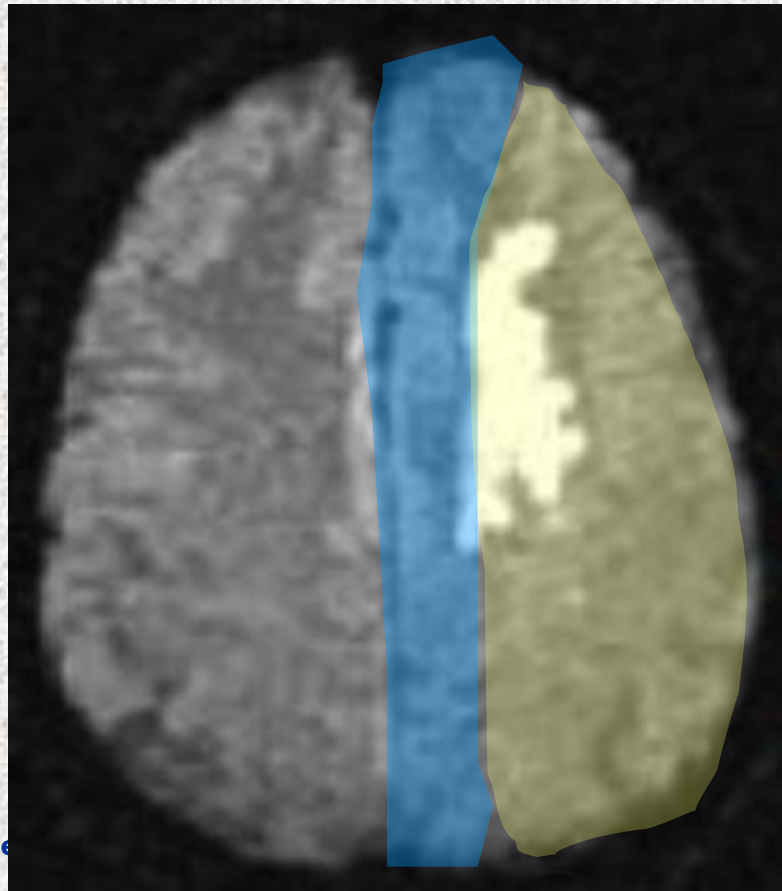


Hämodynamische Infarkte

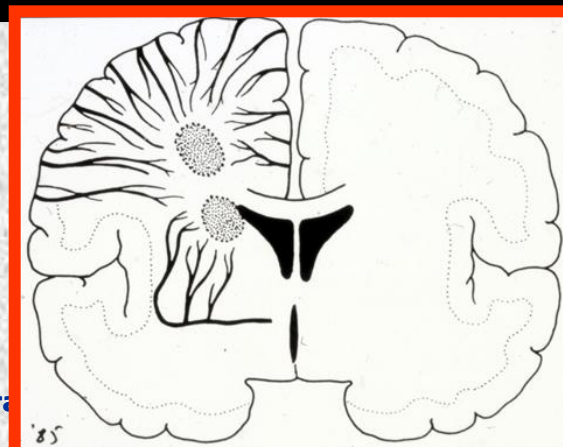
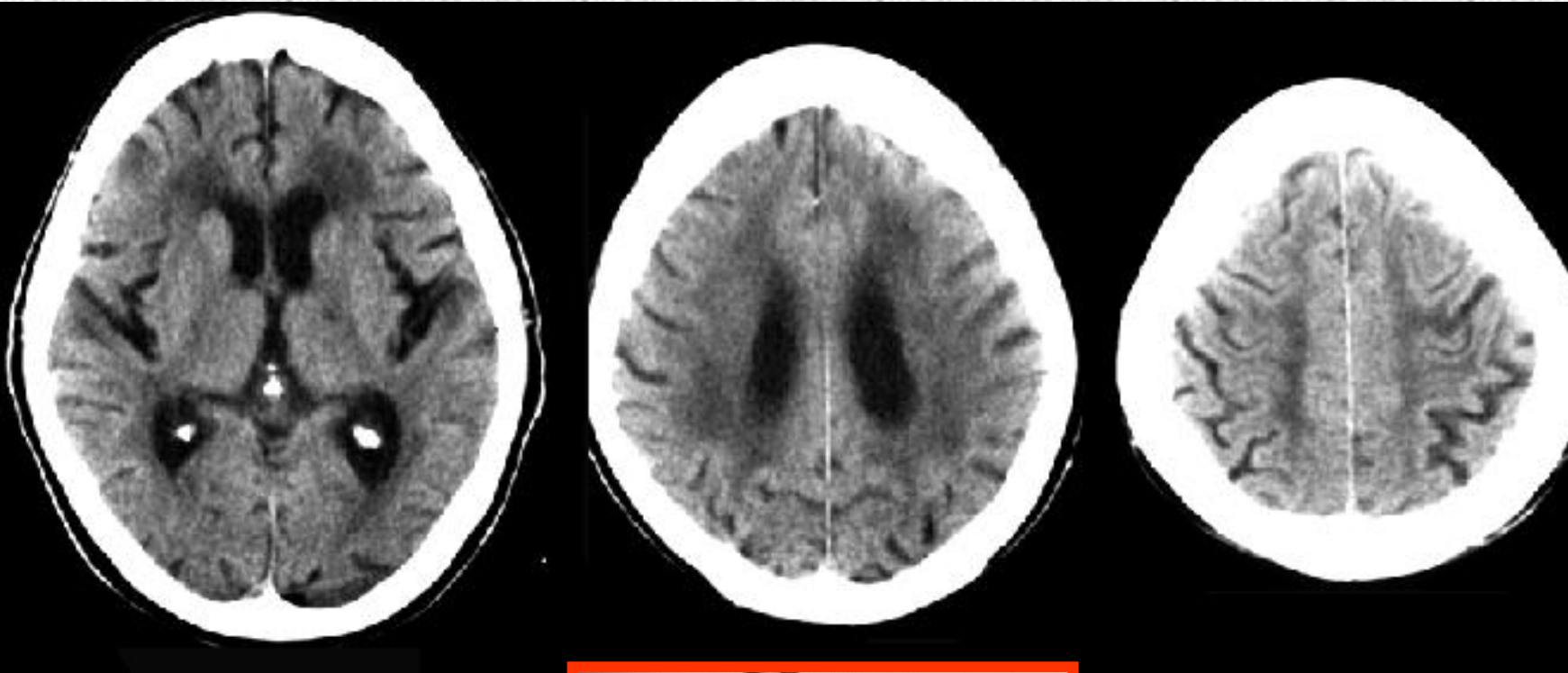
- An der Grenze zweier Versorgungsgebiete
- Grenzzoneninfarkt, „Letzte Wiese“, Wasserscheideninfarkt
- Häufig (mit)bedingt durch vorgeschaltete Stenose



it für Ne



Zerebrale Mikroangiopathie



Vielen Dank