



AFSAIN

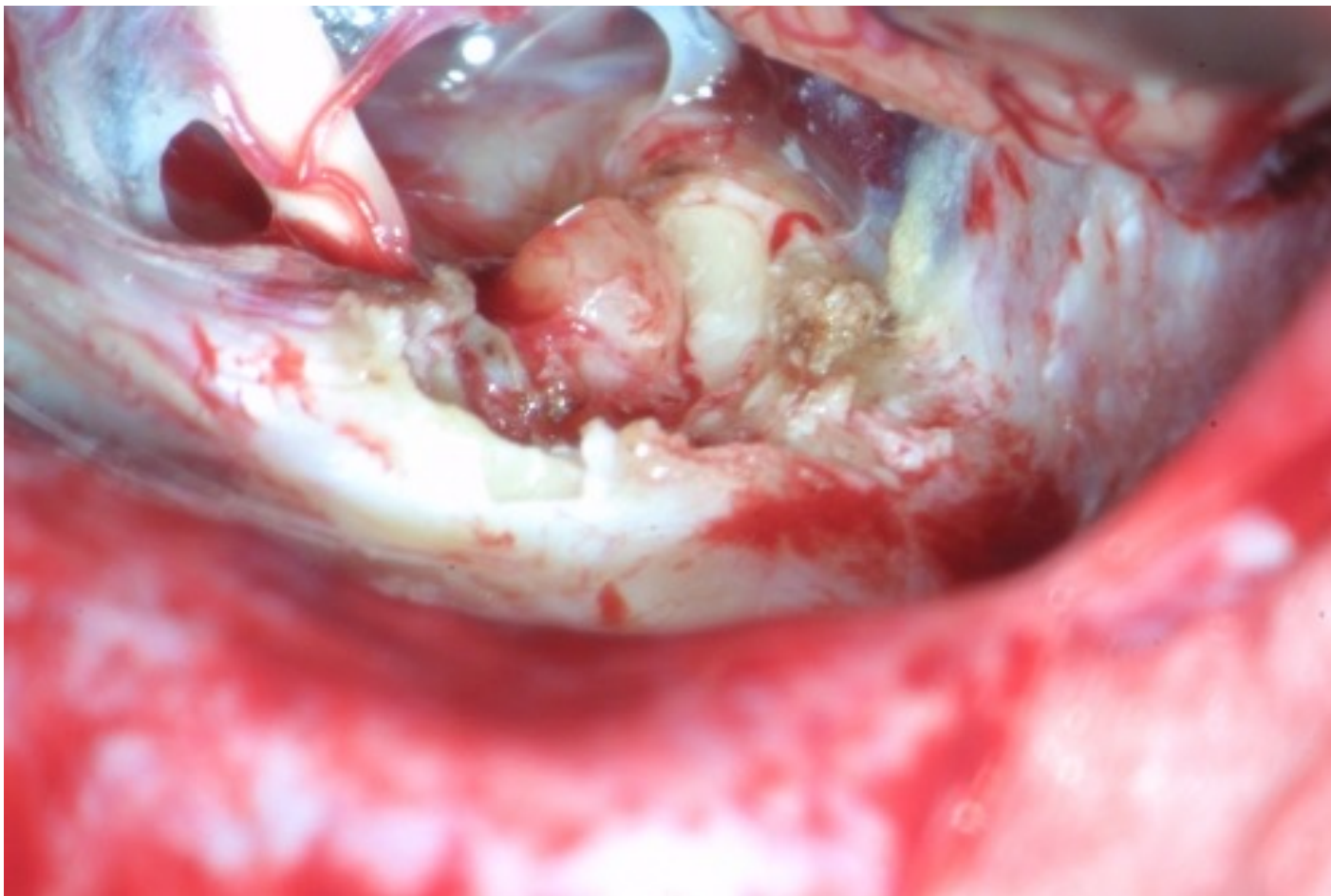
Neurochirurgische OP-Technik

PD Dr. med. Sven Berkmann

Facharzt für Neurochirurgie FMH

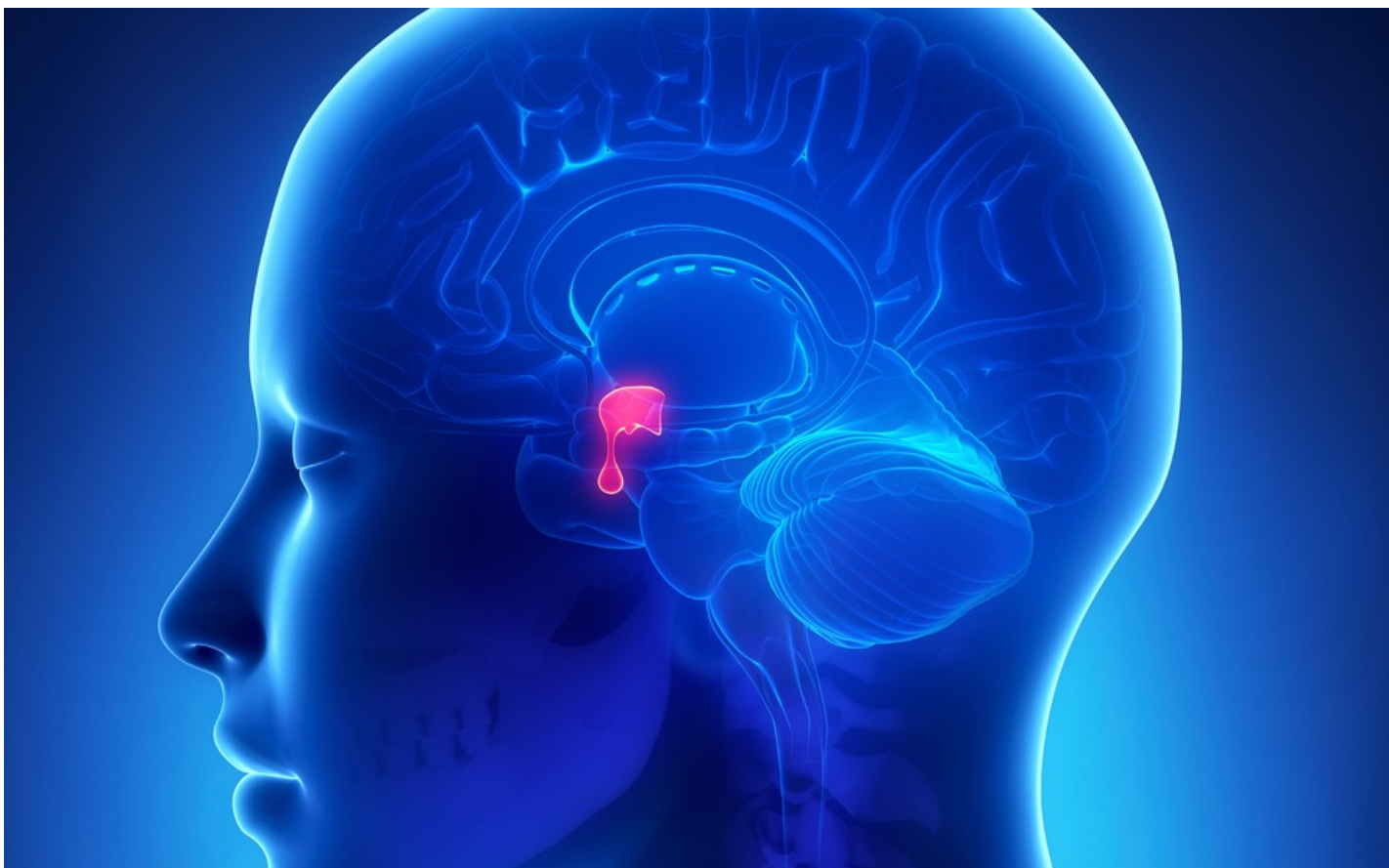






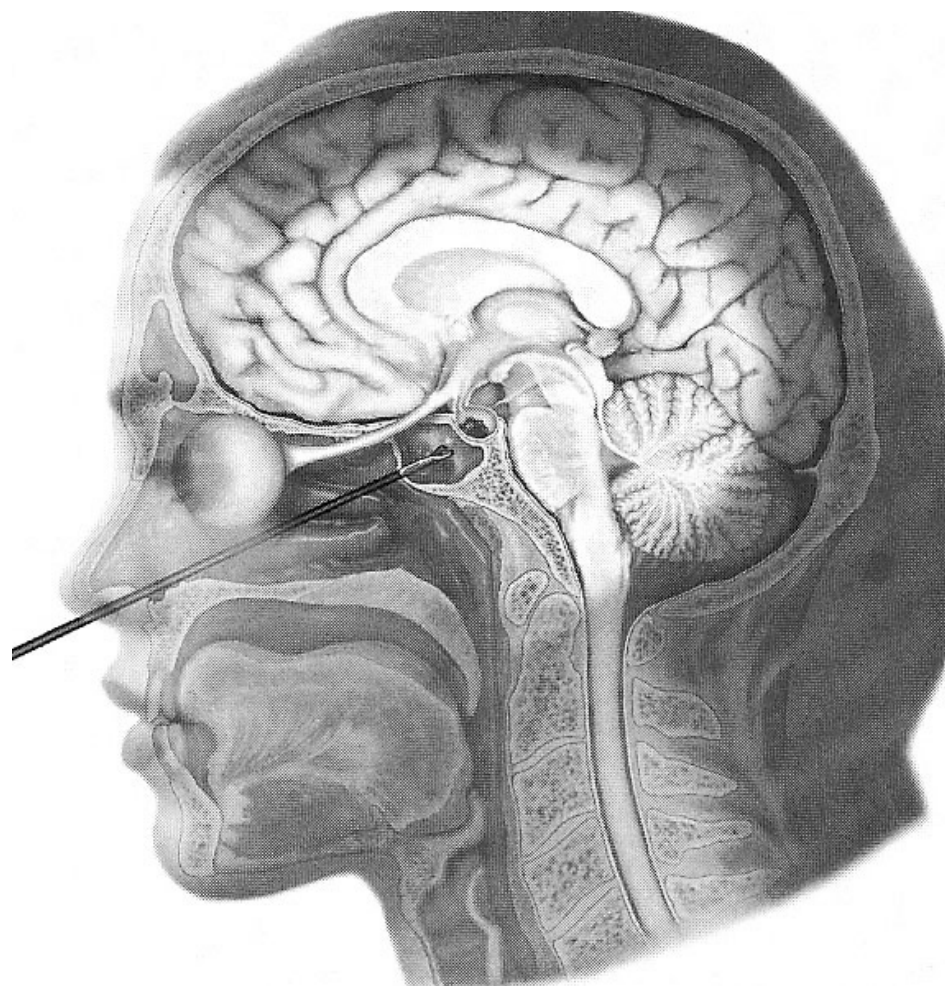


Bsp. Hypophysenchirurgie





Bsp. Hypophysenchirurgie





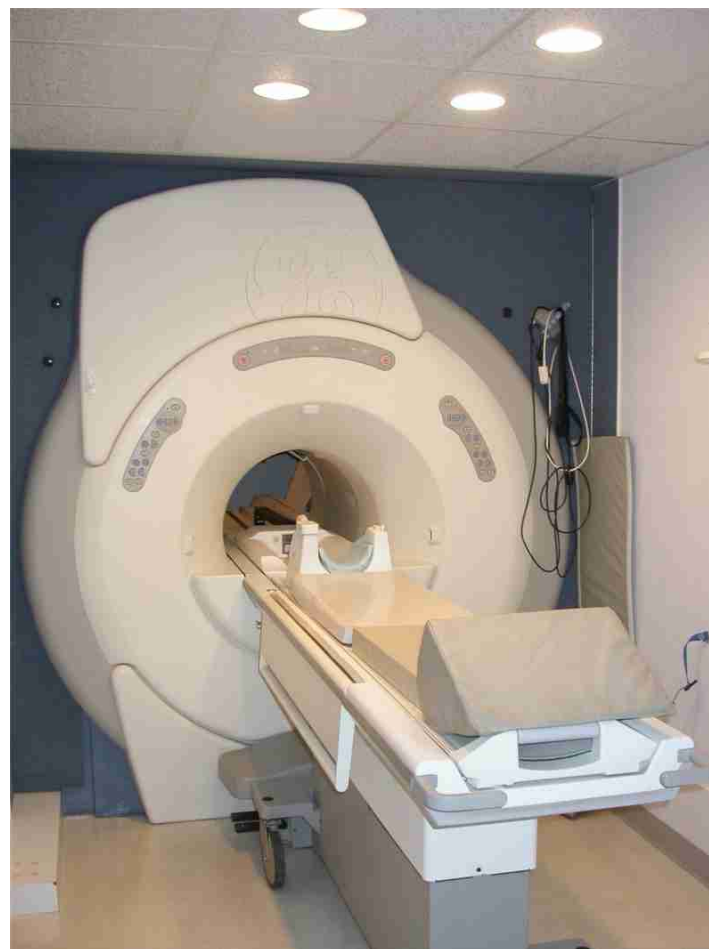
Neuronavigation

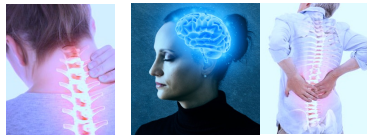




Voraussetzungen:

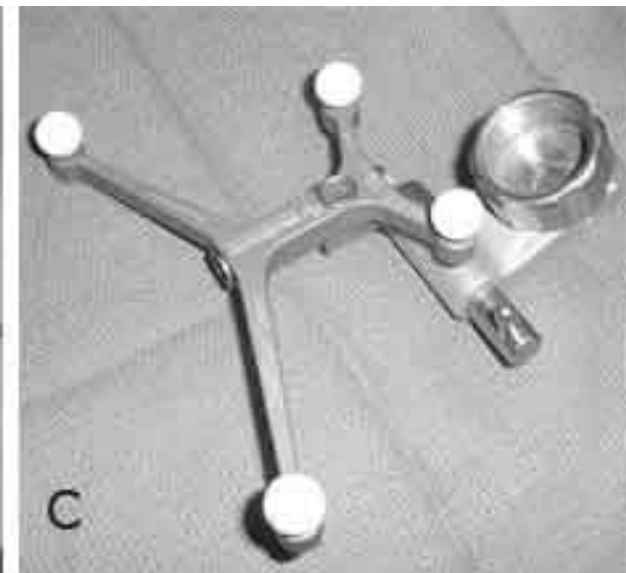
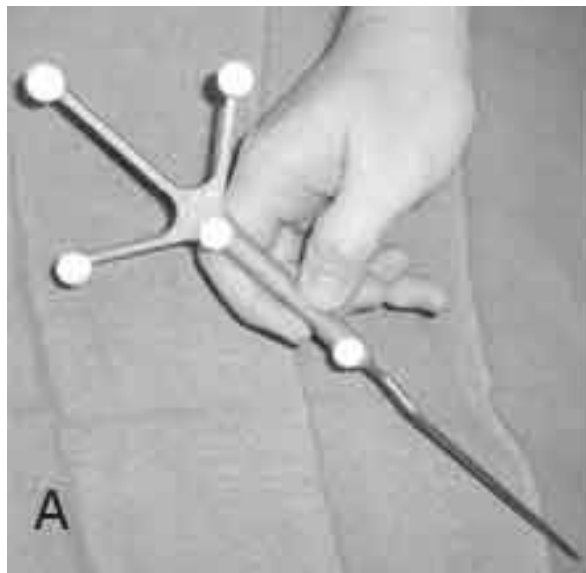
- Bildgebung mit
Möglichkeit einer 3D-
Rekonstruktion
(MRI, CT, US)

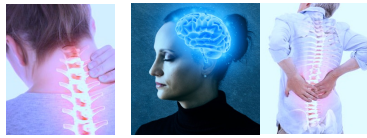




Voraussetzungen:

- Stereoskopische Kamera und «Sichtbarkeit» der Instrumente
- Bewegliche und statische „sichtbare“ Instrumente



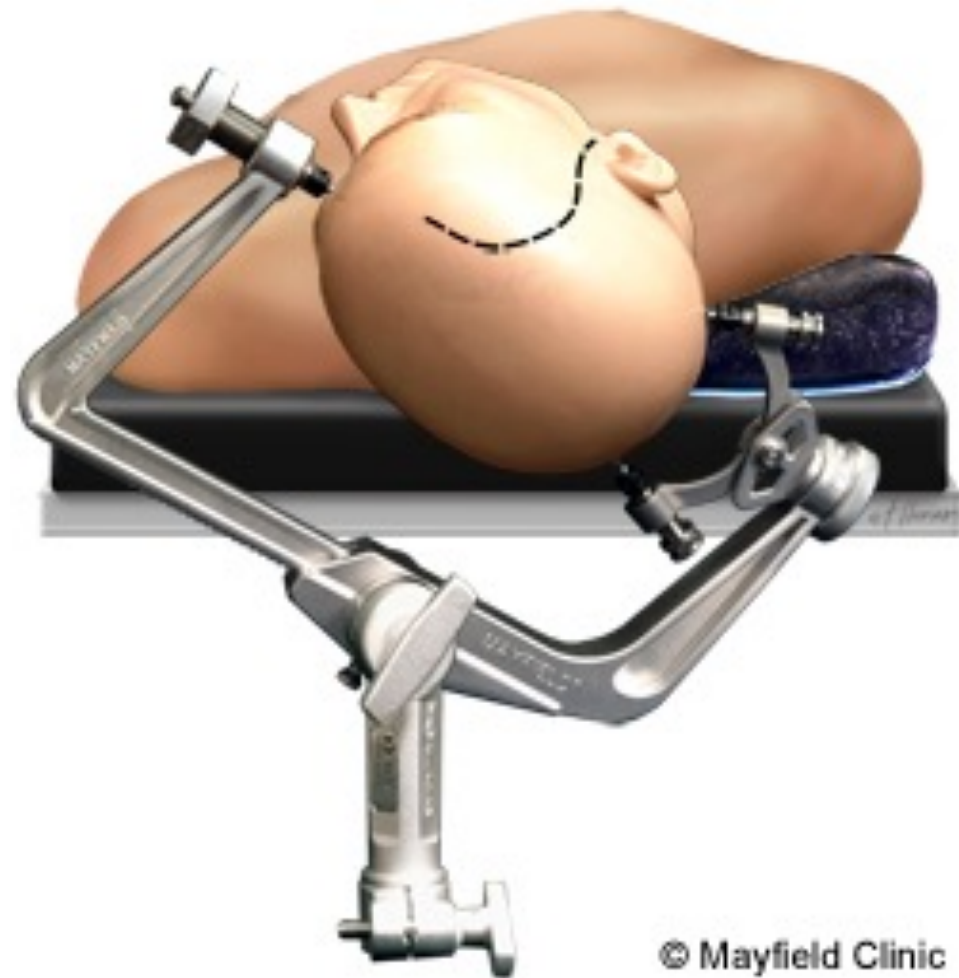


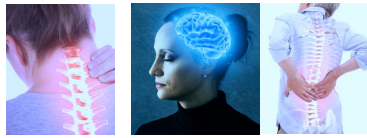
Voraussetzungen:

- **Statische Lage des Navigierenden Objektes Zu den Referenzpunkten**

z.B. mittels Mayfield-Klemme

(Referenzrahmen im Knochen verankert oder Mit straffer Binde am Kopf befestigt)



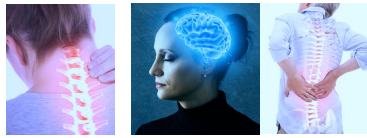


Durchführung:

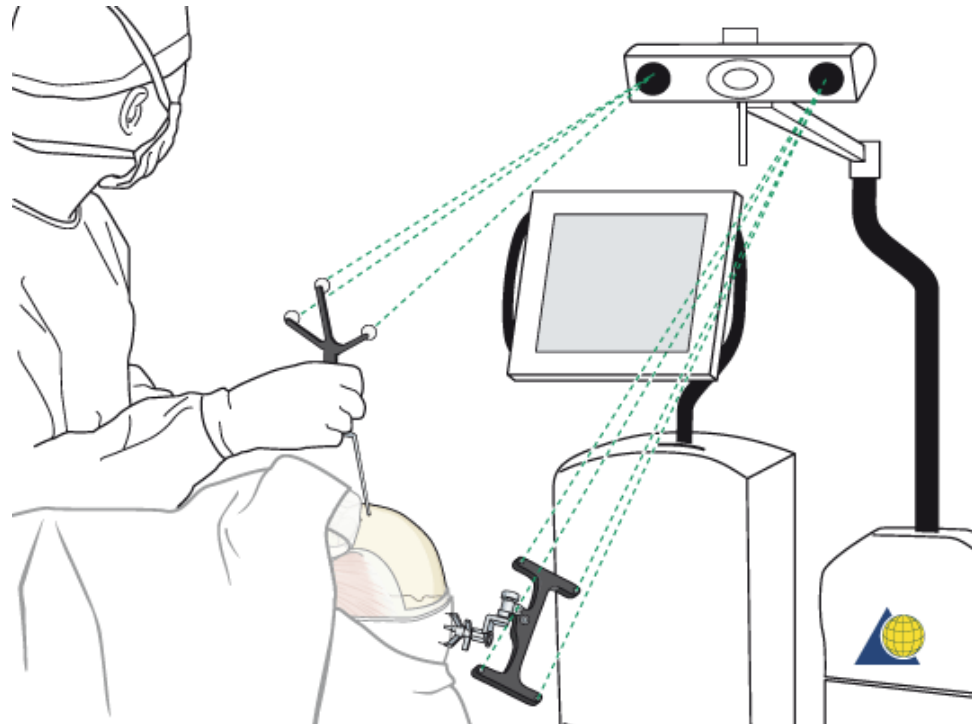
- Referenzierung mittels Scannen der Oberfläche

System gleicht am Pat. erfasste Punkte mit 3D-Modell der präop. Bildgebung ab



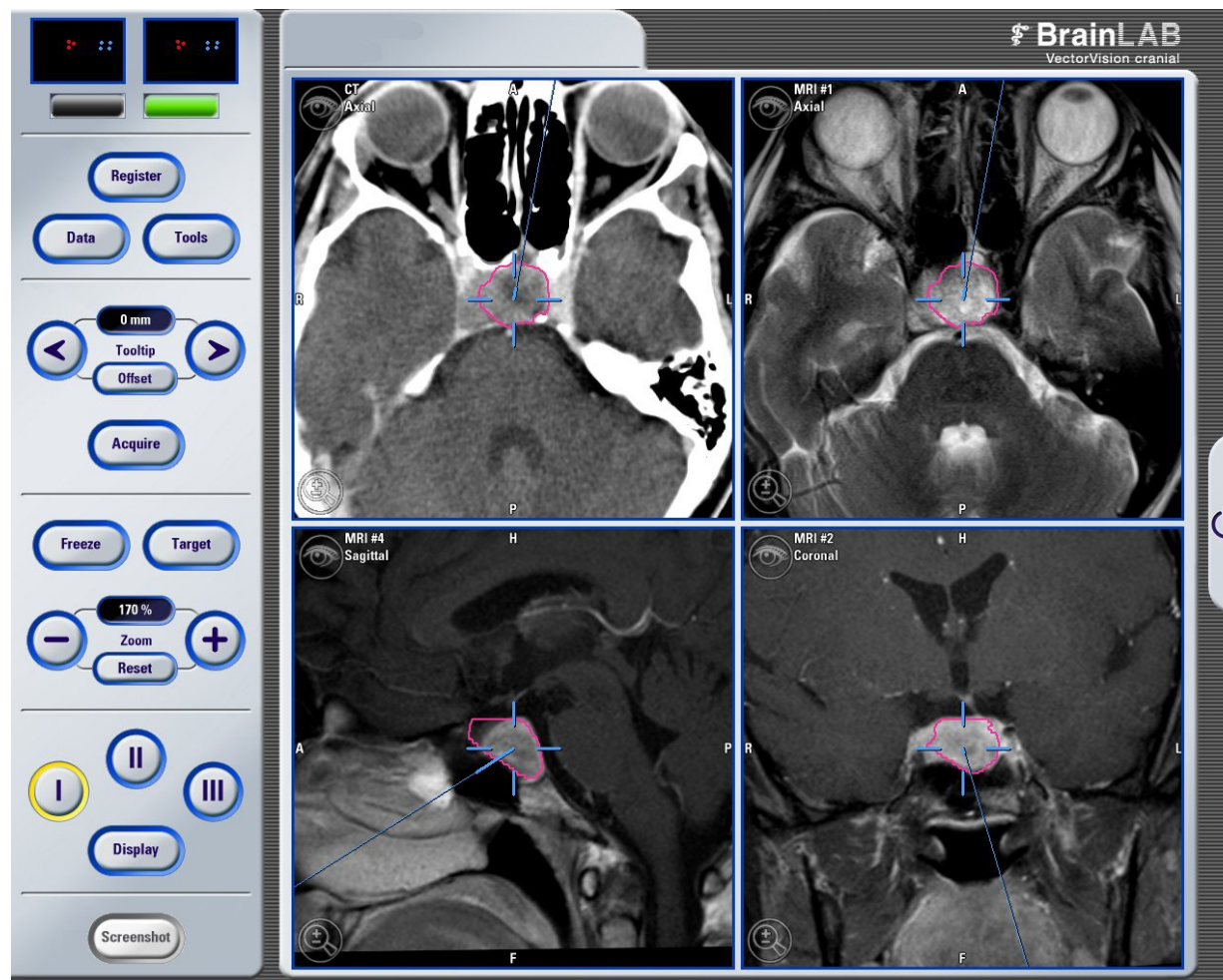


Prinzip: Abgleich der Position des beweglichen Tools mit dem zuvor statisch definierten Objekt



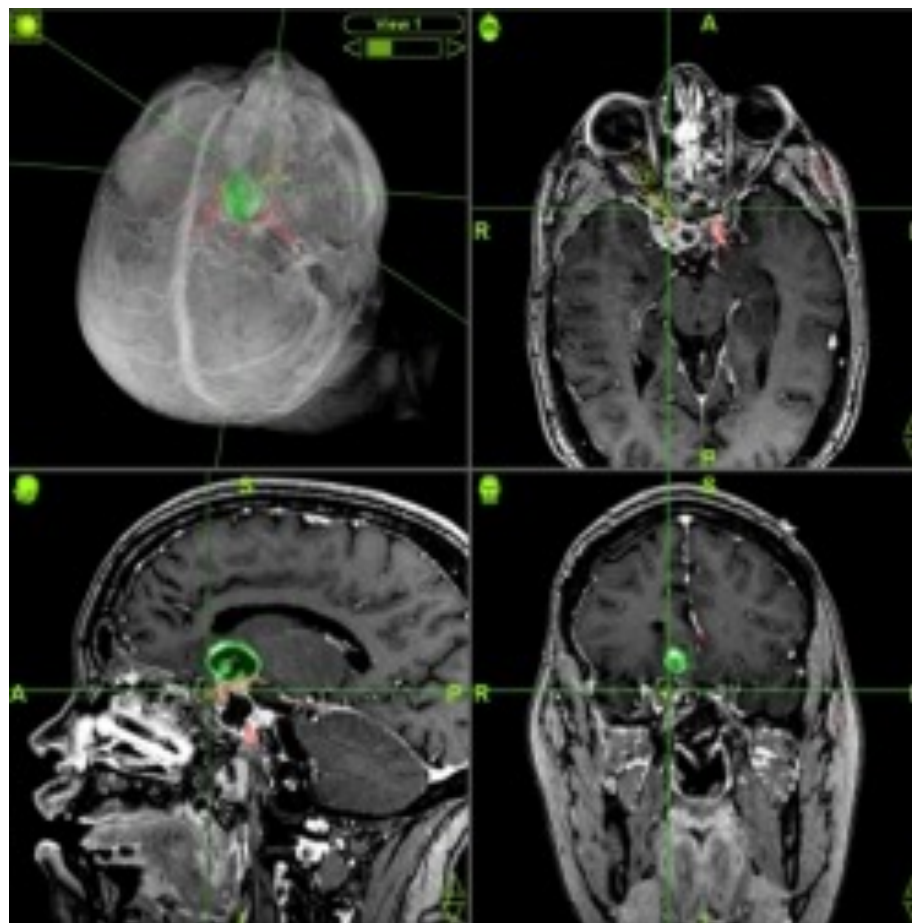


Anwendungsbeispiele: Definition von Zugängen



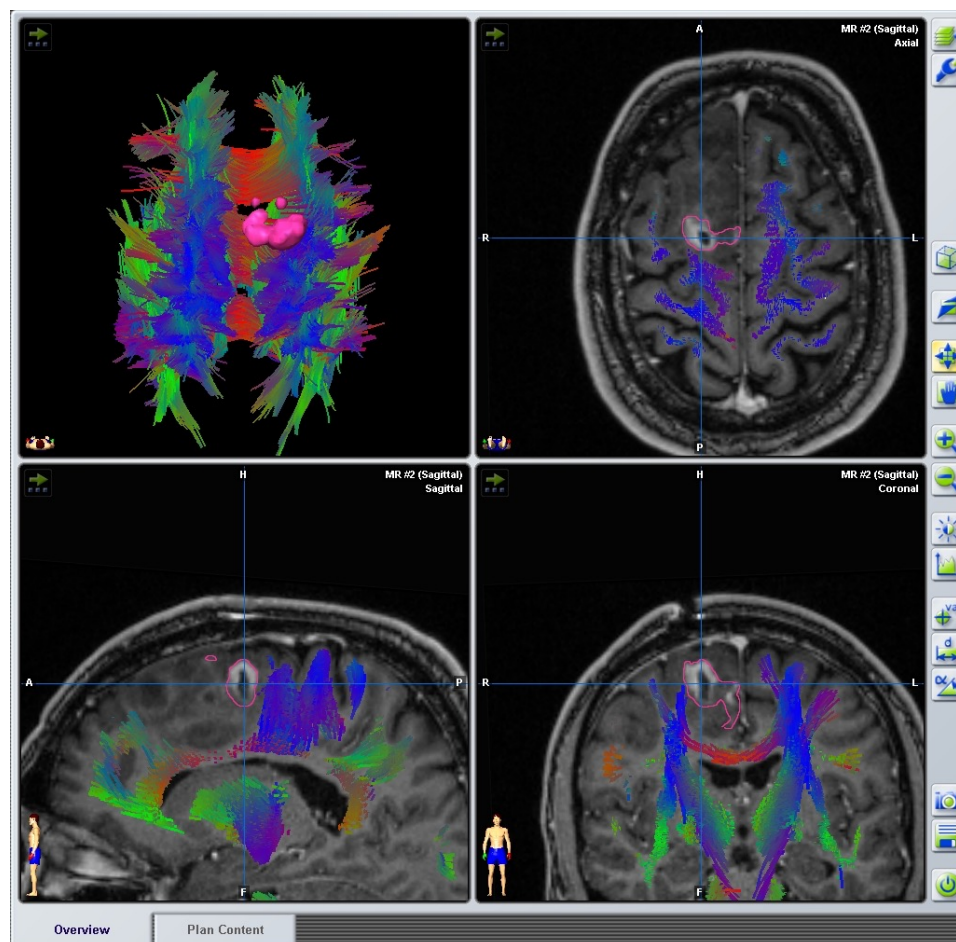


Anwendungsbeispiele: Definition von Resektionsgrenzen





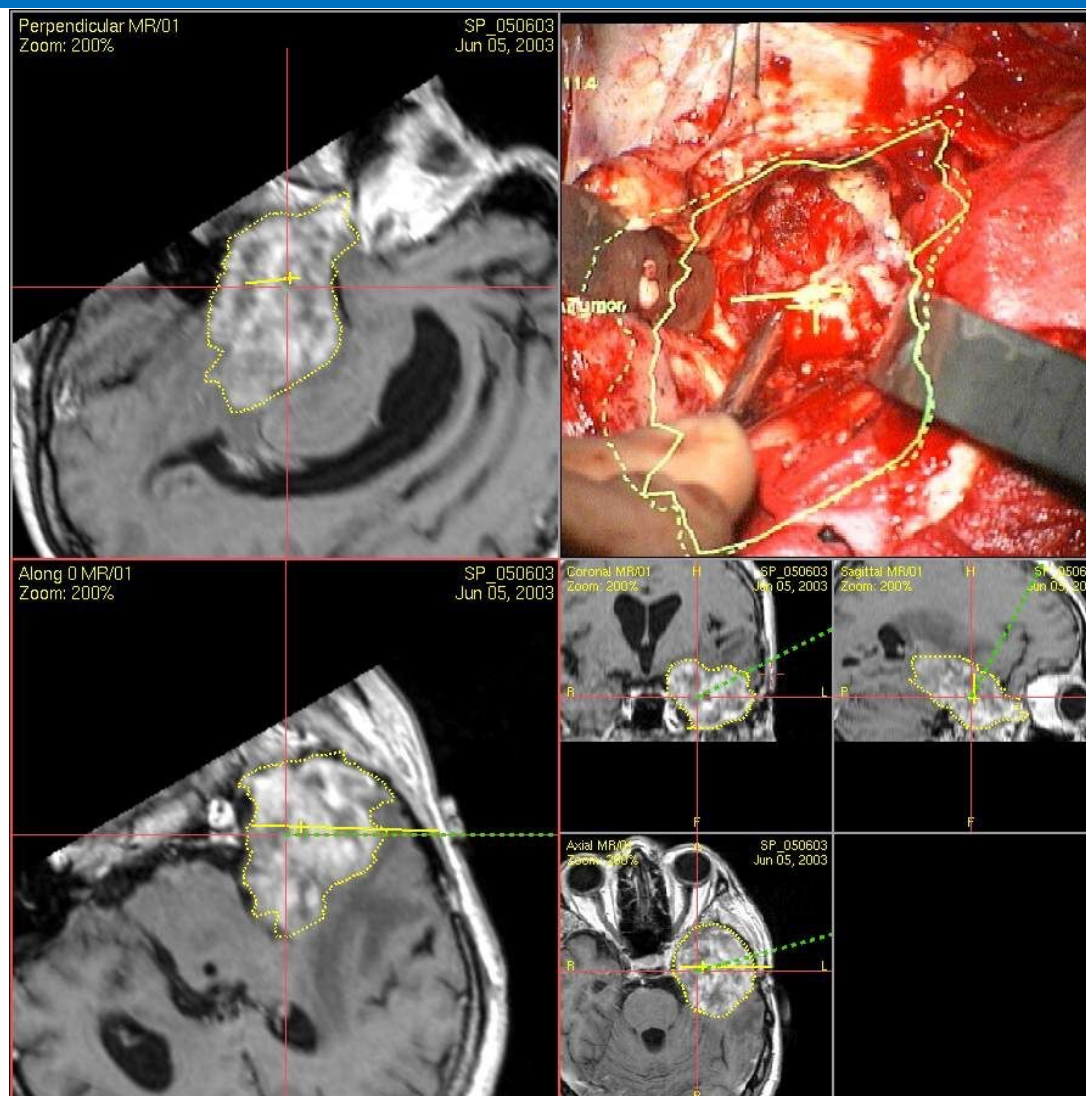
Zusätze: funktionelle Bildgebung

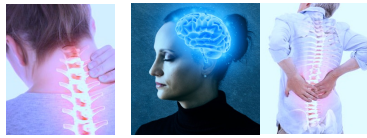




Zusätze: Interaktion mit Mikroskop

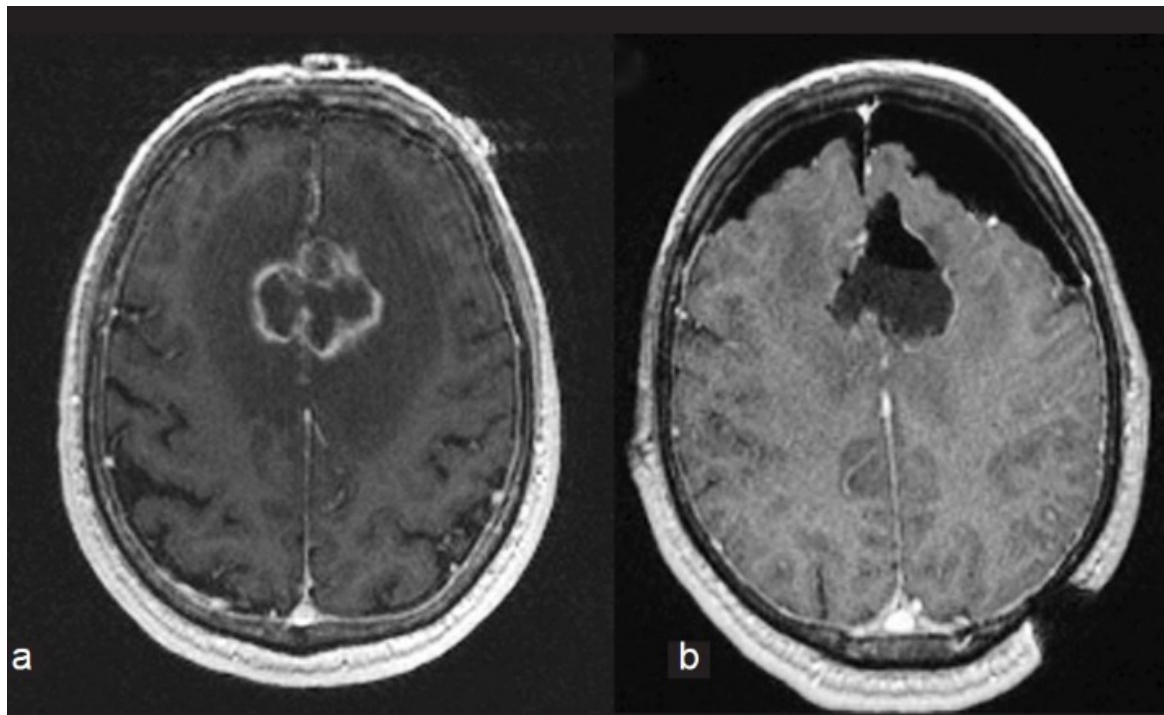






Probleme:

- Sichtbarkeit der Instrumente limitiert
- Referenzrahmen bewegt
- Ohne update rein virtuelles Bild (z.B. Problem Brainshift)





Intraoperative Navigation



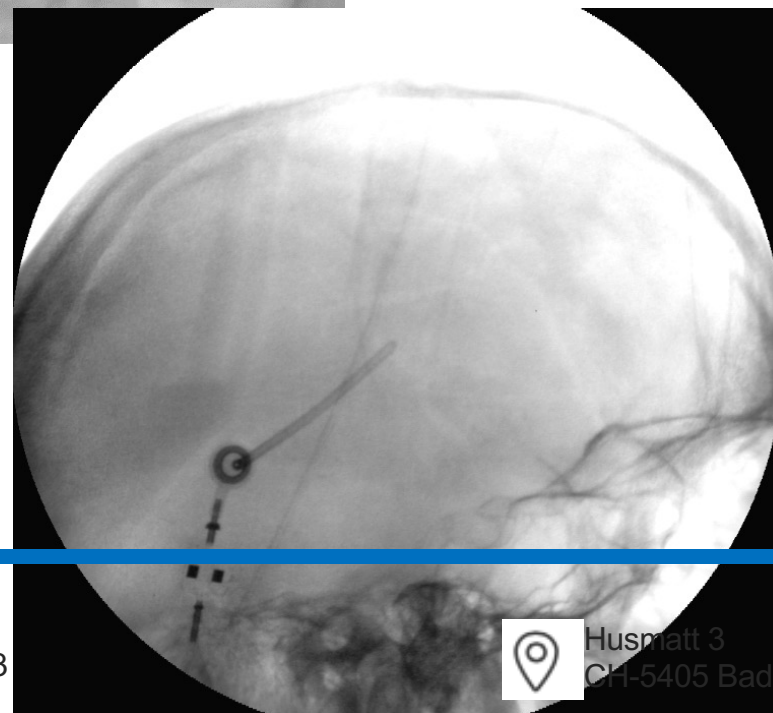
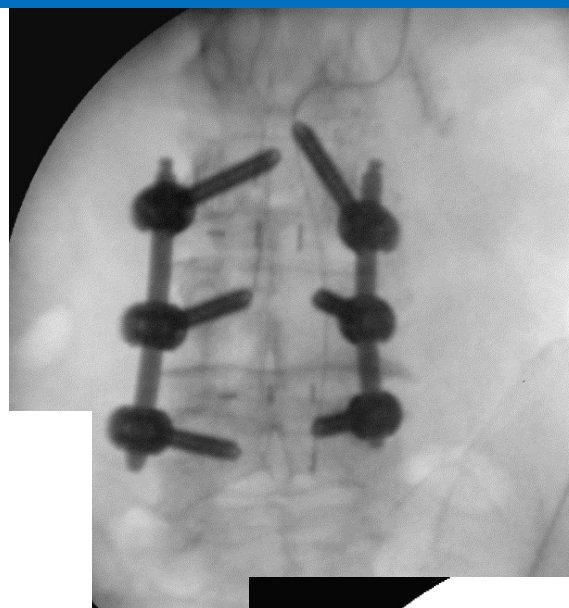


Intraoperative Bildgebung



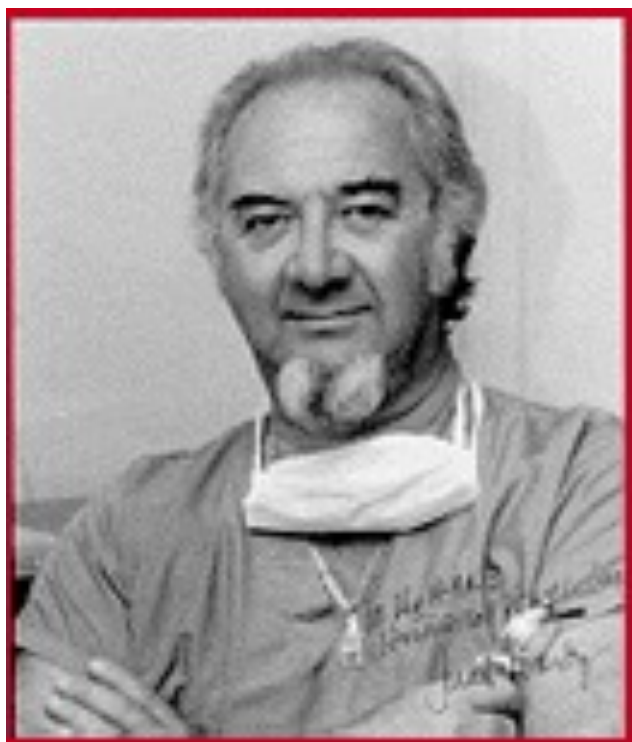


Bildwandler (BV)

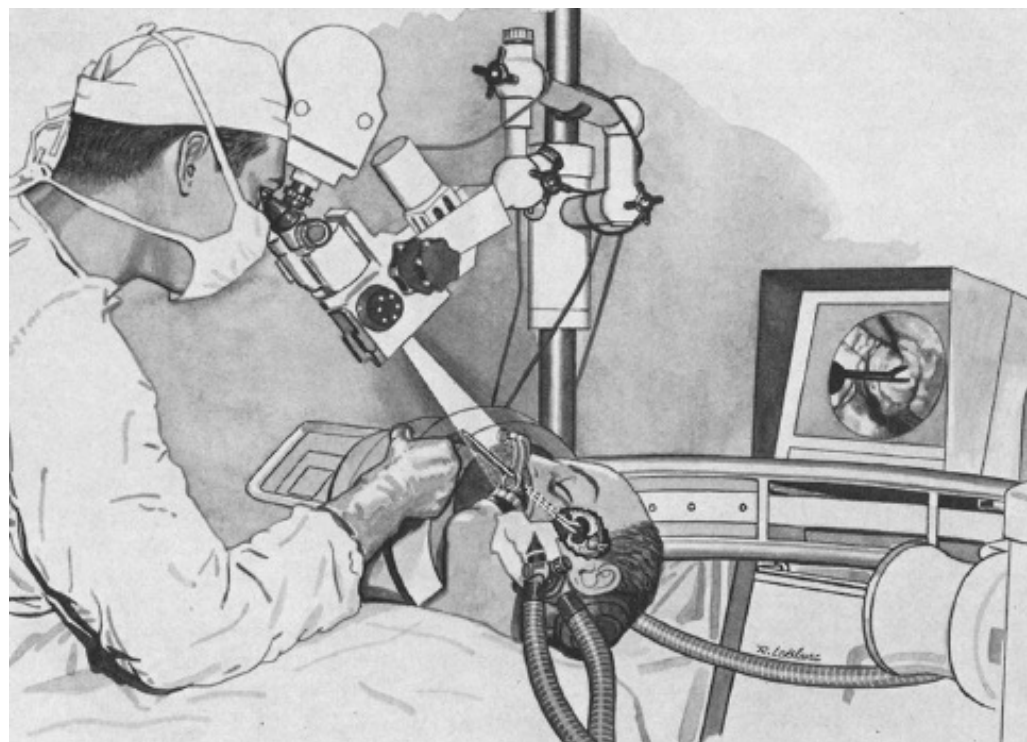




Bsp. Hypophysenchirurgie



Jules Hardy
(*1932)





Intraoperatives MRI

Low-field (<1.5Tesla) (z.B. PoleStar N20)





Live-update der Navigation

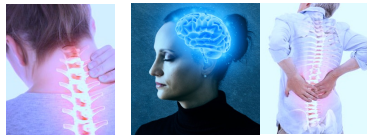
(zB bei «Brain-
Shift», Resttumor etc.)





Finde die Fehler...





Bsp. Hypophysen- chirurgie:

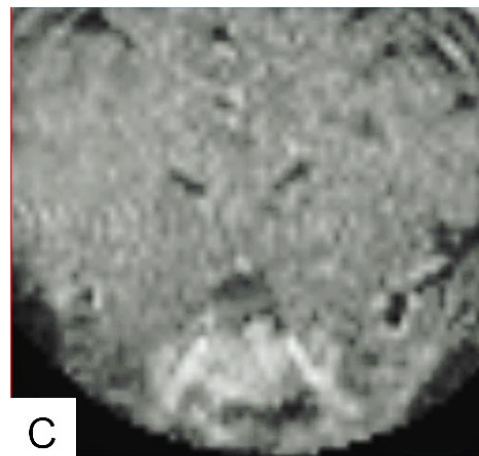
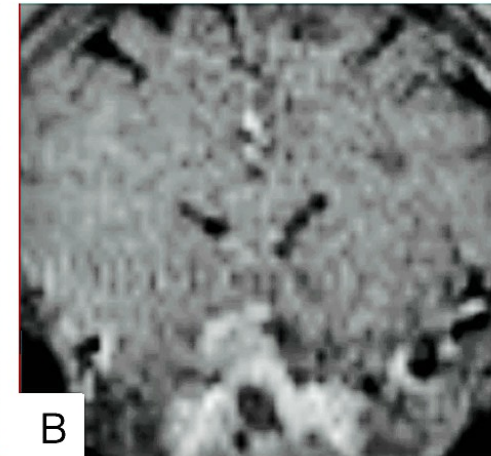
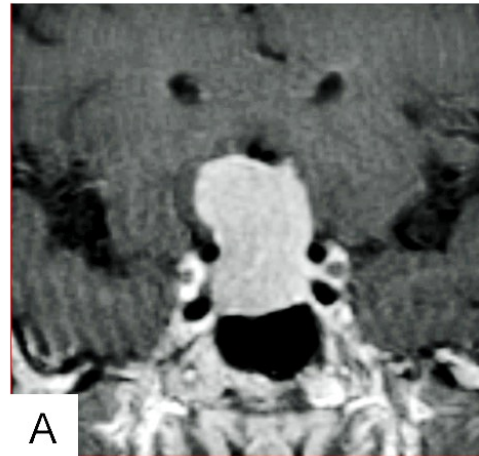
A: präop MRI

**Hypophysen-
Makroadenom**

**B: iMRT-Aufnahme
mit Resttumor**

**C: iMRT-Aufnahme
nach Nachresektion**

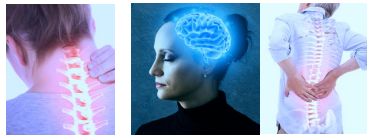
**D: postop MRI ohne
Tumornachweis**



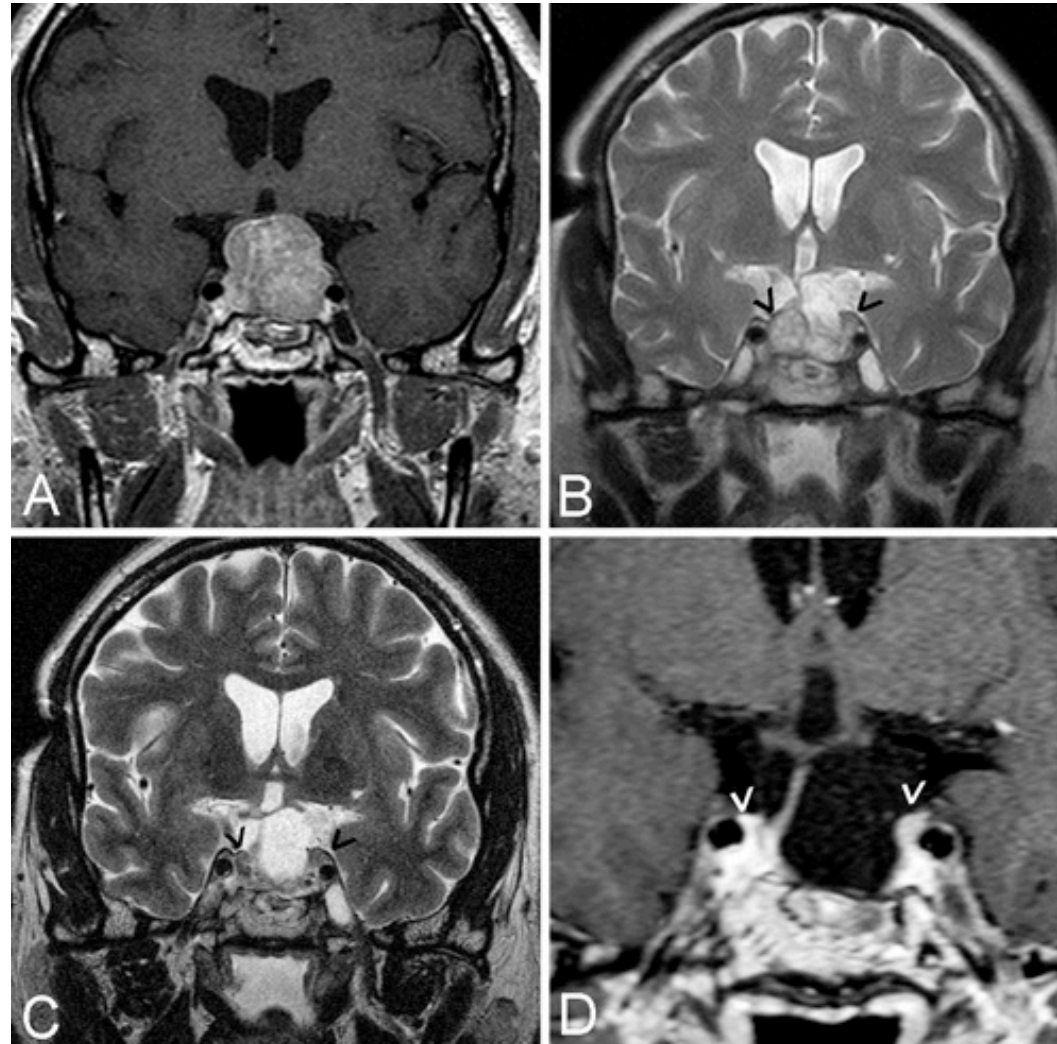


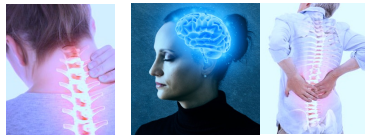
high-field iMRI





Bsp. Hypophysen- chirurgie:





Low-field:

- + handling (staff, OP)**
- + Kosten (Betrieb, Wartung)**
- Bildqualität**
- störungsanfällig**

high-field

- + Bildqualität**
- + für extraop einsetzbar**
- Abschirmung**
- Kosten**





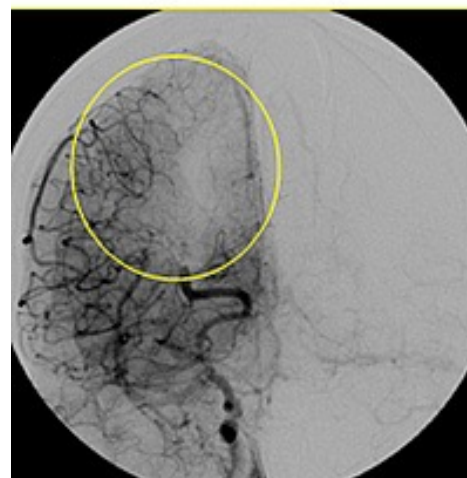
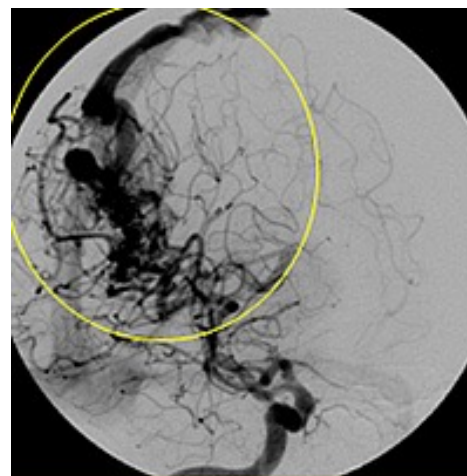
Intraop Angiographie/ iCT







**Fallbeispiel:
Kontrolle bei
arterio-venöser
Malformation
(AVM)**



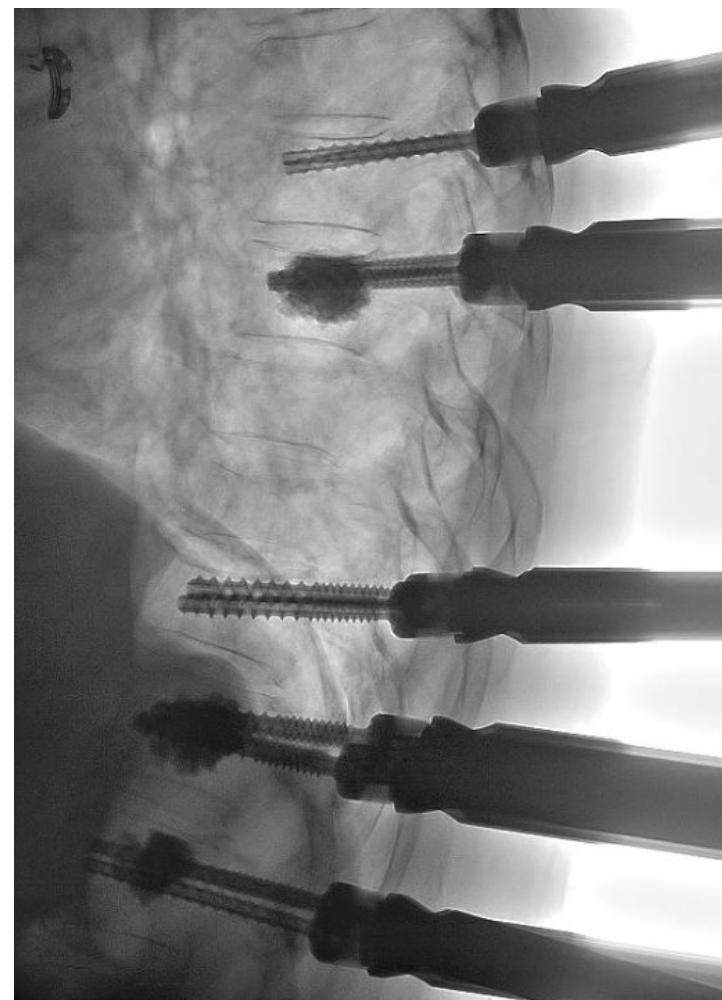
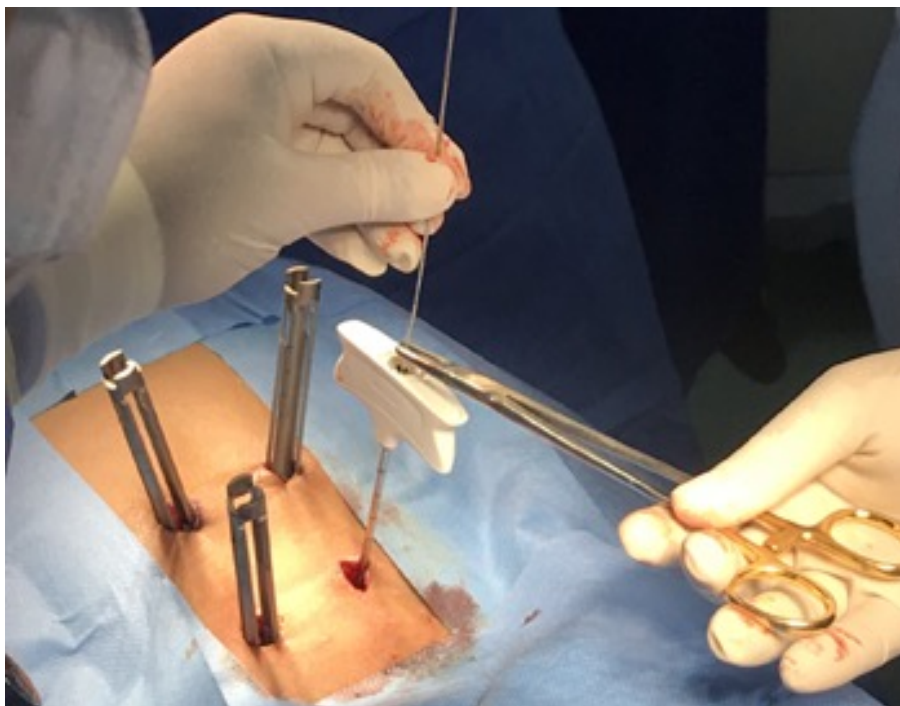


Fallbeispiel: Kontrolle bei spinalen Stabilisationen



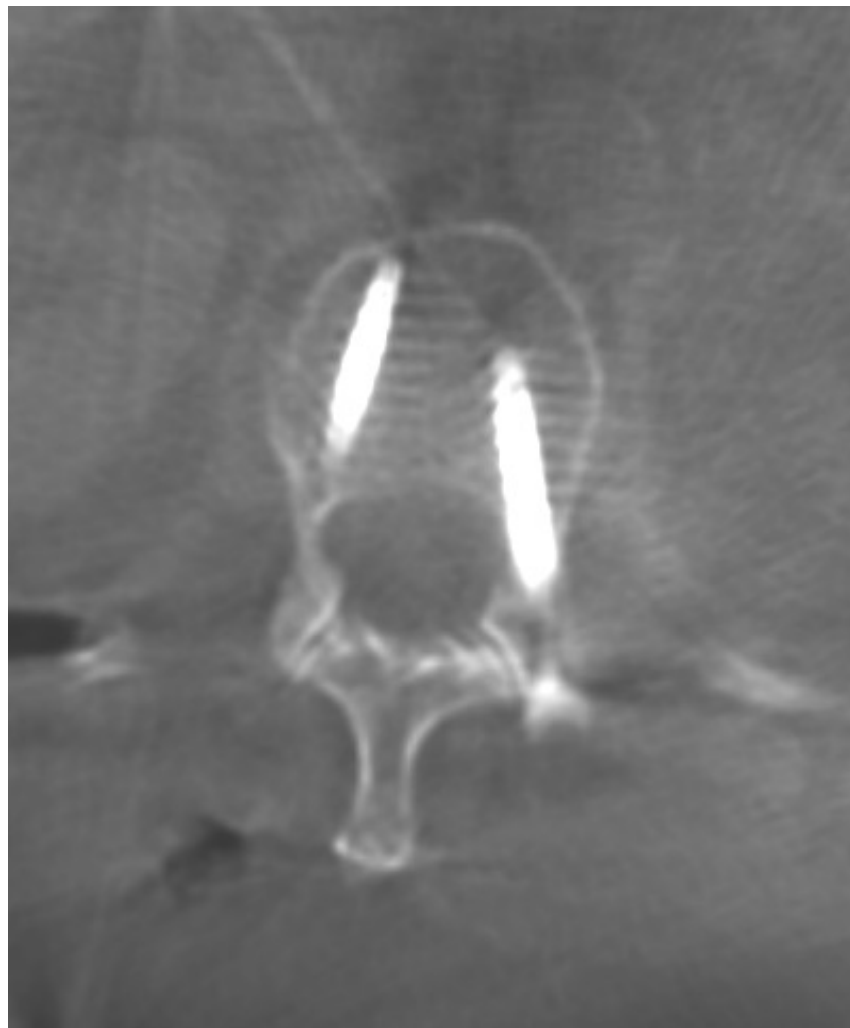


Fallbeispiel: Kontrolle bei spinalen Stabilisationen





Fallbeispiel: Kontrolle bei spinalen Stabilisationen



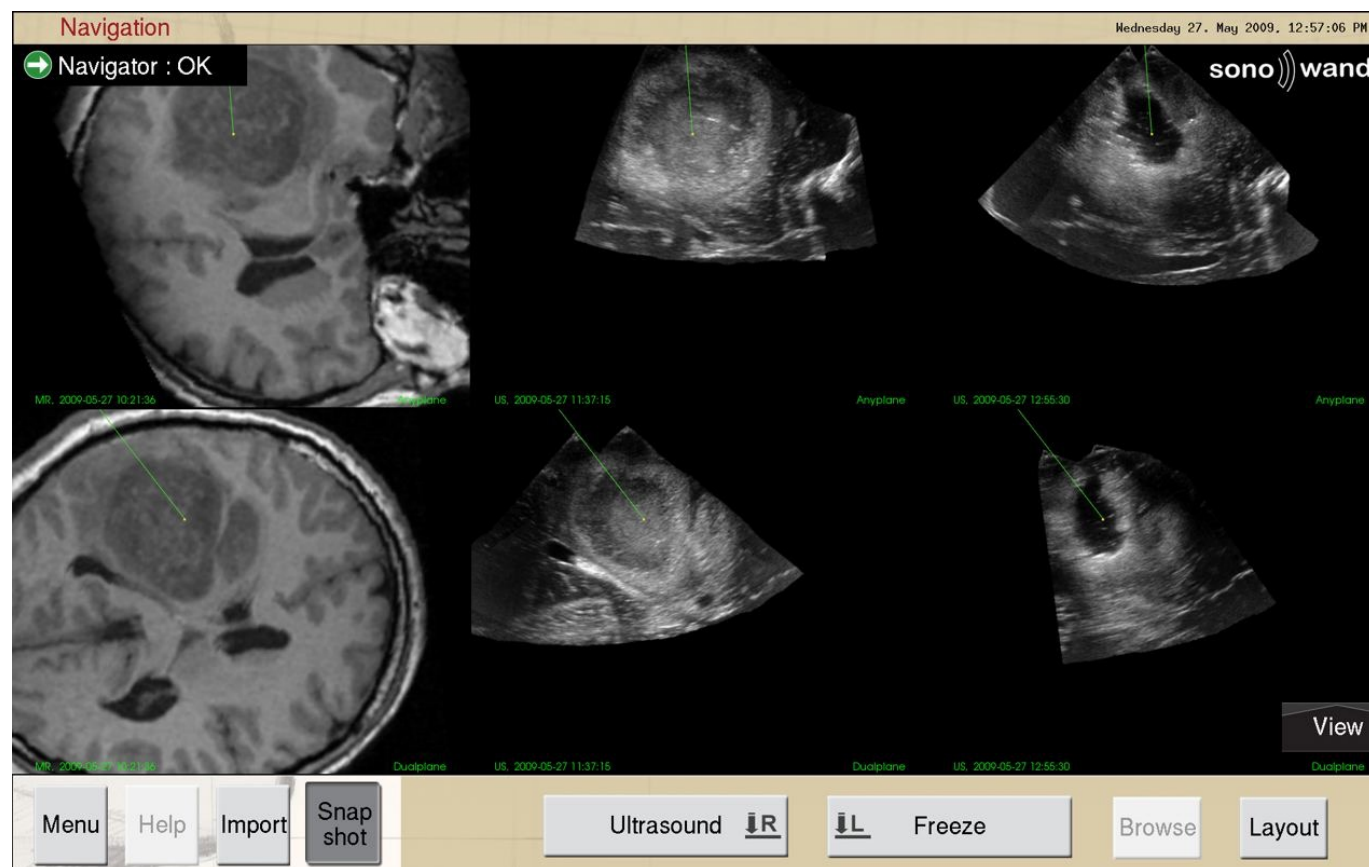


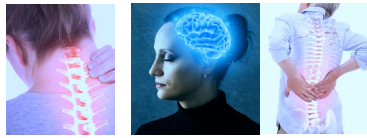
Intraoperativer Ultraschall



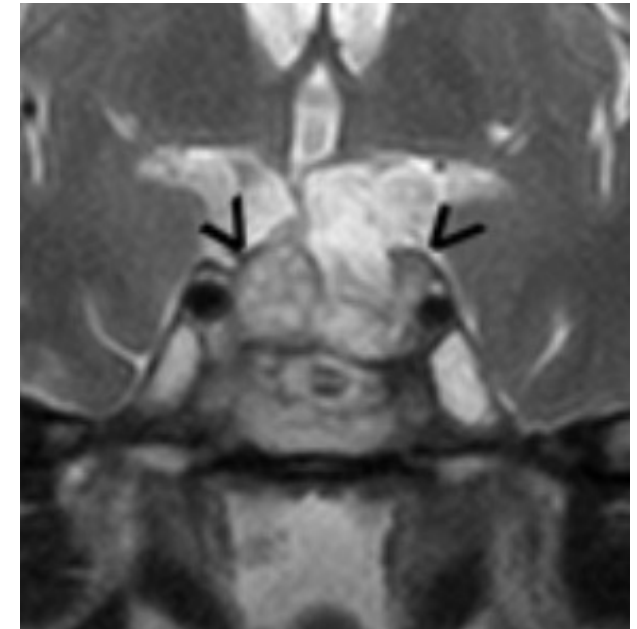
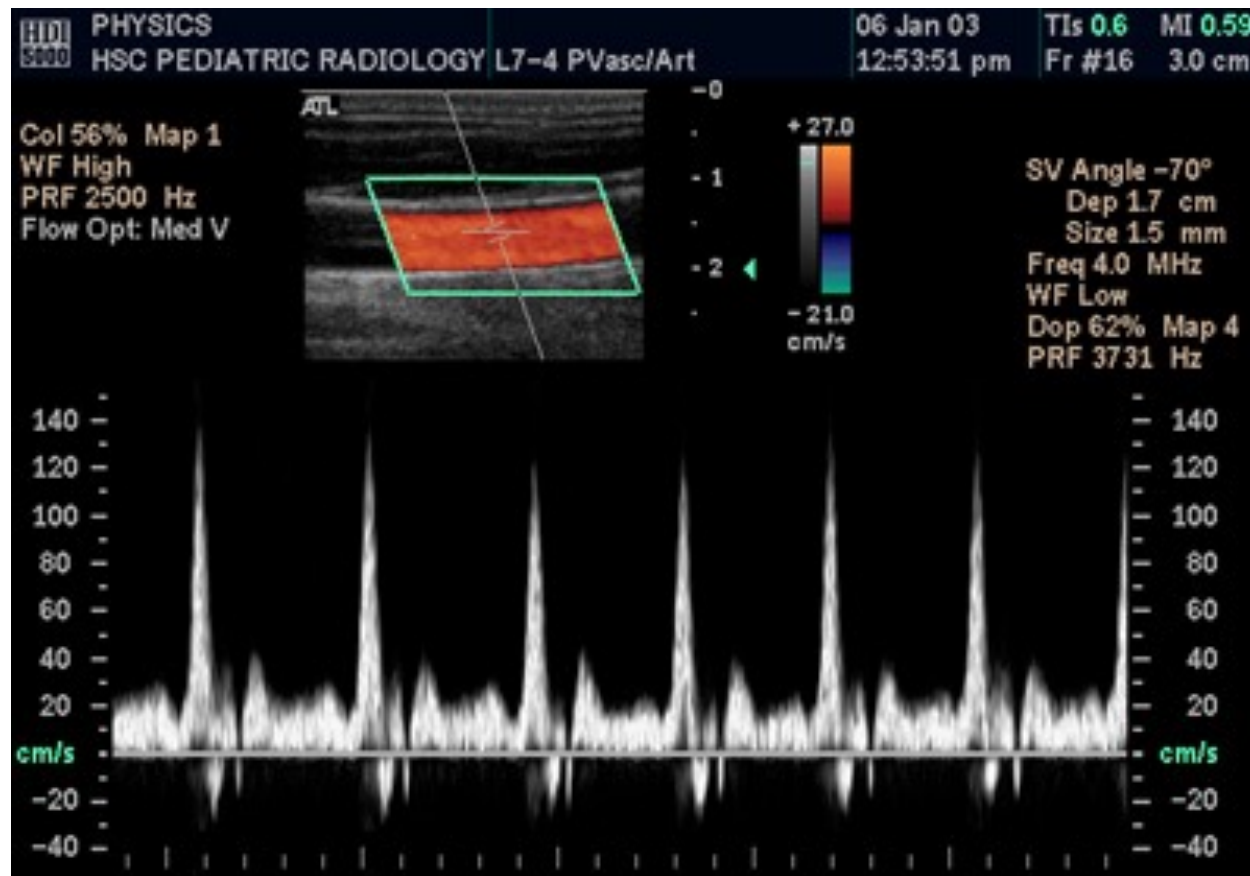


Live-update der Navigation





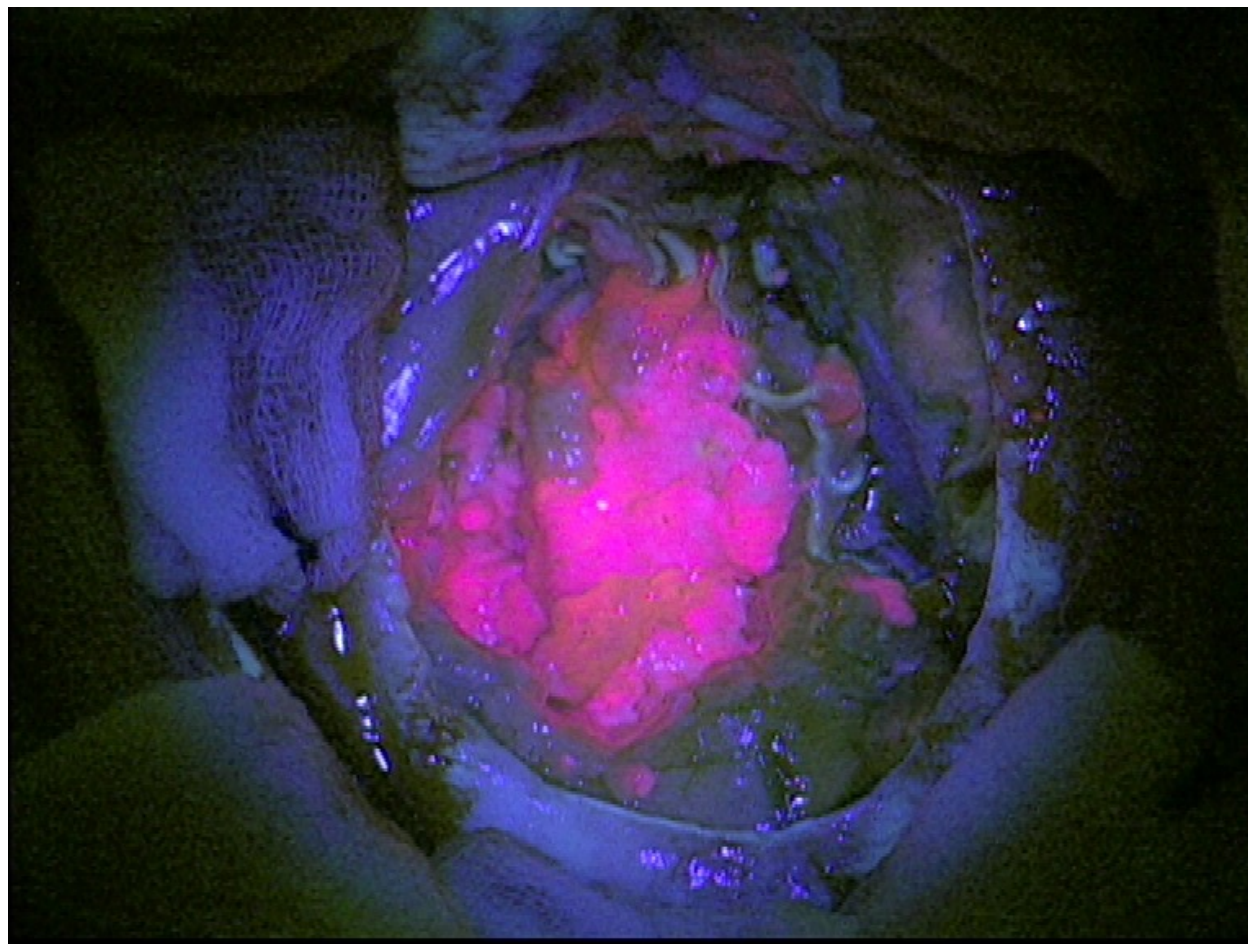
Intraoperativer Doppler

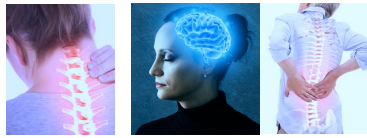




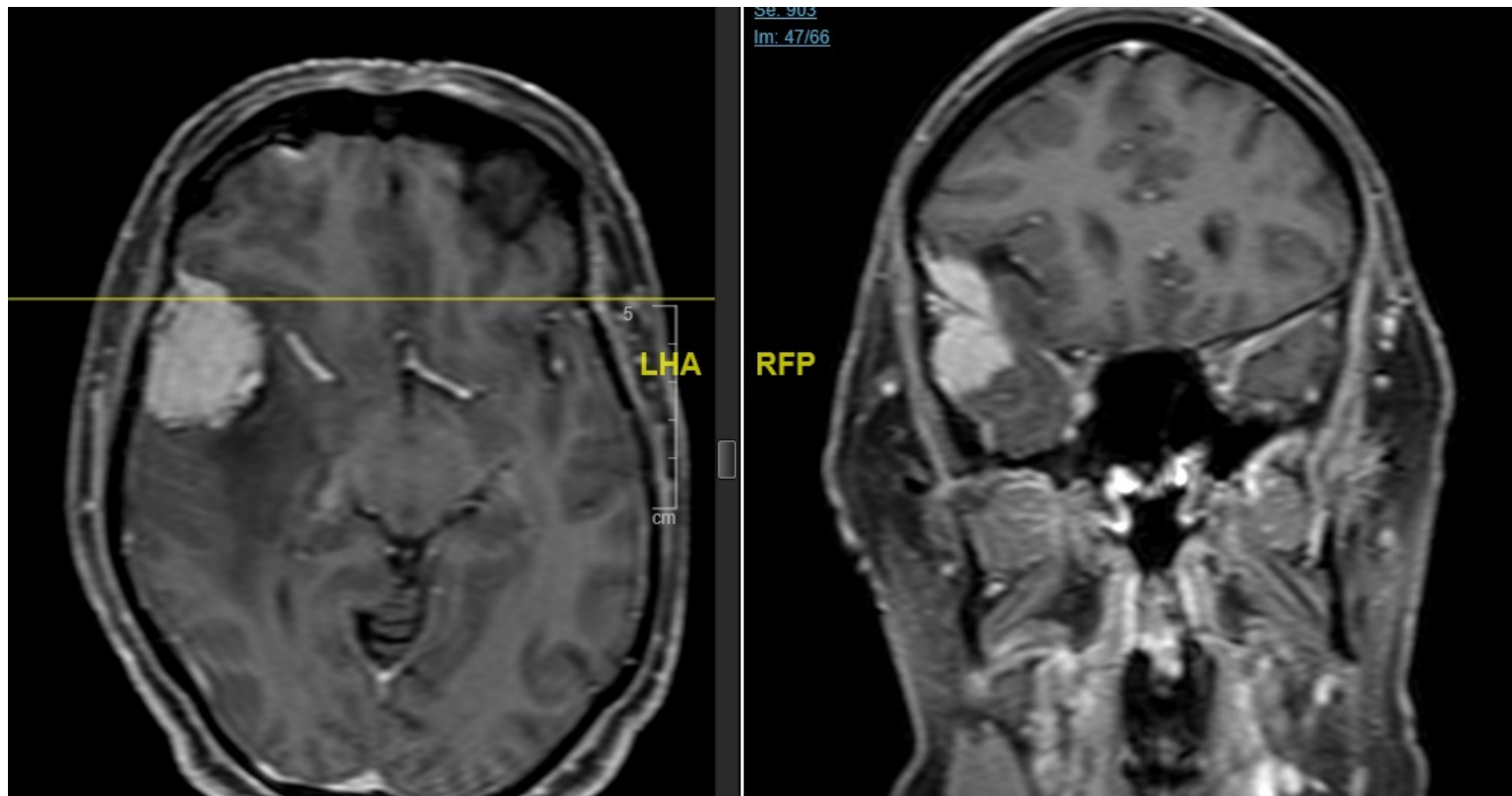
Tumordarstellung mittels 5-ALA

(5-Aminolävulinsäure)



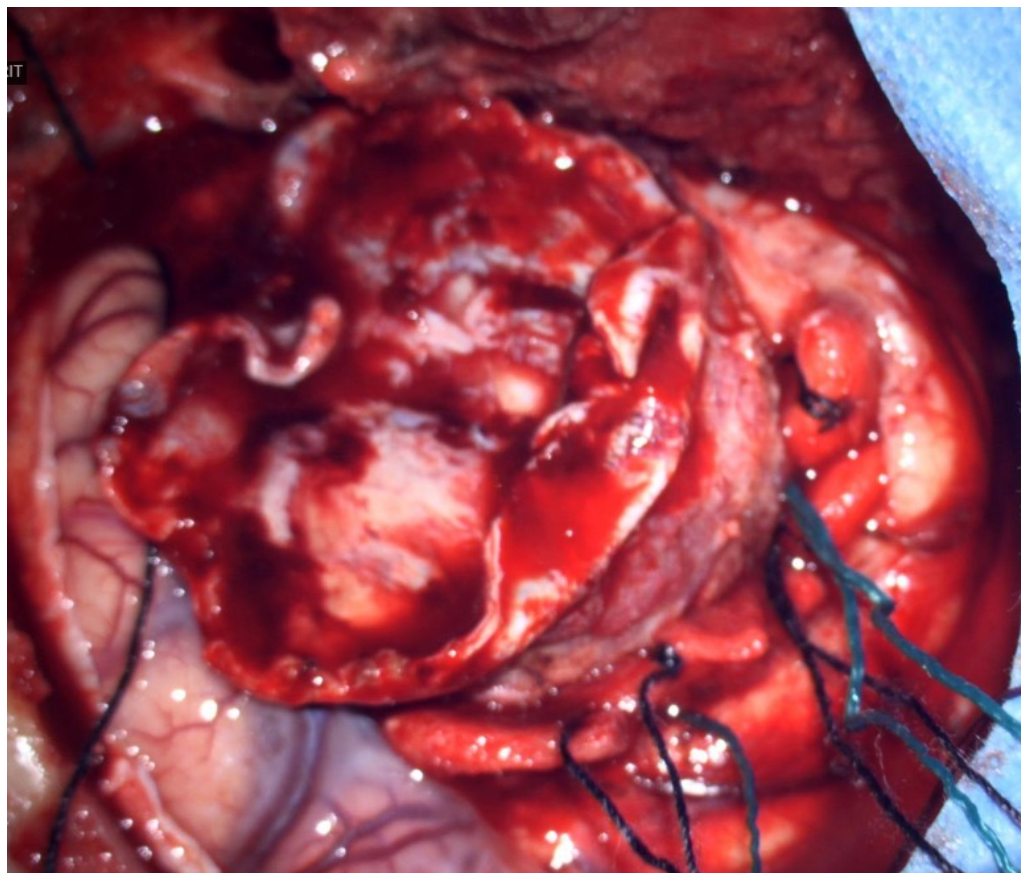


Tumordarstellung mittels 5-ALA (v.a. hochgradige Gliome, Meningeome) (5-Aminolävulinsäure)



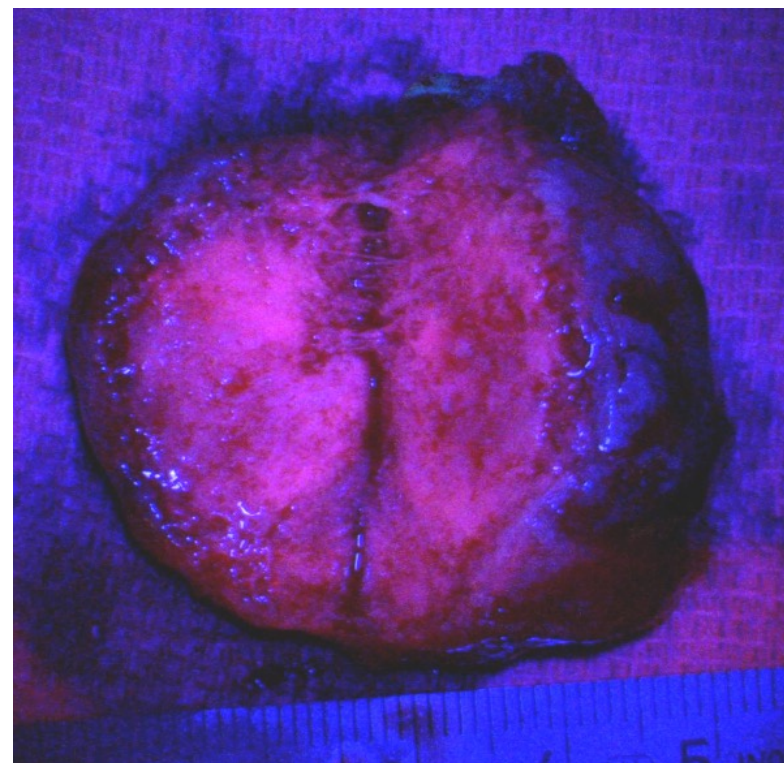


Tumordarstellung mittels 5-ALA (v.a. hochgradige Gliome, Meningeome) (5-Aminolävulinsäure)





Tumordarstellung mittels 5-ALA (v.a. hochgradige Gliome, Meningeome) (5-Aminolävulinsäure)



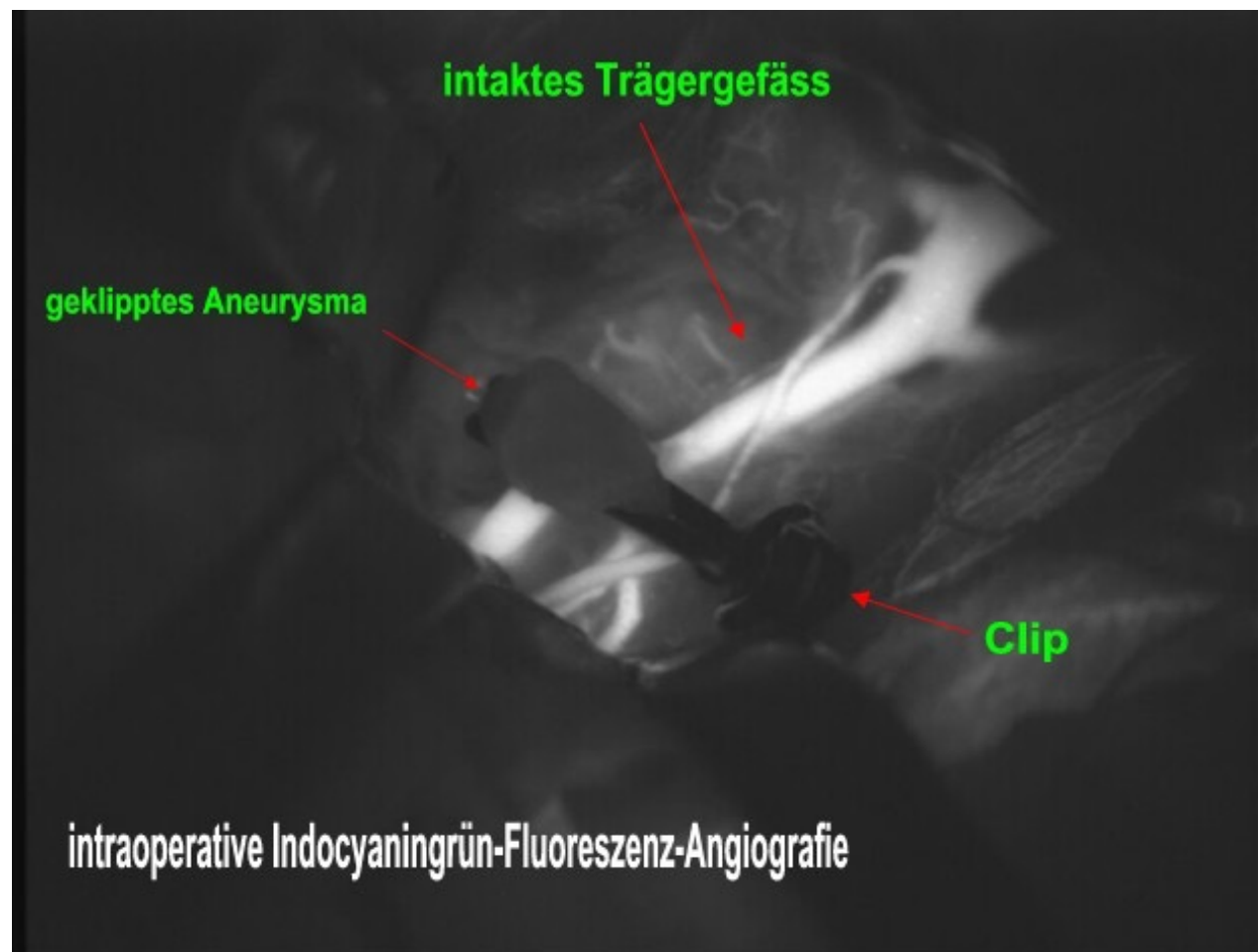


Tumordarstellung mittels 5-ALA (v.a. hochgradige Gliome, Meningeome) (5-Aminolävulinsäure)





ICG-Video-Angiographie (Indocyaningrün)





Intraoperative Bildgebung





Intraoperative Bildgebung – was gehört zu was?

5-ALA (5-Aminolävulinsäure)

PoleStar

intraop. MRI

**Kontrolle
Metallimplantate**

Intraop. Angiographie

**Fluoreszenz im
Tumor**

ICG (Indocyaningrün)

**Fluoreszenz im
Gefäß**

Intraop. CT

Aneurysmaclipping





Intraoperatives Neuromonitoring



Lernziele:

- Beispiele/Techniken für intraoperatives Neuromonitoring nennen können





ICP-Monitoring (intracranial pressure)

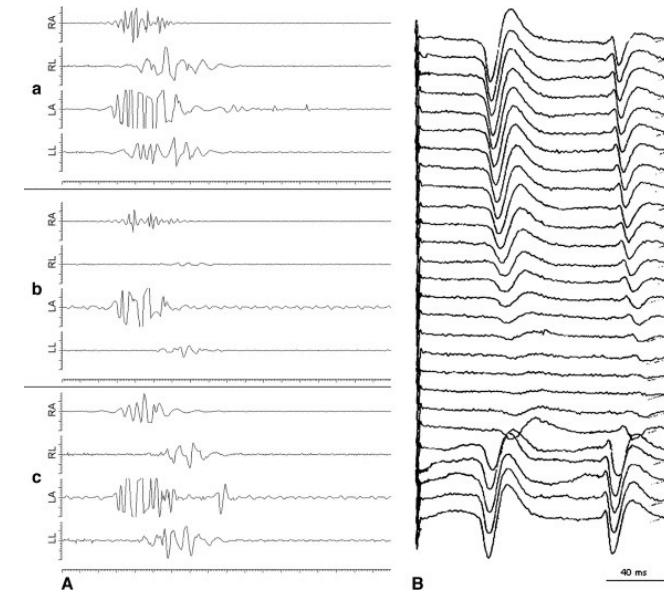
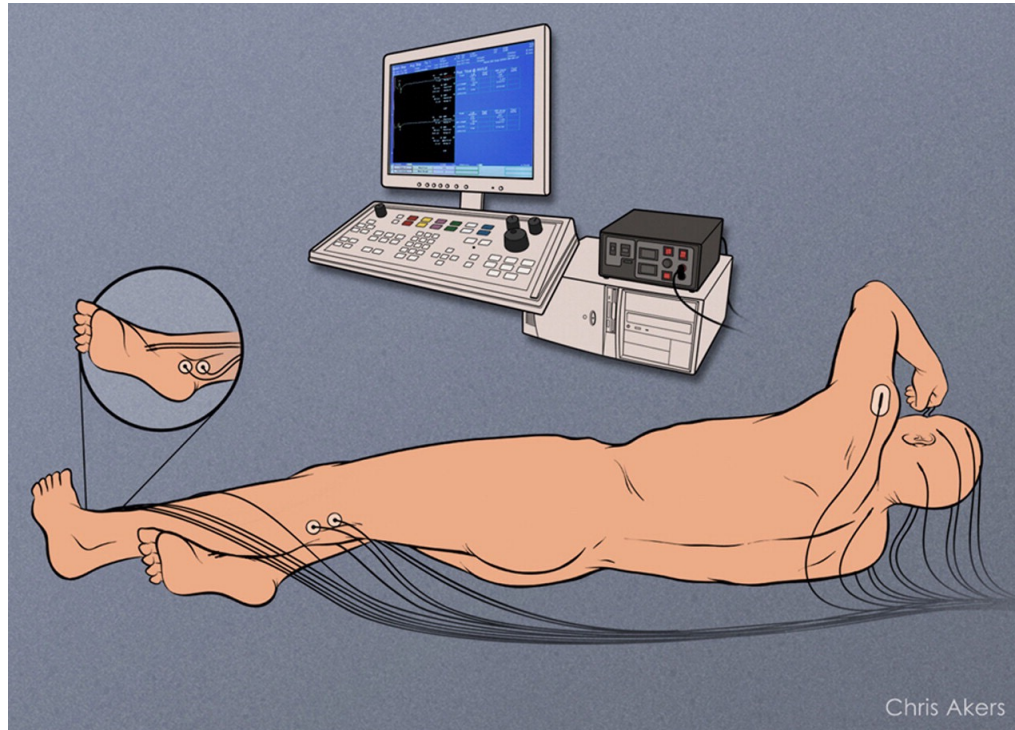


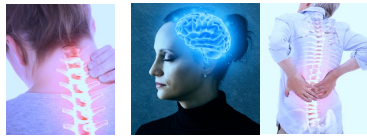


Intraoperatives Neuromonitoring

Elektrophysiologie

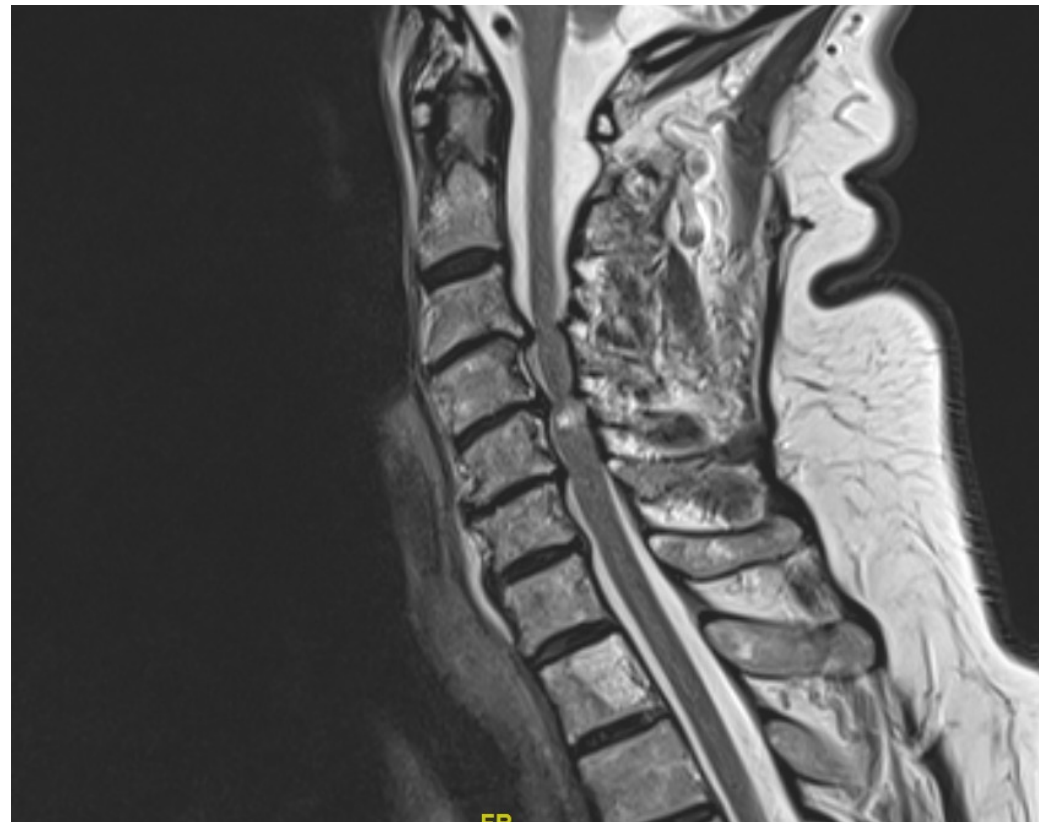
SSEP/MEP/ENG





Intraoperatives Neuromonitoring

Elektrophysiologie
SSEP/MEP/ENG





Intraoperatives Neuromonitoring

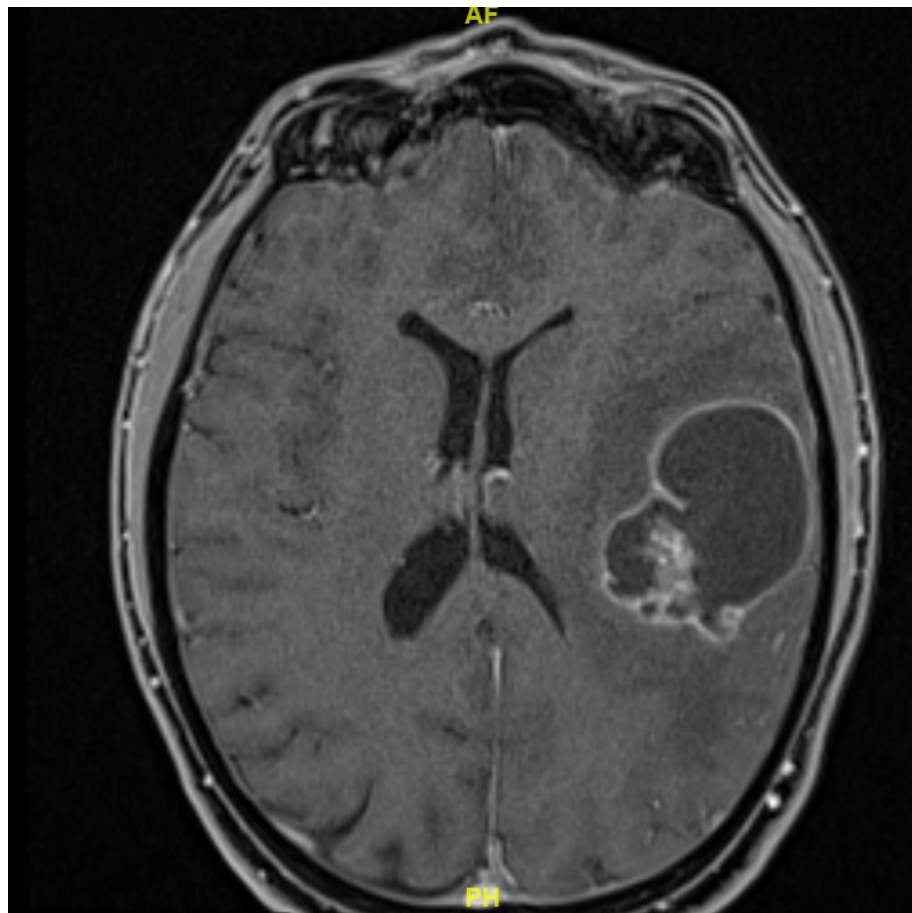
**Elektrophysiologie
SSEP/MEP/ENG**





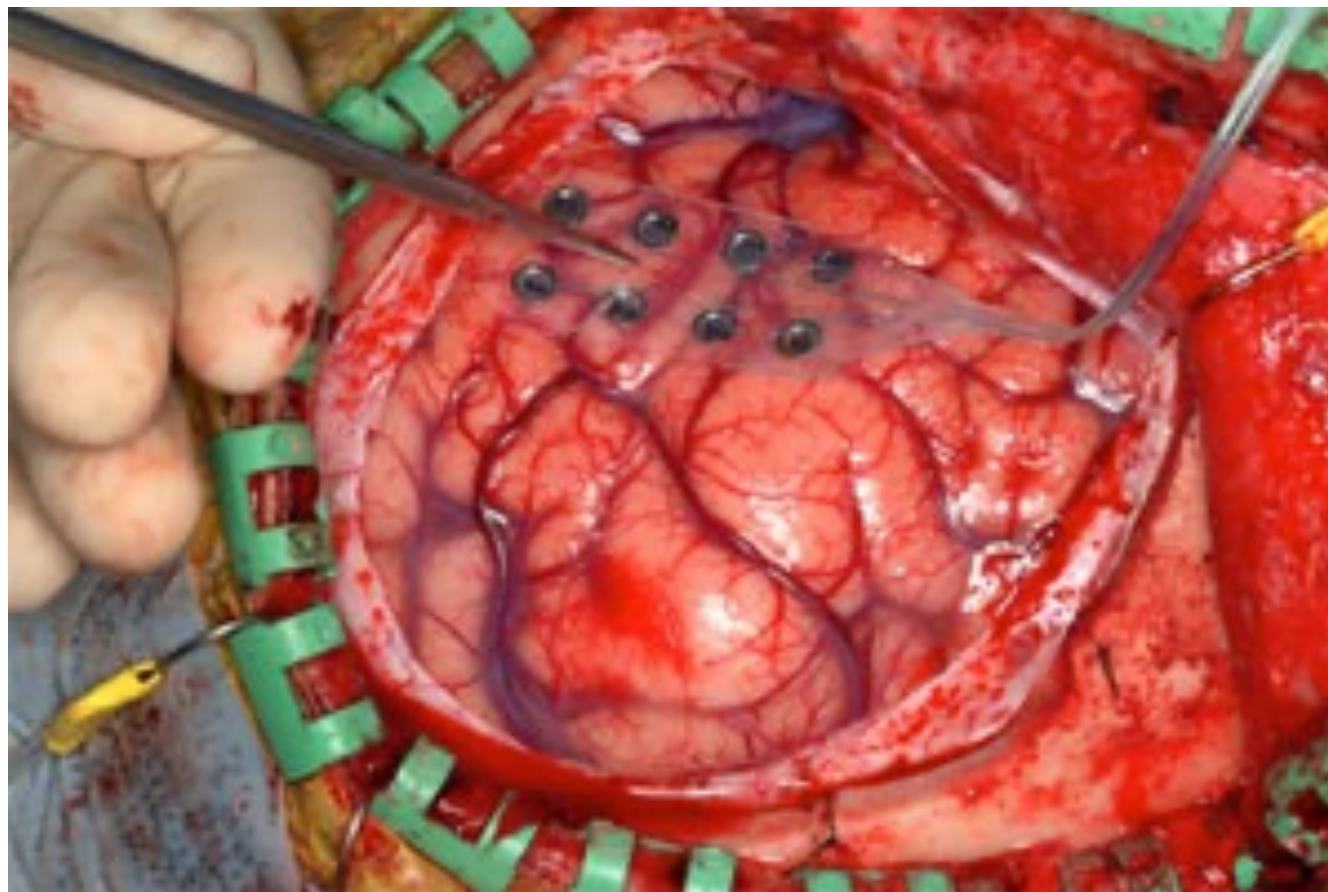
Intraoperatives Neuromonitoring

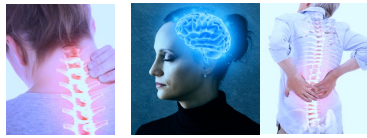
**Elektrophysiologie
Mapping**





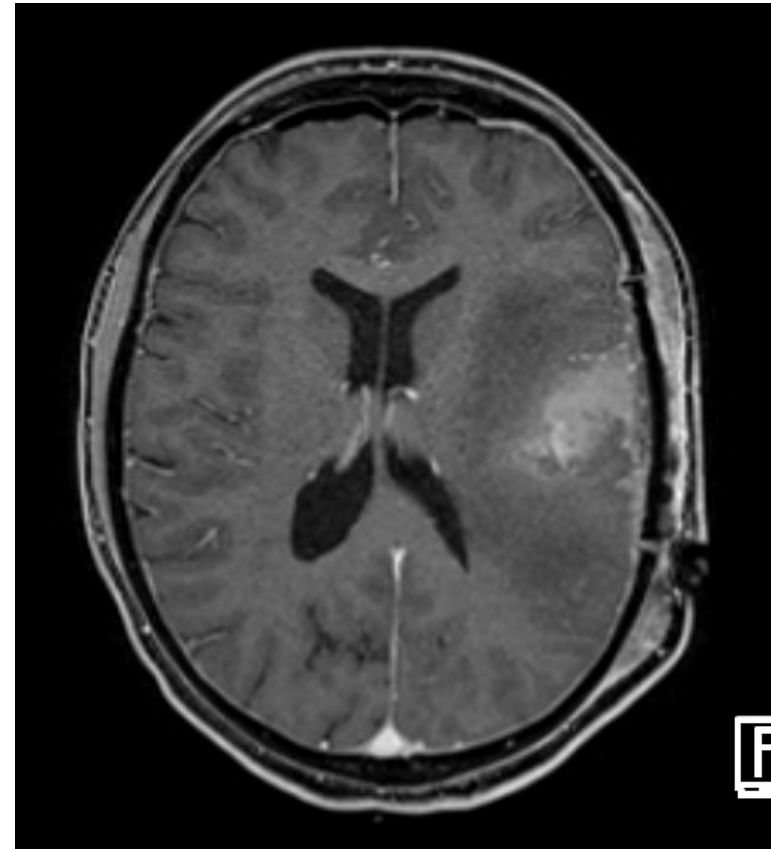
Intraoperatives Neuromonitoring





Intraoperatives Neuromonitoring

Elektrophysiologie
Mapping





Intraoperatives Neuromonitoring

Wachkraniotomie





Intraoperatives Monitoring





Danke

