UniversityHospital Zurich

University of Zurich[UZH]

Brain Tumors

Diagnostics

BIO 389

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Brain tumors - Diagnostics

- **Clinical diagnosis**
  - **Taking history (timing of symptoms onset and progression, severity of symptoms, presence of other diseases, family history etc.)**
  - **Physical examination**
- **Technical diagnostics**
  - **Imaging**
  - **Nuclear medicine**
  - **Lab investigations (cerebro-spinal fluid (CSF))**
  - **Pathology / Molecular analyses**
  - **EEG (electroencephalography)**

Brain tumors - Diagnostics

- **Imaging**
  - Computed tomography (CT)
  - Magnetic resonance imaging (MRI)
    - Anatomical, functional (fMRI), metabolic (spectroscopy)
  - Conventional X-ray, angiography…
  - Intraoperative imaging (ultrasound / MRI)
- **Nuclear medicine**
  - Positron emission tomography (PET)
- **Laboratory investigation**
- **Pathology**
  - from CSF, biopsy, resection

Diagnostics - Imaging

- **Practical issues**
  - **Use CT or better MRI scan to obtain anatomical pictures of the brain and to reveal structural alterations**
  - **Use contrast agent to reveal break-down of the blood-brain-barrier**
  - **Perfusion-MRI and spectroscopy might help to differentiate tumor from other differential diagnosis or to learn more about tumor type**
  - **fMRI might help the surgeon to calculate and avoid risks**
  - **PET gives insight in tumor metabolism or receptor status**
  - **Angigography might help for differential diagnosis and might help the surgeon**

Diagnostics - Imaging

CT scan

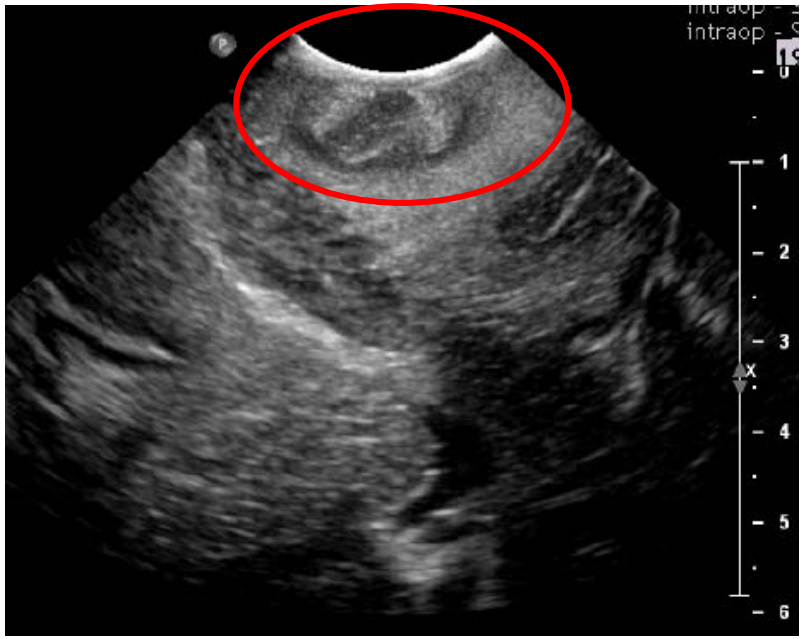
without contrast agent

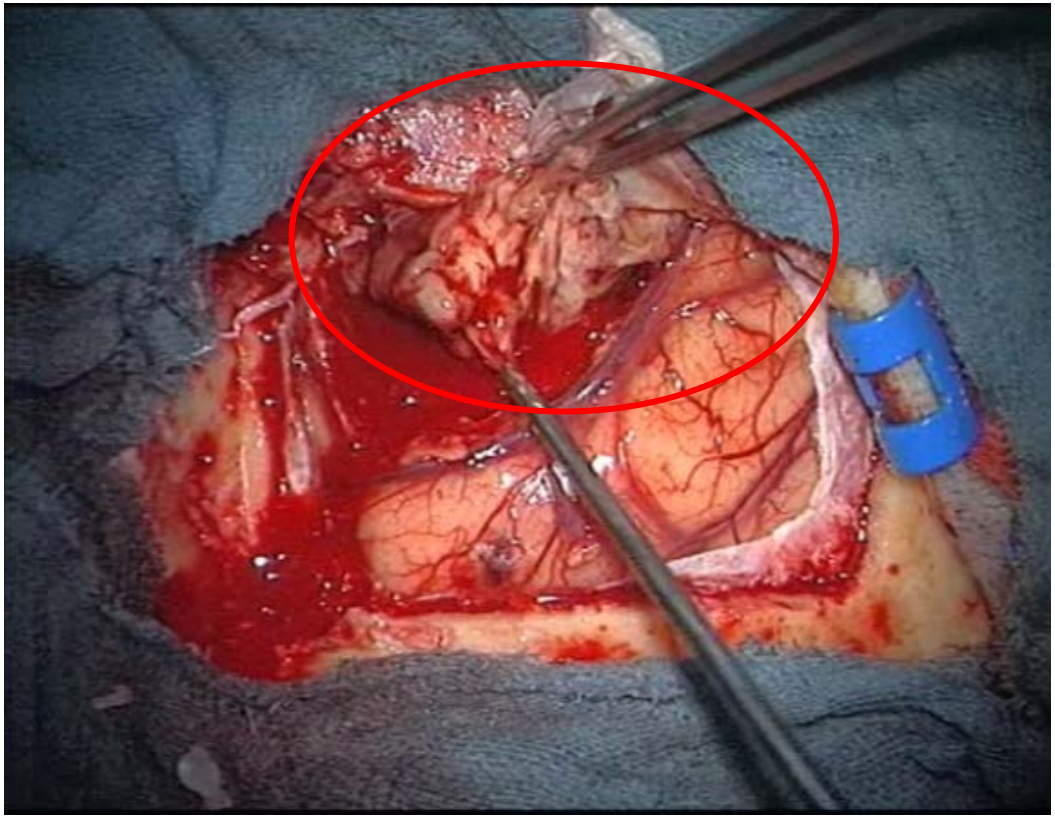
with contrast agent

⇛ helps to make the diagnosis

Diagnostics - Imaging

Intraoperative ultrasound

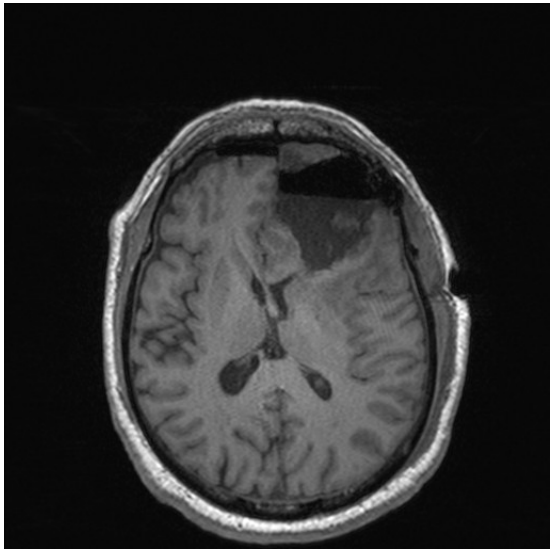




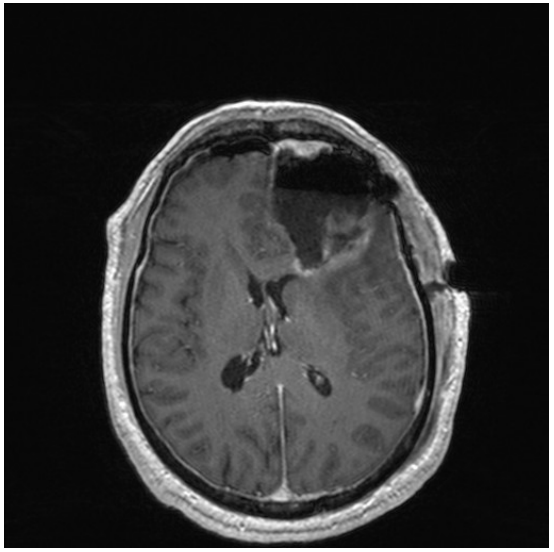
⇛ **helps during surgery**

Diagnostics - Imaging

MRI scan (post-operative) – Histology: glioblastoma



without contrast agent

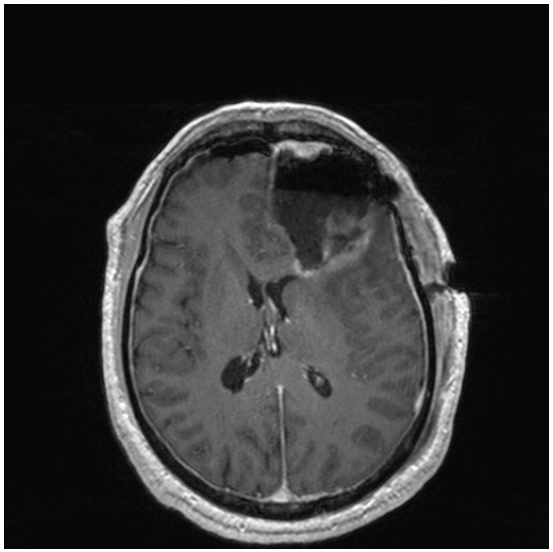


with contrast agent

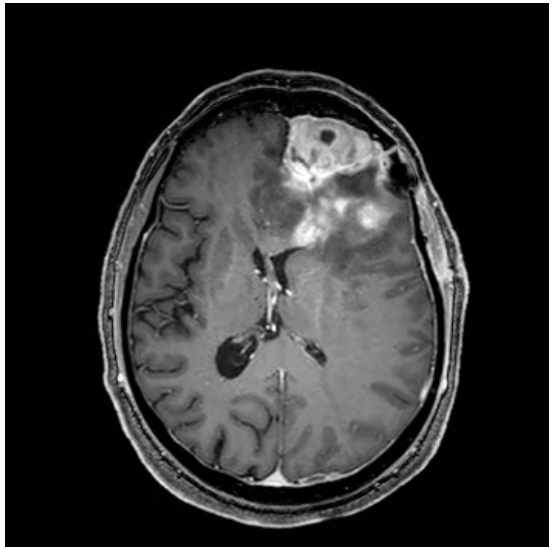
⇛ helps to assess the tumor status after surgery / base line MRI scan

Diagnostics - Imaging

MRI scan



03/2013

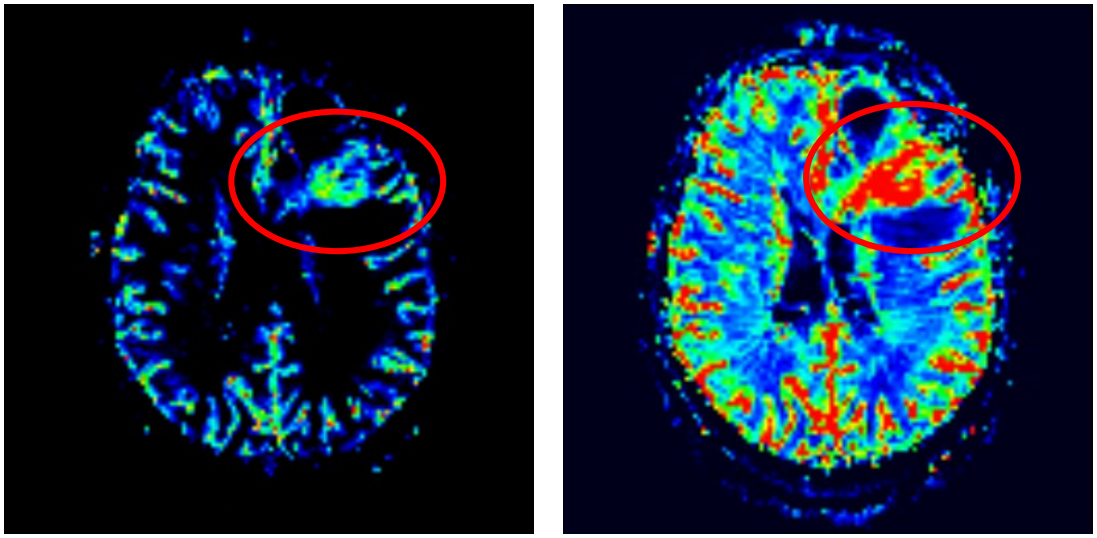


04/2013

⇛ helps to discover tumor progression

Diagnostics - Imaging

MRI perfusion



CBF
Cerebral blood flow

CBV
Cerebral blood volume

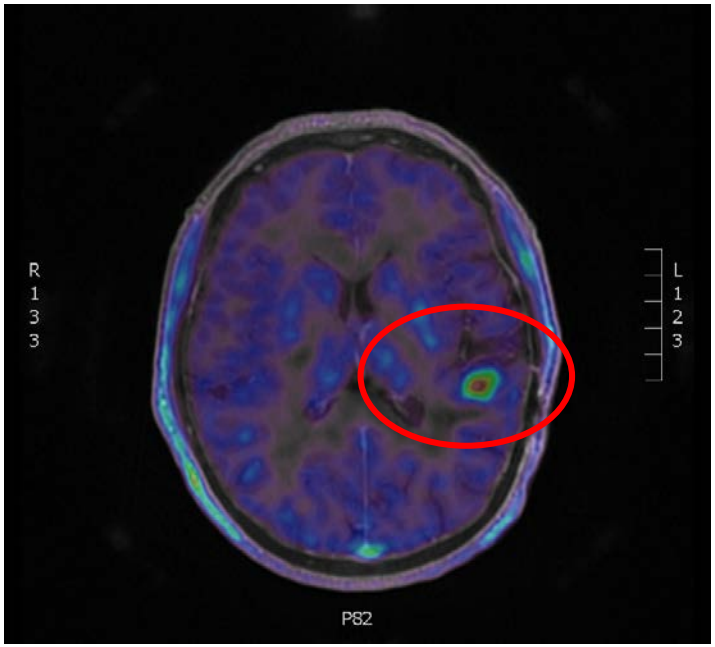
⇛ **helps to discover tumor progression**

Diagnostics - Imaging

MRI scan

plus

FET (fluorethyl-tyrosine) - PET

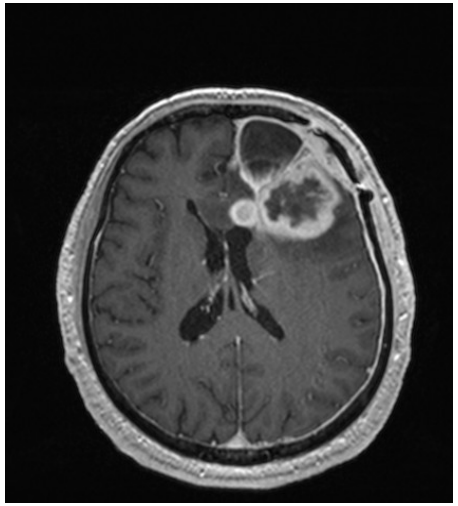


⇛ **helps to discover tumor progression / active tumor**

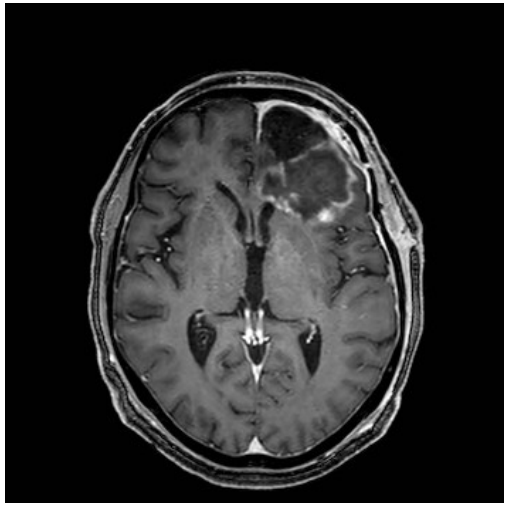
Diagnostics - Imaging

MRI scan

Tumor-specific treatment with bevacizumab



Start

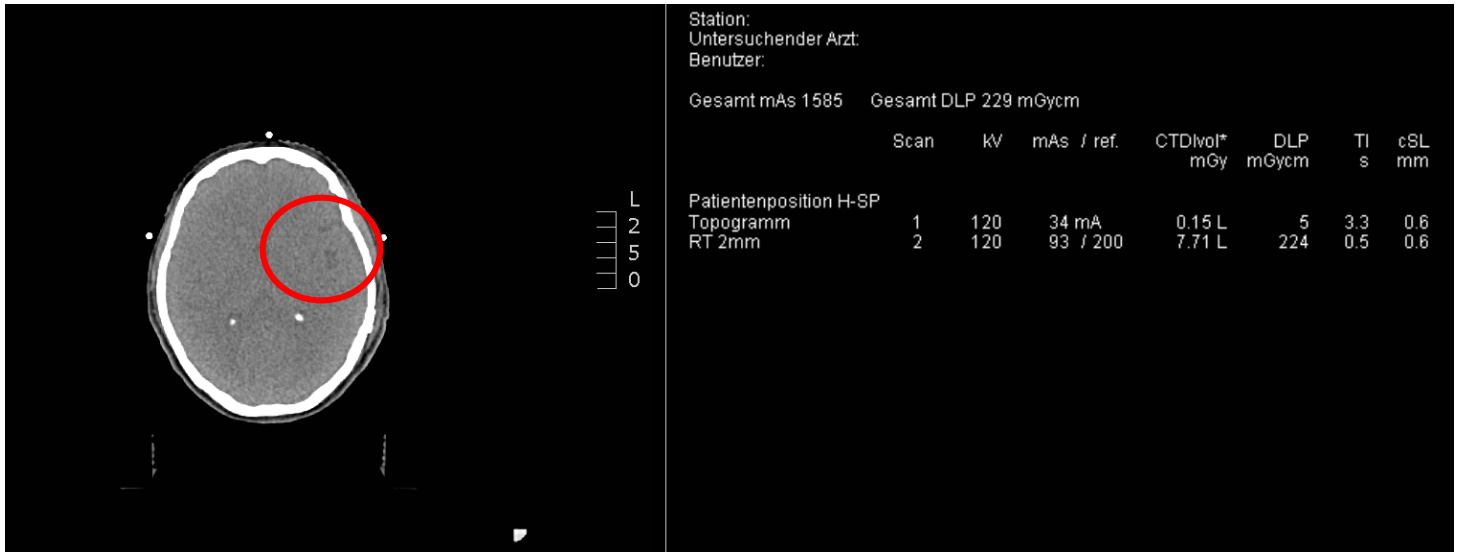


3 months later

⇛ helps to monitor treatment / to make treatment decisions

Diagnostics - Imaging

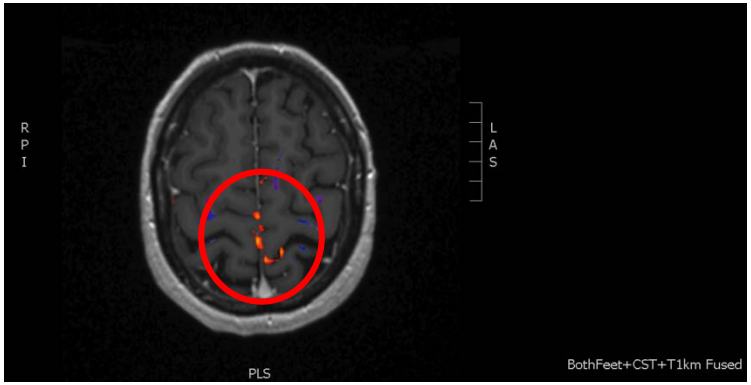
Planning CT scan

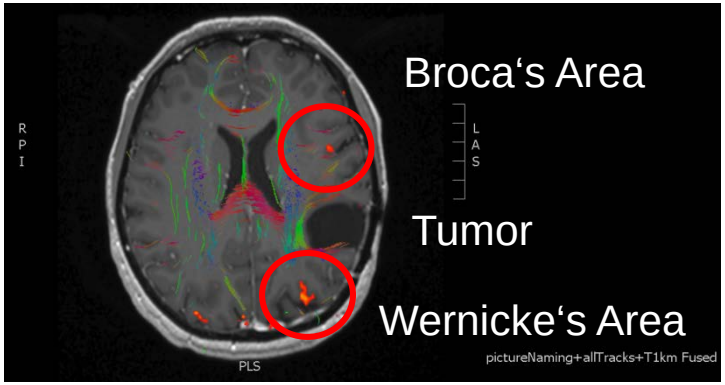


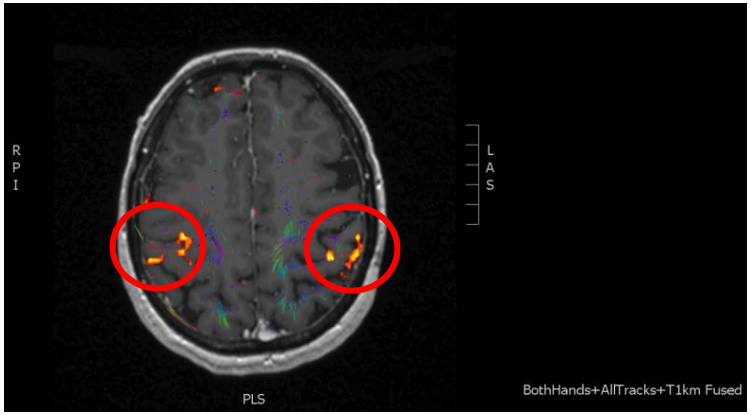
⇛ helps to plan external beam radiotherapy (Department of Radiooncology)

Diagnostics - Imaging

Functional (f) MRI



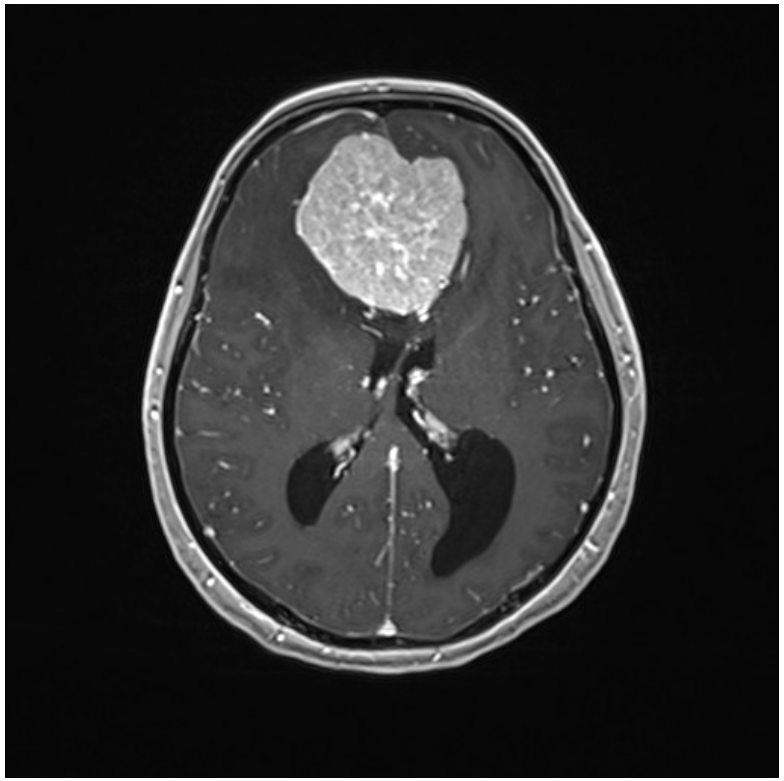




⇛ presurgical planning requires knowledge of eloquent areas of the cortex

Diagnostics - Imaging

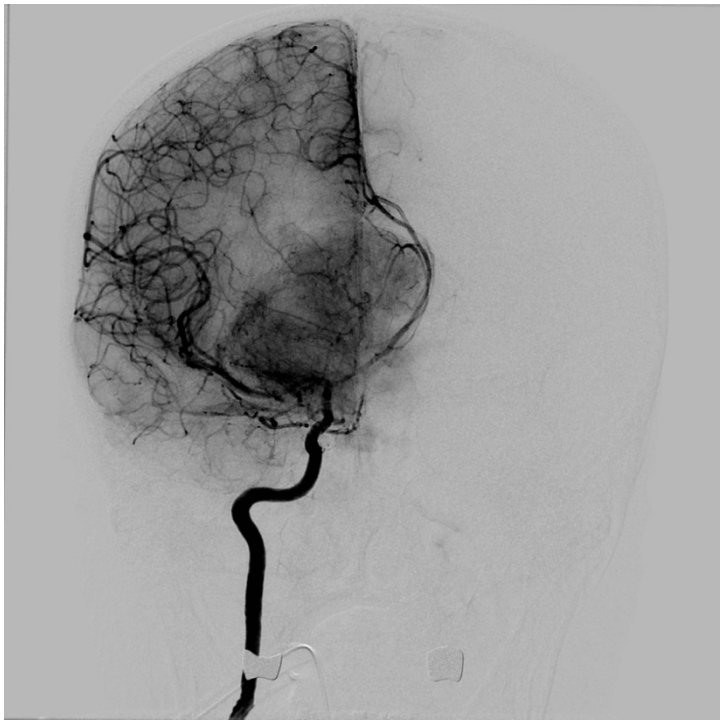
Meningeoma – MRI scan



Diagnostics - Imaging

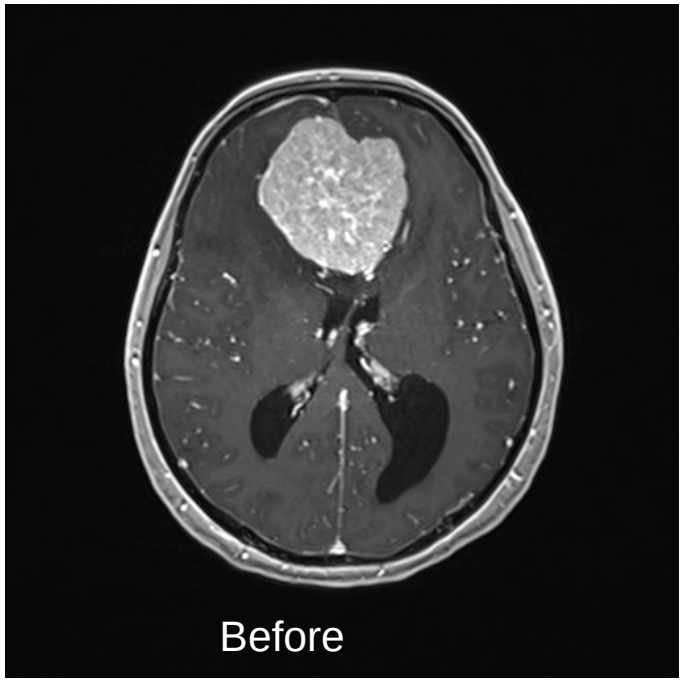
Meningeoma - Angiography

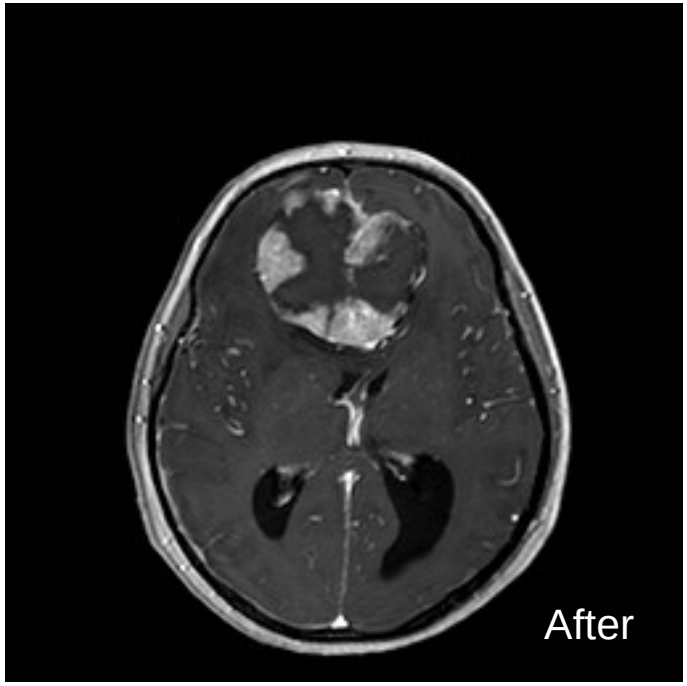
- **Commonly supplied by dural arteries**



Diagnostics - Imaging

Meningeoma – The role of preoperative angiography and embolization





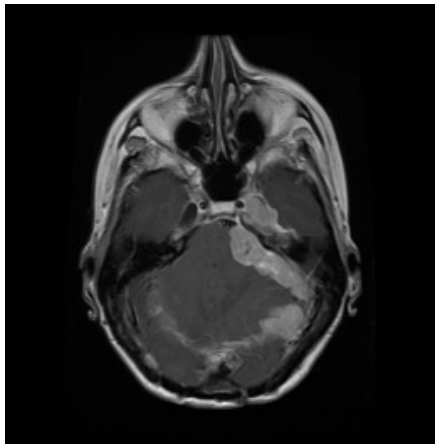
⇛ helps to diminish operative time and intraoperative blood loss

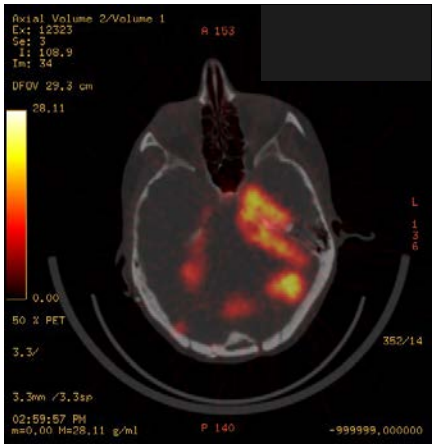
Diagnostics - Imaging

Gallium^{68} DOTATATE-PET

-DOTATATE binds to somatostatin receptors, which are found on the cell surfaces of a number of neuroendocrine tumors, and thus directs the radioactivity (Gallium68) into the tumors

-Tested for diagnosis

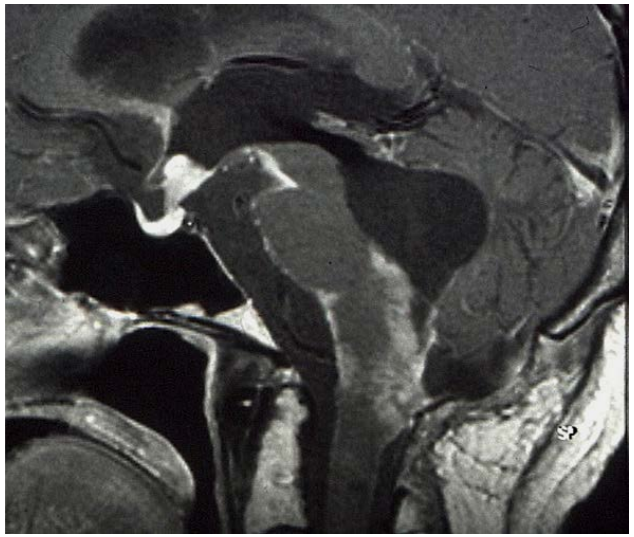




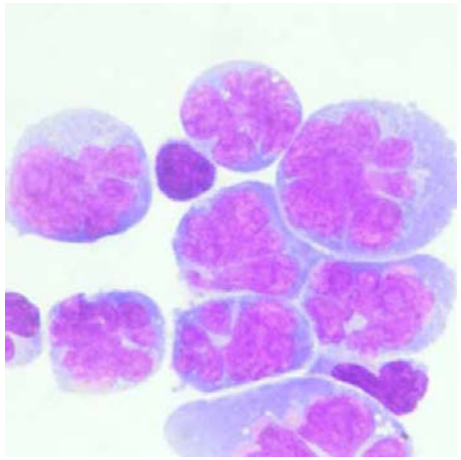
-Lutetium^{117} DOTATATE has been tested for the treatment of somatostatin-positive tumors

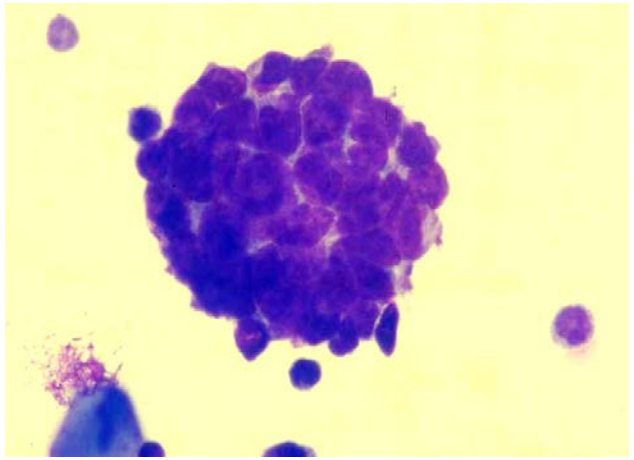
Diagnostics – cerebrospinal fluid

Solid type



Non-adherent type





Brain tumors - Diagnostics

EEG: electrophysiological monitoring method to record electrical activity of the brain

- **Epileptiform pattern**

- **Focal slowing**