Kirurgisk behandling av CNS tumores

Eirik Helseth

Professor i nevrokirurgi

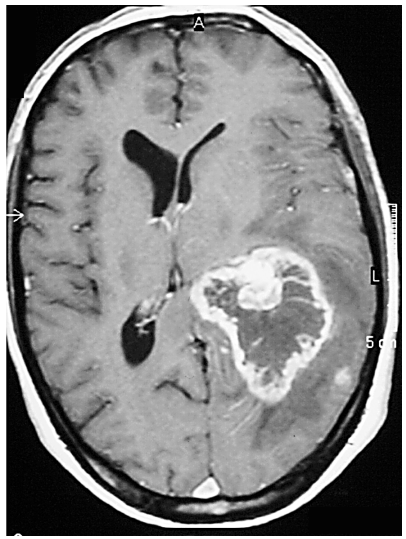
OUS - UiO

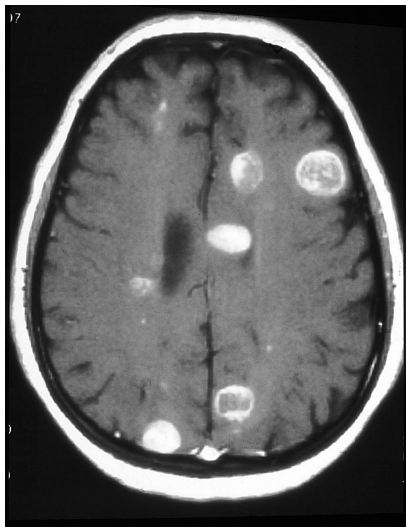
CNS tumores (hjernesvulster)

Intrakraniale svulster

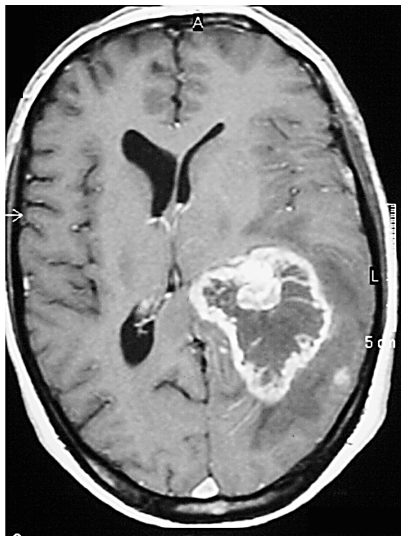
- Primære versus sekundære
- Intraaksiale versus ekstraaksiale

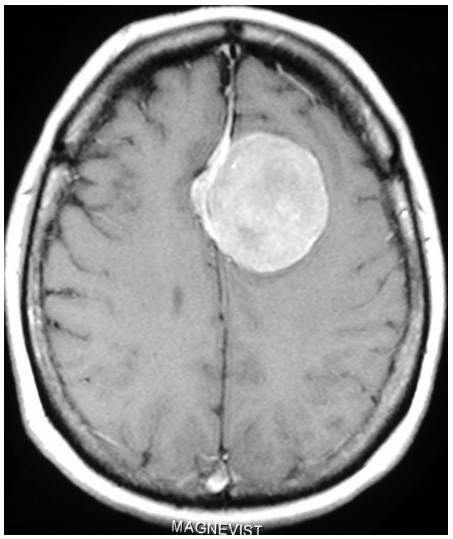
Primære versus sekundære

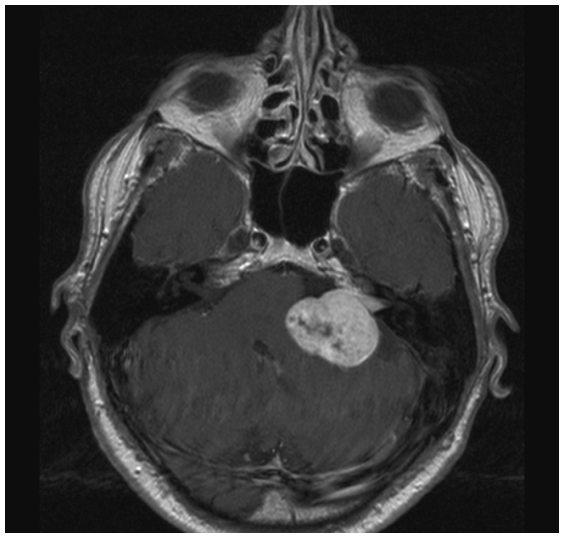




Intraaksiale versus ekstraaksiale







Intraaksiale,

de fleste maligne

Ekstraaksiale, de fleste benigne

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Incidental Findings on Brain MRI in the General Population

Meike W. Vernooij, M.D., M. Arfan Ikram, M.D., Hervé L. Tanghe, M.D., Arnaud J.P.E. Vincent, M.D., Albert Hofman, M.D., Gabriel P. Krestin, M.D., Wiro J. Niessen, Ph.D., Monique M.B. Breteler, M.D., and Aad van der Lugt, M.D.

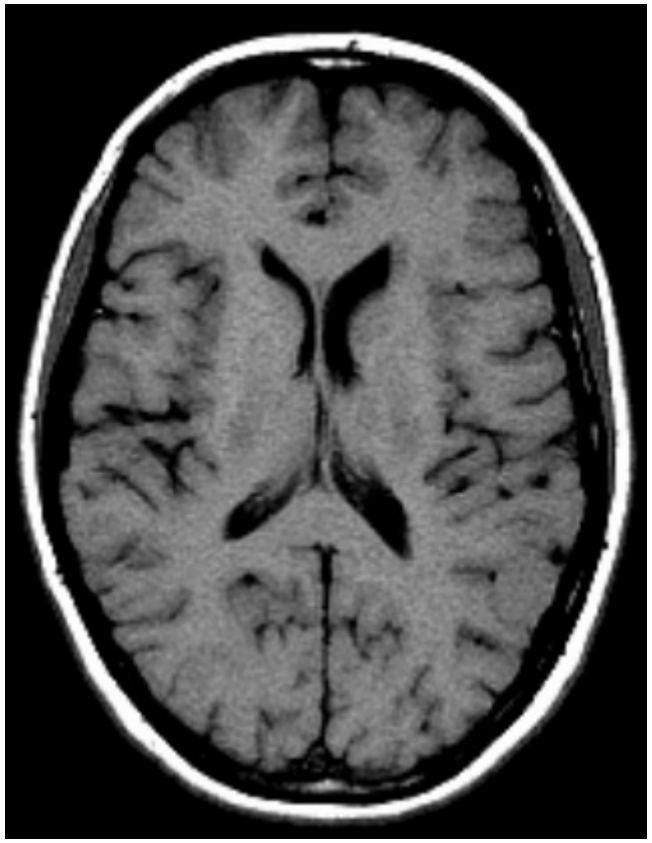
N Engl J Med 2007;357:1821-8.

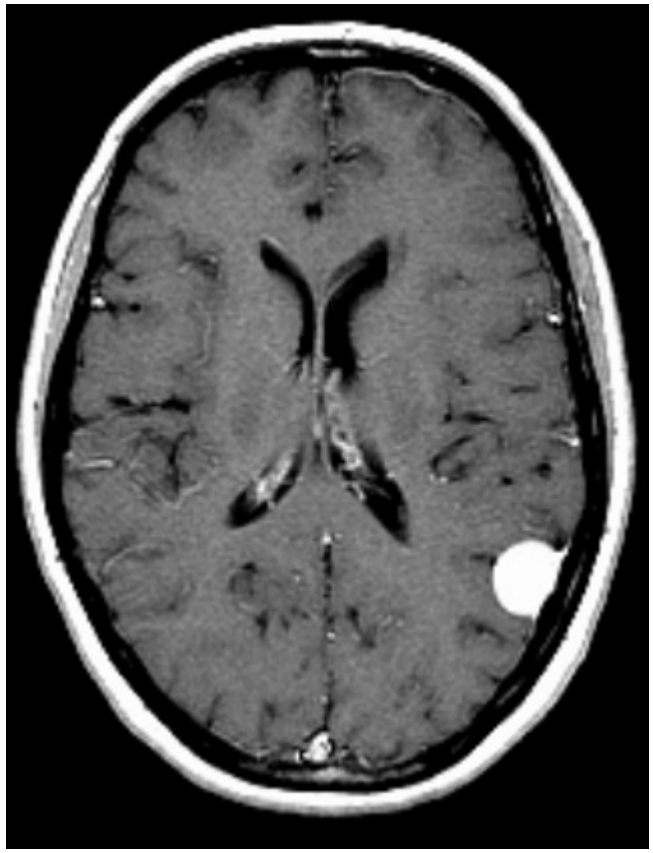
Table 1. Incidental Findings on 2000 MRI Scans.*

Finding	No. (%)
Asymptomatic brain infarct†	145 (7.2)
Lacunar infarct	112 (5.6)
Cortical infarct	41 (2.0)
Primary tumors, benign	31 (1.6)
Meningioma	18 (0.9)
Vestibular schwannoma	4 (0.2)
Intracranial lipoma‡	2 (0.1)
Trigeminal schwannoma	1 (<0.1)
Pituitary adenoma	6 (0.3)
Primary tumors, malignant§	1 (<0.1)
Other findings	
Aneurysm	35 (1.8)
Cavernous angioma	7 (0.4)
Metastases	1 (<0.1)
Subdural hematoma	1 (<0.1)
Arachnoid cyst¶	22 (1.1)
Type I Chiari malformation‖	18 (0.9)
Major-vessel stenosis**	9 (0.5)
Dermoid cyst of lateral orbital rim	1 (<0.1)
Fibrous dysplasia	1 (<0.1)

N Engl J Med 2007;357:1821-8.

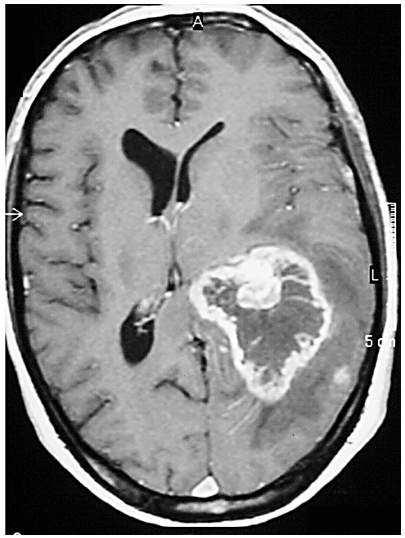
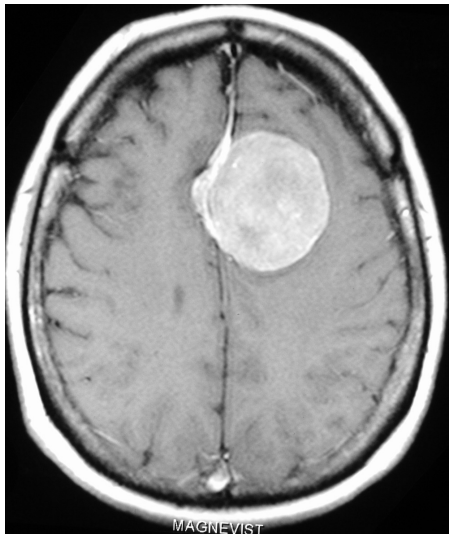
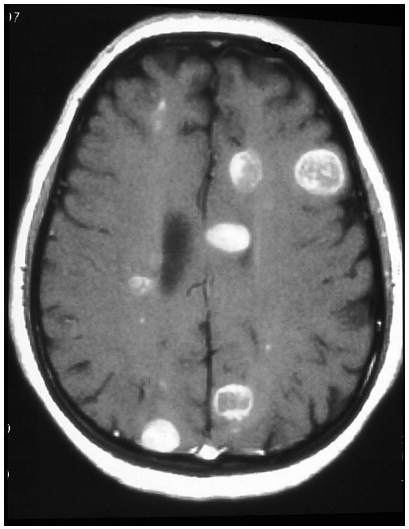
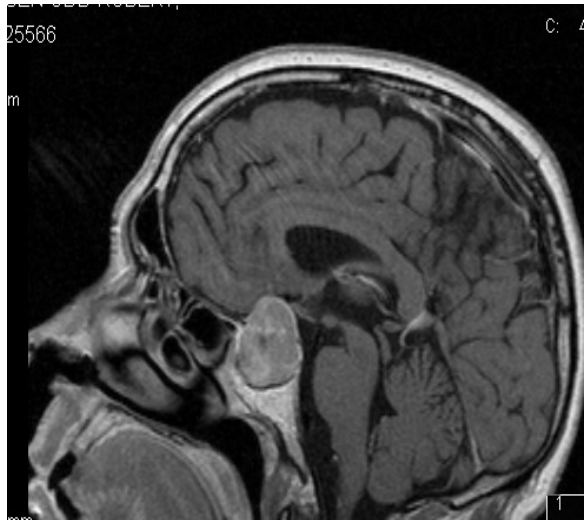
Meningeom – tilfeldig funn
Indikasjon for operasjon?



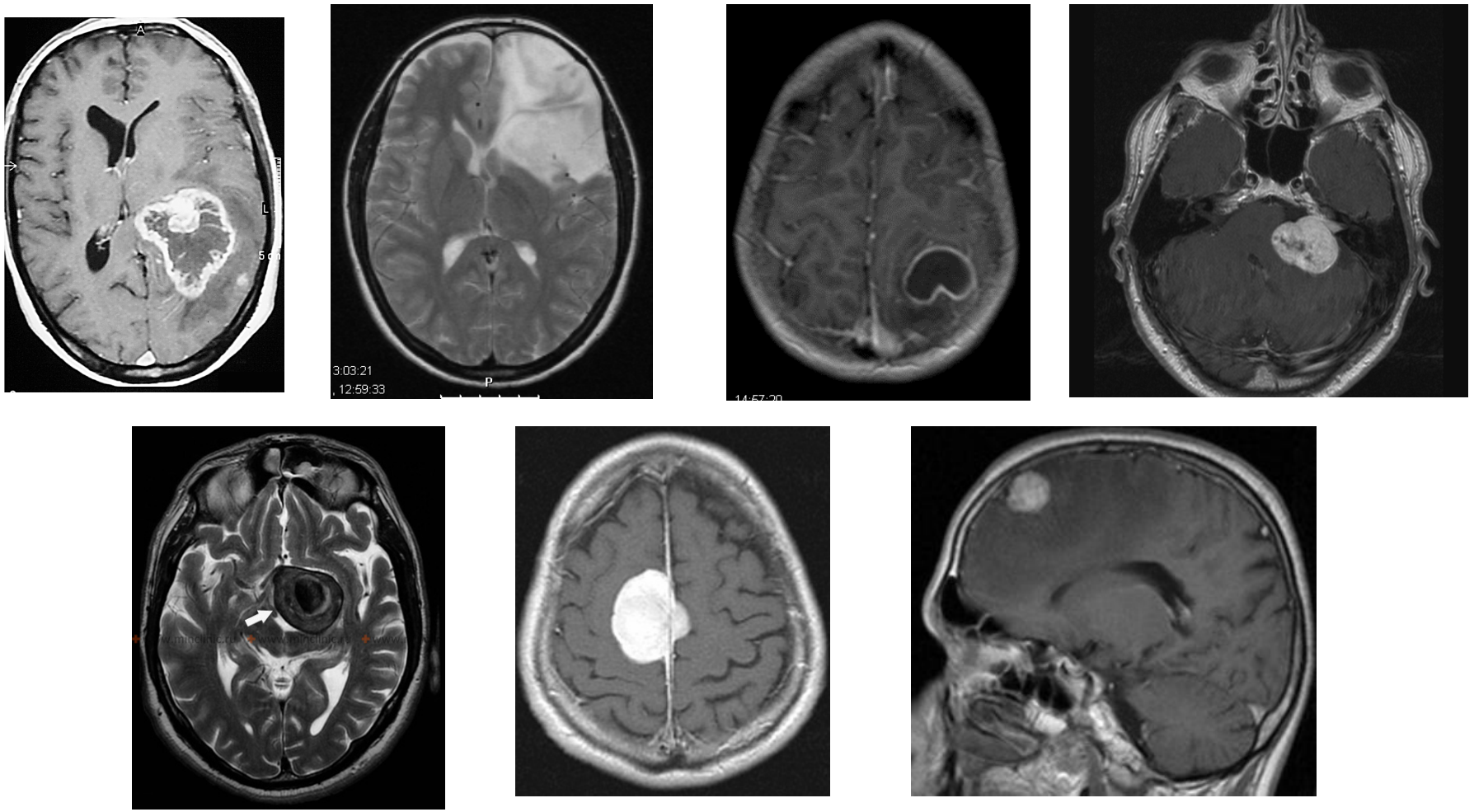


Kirurgi ved intrakraniale svulster

- Naturlig forløp
- Målsetting
  - Diagnose
  - Kurasjon
  - Palliasjon
- Radikalitet
- Komplikasjoner

Nyoppdaget intrakranial svulst



Nevrokirurgisk primærvurdering

- Differensialdiagnoser
  - Infeksjon (abscess, tuberkulom, cysticercose), infarkt, hematom, aneurisme, cavernøs malformasjon etc
- Histologisk malignitetsgrad
  - Benign - malign
- Lokalisasjon
  - Elokvent eller Non-elokvent

Preoperative undersøkelser

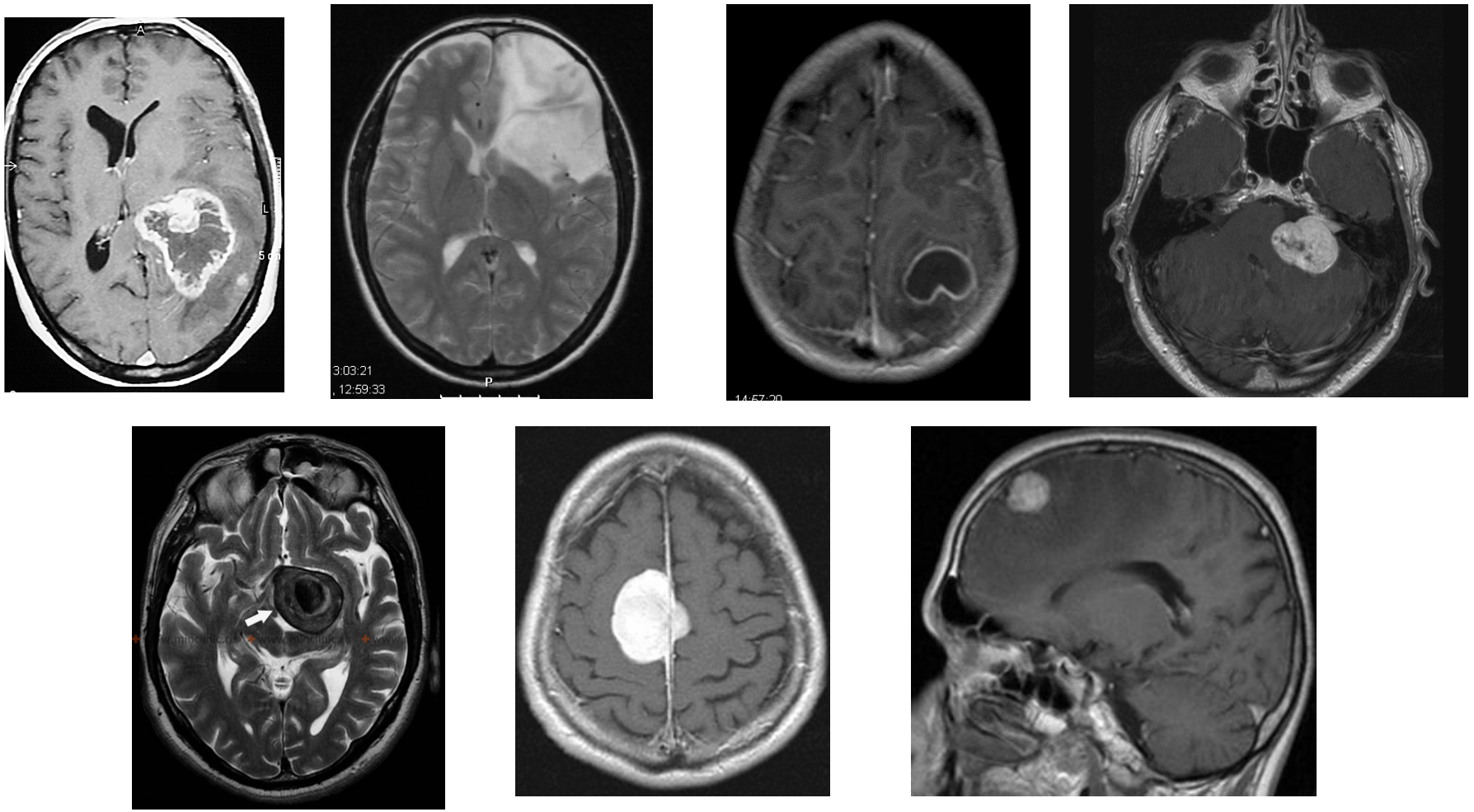
DD og malignitet

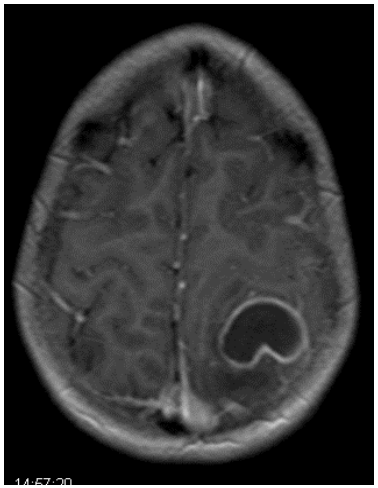
- Erfaring
- MR
  - T1±kontrast, T2, Flair, Diffusjon
  - Spektroskopi
  - Perfusjon
- CTA/MRA

Elokvente områder

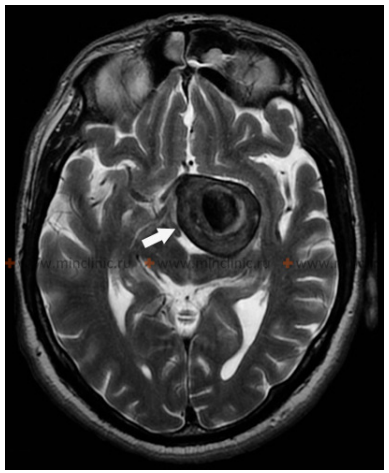
- Erfaring
- Topografisk anatomi
- MR DTI (traktografi)
- fMRI
- WADA

Nyoppdaget intrakranial svulst

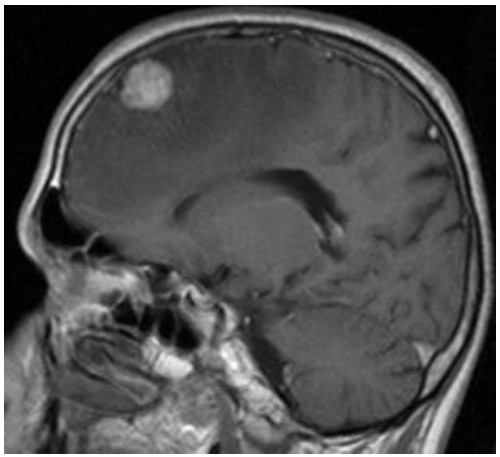




Abscess



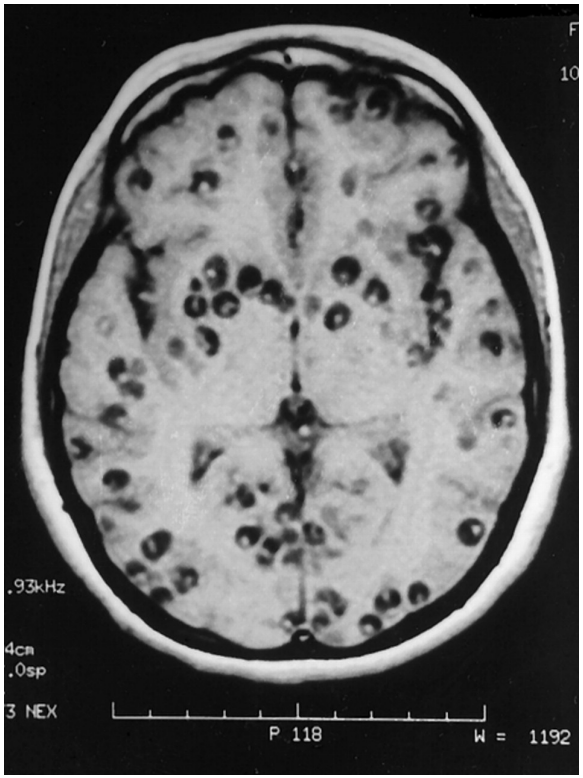
Gigantaneurisme

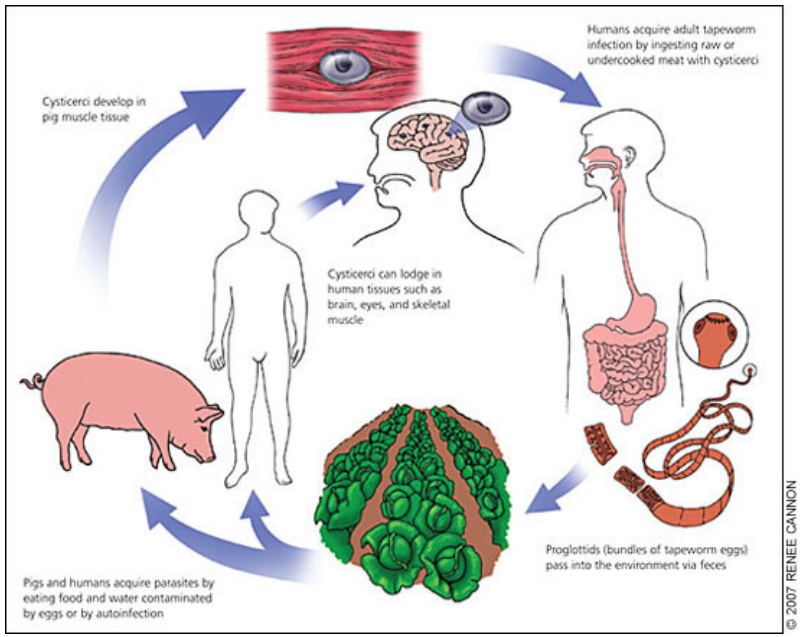


Tuberkulom

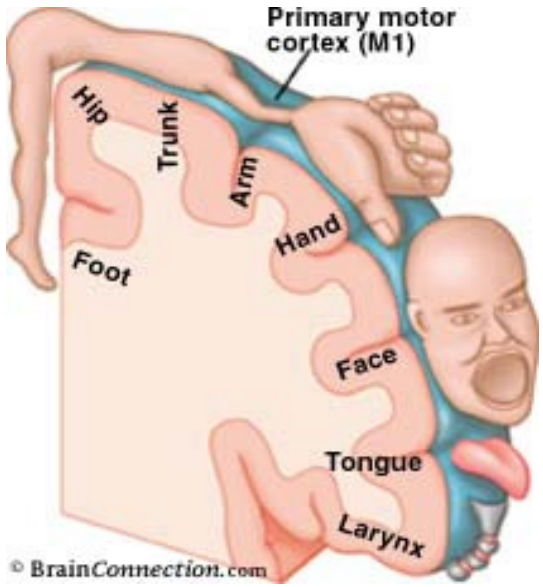
Pasient fra India

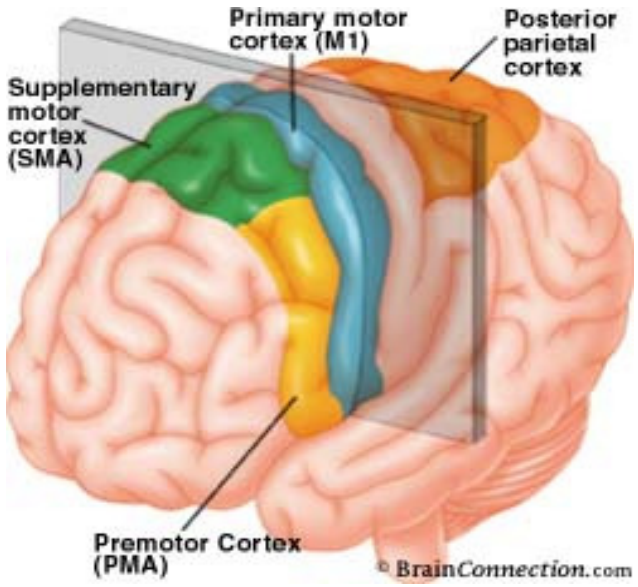
Cysticercosis

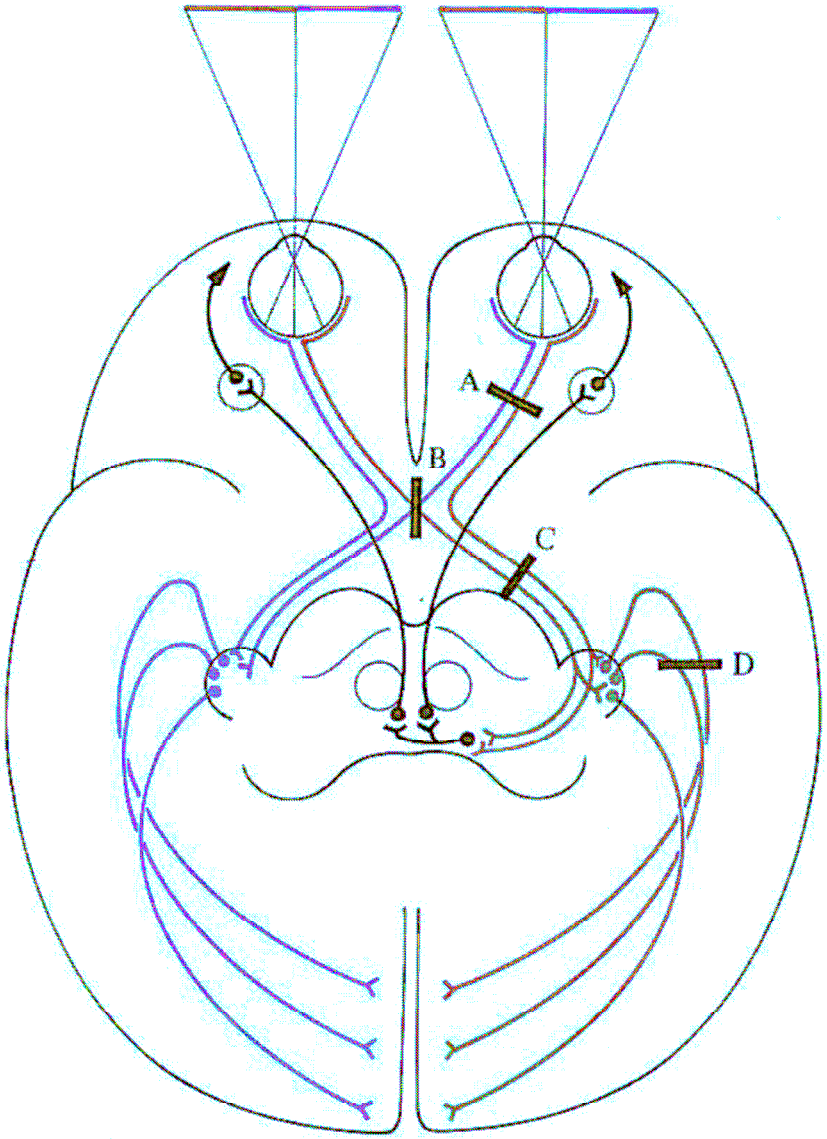




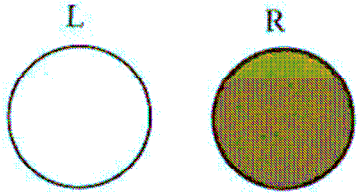
Kirurgi i elokvente områder



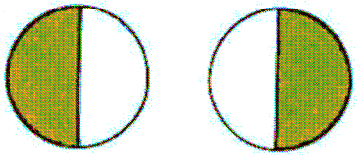




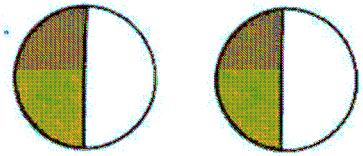
Visual field defects



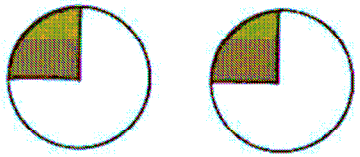
A. Monocular blindness



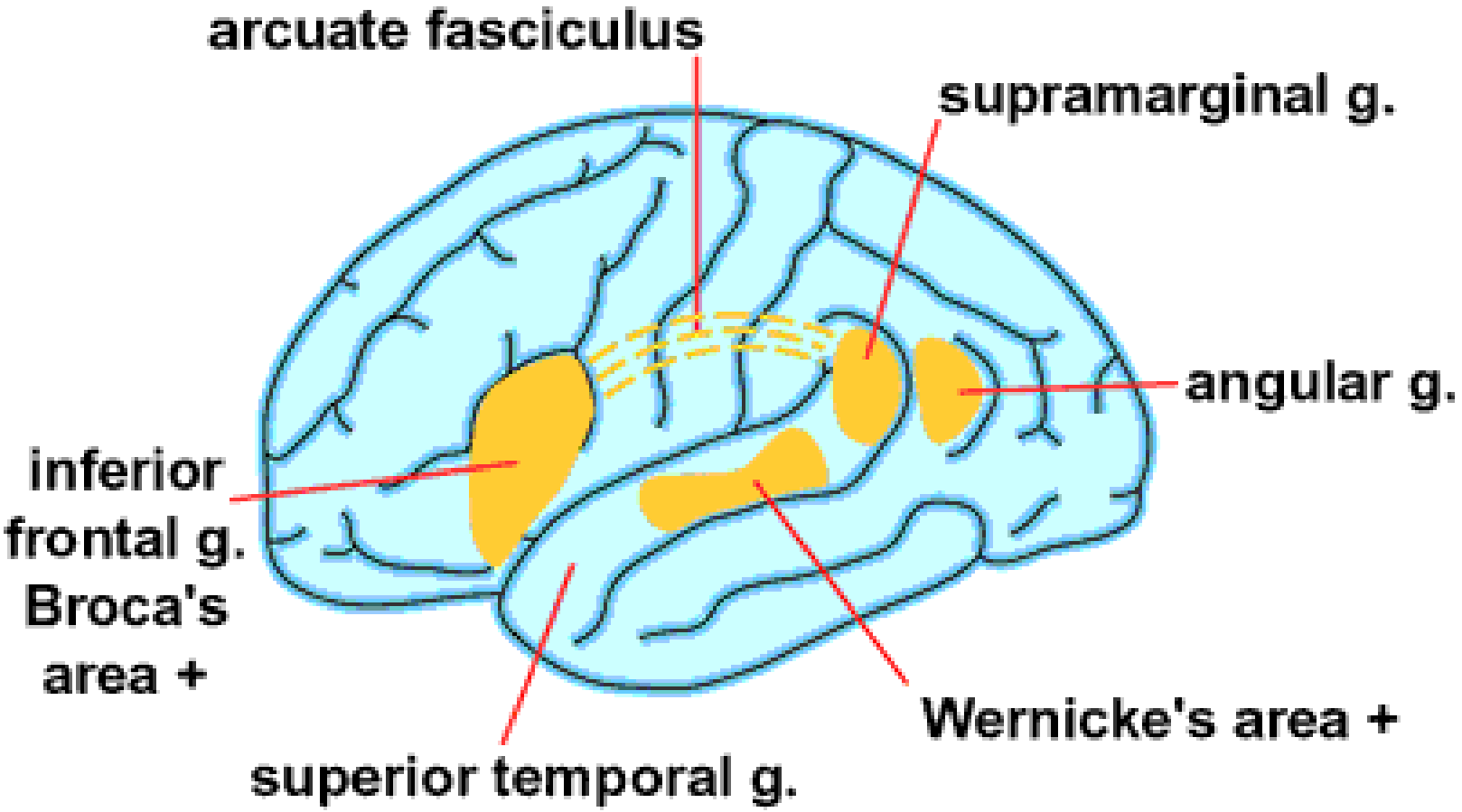
B. Bitemporal hemianopsia



C. Homonymous hemianopsia

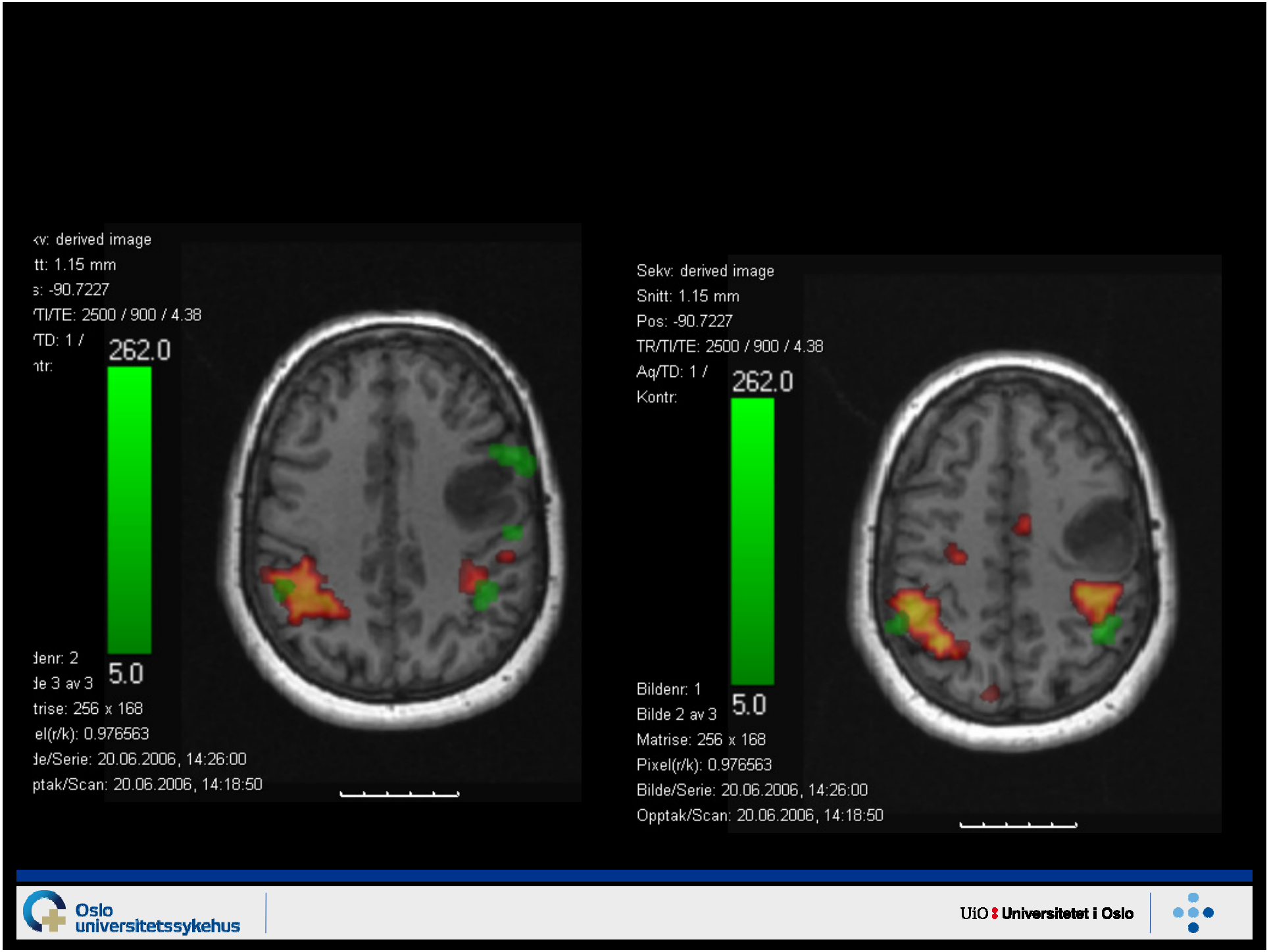


D. Upper quadrantanopsia


arcuate fasciculus
supramarginal g.
angular g.
inferior
frontal g.
Broca's
area +
Wernicke's area +
superior temporal g.

Kirurgi i elokvente områder

- Preoperativ fMRI og DTI
- Peroperativ navigering
- Våken kraniotomi
- Kortikal og subkortikal stimulering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262.0
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Bildenr: 1
Bilde 2 av 3
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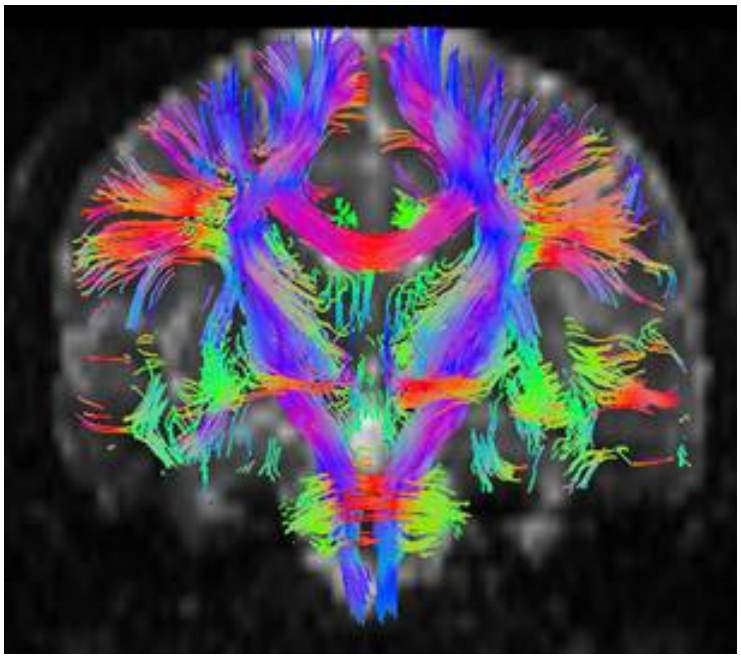
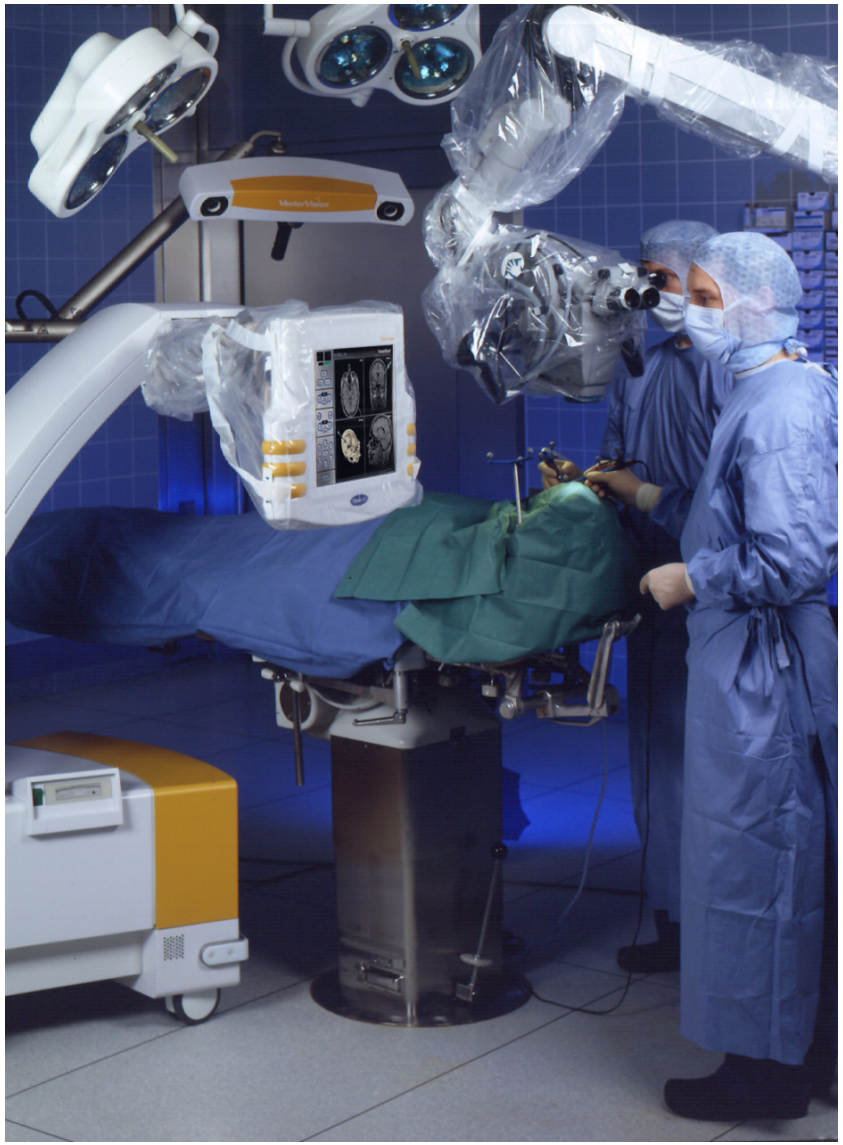
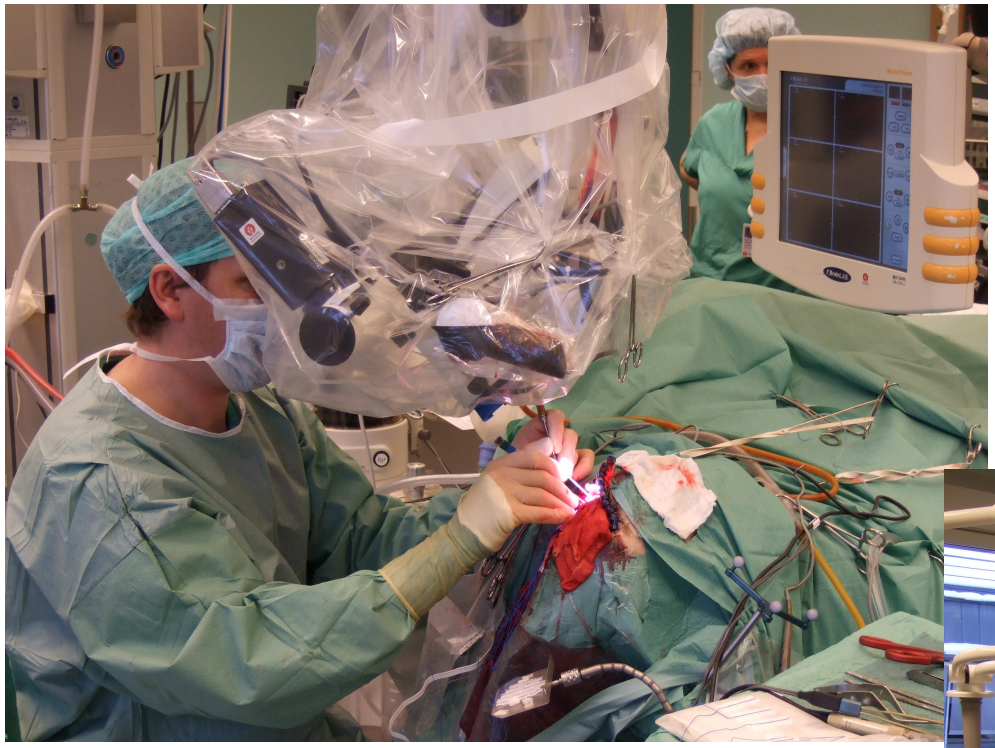
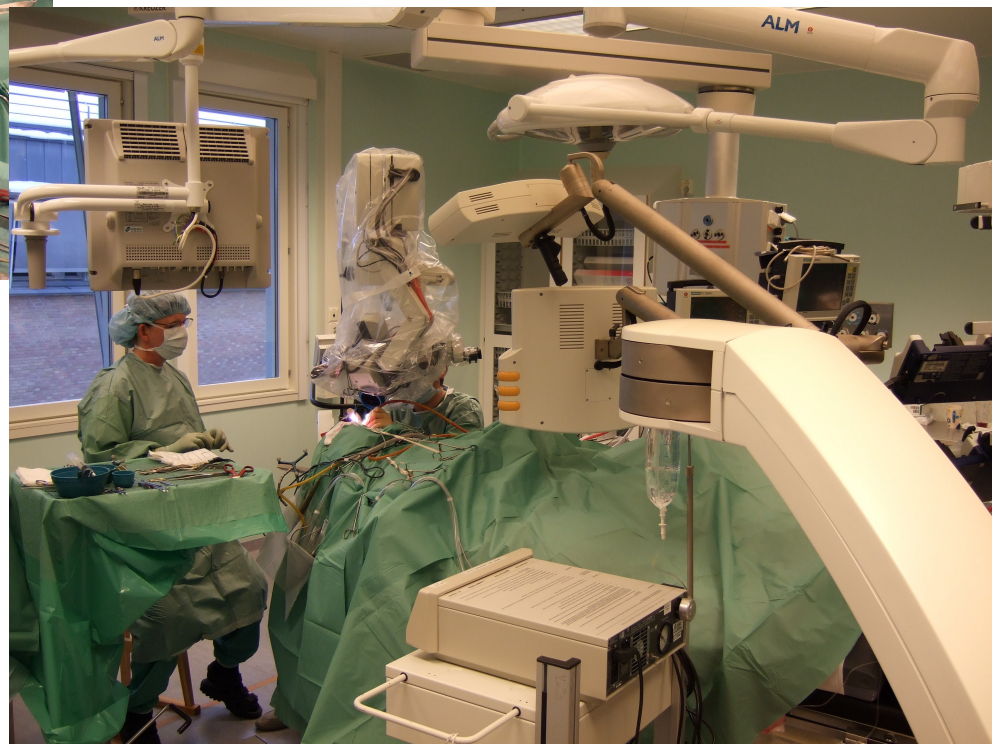
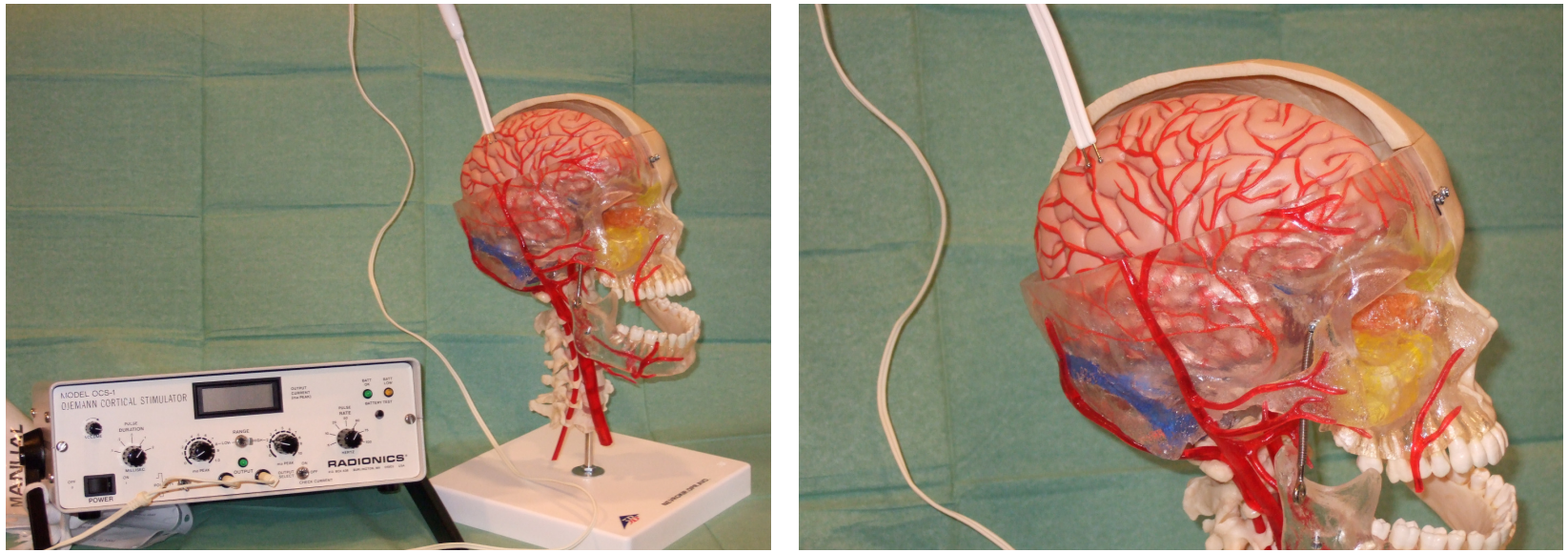




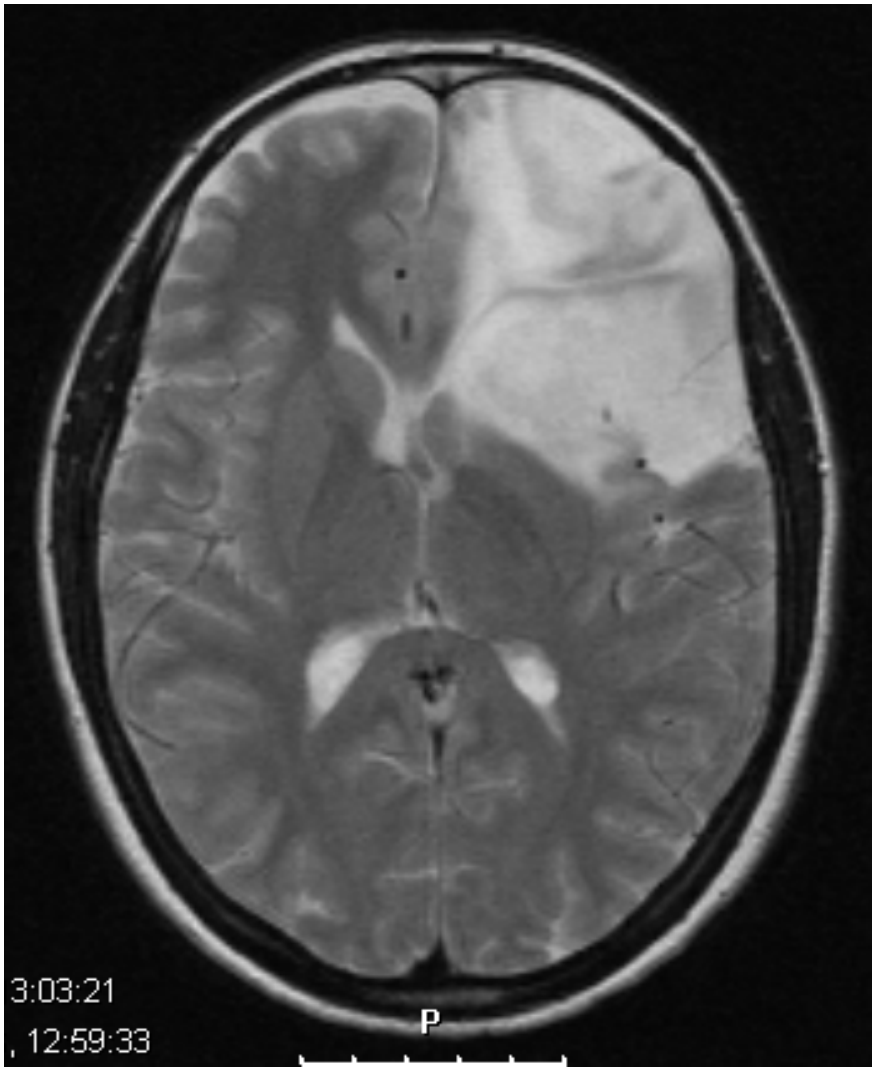



ALM

Cortical og subcortical stimulering



Ojeman stimulatur: 60 Hz, 1 msec, 2-6 mA


3:03:21
, 12:59:33
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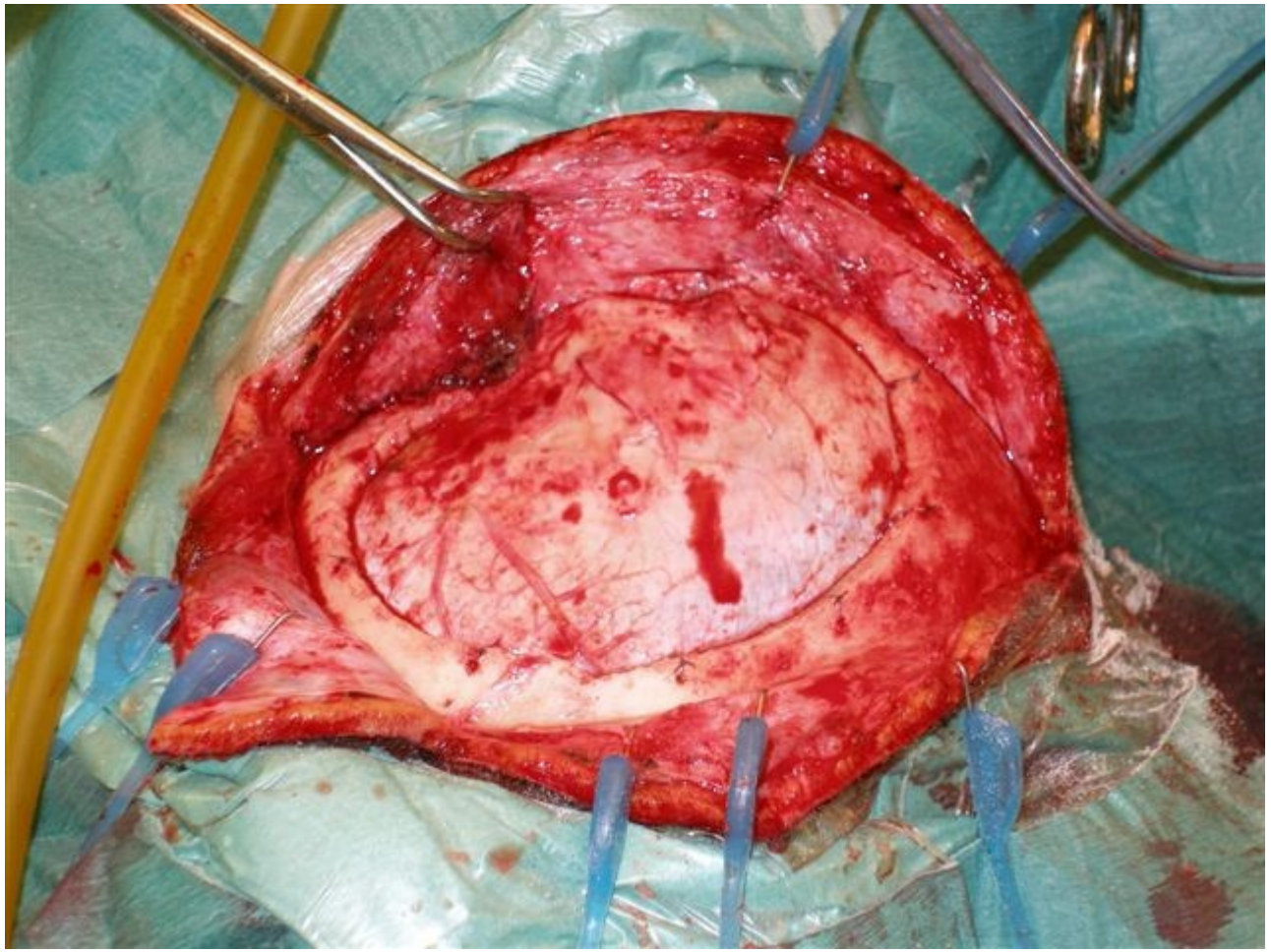

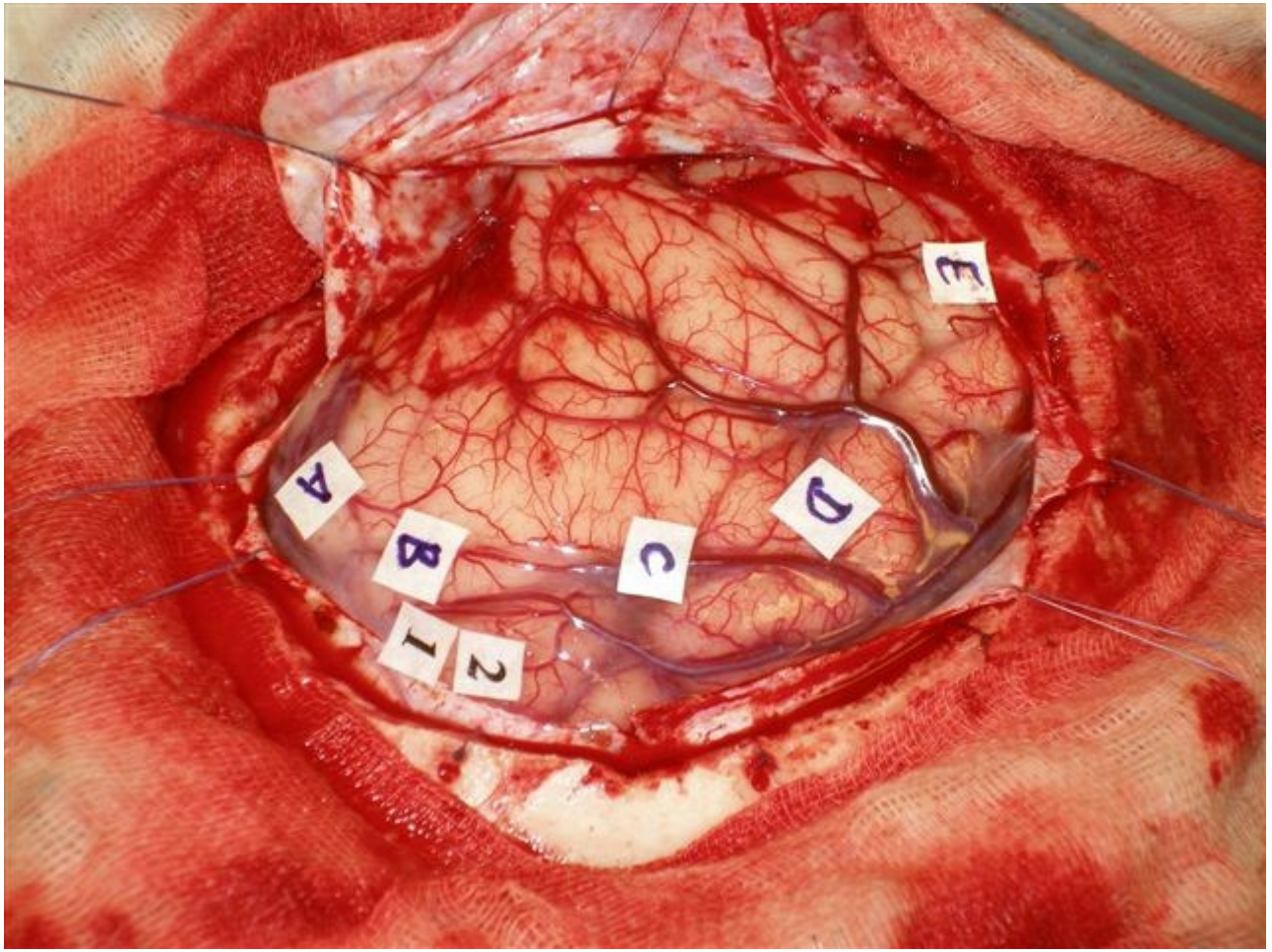
A
B
C
D
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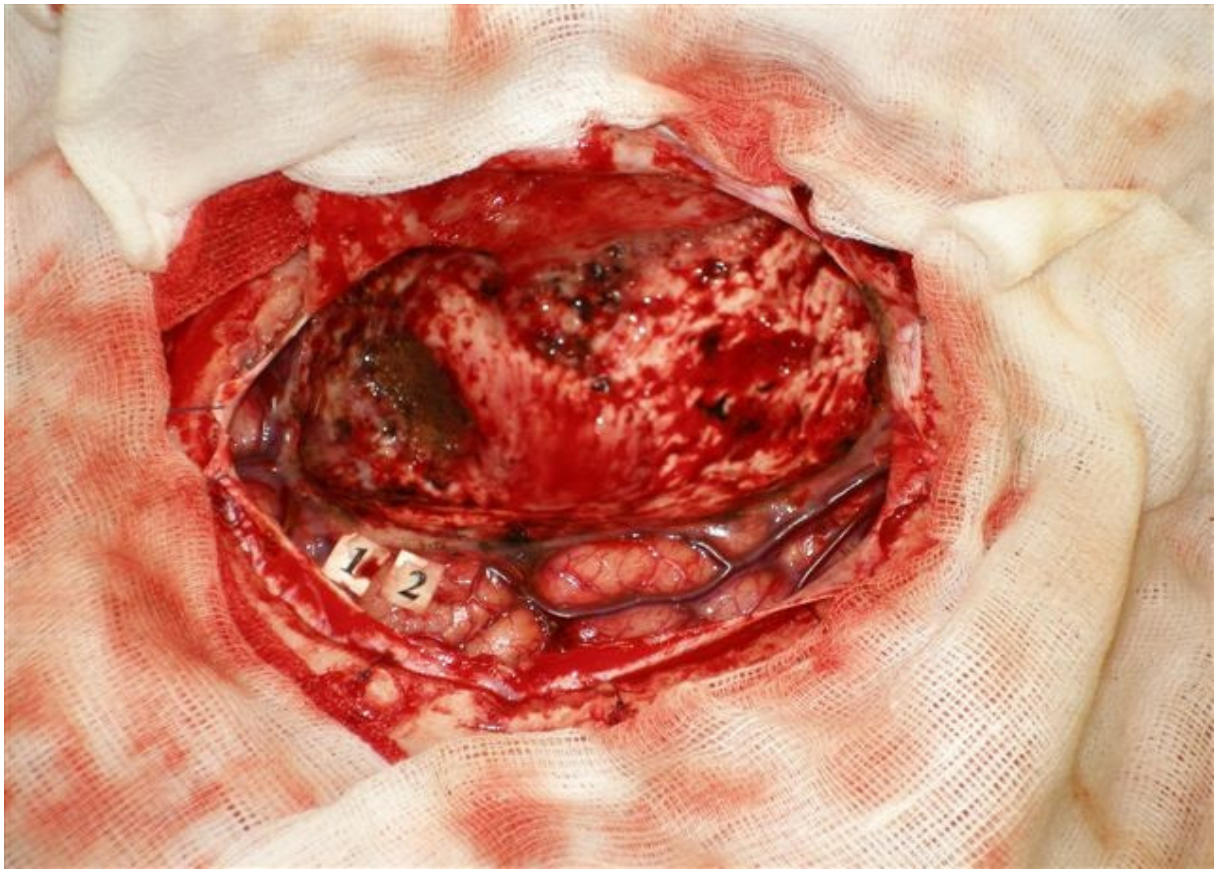
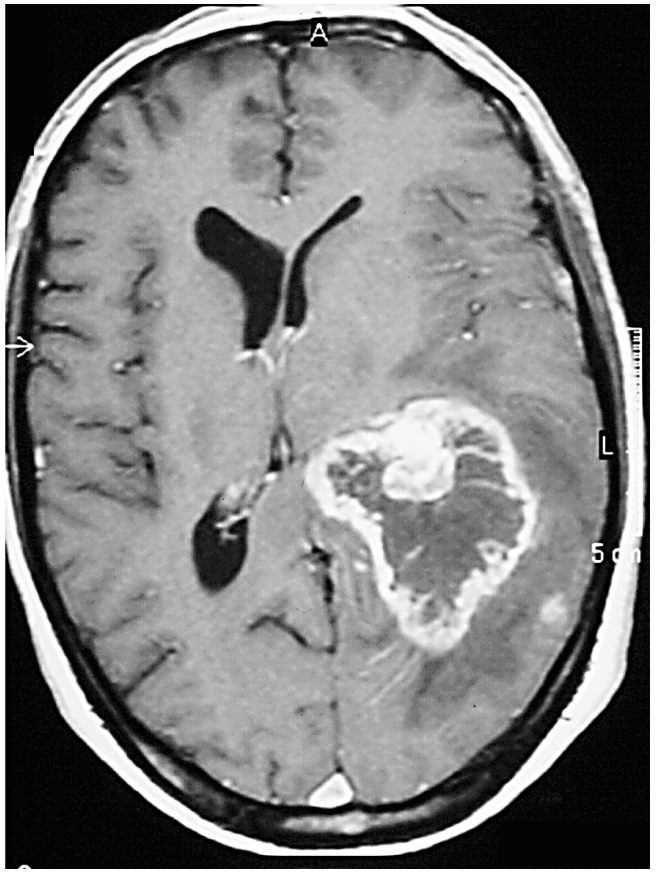

1
2

Høygradige gliomer

HGG

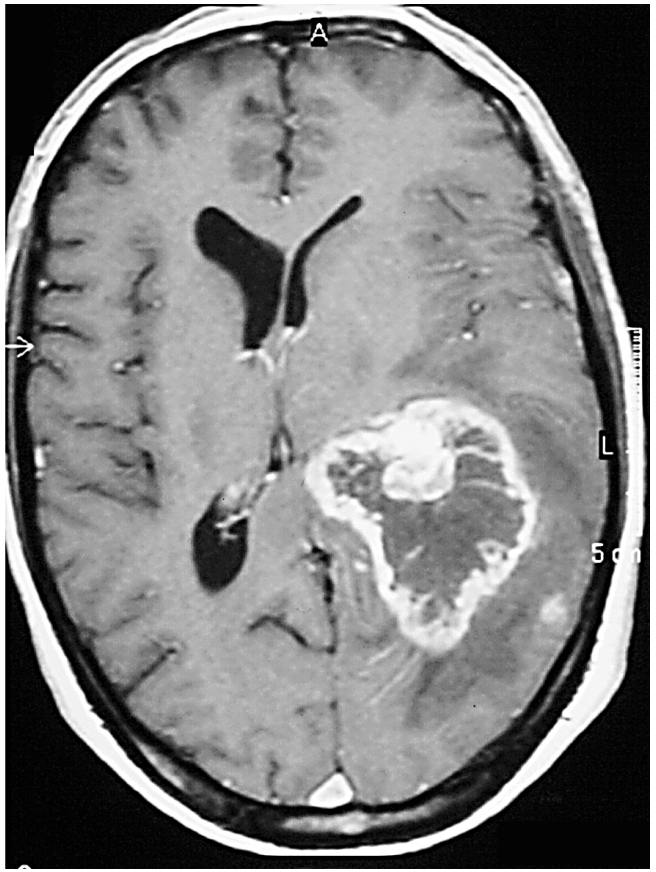
Kirurgisk behandling av HGG

- Naturlig forløp
- Målsetting
  - Diagnose
  - Kurasjon
  - Palliasjon
- Radikalitet
- Komplikasjoner



Kirurgisk behandling av HGG

- Naturlig forløp (OS <3 mndr)
- Målsetting
  - Diagnose (Ja)
  - Kurasjon (Nei)
  - Palliasjon (Ja)
- Radikalitet (Ja)
- Komplikasjoner
  - Mortalitet (<2%)
  - Hematom (<2%)
  - Infeksjon (<2%)
  - Nevrologisk forverring (<10%)



Surgical Mortality at 30 Days and Complications Leading to Recraniotomy in 2630 Consecutive Craniotomies for Intracranial Tumors

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Eirik Helseth, MD, PhD*‡
Pål Ronning, MD‡
David Scheie, MD§
Tom Børge Johannesen, MD, PhD¶
Jan Mahlen, MD, PhD#
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Received, January 17, 2010.
Accepted, September 10, 2010.

BACKGROUND: In order to weigh the risks of surgery against the presumed advantages, it is important to have specific knowledge about complication rates.

OBJECTIVE: To study the surgical mortality and rate of reoperations for hematomas and infections after intracranial surgery for brain tumors in a large, contemporary, single-institution consecutive series.

METHODS: All adult patients from a well-defined population of 2.7 million inhabitants who underwent craniotomies for intracranial tumors at Oslo University Hospital from 2003 to 2008 were included (n = 2630). The patients were identified from our prospectively collected database and their charts studied retrospectively. Follow-up was 100%.

RESULTS: The overall surgical mortality, defined as death within 30 days of surgery, was 2.3% (n = 60). The mortality rates for high- and low-grade gliomas, meningiomas, and metastases were 2.9%, 1.0%, 0.9%, and 4.5%, respectively. Age >60 (odds ratio 1.84, $P < 0.05$) and biopsy compared with resection (odds ratio 4.67, $P < 0.01$) were significantly positively associated with increased surgical mortality. Hematomas accounted for 35% of the surgical mortality. Postoperative hematomas needing evacuation occurred in 2.1% (n = 54). Age >60 was significantly correlated to increased risk of postoperative hematomas (odds ratio 2.43, $P < 0.001$). A total of 39 patients (1.5%) were reoperated for postoperative infection. Meningiomas had an increased risk of infections compared with high-grade gliomas (odds ratio 4.61, $P < 0.001$).

CONCLUSION: The surgical mortality within 30 days of surgery was 2.3%, with age >60 and biopsy vs resection being the 2 factors significantly associated with increased mortality. Postoperative hematomas caused about one third of the surgical mortality.

KEY WORDS: Complications, Craniotomy, Intracranial tumor, Postoperative hematoma, Postoperative infection, Surgical mortality, Survival

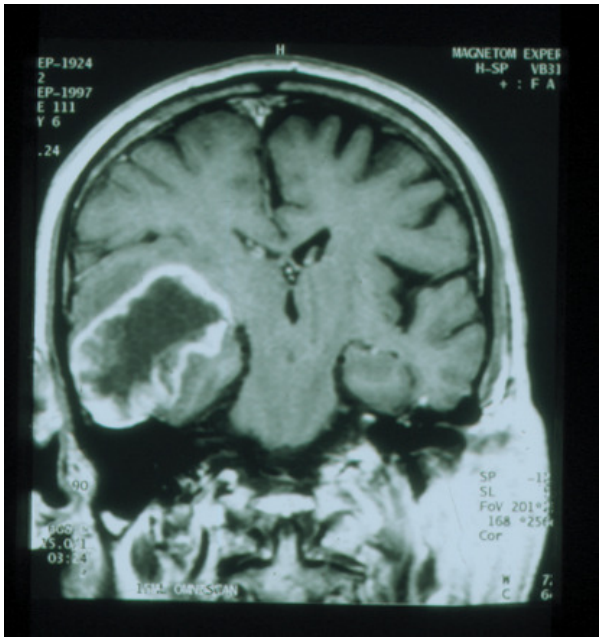
Neurosurgery 68:1259–1269, 2011 DOI: 10.1227/NEU.0b013e318208e1b1 www.neurosurgery-online.com

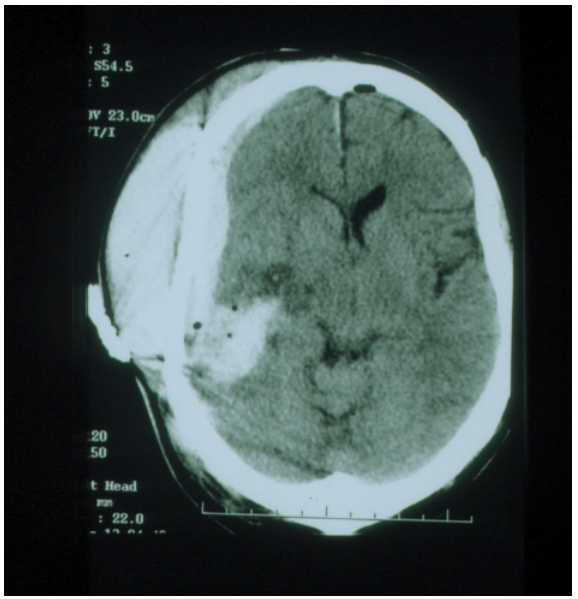
According to The Central Brain Tumor Registry of the United States, the incidence rate of all primary brain and central nervous system tumors is 16.5 cases per 100 000 person-years (9.2 per 100 000 person-years for nonmalignant tumors and 7.3 per 100 000 person-years for malignant tumors).[1] The prevalence rate for all primary brain and central nervous system tumors was estimated to be 130.8 per 100 000 inhabitants.[1] Metastatic brain tumors are thought to have a higher incidence than primary brain tumors.[2]

The cornerstone of brain tumor treatment is surgery. The objective of surgery is to remove as much tumor as possible, as well as to establish an exact tissue diagnosis. The possible benefits of tumor removal include symptom relief, improved quality of life, smaller tumor burden for other treatment modalities, and improved survival.[3-9]

However, craniotomies are not without inherent risks, be it surgical mortality,[10,11] postoperative hematomas,[12,13] or infection.[14] With

ABBREVIATIONS: ABP, antibiotic prophylaxis; cSDH, chronic subdural hematoma; HGG, high-grade glioma; LGG, low-grade glioma





Kirurgisk mortalitet

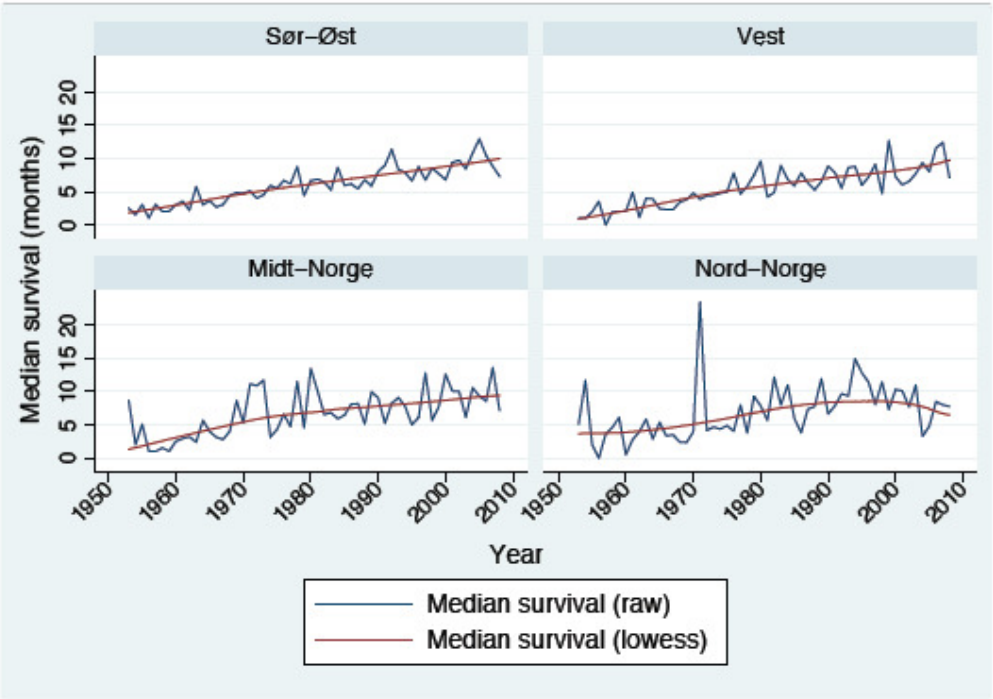
- Død innen 30 dager etter kirurgi
  - 2,3%

Reoperasjon for komplikasjon

- Blødning: 2,1%
- Infeksjon: 1,5%

Kreftregisteret

Glioblastom



Rønning et al 2011

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Radiotherapy plus Concomitant and Adjuvant Temozolomide for Glioblastoma

Roger Stupp, M.D., Warren P. Mason, M.D., Martin J. van den Bent, M.D., Michael Weller, M.D., Barbara Fisher, M.D., Martin J.B. Taphoorn, M.D., Karl Belanger, M.D., Alba A. Brandes, M.D., Christine Marosi, M.D., Ulrich Bogdahn, M.D., Jürgen Curschmann, M.D., Robert C. Janzer, M.D., Samuel K. Ludwin, M.D., Thierry Gorlia, M.Sc., Anouk Allgeier, Ph.D., Denis Lacombe, M.D., J. Gregory Cairncross, M.D., Elizabeth Eisenhauer, M.D., and René O. Mirimanoff, M.D., for the European Organisation for Research and Treatment of Cancer Brain Tumor and Radiotherapy Groups and the National Cancer Institute of Canada Clinical Trials Group*

NEJM 2005

Neuro-Oncology 14(9):1178–1184, 2012.
doi:10.1093/neuonc/nos153

NEURO-ONCOLOGY

A population-based study on the effect of temozolomide in the treatment of glioblastoma multiforme

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Acta Neurol Scand 2010: 122: 159–167 DOI: 10.1111/j.1600-0404.2010.01350.x

ACTA NEUROLOGICA
SCANDINAVICA

Overall survival, prognostic factors, and repeated surgery in a consecutive series of 516 patients with glioblastoma multiforme

Helseth R, Helseth E, Johannesen TB, Langberg CW, Lote K, Rønning P, Scheie D, Vik A, Meling TR. Overall survival, prognostic factors, and repeated surgery in a consecutive series of 516 patients with glioblastoma multiforme.
Acta Neurol Scand: 2010: 122: 159–167.

Objectives – To study overall survival (OS), prognostic factors, and repeated surgery in glioblastoma multiforme (GBM). *Material and methods* – Retrospective study of 516 consecutive adult patients who underwent primary surgery for a GBM in year 2003–2008. *Results* – Median age at primary surgery was 63.7 years (range 18.0–88.0). Median OS was 9.9 months. Age > 60 years, poor preoperative ECOG score, bilateral tumor, biopsy rather than resection, and no temozolomide chemoradiotherapy were negative risk factors. Repeat surgery was performed in 65 patients (13%). Median time between first and second surgery was 7 months. Indications for second surgery were increasing neurological deficits (35.4%), raised ICP (33.8%), asymptomatic but reoperated because of tumor progression verified on MRI (20.0%), and epileptic seizures (11%). Patients who underwent repeated surgery had longer OS; 18.4 months vs 8.6 months ($P < 0.001$). *Conclusions* – OS for adult GBM patients was 9.9 months. Negative prognostic factors were increasing age, poor neurological function, bilateral tumor involvement, biopsy instead of resection, and RT alone compared to temozolomide chemoradiotherapy. Our rate of repeated surgery for GBM was 13% and the main indications for second surgery were raised ICP and increasing neurological deficits. In a carefully selected group of patients, repeat surgery significantly prolongs OS.

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Key words: glioblastoma; survival; primary treatment; repeated surgery; prognostic factors

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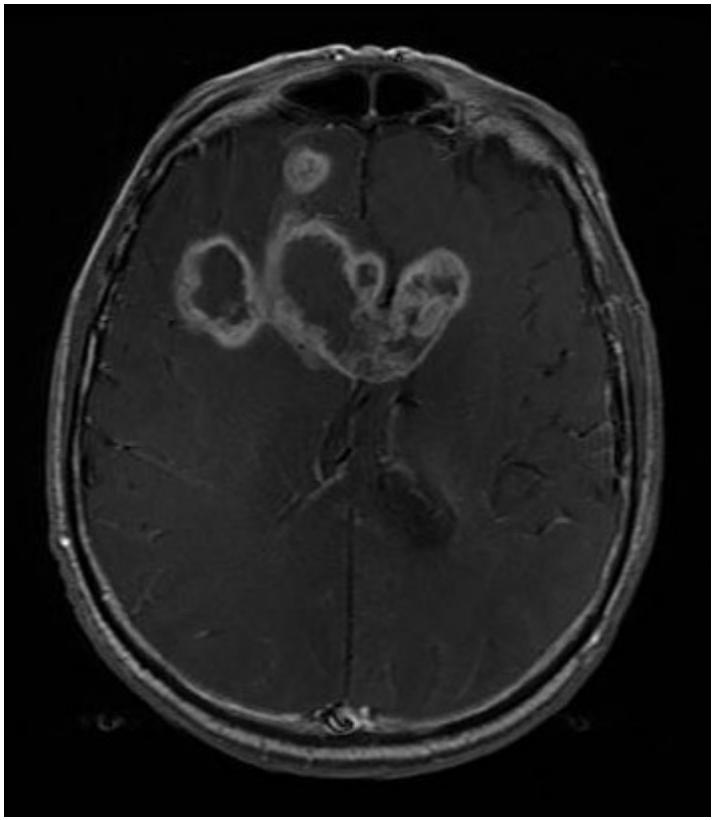
Accepted for publication February 4, 2010

Overall survival - Glioblastoma

- Stupp NEJM 2005
  - Median survival 14.6 months
- Helseth ANS 2010
  - Median survival 9.9 months
  - “Stupp patients” 14.8 months

“Stupp patients” <70 years, ECOG 0-2, surgery + radiochemotherapy

Mann, 80 år, “sommerfuglsvulst”

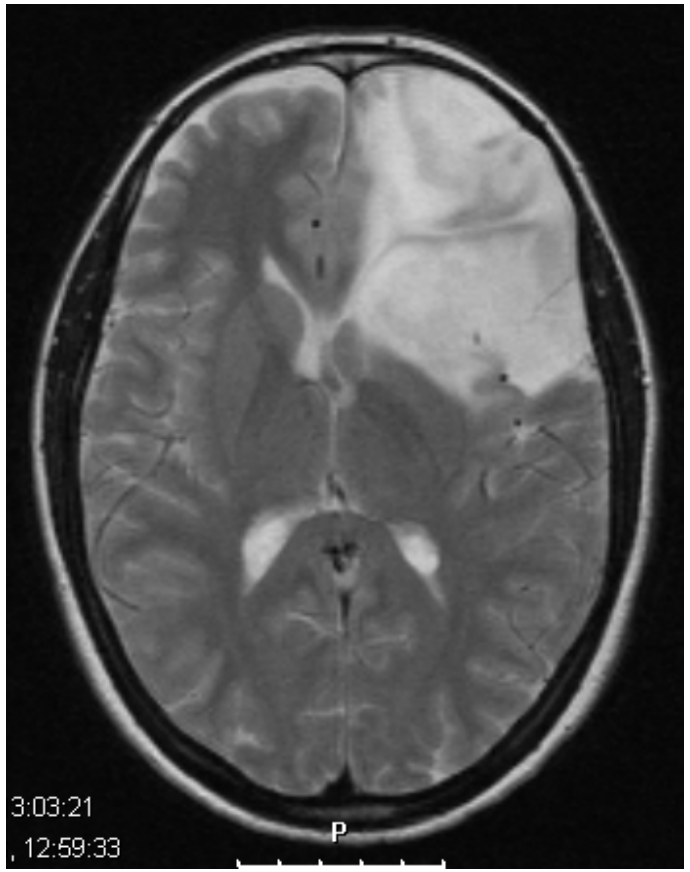


Lavgradige gliomer

LGG

Kirurgisk behandling av LGG

- Naturlig forløp
- Målsetting
  - Diagnose
  - Kurasjon
  - Palliasjon
- Radikalitet
- Komplikasjoner



Kirurgisk behandling av LGG

- Noen få kurable
- Vanskelig å dokumentere effekt av behandling da mange lever lenge ubehandlet

ONLINE FIRST

Comparison of a Strategy Favoring Early Surgical Resection vs a Strategy Favoring Watchful Waiting in Low-Grade Gliomas

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Kristin S. Myrmel, MD
Roar Kloster, MD
Sverre H. Torp, MD, PhD
Sigurd Lindal, MD, PhD
Geirmund Unsgård, MD, PhD
Ole Solheim, MD, PhD

Context There are no controlled studies on surgical treatment of diffuse low-grade gliomas (LGGs), and management is controversial.

Objective To examine survival in population-based parallel cohorts of LGGs from 2 Norwegian university hospitals with different surgical treatment strategies.

Design, Setting, and Patients Both neurosurgical departments are exclusive providers in adjacent geographical regions with regional referral practices. In hospital A diagnostic biopsies followed by a "wait and scan" approach has been favored (biopsy and watchful waiting), while early resections have been advocated in hospital B (early resection). Thus, the treatment strategy in individual patients has been highly dependent on the patient's residential address. Histopathology specimens from all adult patients diagnosed with LGG from 1998 through 2009 underwent a blinded histopathological review to ensure uniform classification and inclusion. Follow-up ended April 11, 2011. There were 153 patients (66 from the center favoring biopsy and watchful waiting and 87 from the center favoring early resection) with diffuse LGGs included.

Main Outcome Measure The prespecified primary end point was overall survival based on regional comparisons without adjusting for administered treatment.

Results Initial biopsy alone was carried out in 47 (71%) patients served by the center favoring biopsy and watchful waiting and in 12 (14%) patients served by the center favoring early resection ($P<.001$). Median follow-up was 7.0 years (interquartile range, 4.5-10.9) at the center favoring biopsy and watchful waiting and 7.1 years (interquartile range, 4.2-9.9) at the center favoring early resection ($P=.95$). The 2 groups were comparable with respect to baseline parameters. Overall survival was significantly better with early surgical resection ($P=.01$). Median survival was 5.9 years (95% CI, 4.5-7.3) with the approach favoring biopsy only while median survival was not reached with the approach favoring early resection. Estimated 5-year survival was 60% (95% CI, 48%-72%) and 74% (95% CI, 64%-84%) for biopsy and watchful waiting and early resection, respectively. In an adjusted multivariable analysis the relative hazard ratio was 1.8 (95% CI, 1.1-2.9, $P=.03$) when treated at the center favoring biopsy and watchful waiting.

Conclusions For patients in Norway with LGG, treatment at a center that favored early surgical resection was associated with better overall survival than treatment at a center that favored biopsy and watchful waiting. This survival benefit remained after adjusting for validated prognostic factors.

JAMA. 2012;308(18):1881-1888
Published online October 25, 2012. doi:10.1001/jama.2012.12807 www.jama.com

THE DIFFUSE LOW-GRADE GLIOmas (LGGs) include World Health Organization (WHO) grade II astrocytomas, oligodendrogliomas, and oligoastrocytomas.[1] Due to diffuse brain infiltration, LGGs are usually not considered surgically curable.[2] In fact, the effect of surgery on survival remains unclear because current evidence relies on uncontrolled surgical series alone.[3,4] Such series can be much affected by selection bias since patients with favorable outcomes may fare better regardless of treatment.[5,6] For example, watchful waiting until progression has been reported safe,[7,8] while others report improved survival and delayed time to malignant transformation if total resection of the tumor is achieved.[9-13] Due to lack of better evidence, management of suspected LGGs has remained one of the major controversies in neuro-oncology[5,14,15] and treatment strategies often differ considerably between neurosurgical centers.[16]

For editorial comment see p 1918.

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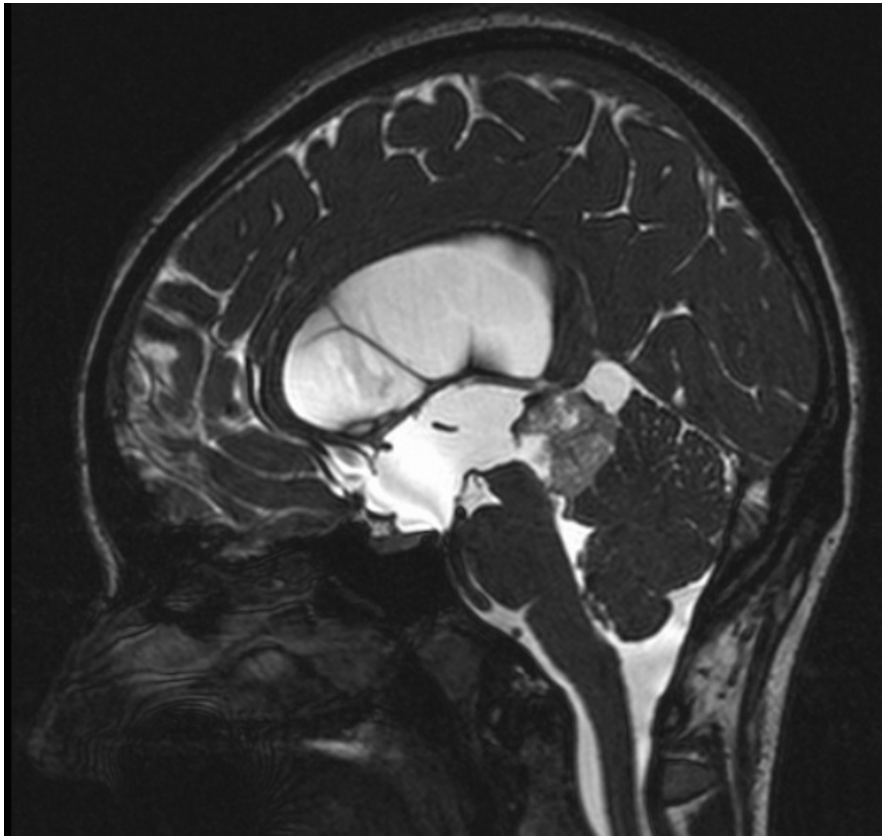
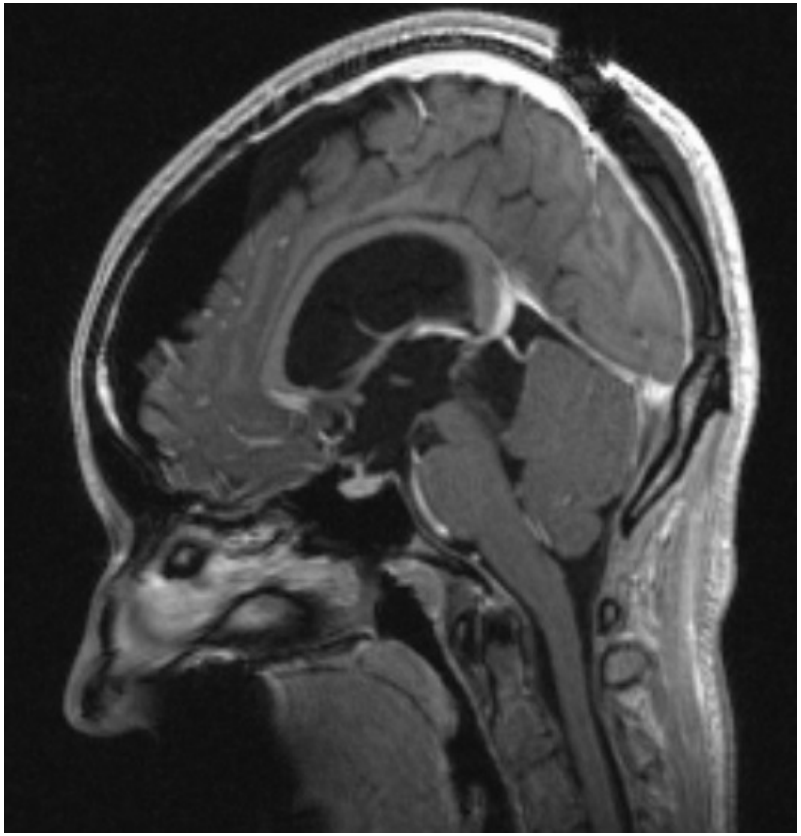
Kirurgisk behandling av LGG

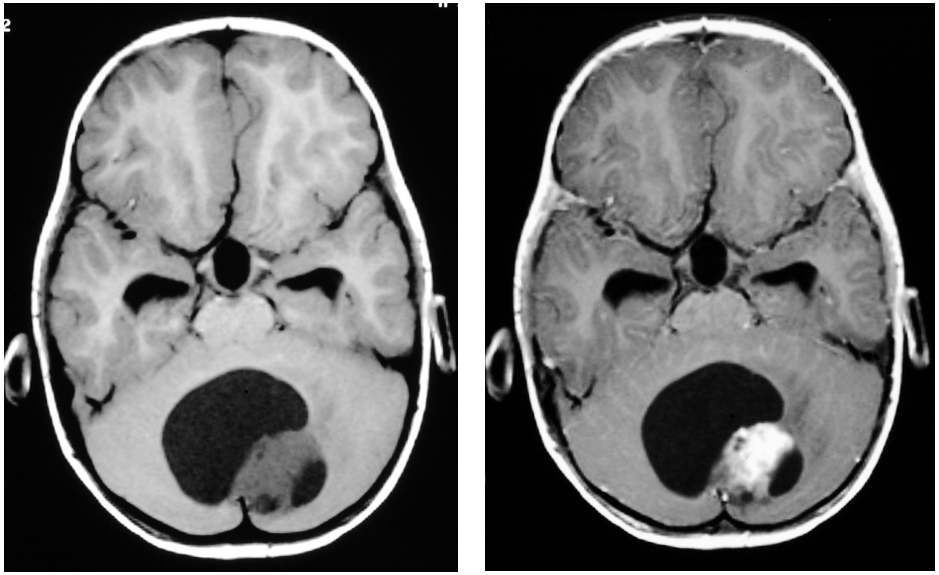
- Kirurgi gir øket OS
- Få kureres
- Tilstrebe lav kirurgisk morbiditet
  - E.g. våken kraniotomi
  - Tekniske hjelpemidler som navigasjon og peroperativ nevrofysiologi

Kvinne 26 år (LGG)

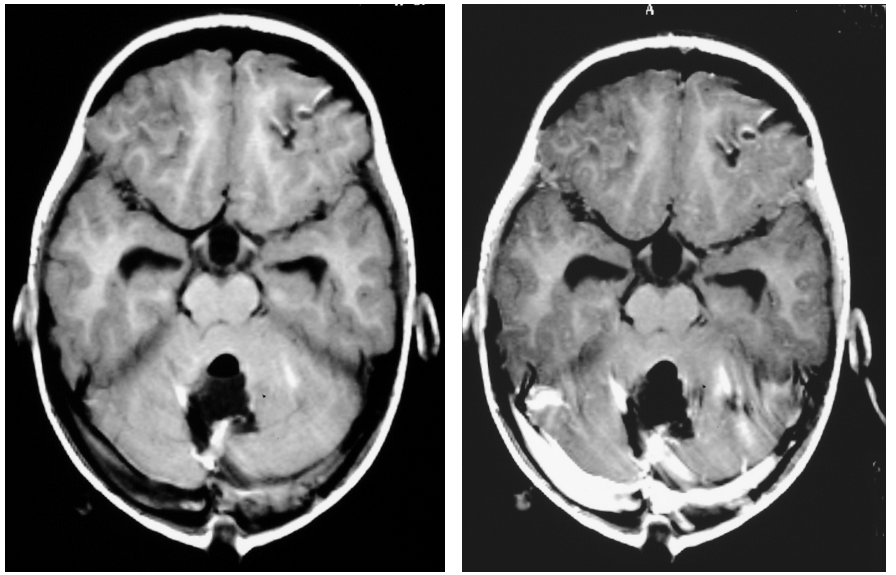




Posterior fossa astrocytoma



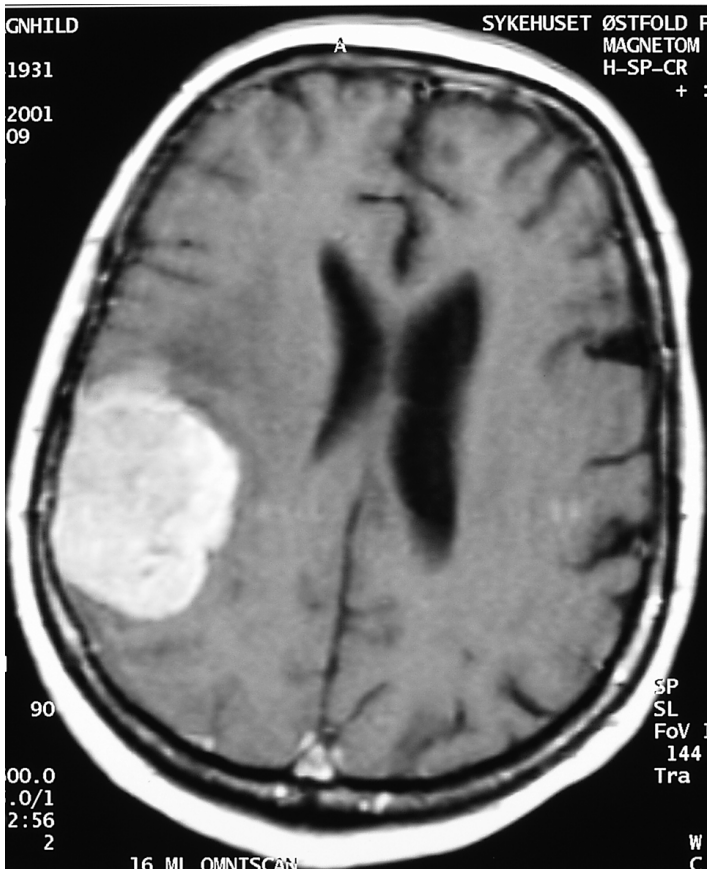
Boy 5-years old



Meningeom

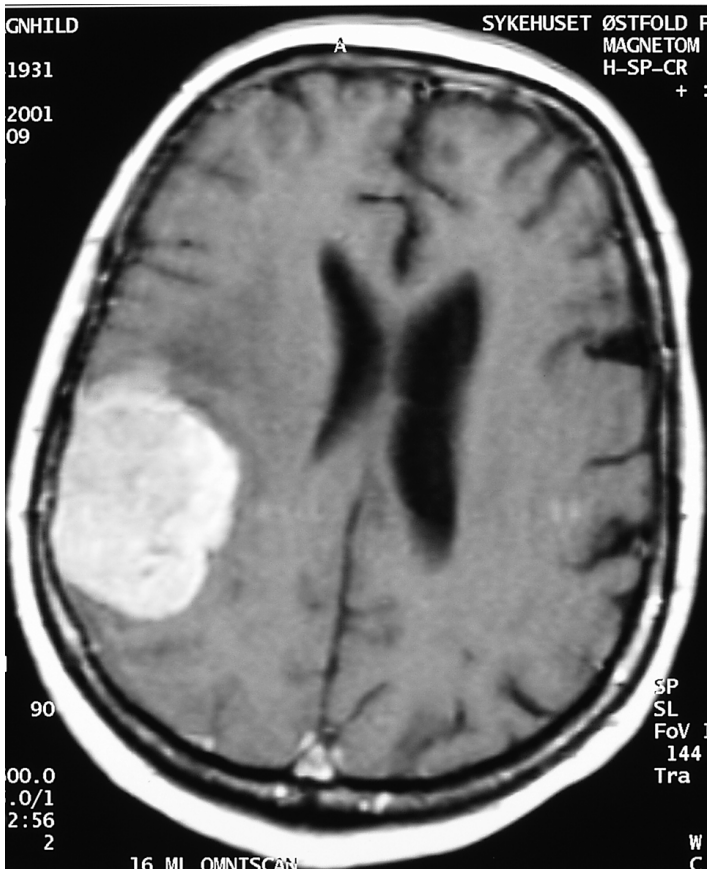
Kirurgisk behandling av meningeom

- Naturlig forløp
- Målsetting
  - Diagnose
  - Kurasjon
  - Palliasjon
- Radikalitet
- Komplikasjoner



Kirurgisk behandling av meningeom

- Naturlig forløp (Viktig)
- Målsetting
  - Diagnose (Ja)
  - Kurasjon (Ja)
  - Palliasjon
- Radikalitet (Ja)
- Komplikasjoner
  - Mortalitet (<2%)
  - Hematom (<2%)
  - Infeksjon (<2%)
  - Nevrologisk forverring (<10%)



See the corresponding editorial in this issue, pp 997–998.

J Neurosurg 117:999–1006, 2012

Surgery for convexity meningioma: Simpson Grade I resection as the goal

Clinical article

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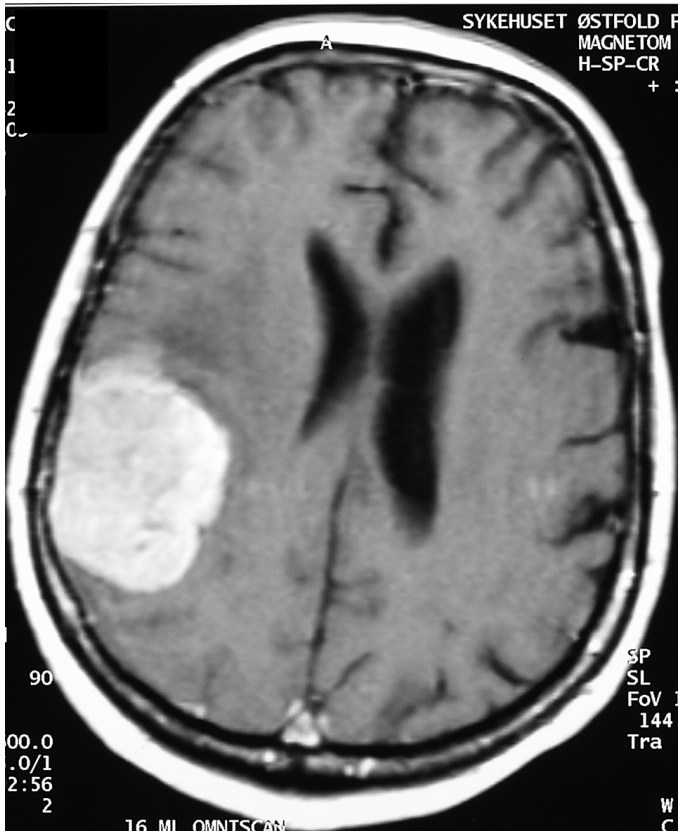
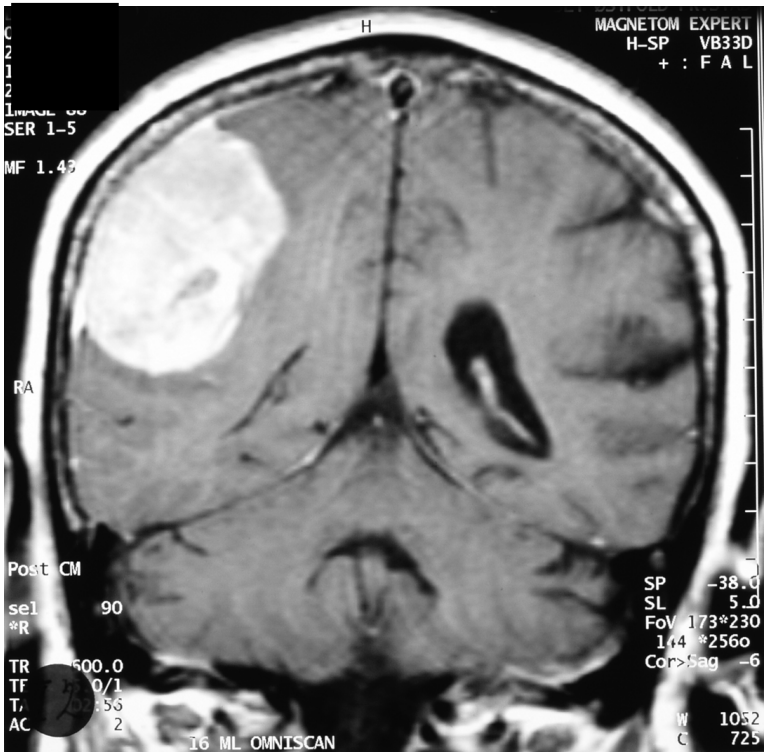
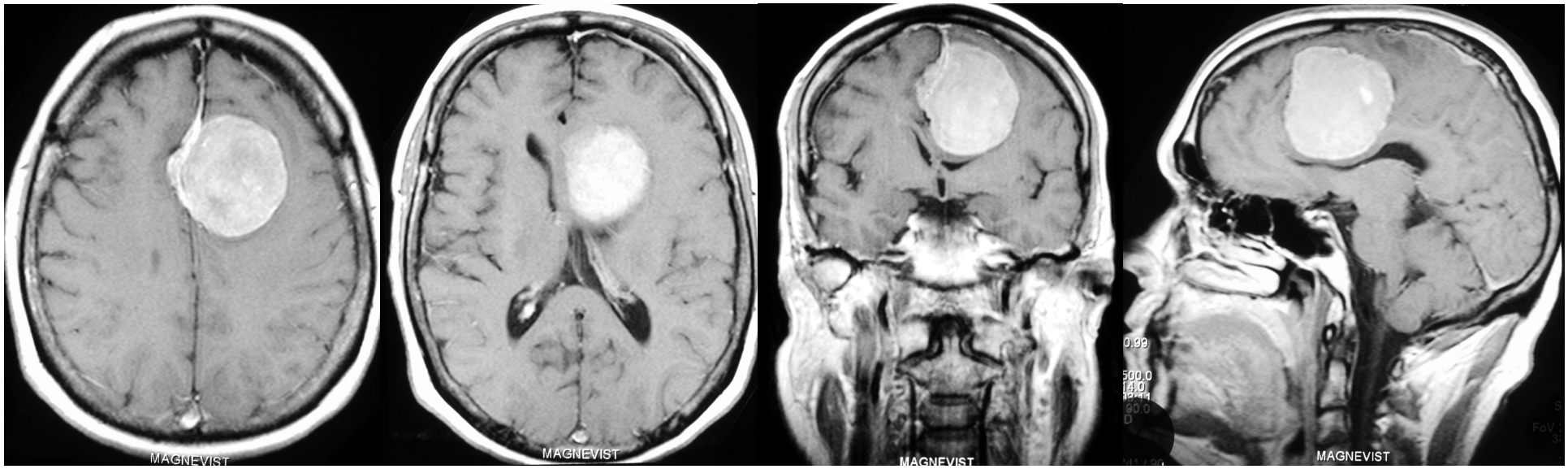
Konveksitetsmeningeom





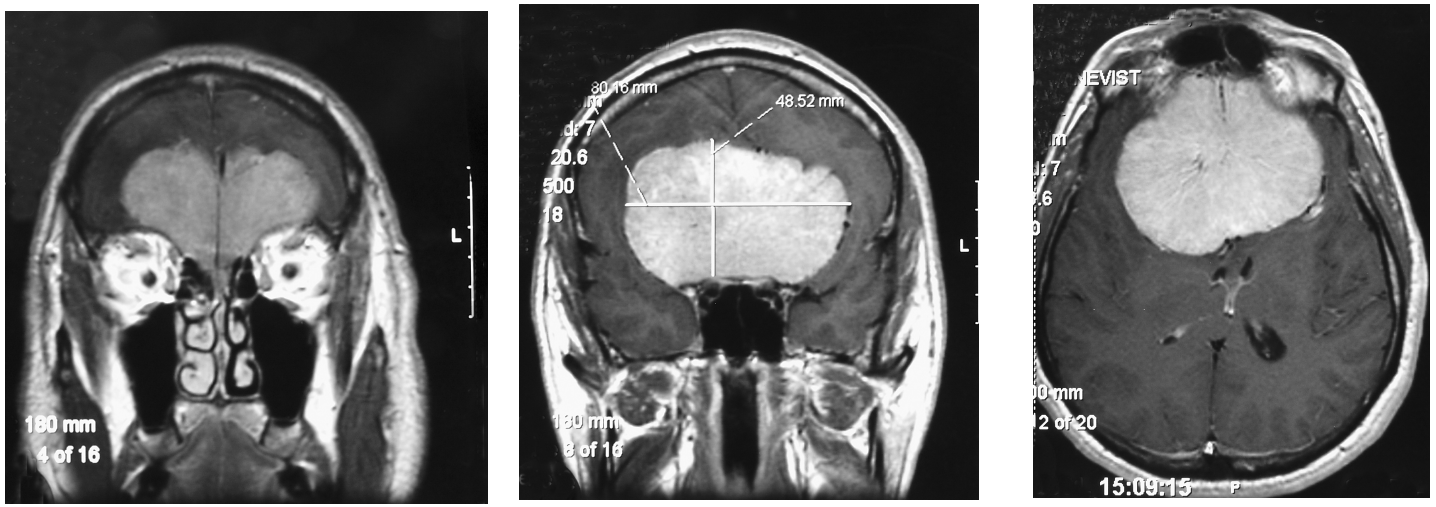
Kvinne, 70 år

Falx meningeom



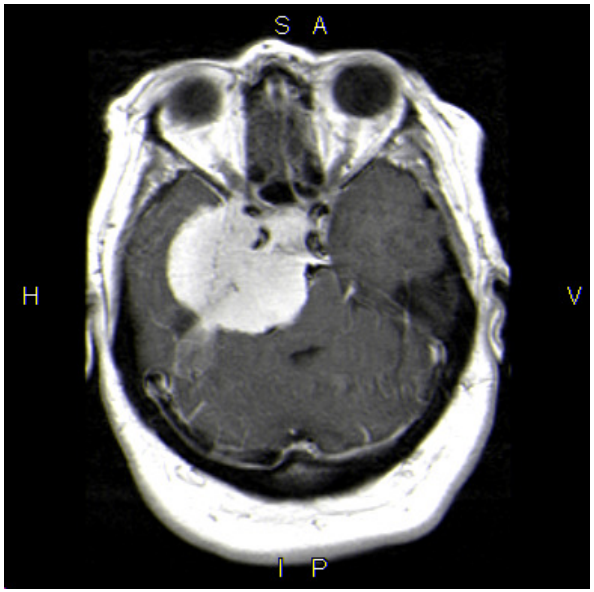
Kvinne, 60 år

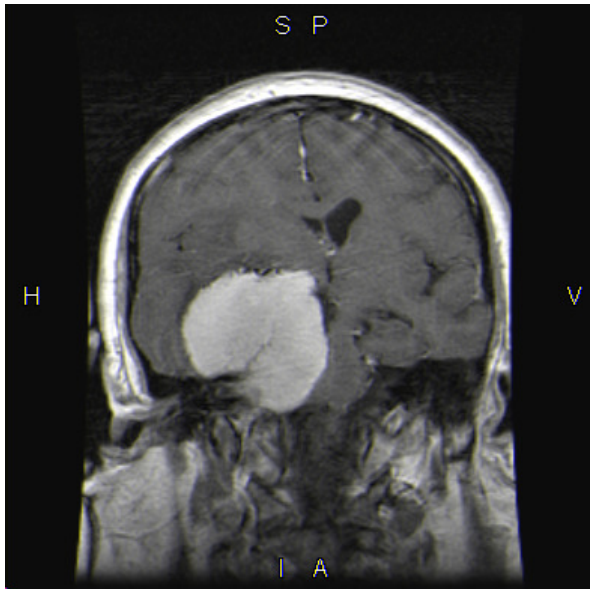
Olfactorius meningeom

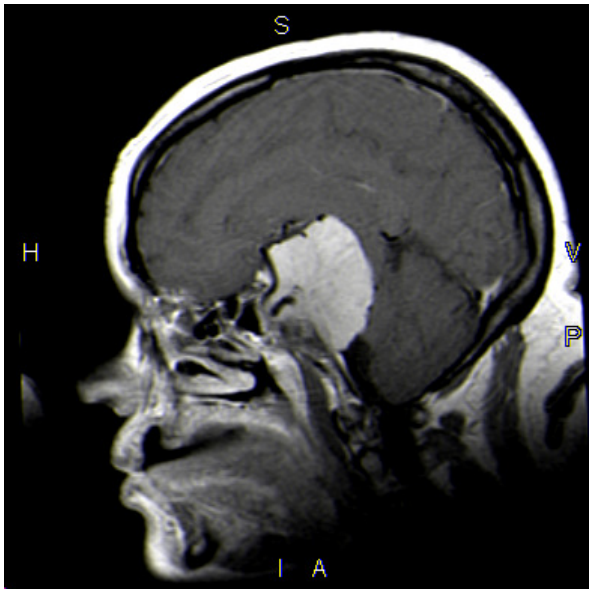


Mann 42 år

Skallebasis meningeom







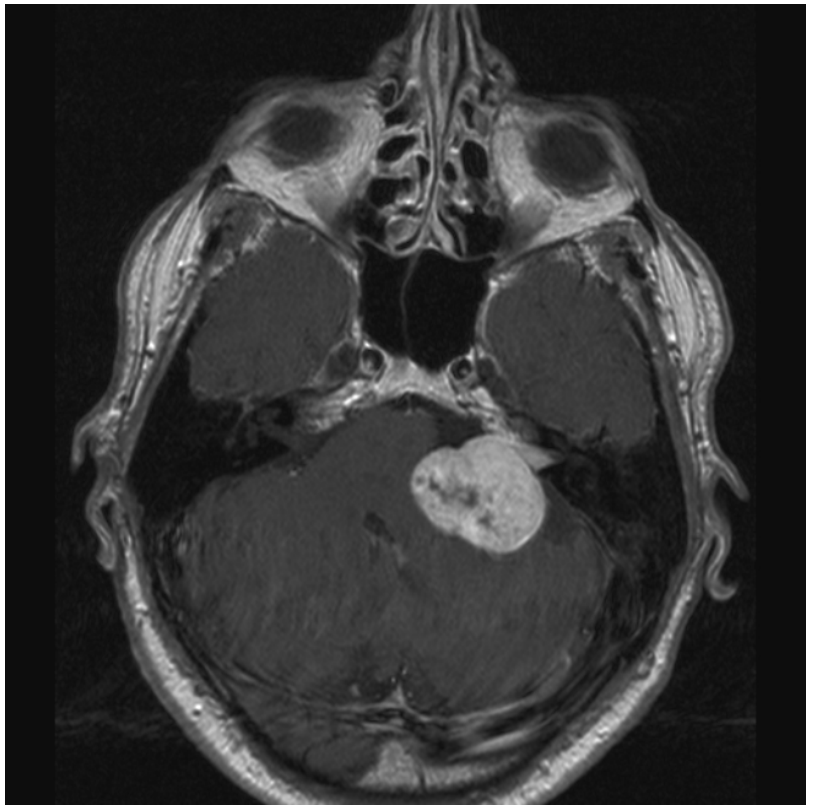
Kvinne 60 år

Vestibularisschwannom

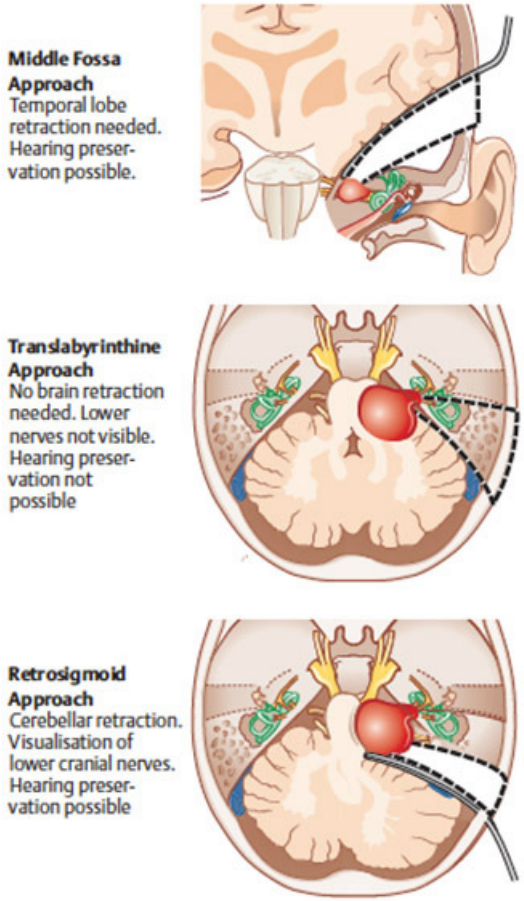
vs

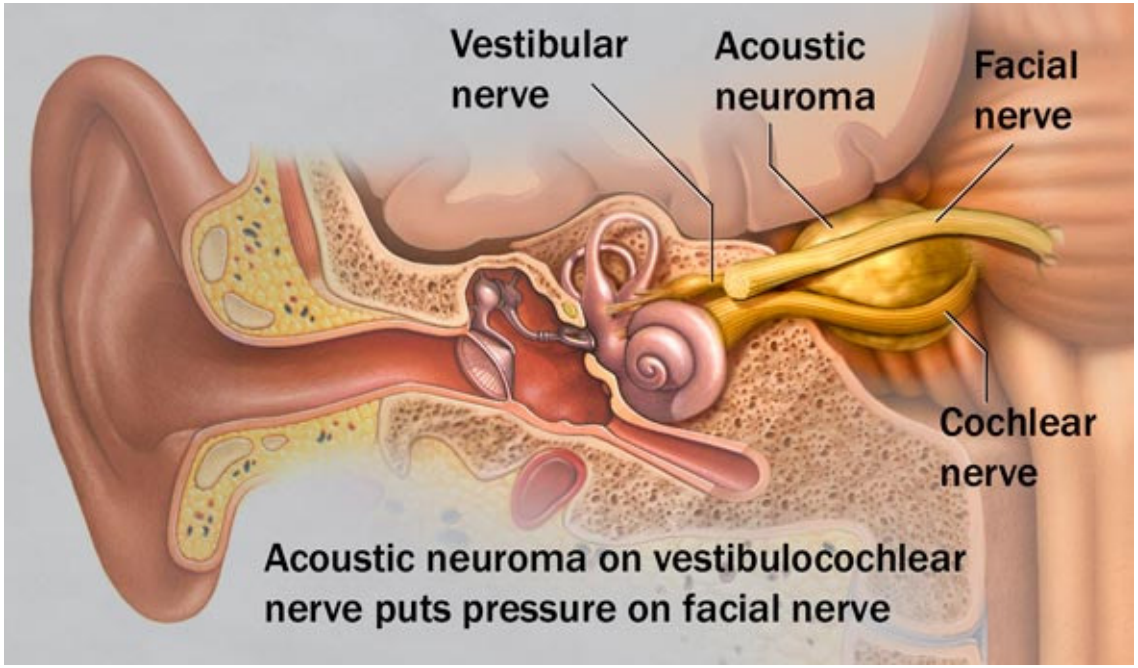
Vestibularis schwannom

- Godartet svulst
- Symptomer og tegn
  - Nedsatt hørsel
  - Øresus
  - Svimmelhet
- Behandling
  - Observasjon (<2 cm)
  - Kirurgi (>3 cm)
  - Gammakniv (2-3 cm)
- Nær relasjon til n.facialis

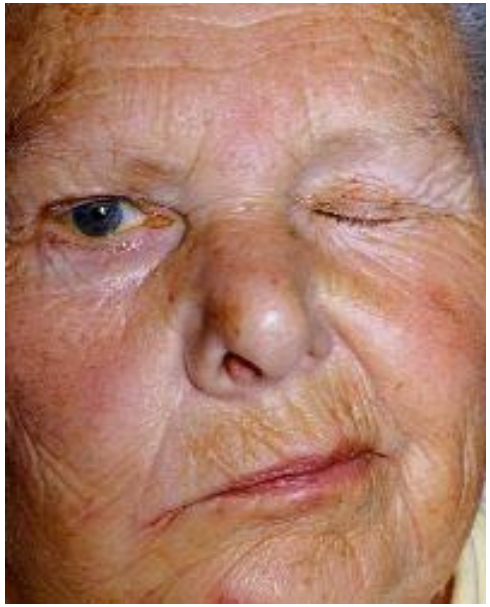


Vestibularis schwannom





Perifer facialis parese



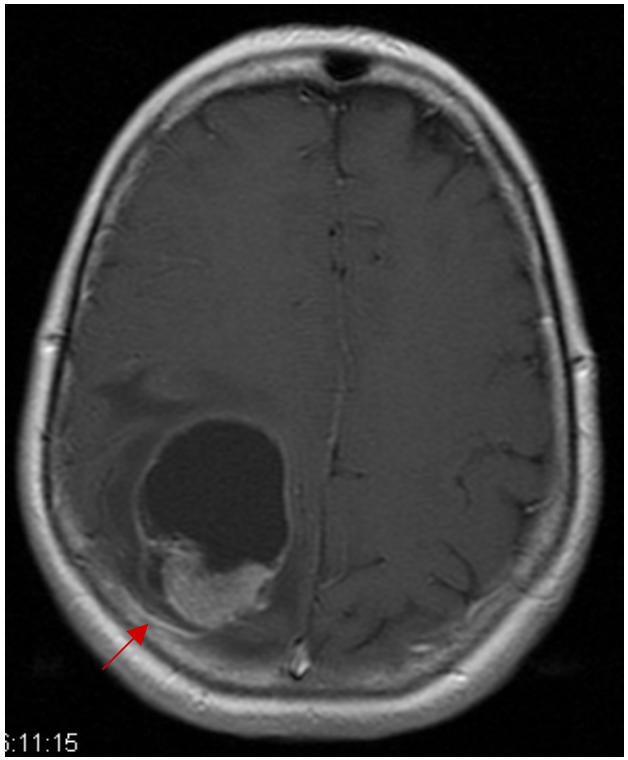
Hjernemetastaser

Treatment of brain metastases

- Surgery alone?
- Surgery + WBRT?
- SRS alone?
- SRS + WBRT?

- What is best? Surgery or SRS

Female, 53-years



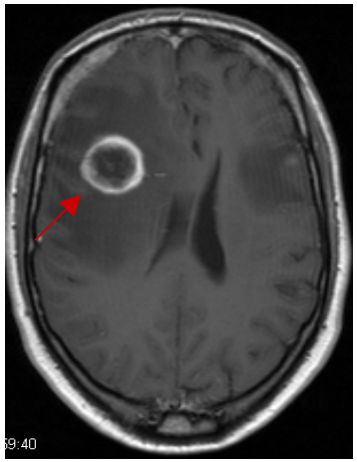
Surgery

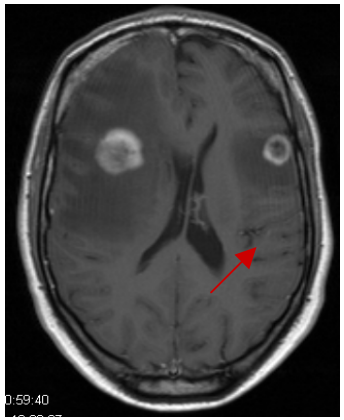
WBRT

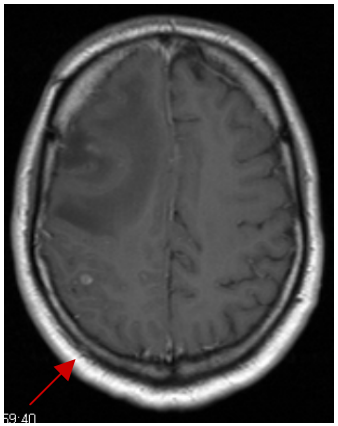
2000: Mammary carcinoma

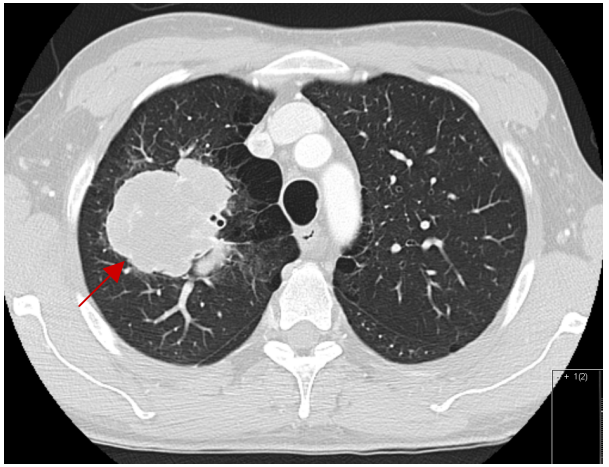
2007: Increasing left sided hemiparesis

Male, 44 years









Surgery

NSCLC **SRS** **SRS**

WBRT

RT

Chemotherapy

February 2007: 2 months history of headache, nausea, vomiting and simple partial seizures with motor signs from left arm