Sede

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Ospedale Sacro Cuore
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ECM

Il congresso è accreditato per Medici specialisti in Oncologia, Chirurgia, Radioterapia, Anatomia Patologica, Medicina Nucleare e Radiodiagnostica.

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Incontri Oncologici Triveneto

Metastasi Cerebrali da Carcinoma Mammario HER2-positivo

NEGRAR 7 OTTOBRE 2014
12° INCONTRO ONCOLOGICO DEL TRIVENETO
OSPEDALE SACRO CUORE

con il Patrocinio di
AIOM

Ospedale Sacro Cuore Don Calabria

Dr L.Romano

RUOLO DELL' IMAGING

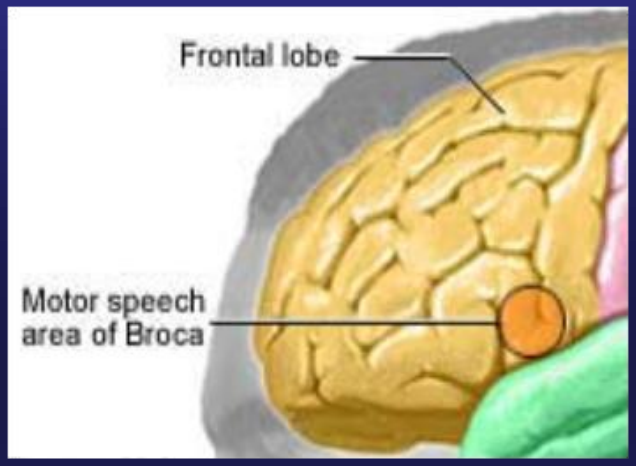
- **TEMPESTIVO RICONOSCIMENTO LESIONE ESPANSIVA**

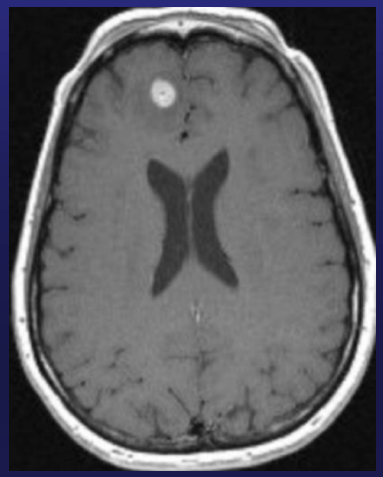
IALE

SFIDA TERAPEUTICA PER IL TRATTAMENTO DELLA MALATTIA
- Remissione sintomi
- Qualità vita

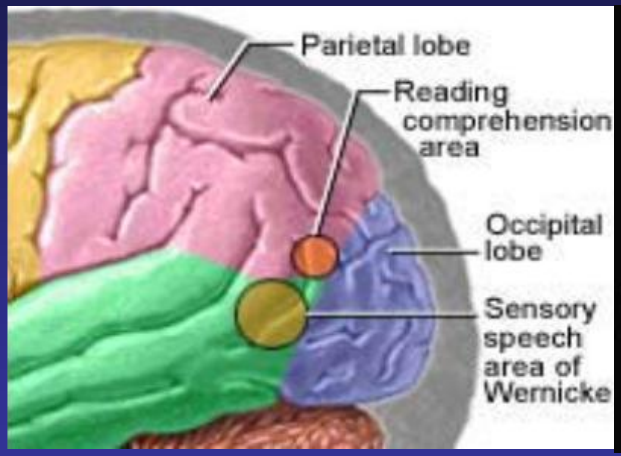
IMAGING & CLINICA

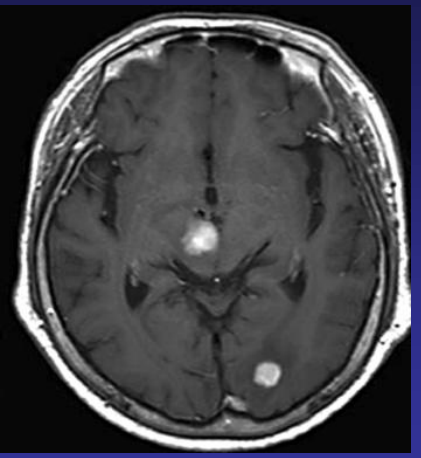
Lobo Frontale
Alterazioni del comportamento
Variazioni della personalità
Perdita di memoria
cefalea
afasia
Disfunzioni motorie



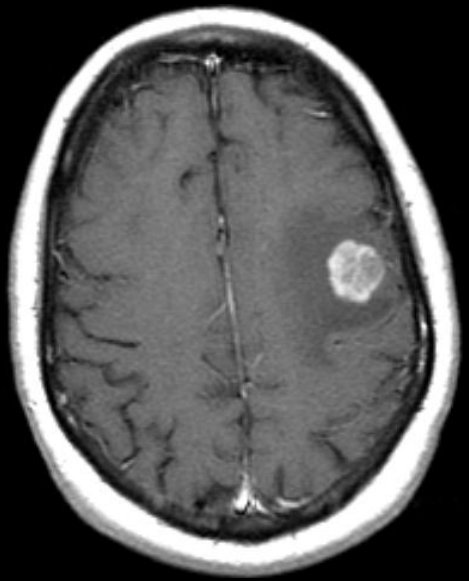


Lobo Parietale
Deficit sensitivi e parestesie
Lobo Temporale
Alterazioni psico-motorie
Lobo Occipitale
Disturbi visivi

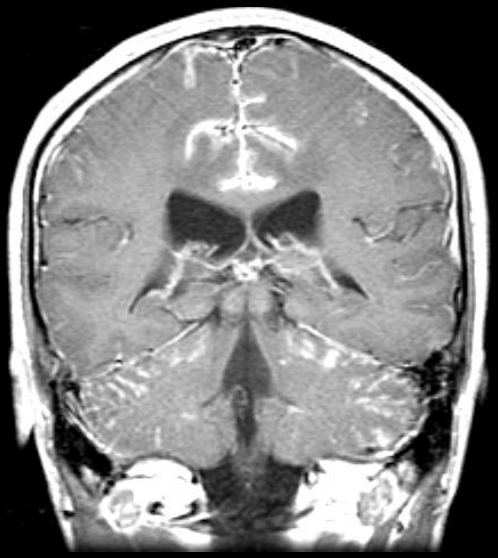




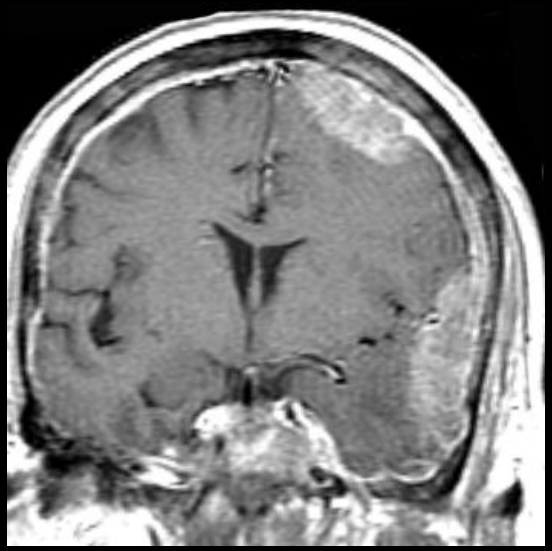
PATTERN DI INTERESSAMENTO



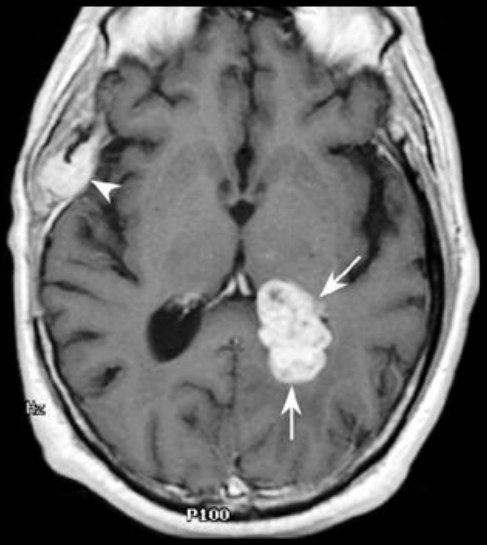
Intra-assiale



Leptomeningeo-subaracnoideo



Durale-epidurale

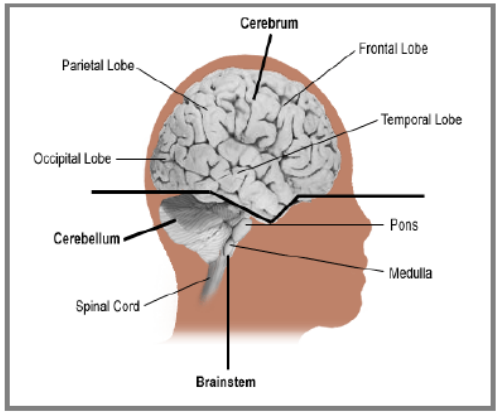


Intra-ventricolare

METASTASI INTRASSIALI

- 80% sopratentoriale a livello giunzione cortico-sottocorticale
- Fattori emodinamici per maggior portata del sistema della a.cerebrale media
- Pecularietà delle zone di confine (rete vascolare terminale intrappola i microemboli neoplastici.
- Associazione con metastasi extrassiali.
- Edema perilesionale in genere molto evidente,sproporzionata alle dimensioni

Breast Cancer-related Brain Metastasis: Location



- Hematogenous spread
- Supratentorial > infratentorial
- Predilection for vascular border zones & gray- and white-matter junctions

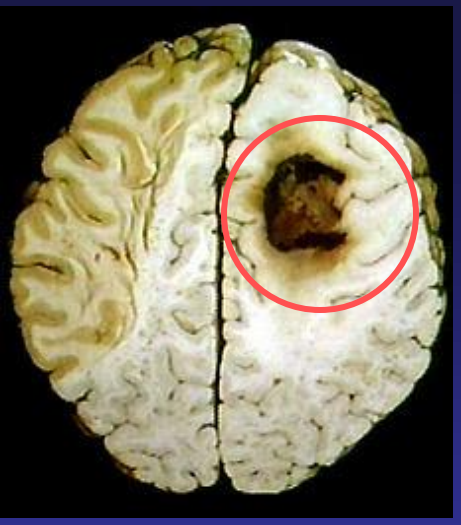
CNS metastases in Brest cancer J.Clin.Oncol. 2oo4

METASTASI INTRASSIALI

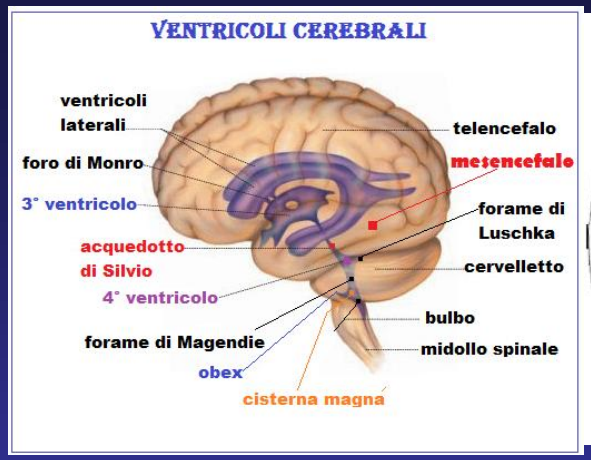
NEOFORMAZIONE

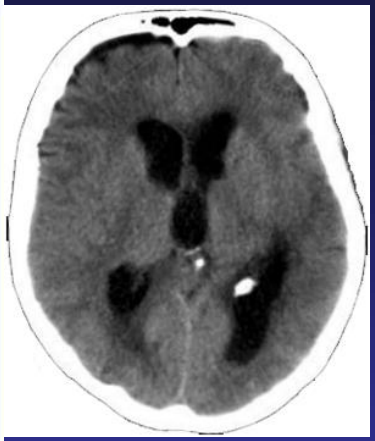
Segni Diretti

Segni Indiretti



NEOFORMAZIONE
Cellularietà
Contenuto idrico
Vascolarizzazione
Fenomeni involutivi associati
(calcificazioni,emorragie,
zone cistiche o necrotiche)





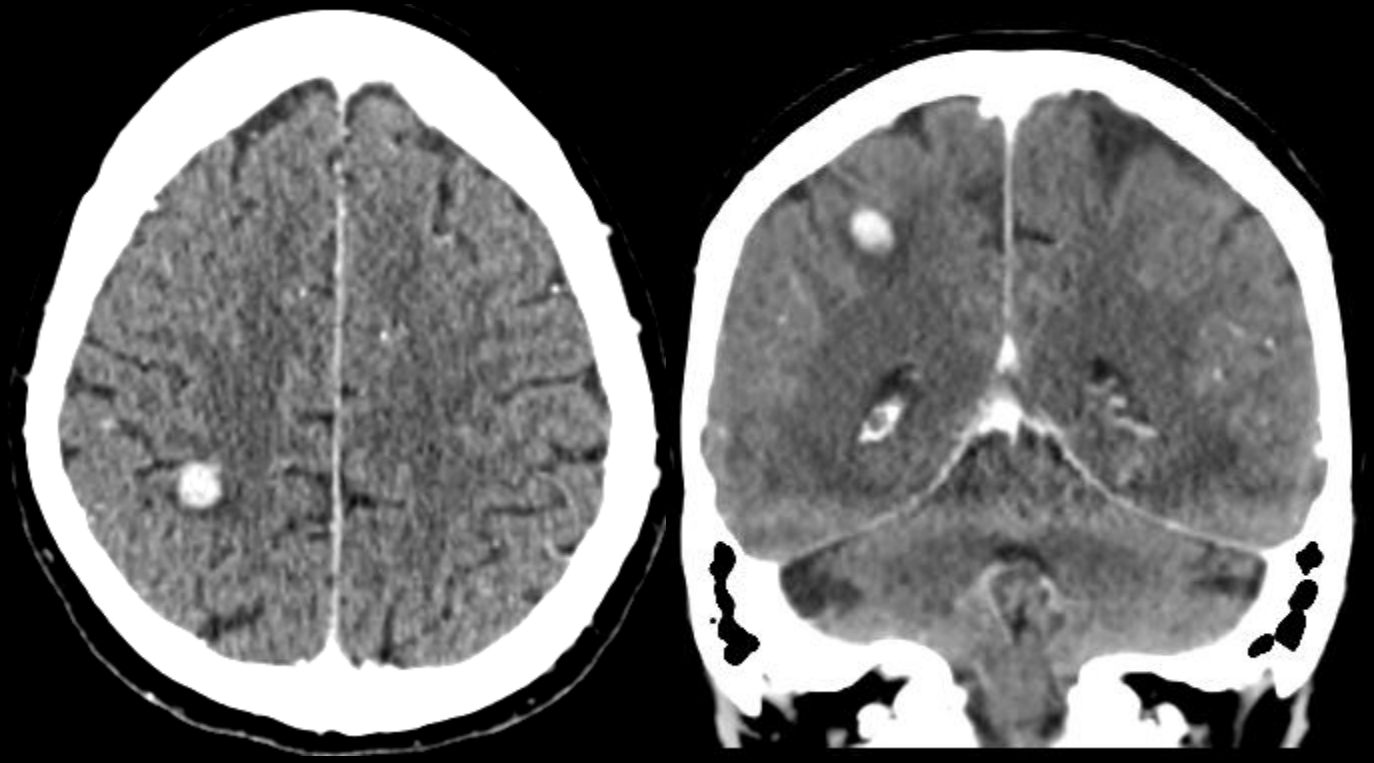
PARENCHIMA ADIACENTE
Edema
Fenomeni reattivi

IPERTENSIONE ENDOCRANICA

SEGNI DIRETTI IN TC

•Alterazione della densita’ (Tc) dell’area tumorale con variabile edema vasogenico.

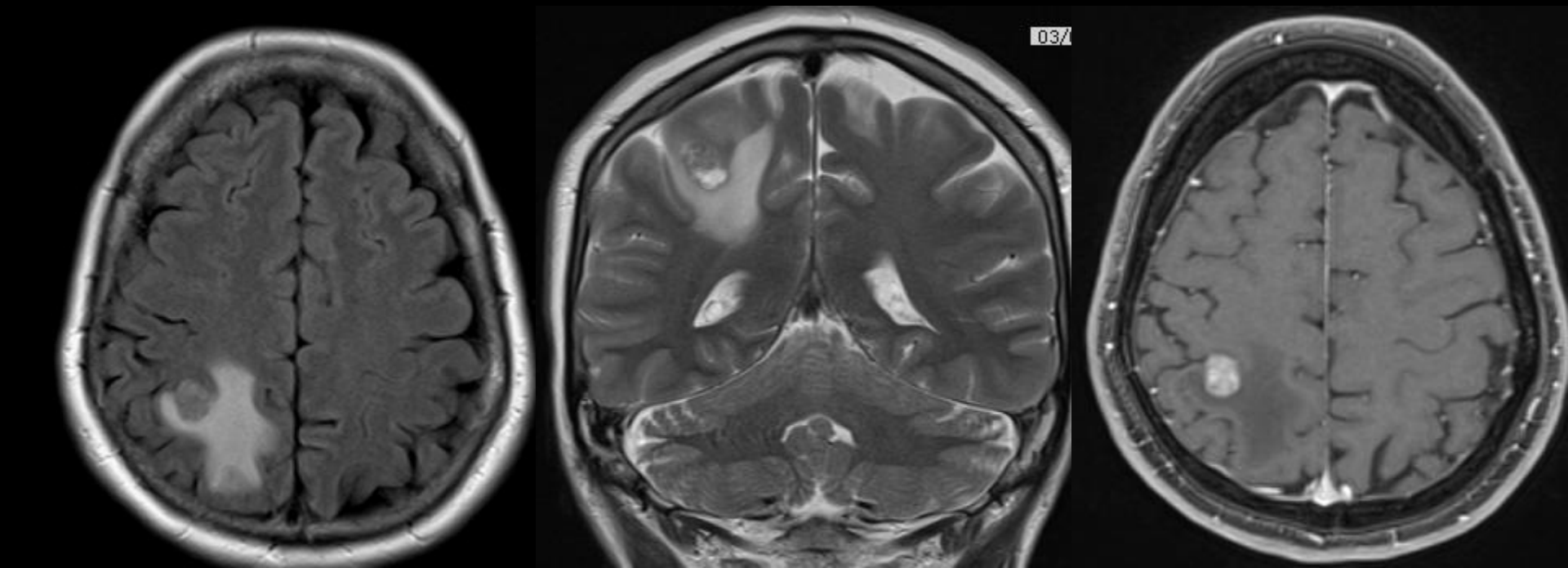
•Impregazione dopo infusione di mdc e.v.(ad anello o completa)



SEGNI DIRETTI IN RMN

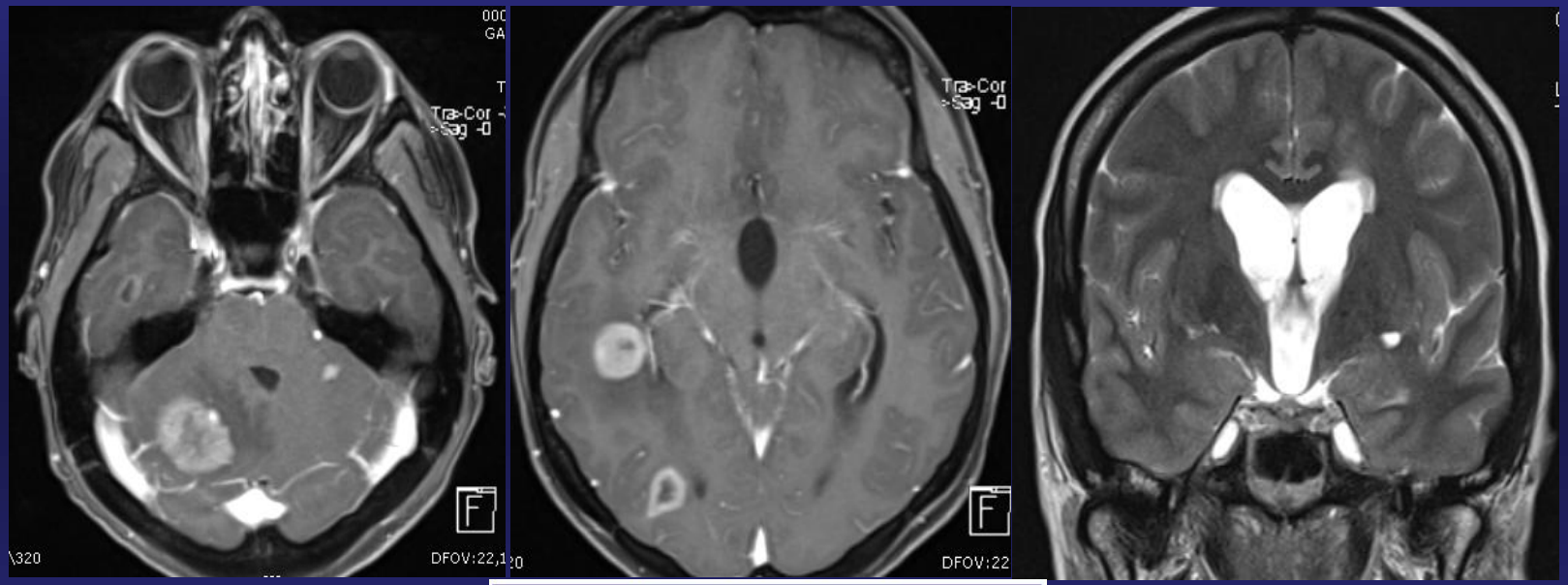
•Alterazione dell'intensità del segnale dell'area tumorale nelle sequnenze T1 e T2 con variabile edema vasogenico.

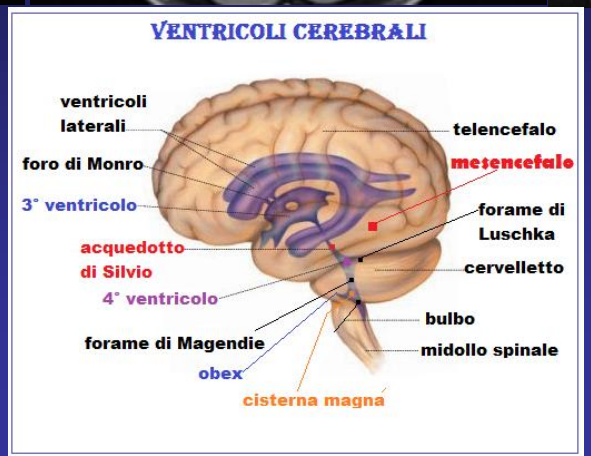
•Impregazione dopo infusione di mdc e.v.(ad anello o completa)



SEGNI INDIRETTI

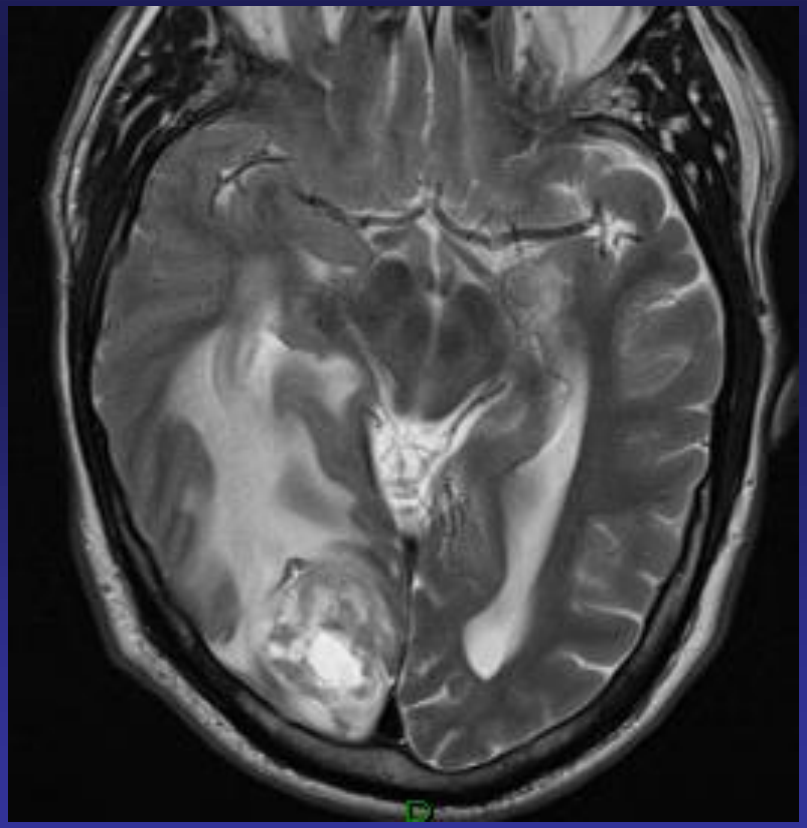
- Coinvolgimento del Complesso ventricolare:Idrocefalo

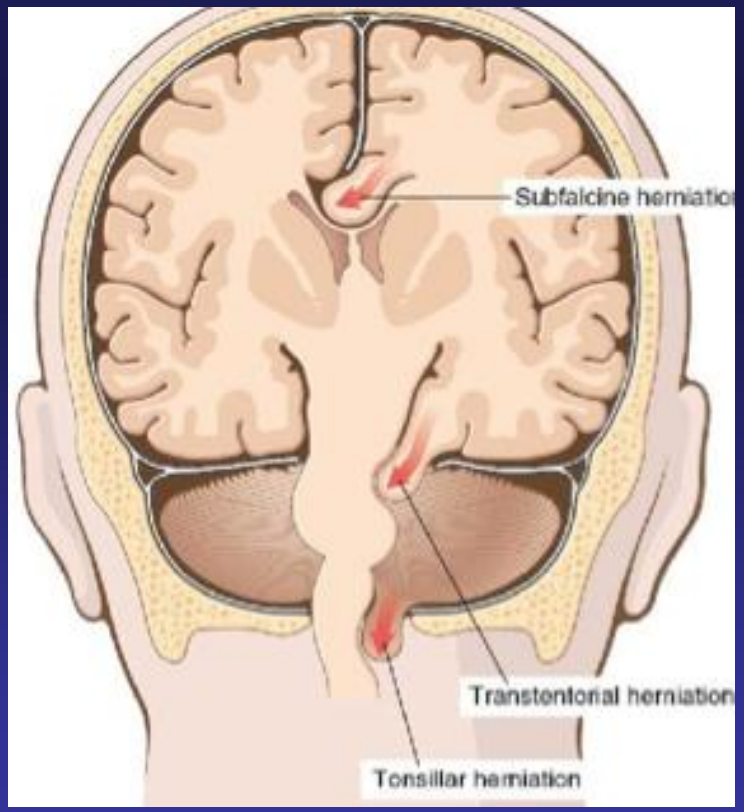




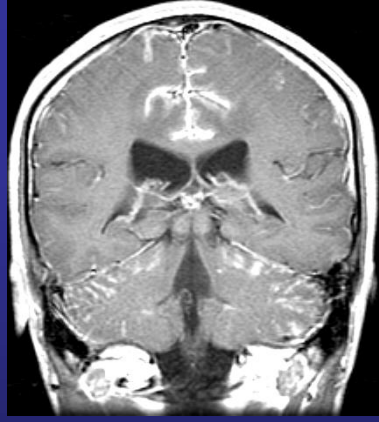
SEGNI INDIRETTI

•Ernie cerebrali:dislocazione di strutture nervose o vascolari dell'espanso nella scatola cranica inestensibile





METASTASI MENINGEE



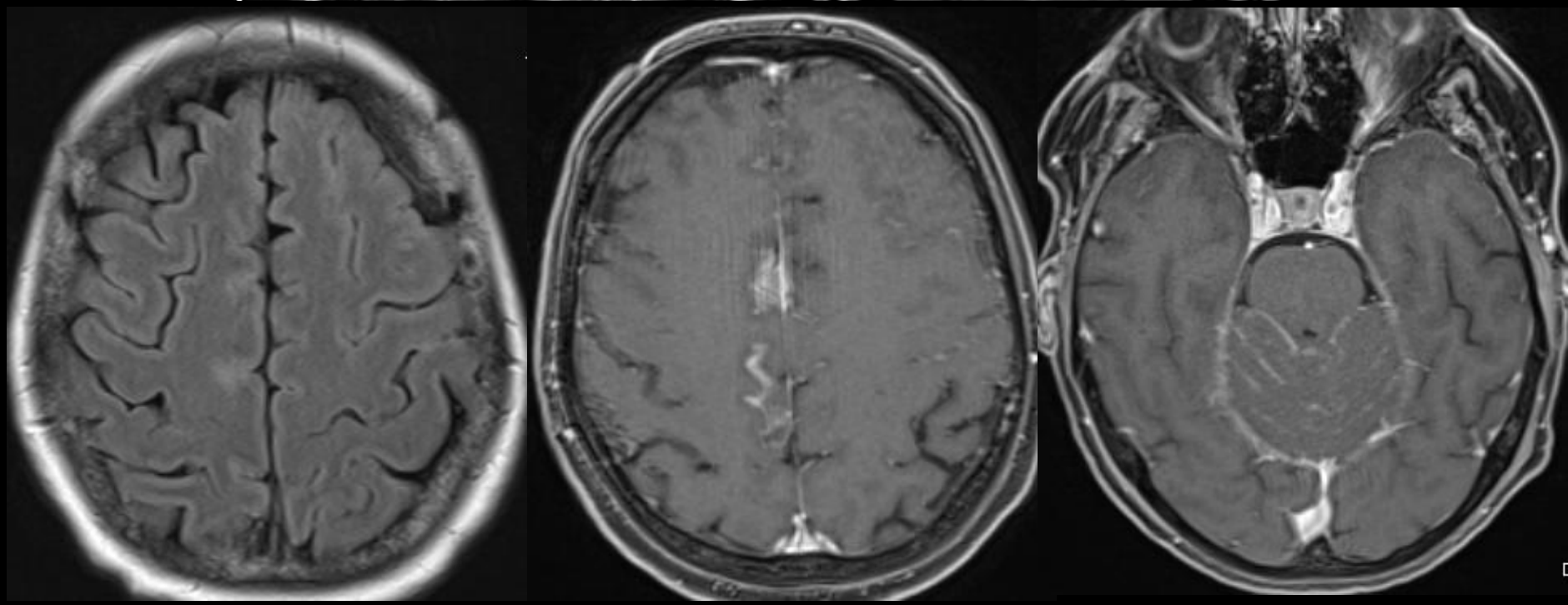
- Cisterne base
- Spazi subaracnoidei convessità cerebrale
- Lungo il decorso nervi cranici (diffusione perineurale)

- Obliterazione spazi subaracnoidei
  diffusa/focale
- Nodulare/Lineare lungo la superficie strutture nervose

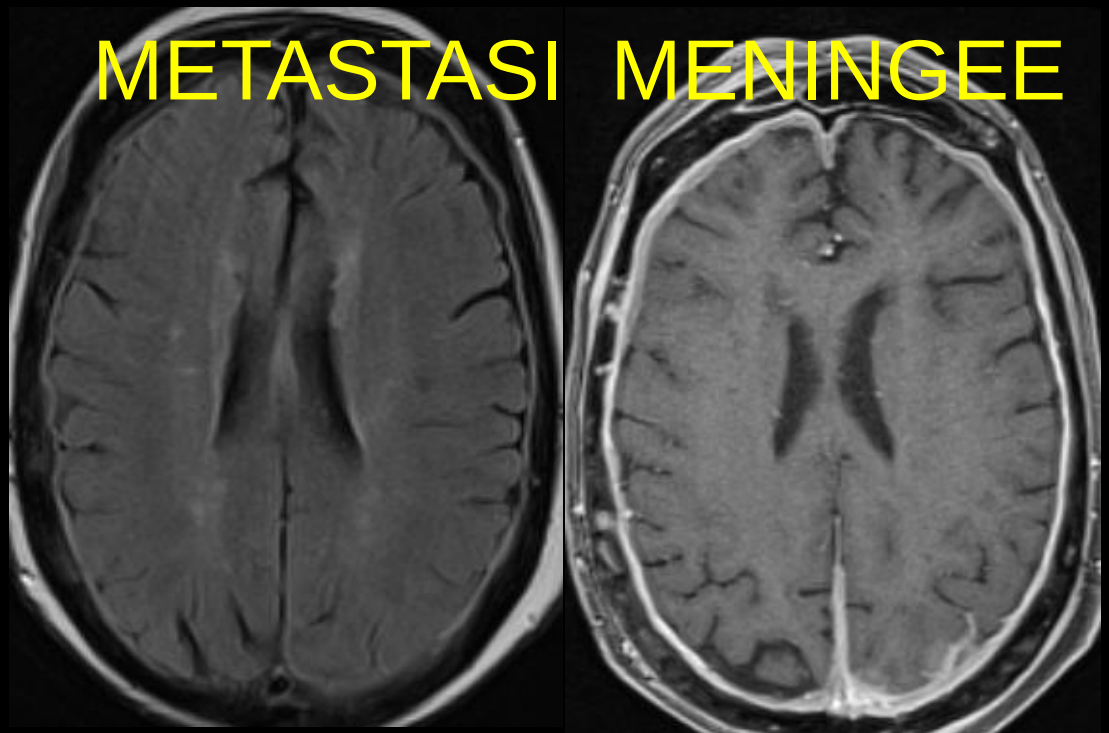
- *Tendenza delle mts leptomeningee alla diffusione liquorale; il riscontro di lesione subaracnoidea intracranico suggerisce valutazione RMN spinale con Mdc*

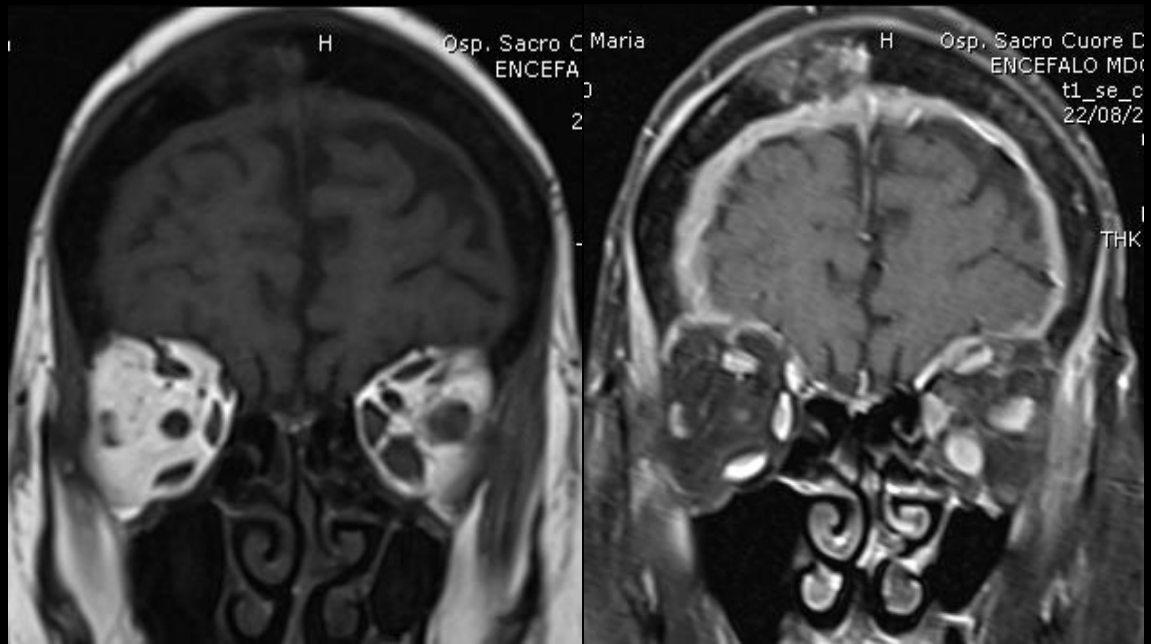
- !!! Ricerca di mts ossee associate

METASTASI MENINGEE

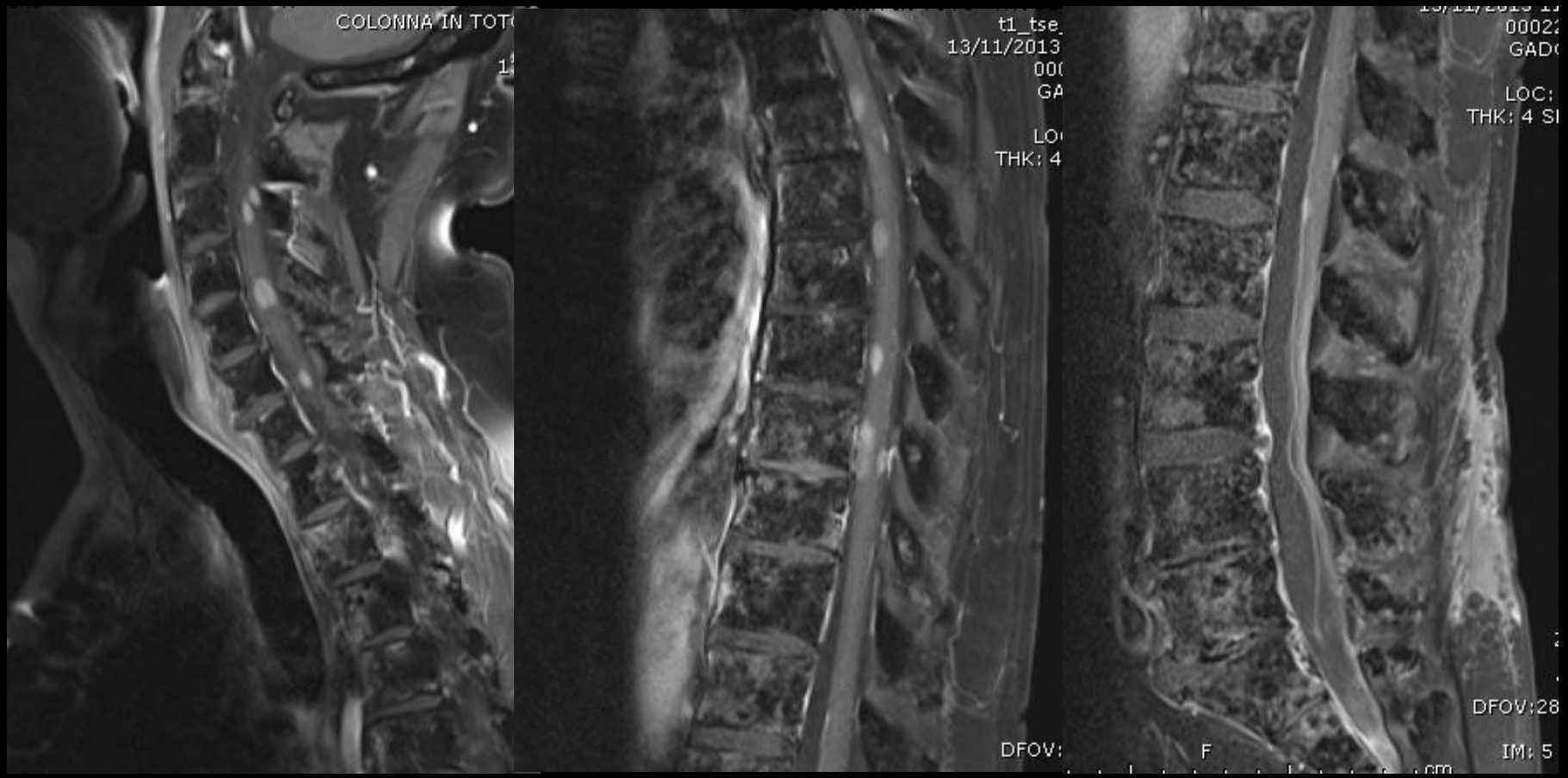


METASTASI MENINGEE





METASTASI MENINGEE ED OSSEE



RUOLO DELL'IMAGING

Detection of Brain Metastases:
Comparison of Contrast-Enhanced MR with Unenhanced MR and Enhanced CT

Gordon Sze[1,2]
Edward Milano
Carl Johnson[3]
Linda Heier

Contrast-enhanced MR studies were compared with noncontrast MR and contrast-enhanced CT scans in the evaluation of intraparenchymal brain metastases. Fifty consecutive inpatients were studied with short and long repetition time (TR) sequences before and after the administration of gadopentetate dimeglumine. In addition, a delayed short TR sequence was performed. The contrast CT, noncontrast MR, immediate post-contrast short TR sequence, postcontrast long TR sequence, and delayed postcontrast short TR sequence were each read blindly and independently by two neuroradiologists. These results were then compared with a final interpretation, reached by all the neuroradiologists in the study, using all the clinical information and imaging findings. Postcontrast short TR scans proved to be superior to other sequences. They were particularly useful in the detection of metastases in the posterior fossa and cortex. The delayed postcontrast short TR scan held no definite advantage over the immediate postcontrast short TR scan, although metastases were sometimes seen slightly better after the delay. While long TR sequences were not always sensitive or specific, they often did provide ancillary information and were particularly useful in cases of hemorrhagic metastases.

Because of these findings, we recommend that the evaluation of intraparenchymal metastases consist of a single postcontrast long TR scan followed by a single postcontrast short TR scan. While these sequences should be very accurate in the detection of metastases, we also generally perform a single precontrast short TR scan as well, since the question of hemorrhage or bone lesion may be clinically relevant.

AJNR 11:785–791, July/August 1990

Journal of Neuro-Oncology **44:** 275–281, 1999.

Clinical Study

Diagnostic accuracy of MRI compared to CC

Peter D. Schellinger[1], Hans M. Meinck[1] and Armin Thron[2]
[1]*Department of Neurology, University of Heidelberg, Germany*
University of Aachen, Germany

Key words: brain metastases, magnetic resonance imaging, con

Summary

Objectives. In patients with extracranial neoplasms, the occurrer
for further diagnostic approaches and therapeutic strategies and
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Neuroradiology (1989) 31: 391–395

Neuro radiology
© Springer-Verlag 1989

Imaging of brain metastases

Comparison of computerized tomography (CT) and magnetic resonance imaging (MRI)

M.J.B. Taphoorn[1], J.J. Heimans[1], M.C.R.L.E. Kaiser[2], R.G.M. de Slegte[2], F.C. Crezee[2], and J. Valk[2]
Departments of [1] Neurology and [2] Neuroradiology, Free University Hospital, Amsterdam, The Netherlands

Assessment of Diagnostic Accuracy of Perfusion MR Imaging in Primary and Metastatic Solitary Malignant Brain Tumors

Nail Bulakbasi, Murat Kocaoglu, Anar Farzaliyev, Cem Tayfun, Taner Ucoz, and Ibrahim Somuncu

PURPOSE: **The purpose of this study was to estimate the diagnostic accuracy of relative cerebral blood volume (rCBV) measurement in preoperative grading and differentiation of solitary intra-axial malignant brain tumors.**

METHODS: **Thirty-six low-grade glial tumors (LGGTs), 22 high-grade glial tumors (HGGTs), and 17 metastases (METs) were prospectively evaluated by MR imaging and standard dynamic susceptibility contrast-enhanced gradient echo, echoplanar imaging during first pass of a bolus injection of contrast material. Normalized rCBV values from tumoral ($rCBV_T$) and peritumoral ($rCBV_p$) areas were calculated by standard software and statistically tested independently.**

RESULTS: **The mean differences of $rCBV_T$ and $rCBV_p$ values between LGGT (2.30 ± 1.12 and 1.18 ± 0.24) and HGGT (5.42 ± 1.52 and 2.17 ± 0.82) ($P < .001$); HGGTs and METs (3.21 ± 0.98 and 0.97 ± 0.09) ($P < .001$); and LGGTs and METs ($P < .05$ and $P < .001$, respectively) were significant. No clear cutoff value was present. A clear $rCBV_T$ cutoff value of 2.6 was detected for differentiation of low- (1.75 ± 0.38; LGA) versus high-grade (4.78 ± 0.99; HGA) astrocytomas when nonastrocytic glial tumors were excluded. The $rCBV_T$ values were linearly correlated with degree of malignancy ($r = 0.869$; $P < .001$). Cutoff $rCBV_p$ values of 1.1 and 1.2 were quite effective in differentiation of METs from LGGTs and HGGTs, respectively. The overall efficacy of rCBV was higher in grading than in differentiation.**

CONCLUSION: **The diagnostic accuracy of rCBV measurement is higher in grading of glial brain tumors than in differentiation of HGGTs from solitary intra-axial METs. The astrocytic and nonastrocytic glial tumors have to be evaluated separately for precise grading.**

Preoperative Diffusion-Weigh
Metastases Correlates with P

**Anna Sophie Berghoff[1,9], Thomas Spanberger[2,9], Ays
Markus Hutterer[4], Adelheid Woehrer[1,9], Monika Hack
Christine Marosi[3,9], Peter Birner[8,9], Daniela Prayer[2,9],**

1 Institute of Neurology, Medical University of Vienna, Vienna, Austria, **2** Department
Austria, **3** Department of Medicine I, Medical University of Vienna, Vienna, Austria, **4** De
Hospital Regensburg, Regensburg, Germany, **5** Austrian National Cancer Registry, Statis
Vienna, Vienna, Austria, **7** Department of Radiotherapy, Medical University of Vienna, Vie
Vienna, Austria, **9** Comprehensive Cancer Center CNS Tumors Unit, Medical University

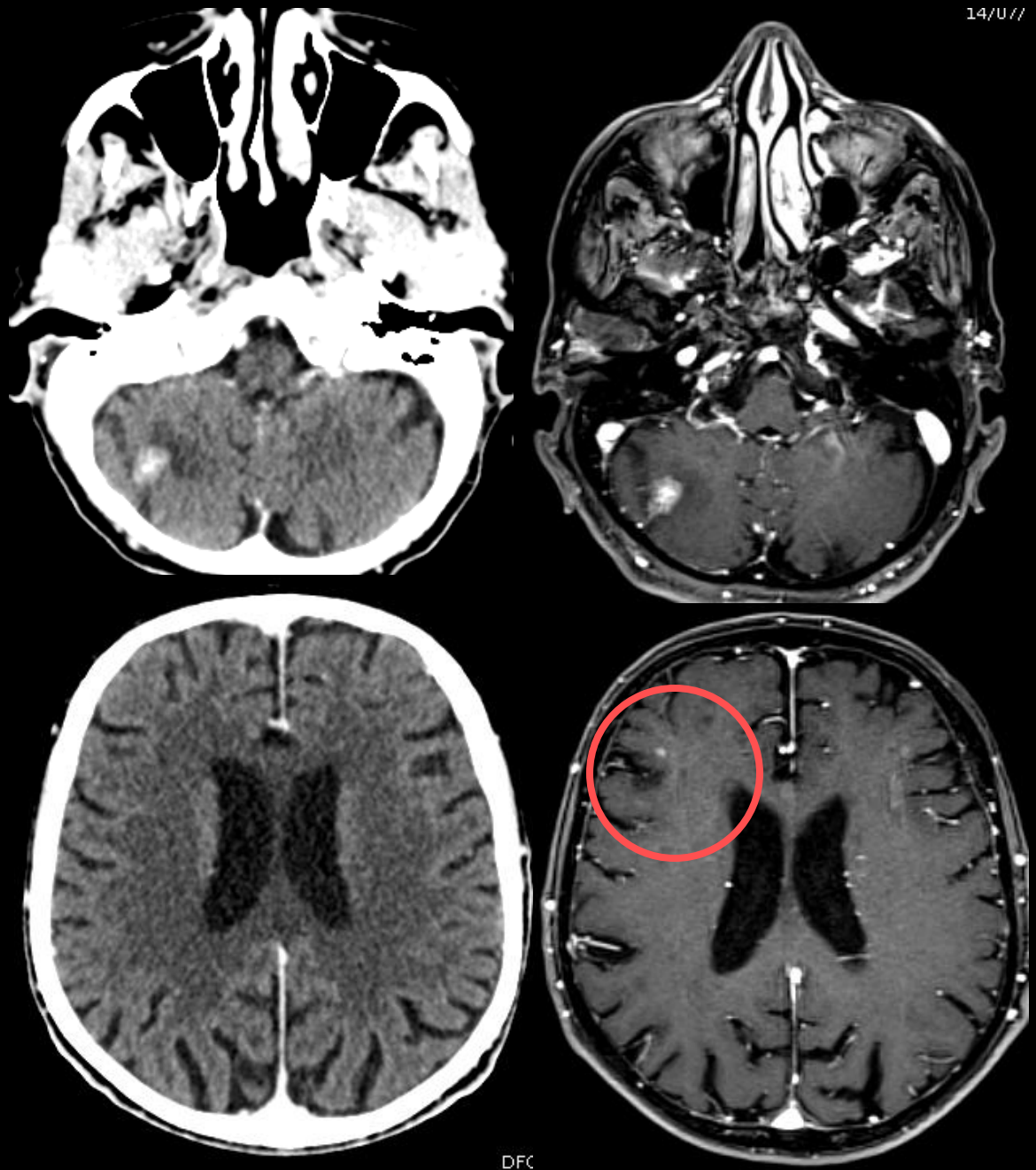
L'IDENTIFICAZIONE RMN vs TC

- Identifica piccole lesioni
- Maggior risoluzione contrasto
- Impregnazione più intensa con mdc e.v.
- Assenza artefatti con l'osso della teca
- Multiplanarietà e multiparametricità

- Più costosa
- Meno disponibile
- Minor sensibilità per lesioni ossee

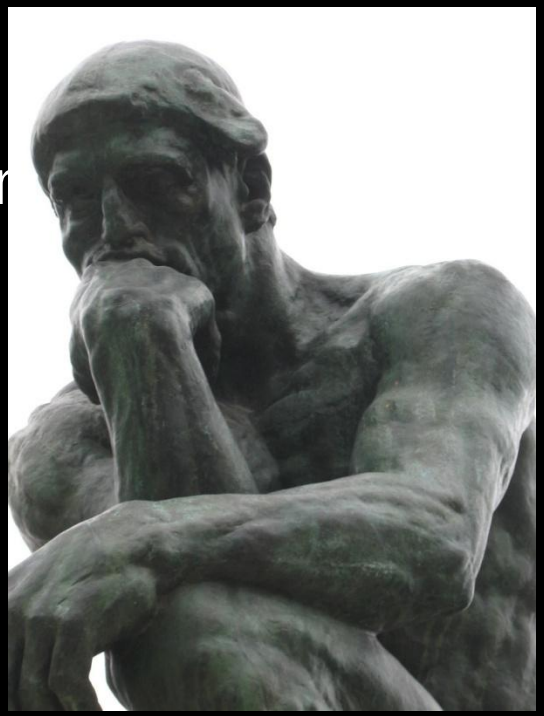
Magnetic Risonance Imaging of Metastasis disease to brain
Neuroradiology 2002 Belariaux D

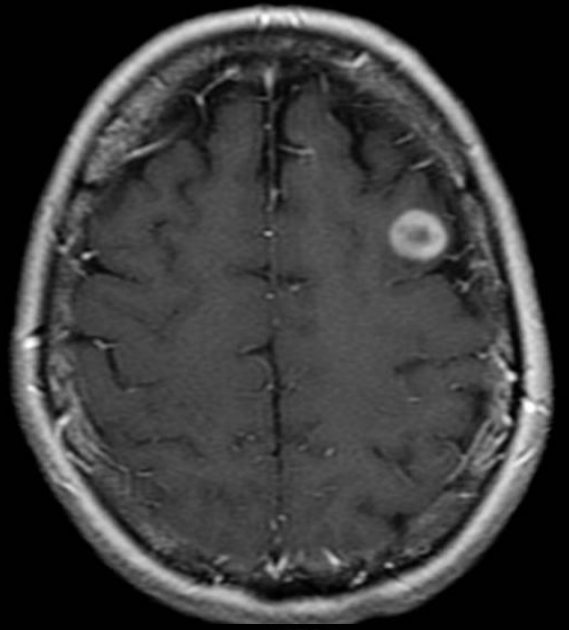
RMN vs TC:LA RISOLUZIONE SPAZIALE

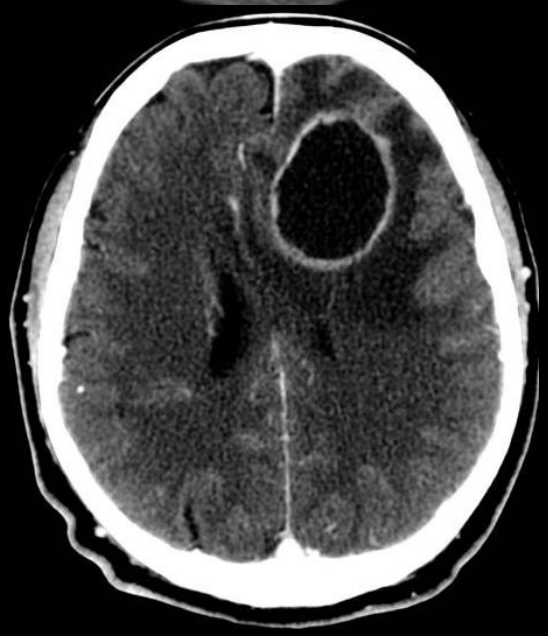


LA LESIONE UNICA:DIAGNOSI DIFFERENZIALE

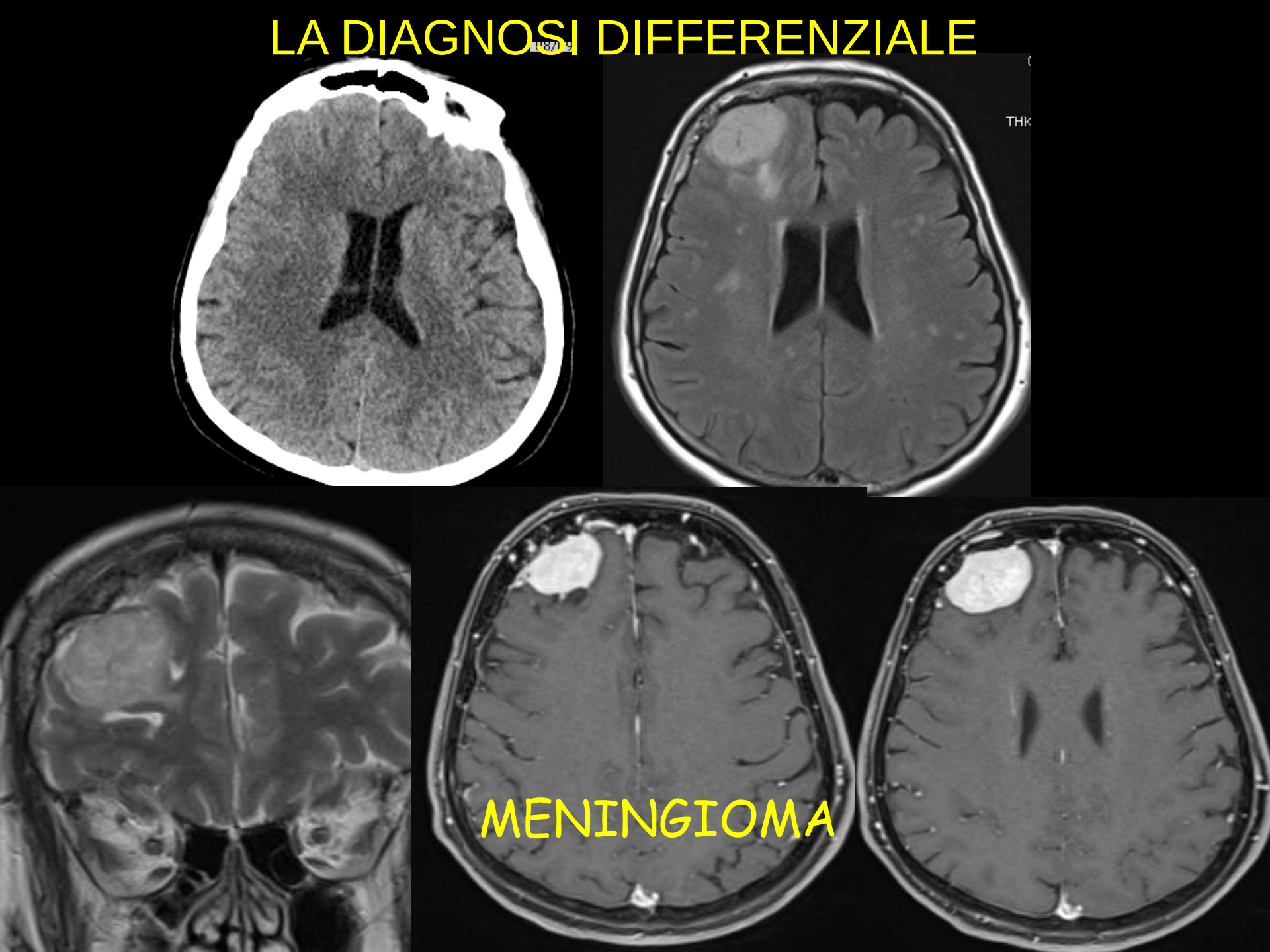
- Neoformazione primitiva gliale
- Ascesso cerebrale
- Radionecrosi
- Lesione ischer
- Meningioma







LA DIAGNOSI DIFFERENZIALE



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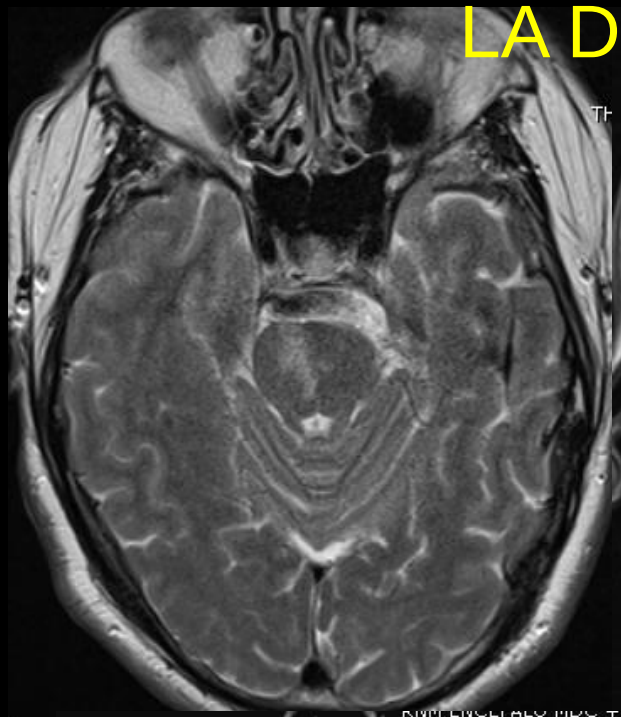
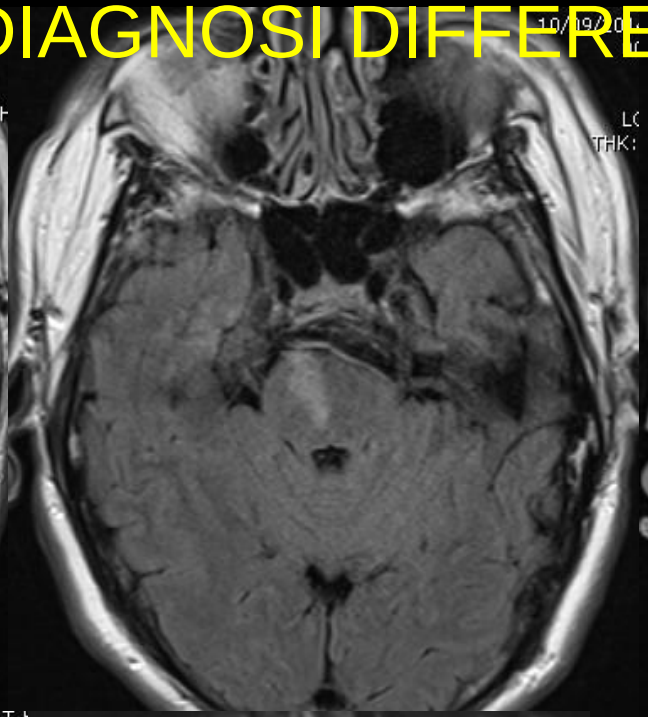
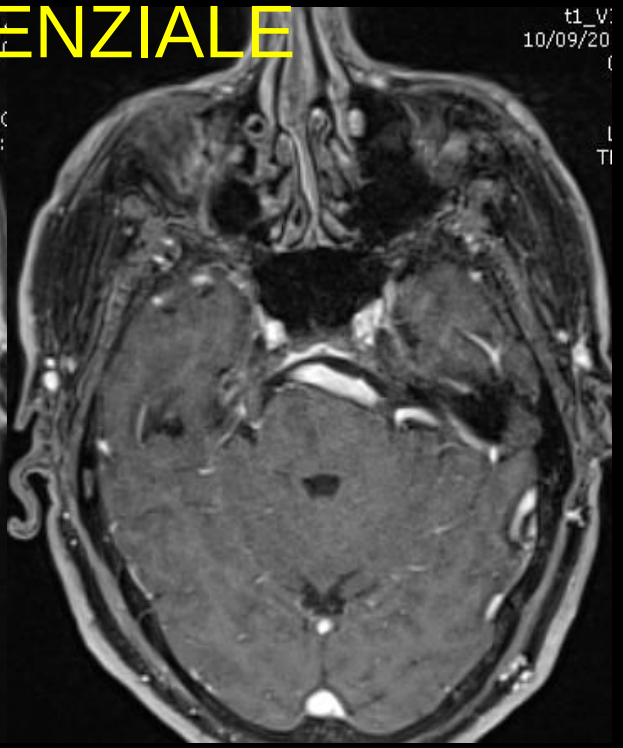
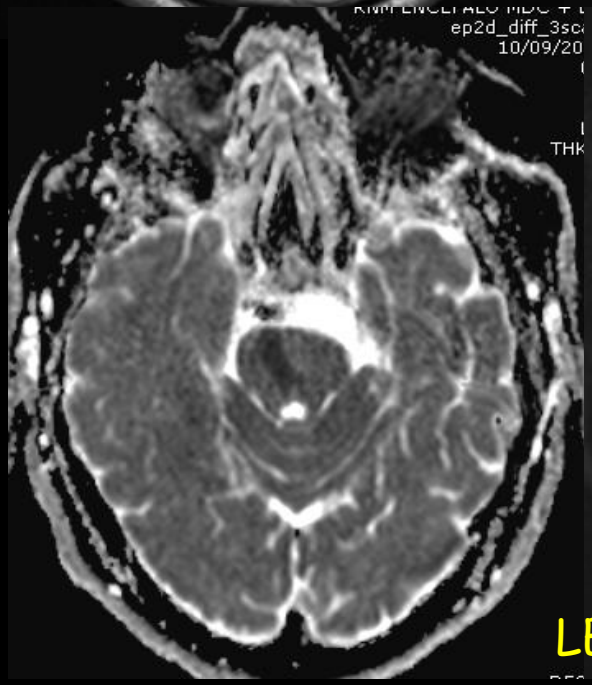
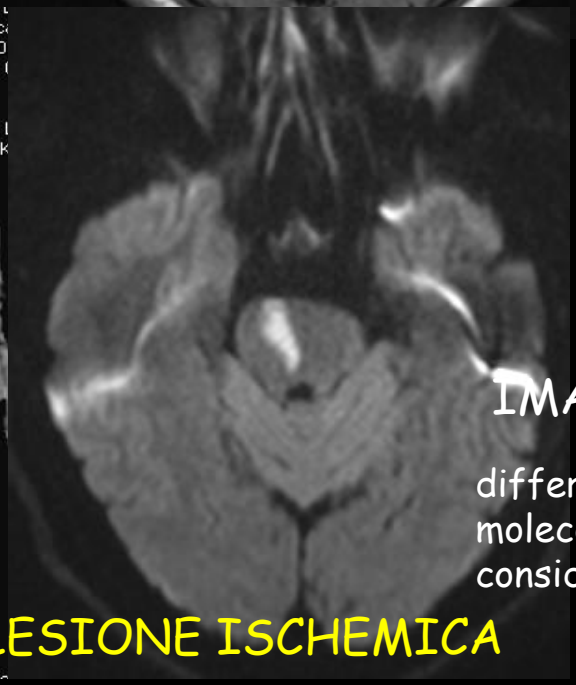










IMAGING IN DIFFUSIONE

differente diffusività (**traslazione**) delle molecole di acqua nelle strutture biologiche considerate

LESIONE ISCHEMICA

IL FOLLOW-UP DOPO GAMMA KNIFE

Arleen M. Peterson, MD
Carolyn Cidis Meltzer, MD
E. Jane Evanson, FRCR
John C. Flickinger, MD
Douglas Kondziolka, MD

Index terms:
Brain, MR, 13.121411, 13.12143
Brain neoplasms, secondary, 13.381, 13.3810, 13.3816, 13.38181, 13.382, 13.3820, 13.3826, 13.38281
Stereotaxis, 13.1267

Radiology 1999; 211:807–814

[1] From the Departments of Radiology, Division of Neuroradiology (A.M.P., C.C.M., E.J.E.), Psychiatry (C.C.M.), Radiation Oncology (J.C.F., D.K.), and Neurological Surgery (J.C.F., D.K.), University of Pittsburgh Medical Center, Rm PUH D-132, 200 Lothrop St, Pittsburgh, PA 15213-2582. Received March 20, 1998; revision requested June 17; revision received August 7; accepted November 5. **Address reprint requests to** A.M.P.

MR Imaging Response of Brain Metastases after Gamma Knife Stereotactic Radiosurgery[1]

PURPOSE: To characterize the magnetic resonance (MR) imaging response of brain metastases after gamma knife stereotactic radiosurgery and determine whether imaging features and tumor response rates correlate with local tumor control and survival.

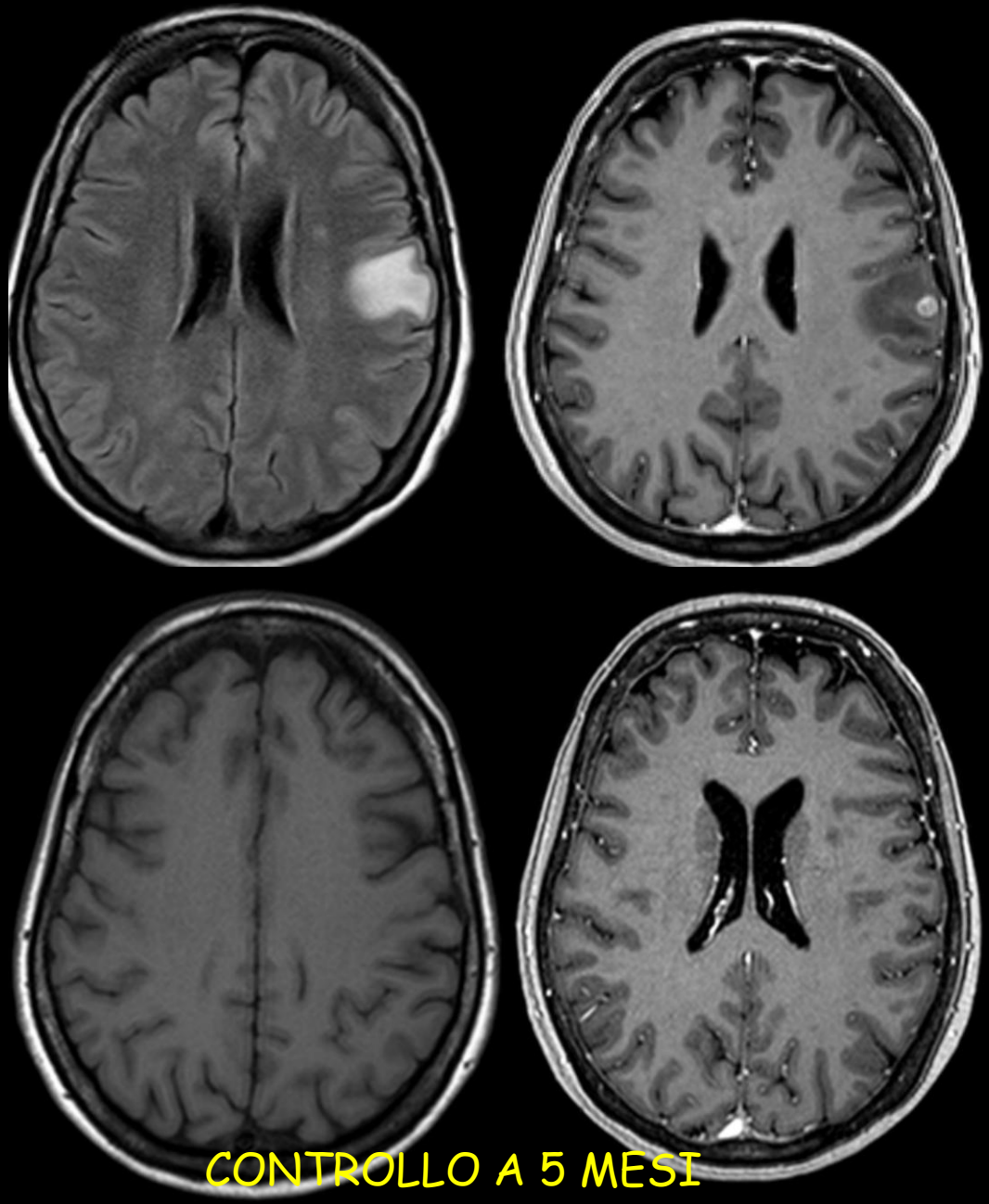
MATERIALS AND METHODS: Serial MR examinations were performed in 48 patients (25 men, 23 women; mean age, 58 years) with 78 lesions. Pretreatment and follow-up enhancing lesion volumes and imaging features were assessed. Rates of response to stereotactic radiosurgery were calculated. Prognostic imaging features affecting local control and survival were analyzed.

RESULTS: Local tumor control was achieved in 66 (90%) of 73 metastases at 20 weeks after stereotactic radiosurgery; 61% maintained local control at 2 years. A homogeneous baseline enhancement pattern and initial good response rate (>50% lesion volume reduction) predicted local control. Five metastases demonstrated a transient volume increase after treatment. The median survival time after stereotactic radiosurgery was 53 weeks and correlated with systemic disease burden and primary tumor type.

CONCLUSION: Baseline homogeneous tumor enhancement and initial good response correlate with local control. Initial lesion growth does not preclude local control and may represent radiation-related change. Recognition of these serial MR imaging findings may guide image interpretation and influence treatment in patients with stereotactic radiosurgery–treated metastases.

Stereotactic radiosurgery is a noninvasive procedure for the treatment of brain metastases and an alternative to surgical resection (1). Lars Leksell, MD, is credited with the concept, terminology, and initial development of the technology (2). With computed tomography (CT) or magnetic resonance (MR) guided stereotactic localization of an intracranial lesion, in stereotactic radiosurgery, a Gamma Knife (Elekta Instruments, Atlanta, Ga) is used to deliver a single high dose of cobalt 60 gamma radiation to a radiographically discrete target (3). Radiosurgery can also be performed with a modified linear accelerator or cyclotron. With stereotactic radiosurgery, there is a steep dose gradient at the target periphery, which markedly reduces the dose of radiation to the surrounding normal brain tissue (4). Unlike complete surgical resection, which eliminates the tumor at the time of the operation,

IL FOLLOW-UP DOPO GAMMA KNIFE



CONTROLLO A 5 MESI

L'IMAGING SOFISTICATO

RadioGraphics

RADIATION ONCOLOGY

Radiation Necrosis in th Brain: Imaging Feature and Differentiation fro Tumor Recurrence[1]

Ritu Shah, MD • Surjith Vattoth, MD, DNB, FRCR • Rojymon Jacob, DNB, FRCR • Fathima Fijula Palot Manzil, MBBS, DMRT • Janis O'Malley, MD • Peyman Borghei, MD • Bhavik N. Patel, MD • Joel Curé, MD

ONLINE-ONLY CME

See www.rsna.org/education/rg_cme.html

LEARNING OBJECTIVES

After completing this journal-based CME activity, participants will be able to:

- Identify and evaluate three distinct clinical scenarios that produce radiation necrosis in the brain.
- Discuss the basic concepts of tumor volume estimation and radiation treatment planning.
- Recognize the imaging features of brain radiation necrosis.

TEACHING POINTS

See last page

Radiation necrosis in the brain commonly occurs in three distinct clinical scenarios, namely, radiation therapy for head and neck malignancy or intracranial extraaxial tumor, stereotactic radiation therapy (including radiosurgery) for brain metastasis, and radiation therapy for primary brain tumors. Knowledge of the radiation treatment plan, amount of brain tissue included in the radiation por type of radiation, location of the primary malignancy, and amount of time elapsed since radiation therapy is extremely important in determining whether the imaging abnormality represents radiation necrosis or recurrent tumor. Conventional magnetic resonance (MR imaging findings of these two entities overlap considerably, and ever at histopathologic analysis, tumor mixed with radiation necrosis is a common finding. Advanced imaging modalities such as diffusion tensor imaging and perfusion MR imaging (with calculation of certa specific parameters such as apparent diffusion coefficient ratios, rela peak height, and percentage of signal recovery), MR spectroscopy, and positron emission tomography can be useful in differentiating between recurrent tumor and radiation necrosis. In everyday practic the visual assessment of diffusion-weighted and perfusion images m also be helpful by favoring one diagnosis over the other, with restric diffusion and an elevated relative cerebral blood volume being seen much more frequently in recurrent tumor than in radiation necrosis

Neuroradiology

High-Grade Gliomas and Solitary Metastases: Differentiation by Using Perfusion and Proton Spectroscopic MR Imaging[1]

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Index terms:
Brain neoplasms, diagnosis, 13.363, 13.3634, 13.38
Brain neoplasms, MR, 13.121412, 13.121415, 13.121416, 13.12143, 13.12144, 13.12145
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Magnetic resonance (MR), spectroscopy, 13.12144, 13.12145
Magnetic resonance (MR), perfusion study, 13.12144, 13.12145

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Abbreviations:
Cho/Cr = choline-to-creatine ratio
NAA/Cr = N-acetylaspartate–to-creatine ratio
rCBV = relative cerebral blood volume

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Author contributions:
Guarantors of integrity of entire study, E.A.K., A.W.L.; study concepts and design, M.L., S.C.; literature research, M.L., J.A.; clinical studies, E.A.K.; data acquisition, M.L., J.A.; data analysis/interpretation, M.L., S.C., J.A.; statistical analysis, M.L., G.J.; manuscript preparation, M.L., S.C.; manuscript definition of intellectual content, M.L., A.L.; manuscript editing, M.L., E.A.K.; manuscript revision/review, E.A.K., S.C., G.J.; manuscript final version approval, E.A.K., G.J., A.L.

PURPOSE: To determine whether perfusion-weighted and proton spectroscopic MR imaging can be used to differentiate high-grade primary gliomas and solitary metastases on the basis of differences in vascularity and metabolite levels in the peritumoral region.

MATERIALS AND METHODS: Fifty-one patients with a solitary brain tumor (33 gliomas, 18 metastases) underwent conventional, contrast material–enhanced perfusion-weighted, and proton spectroscopic MR imaging before surgical resection or stereotactic biopsy. Of the 33 patients with gliomas, 22 underwent perfusion-weighted MR imaging; nine, spectroscopic MR imaging; and two underwent both. Of the 18 patients with metastases, 12 underwent perfusion-weighted MR imaging, and six, spectroscopic MR imaging. The peritumoral region was defined as the area in the white matter immediately adjacent to the enhancing (hyperintense on T2-weighted images, but not enhancing on postcontrast T1-weighted images) portion of the tumor. Relative cerebral blood volumes in these regions were calculated from perfusion-weighted MR data. Spectra from the enhancing tumor, the peritumoral region, and normal brain were obtained from the two-dimensional spectroscopic MR acquisition. The Student *t* test was used to determine if there was a statistically significant difference in relative cerebral blood volume and metabolic ratios between high-grade gliomas and metastases.

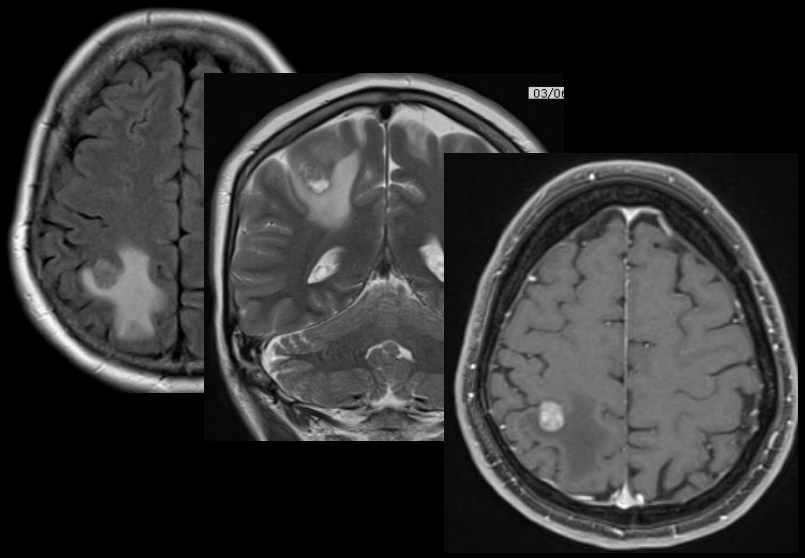
RESULTS: The measured relative cerebral blood volumes in the peritumoral region in high-grade gliomas and metastases were 1.31 ± 0.97 (mean ± SD) and 0.39 ± 0.19, respectively. The difference was statistically significant ($P < .001$). Spectroscopic imaging demonstrated elevated choline levels (choline-to-creatine ratio was 2.28 ± 1.24) in the peritumoral region of gliomas but not in metastases (choline-to-creatine ratio was 0.76 ± 0.23). The difference was statistically significant ($P = .001$).

CONCLUSION: Although conventional MR imaging characteristics of solitary metastases and primary high-grade gliomas may sometimes be similar, perfusion-weighted and spectroscopic MR imaging enable distinction between the two.

Intracranial metastases and primary high-grade gliomas are two common brain tumors encountered in adults. The management of these two tumors is different and can potentially affect the clinical outcome. In many cases, the two entities can be differentiated by using conventional magnetic resonance (MR) imaging and clinical history. In some instances, particularly when the lesion is solitary and clinical findings are noncontributory, conventional MR imaging alone cannot be used to differentiate the two.

Investigators in several studies (1–5) have used single-voxel MR spectroscopy and multivoxel metabolic mapping techniques in an attempt to differentiate the two entities.

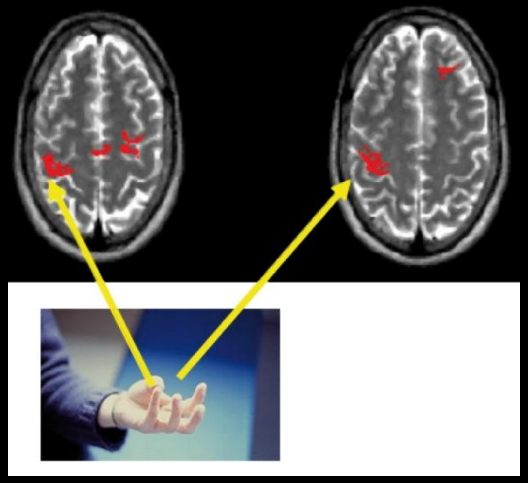
L’IMAGING SOFISTICATO



Imaging morfologico

TSE T1, T2, IR, FLAIR

Gd-DTPA



Imaging ultrastrutturale

- DWI (Diffusione)
- DTI (Tensore)
- PWI (Perfusione)
- MRS (Spettroscopia)

SPETTROSCOPIA RMN

- Non invasiva
- Non morfologia ma metabolismo
- Metodica fondamentale per:

- analisi dell'interazione molecolare

- identificazione dei composti chimici

Metaboliti in Esame
N-Acetilaspartarto:marker di integrità neuronale
Colina:marker di proliferazione cellulare
Creatina:marker di metabolismo energetico
Lattati:marker di ipossia tissutale
Lipidi:marker di necrosi tissutale

SPETTROSCOPIA RMN

"Spettro"

rappresentazione del segnale RM in funzione della frequenza di risonanza

"Picchi"

rappresentazione grafica del segnale emesso dai vari metaboliti

Unità di misura

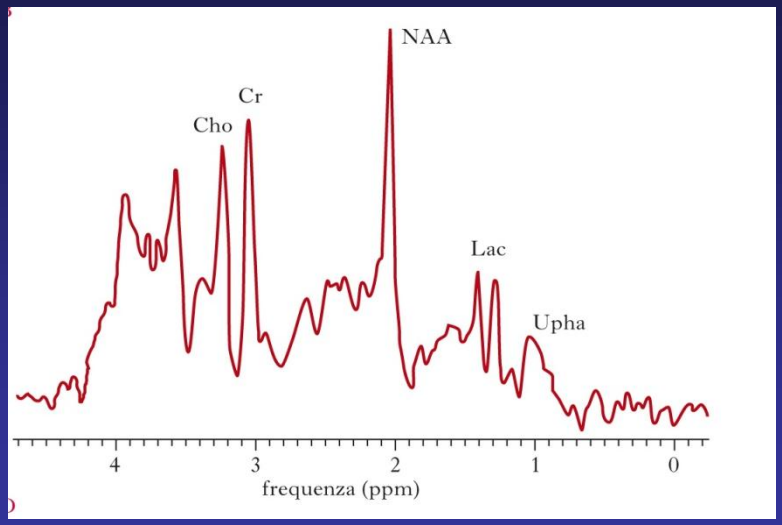
PPM (Parti Per Milione) per potere confrontare spettri a c. magnetico diverso

Posizione

Struttura chimica

Intensità (area)

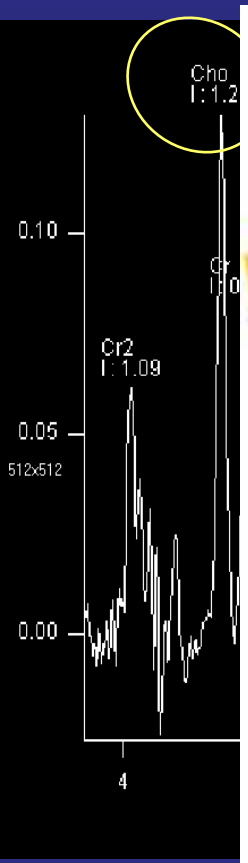
Concentrazione

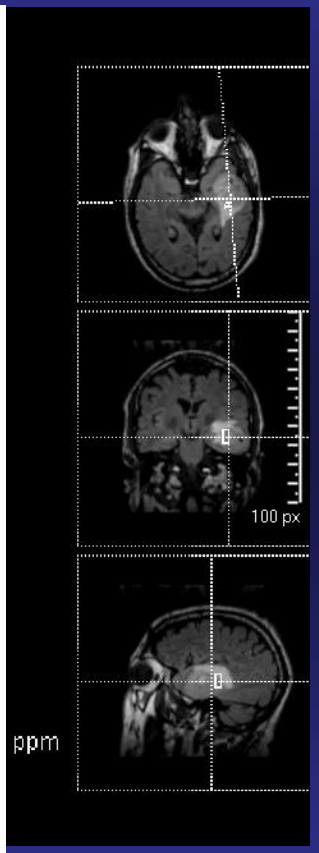


SPETTROSCOPIA RMN

Tournover cellulare di membrana

Marker di integrità neuronale





GLIOMA

Courtesy of dr F.Alessandrini

GRAZIE PER L'ATTENZIONE

Ospedale
Sacro Cuore Don Calabria

Dr L.Romano