FEBRİL NÖTROPENİK HASTADA RADYOLOJİK TANI

NÖRORADYOLOJİ

Dr. S. Efsun Şenocak

HACETTEPE ÜNİVERSİTESİ TIP FAKÜLTESİ
RADYOLOJİ ANABİLİM DALI

OLGU 1

7 yaş/K

- Daha önce bir şikayeti yokken 1 ay önce boğaz ağrısı ve ateş
- Huzursuzluk, sinirlilik, yememe, karakter değişikliği, öksürük
- 2 gün önce sağ alt ekstremite ve sol üst ekstremitede güç ve his kaybı
- Annesini tanımamaya, konuşmakta zorlanma

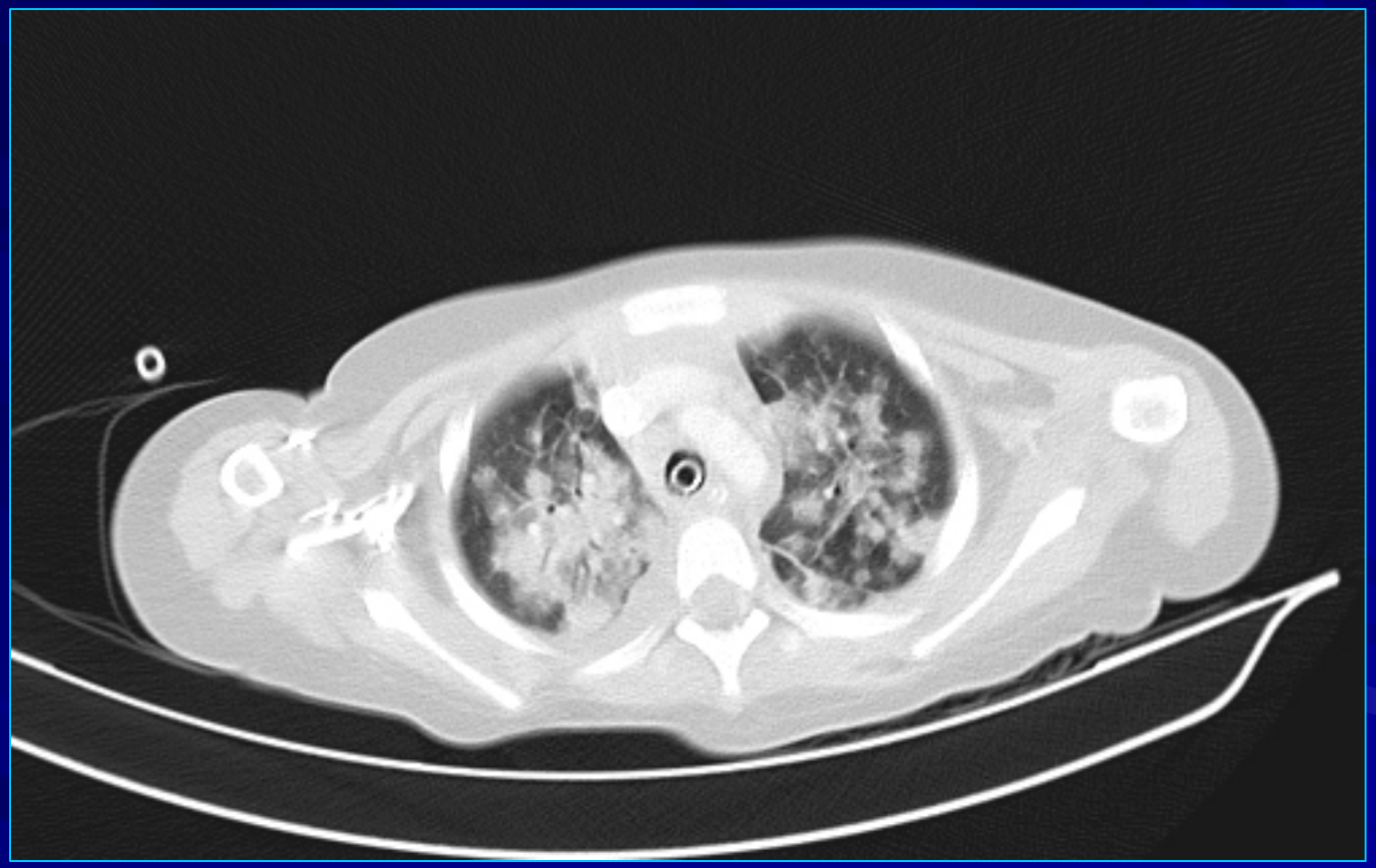
OLGU 1

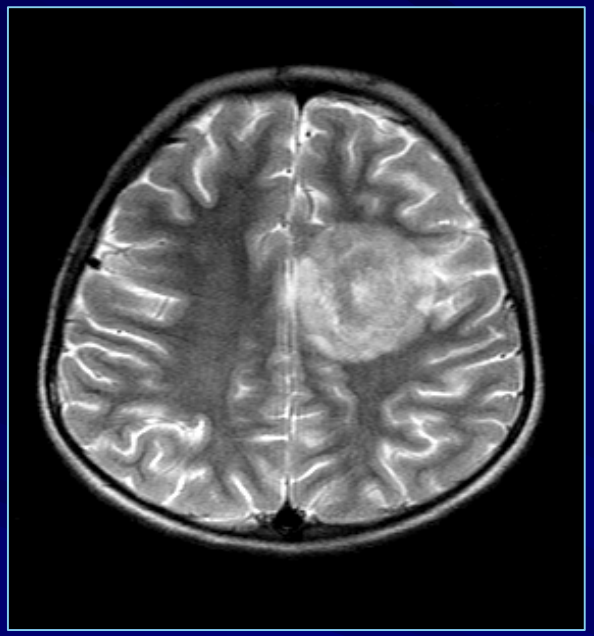
- Solunum sıkıntısı(+)
- Bilinçte kapanma
- Tüm bu süreçte hasta kullanmış olduğu ilaçlardan fayda görmemiş

OLGU 1

- CRP: 7.8 mg/dl
- Eritrosit sedimentasyon hızı (ESR): 120
- Nötropeni

OLGU 1





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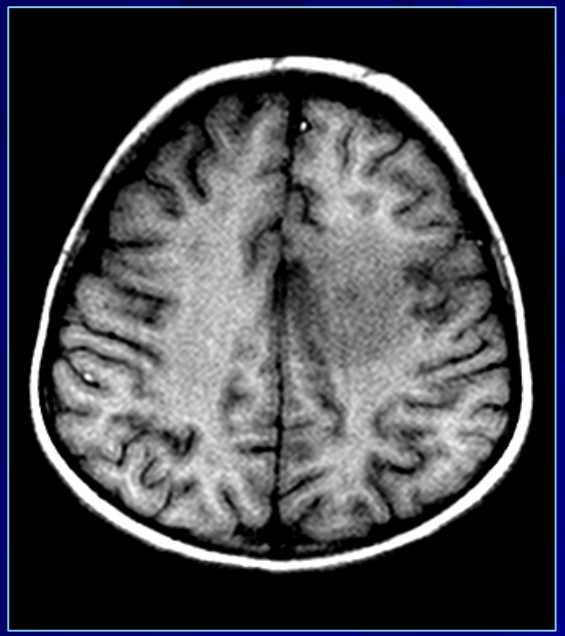

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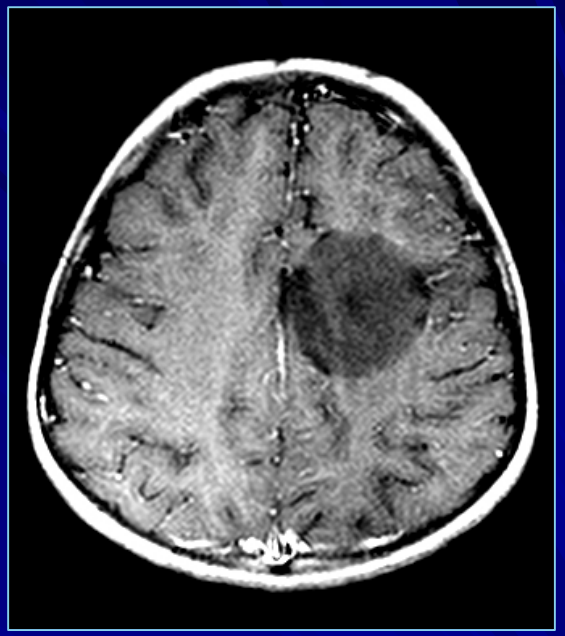

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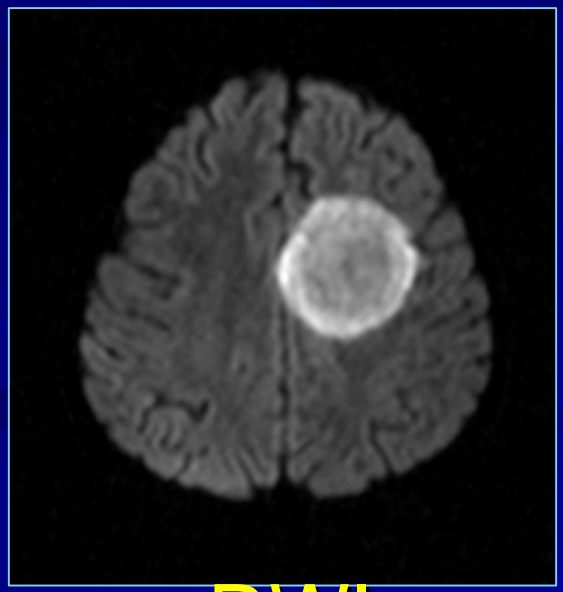

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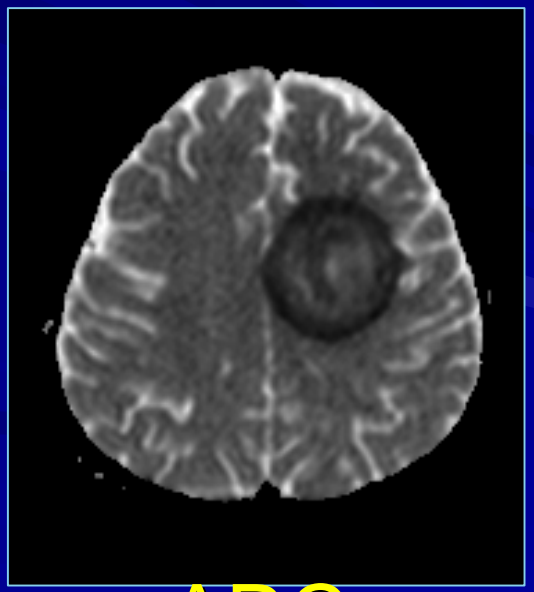


ADC

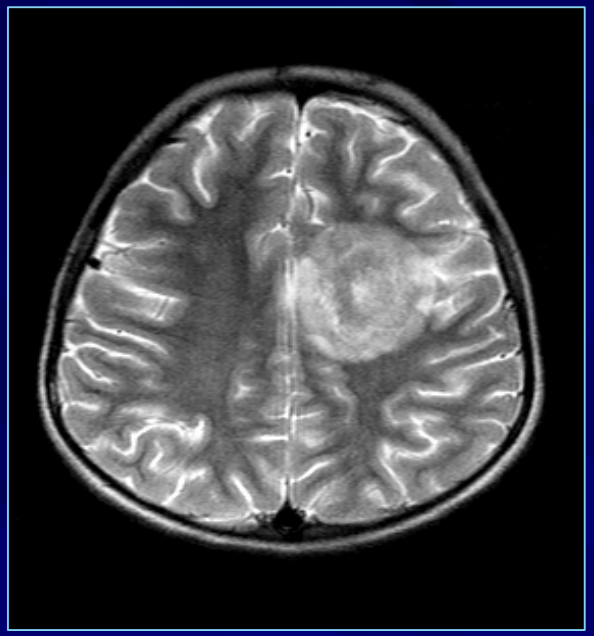
- Tanınız?

A) Beyinde demyelinizan lezyon
B) Akciğer ve beyinde miliyer tbc
C) Akciğer ve beyinde metastaz
D) Akciğer ve beyinde mantar enfeksiyonu

OLGU 1

D) Akciğer ve beyinde mantar enfeksiyonu

- Nötropenik ateş ve akciğer bulgularının olması nedeniyle sepsis ve multiorgan yetmezliği ekarte edilemeyeceğinden ve akciğer grafisi mantarla uyumlu olabileceğinden meropenem, amikasin, teikoplanin, bactrim, klacid, amfoterisin B başlandı (Epikriz) (ex.)



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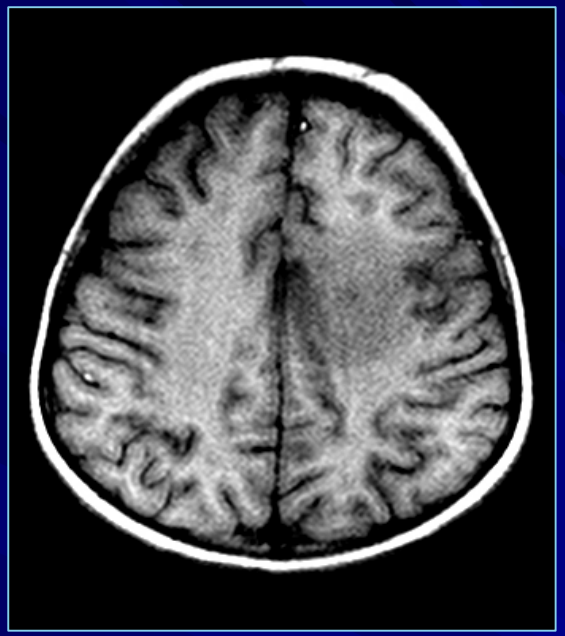

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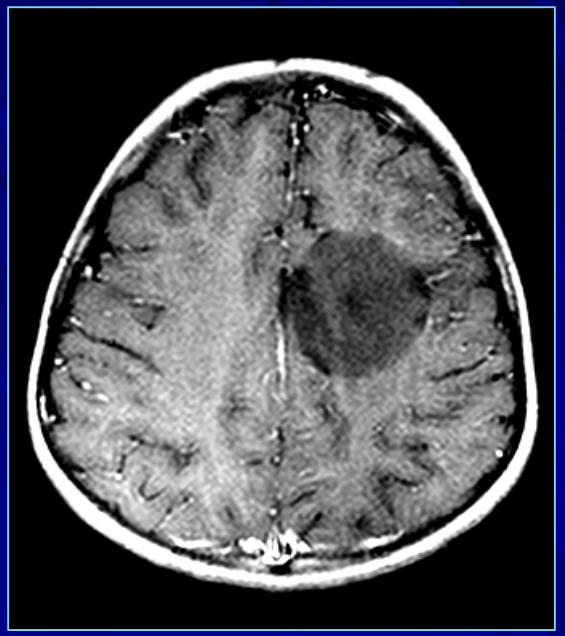

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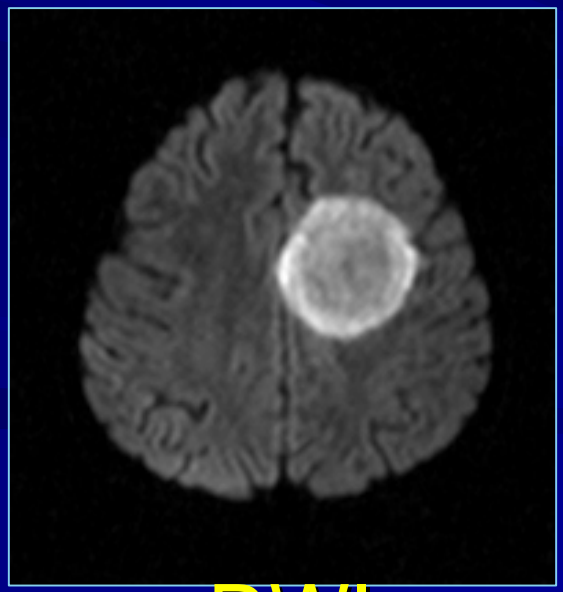

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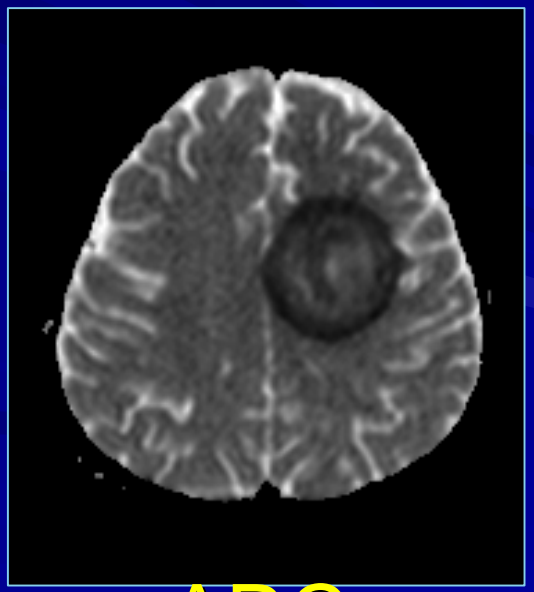

ADC

Fungal Brain Abscesses in Leukemia

Fani Athanassiadou
Athanassios Tragiannidis
Theodotis Papageorgiou
Aristea Velegraki*

Invasive fungal infections remain a life threatening complication in children with hematological malignancies. The brain represents a common site of hematogenously disseminated infections from an extracranial focus. We report our experience in the diagnosis, radiological aspects and therapeutic approach of fungal brain abscesses in 2 children receiving chemotherapy for acute lymphoblastic leukemia (ALL).

Key words: *Acute lymphoblastic leukemia, Aspergillus, Brain abscess, Cryptococcus.*

Invasive fungal infections are common in immunocompromised children receiving cytotoxic chemotherapy for hematological malignancies. Invasive central nervous system (CNS) aspergillosis is rare and accounts for about 10% of all cases of invasive aspergillosis(1,2). Cryptococcal CNS infection is uncommon and mainly associated with manifestations of meningitis and encephalitis(3-5). Significant morbidity and mortality are associated with Aspergillus and Cryptococcus CNS infections, and only occasional case reports note survival.

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Case Report

Case 1

A two-year-old boy was referred to our department for fever and pancytopenia. Clinical and laboratory examination revealed evidence of B-ALL and the boy received induction chemotherapy with ALL BFM 95 protocol. One month after initiation of cytotoxic chemotherapy he presented with a febrile neutropenia episode and developed symptoms of upper airway obstruction accompanied by cough. Bronchoalveolar lavage (BAL) culture was positive for Aspergillus fumigatus. PCR confirmed detection of Aspergillus DNA in blood and sputum. Treatment was started with liposomal amphotericin (LAmB) (3 mg/kg/day i.v.). Two weeks after initiation of antifungal treatment the patient had sudden onset of CNS symptoms with headache. Magnetic resonance imaging (MRI) of the brain with contrast revealed the presence of a single lesion in the right parietal lobe showing ring enhancement indicative of abscess (*Fig.1*). He was immediately treated with high doses of LAmB (10 mg/kg/day i.v.) and voriconazole (VRC) (8 mg/kg/day i.v.). MRI scan performed 6 weeks later showed a nearly total regression of the abscess. At 8 months evaluation, the patient was asymptomatic, CT and MRI scans of chest and brain were normal and antifungal treatment was discontinued. The patient has completed consolidation chemotherapy treatment and is in a good clinical condition.

Case 2

A 5-year-old boy was admitted to our department with fever, anemia and cervical

- İnvaziv funfal enfeksiyonlar hematolojik maligniteler nedeniyle sitotoksik kemoterapi alan immünyetmezlikli çocuklarda sıktır.
- İnvaziv SSS aspergillozu invaziv aspergilloz vakalarının %10'unu oluşturur.
- Belirgin mortalite ve morbidite sebebidir ve sağkalım nadirdir.
- Prognoz kötüdür, sebep olan organizmanın erken tanınması ve acil antifungal tedavinin başlanmasına bağlıdır.

Fungal brain abscesses in leukemia.

Athanassiadou F, Tragiannidis A, Papageorgiou T, Velegraki A.

Indian Pediatr. 2006 Nov;43(11):991-4.

Vorikonazol ile tedavi edilen dirençli pulmoner ve serebral aspergilloz olgusu

Eyüp Sabri UÇAN[1], Vildan AVKAN OĞUZ[2], Özkan GÜNGÖR[3], Aşkın GÜLŞEN[1], Nurbanu UĞURAL SEZAK[2], Kemal Can TERTEMİZ[1], Emel CEYLAN[1], Aydanur KARGI[4], Pınar BALCI[5], Emel ADA[5], Aydın ŞANLI[6]

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ÖZET

İnvazif pulmoner aspergillozis (İPA) immünsüpresif olgularda fungal akciğer infeksiyonlarının en sık nedenidir. Bu hastalıkta tanı güç, tedavi süresi değişken ve mortalite yüksektir. Serebral tutulumun eşlik ettiği olgularda prognoz daha da kötüdür. Usual interstisyel pnömoni nedeniyle takip edilen kortikosteroid ve azatioprin tedavisi alan hasta baş ağrısı ve ani görme kaybı nedeniyle başvurdu ve yapılan tetkikler sonrasında İPA ve serebral aspergillozis tanısı aldı. Olguya serebral ve pulmoner tutulum nedeniyle amfoterisin B lipid kompleks tedavisi verildi. Yanıt alınamaması üzerine hastaya vorikonazol tedavisi başlandı. İntraserebral etkinliği daha iyi olduğu bilinen vorikonazol ile başarılı bir şekilde tedavi edilen olguyu sunmayı uygun bulduk.

Anahtar Kelimeler: Vorikonazol, serebral aspergillozis, immünsüpresyon.

SUMMARY

A case of resistant pulmonary and cerebral aspergillosis succesfully treated with voriconazole

Eyüp Sabri UÇAN[1], Vildan AVKAN OĞUZ[2], Özkan GÜNGÖR[3], Aşkın GÜLŞEN[1], Nurbanu UĞURAL SEZAK[2], Kemal Can TERTEMİZ[1], Emel CEYLAN[1], Aydanur KARGI[4], Pınar BALCI[5], Emel ADA[5], Aydın ŞANLI[6]

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[2] Department of Infectious Disease and Clinical Microbiology, Faculty of Medicine, Dokuz Eylul University, Izmir, Turkey,
[3] Department of Internal Medicine, Faculty of Medicine, Dokuz Eylul University, Izmir, Turkey.

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- İPA'da hematolojik yolla yayılım sonrasında serebral tutulum görülebilir ve prognozun daha kötüleşmesine neden olmaktadır.
- Santral sinir sistemi (SSS) tutulumu sonrasında tedavi güçleşmekte ve mortalite oranları artmaktadır.
- Kontrol altına alınamayan ateş yüksekliği, baş ağrısı, kusma ve nörolojik defisit gelişimi halinde serebral tutulum akılda tutulmalıdır.

Case of Resistant Pulmonary and Cerebral Aspergillosis Succesfully Treated with Voriconazole

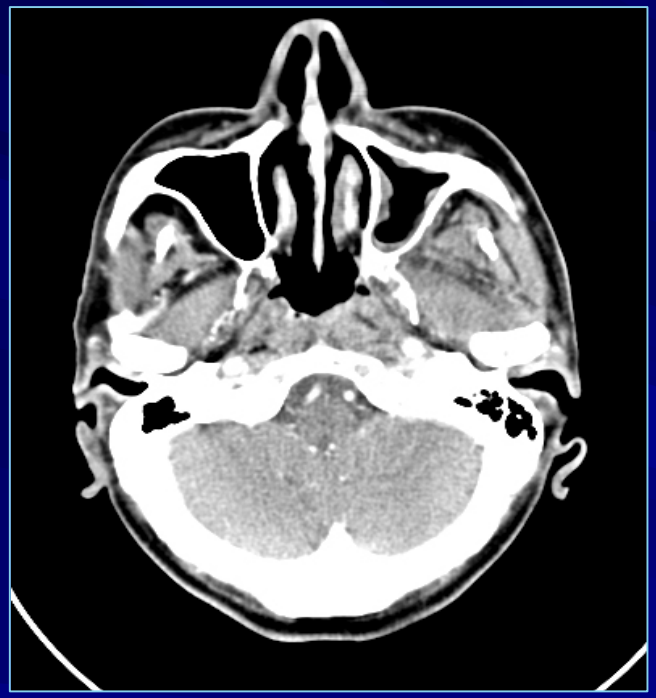
UÇAN ES, OĞUZ VA, GÜNGÖR Ö ve ark.

1Tüberküloz ve Toraks Dergisi 2006; 54(1): 75-79.

OLGU 2

- 66 yaş/E
- 3 senedir Miyelodisplastik Sendrom ve DM
- Yüzün sol tarafında uyuşma

İLK GÜN



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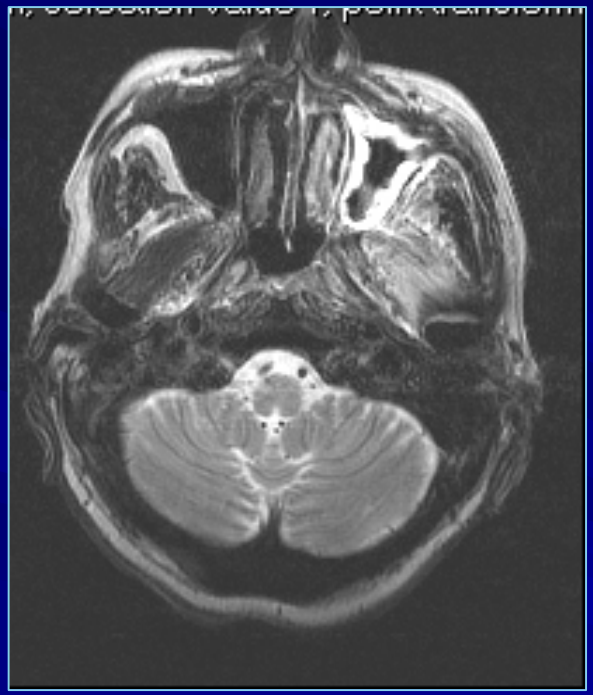

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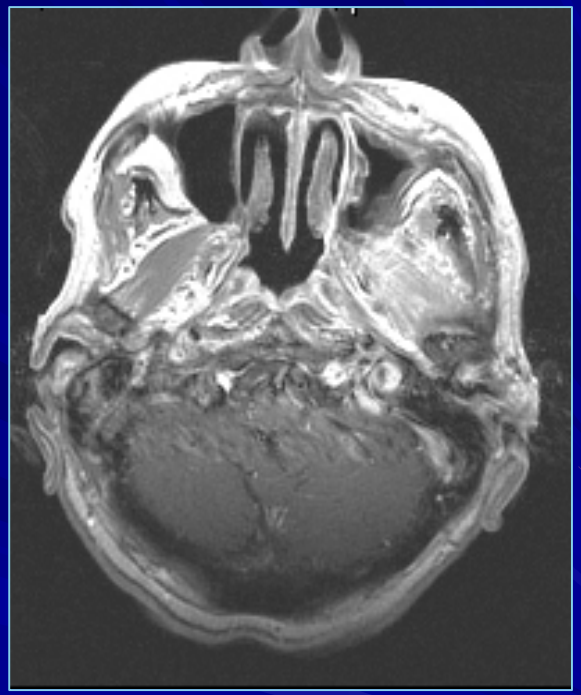
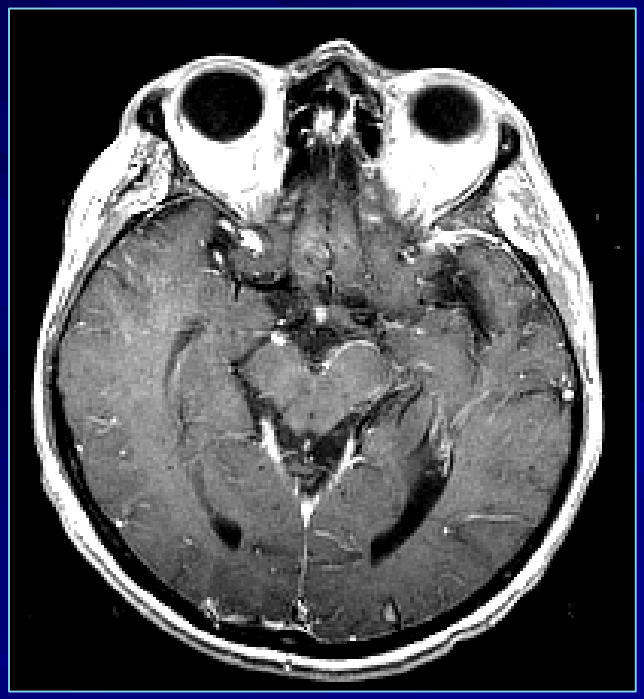


T1 + C

3. GÜN



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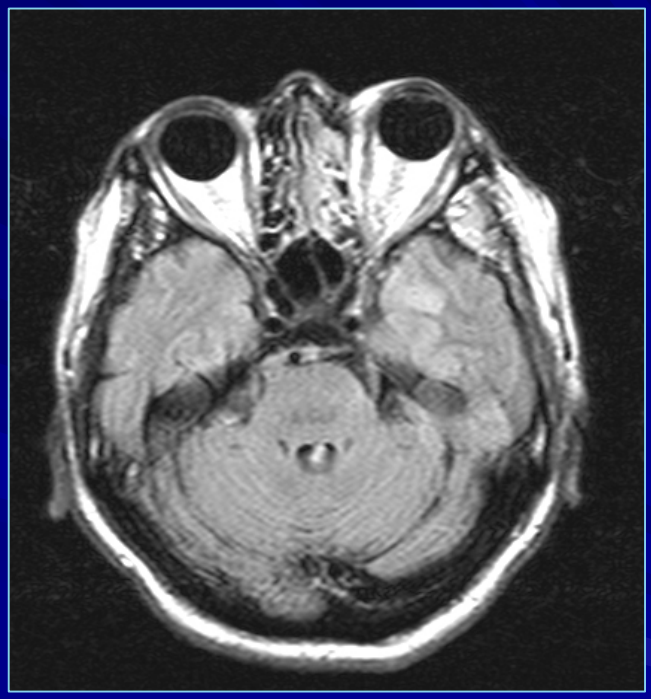
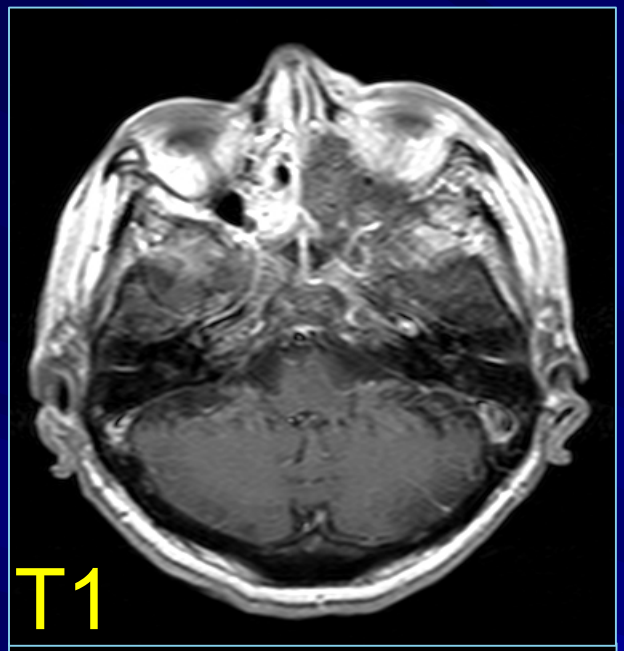
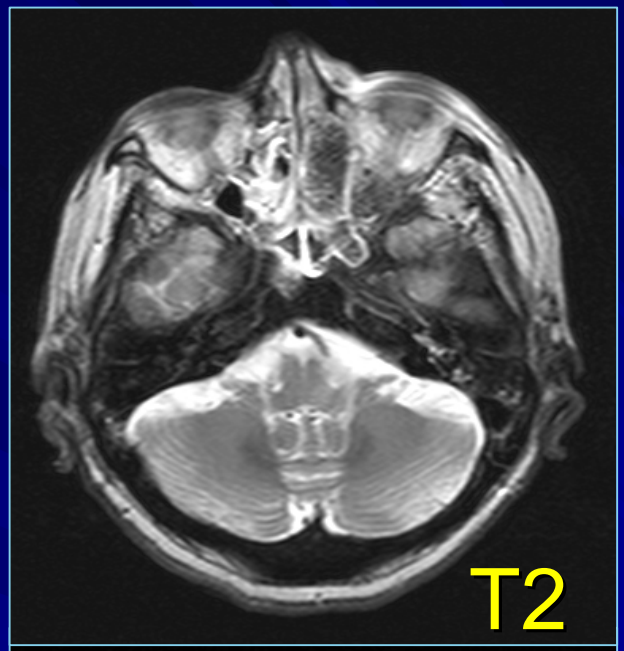
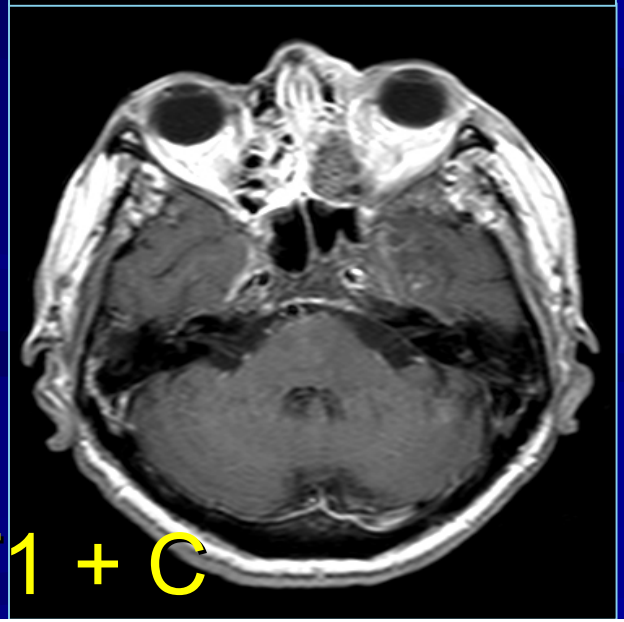


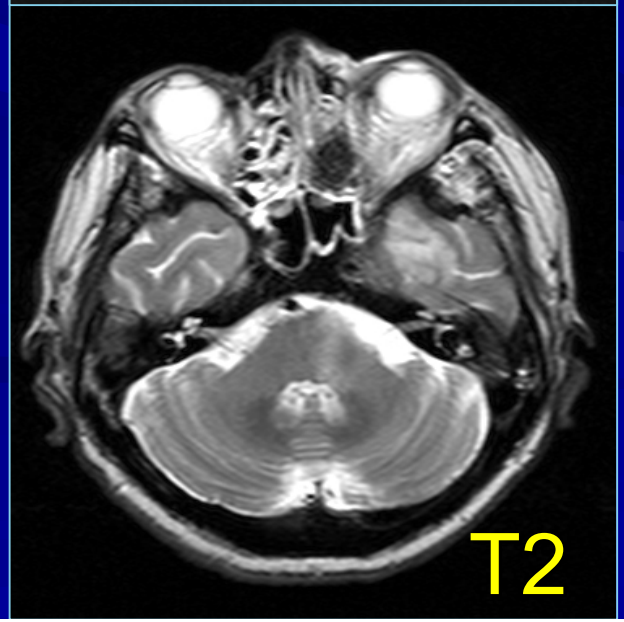
FLAIR

4. GÜN









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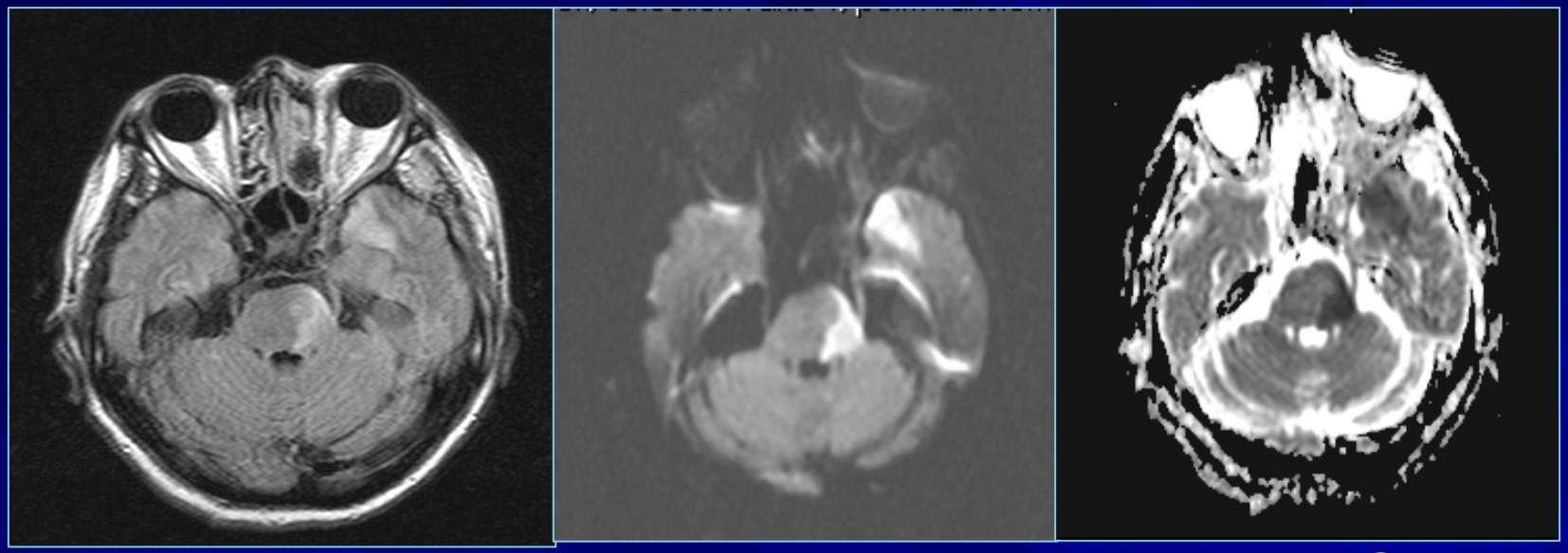
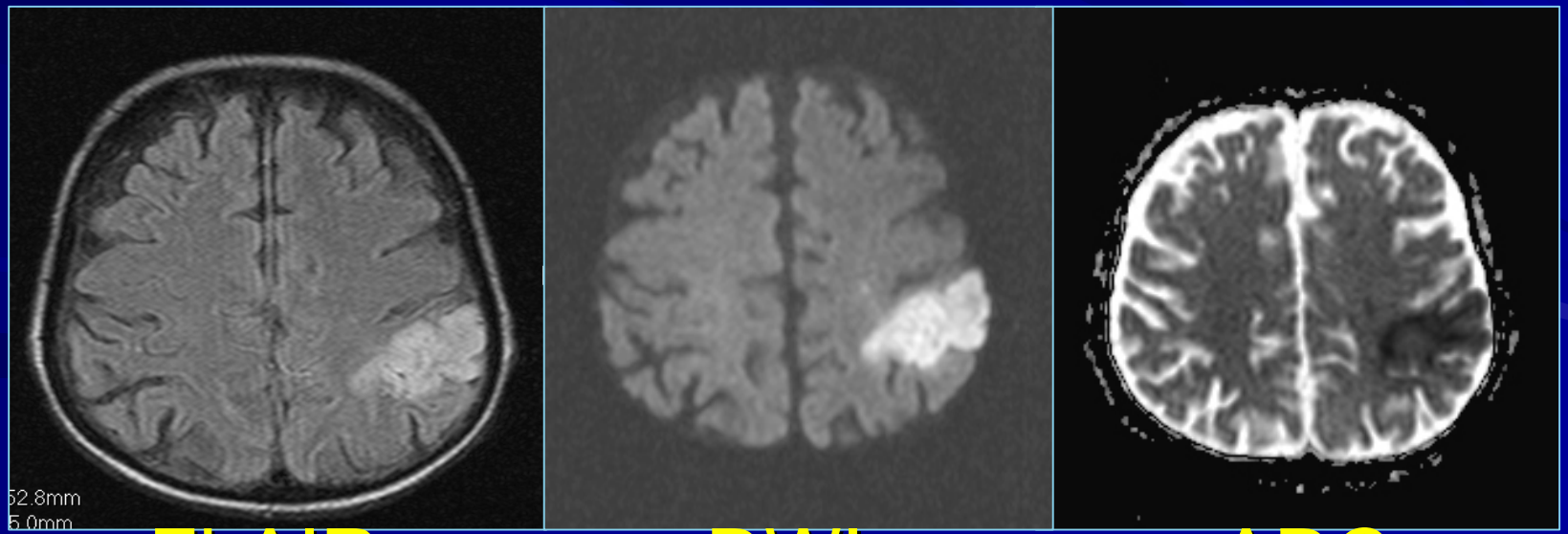


FLAIR DWI ADC



FLAIR DWI ADC

OLGU 2

Maksiller sinuse caldwell-luc ameliyatı

- Biyopsi örneği alındı ve debride edildi.

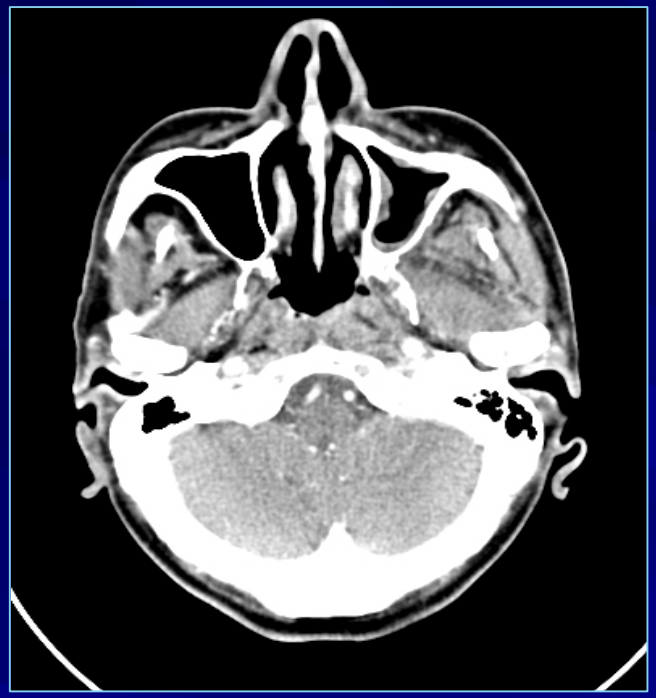
Tanınız?

A) Mantar Enfeksiyonu
B) HSV Enfeksiyonu
C) Anaerop Bakteri Enfeksiyonu

A) Mantar Enfeksiyonu

TANI : Mukormikozis infeksiyonu

İLK GÜN



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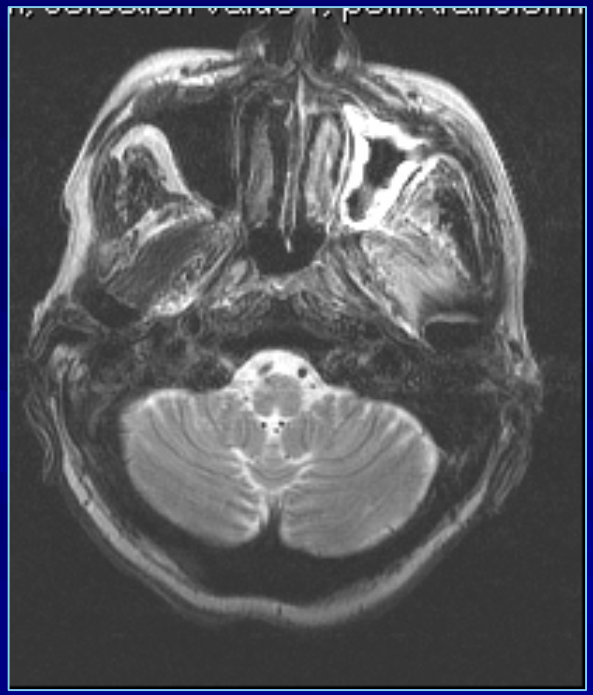

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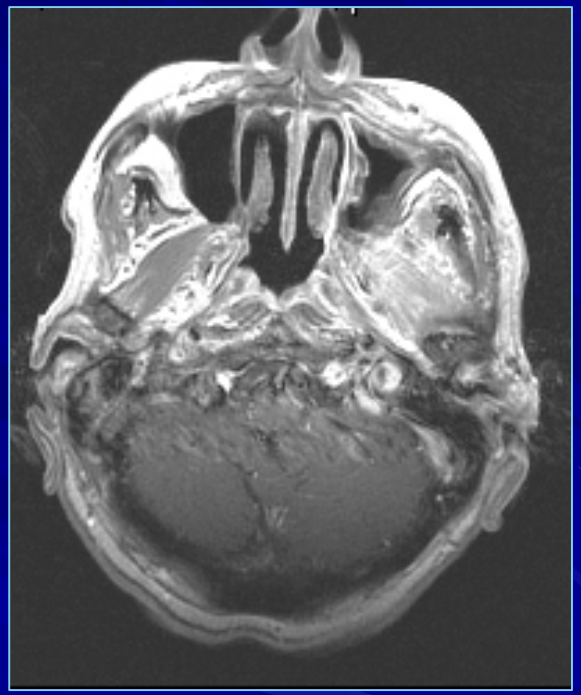
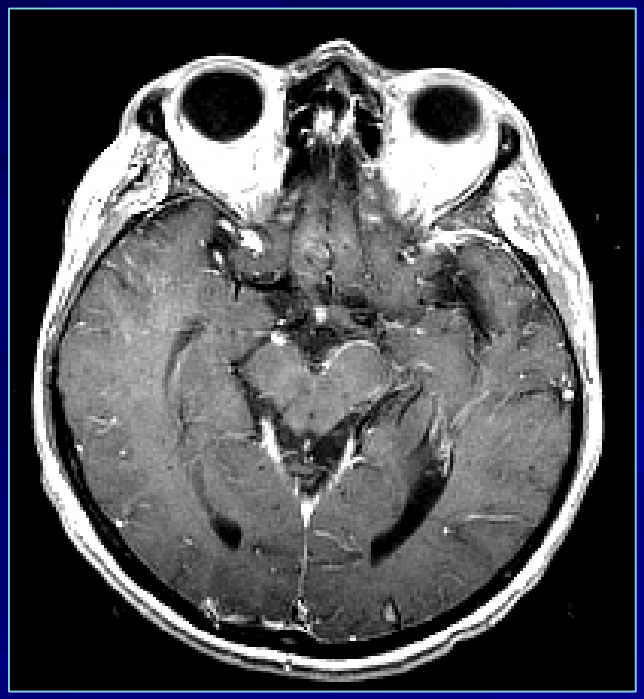


T1 + C

3. GÜN



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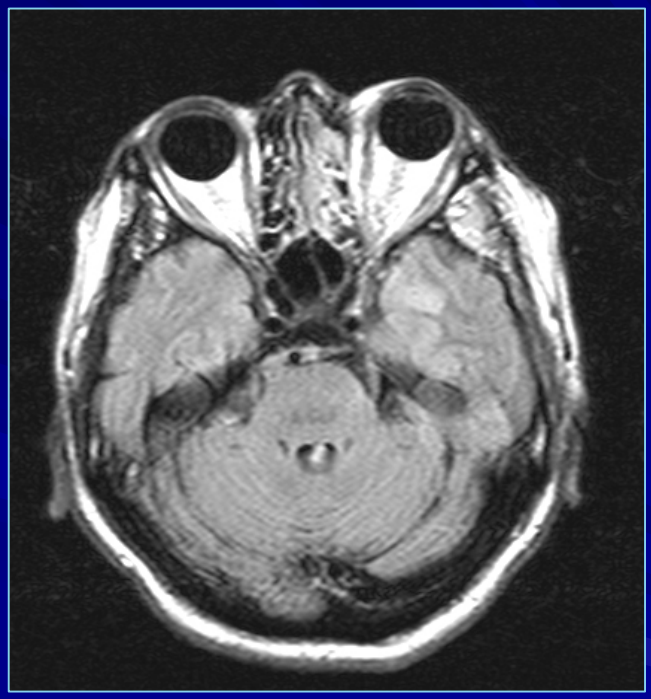

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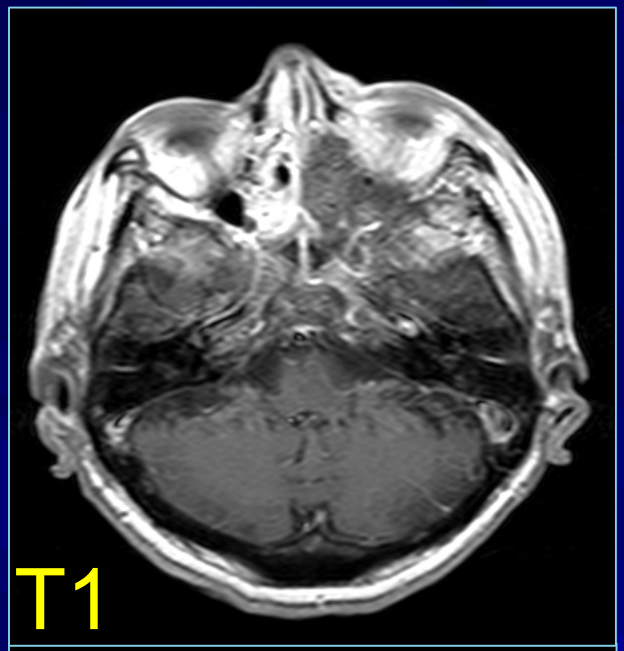

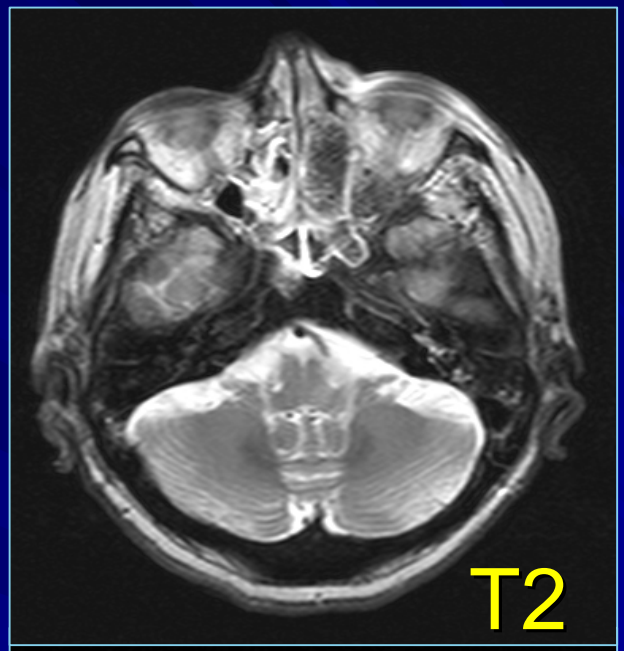

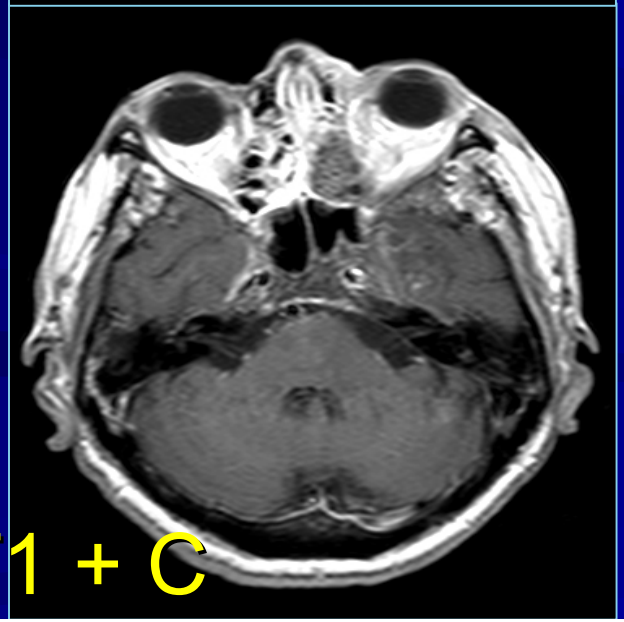

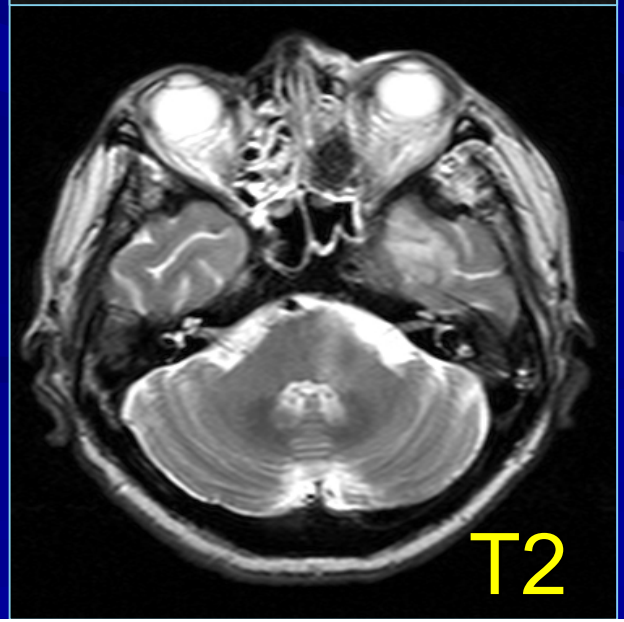

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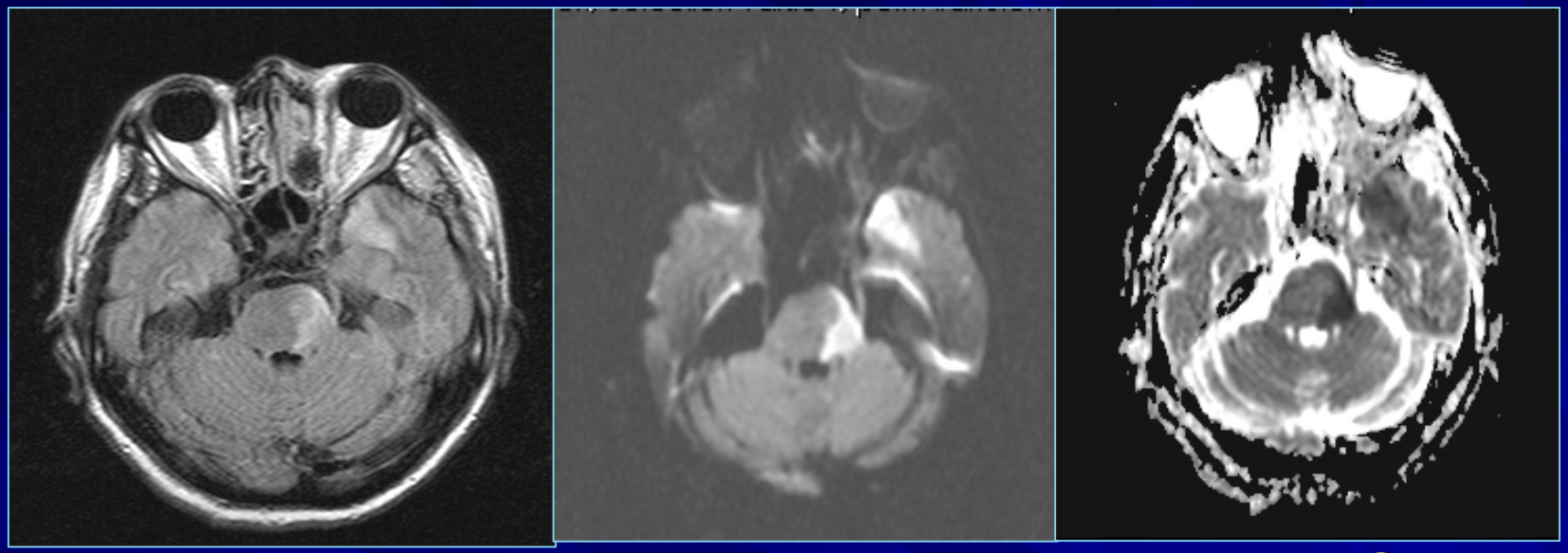
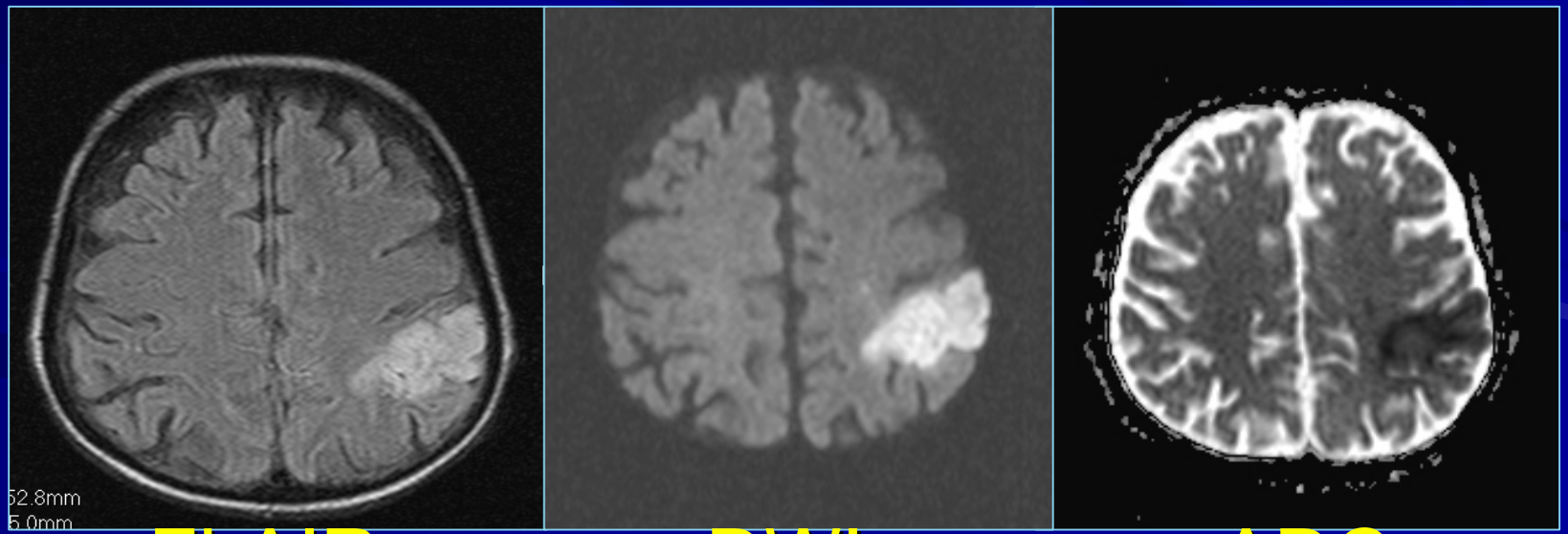


FLAIR DWI ADC



FLAIR DWI ADC

Eur Arch Otorhinolaryngol (2009) 266:71–76
DOI 10.1007/s00405-008-0692-y

RHINOLOGY

Rhino-orbital-cerebral mucormycosis and aspergillosis: differential diagnosis and treatment

Susan Arndt · Antje Aschendorff · Matthias Echternach · Tanja Daniela Daemmrich · Wolfgang Maier

Received: 30 November 2007 / Accepted: 24 April 2008 / Published online: 10 May 2008

Abstract In immunocompromised patients, symptoms and the pathogen spectrum of sinusitis are frequently atypical. If progressive loss of vision occurs, an infection of the anterior skull base or nasal sinuses should be considered. We report on four patients with orbit-associated symptoms. CT-imaging revealed bony defects in sinus borders to orbits or endocranium. In all the cases immediate surgical drainage was performed because complications following sinusitis were suspected. Histopathological diagnosis revealed two cases of aspergillosis and mucormycosis. The possibility of opportunistic infections by saprophytic fungi must be taken into account in immunocompromised patients, as they may endanger both vision and survival. Immediate diagnosis and therapy are essential. Nowadays, therapeutic success can be achieved due to advances in antimicrobial therapy, hyperbaric oxygen therapy and treatment of the underlying disease. Radical procedures like orbital exenteration must be considered in all cases. The current state of diagnostics, therapy and prognosis is discussed based on these case reports and the recent literature.

Keywords Mucormycosis · Aspergillosis · Opportunistic infections · Anterior skull base · Surgery of the paranasal sinuses

Presented at the 7th European Skull Base Society Congress, Fulda, November 2005.

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Introduction

Rhino-cerebral-orbital mucormycosis (zygomycosis) and *Aspergillus* infections are aggressive fungal infections with a high mortality rate [1–3]. These infections have a higher incidence in patients with untreated diabetes, kidney diseases or with hematological malignancies [1, 4–6].

Of the almost 900 species of *Aspergillus*, the one most often found in human diseases is *Aspergillus fumigatus*. Fungal rhinosinusitis is classified into an invasive and a non-invasive form. The non-invasive forms are allergic *Aspergillus* sinusitis and aspergilloma. This infection leads to destruction of the sinus mucosa and bone atrophy. Invasive *Aspergillus* infections can be either limited or fulminant, affecting multiple organs. The limited form starts in the paranasal sinuses and spreads by bony destruction or vessel infiltration into the orbit and/or anterior skull base [3, 7].

Following aspergillosis, mucormycosis is the second most frequent mycosis caused by filamentous fungi.

The family of the *Mucoraceae* is divided into the subspecies absidia, rhizopus and mucor [7]. The most typical clinical manifestations are rhino-cerebral, maxillo-facial and pulmonary mucormycosis. Rhino-cerebral mucormycosis starts in the nose or oral cavity infiltrating the paranasal sinuses, the orbit or the brain over the orbital apex or the cribriform plate. The first symptoms are non-specific with headache, fever or rhinorrhea. Frequently, intranasal black necrotic crusts can be found [1, 6, 8]. At the time of presentation, the symptoms often are advanced and patients already show complications like orbital involvement of the disease with proptosis, ophthalmoplegia or intracerebral spread with meningitis or brain abscess [4]. Three clinical stages for mucormycosis infection have been identified according to Nithyanandam et al. [8]: patients with limited sino-nasal disease (clinical stage I), patients with limited

- İmmünyetmezlikli hastaların genellikle nonspesifik sinüzite bağlı baş ağrısı, rinore, nazal obstrüksiyon ve ateş gibi hafif semptomları olur. Bu sebeple tanı zordur.
- Orbita ve ön kafa tabanı gibi komşu yapıların hızlı infilrasyonu ile giden fulminan proses tipiktir.
- Kemik destrüksiyonu göstermede BT gerekli
- MR erken meningeal ve intraparankimatöz yayılımı ayrıca intrakranial vasküler oklüzyonun gösterir.

Rhino-orbital-cerebral mucormycosis and aspergillosis: differential diagnosis and treatment.

Arndt S, Aschendorff A, Echternach M, Daemmrich TD, Maier W.

Eur Arch Otorhinolaryngol. 2009 Jan;266(1):71-6.

- En sık rinoserebral, maksillofasyal ve pulmonar mukormukoz olarak karşımıza çıkar.

- Hasta başvurduğunda genellikle orbital tutulum, menenjit veya beyin absesi gibi komplikasyonlar oluşmuştur.

Rhino-orbital-cerebral mucormycosis and aspergillosis: differential diagnosis and treatment.

Arndt S, Aschendorff A, Echternach M, Daemmrich TD, Maier W.

Eur Arch Otorhinolaryngol. 2009 Jan;266(1):71-6.

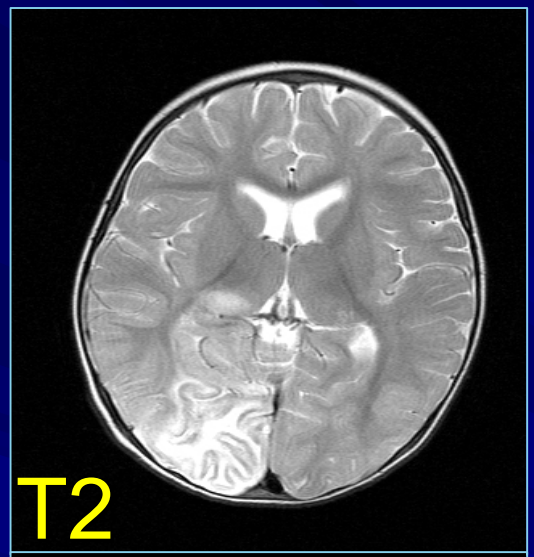
OLGU 3

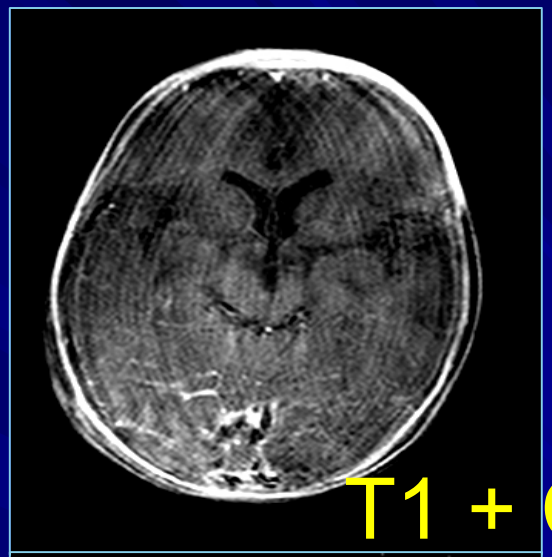
- **2 yaş/E**
- Ateş, kusma
- Sağ bacakta başlayıp sağ kolda da olan sıçrama tarzında daha sonra tüm vücut yayılan kasılmalar

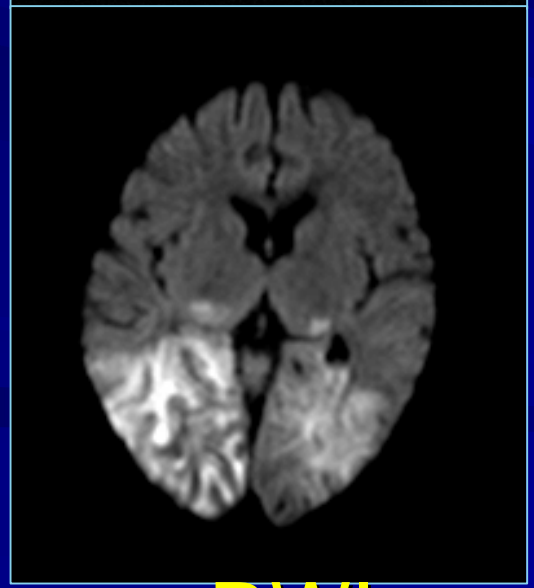
OLGU 3

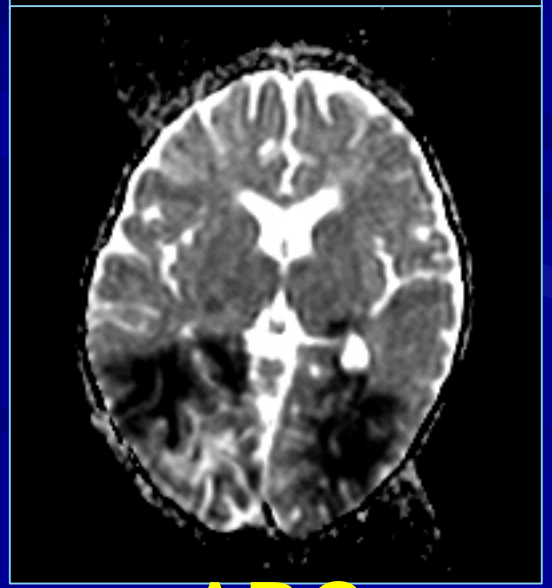
- İki gün önce halsizlik ve iştahsızlık
- Dün başını hiç tutamama, anne ve babayı tanıyamama

OLGU 3

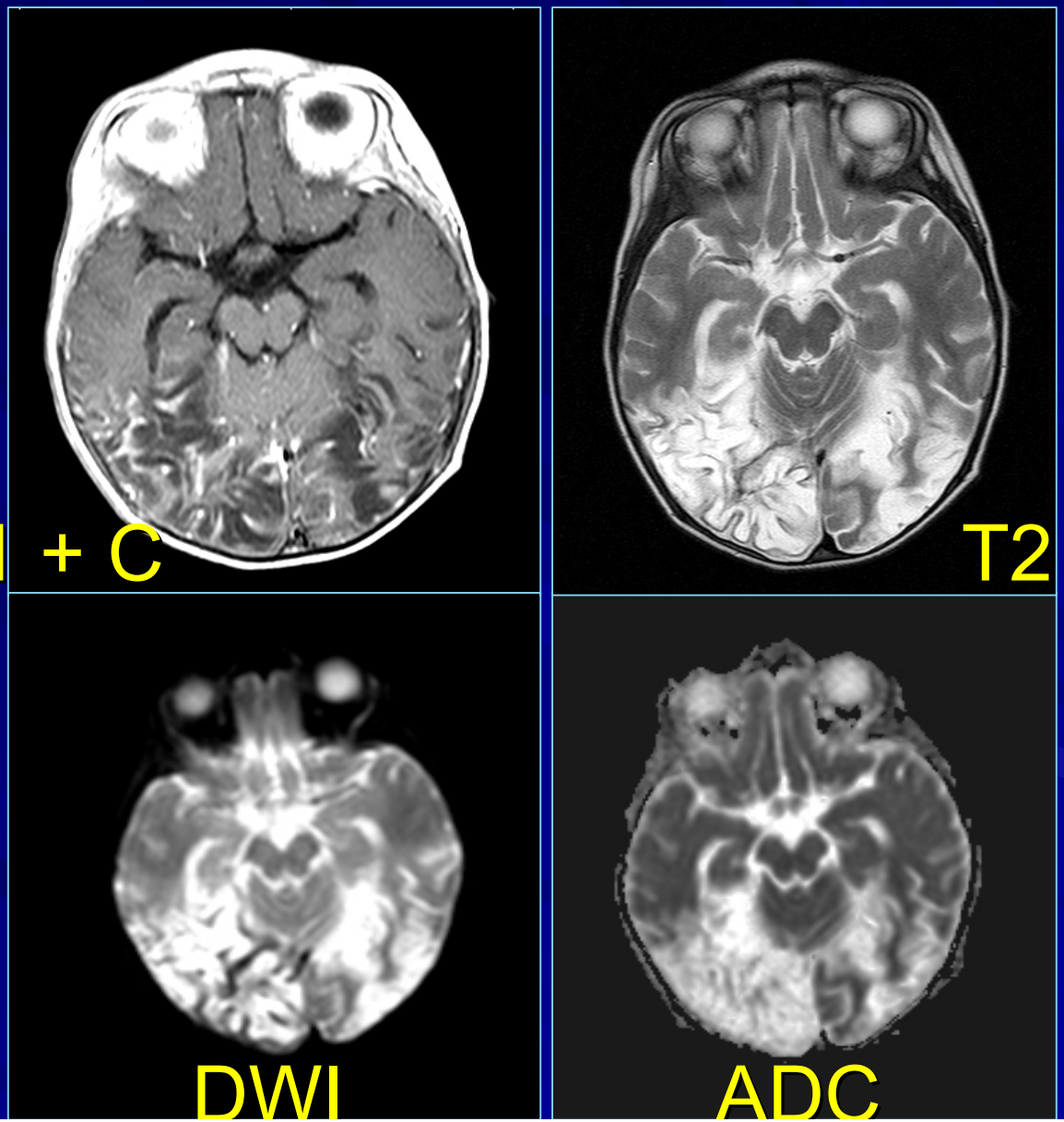








1 AY SONRA



- Tanınız?

A) PRES (Posterior Reversible Encephalopathy)

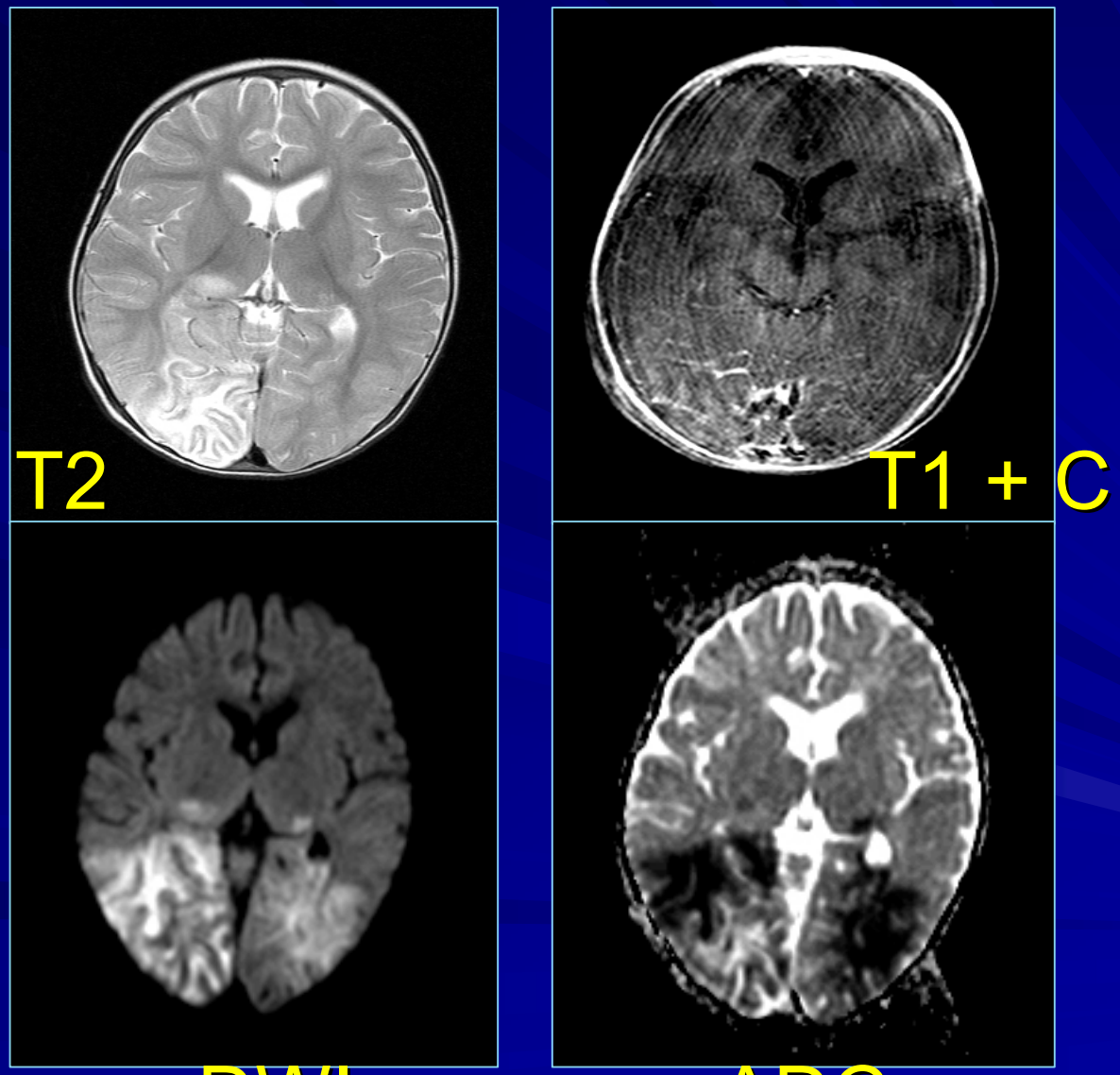
B) HSV Ensefaliti

C) SLE SSS tutulumu

OLGU 3

B) HSV Ensefaliti

OLGU 3



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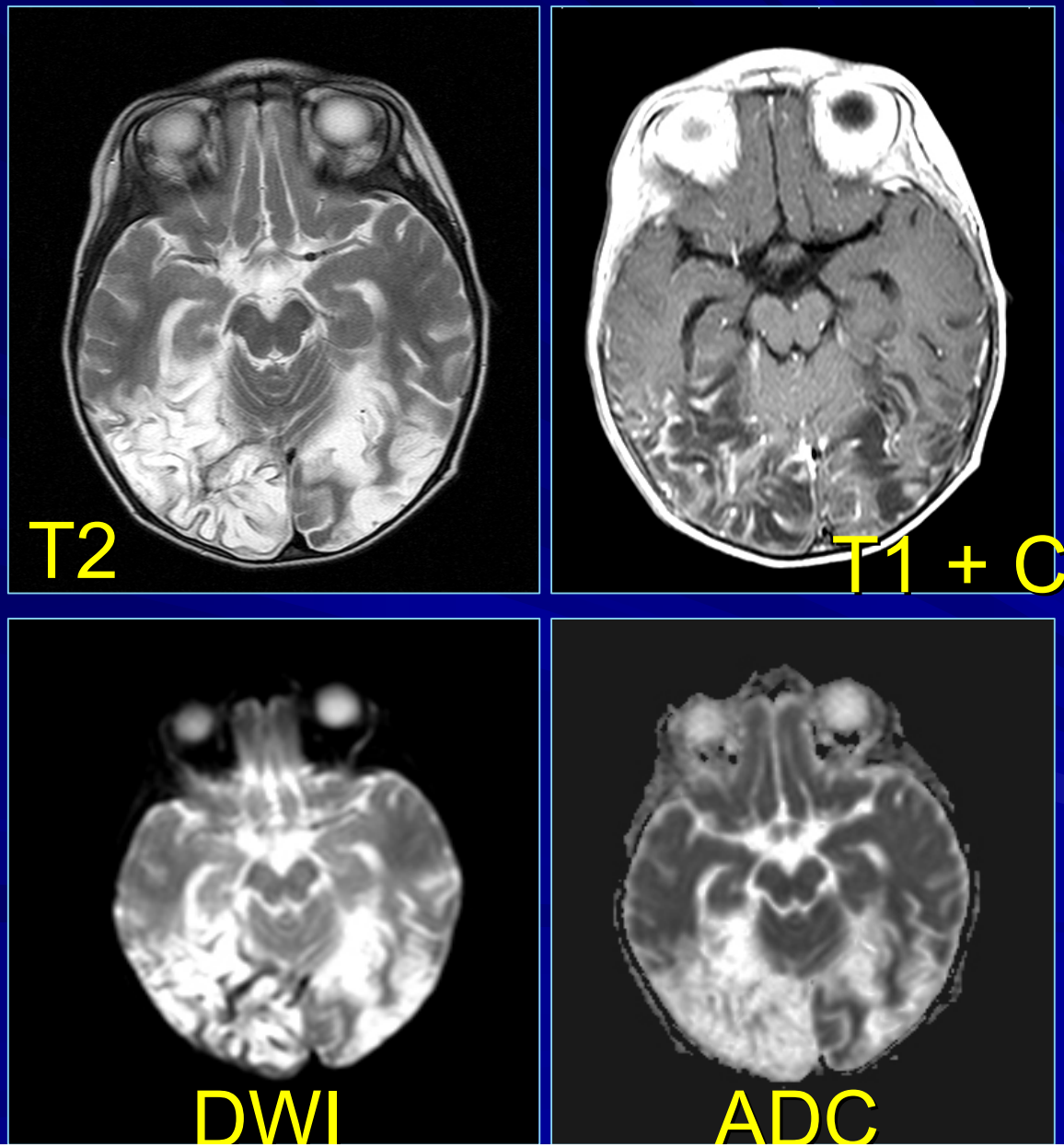


NEUROLOGY

HSV encephalitis with posterior localization

Kouichi Ohta, Mitsuhisa Tabata, Ichiro Nakachi and Katsuyuki Obara

Neurology 2003;61;862

- MR ile temporal, paryetal ve oksipital loblara sınırlı olduğu gösterilmiş HSV ensefaliti vakası

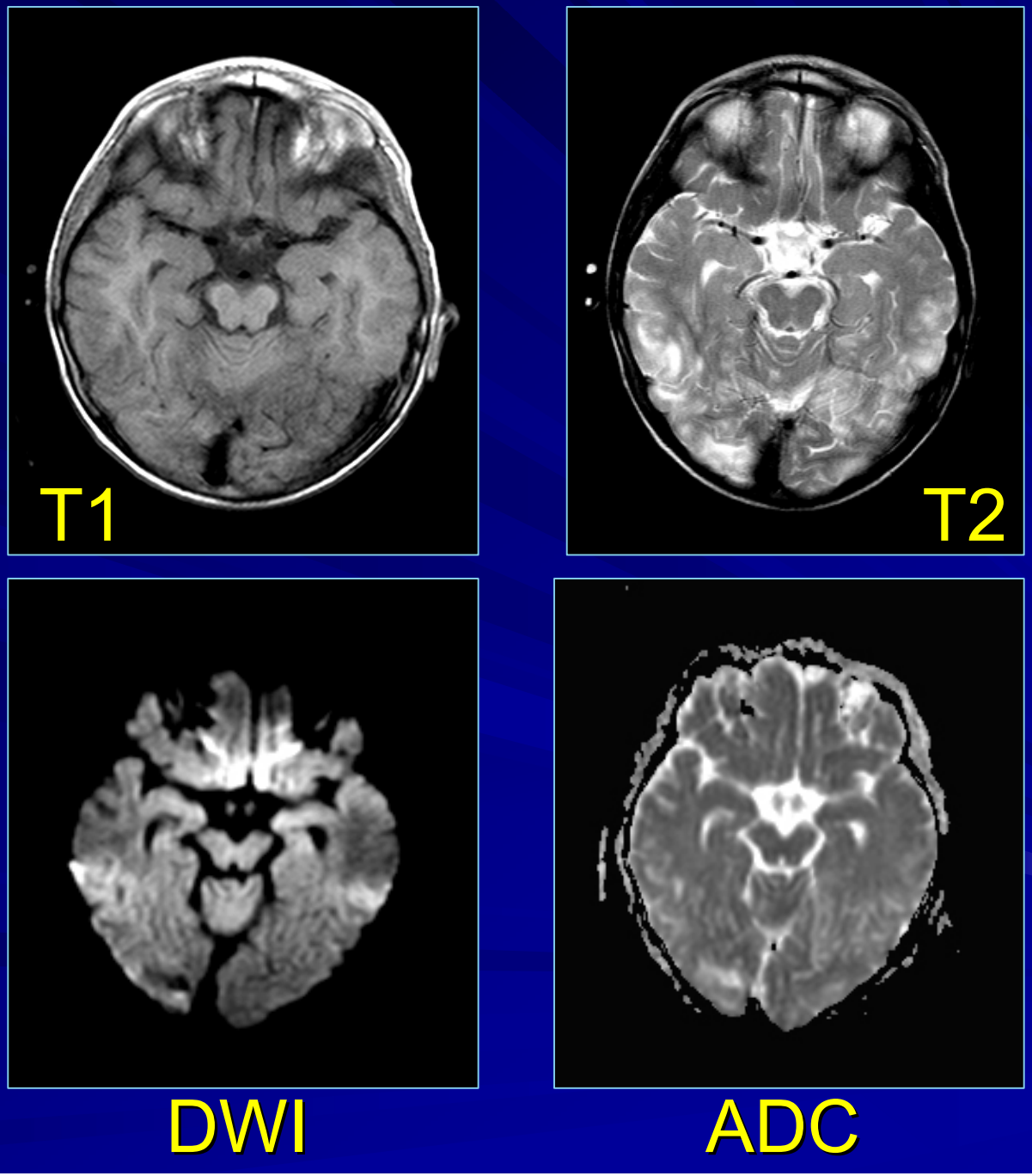
- Tipik lokalizasyonlar olan insula ve inferior frontal lobda lezyon izlenmedi

- Asiklovir ile lezyonların ilerleyişi durdu ve klinik düzelme elde edildi

HSV encephalitis with posterior localization.
Ohta K, Tabata M, Nakachi I, Obara K.
Neurology. 2003 Sep 23;61(6):862.

OLGU 4

- 4 yaş/E
- Hırıltılı solunum ateş ve öksürük
- Tekrarlayan akciğer enfeksiyonu
- Tekrarlayan idrar yolu enfeksiyonu


T1
T2
DWI
ADC

OLGU 4

- Tedavi sonrası kliniği tamamen düzeldi.
- Radyolojik bulgular tamamen düzeldi.

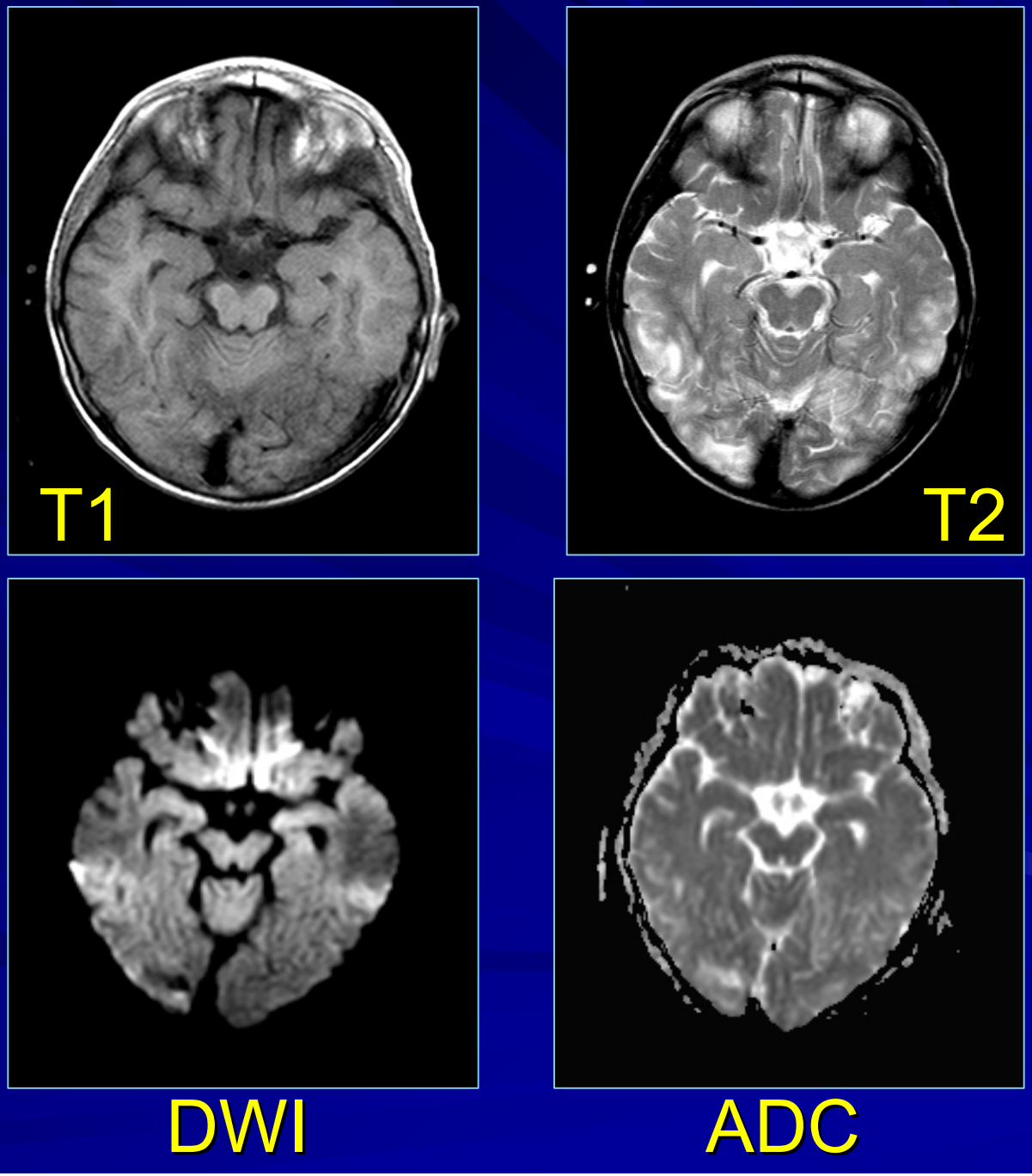
- Tanınız?

A) HSV ensefaliti

B) PRES (Posterior Reversable Encephalopathy)

C) SLE SSS tutulumu

B) PRES (Posterior Reversable Encephalopathy)


T1
T2
DWI
ADC

A REVERSIBLE POSTERIOR LEUKOENCEPHALOPATHY SYNDROME

JUDY HINCHEY, M.D., CLAUDIA CHAVES, M.D., BARBARA APPIGNANI, M.D., JOAN BREEN, M.D., LINDA PAO, M.D., ANNABEL WANG, M.D., MICHAEL S. PESSIN, M.D., CATHERINE LAMY, M.D., JEAN-LOUIS MAS, M.D., AND LOUIS R. CAPLAN, M.D.

Abstract *Background and Methods.* In some patients who are hospitalized for acute illness, we have noted a reversible syndrome of headache, altered mental functioning, seizures, and loss of vision associated with findings indicating predominantly posterior leukoencephalopathy on imaging studies. To elucidate this syndrome, we searched the log books listing computed tomographic (CT) and magnetic resonance imaging (MRI) studies performed at the New England Medical Center in Boston and Hôpital Sainte Anne in Paris; we found 15 such patients who were evaluated from 1988 through 1994.

Results. Of the 15 patients, 7 were receiving immunosuppressive therapy after transplantation or as treatment for aplastic anemia, 1 was receiving interferon for melanoma, 3 had eclampsia, and 4 had acute hypertensive encephalopathy associated with renal disease (2 with lupus nephritis, 1 with acute glomerulonephritis, and 1 with acetaminophen-induced hepatorenal failure). Altogether, 12 patients had abrupt increases in blood pressure, and 8 had some impairment of renal function. The clinical findings included headaches, vomiting, confusion, seizures, cortical blindness and other visual abnormalities, and motor signs. CT and MRI studies showed extensive bilateral white-matter abnormalities suggestive of edema in the posterior regions of the cerebral hemispheres, but the changes often involved other cerebral areas, the brain stem, or the cerebellum. The patients were treated with antihypertensive medications, and immunosuppressive therapy was withdrawn or the dose was reduced. In all 15 patients, the neurologic deficits resolved within two weeks.

Conclusions. Reversible, predominantly posterior leukoencephalopathy may develop in patients who have renal insufficiency or hypertension or who are immunosuppressed. The findings on neuroimaging are characteristic of subcortical edema without infarction. (N Engl J Med 1996;334:494-500.)

BOTH acute medical illness and treatment with immunosuppressive drugs are occasionally complicated by neurologic abnormalities, including altered mental function, visual loss, stupor, and seizures. These abnormalities appear to be the result of an acute encephalopathy that is probably related to edema within the brain, usually in the cerebral white matter.

The cerebral white matter is composed of myelinated-fiber tracts in a cellular matrix of glial cells, arterioles, and capillaries that makes this region susceptible to the accumulation of fluid in the extracellular spaces (vasogenic edema). Modern neuroimaging techniques are sensitive to changes in the distribution of water in the brain and make it possible to detect white-matter edema even in its early phases. Patients with hypertensive encephalopathy, hypertension associated with acute glomerulonephritis,[1,2] and eclampsia of pregnancy[3-13] have been known to have edema in the brain, predominantly in the posterior portions of the cerebral white matter. Recently, patients treated with cyclosporine and other immunosuppressants have been reported to have similar findings on neuroimaging.[14-29]

We have noted a variety of disorders associated with findings on neuroimaging that suggest white-matter edema, mostly in the posterior parietal–temporal–occipital regions of the brain. The clinical findings in these patients make up a recognizable syndrome characterized by headache, decreased alertness, altered mental functioning, seizures, and visual loss, including cortical blindness. In our experience, the clinical signs and abnormalities on imaging are always reversible. This syndrome, which we call reversible posterior leukoencephalopathy, is unfamiliar to many. In this report we describe the clinical and neuroimaging features of the syndrome, which appears to involve capillary leakage and acute disruption of the blood–brain barrier.

From the Department of Neurology, New England Medical Center and Tufts University School of Medicine, Boston (J.H., C.C., B.A., J.B., L.P., A.W., M.S.P., L.R.C.), and the Service de Neurologie, Hôpital Sainte Anne, Paris (C.L., J.-L.M.). Address reprint requests to Dr. Caplan at the Department of Neurology, New England Medical Center, 750 Washington St., Boston, MA 02111.

METHODS

We searched the log books recording computed tomographic (CT) and magnetic resonance imaging (MRI) procedures performed at the New England Medical Center to identify patients evaluated from 1988 through 1994 who had prominent white-matter abnormalities. We reviewed all CT and MRI scans and charts for these patients and selected those with reversible clinical or radiologic lesions for further study. Our analysis of the charts included information about symptoms, concurrent medical illnesses, medications, findings on neurologic examination, and results of the analysis of cerebrospinal fluid, electroencephalography (EEG), and other neurologic evaluations. Abnormalities on imaging were defined as areas of low white-matter attenuation on CT scans and as T_1-weighted hypointense and T_2-weighted hyperintense areas on MRI scans that had partially or completely resolved on follow-up scanning, when subsequent images were available. These changes probably represent increased water in the white matter.[30]

RESULTS

We identified 13 patients seen at the New England Medical Center in Boston, as well as 2 seen at Hôpital Sainte Anne in Paris, who had the characteristic clinical and imaging features of this syndrome. The 15 patients (13 female and 2 male) ranged in age from 15 to 62 years (average, 39). All underwent cranial imaging studies; 2 underwent only CT scanning, 3 only MRI scanning, and 10 both CT and MRI scanning. Clinical and imaging findings are summarized in Table 1.

Four patients (Patients 1, 2, 3, and 4) had hyperten-

- Hem akut medikal hastalık hem de immunsupresif tedaviler zaman zaman azalmış mental fonksiyon, vizüel kayıp, stupor ve nöbet gibi nörolojik bozukluklara sebep olabilir.
- Bu anormallikler serebral beyaz cevherde oluşmuş ödeme nedeniyle gelişen akut ensefalopatiye bağlıdır.
- Klinik bulgular ve görüntüleme bulguları geri dönüşlüdür.

A reversible posterior leukoencephalopathy syndrome.
Hinchey J, Chaves C, Appignani B, Breen J, Pao L, Wang A, Pessin MS, Lamy C, Mas JL, Caplan LR.
N Engl J Med. 1996 Feb 22;334(8):494-500.

ELSEVIER

European Journal of Radiology 62 (2007) 454–459

EJR

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Widening the spectrum of PRES: Series from a tertiary care center

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Received 10 August 2006; received in revised form 5 December 2006; accepted 5 December 2006

Abstract

Posterior reversible encephalopathy syndrome (PRES) has been defined as a neurologic disorder with distinct radiologic findings demonstrating lesions in the subcortical white matter at posterior circulation territory. Several authors suggested alternative descriptive terms for this syndrome as atypical radiologic features have been described more frequently. In this retrospective study, we sought to determine the frequency and features of radiologic findings in the setting of a tertiary care center. We also noticed that some of our patients had simultaneous multiple conditions that were previously shown to cause PRES independently in the literature. These probable predisposing factors were also revisited.

Keywords: Hypertensive encephalopathy; Magnetic resonance imaging; Brain; Multifactorial causality

1. Introduction

Hypertensive encephalopathy (HTE) was first described by Schwartz in 1992 as a *syndrome* consisting of headache, seizures, visual changes, and other neurologic disturbances in patients with elevated systemic blood pressure [1]. Same disease pattern was later described by Hinchey et al. as a clinico-radiologic picture which they called 'reversible posterior leukoencephalopathy syndrome' (RPLS), characterized by radiologic changes in the subcortical white matter at posterior circulation territory [2]. Hypertensive encephalopathy, immunosuppressive treatment, eclampsia and renal failure were the main reported causes of PRES [2]. Subsequently, PRES has been reported in a variety of autoimmune diseases such as systemic lupus erythematosus (SLE), polyarteritis nodosa (PAN), pheochromocytoma, and in patients under treatment with various immunosuppressive drugs [2–6]. The term 'reversible posterior leukoencephalopathy *syndrome*' implies a reversible disease of the white matter with involvement of the posterior circulation. However, irreversible parenchymal changes, as well as anterior and gray matter lesions commonly occur, making the terminology partly inaccurate [7]. In this retrospective study, radiologic findings were evaluated in a tertiary care center series with a wide demographic and etiologic spectrum.

2. Materials and methods

Twenty one patients (10 female, 11 male); with an age range of 10 months–72 years (with a mean of 24.66) who had the diagnosis of PRES based on clinical and radiologic findings between January 2002 and October 2005 in a tertiary care center were retrospectively evaluated. MR imaging was performed with a 1.5 T (Symphony, Siemens, Erlangen, Germany) and a 3 T (Allegra, Siemens, Erlangen, Germany) units utilizing a standard head coil. All patients had a routine brain magnetic resonance (MR) examination which included sagittal and transverse T1-weighted (W) spin-echo (SE) and transverse and coronal T2W turbo SE imaging. Additionally, intravenous gadolinium diethylenetriamine pentaacetic acid (Gd-DTPA) was administered in 10 patients. Seventeen patients had also diffusion-weighted (DW) imaging. Follow-up imaging (1 week–16 months) was present in 10 patients. Evaluation was performed reaching a mutual agreement by two radiologists. Evaluated radiologic parameters included location (cortical/white matter) and distribution (anterior/posterior vascular territory, brain stem, cerebellum, basal ganglia) of lesions, findings on DW imaging, and findings (resolution/sequela) on follow-up imaging. The cases were also evaluated for the presence of multiple predisposing factors that may have led to PRES. Underlying disorders and drug treatments were regarded as separate and independent factors. However, comorbidities (one factor leading to another such as eclampsia and hypertension) were not regarded as independent factors.

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E-mail address: karlioguz@yahoo.com (K.K. Oguz).

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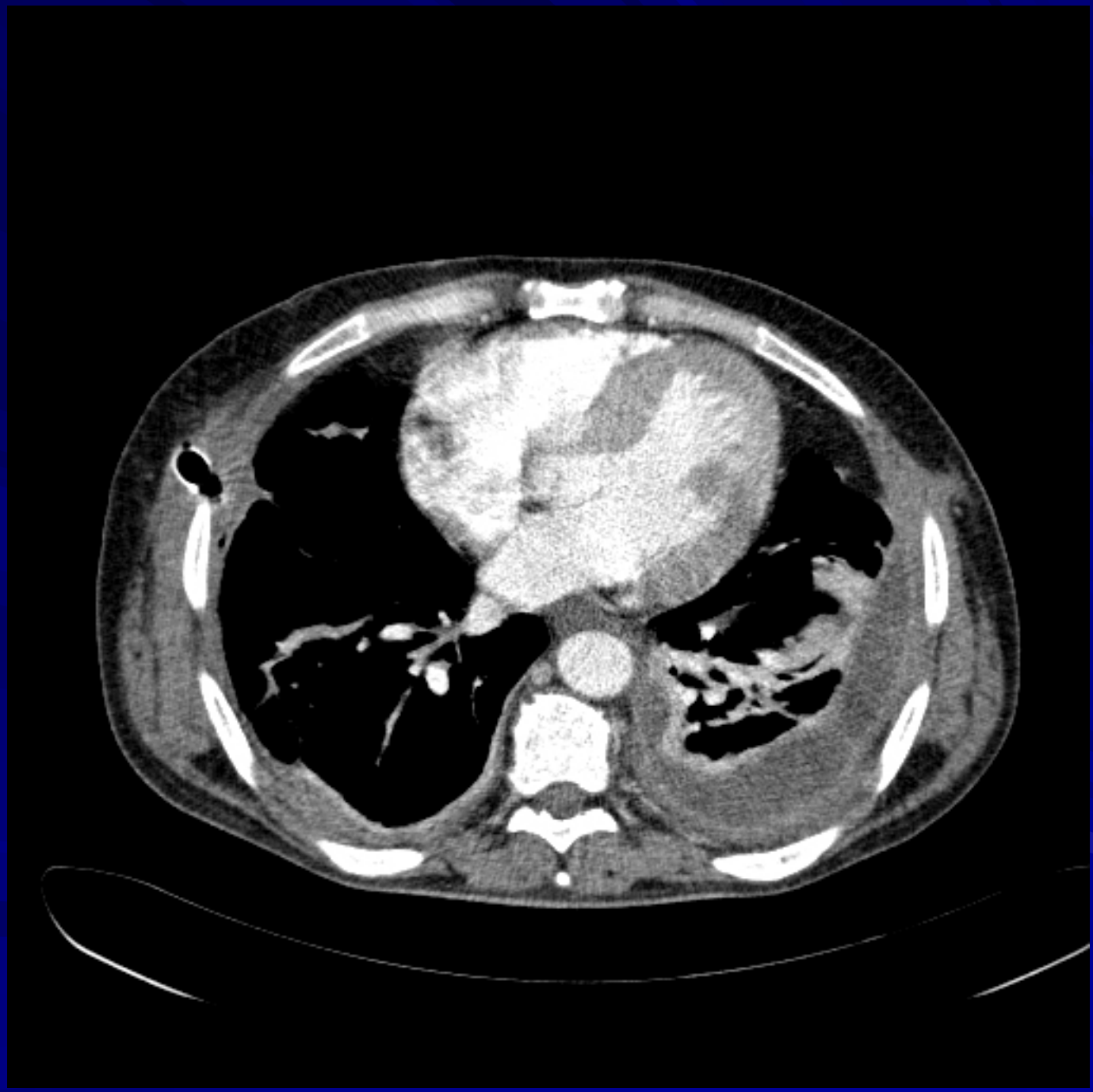
doi:10.1016/j.ejrad.2006.12.001

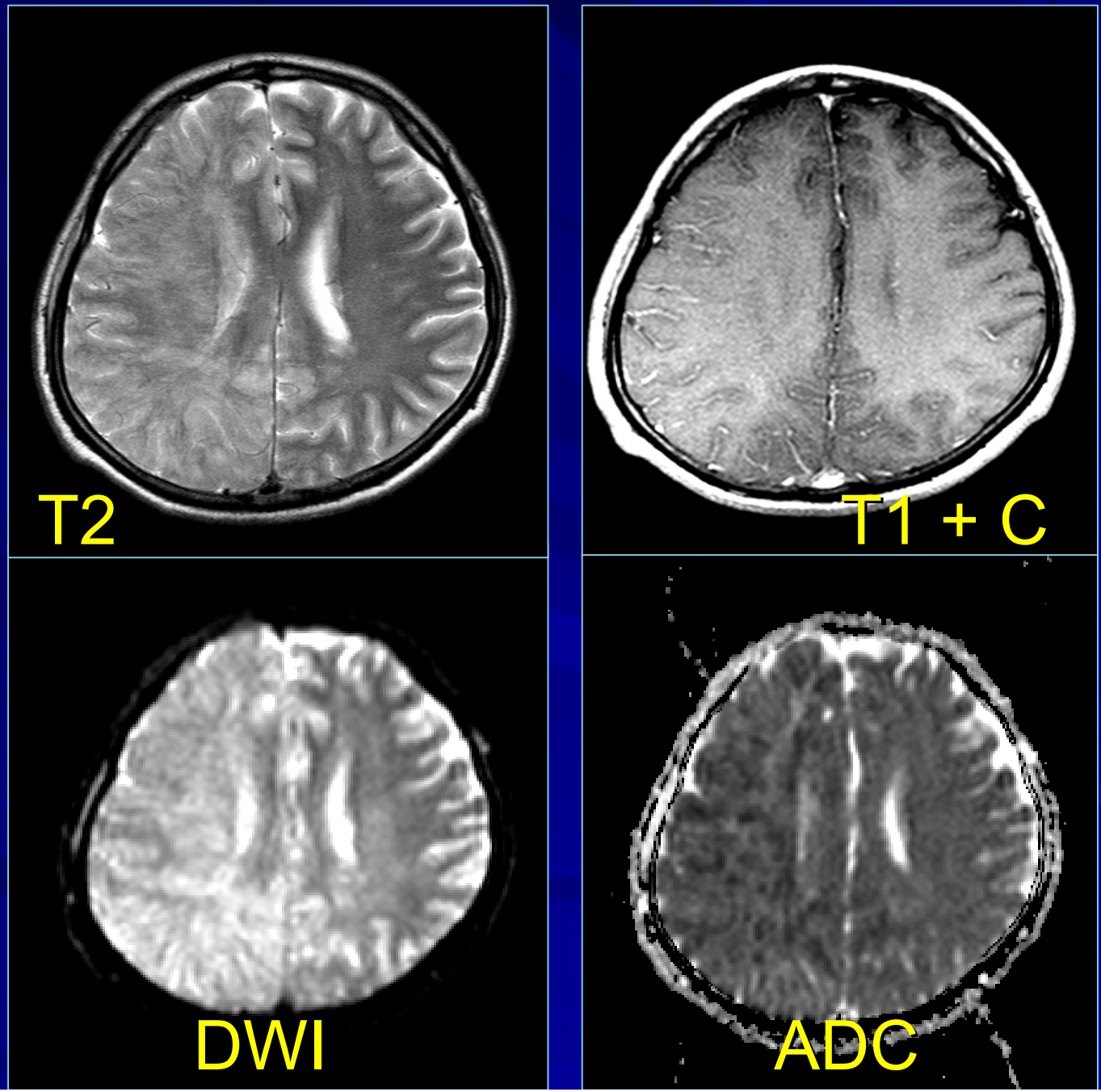
- Hipertansif ensefalopati, immunsupresif tedavi, eklampsi, renal yetmezlik PRES'de altta yatan ana sebeplerdir.
- 'Reversible posterior leukoencephalopathy syndrome' posterior sirkülasyonda beyaz cevheri ilgilendiren geri dönüşümlü bir durumu ifade etmektedir.
- Bununla birlikte irreversable, frontal beyaz cevher ve gri cevheri de etkileyen parankimal değişiklikler de bildirilmiştir.

Widening the spectrum of PRES: series from a tertiary care center.
Gocmen R, Ozgen B, Oguz KK.
Eur J Radiol. 2007 Jun;62(3):454-9.

OLGU 5

- 48 Yaş/E
- Opere mide ca, anastomoz kaçağı
- Dirençli acinetobakter üremesi
- Senkop sonrası genel durumda bozulma, bilinçte kapanma



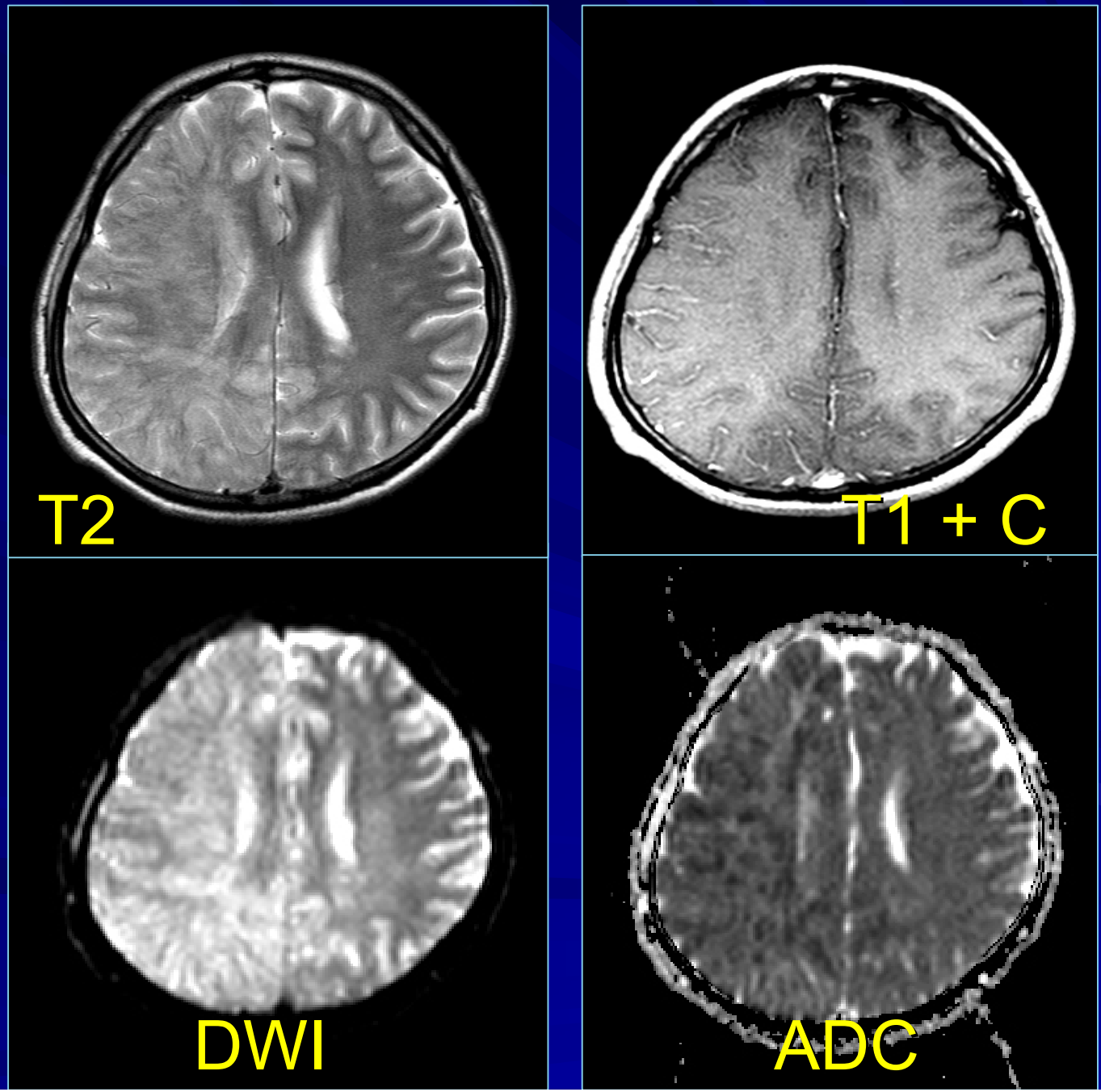

T2
T1 + C
DWI
ADC

- Tanınız?

A) Yaygın MCA Enfaktı
B) Meningoensefalit
C) Serebral Ödem
D) Progresif Multifokal Lökoensefalopati

B) Meningoensefalit

- Sonuç : Enterococcus faecium


T2
T1 + C
DWI
ADC

NeuroRx®: The Journal of the American Society for Experimental NeuroTherapeutics

Neuroimaging of Infections

Oliver Kastrup,* Isabel Wanke,† and Matthias Maschke*

**Department of Neurology, †Department of Neuroradiology, University Duisburg-Essen, 45122 Essen, Germany*

Summary: Neuroimaging plays a crucial role in the diagnosis and therapeutic decision making in infectious diseases of the nervous system. The review summarizes imaging findings and recent advances in the diagnosis of pyogenic brain abscess, ventriculitis, viral disease including exotic and emergent viruses, and opportunistic disease. For each condition, the ensuing therapeutic steps are presented. In cases of uncomplicated meningitis, cranial computed tomography (CT) appears to be sufficient for clinical management to exclude acute brain edema, hydrocephalus, and pathology of the base of skull. Magnetic resonance imaging (MRI) is superior in depicting complications like sub-/epidural empyema and vasculitic complications notably on FLAIR (fluid-attenuated inversion recovery)-weighted images. The newer technique of diffusion-weighted imaging (DWI) shows early parenchymal complications of meningitis earlier and with more clarity and is of help in differentiation of pyogenic abscess (PA) from ring enhancing lesions of other etiology. Proton magnetic resonance spectroscopy (PMRS) seems to produce specific peak patterns in cases of abscess. The presence of lactate cytosolic amino acids and absence of choline seems to indicate PA. Also in cases of suspected opportunistic infection due to toxoplasma DWI may be of help in the differentiation from lymphoma, showing no restriction of water diffusion. In patients with herpes simplex and more exotic viruses like West Nile and Murray Valley virus DWI allows earlier lesion detection and therapeutic intervention with virustatic drugs. Key Words: Neuroimaging, infections, therapy, MRI, diffusion-weighted imaging.

INTRODUCTION

Infections of the nervous system and adjacent structures are often life-threatening conditions. The prognosis mainly depends on rapid identification of the site of inflammation and pathogen to install effective antimicrobial treatment as early as possible. Whereas analysis of CSF, biopsy, and laboratory analysis remain the gold standard to identify the infectious agent for instance in meningitis, neuroimaging is crucial in clearly depicting inflammatory lesions of brain and spine. Visualization of typical lesion patterns often allows a rapid diagnosis and subsequent therapeutic decisions. Notably, in opportunistic disease neuroimaging has a pivotal role not only in diagnosis but also in monitoring therapeutic response. The following review summarizes recent findings in neuroimaging of CNS infections such as bacterial meningoencephalitis, ventriculitis, infectious disease of the spinal cord as well as viral and opportunistic disease of the CNS.

Address correspondence and reprint requests to Dr. Oliver Kastrup, Department of Neurology, Universität Duisburg-Essen, Hufelandstrasse 55, 45122 Essen, Germany. E-mail: oliver.kastrup@uni-essen.de.

MENINGITIS

In cases of suspected bacterial meningitis with clouded consciousness, an immediate cranial computed tomography (CT) is recommended before lumbar puncture to rule out causes for swelling that might lead to herniation. However, it has to be noted that empirical antimicrobial treatment has to be started before CT scan and/or lumbar puncture is performed. In the early phase of meningitis, the CT findings are mostly normal. Contrast-enhanced CT may show beginning meningeal enhancement, which becomes more accentuated in later stages of disease. Parenchymal lesions are not easily visualized, except for areas of ischemia due to secondary vasculitis, a complication in up to 20% of cases (FIG. 1). CT is important and sufficient to define pathology of the base of skull that may be causative and require rapid therapeutic intervention and surgical consultation. Potential sources of infection include fractures of the paranasal sinus or petrous bone as well as inner ear infection and mastoiditis. CT venography is an excellent tool to diagnose complicating thrombosis of the transverse and sagittal sinus, necessitating therapeutic anticoagulation with intravenous heparin. In later stages, persistent drowsiness and meningeal signs should be regarded as an indication for repeat CT to rule out a resorptive hydroceph-

- Menenjtin erken dönemlerinde BT genellikle normaldir, kontrastlı BT tetkikinde meningeal hafif kontrastlanma izlenebilir.
- Bu kontrastlanma zaman içinde artar.
- Parankimal lezyonlar kolay kolay izlenmez, ancak sekonder vaskülite bağlı oluşmuş iskemik alanlar görüntülenebilir.
- Paranazal sinüs fraktürü, mastoidit gibi altta yatabilecek sebepleri gösterebilir.
- BT venografi sinüslerdeki antikoagülan tedaviyi gerektirebilecek trombüsü gösterebilir.

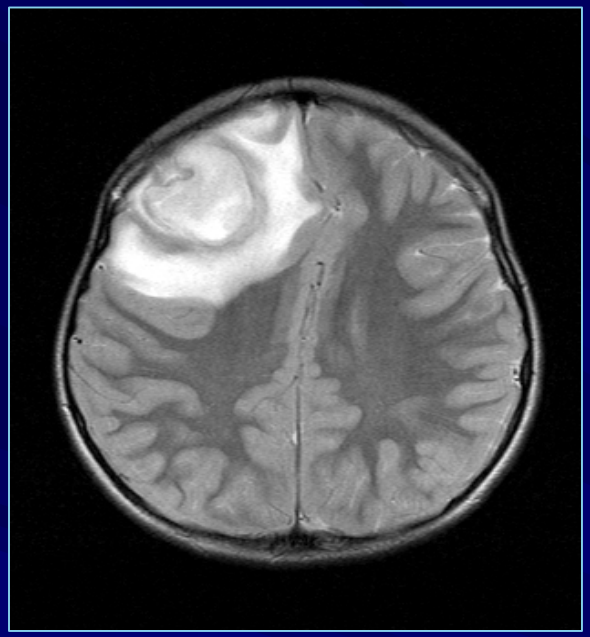
Neuroimaging of infections.
Kastrup O, Wanke I, Maschke M.
NeuroRx. 2005 Apr;2(2):324-32.

- MR nonkomplike menenjit durumunda gerekli değil ama meningeal kontrastlanmayı çok daha güzel gösterir.
- Fokal bulgu yada epilepsi gelişmiş komplike vakalarda MR, meningoensefalite bağlı parankimal lezyonları ya da vaskülitik komplikasyonları göstermede üstündür.
- DAG'da ensefalit, serebrit gibi akut inflamatuar lezyonlarda kısıtlanmış difüzyon izlenir.

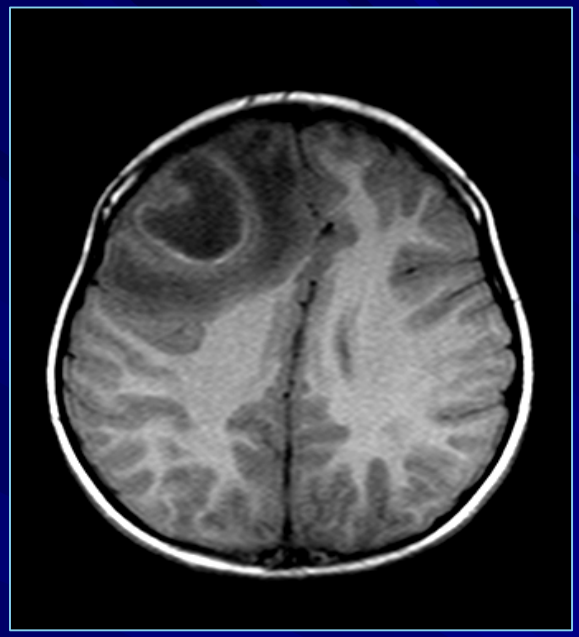
Neuroimaging of infections.
Kastrup O, Wanke I, Maschke M.
NeuroRx. 2005 Apr;2(2):324-32.

OLGU 6

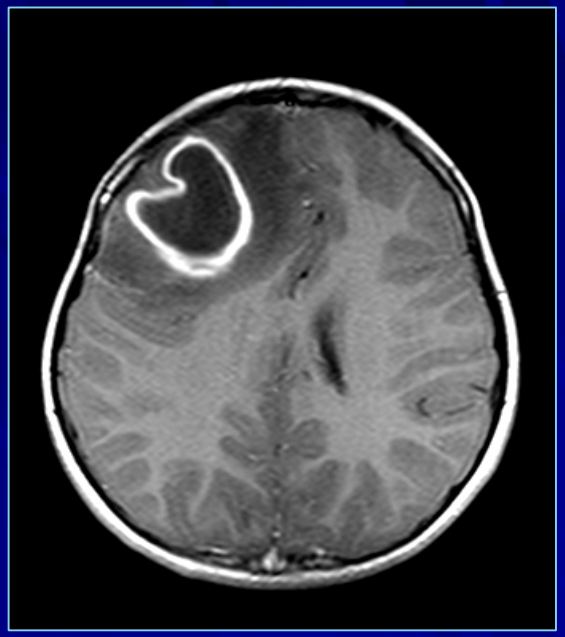
- 15 y/E
- Öksürük, baş ağrısı, karın ağrısı
- Bulantı (+) , kusma (+), ateş (+)
- Halsizlik



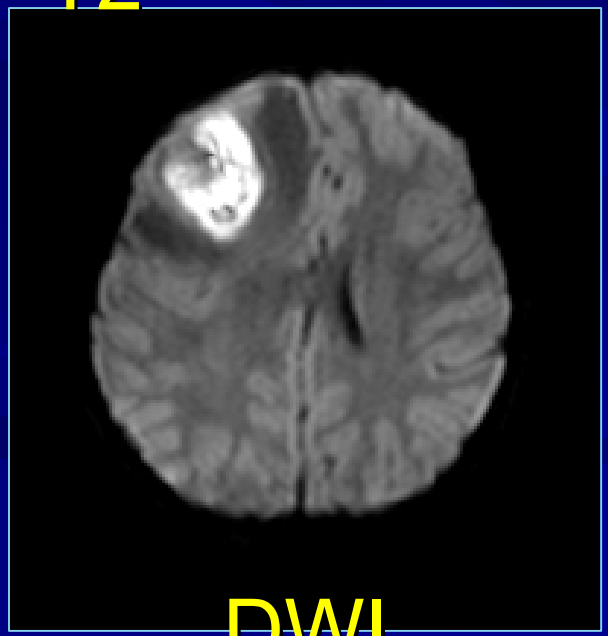
T2



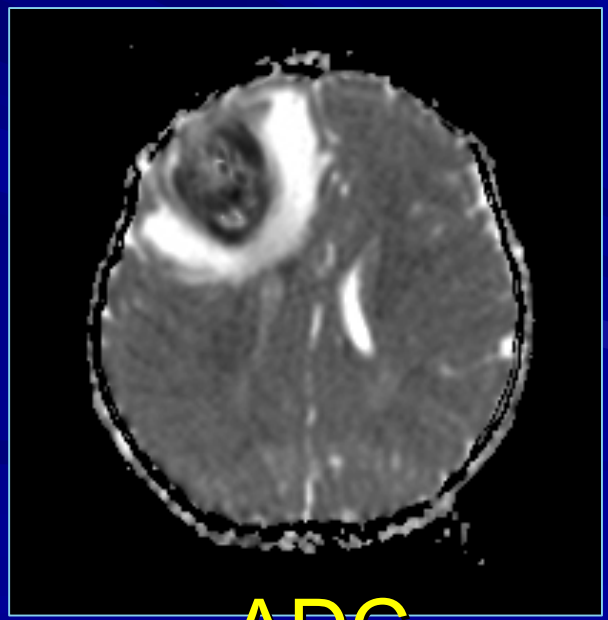
T1



T1+C



DWI



ADC

- Tanınız?

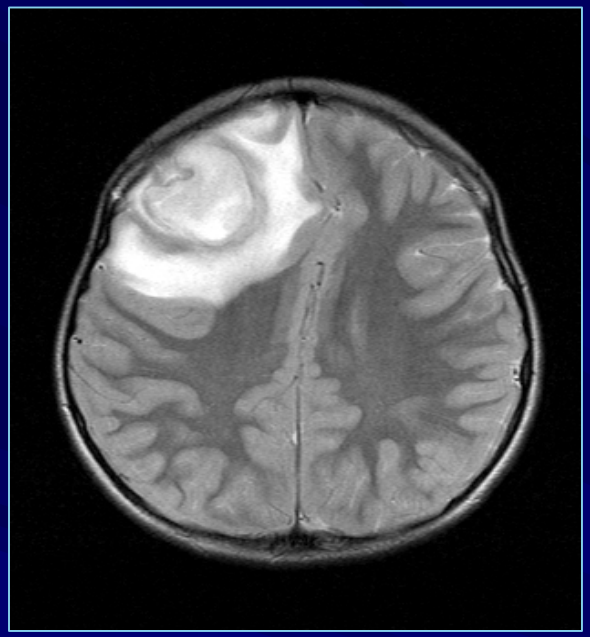
A) Beyinde Abse

B) Beyinde Metastaz

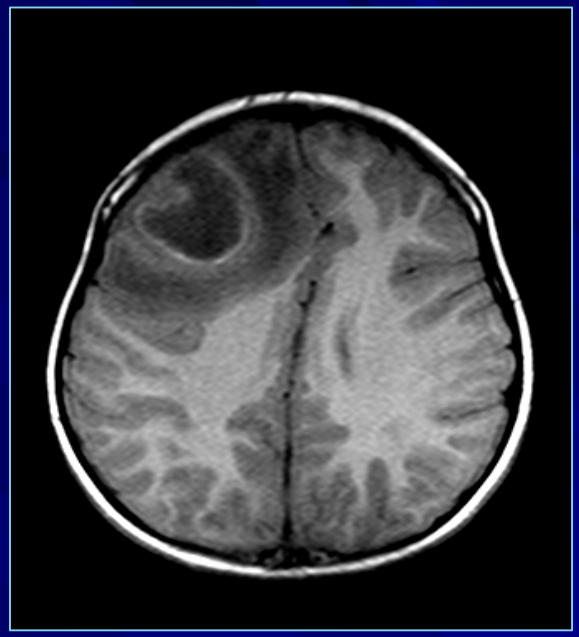
C) Glioblastoma Multiforme

A) Beyinde Abse

- Sonuç: Streptococcus parasanguis



T2



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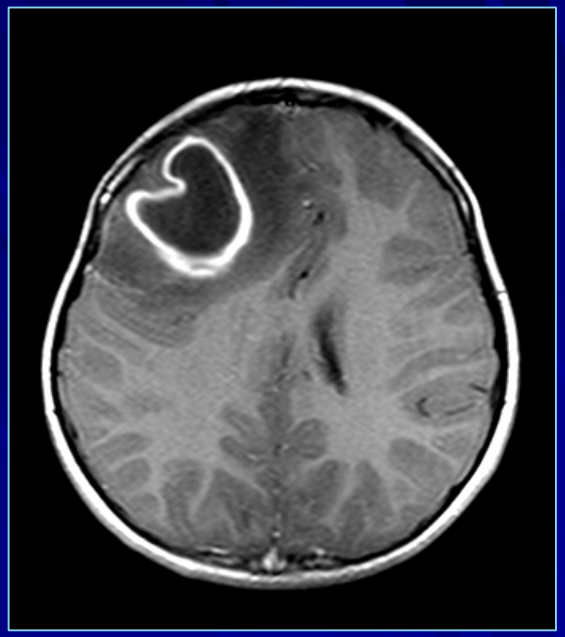

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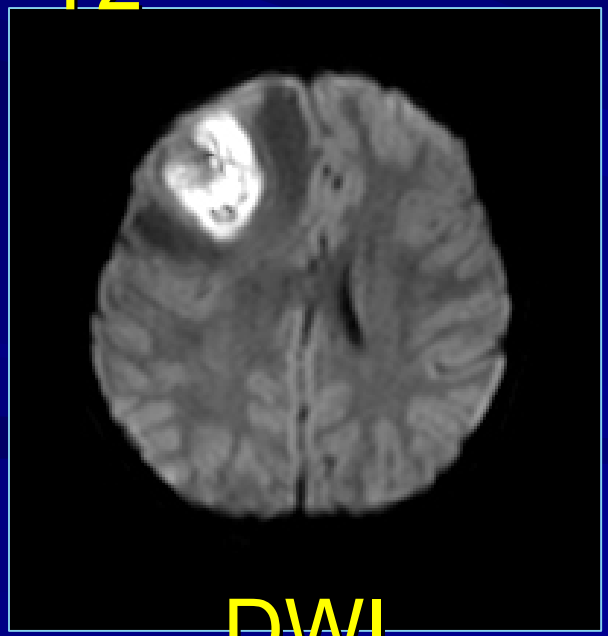

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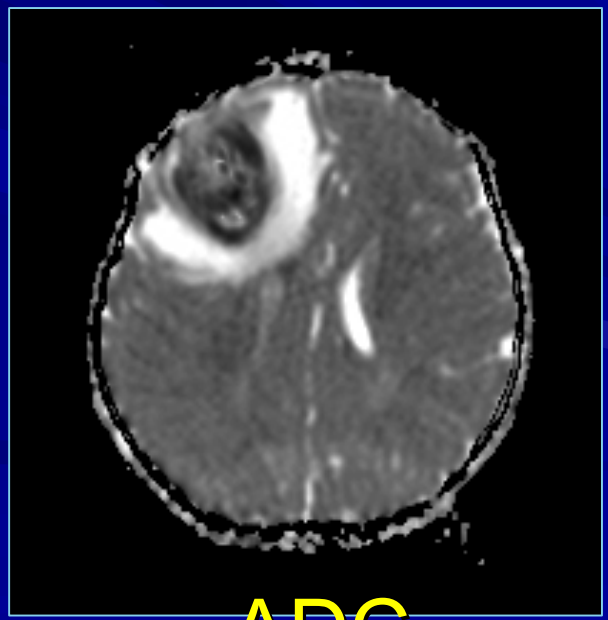

ADC

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Pyogenic brain abscess

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✓Brain abscesses have been one of the most challenging lesions, both for surgeons and internists. From the beginning of the computed tomography (CT) era, the diagnostic and treatment of these entities have become easier and less invasive. The outcomes have become better with the improvement of diagnostic techniques, neurosurgery, and broad-spectrum antibiotics. Atypical bacterial abscesses are more often due to chemotherapy usage in oncology, long life expectancy in patients with human immunodeficiency virus (HIV) infection, and immunosuppression in conjunction with organ transplantation. Surgical treatment options showed no significant difference with respect to mortality levels, but lower morbidity rates were achieved with stereotactically guided aspiration. Decompression with stereotactically guided aspiration, antibiotic therapy based on results of pus culture, and repeated aspirations if indicated from results of periodic CT follow-up scans seem to be the most appropriate treatment modality for brain abscesses. Immunosuppression and comorbidities, initial neurological status, and intraventricular rupture were significant factors influencing the outcomes of patients. The pitfalls and evolution in the diagnosis and treatment of brain abscesses are discussed in this study. *(DOI: 10.3171/FOC/2008/24/6/E2)*

Key Words • **abscess incidence** • **brain abscess** • **outcome** • **stereotaxy** • **treatment options**

In 1893, Sir William Macewen reported only 1 death in 19 patients suffering from brain abscess.[8] Unfortunately, until the advent of the CT modality, the outcomes in patients with brain abscess were not as satisfactory as in Macewen's series. Use of CT and MR imaging, evolution of microbiological diagnostic techniques, and production of broad-spectrum antibiotics have improved outcomes in the past 20–25 years. The routine use of CT scanning has facilitated the diagnosis of brain abscess and made the patients' follow-up safer.[12,21,55,58,100] The mortality rate decreased from a range of 22.7–45%[2,3,17,73,93,102] to 0–20%[44,82] after the routine use of CT scans. Before the advent of CT scanning, brain abscesses were mostly diagnosed intraoperatively and resected totally.[55,104] However, easier and safer diagnostic techniques made stereotactic aspiration a favorable treatment option, especially in multiple and noncortical lesions.[22,64,71,74] Also, in some cases CT scanning enables safe and successful medical treatment without any surgical intervention.[42,64,65,80,81] Nevertheless, there is no consensus on treatment of brain abscess; the necessity of surgical intervention and the type of surgical procedure are still doubtful.

Demographic Factors

Brain abscesses are seen in ~ 1500–2500 cases/year in the US, with a higher incidence in developing countries.[17] There were more male than female patients; ratios from 1.3:1 to 3.0:1 have been reported.[18,48,62,88] The patients ranged in age from infants to elderly individuals.[36,48,62,66,79,88] Roche et al.[79] reported that most brain abscesses occur in the first 2 decades of life. However, their opinion was based on literature published several decades ago, when intracranial complications of sinus/otitis infections, a common childhood infection, were seen more frequently.[44,62,66,75,87] Even Roche et al.[79] found the incidence of brain abscesses in children to be lower than they had expected from earlier reports. However, some authors reported that the incidence in patients < 15 years of age was no more than 15–30%.[18,41,43,88]

Origins of Abscesses

Cerebral abscess occurs in patients with the following predisposing states: 1) contiguous purulent spread (for example, frontal sinus infection leading to frontal lobe abscess, sphenoid sinus infection leading to cavernous sinus extension, and middle ear/mastoid air cell infection leading to temporal lobe and cerebellar abscess); 2) hematogenous or metastatic spread (for example, pulmonary infections and arteriovenous shunts, congenital heart disease and endocarditis, dental infections, and gastrointestinal infections); 3) head trauma; 4) neurosurgical procedure; and 5) immunosuppression.

According to the earlier literature,[48,63,81,104] the most common predisposing factor for brain abscesses was direct spread from the middle ear, meninges, mastoid infections,

Abbreviations used in this paper: ADC = apparent diffusion coefficient; CHD = congenital heart disease; CNS = central nervous system; CSF = cerebrospinal fluid; DW = diffusion weighted; MCA = middle cerebral artery.

- BT'nin kullanıma girmesi ile beyin abselerinin tanı ve tedavisi daha kolay ve daha az invaziv hale geldi. Diagnositk ve cerrahi tekniklerin gelişmesi ve geniş spektrumlu antibiyotikler sayesinde daha iyi sonuçlar alınmaktadır

- Kemoterapi, HIV + hastalar, organ tranplantasyonunda immunsupresse hastalarda atipik bakteriyal abseler daha sıktır.

- Stereotaksik aspirasyon ile daha düşük morbidite oranları elde olunmakta

- Stereotaksik aspirasyon ile dekompresyon, kültür sonucuna göre antibiyotik tedavisi ve takip BT inceleme sonuçlarına göre gerekli durumlarda aspirasyonun tekrarlanması beyin absesinde en uygun tedavi gibi görünmekte

- İmmunosupresyon, komorbiditeler, başlangıç nörolojik statusu, olası intraventriküler rüptür prognozda önemli faktörler

Pyogenic brain abscess.
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Brain Abscess and Necrotic Brain Tumor: Discrimination with Proton MR Spectroscopy and Diffusion-Weighted Imaging

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BACKGROUND AND PURPOSE: Discriminating pyogenic brain abscesses from cystic or necrotic tumors is sometimes difficult with CT or MR imaging. We compared findings of proton MR spectroscopy (^{1}H-MRS) with those of diffusion-weighted imaging to determine which technique was more effective for this differential diagnosis.

METHODS: Fourteen patients (necrotic or cystic tumor [n = 7]; pyogenic abscess [n = 7]) who underwent 1.5-T ^{1}H-MRS and diffusion-weighted imaging and had findings of ring-shaped enhancement after contrast agent administration were enrolled in this study. Diffusion-weighted imaging was performed with a single-shot spin-echo echo-planar pulse sequence (b = 1000 s/mm^2). The apparent diffusion coefficient and ratio were also measured.

RESULTS: Spectra for two patients were unacceptable because of either poor shimming conditions or contamination from neighboring fat. Spectra in three of five patients with abscess had lactate, amino acids (including valine, alanine, and leucine), and acetate peaks; one of the three spectra had an additional peak of succinate. In one patient with abscess treated by antibiotics, only lactate and lipid peaks were detected. Spectra for four of seven patients with cystic or necrotic tumors showed only lactate peaks. Lactate and lipids were found in three patients with tumors. Hyperintensity was seen in all the pyogenic abscess cavities and hypointensity in all the cystic and necrotic tumors on diffusion-weighted images.

CONCLUSION: ^{1}H-MRS and diffusion-weighted imaging are useful for differentiating brain abscess from brain tumor, but the latter requires less time and is more accurate than is ^{1}H-MRS. ^{1}H-MRS is probably more limited in cases of smaller peripheral lesions, skull base lesions, and treated abscesses.

Differentiating brain abscesses from cystic or necrotic tumors by CT or MR imaging can be difficult. Difficulties in the diagnosis of intracranial abscess are mainly due to the combination of often unspecified clinical findings and similarities in the morphologic appearance of some intracranial mass lesions, such as cystic gliomas, metastases, and brain abscesses (1, 2). Findings from several studies have suggested that proton MR spectroscopy (^{1}H-MRS) can noninvasively contribute to the establishment of the differential diagnosis between brain tumors and abscesses (3–13).

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Diffusion-weighted imaging provides a way to evaluate the diffusion properties of water molecules in tissue and has been used for diseases such as ischemia, tumors, epilepsy, and white matter disorders (14). In recent publications, diffusion-weighted imaging is said to be valuable in the differential diagnosis of abscesses and cystic necrotic tumors (15–18). The aim of this study was to compare ^{1}H-MRS findings with those of diffusion-weighted imaging to determine which technique is more effective in discriminating pyogenic brain abscesses from cystic or necrotic tumors.

Methods

Patient Population

From February 1999 to November 2001, we performed ^{1}H-MRS and diffusion-weighted imaging in 14 patients (10 men and four women; age range, 26–74 years [mean, 55 years]) with necrotic lesions and MR imaging evidence of ring-shaped enhancement after the injection of contrast material; seven patients had tumors, and seven had pyogenic abscesses. The tumors were glioblastomas (three patients), an anaplastic as-

- Difüzyon ağırlıklı görüntüleme beyin absesini kistik-nekrotik tömörden ayırmada faydalıdır. Abse kavitesi içindeki püy su moleküllerinde kısıtlanmış difüzyon oluşturur. Kistik-nekrotik tümörlerde ise artmış difüzyon izlenir.

- MR spektroskopi kistik-nekrotik beyin tümörü ve abse ayrımında faydalıdır. Abse kavitesinin MR spektroskopisinde artmış asetat, süksinat ve amiositler izlenir.

Brain abscess and necrotic brain tumor: discrimination with proton MR spectroscopy and diffusion-weighted imaging.
Lai PH, Ho JT, Chen WL, Hsu SS, Wang JS, Pan HB, Yang CF.
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Teşekkürler