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Case Report

Brain Abscess Developing in a Non-Operated Spontaneous Intracerebral Haemorrhage: A Case Report and Literature Review

Ameliyat Edilmemiş Spontan İntraserebral Hemorajide Gelişen Beyin Apsesi: Bir Olgu Sunumu ve Literatürün Gözden Geçirilmesi

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ABSTRACT

Brain abscesses are a rare but potentially lethal neurological lesions, generally occurring after septic episodes in immunodeficient patients or complicating neurosurgical procedures. Even though they are known complications of surgically treated intracerebral haemorrhages (ICH), the presence of a brain abscess at the site of an untreated ICH is a rare event. Such cases may result from haematogenous spread from distant foci or contiguous sites and are often preceded by episodes of sepsis and local infection. Immunodeficiency, AIDS, age, diabetes mellitus and vitamin-K deficiency are predisposing factors. Abscess formation should be considered in case of clinical deterioration, headache, and any neurological deficit after febrile episodes. Early diagnosis with neuroradiological imaging, infection blood markers and microbiological identification of the causative pathogen is crucial for treatment with surgical drainage or excision and specific antibiotic therapy, which guarantee good outcome and long-term survival. In fact, while prompt diagnosis and treatment guarantee good outcome and long-term survival, morbidity and mortality are very high in case of misdiagnosis. We report a case of a 49-year old man presenting with a brain abscess 13 weeks after a spontaneous ICH, without previous episodes of sepsis and with a suspected septic arthritis 2 weeks after abscess drainage.

KEYWORDS: Brain abscess, Intracerebral haemorrhage, Stroke

ÖZ

Beyin apseleri genellikle immün yetmezlikli hastalarda septik episodlar sonrasında gelişen veya nöroşirürji işlemlerinin komplikasyonları olarak görülen nadir ama ölümcül olabilen nörolojik lezyonlardır. Cerrahi olarak tedavi edilen intraserebral hemorajilerin bilinen komplikasyonları olsalar da tedavi edilmemiş bir intraserebral hemoraji bölgesinde bir beyin apsesi bulunması nadir bir durumdur. Bu tür olgular uzak odaklardan veya komşu bölgelerden hematojen yayılmanın sonucu olabilir ve sıklıkla öncelerinde sepsis ve yerel enfeksiyon episodları görülür. İmmünyetmezlik, AIDS, yaş, diabetes mellitus ve K vitamini eksikliği predispozan faktörlerdir. Apse oluşumu febril episodlardan sonra herhangi bir nörolojik defisit, başağrısı ve klinik durumda bozulma durumunda dikkate alınmalıdır. Nöroradyolojik testler, enfeksiyon kan işaretleri ve neden olan patojenin mikrobiyolojik olarak tanımlanması uzun dönemli iyi prognoz ve uzun dönemli sağkalımı garanti edecek şekilde cerrahi drenaj veya eksizyon ve spesifik antibiyotik tedavisiyle tedavi amacıyla erken tanı için şarttır. Hatta erken tanı ve tedavi iyi prognoz ve uzun dönemli sağkalımı garanti ederken yanlış tanı durumunda morbidite ve mortalite çok yüksektir. Daha önce sepsis episodu olmadan, spontan intraserebral kanamadan 13 hafta sonra beyin apsesiyle gelen ve apse drenajından 2 hafta sonra septik artrit durumundan şüphelenilen 49 yaşında bir erkek hastayı sunuyoruz.

ANAHTAR SÖZCÜKLER: Beyin apsesi, İntraserebral hemoraji, İnme

INTRODUCTION

Brain abscesses are serious infections of brain parenchyma, requiring prompt surgical drainage and high-dose antibiotic therapy, affecting 1/10000 patients in developed countries (1). Mortality rate is 0-15%, although it can increase up to 80% due to incorrect diagnosis (7,8,17). Common sources of infection include contiguous sites (sinusitis, otitis, dental infection, cranial trauma) or haematogenous spread from distant foci (infectious endocarditis, right-to-left-shunt heart disease, pneumonia, sepsis, urinary infections) (13,17). 40 % of the cases remain cryptogenic (14), partly because of incomplete diagnosis. Immunodeficiency, AIDS (17), vitamin K deficiency (8), age, diabetes mellitus (7) are predisposing factors. Unlike extra-axial empyemas, fever is not a common presenting sign. On the other hand, signs of increased intracranial pressure (headache, nausea and vomiting, drowsiness, confusion) are the most frequent initial symptoms of cerebral parenchymal abscesses followed by seizures, motor/sensory deficits, and

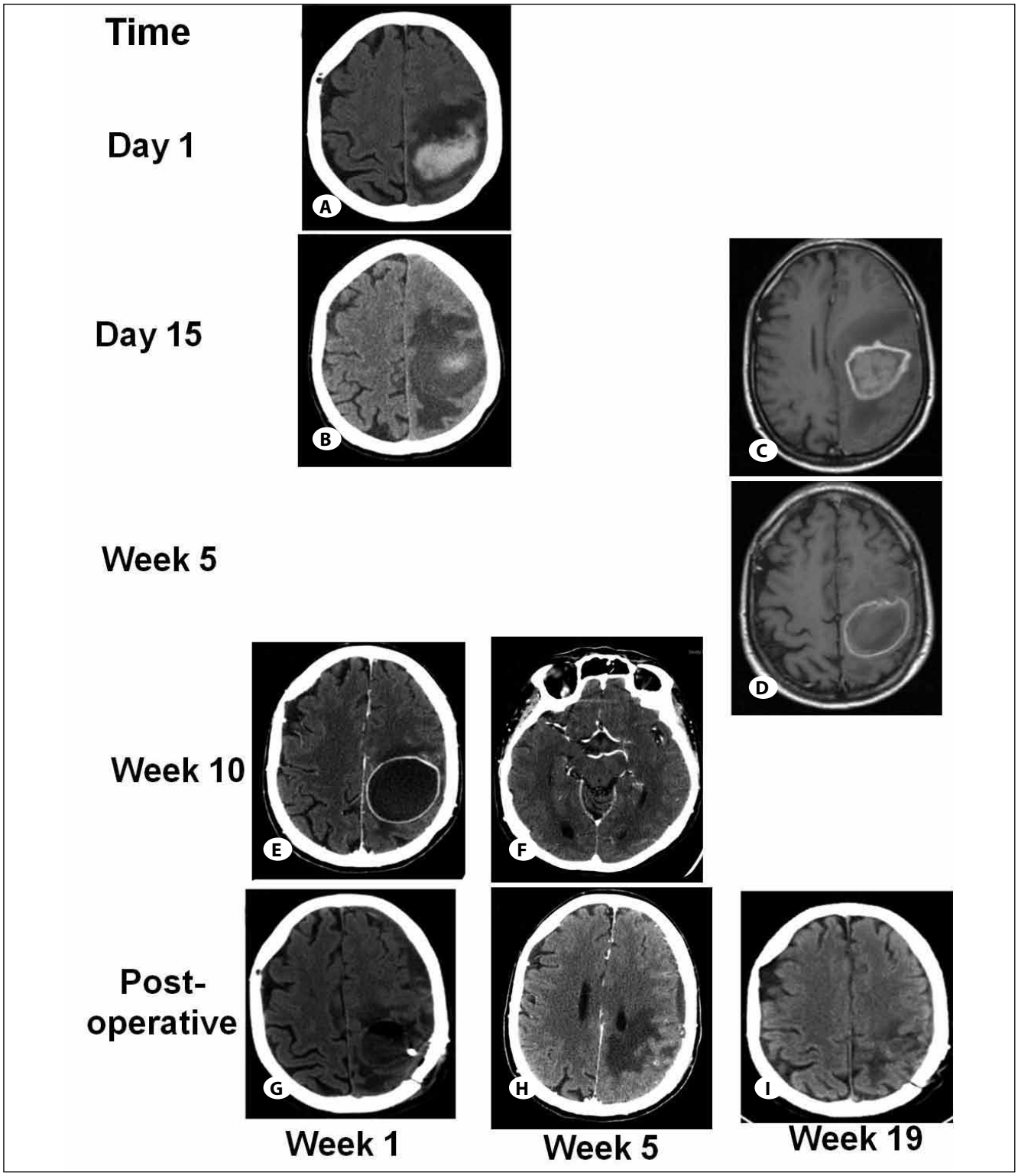

Figure 1: A) Head-CT showing an ICH in the left parietal lobe; **B)** Head-CT showing an initial volume reduction of haemorrhage and **C)** T1W MRI image with contrast illustrating signs suspected for an early phase of brain abscess at the site of the previous ICH at 2 weeks; **D)** T1W MRI image with contrast five weeks after ICH, showing cystic mass at the site of the ICH; **E)** and **F)** Head CT-angiogram with contrast ten weeks after the ICH, showing cystic lesion with thick wall exerting mass effect on brain parenchyma and no vascular malformation; **G)** Head-CT one week after surgery, showing partial reduction of the abscess and the intracavitary catheter; **H)** Head-CT with contrast five weeks after surgery and **I)** Head CT nineteen weeks after surgery, showing progressive resolution of the abscess and the mass effect.

speech disorders (30-50%) (9). 30% of the patients who survive after the treatment of a brain abscess are left with neurological deficits or seizures (15). Brain abscesses after surgically treated intracerebral haemorrhages (ICHs) are intuitively possible. However, brain abscesses at the site of previously untreated ICHs are rare. We report a case and literature review.

CASE REPORT

A 49-year-old man with mild hypertension and Hodgkin lymphoma (Stage II) successfully treated with radio- and chemotherapy five years before, suffered from a sudden onset of headache, right-side weakness, and dysarthria. After admission, head Computed Tomography (CT) showed a left parietal spontaneous ICH (Figure 1A) with no midline shift nor signs of increased ICP; therefore, the haematoma was conservatively treated. The patient's neurological conditions gradually improved. On the 15th inpatient day, right hemiparesis and speech disturbance worsened; he developed fever (38.5°C). Neuroradiological imaging showed signs of initial volume reduction of the hemorrhage (Figure 1B) and signs suspected for an early phase of brain abscess in the same region (Figure 1C). Gram's stain and blood cultures were negative for microbiological pathogens. Fever was treated with antipyretics and resolved within days. High-dose corticosteroids were given to treat neurological deficits that improved. Five weeks later, Head Magnetic Resonance Imaging (MRI) showed a cystic lesion at the site of the previous ICH (Figure 1D). Ten weeks after the ICH, motor and speech deficits worsened again; the patient was hospitalised. Clinical examination revealed right hemiparesis and mild dysarthria. Blood pressure was 130/80 mmHg, body temperature 37°C, WBC 13.20x10^9/l, Segmented neutrophils 87.4%, Lymphocytes 8.1%, ESR 104 mm, CRP 121.0 mg/l. Head-CT displayed a 51x47 mm hypodense cystic lesion, exerting significant pressure on brain parenchyma and causing midline shift, surrounded by a thick contrast-enhancing capsule and mild edema. Head-CT angiogram with contrast excluded AVM/aneurysms (Figure 1E-F). A left parietal mini-craniotomy was performed with the evidence of a well-defined lesion with an elastic wall, containing yellowish viscous fluid mixed with old clots. After irrigating the cavity with 0.9% saline solution, a Codman®-Bactiseal® catheter was placed inside the cyst. Methicillin-sensitive *Staphylococcus aureus* (MMSA) was isolated and IV Oxacillin was given for seven weeks. Blood cultures from peripheral blood were negative, whereas subcutaneous port central venous catheter system (for e.v. chemotherapy) showed positivity for MMSA. Echocardiogram, chest x-ray, and fundus oculi examination were negative, while lower limbs color Doppler ultrasound showed deep vein thrombosis on both legs. On this basis, subcutaneous Enoxaparin therapy was started. Hematologic values returned within reference range and post-operative head-CT with contrast (Figure 1G) showed partial abscess drainage. 10 days after surgery right knee swelling appeared. Ultrasonography showed abundant supra-patellar fluid collection with unstructured hyperechogenic material. Arthrocentesis microbiological exam was negative and cytochemical exam revealed fibrous deposit of neutrophils. On the 12th post-operative day the patient complained of lumbar pain. Spine MRI with contrast documented an osteoporotic-traumatic vertebral collapse with cuneiform deformation of the L1 body. A contrast-enhancing lesion lateral to the spinous process of L2 and to the left articular processes of L2 and L3, suggestive of an inflammatory area, were also detected. Analgesic therapy and an orthotic brace were successfully applied. Head-CT with contrast at five weeks (Figure 1H) showed abscess absorption and resolution of mass effect. Neurological deficits gradually improved and the patient was eventually discharged. Oral Levofloxacin 750 mg/day and Rifampicin 600 mg/day was given for fifteen weeks. At nineteen weeks (Figure 1I) abscess was completely resolved; the patient presented no dysarthria and only mild right leg weakness.

DISCUSSION

Only 19 cases of brain abscess at the site of previously untreated ICHs have been reported in literature (Table I) (1-8, 10-19). Spontaneous ICHs are predominant in the basal ganglia and cause damage to the blood-brain barrier. Since systemic infections may easily reach such well-vascularised sites by haematogenous spread, spontaneous cerebral abscess are predominant in deeper areas rather than in cortical areas of brain parenchyma (11/18 cases in which abscess location was reported). In our case, however, ICH was in the left parietal lobe and it was not apparently anticipated by sepsis: the abscess etiology may have left cryptogenic (no endocarditis, lung infection nor chorioretinitis detected). Further exams, however, demonstrated MMSA positivity and flogistic signs in the right knee (leukocyte sediment without microbiological positivity in the synovial fluid, as effect of systemic antibiotic therapy) and the lumbar spine. Our patient's clinical history probably started with a focal infection (septic arthritis) that caused sepsis and eventually the brain abscess because of BBB damage due to the ICH.

Looking at previous reports, both G+ and G- are responsible pathogens of brain abscesses; cutaneous and respiratory airways bacteria are predominant. Staphylococcus genus is the most commonly responsible pathogen (found in 50% of the cases where the pathogen was identified). It is a genus of facultative anaerobic G+ cocci commonly found on the skin and in the upper respiratory airways. Other common G+ or G- bacteria commonly present in respiratory airways or the intestinal tract like Streptococci (2 cases), Enterococcus faecalis (2 cases), Klebsiella (1 case) and Morganella morganii (1 case) have also been reported. Takeuchi et al. reported a case of brain abscess caused by Stenotrophomonas maltophilia, an aerobic non-fermentative G- bacterium common usually causing nosocomial infections in immunocompromised patients in which prostetic devices are used (urinary catheters, endotracheal or tracheostomy tubes, central venous catethers) (19). In four cases it was not possible to identify the causing pathogen.

Sepsis anticipated the occurrence of cerebral abscess in 7 cases, pneumonia in 3, while urinary infection and flebitis

Table I: Reported Cases of Cerebral Abscess at the Site of Former ICHs

Author,Year	Age / Sex	ICH site	Time to abscess formation after ICH (weeks)	First febrile episode after ICH (days)	Treatment	Origin of infection	Pathogen	Outcome	Resolution time (weeks)
Busse[5], 1981	45/M	R putamen	8	9	Drainage	Sepsis	Unidentified		
Biller[3-4], 1985	62/M	R frontal	>2	0	Excision	Infected wound of carotid	*Staphylococcus aureus*		
	34/F	R basal ganglia	4	10	Drainage	Infected episiotomy	*Staphylococcus epidermidis and alfa-heamolitic Streptococcus*		
Kurihara[12],1989	53/M	R putamen	20	8	Drainage	Phlebitis	*Staphylococcus*	Positive	
Lee[13], 1994	64/M	R putamen	4	7	3 months antibiotics +drainage; external ventricular drainage+ antibiotics	Sepsis	*Streptococcus*	Post-operative extension, then resolution	11
Iida[10], 1994	71/M	Cerebellum	3	14	Drainage	Pneumonia	*Staphylococcus aureus*		
Chen[6], 1995	56/F	L putamen	5	4	6 weeks antibiotics, then drainage+8 weeks antibiotics	Sepsis	*Klebsiella*	Positive	8
Bert[2], 1995	42/F	L temporoparietal	8	4	Drainage+excision	Phlebitis	*Staphylococcus aureus*		
Sumioka[18],1995	55/M	R putamen	8	<14	Drainage	Unknown	*Morganella morganii*	Positive	
Okami[16], 2000	51/M	L thalamus	12	None	Drainage+antibiotics	Sepsis	*Staphylococcus aureus*	Positive	
Amayo[1], 2002	66/M	L basal ganglia	4	0	Drainage	Pneumonia	Unidentified		
Inamasu[11],2002	48/M	R putamen	4	3	Drainage	Pneumonia	*Enterococcus faecalis*		
Nowak[15], 2003	58/M	L thalamus	9	55	6 weeks antibiotics	Catheter induces sepsis	*Staphylococcus aureus*	Partially positive	6
Nakai[14], 2006	75/M	R temporo-parietal	4	21	Drainage+4 weeks antibiotics	Unknown	*G+ coccus*	Positive	7
	32/M	R occipital	3	0	Excision+2 weeks antibiotics	Sepsis	Unidentified	Positive	3
Siatouni[17], 2007	79/M	L parietal	1	10	Drainage+antibiotics	Urinary infection	*Enterococcus faecalis*	Positive	6
Takeuchi[19], 2007	>70					Cerebral amiloid angiopathy	*Stenotrophomonas maltophilia*		
Eser[8], 2008	45 dd	R fronto-temporo-parietal	0	0	Excision+antibiotics	Staphylococcus aureus bacteraemia	Unidentified	Positive	5
Dashti[7], 2008	30/F	L basal ganglia	4	0	Excision+VP-shunt+8 weeks antibiotics	ACA and MCA vasculitis	*Citrobacter koseri*	Positive	8
Present case, 2012	49/M	L parietal	8	15	Drainage+5 weeks IV antibiotics+15 weeks oral antibiotics	Unknown	*Staphylococcus aureus*	Positive	19

was the origin of infection 1 patient, respectively. Cerebral amyloid angiopathy and vasculitis were detected in two cases before abscess formation.

Immunodeficiency definitely represents a predisposing factor for brain abscess. Our patient had an oncologic history and was treated with radio- and chemotherapy. Moreover, when his neurological deficits worsened, he was initially treated with long term high-dose corticosteroids.

Analysing the literature, a first febrile episode is generally reported within 15 days and neurological deterioration 25-90 days after ICH. Time to abscess formation after ICH is 0-20 weeks. During initial stages of infection, headache and focal neurological deficits are not always present. Our patient showed no signs of increased ICP, headache nor seizures.

Surgical treatment with intra- and perioperative antibiotic prophylaxis showed good results. Five cases required total abscess excision, probably because of the thick consistence of the cystic capsule, while Nowak et al. reported the use of only systemic antibiotics (15). In our opinion, however, pure medical management should be considered only for patients with multiple brain abscesses, small lesions or poor surgical candidates, as outlined by Greenberg (9). In fact we believe that surgical drainage followed by systemic antibiotic therapy (initially broad spectrum, then pathogen-targeted) has the highest rate of success for the treatment of this condition. Reported abscess resolution time was 3 (Nakai et al. (14)) to 19 weeks (our case), as confirmed by the laboratory tests, neuroradiological evidences and clinical follow-up.

Systemic infections in patients with recent cerebrovascular accidents should be scrupulously investigated and immediately treated. Broad-spectrum antibiotics prophylaxis must be considered in patients with predisposition to infection and brain abscess formation.

CONCLUSIONS

Brain abscesses are rare complications of previously untreated intracerebral haemorrhages (ICHs), often anticipated by sepsis or local infections. Abscess formation should be considered in cases of clinical deterioration with or without febrile episodes after an ICH. Neuroradiological imaging and laboratory tests are crucial for early diagnosis and treatment of this potentially life-threatening condition. Surgical drainage and antibiotic therapy are in our opinion the best treatment option for this pathological condition.

REFERENCES

1. Amayo EO, Kwasa TO, Musau CK, Mugo N, Wambani J: Primary intracerebral haemorrhage complicated by cerebral abscess: Case report. East Afr Med J 79:163–164, 2002
2. Bert F, Maubec E, Gardye C, Branger C, Lambert-Zechovsky N: Staphylococcal brain abscess following haematogenous seeding of an intracerebral haematoma. Eur J Microbiol Infect Dis 14:366–367, 1995
3. Biller J, Adams Jr P, Godersky JC, Johnson R: Preeclampsia complicated by cerebral hemorrhage and brain abscess. J Neurol 232: 378–380, 1985
4. Biller J, Baker WH, Quinn JP, Shea JF: Intracranial haematoma with subsequent brain abscess after carotid endarterectomy. Surg Neurol 23:605–608, 1985
5. Busse O, Grumme T, Agnoli AL: Abszebildung nach zerebraler Massenblutung und ischamischen infarkt. Akt Neurol 8: 69–72, 1981
6. Chen ST, Tang LM, Ro LS: Brain abscess as a complication of stroke. Stroke 26:696–698, 1995
7. Dashti SR, Baharvahdat H, Sauvageau E, Chang SW, Stiefel MF, Park MS, Spetzler RF, Bambakidis NC: Brain abscess formation at the site of intracerebral hemorrhage secondary to central nervous system vasculitis. Neurosurg Focus 24:E12, 2008
8. Eser O, Cosar M, Aslan A, Koken R, Aktepe F, Eser B: Intracerebral hematoma complicated with brain abscess in an infant. Case report. Neurol Med Chir (Tokyo) 48:176-178,2008
9. Greenberg MS: Cerebral abscess. Subdural empyema. In: Greenberg MS (ed), Handbook of Neurosurgery, Sixth ed. New York: Thieme, 2006:217-224
10. Iida J, Takemura K: A brain abscess following a cerebellar hemorrhage: A case report. Jpn J Neurosurg 3:65–68, 1994
11. Inamasu J, Kagami H, Nakamura Y, Saito R, Niimi M, Ichikizaki K: Brain abscess developing at the site of preceding intracerebral haemorrhage. J Neurol 249: 221–223,2002
12. Kurihara H, Mitsui T, Kohno N. Brain abscess following intracerebral haematoma. No Shinkei Geka 17:1037–1040, 1989
13. Lee KS, Bae WK, Bae HG, Doh JW, Yun IG: Brain abscess from a ganglionic hemorrhage - a case report. J Korean Med Sci 9(3):259-263, 1994
14. Nakai K, Yamamoto T, Yasuda S, Matsumura A: Brain abscess following intracerebral haemorrhage. J Clin Neurosci 13:1047-1051, 2006
15. Nowak DA, Rodiek SO, Topka H: Pyogenic brain abscess following haematogenous seeding of a thalamic haemorrhage. Neuroradiology 45:157–159, 2003
16. Okami N, Kawamata T, Sasahara A, Yamasato M, Kawamura H: Brain abscess following thalamic haemorrhage: A case report. No Shinkei Geka 28:275–279, 2000
17. Siatouni A, Mpouras T, Boviatsis EJ, Gatzonis S, Stefanatou M, Sakas D: Brain abscess following intracerebral haemorrhage. J Clin Neurosci 14:986-989, 2007
18. Sumioka S, Kajikawa H, Yamamura K, Furuse M, Kajikawa M, Pant B: Putaminal abscess occurring at the site of haemorrhage: A case report. No Shinkei Geka 24:859–863, 1995
19. Takeuchi H, Fujita T, Ebisu T, Mineura K: Primary intracerebral hemorrhage due to probable cerebral amyloid angiopathy complicated by brain abscess: Case report. No Shinkei Geka 35(5):489-493, 2007