THE HEMORRHAGIC COMPLICATION OF A CEREBRAL ABSCESS, DIAGNOSTIC DIFFICULTIES AND TREATMENT. CASE REPORT

FLORENTINA CRISTINA PLEŞA[1], CARMEN ADELLA SÎRBU[2], CRISTIAN NĂSTASE[3], CĂTĂLIN CONSTANTIN LULCIUC[4], MAGDALENA DIACONU[5], MONICA MARILENA ŢÂNŢU[6]

[1,2,3,4]"Carol Davila" Central Military University Emergency Hospital Bucharest, [5]University of Medicine and Pharmacy Craiova, [6]Piteşti University

Keywords: *cerebral abscess, focal neurological deficits, blood pathway, Enterococcus, anticoagulant*

Abstract: *Cerebral abscess is an infection of the central nervous system (CNS) that occurs through the dissemination of the pathogen agent from an infection situated nearby or from a distant source (travelling by blood pathway). Patients usually have nonspecific neurological manifestations, with unpredictable and sometimes fatal consequences. The occurrence of the hemorrhage in the cerebral abscess is a rare complication that raises issues regarding the differential diagnosis and treatment, especially in patients whose anticoagulant therapy for associated pathology cannot be interrupted. The current case is that of a man who has a metallic valvular prosthesis situated in mitral position and who has previously had sepsis. He is being administrated an overdose of oral anticoagulant treatment; he also has a motor neurological deficit and sudden partial epileptic seizures. Computer tomography (CT) examination of the brain revealed two hyperdense areas (right parietal and left frontal) which generated discussions regarding positive diagnosis: cerebral hemorrhage by overdosing the anticoagulant, cerebral secondary determinations or brain abscesses. Imagistic re-evaluations associated with the disease evolution, persistent inflammatory syndrome and fever have imposed a neurosurgical intervention. The pathological examination and the cultures taken from the cerebral abscess have confirmed Enterococcus as etiological agent of cerebral abscess. The optimal anticoagulation treatment in maintaining the cardiac valvular function has been a challenge, given the hemorrhagic complications of the abscess and the surgical intervention.*

INTRODUCTION

Cerebral abscess is a localized infection of the CNS with a wide ethiology, (bacterial, mycotic or parasitic) and it usually occurs within an immunodeficient organism. In about 15% of the cases, the pathogen agent is not identified (cryptogenic).(1)

Microbial dissemination at cerebral level occurs from a local-regional infection (45-50%) (more frequently in the otorhinolaryngology sphere – otitis, otomastoiditis or sinusitis (2,3) or dental infections. In 10% of the cases, the abscess occurs post-traumatically, whereas in 45-50% of the patients, dissemination travels through blood from a remote outbreak.

Pathogenically speaking, the infection of the cerebral parenchyma takes place in 4 successive steps. During the first 3 days, it is to be noticed the occurrence of the perivascular focal inflammation (early cerebritis) (4), the accumulation of polymorphonuclear neutrophils with initial necrosis and the occurrence of the cerebral edema. In the next 4-9 days, the central necrosis expands with the participation of macrophages and lymphocytic infiltration (late cerebritis).

The formation of the capsular sheath through the development of fibroblasts and newly-formed blood vessels takes place 10 or 14 days later (it resembles a peripheral ring on the CT scanner examination).(5) The last phase is characterized by the destruction of the healthy cerebral tissue surrounding the infectious centre through the breakage of the capsule.

Clinically, it has non-specific neurological symptoms: headaches or focus neurological signs which may vary according to location: motor deficiencies (paresis or paralysis with walking problems) (6), disorders of consciousness or epileptic seizures (up to 25% of all cases).(7) Further on, other signs of infection (fever, leukocytosis) may occur when blood dissemination takes place.(8)

The lesional diagnosis is established radiologically and the etiological diagnosis is obtained through microbiological examination. Radiologically, cerebral CT with contrast substance represents the routine investigation, whereas cerebral nuclear magnetic resonance (NMR) with diffusion is recommended for the differentiation from the primary cerebral tumours. Blood and cerebrospinal fluid (CSF) cultures can identify the etiological agent in almost 25% of all cases.(9) CSF cultures have great importance when meningitis is associated.(10) Stereotactic puncture is essential when the pathologic agent has not been identified.

The differential diagnosis is made between neurological diseases (primary and secondary brain tumours, strokes, venous thrombosis, epilepsy, migraines etc.) and infectious ones (encephalitis, meningitis). Regarding HIV positive patients, we can take into account primary cerebral lymphoma or cerebral toxoplasmosis.

The complications of the cerebral abscess can be:

- hydrocephalus with brain herniation risk and alteration of consciousness, associated with high mortality (up to 85%) (11), if a breakage in the ventricular cavity occurs.
- epileptic focal seizures due to the perilesional edema and abscess expansion, up to epileptic status and coma.

[1]Corresponding author: Florentina Cristina Pleşa, Str. Cuza Vodă, Nr. 103B, Sector 4, Bucureşti, România, E-mail: plesacristina@yahoo.com, Phone: +40722 412028

Article received on 12.07.2015 and accepted for publication on 23.11.2015
ACTA MEDICA TRANSILVANICA December 2015;20(4):90-93

- abscess hemorrhage.
- severe meningitis.
- abscess recurrence.

The treatment of the cerebral abscess is very complex and needs multidisciplinary implication and involvement at etiological level, symptomatic level and complication level. Specific antibiotic therapy (12) with wide-spectrum initially administered and the drainage of the abscess are essential. Stereotactic neurosurgery has the purpose of reducing large abscesses along with a diagnostic one. In case of hydrocephalus, the intracranial shunt plays great role in CSF draining, in monitoring biological and intracranial pressure and in intraventricular antimicrobial treatment.(13)

Treatment with glucocorticoids is indicated for almost 50% of the patients, especially for those in advanced stages who have profound lesions, with increased risk of cerebral hernia (14) and surgical contraindication. Personal symptomatic treatment is associated with elective therapy (antipyretics, analgesics, anticonvulsants). The prognosis of the patients diagnosed with cerebral abscess was a lot improved due to modern radiological techniques, complex therapeutic formulas and the development of minimally invasive surgical techniques, resulting in a significant decrease in mortality and disability.

CASE REPORT

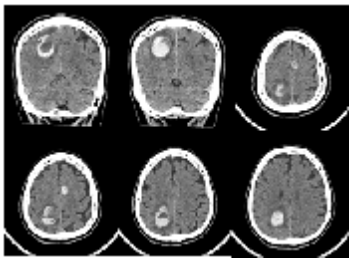
Our case is that of a male patient, aged 65, who has a cardiovascular risk factor (smoker, hypertensive), with a metallic valve prosthesis for his severe mitral insufficiency (March 2014), with chronic anticoagulant treatment administered orally, admitted in emergency room for headaches, dizziness, a crural paresis motor deficit predominantly left which occurred suddenly 3 days before admission and then aggravated progressively. Right after admission he suffered multiple and repeated motor focal seizures in the left half of his body.

From his personal pathologic history (PPH), it is to be noticed: urinary sepsis with Enterococcus in April 2014 (one month after heart-surgery) for which he was admitted in the infectious diseases' ward and has had a favourable evolution since then.

Objectively, the patient had an altered general status, afebrile without any burning in his nuchal region, predominantly crural left hemiparesis, (upper limb proximal right = 5/5, distal = 4/5, lower limb right proximal = 3/5, distal = 4/5), left pyramidal syndrome, left hemihypoesthesia, dysarthria, anxiety, being respiratory, digestively and cardiovascularly balanced.

Native cerebral CT performed at admission showed multiple hyperdense lesions situated in the left fronto-parietal, subcortical, right frontal, right cortical and parietal subcortical areas. The right area has a well delimited aspect, with significant perilesional edema and intralesional liquid level.

Figure no. 1. Picture of native cerebral CT at admission: multiple spontaneously hyper-dense lesions, the right parietal one with fluid-fluid level, perilesional digitiform edema



The neurosurgical examination (on the 22nd of October 2014) rises the suspicion of cerebral-metastatic syndrome and recommends further investigations in order to establish the etiology of the cerebral lesion, the patient not having a surgical indication at admission time.

In order to establish etiological diagnosis of cerebral lesions, we considered the following: multiple cerebral hemorrhages through an overdose of oral anticoagulant (high international normalised ratio (INR), hypertensive patient), secondary cerebral determinations and septic-emboli disseminations or multiple cerebral abscesses with intralesional bleeding (regarding the sepsis from the medical history).

Biological tests were performed along with interclinical consults:

- usual blood tests: high INR= 4.65 – overdose of acenocumarol)
- urine and blood culture: sterile
- tumour markers for the investigation of cerebral metastatic syndrome: within normal limits
- HIV, VDRL = negative
- ECG – sinus rhythm
- cardio- pulmonary radiography: without any pleural-pulmonary lesions.

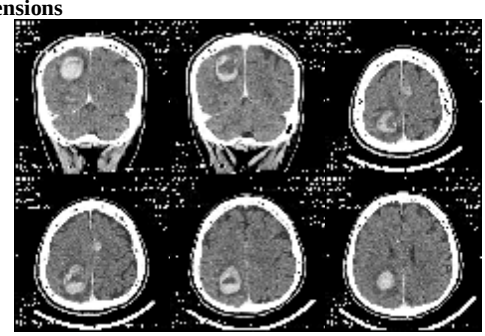
The internal diseases exam recommends investigations regarding a suspicion of a neoplastic disease. Native abdomen and thorax CT and with contrast are performed not revealing any suggestive lesions for tumour pathology. There has also been recommended a CSF exam (biochemistry, cellularity, cultures). Initial lumbar puncture was performed showing hypotensive CSF, slightly xanthochromatic, with 1 element/mm^3, a slightly increased amount of proteins, a normal amount of glucose. The CSF cultures were sterile.

The cardiologic exam along with cardiac echography, which reveals functional mitral valve recommends anticoagulant treatment (intravenous continuous heparin with constant monitoring of the APTT (activated thromboplastin time)=1,5-2 or the witness) in order to maintain the functionality of the mechanical valve situated in a mitral position, thus reducing hemorrhagic risk.

The cardiac transesophageal echography did not point out any specific modifications of endocarditis.

24 hours later, a contrast CT exam was performed again – the aspect of the lesions being the same, with a slight increase in dimension for the right parietal lesion which failed to capture the contrast substance.

Figure no. 2. Picture of cerebral CT with contrast substance: right parietal lesion and perilesional edema with increased dimensions

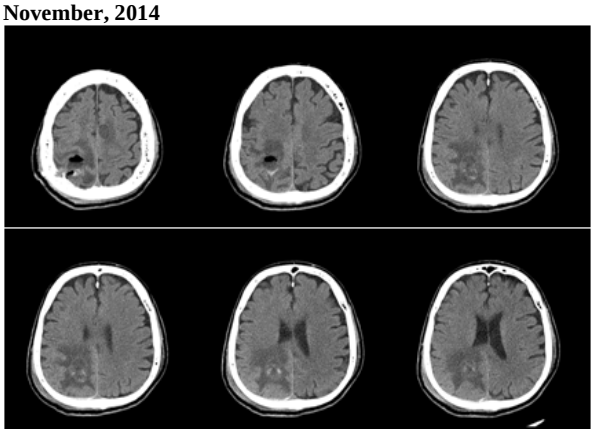


Ever since admission, the patient has received cerebral antiedematous treatment, analgesic, anticonvulsive, wide-spectrum antibiotic and anticoagulant treatment. After a lumbar puncture was performed, the non-fractioned heparin continuous treatment was re-established with the monitoring of the APTT

(holding it up to 1.5-2 times higher than the witness) followed by an oral anticoagulant. Initially, the clinical evolution was slightly favourable with little improvement of the focal deficits (left motor and sensitivity problems at this level without any motor seizures). A week later, the patient presents an aggravation of his general status and motor deficit, consistent with the progression of the lesions seen on the cerebral CT scan.

He is transferred to the neurosurgical ward and an emergency intervention is performed in order to evacuate the right parietal intraparenchymal hematoma through stereotactic aspiration on the 4th of November 2014 with immediate favourable postoperative evolution. The cultures from the collected material after aspiration were negative.

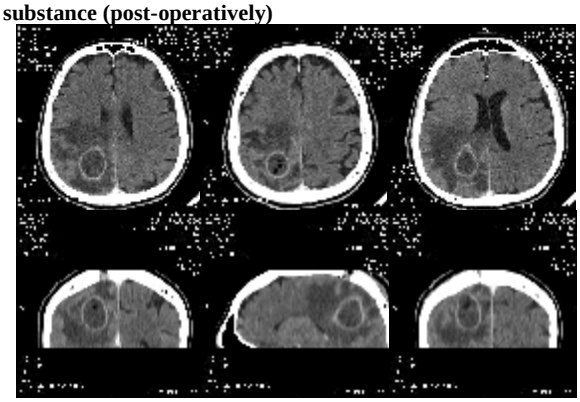
Figure no. 3. Post-operative native cerebral CT – 4th, November, 2014



Next, the evolution was trained, clinically and biologically, with the occurrence of some cardiologic complications (angina, rhythm disorders) wide variations in his coagulogram (INR). It proved to be difficult to maintain a therapeutic optimal post-operative INR.

The cerebral radiologic exams were repeated after the surgery and they showed a right parietal tumour formation with increased perilesional edema, which had captured the contrast substance in the periphery assembling cerebral abscess.

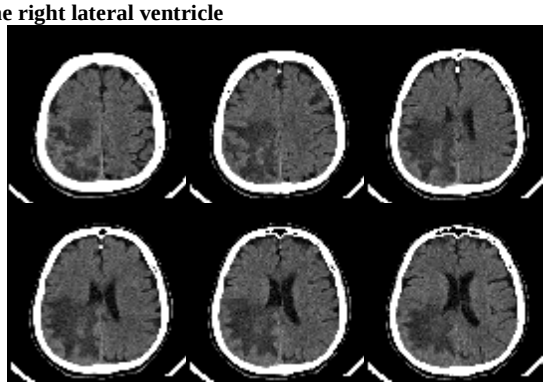
Figure no. 4. Native cerebral CT and with contrast substance (post-operatively)



Post contrast – hypo-dense area, heterogeneous, with net outline, intensely iodophile wall and digitiform edema with mass effect.

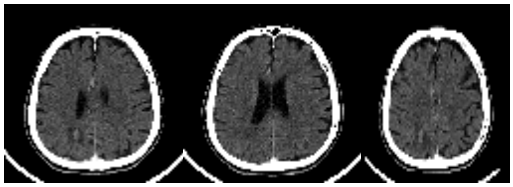
Another surgery was performed on the 5th of December 2014, resulting in the evacuation of the right parietal purulent collection. Cultures were collected from the evacuated material and Enterococcus was found. Antibiotic treatment was administered according to DST.

Figure no. 5. Native brain CT image with contrast substance – post-operative check-up (15th December, 2014) - large heterogeneous hypo-dense area situated right parietally-occipitally (brain abscess after surgery) with mass effect on the right lateral ventricle



Clinical evolution was slowly favourable. The patient followed a physical therapy programme which helped him overcome his left motor deficit almost completely.

Figure no. 6. Routine brain CT



Routine ultrasound check-up 2 months postoperatively showed an important reduction of the lesion with minimal perilesional edema.

Clinical assessment did not reveal any motor deficit, any seizures, the patient being independent, with preserved cardiac function under therapy.

The patient is still in our records and will be monitored clinically and radiologically every 6-12 months.

DISCUSSIONS AND CONCLUSIONS

Even though cerebral abscess is unique, in this case, its multiple placements imply blood dissemination of etiologic agent, hypothesis sustained by the patient's previous pathology (cardiac surgery and sepsis).

In literature, the lesions of blood disseminated cerebral abscess are more frequently multiple and are located in the order of incidence in the frontal, temporal, parietal, occipital lobes (study from 2007) (15), aspect highlighted in this case as well.

Blood dissemination is more frequent in patients with cardiac diseases, endocarditis, pulmonary and abdominal-pelvic infections, those who have previously suffered an organ transplant, neutropenia, HIV infection or after the administration of injection drugs.(16)

The patient's age along with the associated pathology have raised problems regarding the differential diagnosis. The multiple investigations and the interdisciplinary consultations have had an important contribution to establishing the accurate final diagnosis. The presence of the metallic mitral valve limited the usage of brain imaging through NRM, an important investigation in establishing the lesional degree and the differential diagnosis. The imagistic aspect in the pathologic context of this patient initially induced the conservatory treatment as recommended in guidelines, but the unfavourable evolution led to a surgical approach.

The presence of associated multiple pathology with

strict therapeutic indications made the therapeutic approach for the abscess very difficult. In our patient's case, who has a metallic prosthetic in mitral position, maintaining an optimal anticoagulant regimen was essential with minimal incidence of valvular thromboses and systemic embolisms and the risk of a hemorrhagic event was very small.(17) This way, though the optimal INR for metallic mitral prosthetics is 3, 5 (18), the hemorrhagic complications of this type of abscess and the necessity of a surgical intervention have personalized the anticoagulant treatment with frequent cardiac monitoring.

The occurrence of remote neurologic manifestations after urinary sepsis, the negative bacterial result after stereotactic lesional puncture, overdose with oral anticoagulant and hemorrhagic appearance of multiple brain lesions were features that delayed and hampered the accurate diagnosis. Careful monitoring of the clinical evolution correlated with evolutionary imaging changes that required neurosurgical intervention after which etiologic diagnosis was established, supported by targeted antibiotic therapy resulted in healing the patient.

REFERENCES

1. Mathisen GE, Johnson JP. Brain abces. Clin Infect Dis. Octombrie. 1997;25(4):763-79.[Medline]
2. Brook I. Microbiologie și tratament antimicrobian complicațiilor orbitale și intracraniene ale sinuzitei la copii și gestionarea lor. Int J Pediatr Otorhinolaryngol. Septembrie. 2009;73(9):1183-6.[Medline]
3. Glickstein JS, Chandra RK, Thompson JW. Complicații intracraniene ale sinuzitei la copii și adolescenți.Otolaryngol șef Neck Surg. Mai 2006;134(5):733-6.[Medline]
4. Britt RH, Enzmann DR, Yeager AS. Neuropathological and computerized tomographic findings in experimental brain abscess. J Neurosurg. 1981;55:590-603.
5. Rath TJ, Hughes M, M Arabi, Shah GV. Imaging de cerebritis, encefalita, și abces cerebral. Neuroimagistice Clin N Am. Noiembrie. 2012;22(4):585-607.[Medline]
6. Shaw MD, Russell JA. Cerebellar abscess: a review of 47 cases. J Neurol Neurosurg Psychiatry. 1975;38:429-435.
7. Brouwer MC, Coutinho JM, van de Beek D. Clinical characteristics and outcome of brain abscess: systematic review and meta-analysis. Neurology. 2014;82:806-813
8. Ferreyra MC , Chavarria ER , Ponieman DA , Olavegogeascoechea PA . Silent brain abscess in patients with infective endocarditis. Mayo Clin Proc 2013;88:422-423
9. Brouwer MC , Coutinho JM , van de Beek D . Clinical characteristics and outcome of brain abscess: systematic review and meta-analysis. Neurology 2014;82:806-813.
10. Jim KK, Brouwer MC, van der Ende A, van de Beek D. Cerebral abscesses in patients with bacterial meningitis. J Infect. 2012;64:236-238.
11. Chuang MJ, Chang WN, Chang HW, et al. Predictors and long-term outcome of seizures after bacterial brain abscess. J Neurol Neurosurg Psychiatry. 2010;81:913-917.
12. Lonsdale DO, Udy AA, Roberts JA, Lipman J. antibacterian de monitorizare medicament terapeutic în lichidul cefalorahidian: dificultate în realizarea concentrații adecvate de medicament. J. Neurosurg. Februarie 2013;118(2):297-301.[Medline]
13. van de Beek D, Drake JM, Tunkel AR. Nosocomial bacterial meningitis. N Engl J Med. 2010;362:146-154.
14. Rath TJ, Hughes M, M Arabi, Shah GV. Imaging de cerebritis, encefalita, și abces cerebral. Neuroimagistice Clin N Am. Noiembrie 2012;22 (4):585-607.[Medline]
15. Carpenter J, Stapleton S, Holliman R. Analiză retrospectivă a 49 de cazuri de abces cerebral și revizuire a literaturii. Eur J Clin Microbiol Infect Dis. Ianuarie 2007;26:1-11.[Medline]
16. Tunkel AR, Pradhan SK. Infecții ale sistemului nervos central, în utilizatorii de droguri injectabile. Infect Dis Clin North Am. Septembrie 2002;16(3):589-605.[Medline]
17. Magda-Marion DW. Moderate Hypothermia in severe head injuries:the present and the future in Current opinion in Criticale Care. 2002;8:111-114.
18. Hagau MN. Bolnavul cardiac în chirurgia noncardiacă. Probleme de Anestezie și Terapie Intensivă, Editura Medicală Universitară Iuliu Haţieganu, Cluj-Napoca; 2003. p. 95,97,100,109.