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Clinical Case Study of a Surgically Treated Patient for Multiple Brain Abscesses

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Abstract: With a higher incidence in developing countries, mainly affecting males, in a ratio of 3: 1 (men: women), brain abscesses are purulent collections encapsulated or not encapsulated in the brain parenchyma, which may have as a source, the hematogenous pathway, by contiguity or by direct trauma. Risk factors are lung abscesses, arterio-venous fistulas, immunodeficiency, chronic sinusitis / otitis or dental procedures. Most patients with bacterial brain abscess require surgical treatment for optimal therapy. The two available procedures are aspiration of the abscess after the placement of the burr holes or complete excision after craniotomy. A clinical case study was performed on a 22-year-old patient, hospitalized and treated surgically for multiple brain abscesses, in the Neurosurgery Clinic of the County Emergency Hospital, Constanta. The patient is known with chronic maxillo-ethmoido-sphenoidal sinusitis with multiple hospitalizations on the ORL department, for surgical evacuation of purulent secretions, transferring to our clinic after highlighting an interhemispheric subdural empyema and right parieto-occipital brain abscess, visible on MRI contrasting of brain. Surgery is performed, by right temporo-parietal craniotomy and evacuation of the purulent collection, the post-operative evolution being clinically and imagistically favorable, after adjuvant antibiotic therapy with Meronem, Vancomycin and Metronidazole.

Keywords: abcess; abcess surgery; inflammatory samples

Introduction

Brain abscess is a focal, intracerebral infection that begins as a localized area of cerebritis and develops into a collection of pus surrounded by a well-vascularized capsule.

Brain abscess is one of the most serious complications of head and neck infections. Estimates reveal the incidence of brain abscess to be approximately 0.4 to 0.9 cases per 100,000 population, with higher rates in immunocompromised patients (Klein, Pfister, Tunkel, et al., 2014, pp. 522–549; Brouwer, Tunkel, McKhann et. al., 2014; pp. 447–456).

In most pediatric and adult series, a male predominance exists (ratio of 2: 1 to 3: 1) with a median age of 30 to 40 years, although the age distribution varies depending on the predisposing condition leading to the formation of brain abscess. When the abscess is related to a focus in the paranasal sinuses, most

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patients are 10 to 30 years of age; when the abscess is from an otitic focus, patients are younger than 20 or older than 40 years (Brouwer, Tunkel, McKhann et. al., 2014; pp. 447–456).

The most common pathogenic mechanism of brain abscess formation is spread from a contiguous focus of infection, most often in the middle ear, mastoid cells, or paranasal sinuses. Brain abscess occurring secondary to otitis media is usually localized to the temporal lobe or the cerebellum. Compared with earlier reports, more recent series have shown a decrease in the number of cases secondary to otitis media and an increase in cases after neurosurgery and trauma.

A second mechanism of brain abscess formation is hematogenous dissemination to the brain from a distant focus of infection. These abscesses are usually multiple and multiloculated, and they have a higher mortality rate than abscesses that arise secondary to contiguous foci of infection.2 The most common sources of initial infection in adults are chronic pyogenic lung diseases, especially lung abscess, bronchiectasis, empyema, and cystic fibrosis. Trauma is a third pathogenic mechanism in the development of brain abscess. Brain abscess occurs secondary to an open cranial fracture with dural breach or as a result of neurosurgery or a foreign-body injury (Brouwer, Tunkel, McKhann et. al., 2014; pp. 447–456; Xiao, Tseng, Teng et al., 2005, pp. 442–450).

Streptococci (aerobic, anaerobic, and microaerophilic) are the bacteria most commonly cultured from patients with bacterial brain abscess, and they are frequently isolated in mixed infections (30%–60% of cases) (Mathisen & Johnson, 1997, pp. 763–781; Prasad, Mishra, Gupta et al., 2006, pp. 221–227).

The clinical course of brain abscess ranges from indolent to fulminant. A most clinical manifestations are not due to the systemic signs of infection, but rather to the size and location of a space-occupying lesion within the brain and the virulence of the infecting microorganism. Headache is the most common presenting symptom and is observed in 70% to 75% of patients. The headache may be moderate to severe and hemicranial or generalized, but it lacks particularly distinguishing features, accounting for frequent delays in diagnosis. Sudden worsening of the headache, accompanied by a new onset of meningismus, may signify rupture of the abscess into the ventricular space (Zeidman, Geisler & Olivi, 199, pp. 189–193).

The classic triad of headache, fever, and focal neurologic deficit is present in only about 20% of patients with brain abscess on admission (Sonneville, Ruimy, Benzonana et al. 2017, pp. 614–620).

CT has revolutionized the diagnosis of brain abscess. Before the advent of CT, delays in diagnosis contributed significantly to the high morbidity and mortality in patients with brain abscess. The characteristic CT appearance of brain abscess is a hypodense center with a peripheral uniform ring enhancement after the injection of contrast material; this is surrounded by a variable hypodense area of brain edema (Marder & Fink, 2014, pp. 24–47).

As the abscess progresses, contrast enhancement is observed.

Magnetic resonance imaging (MRI) is now the first imaging choice in the evaluation of a patient with suspected brain abscess. MRI is more sensitive than CT and offers significant advantages in the early detection of cerebritis, including greater contrast between cerebral edema and adjacent brain, more conspicuous spread of inflammation into the ventricles and subarachnoid space, and earlier detection of satellite lesions

The empirical approach to antimicrobial therapy for bacterial brain abscess should take into account the frequency of isolation of certain organisms. When the infecting pathogen is isolated, antimicrobial agents can be modified for optimal therapy. The antimicrobial agents used to treat bacterial brain abscess

should be able to penetrate into the abscess cavity and should have in vitro activity against the pathogens isolated.

Most patients with bacterial brain abscess require surgical management for optimal therapy. The two procedures available are aspiration of the abscess after bur hole placement and complete excision after craniotomy (Lu, Chang & Lui, 2006, pp. 979–985; Chun, Johnson, Hofstetter et al., 1986, pp. 415–431).

Complete excision by craniotomy is now infrequently performed because of the development of aspiration and closed drainage techniques described previously, but it may be required in patients with multiloculated abscesses (for whom aspiration techniques have failed), abscesses containing gas, or abscesses that fail to resolve (Lu, Chang & Lui, 2006, pp. 979–985).

Case Report

A 22-year-old patient, known with maxillo-ethmoido-sphenoidal sinusitis, with multiple hospitalizations in the ORL department for surgical evacuation of purulent collections, is transferred to the neurosurgery department after performing a contrast-enhanced cerebral MRI examination that shows subdural empyema. interhemispheric and right parieto-occipital brain abscess (figure 1, 2,3).

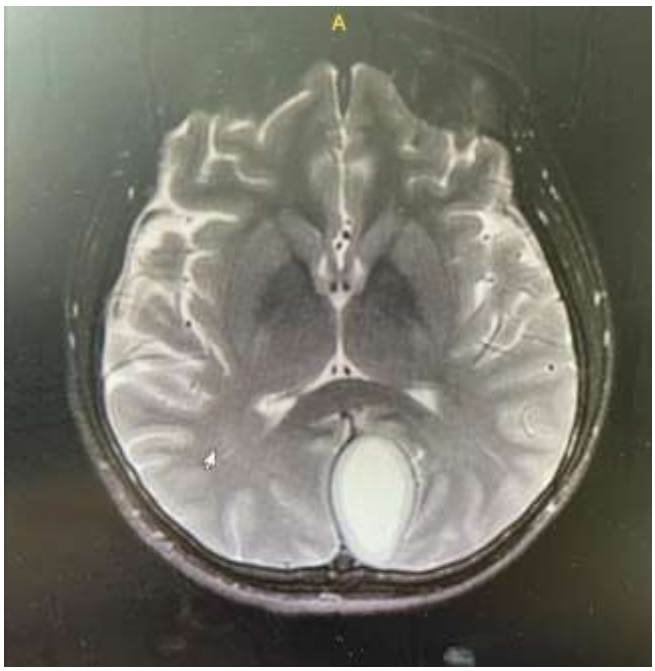

Figure 1. Cerebral MRI with Contrast Substance, Axial View, Left Parieto-Occipital Abscess

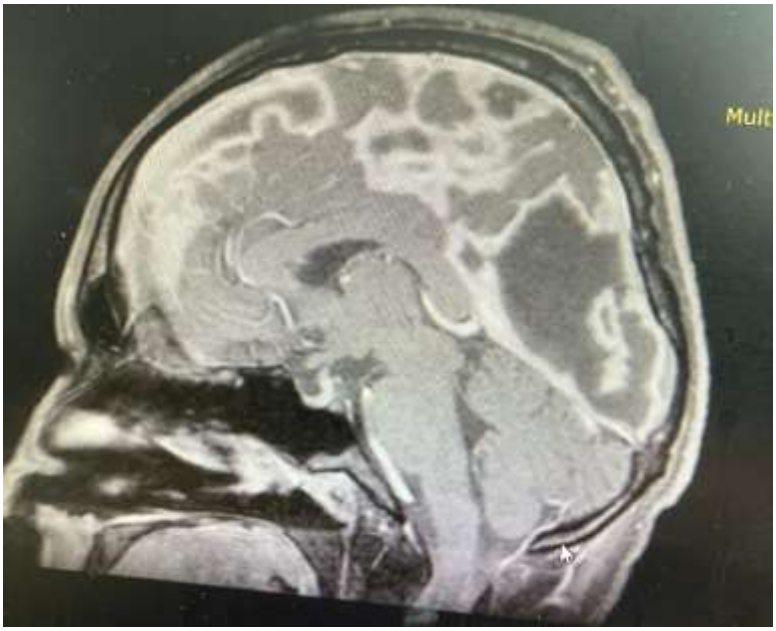

Figure 2. Cerebral MRI with Contrast Substance, Sagittal View, Multiple Parafalciform Abscesses

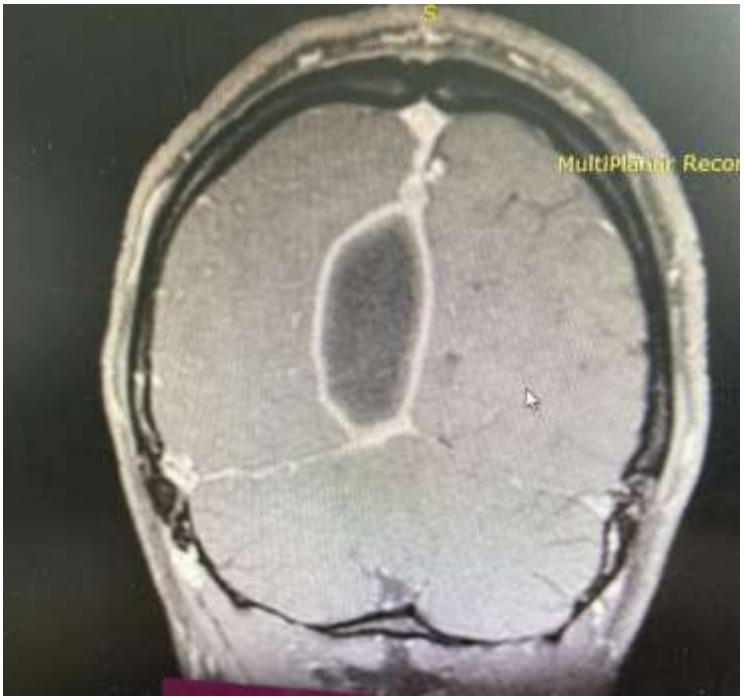

Figure 3. Cerebral MRI with Contrast Substance, Coronal View, Right Pararafalciform Abscess

Clinically, the patient is conscious, cooperative, temporo-spatially oriented, GCS = 15, no signs of meningeal irritation, no neurological deficits, bilateral symmetrical ROT (+), bilateral RCP-in flexion, with moderate occipital headache, vomiting and moderate fever (38.8 C).

Biologically, at hospitalization, the patient presents leukocytosis (19000 elements), with neutrophilia (12000 elements), moderate anemia (Hb = 10.4 g / dl), thrombocytosis (466 thousand elements), non-specific positive inflammatory markers (ESR = 42 mm / h, fibrinogen = 500 mg / dl), PCR = 5.6 mg / dl.

Examination of brain MRI, with contrast substance, reveals: hypointense fluid accumulation with right parieto-occipital peripheral gadophilia extending to the 43/30/26 mm brainstem and multiple accumulations to the brainstem with dimensions from 3mm to 26 mm (fig 1,2,3)

An immunochemistry test for HIV 1 + 2 is performed, refuting the suspicion of purulent collection favored by immunodeficiency given by the HIV virus.

Triple therapy with Meronem (1g / 8 hours), Vancomycin (1g / 12 hours) and Metronidazole (250 mg / 6 hours) is instituted preoperatively and continued postoperatively at the same dose.

Surgery is performed by right parieto-occipital craniectomy with the evacuation of the right parieto-occipital encapsulated purulent collection with the removal of purulent material in order to examine the culture + antibiogram followed by abundant lavage and bone replacement

Postoperatively, the clinical and paraclinical evolution are favorable, with the continuation of the triple antibiotic therapy and the daily bandage of the operatory wound.

Clinically, the headache is in remission, vomiting and fever remitted (t = 37 C)

The culture of purulent secretions does not show any pathogen, being sterile.

Biological samples normalize: leukocytes = 8400 elements, ESR = 15 mm / hour, fibrinogen = 380 mg / dl, PCR = 0.45 mg / dl, moderate anemia is maintained, Hb = 11 g / dl and thrombocytosis = 525 thousand elements.

When performing the craniocerebral CT examination with contrast, control substance, at 7 days postoperatively the resolution of interhemispheric, parafalciform extranevraxial accumulation and postoperative changes is observed in the form of a supratentorial intranevraxial hypodensity, without right parieto-occipital contrast (fig 4,5,6)

The surgical wound has a good evolution, after daily bandage and suppression of sutures.

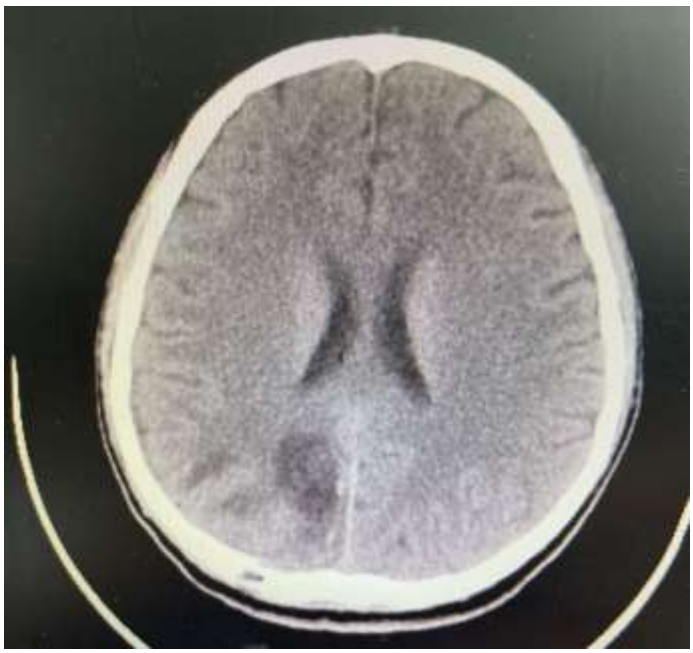

Figure 4. Cerebral CT scan, postoperatively, axial view

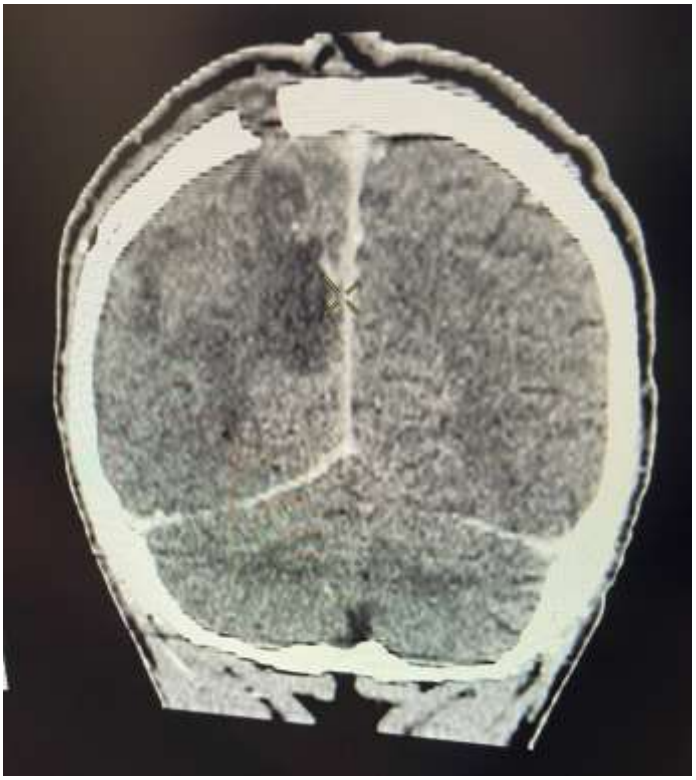

Figure 5. Cerebral CT Scan, Postoperatively, Coronal View

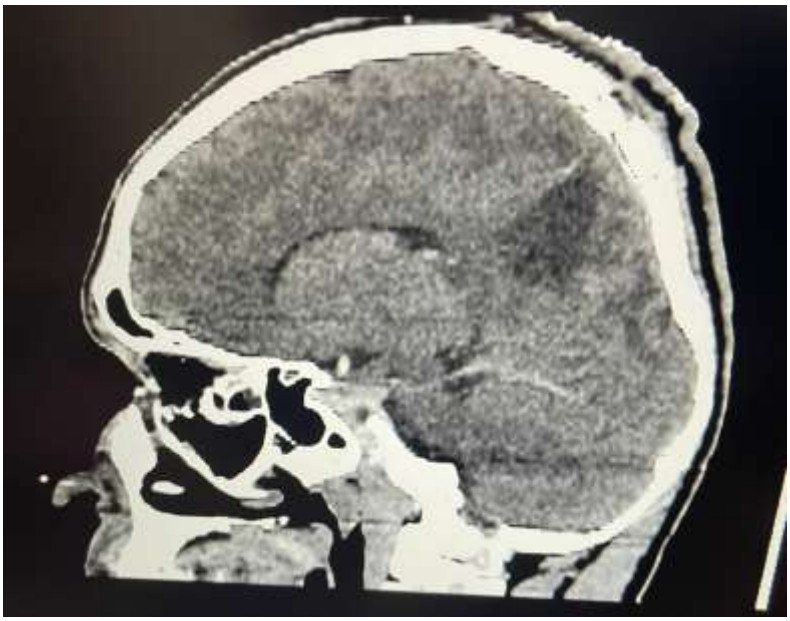

Figure 6. Cerebral CT Scan, Postoperatively, Sagittal View

Discussion

Estimates reveal the incidence of brain abscess to be approximately 0.4 to 0.9 cases per 100,000 population, with higher rates in immunocompromised patients (Mathisen & Johnson, 1997, pp. 763–781; Xiao, Tseng, Teng et al., 2005, pp. 442–450).

In most pediatric and adult series, a male predominance exists (ratio of 2: 1 to 3: 1) with a median age of 30 to 40 years, when the abscess is related to a focus in the paranasal sinuses, although the age distribution varies depending on the predisposing condition leading to the formation of brain abscess (Bennett, Dolin & Blaser, 2020).

Chronic maxillary-ethmoid-sphenoidal sinusitis has played an important role in the appearance of purulent intracerebral and extranevraxial collections, parafalciform, by contiguity, this being the main mechanism of occurrence of brain abscesses.

Although among the most common symptoms in brain abscesses are mental status changes (28-91%), focal neurological deficits (20-66%), nuchal rigidity (5-52%), the patient presents, at admission, only headache (49 -97%), fever (32-79%) and nausea and vomiting (27-85%) (Xiao, Tseng, Teng et al., 2005, pp. 442–450).

The clinical presentation varies depending on the size and location of the abscess, although the abscess has considerable dimensions (46/30/20 mm), due to the parieto-occipital location, this is a poor symptomatology unlike patients with a frontal lobe abscess often present with headache, drowsiness, inattention, deterioration of mental state, hemiparesis with unilateral motor signs and a motor speech disorder. The clinical presentation of cerebellar abscesses includes ataxia, nystagmus, vomiting, and asymmetry. Temporal lobe abscesses can cause ipsilateral headache and aphasia if the lesion is dominant. hemisphere; a visual field defect (for example, a superior homonymous quadrantopia) may be the only present sign of a temporal lobe abscess. Cerebral abscesses are usually manifested by facial weakness, fever, headache, hemiparesis, dysphagia and vomiting (Bennett, Dolin & Blaser, 2020).

Empirical therapy with triple antibiotic therapy was continued postoperatively, as cultures of purulent secretion did not show any pathogens, in 25% of cases they were sterile (Prasad, Mishra, Gupta et al., 2006, pp. 221–227).

In sinusitis abscesses, the most common pathogen found is streptococcus.

The surgical options are aspiration of the abscess after bur hole placement and complete excision after craniotomy, opting for craniotomy with complete excision of the abscess and aspiration of parafalciform accumulations, with very good post-operative results.

Conclusions:

The mechanism of brain abscess formation was contiguous to the infectious focus in the sinuses of the face.

The poverty of the symptoms was due both to the size of the abscess, with the absence of marked compression and to its location.

In the absence of highlighting a germ on the culture medium from the purulent collection, the wide-spectrum antibiotic treatment is continued, which gives very good results.

The choice of the surgical procedure by craniotomy and the complete excision of the cerebral abscess has good results, with the resolution of the purulent collection, on the control tomography of the control and the remission of the algic symptomatology and of the febrile syndrome.

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