CASE REPORT

A cerebral abscess at first internist glance

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SUMMARY

A 73-year-old man was transferred to the neurosurgery ward, with a presumptive diagnosis of cerebral abscess. The case was also discussed with the internists as internal medicine consultants. The neurosurgeons pointed out a right temporal lobe abscedated lesion on CT, but we noticed that the hypodense attenuation that usually surrounds the abscess wall (*vasogenic oedema*) extended to a broader, well-delimited area, suggesting medium cerebral artery territory. The patient had left-sided hemiplegia with a confusional state and low-grade fever. Considering possible haematogenous dissemination, an echocardiography was performed, confirming mitral endocarditis. Blood cultures and aspirated pus isolated *Escherichia coli*. Investigating the patient's medical history, we learned he had been submitted to bladder catheterisation 7 weeks before for acute urinary retention due to benign prostatic hyperplasia, and empirically medicated for urinary tract infection. *E. coli* had also been isolated in a urine specimen at the time. The clinical history of the patient cancelled the pathogenesis of cerebral abscess.

BACKGROUND

Haematogenous cerebral *Escherichia coli* abscess is rare in adults. Brain abscess is a focal pus collection within the brain parenchyma, and the consequence of several infectious processes and agents. Clinical presentation tends to be non-specific, resulting in frequent diagnostic delay and, consequently, poorer prognosis. Although contiguous infection accounts for the majority of cases, haematogenous dissemination should always be considered, especially in situations where the clinical picture is not clear. Radiological and microbiological examinations give

important clues about the aetiology of brain abscesses. Cerebral abscess and endocarditis can be serious complications of common and apparently innocent infections. Complicated urinary tract infections (UTIs) need to be treated aggressively as they can disseminate to cause potentially fatal results. In this setting, important bacteraemia can arise even with minor procedures.

CASE PRESENTATION

A 73-year-old man was transferred from another hospital to our neurosurgery ward, with the suspicion of a cerebral abscess. Our team of consultant internists was included in the initial evaluation of the patient. While the neurosurgeons focused on the abscedated mass and its attendant medical and surgical approaches, we emphasised that the CT scan showed a hypodensity attenuation surrounding not only the abscess wall, but also extending to a well-delimited area suggestive of medium cerebral artery (MCA) territory. We wondered if this could be the result of a previous underlying ischaemic event, and not simply perilesional oedema. The neuroradiology expert confirmed the following findings: presence of a nucleobasal rounded lesion with mass effect; a multiloculated nucleobasal mass with a well-defined wall evidenced by radiocontrast; surrounding hypodense area not corresponding to the usual perilesional vasogenic oedema, but defining a well-delimited vascular territory of the right MCA, raising the hypothesis of an ischaemic event; and discrete haemorrhagic cortical densities superimposed to the ischaemic area (figure 1A–C).

Physical examination was remarkable for the presence of left-sided hemiplegia, a confusional state and low-grade fever. There were no signs of

Figure 1 (A) Parenchymal hypodensity of the right medium cerebral artery territory (A) with cortical haemorrhagic densities superimposed in the ischaemic area (→). (B) Nucleobasal rounded lesion with mass effect. (C) Multiloculated aspect of the mass with well-defined walls enhanced by radiological contrast.

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Figure 2 Vegetation of the anterior mitral valve leaflet (⇒).

sinus ear mastoid or odontogenic infection, meningeal irritation, skin lesions or heart murmurs. No other relevant findings were evident.

INVESTIGATIONS

Blood analysis revealed: normocytic normochromic anaemia (haemoglobin 11.2 g/L), leucocytosis $16.4 \times 10^9/\text{L}$ with 87% neutrophils, platelets $540 \times 10^9/\text{L}$, C reactive protein 78 mg/L (ref: <5), creatinine 1.0 mg/dL, glycated haemoglobin 5.5%, sodium 135 mEq/L, potassium 3.7 mEq/L, aspartate aminotransferase 37 U/L, alkaline phosphatase 93 U/L, total bilirubin 0.9 mg/dL, lactate dehydrogenase 256 U/L and serology for HIV negative. ECG showed: sinus rhythm, heart rate 98 bpm and left bundle branch block. A decubitus anteroposterior chest radiograph produced normal findings.

Considering possible haematogenous dissemination, an echocardiography was performed revealing endocarditis of the anterior mitral leaflet (figure 2). Blood cultures (3) and a diagnostic/therapeutic abscess aspiration were performed, with isolation of *E. coli* in all the biological samples.

In the face of these results, we decided to ascertain the patient's clinical history by contacting the referring hospital. Seven weeks prior, the patient had been admitted to the emergency department due to acute urinary retention, fever and perineal pain. A bladder indwelling catheter was inserted and urine sample collected for examination and culture; the urinary

sediment showed no significant signs of infection but still ciprofloxacin was empirically prescribed for a hypothetical prostatitis. Renal ultrasonography at the time excluded urinary tract obstruction. Two weeks later, the patient was admitted with acute left hemiplegia, and the CT scan revealed 'acute ischaemic infarction of the MCA territory with spontaneous hyperdensity of this artery, corresponding to an endoluminal thrombus' (figure 3A, B). *E. coli* was isolated in the urine sample collected 2 weeks earlier at the emergency department; the antibiogram was identical to the blood and abscess isolates performed at our hospital, including sensitivity to second and third generation cephalosporins.

TREATMENT

Two CT-guided therapeutic needle aspirations were performed and intravenous antibiotics were empirically started—ceftriaxone 2 g 12/12 h and metronidazole 500 mg 6/6 h. We maintained these antimicrobials after sensitivity test results were known. Although there was radiological improvement, the patient's neurological deficits and confusional state persisted. Two weeks after starting treatment, he was transferred to the referring hospital to be close to his family.

DISCUSSION

Brain abscesses can be caused by several different conditions. Only a minority of cases result from direct trauma or neurosurgery. Approximately 40% of cases result from contiguous spread, including direct extension from infections of the paranasal sinuses, middle ear, mastoid cells and teeth.¹ Osteomyelitis with subsequent inflammation of the leptomeninges, or septic thrombophlebitis of the intracranial vessels, are the main physiopathological mechanisms.² Around one-third of cases are metastatic, resulting from haematogenous spread in the context of endocarditis or a primary septic focus in the lungs or pleura. Intrapulmonary right-to-left shunting in patients with arteriovenous malformations (Osler-Weber-Rendu syndrome)³ and cyanotic congenital heart diseases can also be complicated by cerebral abscess, accounting for a minority of these cases. In about 20–40%, the source cannot be ascertained.⁴

Brain abscesses associated with bacteraemia usually result in multiple abscesses, which are commonly located in the distribution of the MCA.⁵ In our patient, the presence of an abscedated lesion with a surrounding hypodensity corresponding exactly to the MCA territory made us suspect endocarditis as the possible source of septic embolism. Endocarditis is seldom caused by Gram-negative bacteria such as *E. coli* and *Klebsiella pneumoniae*, as these microorganisms adhere less readily to heart valves than they do to Gram-positive pathogens.⁶ Also, the most frequent causes of brain abscesses are viridans streptococci and *Staphylococcus aureus*.⁷ Considering these facts, the microbiological isolation of *E. coli* in blood as well as in cerebral abscess cultures provided us with a clue about the primary site of infection and a potential undiagnosed underlying condition. When contacting the referring hospital, we obtained some revealing information that enlightened us, as follows:

- ▶ A UTI, eventually complicated with prostatitis, had been diagnosed 7 weeks earlier. The urine culture had isolated the same pathogen as had our microbiological examinations: *E. coli*.
- ▶ Bladder catheterisation at that time would have been the initiating event leading to bacteraemia and haematogenous spread of *E. coli*.
- ▶ A septic embolus originating from an endocarditis focus was responsible for the ischaemic MCA stroke 2 weeks later.

Figure 3 (A) Right medium cerebral artery (MCA) acute ischaemic infarction. (B) Right MCA spontaneous hyperdensity corresponding to an endoluminal thrombus (→).

Endocardial seeding of this Gram-negative bacteria may have been facilitated by an eventual age-associated degenerative heart valve disease.

- ▶ Secondary cerebral abscedation developed in the ischaemic MCA territory. This corresponds to the lesions detected in the CT scan presented to us 5 weeks later.

Learning points

- ▶ Noticing subtle semiological signs (in this case, a CT scan finding) can modify the global sequence of the clinical reasoning.
- ▶ Physicians should correlate facts and search for global explanations in their daily practice. We expect internists to do this proficiently as part of their expertise in the art of approaching the patient.
- ▶ When there is no evidence of contiguous/direct spread, one should consider haematogenous dissemination among the possible aetiologies of cerebral abscesses, namely endocarditis.
- ▶ The increasing frequency of endocarditis in the elderly runs parallel with the prevalence of degenerative valve disease in this age group. In this context, bacteraemia can easily lead to valvular bacterial seeding.
- ▶ Urinary tract infection (UTI) in an elderly man with urinary retention makes it a complicated UTI and not a simple infection. Such infection should be treated aggressively and the end point of treatment should be met by repeating urine culture after the treatment regime is thought to be complete. In elderly male patients, infections such as prostatitis and other complicated UTIs, can result in potentially fatal dissemination. Invasive procedures in this setting are of particular concern.

Successful management of brain abscesses usually requires a combination of antibiotics and some form of surgical drainage for diagnostic as well as therapeutic purposes.^{8,9} We performed two CT-guided abscess needle aspirations, and ceftriaxone plus metronidazole was the empirical antibiotic regimen chosen for this patient. Although ceftriaxone would cover the haematogenous-spread of *E. coli*, we decided to maintain metronidazole, as anaerobes are frequent co-infectious microorganisms in cerebral abscesses.

This case illustrates the importance of collecting *data* in search for a global explanation, which can reveal less obvious facts from the previous history and modify the future treatment approach.

Competing interests None declared.

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